

REPORT OF THE CHIEF OF ENGINEERS
HEADQUARTERS CORPS OF ENGINEERS
Washington October 21 1867

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The following reports were also submitted namely :
On the improvement of Kalamazoo river Michigan on the 13th of February 1867

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26 SURVEY OF SAUGATUCK HARBOR, MOUTH OF KALAMAZOO RIVER MICHIGAN

A report upon the capacity of this harbor and plan of improvement are given in appendix.

The engineer in charge states that it will be seen by reference to this report and map that the residents of that locality have expended their means freely in improving the entrance. The plan adopted by the residents is to confine the waters of the river by parallel piers built of slabs having a direction S 83 W.

The engineer in charge recommends the continuance of this improvement so as to make this a harbor of refuge. To do this these piers should be extended until a depth of 12 feet of water is reached and the waterway between the piers should be dredged to the same depth. The piers should be built of cribs, ballasted with stone, and the tops of the present piers should be removed to the surface of the water, and a crib superstructure, filled with stone placed thereon.

The estimated cost is \$202,295.80 required for the next fiscal year \$67,500. The project is approved.

(See Appendix A 27.)

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Accompanying this report are the following maps and tracings, made up separate package viz:

- 1 Map of Racine reef on scale of 1/9600
- 2 Tracing of Racine reef on scale of 1/5000
- 3 Tracing of Racine reef on scale of 1/3600
- 4 Tracing of entrance to harbor of Racine on scale of 1/3600
- 5 Tracing of harbor of Saugatuck Kalamazoo river on scale of 1/4800**
- 6 Tracing of mouth of Menominee river Green bay on scale of 1/4800

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In compliance with your orders of July 3, (1867) I proceeded with a leadsman and chainmen to the mouth of Kalamazoo river to make a survey of that place for the purpose of making estimates for its improvement. We reached that place on the evening of the 6th and commenced the survey the following morning completing it on the 13th of July, and left immediately for Milwaukee, Wisconsin reporting at this office on the 14th the following day.

The amount of work performed during these six days is as follows, viz:

Number of triangulation stations built and occupied	19
Number of sounding stations built	45
Number of buoys placed out and located	20

Number of casts of lead made	2,858
Number of lines of soundings made	217
Number of miles of soundings made	25.5
Number of theodolite horizontal angles measured	367
Number of vertical angles measured for topography	51
Number of theodolite readings taken and recorded	512
Number of miles measured with the stadia instrument	9.25
Number of miles of shore line run and sketched.	3.75
Number of observations made to determine true meridian.	2
Number of compass readings taken to ascertain the variations	24

The work of computing and plotting the notes of this survey was done at the office in July, and the map has been projected in pencil on a scale of one inch to two hundred feet; a tracing of it has also been made to accompany your annual report .

The field notes of the survey made in July of Kalamazoo river have all been plotted on a scale of one inch to two hundred feet and a tracing of this map made to accompany your report.

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A 27

Report and estimates on Kalamazoo river

This river takes its rise in the southern part of Michigan and after a circuitous course of about three hundred miles empties into Lake Michigan about midway between Grand Haven and St Joseph. During its course several falls of considerable extent occur furnishing a number of water powers of respectable capacity and thus inducing a large amount of manufacturing which will largely increase as the country grows older. The last and largest of these falls is at Allegan a town of nearly three thousand inhabitants twenty five miles by land and fifty miles by river from Lake Michigan. Previous to settlement the entire country traversed by it was densely covered with forests of pine and hard wood. The first settlement made in the country which bears the same name as the town was about 1830. The town was commenced a few years later about 1835. The first business entered upon was the manufacture of lumber and for several years those engaged in it were blessed with prosperity. The financial crisis of 1837 swept over them and fair prospects received a sudden and discouraging blow resulting in the suppression of operations by nearly all the mills.

About 1843 business began to revive and Allegan has since had a comparatively prosperous career Its chief growth however has been within the last years. The volume of water in the river is quite large, and at Allegan a fall of nine feet giving a very valuable power. This has already been and each year adds to the number of manufacturing establishments manufacture of pine lumber is being somewhat superseded by that of hard which finds a ready market at home and in Chicago.

The town of Allegan has a post office, two churches, two hotels, a large school house, nineteen dry goods, hardware, groceries, drug, and crockery stores, one banking house, and three flouring mills, with a capacity of 1,200 bushels per day. These mills find an ample supply of wheat in the surrounding country without importing and their flour except custom work is shipped to Chicago about 300 barrels are forwarded weekly.

The presence of large tracts of the finest hard wood timber of various kinds in Allegan county has induced parties to give considerable attention to ship building; since 1862 they have built two propellers, two river steamers, two tugs, two schooners, and seven lumber barges at a total cost of \$177,500.

The connection from Allegan to the mouth of the river is made by a daily line of river boats; leaving Allegan in the morning, a ride of six or seven hours brings you to the thriving villages of Saugatuck and Douglas, situated on either side of Kalamazoo lake, a beautiful inland sheet of water, six miles in length and one and a half mile in width and about three miles from the outlet of the river in Lake Michigan. The larger of these is Saugatuck, situated on the north side of the river and contains a population of over one thousand inhabitants. The chief business is the manufacture of lumber in various ways the supply of logs being derived from the pineries along the river between this place and Allegan, and the country back. Saugatuck has a post office, two churches, two hotels, sixteen stores, eight saw mills, one tannery, and a large school house, just completed at a cost of \$10,000. it occupies a beautiful situation overlooking Kalamazoo lake and is a credit to the young village.

Douglas is situated on the south side of the lake; its population is about six or seven hundred inhabitants; it has two steam saw mills and a large tannery, which turns out about 10,000 hides annually.

Singapore a small village of two or three hundred inhabitants is situated about one mile from the mouth of the river, on the north bank; has two steam saw mills, two stores, and a few dwellings.

Besides the various branches of business enumerated above, there are numerous manufactories of furniture, wagons, &c., which find at the extensive water power on the river a congenial field for operations, and when means of transportation are permanently insured they will largely increase.

One of the great sources of wealth for the country bordering on the lake in this part of Michigan will be, and in fact now is, the fruit crop. The sandy soil and lake breezes seem particularly fitted for nourishing fruit trees more especially the peach; already large orchards abound and fruit men are every year investing capital and enlarging the business.

The amount of business done on the river has through the kindness of Mr F. B. Stockbridge been furnished me. It contains a full statement of the amount of lumber, shingles, &c., manufactured at all the points on the river and shipped to Chicago, Milwaukee, Racine. Kenosha, and various other ports during the season of 1867 and will serve to show what other development might arise, should the navigation be made safe and certain.

	Value
Lumber made by 14 water mills and 19 steam mills 70,000,000 feet.	\$840,000.00
Shingles made by 23 shingle mills 85,000,000	300,000.00
Sides of leather 60,000 at \$6.	360,000.00
Flour, 70,000 barrels at \$10	700,000.00
Potatoes, 4,000 barrels at \$2.25	10,000.00
Apples, 10,000 barrels at \$3	30,000.00
Peaches, 25,000 packages at \$1	25,000.00
Hemlock bark, 5,000 cords at \$5	25,000.00
Wood, beach and maple, 10,000 cords at \$3	30,000.00
Railroad ties, 40,000 cords at 50 cents	20,000.00
Hewed timber, 500,000 feet at \$10	5,000.00
Turned stuff for bedsteads, chairs &c	15,000.00
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	\$2,360,000.00

AMOUNT AND VALUE OF IMPORTS

250 tons of mixed merchandise valued at probably	\$500,000.00
30,000 hides valued at probably	240,000.00
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	\$740,000.00

IMPROVEMENTS AT THE MOUTH OF THE RIVER

The existence of two large bars across the mouth of the Kalamazoo river, has heretofore greatly impeded the growth of the villages and towns on the river and of the entire country. Its natural market is Chicago, and although a railway is now in course of construction from the town of Kalamazoo, situated on the line of the Michigan Central railroad, which will do a large business yet the lake must eventually furnish a means for the exit of the chief heavy freight. The realization of this fact led to active measures for the removal of the bar. A company with a subscribed capital of \$30,000 was formed principally of the manufacturers and shippers and nearly the whole amount spent in improvements. They have built two piers or jetties consisting of 500 feet on the north side and 1,575 feet on the south side of slab work placed together firmly and are the best of the kind I have ever seen. These piers have confined the current which has kept a channel of seven feet of water open this season. One result of the present work has been to allow the entrance of a fair class of lake steamers, and the enterprise of several parties has already established the propeller line with Chicago by the new and staunch propeller Ira Chaffee, which makes tri-weekly trips. She was built at Allegan and commenced her trips in May last.

The amount of business done at this point together with the number of vessels which frequent that thoroughfare, (it being a central point for those running to Chicago and Milwaukee on the west shore, and Grand Haven and St Joseph on the east shore,) necessitates the improvement of the harbor of which there are few on Lake Michigan which could afford, with comparatively a small expenditure better shelter during the prevailing autumnal storms. To make transportation safe and certain is to increase the value and results of human industry and the attention of the government should be brought to bear on that fact.

PROPOSED IMPROVEMENTS

Near the village of Singapore, where the river makes a bend and on the line A B shown on the map accompanying this report, is a low piece of ground showing the probable outlet of the river at some remote period. This sort of gulley is about 400 to 500 feet in width and the ground on either side of it is rolling, and ten to fifteen feet higher. The distance across this neck of land is 990 feet, and the average height above the lake surface is about seven feet. It might be true economy for a permanent work to cut across this neck of land and make the improvement at that point but on account of the improvements already made at the present entrance of the river which are available estimates for opening this channel were not made the expenditure being deemed too great.

The estimates made out and submitted consist in improving the present entrance, the south pier 416 feet, to the depth of twelve feet, and the north pier, 1,632 feet, also to a depth of twelve feet these piers to be parallel to each other and 200 feet apart Dredge a channel between them to the depth of twelve feet; also cut a channel in the bay 200 feet wide and twelve feet deep to connect with the deep water near the first bend all of which is shown by red lines on the accompanying map.

By making such improvements a good harbor of refuge can be made which will be of great benefit to the large fleet of vessels frequenting the head of Lake Michigan as well as improving the local trade .

A. - Estimated cost of one crib, 32' x 25' x 20'

3,353 feet square timber at 20 cents per lineal foot	\$670.00
288 feet 3 inch plank board measure at \$15 per M	4.32
3,938 pounds iron bolts at 10 cents per pound	393.80
6 pounds iron bolts at 10 cents per pound60
89 cords of stone at \$16 per cord	1,424.00
10 cords of brush or slabs at \$2.50 per cord	10.00
Labor of framing and placing 3,353 feet at 20 cents	670.60
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	3,188.92
Add ten per cent for contingencies	318.89
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Total cost	\$3,507.81

B. - Estimated cost of one crib, 32' x 20' x 17'

2,368 feet square timber at 20 cents per lineal foot.	\$473.60
288 feet 3 inch plank board measure at \$15 per M	4.32
3,554 pounds iron bolts at 10 cents per pound	355.40
6 pounds iron spikes at 10 cents per pound60
56 cords of stone at \$16 per cord	896.00
6 3/4 cords of brush at 2.50	16.88
Labor of framing and placing 2,368 feet at 20 cents per lineal foot	473.60
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	\$2,220.40
Add 10 per cent for contingencies	222.40
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Total cost of crib	\$2,442.44

Estimated cost of building 2,048 feet of crib work or sixty four cribs for improving Kalamazoo harbor

50 cribs at \$2,442.44 for north pier.	\$122,122.00
12 cribs at \$2,442.44 for south pier	29,309.28
2 cribs at \$2,770.15 for outer ends of piers	7,015.62
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	\$158,446.00

C. - Estimated cost of dredging the harbor of Kalamazoo to place the proposed cribs and the channel between them to the depth of twelve feet.

To excavate 69,329.34 cubic yards outside to place cribs and open a channel 200 feet wide at 40 cents	\$27,731.73
To excavate 32,600 cubic yards inside the river to deepen the channel to 12 feet and 200 feet wide at 40 cents per yard	13,040.00
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	\$40,771.73
Add 10 per cent for contingencies	4,077.17
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	\$44,848.90

Recapitulation of estimates and costs

To build 2,048 feet of crib work.	\$158,446.90
To dredge 101,929.34 cubic yards	44,848.90
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Total cost	\$203,295.80

The town of Saugatuck is in the collection district of Grand Haven. It is not a port of entry. There is a light-house of the sixth order on the north bank of the river situated on a rise of 18 feet. Its focal plane is 53 feet above the lake surface and visible a distance of ten miles. It was rebuilt in 1859, having been washed away twice prior to that time.

I am, colonel, very respectfully, your obedient servant.

WM. T. CASGRAIN
Assistant and Superintendent of Surveys.