

The following is an abstract of the proposals received:

| Name. | Address. | Price for one boat. | Price for two boats. |
|--------------------------------|---------------------------|---------------------|----------------------|
| David S. Barmore | Jeffersonville, Ind | \$5,265 00 | \$10,430 00 |
| John Charles Hegewald | New Albany, Ind | 6,250 00 | 12,000 00 |
| James Rees | Pittsburgh, Pa | 7,500 00 | 14,800 00 |
| Covington Dock Company | Covington, Ky | 7,708 00 | 15,300 00 |
| C. T. Dumont | Cincinnati, Ohio | 7,750 00 | 15,000 00 |
| Cavett, Reams & McKnight | Pittsburgh, Pa | 7,800 00 | 15,600 00 |
| Hartup, McGill & Burke | do | 8,644 00 | 17,288 00 |
| Vulcan Iron Works | Chicago, Ill | 12,175 00 | 23,500 00 |
| J. N. Snowden | Brownsville, Pa | 10,000 00 | 19,500 00 |

The last-named bid was not in duplicate and failed to conform to other requirements. The contract was awarded to David S. Barmore, for construction of the two boats for the sum of \$10,430.

The supplying of steam-drums, which were omitted in the specifications, has added \$80 to the contract price. The boats are to be delivered at Evansville, Ind., on or before August 15, 1879.

It was the purpose to have employed one of these boats upon the river above Mount Carmel, principally between Evansville and Terre Haute, and to keep the other below.

As the appropriation for the next fiscal year is small, it is thought advisable to transfer one of the boats for service on the White River. The appropriation for the White River can refund the cost of the boat, which can be replaced by constructing another as soon as future appropriations will justify.

PROJECT FOR NEXT FISCAL YEAR.

The following project of work for the ensuing year will be pursued as nearly as practicable:

The repairs and planking of the dam at New Harmony and repairs of any injuries to other works of the last season will be completed.

The removal of rock in the channel at Warwick's Ripple will be commenced, and, if possible, completed.

An effort will be made to complete the east dike at Grand Chain.

Some pile, brush, and stone work will be constructed for closing chutes and removing bars.

The work of removing snags will be begun as soon as the boats are completed, and will be continued as far as possible with available funds.

The snagboats are now being built and will probably be completed as the contract requires by August 15.

FUTURE IMPROVEMENTS NEEDED.

The work needed to make the navigation good at Grand Chain at all stages of water has already been discussed in connection with the work of last season.

Six miles below Grand Chain is the reef known as Little Chain. It is situated at a sharp bend of the river, and its form is such as to leave a very crooked channel, which is both difficult and dangerous to navigate during low stages of water.

A short distance above the bend the river is divided, forming an island about 2 miles in length; the smaller channel is known as the Little Chain Cut-off. (See sheets Nos. 8 and 9.)

When free from snags the cut-off is deeper and more easily navigated than the main river.

The earliest projects for improving this locality contemplated turning the main body of water through the cut-off; with this end in view snags were removed and the entrance somewhat widened.

The banks are heavily wooded with large trees, which are constantly adding to the supply of snags, so that the cut-off is again nearly impassable.

A careful survey has shown the project entirely feasible, and it might ultimately result in a better channel than can be obtained through the reef; but it would take several years to accomplish this result, even with the action of the water aided by dredging each year. Constant work would be required to keep the channel free from snags, and in case of a suspension of work from having no appropriation it would result in the ruin of the old channel, while the new one would be useless.

The expense of cutting away a sufficient portion of the reef to make a direct channel of not less than 3 feet in depth at low-water, and of ample width for all purposes, will, it is believed, be less than the ultimate expense of the other plan; it will be accompanied by no element of uncertainty, because whatever work may be done in any year will be to that extent a benefit.

The plan here recommended is to remove entirely the small reef on the point within the bend (sheet No. 9), thence to make a straight channel 200 feet in width, running obliquely from the point to the deep water on the opposite side of the river below.

To do this will require the removal of about 39,000 cubic yards of stone, which can be piled into a dike running from a point on the Indiana side.

The estimated expense of the entire work is \$1 per cubic yard, making \$39,000.

With the improvements recommended at the Grand and Little Chains, numerous large steamers would ascend the river in place of the few which now venture. The fall is but little more than 1 foot, being 1.16 feet, with the stage of water $5\frac{1}{2}$ feet by the nearest gauge.

Next to these improvements the most important below Grand Rapids is the removal of snags, but it is quite impossible to estimate the amount of labor which may be required to entirely clear the channel.

As one of the snagboats now being built will probably be taken to the White River, another should be constructed to replace it for clearing the river above Grand Rapids. For this purpose and for expense of carrying on the work one year, I would recommend an appropriation of \$25,000.

The lower portion of the river has, by constant wearing of its banks and shifting of the channel, become so wide that at low-water it is badly obstructed by bars.

The surveys already made show three bars, and others are known beyond.

To keep the channel good at all times will require not less than 1,000 feet of wing-dam at each place, and they can, in general, be made of piles, brush, and stone; the latter item is an expensive one, as it must be procured from distant points.

The works can be constructed at a cost not exceeding \$10 per linear foot. A length of 3,000 feet could readily be constructed in a single season, and for this the expense is estimated at \$30,000.

Until detailed surveys of the river can be completed, it will be quite impracticable to determine the entire extent to which works for confining

the channel may be found necessary, but whatever may be done in this way will be a permanent benefit, and will encourage development of the navigation.

It is very necessary to continue the surveys of the river, to cover all parts over which navigation may extend. This may be done from year to year in advance of the improvements, the expense of keeping the party in the field as long as circumstances are favorable in a single season being about \$2,000.

It will be a great economy to purchase or build such boats, barges, and other appliances as may be needed in carrying on the works, as the hire of them a single season is frequently nearly as much as their entire value. These and other incidental expenses are placed at \$4,000.

LOCK AND DAM AT GRAND RAPIDS.

In the last annual report no estimate was submitted for this work, as there seemed to be too little necessity to justify a recommendation in its favor.

A study of the history of the works upon the Wabash River has shown that a lock and dam at this place has been generally considered of vital importance.

Some discussion has arisen during the past year regarding the propriety of selecting a new site for the work below the mouth of White River.

Should it be decided to build the dam, a careful survey should be made to determine whether it be best to rebuild on the old site or to select a new one.

The government owns a piece of ground containing about 74 acres on the east bank, and a small piece sufficient to control the end of the dam on the west bank.

Should it be deemed inexpedient to rebuild the lock and dam, the land should be sold, as it serves no purpose, and is only a source of annoyance.

The estimate for a lock and dam which has been submitted in former reports is repeated in the following:

| ESTIMATED FOR YEAR ENDING JUNE 30, 1879. | |
|--|-----------|
| Rebuilding lock and dam at Grand Rapids | \$130,000 |
| Engineering contingencies | 15,000 |
| | 145,000 |
| For improvements as indicated for other portions of the river..... | 125,000 |
| | 270,000 |

Of this amount \$50,000 can be profitably expended upon the lock, and \$125,000 upon the other works, during the year.

HISTORY OF THE WORK.

By act of Congress approved May 23, 1828, an appropriation of \$500 was made "for surveying obstructions to navigation of Wabash River from its mouth to Eel River." The latter stream is at the town now known as Logansport.

The examination was conducted by an engineer officer, assisted by Mr. James B. Bucklin.

No report of the reconnaissance is accessible for reference, but Mr. Bucklin has kindly furnished an outline in a recent letter to this office.

The only obstructions reported were at and below Mount Carmel, Ill. No work was then undertaken by the government, but a company was subsequently formed under charters from the States of Illinois and Indiana. The company was authorized to make such improvements as might be necessary, "provided the first improvement to be made be a lock and dam at Grand Rapids."

A complete statement of the charter may be found on page 512, Report of Chief of Engineers for 1873.

In the summer of 1870, an examination of the river from its mouth to Wabash, Ind., was made under direction of Maj. G. Weitzel, Corps of Engineers, and the same work was continued during the succeeding season.

The expenses of the surveys were paid by allotments from appropriations of July 11, 1870, and March 3, 1871.

The examinations were conducted by Mr. Fr. Stein, who afterwards remained in local charge of the improvements until July 30, 1877.

After the first summer's examination, Mr. Stein estimated the whole expense of improving the river at \$1,163,253.25.

The subsequent year Major Weitzel submitted the following estimate of cost:

| | |
|----------------------------------|-------------|
| Little Chain | \$62,925 86 |
| Grand Chain | 28,546 70 |
| Warwick's Ripple | 2,592 00 |
| Towheads below New Harmony | 2,222 25 |
| New Harmony Cut-off | 6,442 24 |
| Coffee Island Chute | 14,526 62 |
| White River Shoals | 3,901 03 |
| Grand Rapids | 135,000 00 |
| Little Rock | 500 00 |
| Nine-Mile Ripple | 2,775 00 |
| Horseshoe Bend | 4,629 12 |
| Swan Island | 5,787 02 |
| Dredging and snagging | 14,400 00 |

Add 10 per cent. for superintendence and contingencies

Total cost

An appropriation of \$50,000 was made by act of June 10, 1872, and contracts were let the same season for rock excavation and wing-dam at Coffee Island Chute, removing snags, and dredging. No snags were removed or dredging done above Little Chain, and the river was only cleared sufficiently to make a channel not less than 100 feet wide.

The above-mentioned works were completed in the summer of 1873.

In June, 1872, a contract was let for cutting a channel 2,000 feet long and 100 feet wide through the reef at Grand Chain, the price \$1.80 per cubic yard. The work was completed December 3, 1874. This resulted in a great improvement, but the dikes of loose stone taken from the cut were easily injured by floating drift and ice, so that many places were broken through and the fragments strewn in the channel.

During the seasons of 1877 and 1878 the east dike has been considerably raised and its upper end connected with the shore. It is proposed to complete this dike the present season, and, as soon as practicable, to widen the chute at least 25 feet, and so connect the west dike with the shore that at low stages all the water will flow through the cut.

In 1874 the government purchased all the rights and franchises of the Wabash Navigation Company for the sum of \$7,000. This was done in pursuance of an appropriation for that purpose in the act of June 23, 1874, and a clause in the same act forbidding the expenditure of any

portion of that appropriation until the rights and franchises of that company were extinguished.

In May, 1875, contracts were let for constructing a dam across the New Harmony Cut-off, for rock excavation at Warwick's Ripple, and for clearing snags from Little Chain Cut-off.

A full account of the work in New Harmony Cut-off is given in connection with the report of progress during the last fiscal year.

The contractor for work at Warwick's Ripple constructed a coffer-dam, but did not succeed in removing any of the rock, and consequently received no payment thereon. The contract was extended one year, and expired by limitation December 1, 1877.

The remains of the coffer-dam for some time formed a serious obstruction, which has since been removed.

The work of clearing Little Chain Cut-off may be best expressed by quoting from Major Merrill's report made for 1876:

The contractor's snag fleet had barely commenced work at clearing this cut-off when the great August flood began and soon compelled them to stop.

The fleet lay idle at the foot of the cut-off for about two months, and as the river began to fall and to expose the destroyed vegetation of the bottoms, the climate, bad at best, became pestilential, and all hands, including the inspector, were stricken with chills and fever.

When the river got low enough work was resumed and the cut-off was partly cleared out.

The work was not finished to my satisfaction, but as it seemed useless to any longer keep a fleet manned by sick men, it was discharged.

In the autumn of 1876 it was proposed to widen the cut-off at Little Chain by dredging somewhat at the head so that the increased volume of water would enlarge the channel by scouring. The dredges from the Ohio River were accordingly started with the necessary scows and tow-boat for that purpose. They were caught in the ice and compelled to winter at the mouth of the Little Wabash.

In February, 1877, the work was begun and a sufficient amount was removed to afford an opportunity to observe the action of the current.

A careful survey of the cut-off and of the main channel was made in the early part of the summer of 1878.

Observation and study of the subject have led to the conclusion that the cheaper method of making the navigation good past this place will be to close the cut-off and remove a portion of the reef.

After the experience in doing work by contract at New Harmony Dam and Warwick's Ripple it was believed to be better for the works and an economy to the government to carry on the improvements by hired labor and open purchases.

The latter method has therefore been pursued during the present and two preceding seasons, and the results have fully justified the opinion in its favor.

Early in the season of 1878, the Ohio River dredgeboats were again taken to the Wabash River for the purpose of removing snags and cutting certain bars. Most of the time that the dredges could be spared the water was so high that they could not work.

A large amount of snags were removed between Grayville and Grand Chain, and several which were struck in passing at other points further down the river. No dredging of any amount was done, as the bars were found to be so soft and shifting that dredge cuts would immediately re-fill.

Surveys have been made from time to time where improvements were thought necessary, and in the past two seasons a connected survey has

been made from the head of Little Chain to within 7 miles of the Ohio River, a distance of 17 miles.

The works of the last fiscal year are fully described in the report. The improvements have all been made upon the part of the river between Illinois and Indiana, the States being about equally benefited.

The works of improvement have been in charge of the following officers of the Corps of Engineers, viz: Maj. G. Weitzel, from its commencement in 1870 to April 15, 1873; Maj. William E. Merrill, from April 15, 1873, to January 22, 1877; Maj. Jared A. Smith since January 22, 1877.

For some years previous to 1878 the navigation of the river had been almost entirely confined to a few boats which went up from the Ohio River during stages of very high water, and no regular lines or connections were or could be maintained.

To show the growth of navigation in 2 years, nearly all of which has followed directly as a result of improvements made, the following partial statement is given by steamers and shipments on the river:

In 1879, previous to June 30.

| Names of steamers. | Freight carried. |
|-----------------------|--|
| Prairie City | 200 tons lumber, Grayville to Evansville, Ind. |
| Do. | 2,000 bushels of corn, White River to Evansville, Ind. |
| Do. | 180 tons stores, Evansville to New Harmony and Grayville. |
| H. M. Sweetser | 20,000 bushels wheat, New Harmony to Mount Carmel, Ill. |
| Sam Roberts | 40,000 bushels wheat, New Harmony to Madison, Ind. |
| Do. | 500 barrels flour and 100 tons meat, New Harmony to New Orleans, La. |
| Do. | 75,000 bushels corn and 50 tons meat, New Harmony to New Orleans, La. |
| Garrison | 23,000 bushels wheat, New Harmony to New Orleans, La. |
| Raven | 80,000 bushels corn and 250 tons meat, New Harmony to New Orleans, La. |
| Trout | 700 barrels flour, New Harmony to Shawneetown, Ill. |
| Do. | 1,500 barrels flour, New Harmony to New Orleans, La. |
| Hotspur | Five trips from Ohio River—shipments not given. |
| Greyhound | Shipments not given. |
| Ada | Regular trips, New Harmony to Wabash Station, Saint Louis and Southeastern Railroad. |
| Dew Drop | Do. |
| J. J. Frazier | Regular daily trips, New Harmony to Grayville, Ill. |
| Wash. Obenchain | New Harmony to various points. |

CARRIED BY BOATS TO VINCENNES AND CAIRO RAILROAD STATION AT GRAYVILLE, ILLINOIS, DURING THE YEAR ENDING JUNE 30, 1879.

19,000 barrels flour and meal.
 1,800,000 pounds grain, pork, lard, and other merchandise.
 Agricultural implements, machinery, and merchandise shipped by boats from Grayville, Vincennes and Cairo Railroad, 1,000,000 pounds.
 Besides the freights there were several hundred passengers.

SHIPPED BY BOATS TO AND FROM WABASH STATION, ILLINOIS, SAINT LOUIS AND SOUTHEASTERN RAILROAD, FROM DECEMBER 5, 1877, TO JULY 9, 1879.

[These dates include 2 winters and but 1 harvest season. The shipments are constantly increasing.]

29,962,800 pounds of grain, making 1,189 car-loads.
 70,525 barrels of flour and meal, making 565 car-loads.
 2,900,000 pounds pork, beef, and lard, making 116 car-loads.
 4,300,000 pounds miscellaneous merchandise, making 215 car-loads.
 1,600 passengers.

The foregoing does not include any of the river traffic above Mount Carmel, of which there is a considerable amount.

| | |
|---|--------------|
| Entire amount appropriated for improving Wabash River | \$305,000 00 |
| Expended to June 30, 1879 | 267,296 60 |
| Available July 1, 1879 | 37,703 40 |

Money statement.

| | | |
|---|-------------|--------------|
| July 1, 1878, amount available..... | \$91,604 93 | |
| Amount of sales, &c..... | 19 26 | |
| Amount appropriated by act approved March 3, 1879..... | 20,000 00 | |
| | | \$111,624 19 |
| July 1, 1879, amount expended during fiscal year..... | 73,920 79 | |
| July 1, 1879, outstanding liabilities..... | 3,007 84 | |
| | | 76,928 63 |
| July 1, 1879, amount available..... | | 34,695 56 |
| Amount that can be profitably expended in fiscal year ending June 30, 1881. | | 175,000 00 |

W 2.

IMPROVEMENT OF WHITE RIVER, INDIANA.

By letter of the Chief of Engineers, of April 5, 1879, I was informed that an appropriation of \$25,000 had been made for "improving White River, Indiana, from the Wabash River to Portersville, and to the falls on the West Fork, according to report of the Chief of Engineers, without constructing locks and dams."

In accordance with request in the same letter, I submitted a project to apply the amount as follows:

As the appropriation is too small to justify any extensive works, I proposed to expend it on such parts of the improvement as could be done to best advantage. This was—

1. The purchase of apparatus and removal of snags.
2. The deepening of the channel where bars occur, contracting its width with jetties, wing-dams, or dikes.

At the season of the year when navigation on this river would be a vast benefit to a large section of country, the water is low and so much obstructed, principally by snags and sand bars, that it is not practicable for boats to run.

In my report of December 31, 1878, of examinations made on this river, I gave a few indications of its commercial importance. It is the natural outlet to a wonderfully productive portion of the State, and the improvements contemplated cannot fail to result in benefits far exceeding their cost.

The estimate for the entire work submitted with my report of December 31, 1878, was \$150,000.

During the year ending June 30, 1881, I would recommend the completion of improvement at Kelly's Ripple.

To continue removal of snags and deepening channel at various bars, and making rock excavations at various shallow places, detailed surveys should be made to determine more fully the nature and extent of the works required.

It will be an economy to the work and an advantage to the commercial interests to do the work as rapidly as possible, and I would therefore recommend that an appropriation of \$75,000 be made for the ensuing year. I append a statement of funds appropriated and required:

Money statement.

| | |
|---|-------------|
| Amount appropriated by act approved March 3, 1879..... | \$25,000 00 |
| July 1, 1879, amount available..... | 25,000 00 |
| Amount (estimated) required for completion of existing project..... | 125,000 00 |
| Amount that can be profitably expended in fiscal year ending June 30, 1881. | 75,000 00 |

W 3.

EXAMINATION OF THE KANKAKEE RIVER, ILLINOIS AND INDIANA.

In 1847 a company was incorporated under the laws of the State of Illinois, under the name of the "Kankakee and Iroquois Navigation and Manufacturing Company"; the purposes and objects of said company being the "improvement of the navigation of the Kankakee and Iroquois Rivers, the erection of water-power on said streams, and the building and erecting mills and machinery of all kinds on and near said streams."

A subsequent act changed the name of the company to "The Kankakee Company." This company has acquired various rights and franchises from the State of Illinois, accompanied by certain limitations. Through courtesy of officers of the Kankakee Company, and especially of Mr. E. S. Waters, its chief engineer, copies of the company's maps of the river in Illinois were obtained, together with a statement of levels and estimates for the cost of the necessary improvements.

The works completed by the Kankakee Company connect with the Illinois and Michigan Canal by utilizing the Kankakee feeder of that canal a length of little more than 4 miles.

The feeder and dam for its supply were constructed by the State of Illinois.

During the past six years but little if any progress seems to have been made by the Kankakee Company in prosecuting its improvements.

The improvements thus far have unquestionably been of great benefit to the adjacent sections, not only in the great reduction in the price of carrying supplies along its route, but in checking the tendency of railroads to take advantage of people's necessities by unjust discriminations in local freights to points where there are no competing lines.

There can be little doubt that the completion of improvements to render the river navigable to Momence would effect a saving in freight.

In the absence of any complete designs for the works needed to bring the navigation as far as Momence, I take the liberty of referring to the report of Mr. James Worrall, civil engineer, to a Board of Engineers, consisting of Bvt. Maj. Gen. J. H. Wilson, U. S. A., and Mr. William Gooding, United States civil engineer.

The following extract from this report, made in 1867 (see report of the Secretary of War, 1868, pages 466 and 467), is conclusive as to the practicability of the work, and, besides referring to its utility, gives in general terms an estimate of the entire cost:

A regular survey was made from Blue Island to Momence, on the Kankakee, and from Momence to the junction of the Kankakee and the Des Plaines, where the Illinois River is formed. A reconnaissance was made of the Upper Kankakee from Momence, in a northerly direction, along the river well into the State of Indiana, say about 30 miles, among the Kankakee marshes, where boats had to be used, there being no footholding for the instruments.

This survey and reconnoitering, although settling the point forever that there is no practicable outlet from Lake Michigan to the Mississippi waters except the one chosen and reported upon, nevertheless gave rise to suggestions more or less pregnant and important.