

APPENDIX N.

ANNUAL REPORT OF COLONEL J. H. SIMPSON, CORPS OF ENGINEERS, FOR THE FISCAL YEAR ENDING JUNE 30, 1879.

ENGINEER OFFICE U. S. ARMY,  
*Saint Louis, Mo., July 28, 1879.*

GENERAL: I have the honor to forward herewith my annual report upon the improvement of the Mississippi River between the mouths of the Illinois and Ohio Rivers, and upon Osage River in Missouri and Kansas, for the fiscal year ending June 30, 1879.

In addition to my regular duties I have served as a member of the Board of Engineers upon the improvement of the low-water navigation of the Mississippi and Missouri Rivers, constituted by Special Orders No. 71, Headquarters Corps of Engineers, dated July 8, 1878.

I have been aided in the duties of this office, since September 28, 1878, by Capt. O. H. Ernst, Corps of Engineers, to whom I am indebted for very faithful and valuable assistance.

I desire also to express my appreciation of the faithful and very efficient manner in which Assistant Engineer R. E. McMath, and my chief clerk, S. S. Hutchins, assisted by Salem G. Clark, in the office, have performed their respective duties.

Assistant Engineers D. M. Currie, Chas. S. True, W. S. Simpson, and Overseer John J. McDonald, employed in conducting work in the field, and Assistant Engineers Wm. Popp and Preston C. F. West, engaged in surveys, also deserve credit for the zealous and able discharge of every duty assigned to them.

Very respectfully, your obedient servant,

J. H. SIMPSON,  
*Colonel of Engineers, Bvt. Brig. Gen., U. S. A.*

Brig. Gen. H. G. WRIGHT,  
*Chief of Engineers, U. S. A.*

N 1.

IMPROVEMENT OF THE MISSISSIPPI RIVER BETWEEN THE MOUTHS OF THE ILLINOIS AND OHIO RIVERS.

BETWEEN THE ILLINOIS AND MISSOURI RIVERS.

No work was done within these limits during the year. The dams at Piasa and Ellis Islands are in good condition, though the latter has been somewhat flattened by the action of ice last winter. The appropriation of \$20,000 of June 18, 1878, is still available, and with the \$15,000 appropriated March 3, 1879, will enable some new works to be commenced. It is proposed to apply this money to the improvement of the naviga-



tion near Maple Island. The exact location of the works and their estimated cost cannot be given until after the completion of the survey authorized in the act of March 3, 1879.

## SAWYER BEND.

The revetment of this bend was repaired, but urgent demand for funds at other localities prevented any extension of it.

The expenditures were:

2,073.32 cubic yards riprap .....	\$2,590 49
Excavation .....	243 07
Engineering and contingencies .....	154 50
	2,988 06

The unprotected parts of the bend are caving now but slightly, and it is proposed to limit the operations next year to such repairs and small extension as may be found necessary to protect the old work.

## VENICE.

No work was done at this locality and none is proposed for the coming year. A report upon the "damages, if any, done or to be done to riparian owners of lands and improvements thereon, at or in front of the town of Venice, Ill., near Saint Louis, Mo., by reason of government improvements made, or to be made, at or near said town of Venice," together with a historical memoir by Mr. Robert E. McMath upon the harbor of Saint Louis, was submitted April 10, 1878.

A report upon the "practicability, cost, and utility of a dike from Bloody Island, opposite the city of Saint Louis, Mo., north, to the dike or dam opposite Brooklyn on the Illinois shore," the latter being sometimes known as the Venice Dike, or Long Dike, was submitted February 8, 1879. These documents discuss quite fully the conditions of the locality. On the 14th of January, 1879, the House of Delegates of the city of Saint Louis adopted the following resolution:

*Resolved*, That the security of the harbor of this city and the perpetuity of a deep-water channel along the wharf of this city require the construction of a dike or dam upon the Illinois side of the Mississippi from the head of Bloody Island to the west end of the Brooklyn dike built by the Federal Government, and that the Harbor Commissioner be and hereby is requested at once to apply to the Engineer Department of the United States, represented in this city by Col. James H. Simpson, for a recommendation of the advisability and necessity of the suggested improvement to be made by the United States in the interest of its harbor at this city, and in time for action by Congress in providing for river and harbor improvements for the current year.

This resolution was transmitted to me by the Harbor Commissioner with the following letter:

OFFICE OF HARBOR AND WHARF COMMISSIONER,  
Saint Louis, Mo., January 17, 1879.

SIR: I have the honor to call your attention to the following resolution adopted by the honorable House of Delegates of this city on January 14, 1879, viz:

Being perfectly familiar with the condition of the harbor of Saint Louis, you will appreciate the importance of the construction of the proposed dike for the river business of this city.

As matters are now, a great portion of the wharf along the northern part of the city cannot be utilized in times of low-water on account of sand-bars in front thereof, and after every flood we find the levee covered with river deposits several feet in depth, all caused by the lack of sufficient current on this side of the river. The city of Saint Louis having no jurisdiction on the east side of the river, is unable to help herself in this matter, and depends upon the United States for assistance.

Already in 1876 the mayor and city council of Saint Louis petitioned Congress for an appropriation for the work referred to in the resolution above given. I understand that you have since made all necessary preliminary surveys and have also prepared plans and estimates for the work. In compliance with the request of the honorable House of Delegates, expressed by the above resolution, and in view of the great importance of the contemplated work for the navigation of this harbor, I herewith most respectfully ask you to report the matter favorably to the Chief of Engineers as soon as possible, so that it can be considered by Congress in providing for river and harbor improvements for the current year.

Very respectfully,

CHARLES PFEIFER,  
Harbor and Wharf Commissioner.

JAS. H. SIMPSON,  
Colonel United States Engineers.

I replied that I could not make such a recommendation, and requested the Board of Public Improvements of the city of Saint Louis to call at my office and examine my maps when I would explain to them my reasons. The Board called January 23, as requested, and the case was presented to them as follows:

GENTLEMEN: In my letter to Mr. Pfeifer, of the 17th instant, I assumed that the language used in the resolution of the honorable House of Delegates referring to a dike above Bloody Island was not to be literally interpreted. The resolution speaks of a dike from the head of Bloody Island to the west end of the Brooklyn dike. The Brooklyn dike is opposite North Market street, and it is plain that the dike described in the resolution can have no beneficial effect upon the Saint Louis wharf at North Market street or above. The resolution no doubt intended to refer to such dike, wherever placed, as would be most likely to have the desired result. I shall endeavor to show you that it will be necessary to alter the location of the north wharf before success can be expected from any works on the Illinois side.

The proper location of that wharf depends mainly upon the direction in which the river approaches from above. Its present position was given it about the year 1864, when it was intended to bring the main body of the river down through Cabaret Slough. The works designed for that purpose at the Chain of Rocks failed and were abandoned in 1868, and the approach through Sawyer Bend has been accepted ever since. A stone revetment now extends from the water-works up stream in a straight line a distance of 4,600 feet. This line intersects the wharf-line at the water-works, making an angle of deflection of 23° 30', the wharf-line being straight for a length of 12,080 feet from the angle. The question is whether this great river, having a well-established line of direction, can be suddenly turned about an angle of 23° 30' made by two straight lines. There are few things that cannot be done if money enough is expended, and it is possible that if the river is sufficiently contracted it can be made to turn that angle in such a way as to give deep water along nearly all, if not all, of the present line of wharf. I have had some computations made to ascertain what contraction would be required and what depth of water would result upon the Illinois side at a low stage. These show that the greatest width allowable would be 500 feet and the depth on the Illinois side at least 60 feet. The shape of the cross-section would be a right-angled triangle, of which the apex would be on the east side, making it doubtful even then if the water would be deep enough on the Saint Louis side. The main current 60 feet deep would flow parallel to and in contact with the new dike, necessitating massive construction. The cost of such a dike would be enormous.

But to contract the river to that width cannot be thought of. A low-water width of 1,560 feet is the least that can be allowed, and our computations show that even this with banks sloping up on each side upon the ordinary grade of a wharf, will be a dangerous contraction in time of great floods. That width will leave the water shoal on the Saint Louis side above North Market street.

Supposing the river to be held, however, against this line, trouble will be made below Ashley street. Some deposits have already been made there, and these will be increased if in its approach from above the river is compelled to follow the unnatural line proposed. So that actually for the protection of the central wharf it is necessary to push out the northern wharf.

The true line for the north wharf is, in my opinion, a curve, tangent at the water-works to the line of revetment in Sawyer Bend, having the present wharf-line as a chord and a versed sine of about 625 feet. I give that as an approximation. If the honorable Board of Public Improvements should conclude to make the change the exact location could be fixed after further discussion.

The arguments which have been brought forward to oppose any change are—

1st. Much money has been spent in establishing the present line. The answer is that when an error is recognized, the sooner it is abandoned the better and cheaper.



2d. There would be some difficulty in lengthening established sewers. The answer is that the mouths of the sewers being choked with sand now the grade is practically flattened, and their course as open channels extended as far as would in any case be necessary. It is even now considered a necessity that the sewers should empty into a swift current that the *débris* and filth may be swept away, and the time is not far distant when by the growth of the city the increased volume and offensiveness of the sewage will render it an intolerable nuisance if permitted to enter the river and pass along the front of the city. In time an intercepting sewer will be necessary; the construction of a section on this part of the front would merely anticipate and render doubly useful what eventually will be required for the single use of abating a nuisance.

3d. It would require time to reclaim the new area to a height useful for building. The answer is that it is not a question whether land shall be reclaimed, but only where it shall be. The river must be narrowed, if not by encroachment from the city side, where the value of the ground will repay to a great extent, if not entirely, the cost of reclamation, then land must be reclaimed on the Illinois side, where it is almost valueless.

4th. Claims for indemnity would be made by property owners whose ground would then be inland instead of river-front property. The answer is that claims for damages will arise whichever front be extended. It is true that Saint Louis will not be liable for those on the Illinois side if the United States executes the works, but with an honorable people that fact does not weaken the force of the argument.

You are no doubt aware that the city of Saint Louis received in 1849 the consent of the Illinois legislature to construct certain works upon the Illinois side, of which the dike mentioned in the resolution of the honorable House of Delegates, literally interpreted, is one, and gave bonds to execute some of those works in a manner which has never been carried out. The joint resolution giving this consent may be found in Public Laws, Illinois, 1849, pages 238, 239. It is referred to merely to show that the city has recognized its responsibility to the riparian owners on the Illinois side, and that in transferring the improvement of its harbor to the United States it should join the latter in reducing the claims for damages to a minimum. Now it so happens that to place the east side of the river at a distance of 1,560 feet, or even 1,600 feet, from the present north wharf, will expose the United States to large claims for damages, while if it is placed at a similar distance from the wharf that nature requires these claims will be avoided, because the city of Saint Louis, under city ordinance 805, acquired the title in 1841 to construct the works in that position.

It seems to me that these arguments are conclusive.

In their annual report to the mayor for the year ending April 7, 1879, the Board make the following remarks:

In regard to the northern wharf (from Bissell's Point to O'Fallon street), the United States Engineers have proposed a change of the wharf-line, pushing it out into the river about 600 feet in its central portion opposite North Market street, and have urged its adoption by the city. But after a full consideration of the subject the Board feels compelled to report adversely to the proposed change. The proposed line would undoubtedly conform better than the present line to the current of the river, and would enable a greater depth of water to be maintained along its whole extent. But the large expenditure already incurred on the present line and the great cost of improving to the new line furnish strong arguments against the change.

The expenditures of the city for dikes on this part of the wharf prior to 1870 were about \$230,000. The improvement of the wharf since 1870 has cost \$219,300—making a total of \$450,000. This is exclusive of money expended for real estate, much of which would, if the change were made, be entirely useless for wharf purposes and revert to the original owners. The land dedicated for wharf purposes would obviously go back to the donors.

The cost of simply constructing a longitudinal dike (14,000 feet in length) on the proposed line would cost \$240,000, and the necessary spur-dikes about \$110,000—making a total expense of \$350,000. But this would be only the skeleton of the wharf. To construct the wharf itself so as to afford the same facilities to business as the present wharf would cause an additional expense of at least \$300,000.

But outside of all financial considerations, which in themselves are conclusive, an equally urgent reason against the adoption of the line proposed is found in the fact that the construction of the works would for a number of years make the upper part of the wharf unavailable for the large business now done there, and would work almost the destruction of the lumber business of that part of the city.

The change appears the more unwarranted when we consider that the depth of water on this portion of the wharf has not within the last few years been materially reduced.

As there is a good channel for general navigation at all stages in this part of the river, the main object of additional works would be to pro-

cure deep water along the Saint Louis wharf. It is recommended that nothing more be done here by the United States until a wharf-line shall be adopted by the city of Saint Louis which will offer reasonable facilities for the success of our works and protect the United States from claims for heavy damages from riparian owners.

#### CAHOKIA CHUTE.

The dam across the chute east of Arsenal Island was completed as a low dam, the level of its crest being about 9 feet above low-water. It is proposed to leave it at this height, unless my recommendation of former years that the part of the chute below the dam be made an ice-harbor should be carried out. The operation of closing the main channel of the Mississippi was one of great magnitude, and this being the first attempt of the kind, its details are of special interest. They may be found in the report of assistant D. M. Currie, to whose energy and skill the success of the undertaking is mainly due, which report is hereto appended and marked A.

One of the phenomena developed by this work was a very marked deepening of the river for a considerable distance above the dam. Soon after the brush foundation had been placed it was discovered that the depth of water had increased upon the east side about 5 feet, and upon the west side about 2 feet.

It is much to be regretted that hydrographic surveys were not made before and after the construction, to show exactly how far this scour extended. The fact, however, was not anticipated, and exact data upon the subject are therefore wanting. The dam is completed.

#### PROTECTION OF ARSENAL ISLAND.

During the winter the broad flat sheet of sand in the west chute at Arsenal Island gave way and left a good navigable channel, at the same time taking off the heavy strain upon the dam in the east chute. The increased body of water passing through the west chute rendered it necessary to continue the revetment of the west side of Arsenal Island.

That portion of the island which had been eroded to the line fixed for the east shore of the river was therefore protected. Such portions as projected beyond the line fixed are left for further erosions.

The expenditures were:

FOR THE DAM.	
53,563.66 cubic yards riprap, 865.06 cubic yards spalls, 171.95 cubic feet anchor-stone .....	\$53,543 40
997 piles .....	7,762 90
6,167.57 cords brush .....	11,060 11
Grading .....	908 17
Engineering and contingencies .....	3,472 05
	<hr/>
	76,746 63
FOR REVETMENT OF ARSENAL ISLAND.	
10,012.48 cubic yards riprap .....	\$9,132 38
Excavation .....	115 37
Engineering and contingencies .....	426 10
	<hr/>
	9,673 85

#### HORSETAIL BAR.

When operations were resumed there were several breaks in dike 5, the largest of which was 200 feet wide and 18 feet deep at the deepest part. In dike 3 there was a break about 300 feet wide and 45 feet deep at its deepest part. About 200 feet below dike 3, opposite the break,



Training-wall (5,600 feet):		
39,545.10 cubic yards riprap, 35 cubic feet anchor-stone .....	\$37,219 44	
896 piles .....	7,078 40	
6,306.28 cords brush .....	10,902 84	
Excavation .....	66 20	
		\$55,266 88
Plank training-wall (350 feet):		
1,517.18 cubic yards riprap .....	1,383 82	
150 piles .....	712 50	
139.55 cords brush .....	207 93	
Labor, &c .....	439 20	
		2,743 45
Hurdles (5,500 feet):		
593 piles .....	\$2,816 75	
237.18 cords brush .....	398 10	
Timber .....	190 35	
Labor .....	972 72	
	4,377 92	62,388 25
Engineering and contingencies .....		2,454 80
		64,843 05

It is proposed during the coming year to continue the construction of the training-wall and hurdles. As the extensive use of riprap in the training-wall makes it quite costly, it is desirable to seek some cheaper material. A form of construction has been designed by Captain Ernst, which is now undergoing the test of experience. For details see appended report of Mr. Currie.

The section built this spring has been left without the sand filling, with the expectation that the deposits from the river will render a part, if not all of it, unnecessary. This filling will be required for those portions built in the fall, and it is thought that it can be put in cheaply by means of a sand pump. Although the section actually built has cost \$7.85 per foot, it is estimated this wall, exclusive of the sand filling, may be constructed at a cost of \$4.75 per running foot in the same average depth of water as that worked in this year, or 14 feet. No accurate estimate can now be given of the cost of the sand filling. It may vary from 0 to \$2.50 per running foot; but with proper appliances should not exceed \$1 per running foot, even where no assistance is received from the river deposits. In any case there is a considerable margin in favor of this method over the \$9.75 per foot which the other has cost.

## FORT CHARTRES DAM.

No work done or contemplated.

## TURKEY ISLAND DAM.

No work done or contemplated.

## PROTECTION OF BANK NEAR KASKASKIA.

The apprehensions expressed in my last annual report concerning the work done at this point proved well founded. When the water fell, it was found that the channel had cut in behind the revetment placed there in the fall of 1877, and that it was a total loss. This is an excellent illustration of the evil resulting from the requirement so often attached to the appropriation bills that certain small sums shall be expended at certain points.



A new protection was begun last fall at the head of the bend, and the brush foundation was extended downstream a distance of 2,725 feet. A covering of riprap was extended up the face of the bank to a level about 10 feet above low-water. This covering has been further extended this spring to a height sufficient to cover the most treacherous part of the bank, and the revetment, completed as it advanced, has been extended downstream a distance of 1,700 feet, making 4,425 feet in all for the year.

The peculiar soil of this bank and the unfavorable direction of the approach of the river make it the most difficult work of the kind that we have yet undertaken. There is a layer of very fine sand extending from below the surface of the water to a height varying in different places from 18 to 30 feet above low-water. When the water comes in contact with this sand it "melts it like sugar," and a strip 50 feet wide will go out in a few days. The method employed elsewhere of protecting the lower part first and allowing the upper part to grade itself before covering it, cannot be employed here. It is necessary to grade the bank by hand and cover it to a height above the sand layer before the occurrence of high water. This adds materially to the cost and to the time required to check the erosion at any given point.

The amount specially appropriated for this work in the act of June 18, 1878, was \$10,000, and by act of March 3, 1879, \$8,000, which were supplemented by additional allotments of \$10,000 and \$12,000, in order to procure substantial results.

The funds available will scarce be sufficient to put the work already begun in safe condition. Work will necessarily be suspended at an early date.

The expenditures were:

23,298.74 cubic yards riprap .....	\$23,090 68
1,844 cords brush .....	4,825 01
127 piles .....	1,011 77
Mattresses .....	399 45
Excavation .....	430 35
Engineering and contingencies.....	1,166 29
	30,923 55

## LIBERTY ISLAND.

As stated in my last report, the river had washed away the earth back of the upper end of the old revetment. A new revetment was constructed over a length of 670 feet behind the old one, and was then extended upstream a distance of 1,285 feet. The total length of continuous protection on the Missouri shore is now 7,325 feet. It has all been put in good repair this spring, and extends to a height about 25 feet above low-water. The total expenditure upon this protection has been \$45,129.40, or \$6.16 per linear foot of bank.

The expenditures this year were:

7,218.61 cubic yards riprap .....	\$8,050 57
58 piles .....	590 00
293 cords brush .....	761 10
Excavation .....	25 20
Engineering and contingencies.....	585 56
	10,012 43

It is proposed to limit the operations during the coming year to such repairs and small extension as may be required to protect the work done.

## DEVIL'S ISLAND.

The dike and dams remain in good condition. No work was done during the year and none is contemplated.

## DICKEY ISLAND TO MOUTH OF THE OHIO.

The brush and stone foundation for the protection in rear of Cairo was extended up-stream a distance of 7,300 feet. The stone covering was extended up the face of the bank to a height about 10 feet above low-water. It is intended to allow the bank to grade itself to a gentler slope before completing the covering. Stone was deposited upon 1,150 feet of the old work where this grading process had occurred.

The expenditures were:

27,082.09 cubic yards riprap .....	\$42,352 66
113 piles .....	732 44
737.28 cords brush .....	1,948 12
Mattresses .....	6,884 28
Grading .....	141 95
Engineering and contingencies.....	2,992 08
	55,051 53

## SURVEYS.

Surveys and examinations have been made under resolution of the Board of Engineers, convened by Special Orders No. 71, Headquarters Corps of Engineers, 1878, at Saint Louis Harbor, Brickey's Mill, Vancill's Landing, and Dickey Island.

These surveys were designed to furnish data for the study of the general problem of the improvement of the Mississippi through determination of volume at different stages, the amount and character of sediment carried by the river and its variations; also the movements of bars and bar-material at the bottom of the river. Much valuable material was collected, and it was hoped that the series of observations might be continued so as to include periods of both high and low water. The creation of the Mississippi River Commission by a recent act of Congress placed the further prosecution of such investigations in other hands, and the observations were suspended at the close of the fiscal year.

A survey was made to "ascertain the practicability, cost, and utility of a dike from Bloody Island opposite the city of Saint Louis, Missouri, north to the dike or dam opposite Brooklyn on the Illinois shore," the map and report of which were submitted February 8, 1879. For this survey \$500 was allotted and expended from appropriation for examinations and surveys, &c., June 18, 1878.

## EQUIPMENT.

Four new-model barges, built by contract, were added to the fleet, and a small steam-launch was received from Major Farquhar. Pile-driver No. 1 was dismantled, her hull having become too weak for the service. Her machinery was placed in store, and the hull fitted up as a quarter-boat for one of the surveying parties.

## GENERAL REMARKS.

The progress made during the year towards the great object aimed at, of procuring 6 feet depth of water at the lowest stage from the mouth of the Illinois to Saint Louis and 8 feet from Saint Louis to Cairo, has been