

Ridge," about 2 miles in width, and having a very fertile soil, begins at Poplar Bluff, and runs in a northerly direction for many miles.

There are two saw-mills on this part of the bayou, one at Blumer's Ferry, and the other at Poplar Bluff.

The steamboats at present running on this part of the bayou are the Acme, 127 feet long, with 22 feet beam, draws 14 inches light, and $3\frac{1}{2}$ feet forward by $2\frac{1}{2}$ feet aft; when loaded carries 500 bales of cotton; and the Timmie Baker, 105 feet long, with 24 feet beam, draws 13 inches light, and 3 feet forward by 2 feet aft; when loaded carries 450 bales of cotton.

The Wiggins place, distant 89 miles from Baxter, is virtually at present the head of steamboat navigation, and one trip per week being made to that point. The passengers carried on these boats do not average more than 20 for the round trip per season, which usually begins by the last of November and ends the first of June. Steamboats which usually begin by the last of November and ends the first of June, there being no freight of any account. Three years ago the bayou was not navigable until the month of February.

AVERAGE PRODUCTS PER SEASON.

Oak staves, carried on flatboats	180,000
Oak staves, carried on steamboats	12,000
Total	192,000
Cotton, carried on steamboats, bales	5,000
Cotton, hauled to Mississippi, bales	1,000
Total	6,000

PREVIOUS IMPROVEMENTS.

I was informed by several responsible persons that work to the amount of \$100 per mile was done in the bayou between the north line of Ashley County and the Louisiana line, about twenty years ago, the appropriation being made by the State of Arkansas, but that many of the overhanging trees then cut were left obstructing the bayou more than ever. With the exception of cypress, the overhanging trees, when cut, sink to the bottom of the stream.

There are two wrecks in this part of the bayou—the *Economist* (which carried 600 bales of cotton) at the Kinnebrew place, 14 miles above Poplar Bluff, and the *Lightwood* at the Williams place, a short distance above the Louisiana line, neither of which, however, obstructs navigation, being in deep water outside of the steamboat channel. There are forty-seven caving banks, but the majority of them are well protected by trees and distant from the channel.

OBSTRUCTIONS TO NAVIGATION.

There are six bad bends between Baxter and Rust's, and a difficult one for navigation at the Curtis place, above Cut-off Creek. A hurricane crossed the bayou one mile above Portland four years since, and here the trees are lying thick across the stream, which at this point is from 10 to 12 feet deep at low-water. From Portland to a point below Bloomer's Bend (a distance of about 20 miles) is regarded the most difficult part of the bayou to navigate, as it is very crooked and full of snags and logs.

Principal fords.

Name of ford.	Distance, miles from Baxter.	Depth in feet, low-water.	Name of ford.	Distance, miles from Baxter.	Depth in feet, low-water.
Gaster's	3	1	Bloomer's	111	3
Rust's	25	2	Sanford's	114	3
Townsend's	36	2	Sandy Point	117	2 $\frac{1}{2}$
Mrs. Womack's	53	1 $\frac{1}{2}$	Smith	133	3
Perkins's	86	3 $\frac{1}{2}$	Dade	134	3
Shearer's	97	2 $\frac{1}{2}$	Eastman	138	3
Pugh	108	3			

The serious obstructions to navigation are, however, the overhanging trees, trees which have either blown down or been cut, falling across the stream, and the snags and sawyers in the channel. The examination being made when the water was from 4 to 8 feet above low, I was unable to get the exact number of snags and fallen trees in the channel, but from information obtained from steamboat pilots, and persons acquainted with the bayou at low-water, I should estimate the number of fallen trees at 10 per mile, and the snags at 5 per mile in addition to those counted.

Overhanging trees	1,050
Logs in channel	184
Fallen trees, counted	313
Fallen trees, estimated	1,670
	1,983
Snags and sawyers, counted	98
Snags and sawyers, estimated	835
	933

LOUISIANA LINE TO OUACHITA RIVER.

[Estimated distance, 158 miles.]

From the boundary-line between the States of Arkansas and Louisiana, the bayou flows in a southwesterly direction through Morehouse Parish, until in township 20 south, and range 4 east, it is lost in the Ouachita River, in the vicinity of Ouachita City.

The stream as above is exceedingly tortuous, there being many bends where a distance of one-half mile across by land will save from 5 to 8 miles by the stream. The velocity of the current is greater than in the upper bayou, being from $1\frac{1}{2}$ miles to $2\frac{1}{2}$ miles per hour in many places, but the average depth is less. The caving banks have a more sandy nature and fewer of them are protected by trees, the steamboat channel in many places being close to the caving part. In width the bayou varies from 100 to 190 feet, and in depth, except at fords and shoals, from 5 to 9 feet, although in most cases below each shoal there is a hole from 15 to 20 feet in depth, while up stream from the shallow places the increase in depth is very gradual. Sand and clay form the bed of the stream for the most part, but on some of the fords gravel and even small rocks are found. The average between high and low water is 22 feet. Extreme high-water, April 25, 1874, was 4 feet above the average. In this part of the bayou willows make their appearance, and on many of the bends they are a great obstruction to steamboats. The bayou at the Round Bends (distant from 80 to 90 miles below the Louisiana line) is about 120 feet wide, and at low water will average 15 feet in depth, the current running at the rate of 3 miles per hour.

There are four islands covered with willows, about 200 feet in length by 40 feet in width, the chutes on either side being from 40 to 90 feet in width.

TRIBUTARIES.

On the right bank 5 small streams flow into the bayou in addition to Overflow Creek which is 10 miles below the line, and from 30 to 40 feet in width. On the left bank 5 streams, from 6 to 15 feet in width, in addition to Bayou De Saired, which is 35 feet wide and distant about 10 miles above the mouth.

Little Bayou Bœuf, previous to the year 1840, ran into the bayou at the Scarborough place, 20 miles from the mouth, but now the two bayous are 200 feet apart, a levee 8 feet wide by 60 feet in length intervening.

CHARACTER OF ADJACENT COUNTRY.

In addition to the valley of the bayou (which is never cultivated) and which averages 500 feet in width, there are two distinct kinds of land in close proximity to the stream: 1st, the true bayou land having a rich soil capable of producing one bale of cotton per acre; 2d, the pine bluffs with sandy soil and subsoil, and which will not average half a bale per acre. From the Louisiana line to Plantersville, distance 40 miles, on the left bank we find the true bayou land, with banks from 18 to 24 feet above low-water, while on the right, pine bluffs composed of red sand, and from 40 to 70 feet in height, predominate.

In the vicinity of Plantersville the pine bluffs cross the bayou, and are found for the first time on the left bank, and from this point they extend for a distance of 3 miles back and 50 miles down the stream, being at Point Pleasant, 2 miles back from the bayou. From Plantersville to Point Pleasant on the right bank the pine bluffs are often met with.

From Point Pleasant to mouth of the bayou on both sides (although the banks are somewhat higher) the true bayou land is found on the right; it does not average more than one mile in width, the country back being swampy, interspersed with pine ridges,

while on the left the average is 2 miles in width to the pine hills, which cover an extent of country 8 miles in width. From Point Pleasant to the mouth the bayou has a second bank about 3 feet below the first, or main bank, which is covered, except at very low water.

TOWNS AND SETTLEMENTS.

Line, situated on the left bank, where the bayou crosses from the State of Arkansas into Louisiana, has 3 stores and 7 houses, distant from Grand Lake on the Mississippi River 45 miles; the soil for 5 miles back is good and the country thickly settled. From Line to the pine hills on the right the distance is 6 miles, with swampy lands the greater part of the way.

Lind Grove, distant 33 miles from the Louisiana line, also on left bank, has 5 stores and 20 houses; good land for 2 miles back from bayou, when swamps and cypress brakes abound. Above this town Bayou Bartholomew goes by the name of Upper Bayou, while below it is called Lower Bayou.

Point Pleasant, distant 108 miles from the Louisiana line, is the shipping point for Bastrop and surrounding country; it has 2 large warehouses and 4 houses; soil is fertile for 1½ miles back from bayou on both sides; distance to the Mississippi River, 65 miles. Five thousand bales of cotton were shipped from this point last season, most of it raised in the vicinity of Bastrop, which is a town of 1,000 inhabitants, distant 2 miles east of Point Pleasant.

The overflow from the Mississippi River comes within 8 miles of Bastrop on the east. There are 119 steamboat-landings, 13 wagon-ferries, and 1 saw-mill on this part of the bayou.

The timber is greatly inferior to that above the Louisiana line, and but few staves are shipped. The up freights, which consist principally of groceries and dry goods, are fully equal in value to the cotton carried out of the bayou. The clearings are almost continuous on both sides from the Louisiana line to the mouth, except where the pine hills approach the bayou.

Two steamboats (in addition to the two on the Upper Bayou) run between New Orleans and Lind Grove, making the trip every two weeks during a season of three or four months. This season the cotton was less than two-thirds of a crop, and one boat has done the business. The Bastrop is now running on this part of the bayou; dimensions, 155 feet long, with 33 feet beam; draws 15 inches light and 4½ feet forward and 2½ feet aft when loaded; the smoke-pipes are 60 feet above water, but can be lowered if necessary; has room for 1,000 bales of cotton. The passengers average 10 per trip; large steamboats run in Lower Bayou from December to last of May.

Cotton raised:

	Bales.
Shipped on large steamboats.....	13,000
Shipped on small steamboats.....	5,000
Hauled to Mississippi River, Monroe, and Ouachita City.....	4,000
Total	22,000

PREVIOUS IMPROVEMENT.

In the year 1855, fifty slaves owned by the State cut a large number of the leaning trees, but the majority of them were left in the stream, to the detriment of navigation. In the year 1870 an appropriation was made by the State, and over \$1,000 worth of work done between the mouth of the bayou and Point Pleasant, but the work was done in comparatively high-water, and but little was accomplished.

OBSTRUCTIONS TO NAVIGATION.

There are 15 bad bends between the line and the mouth of the bayou, all of them more or less obstructed by willows; 69 caving banks, some of them 35 feet above low-water, having a slope of ¼ to 1.

Eighteen fords where the depth is from 1½ feet to 3 feet at low-water, and two of them composed of small rocks. There are two wrecks: *Mattie*, sunk 16 years ago above the Livingston Ford, but she is outside of the channel, and very little of her is left; *Big Horn*, at the Smith place, 20 miles above the mouth. This was the largest steamboat ever run in the bayou: length, 175 feet; beam, 33 feet; depth of hold, 5 feet. Her stern is in the channel, as well as the snag that sunk her, making it very difficult for steamboats to pass.

But here, as on the Upper Bayou, the serious obstructions to steamboat navigation are found in the overhanging trees, fallen trees, and snags or sawyers. These number—

Overhanging trees.....	224
Willows in bends.....	167
Fallen trees, counted.....	177
Fallen trees, estimated.....	948
Snags and sawyers, counted.....	1,125
Snags and sawyers, estimated.....	91
	474
	565

IMPROVEMENT AND ESTIMATES.

All that I can propose for the improvement of Bayou Bartholomew between Baxter and the Ouachita River would be the cutting of the overhanging trees and the removal of the snags, sawyers, and fallen timber. The best time would be at low-water, or from July to December, giving six months out of the year to work in, although many of the trees on the straight reaches could be cut in high-water. Probably one-half of the overhanging trees could be cut and swung back from the stream; in that case it would not be necessary to cut them in 12-foot lengths. I think the work could be best accomplished by employing a small flatboat with steam capstan, the boat to draw not more than 15 inches of water, and which could be towed up to Rust's while the water is high.

I present the following estimate for the improvement of the bayou in Arkansas and Louisiana:

EXPENSES FOR ONE MONTH.

Assistant engineer.....	\$150 00
Foreman.....	125 00
Fireman.....	90 00
Cook.....	60 00
Fifteen laborers, at \$35 per month each.....	525 00
Subsistence for 19 men, at 75 cents per day each, say.....	428 00
	1,378 00
Cost of flat-boat with necessary tools.....	3,000 00
Removal of 4,790 fallen trees, willows, snags, and sawyers, and cutting 1,441 trees, 12 months' work.....	16,536 00
Add one month for rainy weather and moving.....	1,378 00
	20,914 00
Add 10 per cent. for contingencies.....	2,091 00
Total.....	23,005 00

By the expenditure of this sum the safe navigation of the bayou can be secured during the ordinary steamboat season.

Respectfully submitted.

M. L. LUM,
Assistant Engineer.

Capt. W. H. H. BENYAUD,
Corps of Engineers, U. S. A.

L 23.

EXAMINATION OF SALINE RIVER, ARKANSAS.

UNITED STATES ENGINEER OFFICE,
Memphis, Tenn., February 25, 1879.

GENERAL: I have the honor to transmit herewith the report of Mr. Zeph Harrison, assistant engineer, upon the examination of the Saline River, Arkansas, with estimates for the improvement of the same.

I have heretofore reported incidentally upon the Saline River and the obstructions existing to navigation, which were so well known that it was not deemed necessary to make an instrumental survey of the same.

Like all rivers of the same class the first improvement to be inaugurated is the removing of all accidental obstructions, such as snags, sunken logs, &c., and then, if justified, to commence the radical improvement. In the Saline there is not sufficient water at all seasons of the year to give uninterrupted navigation, and as the commercial season (or that time during which the products of the country are being moved) corresponds generally with the season at which we have at least a good stage of water, it is deemed sufficient for all purposes at present to attempt only the removal of the snags, logs, &c., and to cut the leaning timber along the banks.

The total distance to be operated upon is from the Big Island to the junction with the Ouachita—260 miles, as estimated by pilots' measurements. In this stretch, in addition to the ordinary obstructions, there are 10 shoals, as enumerated in the report, with water over them varying from 12 to 18 inches. These shoals have been formed by deposits upon beds of sunken logs. By the removal of the latter the shoals would entirely disappear.

The river is quite an important one in a commercial view, and the products of the adjacent country would no doubt be greatly increased were better facilities for navigation and shipment afforded.

The amount estimated for the removal of all obstructions is \$30,151.

Very respectfully, your obedient servant,

W. H. H. BENYAURD,
Captain of Engineers.

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

REPORT OF MR. ZEPH HARRISON, ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Memphis, Tenn., February 23, 1879.

MAJOR: I have the honor to present herewith my report on the recent examination of the Saline River, Arkansas.

The Saline River is formed by the junction of the North, Alum, Middle, and South Forks, in the county of Saline, about the middle of the State, and at Benton on the Saint Louis, Iron Mountain and Southern Railway, 25 miles southwest of Little Rock. The general direction of its flow is in a southeasterly course, emptying into the Ouachita River near "Marais Saline" Landing. The length of the river is about 485 miles.

In accordance with your instructions of date January 17, 1879, I left Memphis and arrived in Little Rock on the 18th, procured the stores necessary for camping out, obtained two men with a large skiff of light draught, and proceeded by rail to Benton, which I made the initial point of my examination. We then descended the stream, taking its sinuosities, soundings, number of snags, &c. The stage of water was about 3 feet above low-water and on the decline. In the upper part of the river, between Benton and the "Big Island," a distance of 225 miles, it is extremely tortuous and a succession of shoals, which are broad and shallow with a gravel bottom; the banks, being also of a gravel formation, wash and undermine the long timber which falls across the river and holds the accumulating drift until heavy jams are formed, which seem to be rapidly increasing. We were compelled to drag the boat around these places over steep banks 10 and 12 feet high. These jams are from 50 to 200 feet long. I counted 1,300 snags in this distance. The depth of water between shoals is from 6 to 8 feet at the lowest stage. The Big Island is formed by the forks of the river above Morning's Ferry. The river here separates into two main channels and innumerable sloughs and cut-offs, all of which are filled with drift. This offers at present an insurmountable barrier to navigation above, but by holding the drift leaves the river comparatively free from snags below. All the channels unite at the lower end of the island and form a much larger stream, the river being from 300 to 400 feet wide and 6 to 50 feet deep at low-water, except the shoals, of which we give a table of the principal ones below. The stream also becomes less crooked. At Long View there are stretches of 2 to 4 miles in length, perfectly straight, and from 20 to 50 feet deep with scarcely a perceptible current. These long river views gave rise to the present name of the place.

List of the principal shoals from the Big Island to mouth of river.

Name of shoal.	Distance from mouth of river.	Length of shoals.	Width of river at low-water.	Channel at low-water.			Kind of bottom.	Remarks.
				Width.	Depth.	Fall.		
Hog	Miles. 115	Feet. 75	Feet. 40	Feet. 20	Ins. 15	Feet. 2.5	Gravel..	Full of large logs.
Clear Creek	96	115	30	20	13	4	do	Do.
Osment's	92	100	70	14	14	3	do	Do.
Veasy's	86	40	60	14	12	1.5	Rock ..	
Franklin	81	75	65	20	15	2.5	Gravel..	Do.
Horsehead	68	100	100	20	14	4	do	Do.
Akan's	54	50	50	15	13	3	Boulder.	Do.
Moore's Mill	48	40	50	20	15	2	Gravel..	Do.
Devil's Island	20	30	40	20	18	1.5	do	
Quallett's	18	50	50	15	12	2	do	Do.

Nearly all of these shoals have a number of heavy logs imbedded in the gravel bottom. When these are taken out the channel will wash out much deeper. The banks are now caving and gradually lessen in height from the upper part of the river to its mouth, where they are about 6 feet above low-water. There are generally two overflows annually, one in the spring and the other in the fall season; they cover about three-fourths of the bottom-land, and are very destructive to stock. When we reached the mouth of the river it had been raining very hard for some days and the water had risen to a height of 10 feet above the level of the bottom-lands. We saw hundreds of hogs and cattle drowned in the flood, floating in the timber. I estimate the fall in the water surface between Long View and the mouth of the river to be nearly 30 feet, or 5 inches to the mile.

CHARACTER OF ADJACENT COUNTRY.

The bottoms are very productive, and seldom yield less than a bale of cotton to the acre, with present mode of cultivation. Cotton is the chief, and in the lower country the only article of export. Corn, wheat, and other cereals are raised sufficient for home consumption.

The low pine ridges which limit the Saline Valley on either side above Long View are farmed more than the overflowed land. It only yields about one-third of a bale of cotton to the acre, or 20 bushels of corn, but it subjects the farmer to no risk from overflow, and is much healthier than the malarial and swampy country near the river.

Throughout the whole length of the Saline River the banks are covered with a very heavy growth of timber, embracing all the different varieties of cypress, oak, gum, elm, holly, sycamore, maple, sassafras, birch, beech, willow, ironwood, pecan, paw-paw and other growth indigenous to that climate. The ridges beyond bear a very superior growth of yellow pine. The white oak in the valley is of the finest timber in the State for the manufacture of staves; this is beginning to claim attention from a number of parties from New Orleans, who were making preparations for prosecuting this business as I was passing through. Rafting has been much neglected of late years.

OBSTRUCTIONS TO NAVIGATION.—IMPROVEMENT AND ESTIMATES.

In the last few years some work has been done by private contract in cutting the worst leaning trees and removing some of the more dangerous snags. A slough near Akan's Bluff has been cleared of drift and is now the main channel of the river; it is nearly a mile in length and saves 4 miles. Near the mouth of the river it suddenly turns and runs westward, emptying into the Ouachita River $\frac{1}{2}$ of a mile farther up than it will eventually; this leaves a strip of land between the two rivers 40 feet wide and nearly a mile in length. The timber on this strip has been deadened to a width of 100 feet at the east end, to allow a new channel to wash through, which it will probably do in a few years.

The obstructions to navigation in the Saline River are principally snags and leaning trees. I counted 1,800 snags and 4,000 leaning trees, but on account of high-water the former number will have to be considerably increased.

In order to widen the river at sharp curves it will be necessary to clear the inner bank of timber to the width of 30 feet and length of the curve. I have estimated these distances, which amount to 27.5 miles.

The most thorough manner of removing the snags, logs in shoals, &c., would be by means of a light-draught snagboat, say 18 inches draught. There is enough water to

accommodate such a boat at the very lowest stage in any part of the river under consideration, viz, from the Big Island to the mouth. There are all the necessary conveniences for building this boat at Monroe, on the Ouachita River, but one day's run from the Saline River.

The monthly expenditure in operating such a boat would be—

Supervising engineer	\$150
Mate	100
Cook and helper	60
Twenty laborers, at \$40 per month	800
Subsistence for 24 men, at 50 cents per day	360
	1,470

ESTIMATE OF COST OF PROPOSED IMPROVEMENT OF SALINE RIVER FROM THE BIG ISLAND TO ITS MOUTH, 260 MILES.

Building light snagboat	\$5,000
Flatboat for quarters, &c.	800
Outfit of tools, 400; 25 per cent. for repairs	500
Removing snags and cutting timber, twelvemonths' work, at \$470 per month.	17,640
Clearing 27.5 miles, 30 feet wide, 100 acres, at \$20	2,000
Add one month's passage down stream	1,470
Contingencies, 10 per cent	2,741
	30,151

COMMERCIAL STATISTICS.

The amount of commerce carried on during the six months ending January 31, 1879, on the Saline River, Arkansas, embraces—

Cotton, about 20,000 bales, valued at	\$800,000
Staves, timber, &c., estimated	10,000
Hides, about 4,000 pounds, sundries, &c.	2,000
Tobacco, about 15,000 pounds, valued at	2,000
	814,000
Value of down freight	500,000
Return stores, supplies, estimated	
	1,314,000

It is said by many cotton-growers and storekeepers along the stream, that if the navigation of the Saline River is improved, it will amount to over \$2,000,000 per annum.

The river was navigated during good stages of water in the past six months by the steamers Willie and Acme, which made alternate trips, under one management, every ten days between Cavaness Landing and Trenton, La. These boats have each a carrying capacity of 500 bales of cotton.

The following is a list of the principal steamboat landings, and bales of cotton shipped from each:

Names.	Distance from mouth of river.	Bank.	Bales.	Names.	Distance from mouth of river.	Bank.	Bales.
	<i>Miles.</i>				<i>Miles.</i>		
Godfrey	22	Right.	400	Gee's	80.5	Left ..	400
Hamlett's	30	Left ..	400	Veasy's	86	Left ..	200
Baden Cut-off	42	Left ..	300	Osment's Bluff	92	Left ..	250
Hampton's	50	Right.	1,000	White's	98	Left ..	200
Akan's Bluff	58	Left ..	100	Frazer's	106	Right.	600
Meek's	70	Right.	200	Sutton's	109	Right.	650
Long View	71	Left ..	2,000	Caveness	119	Left ..	3,000
Pugh's	71.5	Right.	100	Scobey	131	Right.	200
Carcoff	76.5	Right.	400	Mount Elba	159	Right.	5,000

Very respectfully, your obedient servant,

Maj. W. H. H. BENYAURD,
Captain Corps of Engineers, U. S. A.

ZEPH HARRISON,
Civil Engineer.

APPENDIX M.

REPORTS OF BOARD OF ENGINEERS ON IMPROVEMENT OF LOW-WATER NAVIGATION OF MISSISSIPPI AND MISSOURI RIVERS.

M I.

IMPROVEMENT OF LOW-WATER NAVIGATION OF THE MISSISSIPPI RIVER BELOW CAIRO.

OFFICE OF THE CHIEF OF ENGINEERS,
Washington, D. C., January 28, 1879.

SIR: I beg leave to submit herewith a copy of the preliminary report of the Board of Engineers appointed to consider and report a plan for the improvement of the low-water navigation of the Mississippi River below the mouth of the Ohio River.

The general plan of improvement proposed by the Board is that of contracting the channel to an approximate low-water width of 3,500 feet by means of dikes of brush, &c., and where the bed of the river is found to be too hard to be worn away by the river-current, dredging, in addition to the reduction of width, to be resorted to.

The Board states that—

The main question is one of cost. Previous, then, to entering upon any general scheme of improvement involving an expenditure of many millions, this question should be settled in the only practicable way, by trial. * * *

That such a trial may thoroughly test the practicability and the cost of regulating the river and increasing its low-water depth, one of the worst places should be selected. Such a place is the Plum Point Reach, 160 miles below Cairo. This reach is about 20 miles in length, and presents in many places excessive width, reaching 2 miles at high-water and a mile and a half at low-water. * * *

Should experience show that works of a light character, such as hurdle work, brush ropes, and very light brush dikes, whose object is to make the river drop its sediment, thus building itself its contracting works, may be largely used, the Board still do not estimate the cost of obtaining 10 feet of water at low-water through this reach at less than \$600,000. Should substantial dikes be required throughout, this cost may be tripled.

The Board, therefore, recommends in sum as follows:

- 1st. That an appropriation of \$600,000 be asked for the improvement of the Plum Island Reach.
- 2d. That the improvement be effected by narrowing the shoal or wide portions of the low-water river to about 3,500 feet, and by protecting caving banks where necessary.

I concur in the recommendations of the Board, and respectfully suggest that the report be sent to the House of Representatives for the information of the Committee on Commerce.

Very respectfully, your obedient servant,

A. A. HUMPHREYS,
Brigadier-General and Chief of Engineers.

Hon. GEO. W. MCCRARY,
Secretary of War.