

## MESSAGE

FROM

### THE PRESIDENT OF THE UNITED STATES,

*In answer to a resolution of the Senate, relative to the application of the appropriations for the improvement of the Ohio and Mississippi rivers.*

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FEBRUARY 28, 1831.

Read, and ordered to be printed, and referred to the Committee on Roads and Canals.

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WASHINGTON, 26th February, 1831.

*To the Senate of the United States:*

The enclosed report of the Secretary of War is herewith enclosed in answer to the resolution of the Senate of yesterday's date.

ANDREW JACKSON.

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DEPARTMENT OF WAR,

February 26, 1831.

The Secretary of War, to whom was referred the resolution of the Senate of the 25th instant, requesting the President of the United States "to inform the Senate whether the appropriations of money heretofore made for the improvement of the navigation of the rivers Ohio and Mississippi, commencing at Louisville, in the State of Kentucky, have been faithfully and beneficially applied to those objects; whether the obstructions to the passage of steamboats and other craft on said rivers have been removed, and, if so, at what places, to what extent, and what sum has been expended on such works of improvements, respectively; and, also, whether the superintendent employed to expend said appropriation for the purposes aforesaid has discharged his duties to the satisfaction of the Department from which he received his appointment," has the honor to enclose a report from General Gratiot, in answer to said resolution.

Respectfully submitted.

J. H. EATON.

To the PRESIDENT of the United States.

## ENGINEER DEPARTMENT,

*Washington, February 26, 1831.*

SIR: I have the honor to submit the following report on the subject of a resolution adopted yesterday by the Senate, and referred to this Department, calling on the President for information relative to the measures taken for the improvement of the Ohio and Mississippi rivers.

A full answer to the inquiries "at what places and to what extent" the obstructions to the navigation have been removed, would require a detailed abstract of the several reports of operations since the commencement of them; but as this would probably consume too much time to admit of the information being furnished during the present session of the Senate, I annex copies of the last annual report of the superintendent, and of an inspection report made by an officer of engineers last summer. From these and other means of information possessed by this Department, I do not hesitate to say that the funds appropriated for these improvements have been faithfully and beneficially applied since the business was placed in the hands of the present superintendent, under whose direction all the work on the Mississippi, and on the Ohio below Louisville, has been executed. The Grand Chain, which formed the principal obstruction to the navigation of that part of the Ohio referred to in the resolution of the Senate, has been cut through, and a straight channel opened, of sufficient width to afford a safe navigation, carefully marked out by buoys. On the Mississippi also, between St. Louis and the mouth of bayou Sarah, (near point Coupée,) the obstructions to the passage of steamboats and other craft have been very much diminished, as is evinced by the smaller number of accidents from snags, and the reduced rate of insurance effected on river craft; the causes of the formation of such obstructions have also been, in many places, removed, by cutting off the timber on or near the banks of the river. The Department has reason to be satisfied with the manner in which the superintendent has discharged his duties.

For the improvement of the navigation of the Ohio and Mississippi rivers there have been appropriated \$255,000, of which the sum of \$215,313 94 had been expended up to the first day of the present year.

Very respectfully, sir, your obedient servant,

C. GRATIOT, *Brig. Gen.*

To the Hon. J. H. EATON, *Sec. of War.*

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*Annual Report of the work done in the improvement of the navigation of the Ohio and Mississippi rivers, for the year ending the 30th of September, 1830.*

GRAND CHAIN, OHIO RIVER, 15th October, 1830.

From the 30th of September, 1829, to the 1st of March, 1830, the United States' steamboat Helepolis removed from the main channel of the Mississippi river 1,307 dangerous snags or trees, a large proportion of which were taken up at the most dangerous places in the river, from the mouth of the Ohio river to the mouth of bayou Sarah, a distance of about 850 miles. In the same period of time above stated, the crew of that boat also cut timber from the points that were near the falling in banks, to the number of 420 trees, and many logs that had fallen in. On the banks and shore, trees

and logs were cut at different times, when the water was too high to find snags, and while delayed waiting for a main shaft of the engine, which was broken.

From the 1st of March to the 1st of July, the Helepolis was not worked. She went up to Louisville, repaired her engine, machinery, boats, &c., and returned to the mouth of the Ohio. From the 1st July to the 15th September, she removed from the main channel of the Mississippi, between the mouths of the Ohio and Missouri rivers, 559 snags, taken from the most dangerous places in that part of the river. From the 15th to the 30th of September, that boat worked from the mouth of the Ohio down to island No. 10, 65 miles distance, the water being extremely low: she removed every description of snags in that distance, to the number of 227, making in all 2,093 snags, all of which have been taken out by the roots, or broken off below the surface of the bottom of the river.

On the 10th of October, last year, three machine boats commenced work in the channel of the Mississippi river, and were worked until the 29th of November, at which time the water had risen too high for them to operate: they removed in that time 378 snags. On the 1st of October, 196 men, four parties, commanded by Capt. Richards, Smith, Price, and Morrison, commenced work on the sand bars, shores, and island chutes, and worked about two months and ten days, when the water rose so high as to stop that work. Those men were employed in cutting snags from off the sand bars and out of the chutes that are dry at low water, and felling timber situated on the banks that cave in at high water. Capt. Smith worked on the Mississippi river from the mouth of the Ohio river up to Herculaneum, a distance of 150 miles, exclusively on the bars and in the chutes, cutting all the snags that were dry. But the stage of water being higher than usual at that season of the year, the snags could not be cut as low on the bars, &c. as was expected, (those snags on the low flat bars, being in the water, were left standing.) Richards, Price, and Morrison worked below the mouth of the Ohio, and proceeded down as low as lake Washington, 500 miles. Some experiments were made at different places on the river, by cutting the timber off the shores from 100 to 200 feet back from the bank, that fall in most extensively at high water. They had the effect anticipated: the shores were left free from snags and logs at low water, and the falling of the banks at those points was not so extensive as it usually had been.

The navigation of the Mississippi river was evidently greatly improved last year; for example, in the year 1828, the losses by snags in that river were not less than one hundred thousand dollars, sixty-eight thousand of which was paid by the insurance offices in Louisville, Cincinnati, and New Orleans; in 1829, the losses were about seventy thousand dollars; forty eight thousand were paid by the offices above mentioned. In the year 1830, there has not been but one flat boat lost on a snag in that river that has come within my knowledge, and not a solitary loss by snags of any other description of boats.

Preparations were made last year for removing the rocks from the channel of the Ohio river at the Grand Chain, by building boats, preparing tools, materials, &c., and transporting men to that point for executing the work; but, in consequence of the high stage of water, the work could not be commenced: the men that were brought down were employed from 1½ to 2 months in building houses for quartering the laborers, blacksmith shops, powder magazine, making buoys to be placed in the channel, canoes for the blasters and drillers in the execution of the work.

Capt. John K. Dillingham, with three men, was retained to keep the boats and property safe, until the 1st of July last: at that time some men were employed to make the necessary preparations for commencing the work. On the 31st of that month, the water was sufficiently low to commence operations on the rocks: since that time, the work has been driven as fast as circumstances would admit. There have been blasted and removed from the channel 225 boatloads of rocks, averaging 15 tons each, amounting to 3,375 tons. One rock, which stood immediately below the lower end of the channel through the Chain, at the distance of about  $\frac{1}{4}$  of a mile, not included in the above tonnage, the water being 16 feet deep around it, the broken rocks were thrown off, and sunk sufficiently low to be entirely out of reach of any boat that can pass at any stage of water. That rock projected  $4\frac{1}{2}$  feet above the water at its lowest stage: it has been blasted, and taken off eight feet, being  $3\frac{1}{2}$  feet below the present extreme low water, which is 19 inches below the deepest channels over the bars in the river from Louisville to this place. That rock, at its upper surface, when finished, measured in length 42 feet, and 19 feet in width. All the dangerous rocks in the channel, for the whole extent of the Chain, have been removed. That important work will be completed at farthest by the 10th November next.

I am, sir,

Very respectfully,

Your obedient servant,

HENRY M. SHREVE,

*Superintendent, &c.*

Brig. General C. GRATIOT,

*Chief Engineer, Washington.*

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LOUISVILLE, November 13, 1830.

SIR: I am gratified to inform the Department that I have completed the improvement of the navigation of the Ohio river at the Grand Chain, to the full extent of the law of Congress authorizing that improvement. In some particulars I have exceeded the letter of that law, and my instructions from the Department. The letter from the Department, dated 9th April, 1829, instructed me to open a channel of 400 feet in width. When executing the work, I found that a channel of that width would not remove the rocks which were the most dangerous to the navigation at a middle stage of water, and were situated on the sand bar, and dry at extreme low water, covering a space of about one acre, and rising from ten to twelve feet above the surface of the sand bar. To make the improvement complete, I deemed it necessary to remove that reef of rocks. There was also a reef running from the above named rocks on the bar, quite across the channel, to the main and lower reef of rocks, many of which projected above the surface of the water when low, and none of them more than one foot below the water; all of which have been removed; by which means a channel has been opened from the main reef of rocks to the sand bar on the Kentucky shore, of about 1,200 feet in width. I thought it most advisable to pursue the same plan throughout the chain. I have therefore caused all the rocks from the channel to the Kentucky shore to be taken out, and by that means the improvement has been made complete. The rocks that were taken out of the chan-



nel have been placed into several deep channels, which passed through the rocks next to the Illinois shore, where at least one-half of the water which flowed down the river at its lowest stage passed; by which means the quantity of water flowing down the channel did not afford more than 22 inches of water over the sand which drifted into it. For the purpose of removing that impediment, I ventured an experiment, by completely filling up the passes through the rocks, so as to form a dam of rocks from the Illinois shore to the outer point of the lower reef, and turn the whole force of water down the channel. After having thrown in the rocks taken from the channel near the lower reef, I had a sufficient quantity of rock boated from the reef and shore to complete the dam, which now extends from the Illinois shore to the outermost point of the lower reef of rocks in the chain, a distance of 557 yards, and above the water when within one foot of its lowest stage. The experiment has had the contemplated effect: the sand bar in the main channel, which previously afforded not more than 22 inches water, has been washed away, opening a channel of 4 feet depth, 1,200 feet in width, free from obstructions, and easy to be seen by all descriptions of craft that navigate the river. It is also straight and smooth. To mark the channel in a higher stage of water, I have placed 5 buoys in a line with the rocks, in such a manner that every boat passing, that keeps between the buoys and the Kentucky shore, cannot come in contact with the rocks remaining along the Illinois shore. The buoys are made of poplar trees, sixteen feet long, three feet in diameter in the middle, tapered to a point at each end, the upper end covered with straps of iron, so as to prevent them from being cut by the drifting ice. They are permanently fastened to rocks in the bottom of the river by bolts and chains 60 feet in length.

At the Little Chain, fifteen miles above the Grand Chain, there were several large rocks in the channel, one of which I deemed necessary to remove, and which has been done. On two others that were a little below the surface of the water, I have buoys of the same size and construction as those at the Grand Chain. After completing the work at the Chain, I had all the property at that place belonging to the United States carefully stored. The three old machine boats, which were built in 1827 for removing snags, &c. from the channel in the Mississippi river, and worked this year on the Grand Chain, are rotten and unfit for further service, excepting the machinery belonging to them. That has been taken off, and stored with the other property. The two machine boats built last year for the removal of rocks at the Grand Chain, together with the scows, have been laid up at the Grand Chain for safe keeping, in the care of a trusty man. Those boats will be serviceable next year, should the Government continue the improvement of the river. The machinery which has been taken from the old machine boats will be serviceable to put on new boats for the same service, as will all the tools, &c. remaining on hand. The provisions remaining on hand I have sent to the different parties of men employed on the Mississippi. That I deemed the best disposition that could be made of them. In a few days you will be furnished with an inventory of them, accompanying the accounts for the completion of the work done at the Grand Chain, and between the Louisville and Portland canal and the mouth of Falling run, which work has also been completed.

The experiment made by the construction of the dam at the Grand Chain proves clearly that all the bars in the Ohio river, from the falls to its mouth, may be improved in the same manner. A portion of those dams may be formed by placing the logs which lie on the bottom of the river on the

bars at the proper point for constructing such dams. At many places there will be nearly a sufficient quantity of logs found in the channel to build such dams as would be required. By disposing of the logs in that manner, they will be effectually placed out of the reach of boats navigating the river, and answer a double purpose, as much labor will be saved in getting them effectually out of the way. The logs and trees which obstruct the navigation of the Ohio river are of a different description to those of the Mississippi. In the Ohio, the logs lie on the bottom of the river, are of heavy timber, and will not float; consequently, when they are taken from the channel, they must be disposed of by some means, to prevent their getting in the way again. The river is not of sufficient depth to sink them where they will be out of reach of boats; and, if placed in deep water, it is found they are liable to roll in high water, and lodge again on shoals. That fact has been tested by Messrs. John Bruce and William Courtney's operations on the Ohio river. I know of no plan so economical as to place them in dams on the bars, where, by the addition of a sufficient quantity of rock to complete that work, they will be held firmly to the spot where they are placed: otherwise, they must either be taken up the banks of the river above high water mark, or cut or split to pieces in such a manner as to pile them on shore, where they will dry and burn. The latter plan was pursued with the logs removed from the bed of the river this year, between the Louisville and Portland canal and the mouth of Falling run, where many hundred cords were found and disposed of at great labor. The depth of water over the sand bars in the Ohio river at low water, in its present situation, is not more than 22 inches; many of them have been as shoal as 20 inches during the last 3 months. By constructing dams, as above described, there can be no doubt but the depth of water may be doubled, and perhaps 4 feet may be had at the lowest stage of the river. The immense advantage arising from such an improvement needs no explanation. I am not able to inform the Department what number of dams would be required, or to estimate the expense of their construction correctly. My present impression is, that sixty-one dams will be required in the whole extent of the river from Louisville to the Mississippi. The expense of their construction, if carried on at the same time that the obstructions are removed from the channel, will not exceed an average of more than \$1,200 each, in addition to the removal of the obstructions that must be removed, to make the river a safe navigation in its present situation.

I am, sir, very respectfully,

Your obedient servant,

HENRY M. SHREVE, *Superintendent, &c.*

To Brig. Gen. C. GRATIOT,

*Chief Engineer, Washington,*

We, whose names are hereunto subscribed, do certify that the statement in the foregoing letter, in relation to the improvement of the Ohio river at the Grand Chain, made by Capt. Henry M. Shreve, the Superintendent under the Engineer Department, is strictly correct. We have been employed by him as officers to assist in the execution of that work, and are particularly acquainted with all the facts stated, and know them to be true.

JOHN K. DILLINGHAM.

MADISON EVANS.

WILLIAM L. EVANS.

McDOWELL PUNTNEY.

LOUISVILLE, 18th November, 1830.

SIR: Enclosed I transmit to the Department Captain John Sowers's report of work done from the 15th of September to the 30th of October, inclusive, showing each day's work in detail. That the Department may form a correct idea of the extent of the work done, and yet necessary to be executed, I beg leave to inform you, that, in that part of the Mississippi river where those 647 snags have been taken out, a distance of 96 miles was worked over last year by the same boat, in such manner as to be entirely free from every description of snags, when the river was ten feet above extreme low water, or in such stage that the medium size steamboats can navigate the Ohio and Upper Mississippi rivers. The river being, at the time when the work shown in Capt. Sowers's report was done, about five feet lower than at any time within the last four years. The snags that lie near the bottom, and are so fixed as not to rise and fall with the different stages of the water, are, at the present extreme low stage of the river, exposed to view, either above the water, or by the breakers of them near its surface.

The men employed this year to work on the sand bars, island chutes, and shores, are making good progress; and, from present prospects, will be able to work to advantage as late as the 1st of January next. I shall, however, be governed by circumstances, as relates to that part of the work. The steamboat will work until the first of March.

I am, sir,

Very respectfully,

Your obedient servant,

HENRY M. SHREVE,

*Superintendent.*

Brig. Gen. C. GRATIOT,

*Chief Engineer, Washington.*

*LIST of the number of snags removed from the 15th of September to the 30th October, inclusive, between the mouth of the Ohio and the head of Prairie bend, distance 96 miles.*

Date.					No. of Snags.
1830, Sept. 15,	Removed,	-	-	-	14
16,	do	-	-	-	18
17,	do	-	-	-	30
18,	do	-	-	-	10
19,	Sunday, at Puntney's wood yard.				
20,	Removed,	-	-	-	6
21,	do	-	-	-	2
22,	do	-	-	-	9
23,	do	-	-	-	18
24,	do	-	-	-	16
25,	do	-	-	-	25
Total, from mouth of Ohio to island No. 2,					148

## LIST—Continued.

Date.	No. of Snags.					
1830, Sept. 26, Sunday, at Puntney's wood yard.						
27, Removed,	-	-	-	-	-	21
28, do	-	-	-	-	-	22
29, do	-	-	-	-	-	12
30, Sounded Wolf island, $5\frac{1}{2}$ to right, and 6 feet to left.						
Oct. 1, Removed,	-	-	-	-	-	30
2, do	-	-	-	-	-	8
3, Sunday, at Wills's point.						
4, Removed,	-	-	-	-	-	17
5, do	-	-	-	-	-	10
6, do	-	-	-	-	-	17
7, do	-	-	-	-	-	21
8, do	-	-	-	-	-	11
9, do	-	-	-	-	-	26
10, Sunday, at Donaldson's wood yard.						
11, Removed,	-	-	-	-	-	22
Total, from head of No. 2 to the head of No. 10,						217
12, Removed the island chute of No. 10,	-	-	-	-	-	17
13, do	-	-	-	-	-	12
14, do	-	-	-	-	-	15
15, do	-	-	-	-	-	21
16, do	-	-	-	-	-	12
17, Sunday, 3 miles above N. Madrid—seven earthquakes.						
18, Removed,	-	-	-	-	-	19
19, do	-	-	-	-	-	19
Total from No. 10 to N. Madrid,						98
20, Removed,	-	-	-	-	-	20
21, do	-	-	-	-	-	24
22, do	-	-	-	-	-	22
23, do	-	-	-	-	-	6
24, Sunday, at Labesier's wood yard.						
25, Removed,	-	-	-	-	-	16
26, do	-	-	-	-	-	33
27, do	-	-	-	-	-	20
28, do	-	-	-	-	-	7
Total from N. Madrid to island 14,						148
29, Removed,	-	-	-	-	-	12
30, do	-	-	-	-	-	7
						19
Total number of snags removed to the 30th October,						647

Correct statement.

JOHN SOWERS,

*Ass. Sup. improving Ohio and Mississippi rivers,  
and Master of the U. S. steamboat Helepolis.*

31st October, 1830.



*Inspection Report on the operations under the superintendence of Captain Henry M. Shreve, for improving the navigation of the Mississippi river, and of the Ohio river at the Grand Chain, 1830, by Captain R. Delafield, under orders from the War Department.*

The difficulties in the navigation of the Mississippi consist in the numerous snags that are found in the track of steamboats and flatboats, on the whole length of the river, and so numerous that no pilot can possibly bear in mind their location. To remove them, the present superintendent has contrived and put in operation a steamboat, provided with the necessary machinery, worked by the engine of the boat, which answers the purpose admirably well. This boat commenced its operation in August, 1829, and worked eight months, during which period she worked between the mouth of the Ohio and bayou Sarah, a distance of 823 miles, removing from the most dangerous points about 1,548 snags, all of which endangered both the ascending and descending trade; and was particularly beneficial in removing the dangerous snags thrown in the bed of the river by the earthquakes during the winter of 1811 and '12, at Plum point—a position that could not be passed without daylight, and which at present is as safe as any part of the river. Also at three other dangerous points, viz: at islands Nos. 62 and 63, at point Chicot, and at the mouth of St. Francis river; at all of which places it was extremely hazardous to navigate during the night; and where boats would come to until daylight, now they are equally safe with other parts of the river. Heretofore flatboats did not make it a practice to run at night until they had reached Natchez; at present, they run night and day, from the mouth of the Ohio to New Orleans.

The boat is at present operating on the Mississippi, about six miles above Cape Girardeau, having this season removed the most dangerous snags between this point and the mouth of the Ohio. It is the intention of the superintendent to continue on this part of the river about three weeks longer, when the fall of the river will make it necessary to go below the mouth of the Ohio, where it will be in the most favorable state for working advantageously, as the water will by that time have subsided to its lowest level. He is now organizing a force of two hundred laborers, to be despatched in flatboats, provided with axes, for removing all the snags on the sand bars above low water mark, and which are dangerous during the high stage of the floods. This force will also remove the standing timber from those failing in banks which furnish most of the trees that afterwards float off, and, lodging on some sand bar below, form the dangerous snags. It is his intention to send one party above, and another below the mouth of the Ohio, to perform the work. These parties, and the continued operation of the snagboat, will, by the end of the season, produce the most favorable and valuable results to the navigation of the river.

The boat is commanded by a man from whom the Department may calculate upon good management, promptness, and expedition: his mates and crew are also to be relied upon for their fidelity; and, with the ability of the superintendent, the Department need be under no apprehensions of this work's going on in any other than the most advantageous manner. To give a proper idea of the boat machinery and the manœuvre, I accompany this report with several sketches. It will be perceived that two methods are necessary for removing the snags. The first, as shown in fig. 1, is when the tree is firmly planted; it is removed by breaking off at the point *d*, and in some

instances even twelve feet below it, as at *b*—a case similar to which occurred during my stay on board the boat. When the tree is not broken, it throws it in the position *c*, sufficiently loosened from its bed to enable the machinery calculated for this purpose to take it on deck, where the root is cut off and dropped in deep water, and the tree cut into parts and thrown overboard. This manœuvre will be understood by inspecting the other sketches accompanying this.

Figs 1, 2, and 3 are side and end views and plan of the boats, connected together at the bows by the strong timbers forming the snag-beam *g*. The boat being put in motion by the full power of the engine, is directed in such manner as to receive the end of the snag on *top* of the beam, where, by the great momentum of the whole moving mass, together with the continued action of the engine, the snag either is broken off at *d* or *b*, or is loosened from its bed and thrown in the position *c*—in which case it becomes necessary to raise it on deck—to accomplish which, it is brought *under* the snag-beam, and between the two boats, in the space *m, n, o, p*, when the chain from the windlass (fig 4, *a*) is passed round it. This windlass is worked by the fall *b*, passing through the leading block *c*, to a barrel of 16 inches diameter on the main shaft of the engine, at *d*. When the log is raised to meet the shaft of the windlass, it is secured for the moment to the bolster *e* by a chain on deck, when the windlass is overhauled by the downhaul *f*, which is also worked by a barrel on the main shaft; at the same time, the chain, as it slacks, is hauled out in the position represented in fig. 4, by a line attached to the ring *o*, passing forward to a leading block *p*, and then back to a barrel on the main shaft of the engine.

As the log or snag rises and becomes counterpoised, it falls back on the rollers *r, r*, of figs. 1 and 2, between the strong timber frame on each side of the rollers, which secures other parts of the boat from injury; when in this position, the root is cut off, and drops through the space *m, n, o, p*, in the river; the trunk of the tree is then cut in two pieces, one-half of which is launched by a tackle purchase into the river, through *m, n, o, p*, and the other half, by another tackle purchase, is launched astern over the inclined plane *s*, fig. 2. The falls of both these purchases are led to the main shaft of the engine. The whole manœuvre being performed by the power of the engine, with the single exception of sawing, which is done with cross-cut saws, worked by hand. A great saving in time would be effected by working these saws with the engine, a plan for which I suggested to Capt. Shreve, by means of a band passing round the fly-wheels. He proposes making this improvement—the only one I could discover in any way requisite for facilitating this splendid piece of mechanism, the power of which is such as to raise the largest and most firmly planted snag in the river. One of the largest raised contained 1,600 cubic feet of timber, after separating the root from it, which could not altogether have weighed less than 60 tons.

In 1829, it raised a tree 160 feet in length, and  $3\frac{1}{2}$  feet diameter, and another that was planted 20 feet in the bed of the river. The greatest number of snags removed in a day is 47: the number removed on the 5th August, at the time of making this inspection, was 17, and the day previous 37. Her crew consists of a captain, 2 mates, 2 hands for working the engine, 2 pilots, 1 carpenter, 2 smiths, 8 firemen, 20 laborers, deck hands, &c., 2 cooks, and 1 steward—in all 40 hands; and consumes about half a cord of wood per hour, the whole daily expense being about \$83 81.

The expenditures, account current, &c. were forwarded by the superintendent for this work up to the 30th June, 1830, when there remained a balance on hand of \$8,161 09. Since when, there has been expended,

For fuel	-	-	-	-	-	\$336 75
To Bushnell, for blocks, &c.	-	-	-	-	-	69 30
To steamer Waverly, freight	-	-	-	-	-	8 24
For payments to laborers in part for services rendered, per receipt book	-	-	-	-	-	215 12
						<hr/> \$629 41

Which, deducted from the balance on hand on the 30th June, leaves an available sum for the present quarter of \$7, 531 68, to which has to be added the sum remaining on hand from the Grand Chain, of

As above	-	-	-	-	-	<hr/> 7,531 68
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The amount in the hands of the superintendent - \$14,313 57 with the exception of \$2,500 placed by him in the hands of a merchant in Louisville, for the purpose of purchasing provisions; the reasons for doing which, I understood the superintendent to say, had been explained to the Department, and obtained its sanction.

This balance remaining on hand will suffice for all purposes until the end of the season, when, and not till then, do the laborers and all others employed receive their wages; this being a condition subscribed to before entering on the service.

All of which is respectfully submitted,

By your obedient servant,

RICHARD DELAFIELD,

*Captain of Engineers.*

Brig. Gen. CHARLES GRATIOT,

*Chief Engineer.*

*Inspection Report, containing "information with regard to the progress and conduct of operations for the improvement of the navigation of the Ohio and Mississippi rivers," under the superintendence of H. M. Shreve.*

GRAND CHAIN, NEAR THE MOUTH OF THE OHIO RIVER,

*August 4, 1830.*

The operations at this place commenced on the 31st of July, when, for the first time during the season, could any thing be done, on account of the floods of the Ohio, and the back water from the Mississippi, which latter river influences the depth of water at the Grand Chain, by preventing the free discharge of the Ohio, whenever the Mississippi is highest. A very perfect organization exists, to father the work with rapidity, whenever the depth of water will justify an increased force being employed. The superintendent can command the services of one hundred men in three days' notice, all residing in the adjacent country, and anxious to be employed. The necessary tools, boats, scows, machinery, temporary quarters, (huts,) and part of the provisions for such an increased force, are at hand, and, from the present appearance of the river, will be called into operation during the coming week.

The result of the few days' work done at this point proves very satisfactory. The force consisted of seventeen men, who have blasted a large quantity of rock under water, and removed three lighter loads (say thirty tons) of the pieces and fragments from the channel, to a point on the shoal where they can be of no inconvenience to the navigation. The power of the machinery (see accompanying sketches) is such, that a mass of rock measuring 128 cubic feet was removed with facility, and deposited out of the channel. They find the rock on which their labor has been bestowed to consist of detached masses, resting on the sand bed of the river, and, without difficulty, have succeeded in removing such as they have blasted, leaving no trace of them behind. The most favorable results may be looked for, should the water fall, or even continue at the present stage of four feet in the channel. The rock is of a nature to yield readily to the blast of gunpowder, being indurated on the surface, and quite soft within: wedges and sledge hammers are applied to breaking up such masses as are too large to handle, and which it would be a loss of time to remove with the machines. There are five machines for raising large masses of rock, and eight scows for removing the stone to the shoals; at present, one only is in operation; the other four will forthwith be put in operation, should the river continue at a stand, and no indications of a rise of water, when the present force of an overseer and seventeen laborers will be increased to one hundred.

Buoys have been prepared to mark out the channel, when improved. The preparatory arrangements, so far as I can discover, are well matured, the machinery well calculated for its intended purposes, and the subordinate agents employed by the superintendents, trusty, and attentive to the work: under these circumstances, nothing, other than a rise of water, can prevent these dangerous obstructions to the navigation of the river being entirely removed. The rocks now removing are marked *a* on the accompanying plan of that (fig. 1) part of the river to be improved, being a cluster directly in the centre of the navigable channel, and which have heretofore caused heavy losses. The plan adopted by the superintendent for improving this pass in the river, is to blast all the rocks in the channel, between (fig. 1) the dotted lines *b*, *c*, *d*, *e*, and deposite the fragments to the right and left, on the shoals and reef—first removing those most dangerous to the navigation, as at *a*, (fig. 1,) then proceeding to the points *m* and *n*, which will materially increase the width of the present navigable channel. To effect this object, the rock is first bored in the usual manner: being under water adds nothing to the difficulty. The charge of powder is placed (fig. 2) in a tin canister of the diameter of the drill, to which is attached a tin tube long enough to reach the surface of the water, and some little above, for priming, when the ramming is done in the usual way, (see fig. 2.) After the rock is sufficiently broken, the double scows, with their machinery, are brought over (fig. 3 and 4) the rock, and the large masses hoisted on deck, from whence they are broken up and transferred to the lighters, conveyed and deposited on the shoals. (See figs. 3 and 4.)

The amount of expenditures to the 31st of March of this year,	
was - - - - -	\$7,618 10
Since when, the sum of \$665 has been expended for services, a	
boat, and provisions, up to this date - - - - -	665 00
This sum was deposited in the hands of merchants at Louisville,	
to purchase provisions - - - - -	2,500 00
	<hr/>
	\$10,783 10



Balance on hand 31st March, per accounts rendered	-	-	\$2,446 89
Received from Treasury Department since	-	-	5,000 00
			<hr/> 7,446 89
From which has been expended the	\$665 00		
And the sum deposited for purchasing subsistence stores	2,500 00		
			<hr/> 3,165 00
Leaving this available sum			<hr/> 4,281 89

Which should suffice for all purposes until the end of the season, when, and not till then, are any moneys due the laborers, it being a part of their contract to receive their pay at the expiration of their terms of service.

The expenditures on the snag-boat since the date of the last settlement of accounts (30th June) is \$629 41½.

The report on that business shall next engage my attention.

Respectfully,

**RICHARD DELAFIELD,**

*Capt. of Engineers.*

To Brig. Gen. CHARLES GRATIOT,

*Chief Engineer.*





