if even for a short time, this will increase the depth and fill in the obstructed side. The bends thus made are usually on alternate sides of the river.

For 1½ miles from the cut-off in the middle of the 112th mile the river has on its right bank a nearly vertical gravel-bank, which is 35 feet above low-water, but the fields on this high bottom-land were so much washed as to be ruined in 1874, while on the opposite low bank, covered 15 to 20 feet deeper, there was no washing at all; it was thickly wooded. Several miles below the 113th mile is low sandy land, covered with thick woods. There is no rock in the bank or bed of the river, and the bends are washing very fast. Occasional old fields were all ruined, and are now covered with a thick growth of bushes. There is no straight channel, but all wide, sweeping bends, and were it not for caved-in trees the channel would all be good, as there is sufficient depth of water. The sand-banks on the points advance as fast as the bends are eroded, and as soon as the bank reaches the height of the low woods back of it bushes cover the surface.

Near the beginning of the 116th mile an old river channel leaves on the right, and by the present cut-off channel it is 4 miles to where it returns. The channel of the cut-off is plainly shown on the chart where it first ran, and by its course it is $2\frac{6}{10}$ miles to the same place, the length of this cut-off channel having increased, since 1874, $1\frac{4}{10}$ miles. I did not go around by the old river, but was told that it was 7 miles. Below this cut-off the river is nearly straight for a mile, with a low-water channel 10 to 15 feet in depth, and the right bank is 30 to 40 feet high; the left bank is low woods. About the middle of the 121st mile a cut-off was made. The upper end of the old river is closed, but a large creek enters from the west and finds its outlet down the old river lake. From the 121st to the end of the 125th mile the river makes a wide detour to eastward and returns so far that it is but ¾ of a mile across the bend. The curves are all wide, sweeping ones, and everywhere low woods are caving very fast, and many trees have gone into the river. There are two cut-offs on this bend, each of which shortened the river nearly a mile. The bottom is sand and the river is everywhere deep, but is badly obstructed by the frequent snags and trees. At the beginning of the 126th mile are three large islands in the river, in a very wide place, but the low-water channel now follows the right bank, and is deep. On the next two miles is another wide bend, with but 900 feet width across the neck. All of which is very low woods, filled with drift and covered with a growth of cane and vines, so that a cut-off, though easily made, is not probable through natural causes. From the 129th to the 140th mile the valley is like that of the last few miles. Little high bottom is found, and the few old fields are grown up to bushes. There are but two small cultivated fields, both cleared within two years. An old field on a bluff at the 136th mile has a bank 38 feet high, and the land rises 4 feet higher in the field, yet the water of 1874 washed off all the fences. I could find no high-water mark, but it could not have been less than 45 feet above low-water. The number of obstructions on this rapidly-caving section does not increase, as the river moves so fast that, though a great number of trees go in every year, as many are left in the fast-following sand-banks on the points. The channel is deep, though everywhere obstructed by snags.

At the beginning of the 140th mile the river runs at the base of a high bluff on the west side of the valley, which is here narrowed to a width of ½ mile by a range of hills, through which the river has cut its way. The section of the bluff is as follows: The low-water depth is 14 feet rock bottom, the height of water at time of survey was 10 feet, then 2 feet blue clay, 30 feet yellow clay, 4 feet rod clay, 20 feet brown clay shale, 16 feet hard sand rock, 6 feet yellow clay, 6 feet shale; this is the top of the nearly vertical slide, but the bluff runs up more than 100 feet higher, with more or less rock along its surface, which is covered with soil and trees. The left bank is high bottom and rock 15 feet above low-water mark. At the end of the 140th mile both banks and the bottom are of rock which reaches 15 feet above low-water in the bank, but above which is 15 to 18 feet of alluvial land. At the beginning of the 142nd mile the river runs along the base of a vertical bluff 70 feet high, and a mile below reaches a bluff on the east side of the valley which is far above all overflow. These high bluffs are about ½ mile apart on opposite sides of the valley, and are spurs of a range of hills once continuous across the valley. Below these bluffs the valley at once widens to its former width. At the middle of the 143d mile is a wide, large eddy in a straight reach of the river. It is on the left bank, and its banks are all caving. At the end of the 143d mile is another of those wide eddies where I took soundings and could not get bottom with my line 60 feet long. These two eddies are alike, both in the left bank and both caving in great slides; the valley is high bottom land, and no rock is found in either bank. All was once cultivated field. These abandoned fields are found down to the end of the 147th mile, except where two farms are now in cultivation. The general course of the river here is easterly, but with wide curves caving in every instance. Below the 148th mile are a few new farms cleared since 1874, all on the left bank, succeeded at the 150th mile again by old fields with badly washed surface. Between the wide bends which are everywhere caving are found several bars with but 3 feet on the crossing. A high bluff is reached on the left bank at the middle of the 152d mile, and a large creek enters the river from the east. The river here turns to the southward. I met Mr. Ball, who owns a cultivated field on the 154th mile, but lives on the bluff eastward. He said there was at least 2½ feet on the worst bars during the lowest water of a dry summer, but that for 8 months or more there is always 6 or 8 feet or more on them; that all fields which were cultivated on bottom-land in 1874 were ruined except where, owing to some peculiar situation, there was no current, and that most of the fields now in cultivation have been cleared since that time.

The old fields are covered with bushes, and will, when again cleared, be productive land. That the inhabitants before 1874 lived on the bottom-lands near the river, but all buildings and fences were washed away, and all have moved to the bluff lands; even where cultivating bottom-lands. On the right bank of the 156th mile is a large cypress swamp where were stored in the old channel at the time of the survey large numbers of pine and cypress sawlogs for rafting. The high bluff is here but 1,000 feet distant on the right bank to the south. At the end of the 158th mile the river again reaches a bluff on the east side of the valley. This bluff of pudding-stone rock is far above all overflow, but the old bottom-fields above and below it were badly washed out. There is just below this bluff a wide gravel bar and several gravel islands, but there appears to be a channel through with 3 feet depth at low-water. On the 159th mile is the town of Columbia, the county seat of Marion County, a place of supply for a large extent of country and a shipping point for much cotton; the amount would be greatly increased, I was told by business men, if they had regular facilities for shipment, as was the case before the war; navigation was then comparatively good. Large flocks of sheep are kept, and wool with cotton and timber now forms the chief export product. Freights on supplies and products are now so great as to greatly decrease the production, and owing to this there is now much emigration from this healthy and fine region, to which, with good navigation of their great outlet, there would be a far larger immigration. At the beginning of the 162nd mile is a sharp bend and the river almost doubles on itself; here the ferry crosses. At the lower end of the straight reach just above, a sand-bar crosses with about a low-water channel of 4 feet. Below this is a wide bend to northeast and back, so that it is 2,000 feet across the land and 4 miles around; all wide curves with plenty of water, but many trees in and more constantly going in. There are many cypress swamps which were old river channels of long ago. Through this part of the river but few of the old river channels are shown on the chart, as every field was washed out in 1874, and the sand-banks have a growth of willows which makes it impossible from the river to tell whether any particular wash was an old river filled or a wash-out, except by going to the top of the bank. There was not sufficient time to examine every one of these washes, and there are no inhabitants along the bottoms from whom to inquire. There is nowhere any rock in the bank on these bottom-lands, and every bend is caving fast. No old river channel is put on the chart without full examination, but the chart does not show so many cut-offs as have really been made, and for this region probably not nearly half so many. At the beginning of the 171st mile is a long reach of the river and a gravel bar, where soundings show that there would be but 2 feet at low-water. There are many logs in the channel here, and the bar is probably in greater part of logs, which, if pulled out, would leave an available channel of 1 or 2 feet greater depth. The caving now takes place on both banks.

At the end of the same mile is a large gravel island in mid-river, and the channel follows the right bank around it; the north side of the island is now but a high-water channel, as is the island itself, with a 15-foot rise. From the middle of 172d to the middle of the 176th mile the river makes a wide bend to eastward and back, so that it is but 1,000 feet across the neck, which is of very low woods with cane and vine undergrowth, and not washing. A new field has just been cleared of undergrowth, and the trees girdled; it is in just such a position that at the first high freshet a cut-off will probably take place, washing out the entire field and shortening the river 4 miles. If the river is ever to be made navigable, all such clearings in such places must be prevented. Nor is it any hardship to the owner of the land, for the cost of any such clearing cannot be repaid before it is swept away, and in consequence of it an area of land equal to all included in the cut-off bend must be also washed in with its growth of trees, to be removed or form obstructions. In this particular case old fields form the outer bank of nearly every curve, and the land now being washed in has no stumps or trees. One cut-off, shortening the river a mile, was made on the 173d mile, but it has probably regained its length since that was made, by its rapid caving. The surface on all these old fields is much washed, but is now covered with small bushes so as to be protected. From the 176th to the 180th mile low woods and old fields alternately from the bank, which is everywhere caving. On the bars where the channel crosses form one side of the river to the other, 3 feet is found at low-water. On the 180th mile is a cut-off recently made, which shortens the river ¾ of a mile; here Upper Little River enters from the east, and a mile below on the 181st mile Lower Little River enters from the same side; both are large streams. The lower part of the 183d, and all of the 184th

miles is probably an old cut-off; a channel through which a little water now finds its way runs out to a cypress brake and again enters at the end of the 184th mile, where is a ferry; but no person could be found to give any information about it. At the end of the 187th mile is an old field on the right bank, which is 30 feet above low-water and has been caving fast for some years.

The sand-bank opposite is 1,000 feet wide and partly covered with small trees. I noticed in the caved edge of the bank shell-mounds, and went upon the high bank to examine them; they were scattered thickly, as far as I could see, among the small trees. I dug into several, and examined the section where one was exposed in the caving bank. In every case they were formed of broken pottery, broken bones (part of them human), shells, both fresh-water muscles and gnathodon shells from the salt or brackish water of the gulf bayous, and charred wood-coals. It is now between 50 and 60 miles in an air-line to where the nearest of these gnathodon shells are found living. The mounds were kitchen refuse; a chipped flint knife and many broken arrow-points were found; but half an hour was used in the examination, as we had no time for anything but the most hurried survey. Had the time at my disposal allowed it, I have no doubt but several days devoted to a careful examination of this ancient village would have been time well spent; in such case the chief cost of making an examination is always getting to the place.

At the end of the 190th mile an old river channel enters from the west. I did not notice where it left, but a bayou runs across to it on the 189th mile. On the 192d mile both banks have caved to such an extent that the river is 1,300 feet wide, three low islands being included in the distance. The channel at low-water is entirely confined to the right bank, but at the head of the islands, where it spreads very wide, a low work of cypress-log crib or fascine will be needed to confine the widely-spread water to a narrow channel; it should be so low as not materially to decrease the high-water cross-section. At the beginning of the 195th mile is Harrison Ford's ferry, store, and post-office. At Mr. Ford's house, on the high bottom-land, the water-mark of 1874 is 36 feet above extreme low-water and 6 feet above the highest bottom-land. Most of the land is low bottom and 15 or 20 feet lower than that on which Mr. Ford lives. Just above the end of the 197th mile the line between Mississippi and Louisiana begins at the river and runs west. A prolongation of this line easterly would cross the river five times, but a cut-off has lately formed on the 199th mile, which shortened the river 3 miles and left a large tract of Louisiana on the Mississippi side of the river. At the end of the 199th mile is a rocky bluff, with a sliding, nearly vertical face, 90 feet high; it is on the left bank. At the beginning of the 202d mile is a bluff on the same side, 45 feet above the highest water-mark on it. The valley is here several miles wide and the river on its east side. The west side of the valley is a low, timbered tract, with caving banks in every bend. On the left bank on the 206th mile is Mr. A. B. F. Raull's place; he has for many years been engaged in timber business on the river and told me much about the way in which changes had been made purposely by cut-offs, with the expressed intention of improving the navigation by shortening the distance, so it could wash out its bed deeper, which it did not do, but made shoaler water instead, and multiplied snags. The high-water mark in this mile is 34 or 35 feet above low-water. A cut-off was made in 1859 on the 207th mile, leaving a long tract of Louisiana on the east side and shortening the river a mile or more. At the end of the 210th mile is a cut-off, shortening it 2 or 3 miles and leaving a large piece of Mississippi on the Louisiana side. On the right bank, in the middle of the 211th mile, is Layton's Bluff, 34 feet above low-water and covered in 1874, but the fences on it were not washed off. This is the first bluff on the Louisiana side. From Layton's Bluff to the 215th mile are low woods and abandoned fields, caving on the alternate right and left bends, and many trees annually go in, but the river has been used for rafting logs so much within a few years, that with more than a 5-foot rise the snags are not much in the way, but the river is full at low-water. The 216th and 217th miles are two long bends, both rapidly caving at the extreme ends, but not in such direction as to make a cut-off probable unless the drift should be burned, which now protects it and the cane.

At the beginning of the 220th mile is an old river on the east side with a strong current down it. A little below it is a cut-off on the left bank. At the end of the mile a large bayou runs out to an old river channel on the left, which reaches the river again at the head of the 223d mile. About the middle of the 223d mile is a cut-off on the right bank, which was evidently formed by the caving of the bank, unassisted, shortening the river a mile or more. Below this, first on the right and then on the left bank, the river has cut away its bank to more than its width, and there is at least one continuous line of trees in, and in places they are two or three deep. Near the end of the 224th mile a creek comes to the river on the right bank, which has caved away to it, but water from the river enters the creek, and just below a cut-off bayou crosses from the river to the creek, which flows through a cypress-brake channel and enters the river at the lower end of the next bend, $\frac{1}{2}$ of a mile by the creek and 3 miles by the river. The bayou is much choked at its head with drift, and unless it is burned out at low river it will remain as at present. Burning it would kill the cypress and make a

cut-off in one year. The channel around this bend is good. There are many large gum and water-oak trees, but except at low-water they are not in the way. Near the beginning of the 227th mile is a field in cultivation, the first for many miles, though abandoned fields line the river for half the way. At the end of the 228th mile is a cut-off on the right bank, made, I was told, intentionally, and immediately below it is an old river, leaving on the east side, which only returns on the 233d mile. The current is very strong, and the head is nearly choked by drift. The caving banks have so increased the length of the cut-off that the slope now is greater in the old river. Along the right bank of the cut-off are many bayous discharging into the swamp. On the 233d mile will be a cut-off from natural causes by the next high-river season, as both banks are caving and the neck is very narrow. It will shorten the channel a mile. Both banks are low and swampy, covered with great sweet-gum and water-oak trees, which make bad snags. From the end of the 234th to the middle of the 241st mile is in an air-line but $1\frac{1}{2}$ miles, but is $6\frac{1}{2}$ miles by the channel. Each bend is rapidly caving and lengthening. Many bayous run out on each side of the river, passing through two or three hundred feet of the bank to the gum swamp back. There were many cultivated fields formerly, but none now. On the 239th mile is an old field ditch, across a bend which is rapidly caving, and bids fair to be a cut-off with the present high-water. On the right bank in the middle of the 241st mile is Pond's Bluff, and near the end of the 242d mile is Pool's Bluff, on the same side. These were the earliest settlements on this part of Pearl River. Old inhabitants told me that Mr. Pool settled here more than 100 years ago. The river was for a long time the only means of communication, and all the settlements were on its banks. Within the memory of middle-aged men living here, the river was a clear stream, which had at first its keel-boats and then steamboats. The floods never took off their fences, though the bottom-land was frequently covered a foot or two in depth in winter, and ran in a channel, which it retained with little or no wash of banks. There are now but two small places near the river inhabited for 100 miles on the west side. Every one has moved up on to the pine bluffs because of the unhealthiness of the bottom-lands after the water became muddy, and the great bottoms were covered with a coating of mud with every rise, and because they were forced to abandon the cultivation of bottom-lands from fences being washed away. The channel is all quite deep. Soundings show not less than an 8-foot channel at low-water, but much obstructed by trees and logs. On the 247th mile the river again meets the bluff on the right bank, and after a bend to eastward and back touches the same spur of bluff on its lower side about the middle of the 249th mile. This bluff was covered 10 feet deep in 1874 where it is 16 feet above low-water mark. I found but one water-mark, and it may not have been the top of the flood of 1874. This is the last bluff on this side above Bogue Chitto swamp, and here begins the third section of the river, which will be far more difficult to improve than that above. At the end of the 249th mile two bayous leave on the right bank; one more at the beginning of the 251st mile. About the middle of the 252d mile an old river enters from the east, bringing the water which had before escaped into the east swamps. On the 253d mile seven bayous leave on the right bank. On the 255th mile is a cut-off bayou of small size across a bend. On the 256th mile are five large bayous leaving on the right bank, and two small cut-off bayous across a bend.

On the 260th mile Black Creek enters from the east. Both banks are low and swampy. At the beginning of the 262d mile Bogue Chitto once entered Pearl River from the west, but now Pearl River water runs with a strong current up the same channel some distance, and, with Bogue Chitto water, passes into the new swamp channels on the south side, and only returns at the 282d mile, passing down the west side of the valley through unexplored bayous. On the 262d mile three bayous leave on the right bank. About the middle of the 264th mile two large bayous leave on the right bank at the west end of a long bend. The upper one is 50 feet wide and the lower one 80 feet. Both are very deep. Booms have been placed across their heads, and a large raft has collected in the head of each, but so great is the fall in the bayous that more than two-thirds of the river, already much diminished by nineteen bayous and the channel of Bogue Chitto, escapes to the west swamp channels. This is called the head of West Pearl. Nowhere for 10 miles above it had there been a channel of less than 8 feet depth, but immediately below it the water is but scant 2 feet over a hard sand-bar more than half a mile long. Down to the head of West Pearl banks are caving in every bend, but below it they are not worn, in the bends, and willow banks opposite are advancing as fast. From the head of West Pearl the river runs east a mile and across the bend; from the middle of the 263d to the 265th mile is but 600 feet, and a bayou choked at its head with drift now crosses. In case it is decided to close West Pearl, the river should be closed and a cut-off made here, as a dam would not stand at the present caving bank where the head is. At the end of the 265th mile is Wakiah Bluff, the home of Mr. Lesley, who has run a steamboat or rafted logs on the river for many years. He said it was since 1850, and owing to the closure of old Pearl River, that West Pearl Channel broke through and Bogue Chitto changed its course to the west side of the valley. It is several miles from Wakiah Bluff, west, to

the west side of the valley, and it is all low cypress brakes and bayous and old river channels, bordered with high cane and thick woods in narrow belts. Previous to this discharge to westward, Mr. Lesley said there was never any shoal in the reach above his place, where is the present bar, and that the river banks were entirely without the encroaching belt of willows before that time; that the present shoal and partial closure immediately followed the breaking out of West Pearl, as that followed the partial closure of the river between Home Bayou and the mouth of Abolo Chitto, 5 miles below on the old river. The height of the flood of 1874 was here 26 feet above low-water.

From Wakiah Bluff to the middle of the 268th mile the river follows the eastern bluffs except where twice it makes a short bend out into the bottom land and back, but it has everywhere the narrowed channel constantly shoaling. It here leaves the east side bluffs for the last time.

On the 270th mile is a cut-off on the right bank where the water yet runs out with quite a strong current, at both ends of the old river. There is no caving of any bank in even the sharpest bend, but the encroachment of the opposite bank is almost continuous on the convex sides of bends. At the end of the 271st mile fully a third of the remaining water runs out to the eastward through Farr's Slough, which empties into Abolo Chitto a few miles below. A dam was built across the head of this slough by Captain Poiterent, for the State of Mississippi, but the light, sandy land cut out around it, and it has increased its current. Below Farr's Slough the river is seldom wider than 100 feet. At the beginning of the 273d mile is a great eddy in a bend where the bank is now caving slowly. This is the only place below West Pearl on the old river where it is caving. At the beginning of the 274th mile, Parker's Slough leaves on the right bank, with a strong current, and at the end of the same mile twin bayous leave on the same mile. At the end of the 277th mile old Pearl River makes an abrupt turn to the northeast. At the time of the survey there was a 3-foot rise, but there was with it but 2 feet in the channel of old Pearl River, while just above was 6 to 7 feet, and in Home Bayou, which here leaves to the right, the depth was the same. I followed the old channel down for a mile, finding it there but 28 feet in width with the 3-foot rise and but 1½ feet deep. Rafts of cypress and pine saw-logs were resting on the bottom and for half a mile farther I walked on logs which were on the bottom, and was told that it continued so down to Abolo Chitto. I abandoned the attempt to go down the old channel, finding it to be impossible with less than a 7-foot rise. The old trees, growing on what were once the banks of this channel, show that it was within less than thirty years past fully 200 feet wide, as Mr. Lesley and Mr. Raulls had told me it was. They both said that it was formerly deep, also, through this entire closing portion at that time. The following history of the closure I think is, in the main, accurate, dates being rather uncertain: Soon after 1850, a very large run of saw-logs was boomed in the 5 miles below Home Bayou and Abolo Chitto. Pearl River was falling and Abolo Chitto was rising very fast, making slackwater on this 5 miles and strong current below it. As Abolo Chitto fell suddenly, corners of cribs of logs stuck on the bank and others ran in on top of them. Sand settled in the interstices and no attempt was made to get the logs out at that high-river season; but the next fall the head of the rise brought down more sand and mud on top, and the logs had become soaked and did not rise. So this 5 miles had a pavement of logs on its bottom. With the rise two steamboats which attempted to get through were snagged and sunk. Three times again, before the war, was this 5 miles boomed full of logs and left over summer—the greater part of them in each instance being there yet—at each time raising the bed at least the thickness of an average log and narrowing in the edges, on which willows began to grow. Since the war the same has been again repeated with the same result once or twice; and a few weeks before I reached there with the survey, at a 7-foot rise, the river was boomed above Abolo Chitto and at the fall to 3 feet at the time of the survey; these logs were being filled in with sand ballast, which, without some rise within the present high-river season, will about complete the closure of this part of the river, as the tops of the logs are within 2 or 3 feet of the top of the bank everywhere, and in places within 1 foot of it. Nothing less than a 7-foot rise of Pearl River will now take logs down the old channel. The cross-section at Pool's Bluff is 2,450 square feet, and there was a strong current at the place. The cross-section of old Pearl below Home Bayou was 62 square feet, with a current of 10 feet per minute only. At about an average place, one mile below its head, Home Bayou was 76 feet wide and had a cross-section of 450 square feet the same day; with the 3-foot rise above low-water a current of about 2½ feet per second at the place. The depth of Home Bayou was nowhere on bars less than 5 feet, and 7 to 10 feet most of the way, with the rise at the time. The width varies from 60 to 100 feet, and it is very crooked, full of very sharp, short bends; the banks are everywhere caving slowly without any corresponding advance on the opposite side. A steamboat longer than 120 feet would not be able to make the turns, nor would any but a stern-wheel or recess-wheel boat be able to run at all. A mile below its head Little Home Bayou leaves to the westward, but it is joined by several bayous from the west swamps, and where it again returns at the 280th

mile it has fully twice as much water as it had when it left. Below its re-entrance into Home Bayou there is an immediate increase of 5 feet in depth on the shoal places and a width of not less than 100 feet. It is not straighter than above and every bend is caving. At the end of the 282d mile West Pearl River again enters with nearly all the water of the valley, including Bogue Chitto; and it had a cross-section at the time of about 3,000 square feet. The section from the old entrance of Bogue Chitto to the 282d mile should be carefully examined, mapping its various bayous, swamps, and channels, before deciding to use the present route or to go up by some west side line. There was no time to make this examination, as it is really more work to do it than was used on the entire survey. Home Bayou is far more hopeful as a channel than the old river from its head to West Pearl head. In case it was decided to use this line with no further examination, it would be necessary to use the cut-off, crossing the bend a mile above West Pearl head, and dam the river twice; to clear the banks below wherever trees needed removal to allow for necessary caving, to increase the cross-section, and a pretty general clearance on the bank of Home Bayou of trees and stumps, so as to allow it to widen without filling its bed with trees, as would otherwise be done.

The State of Louisiana once made a cut up through bayous and swamps on the west side, trying to get to the river above, but it was a failure. They then had Home Bayou cleaned out; all snags and overhanging trees were taken out, and to this is owing all the navigation there is at present on the river. The left bank of Home Bayou is called Honey Island, and it retains the name down to East Pearl entrance, near the mouth. Honey Island was once inhabited, and very many farms were for a long time cultivated on it; but owing to the height of floods it has been nearly abandoned.

About the middle of the 283d mile the gunboat Arrow lies in the west of two channels, inclosing a low wooded island; and in its present position it is not only no obstruction, but a real help, forming a wing-dam to direct the current to the east side of the island, where is the best water. Near the end of the 284th mile Broad Axe Bayou runs out to westward, with a cross-section at the 3-foot rise of about 800 square feet; but it has a sluggish current and is not increasing, while the main channel is caving at every bend. The banks are everywhere covered with large trees and a thick growth of cane, except in swamps too low for it. Everywhere below Columbia saw-logs form a part of the obstructions, and the number is annually increasing. There is in all this part of the river a deep channel, but it is so obstructed with logs, snags, and trees as to be impassable at low-water. With the 287th mile begins the lower series of cut-offs, the greater number of which have been purposely made within a few years with a view to improving navigation. There is one cut-off on this mile, shortening the river ½ a mile. The cut-off at the head of the next mile appears to have been a natural one. Just below it Broad Axe Bayou returns from the west, and near it Little Broad Axe also returns, and an old channel called Little Current River leaves to westward. Its head is nearly filled with a large drift-tree. On the 289th mile is one cut-off. About the middle of the 290th mile on the east bank is Robinson's upper store, and just below it a cut-off was made in the left bank. At the lower end of the 290th mile Porter's River leaves to westward; it appears to be decreasing. The 291st mile has three cut-offs, shortening together a mile. On the 292d mile are two cut-offs shortening it 3 miles. The first, made in 1875, was a natural one, and the last was made in 1877. This last was the worst of the whole series in its results. On the 293d mile are two cut-offs, shortening the river a mile, and two more on the 295th mile. On the 296th mile the river reaches the west bluffs, and all the water of the valley, except that which left at Farr's Slough and Old River above Home Bayou, is confined to one channel. Porter's and Morgan's Rivers enter just above these bluffs. Captain Poitevent's store, ship-yard, and house are located here. This is the first high pine land below the 249th mile on the west side of the valley. The channel here leaves the bluffs and running to eastward between low, swampy banks, it divides near the middle of the 298th mile, and its left branch is called Middle River, its right retaining the name of West Pearl and two-thirds of the water. After a very crooked course through gum swamps, once touching the west bluff at Gaus's store, it reaches Robinson's store and saw-mill at a high point at the beginning of the 301st mile. Large fields are here in cultivation. From here to the beginning of the 305th mile, at Indian Village, the river runs between gum and cypress swamps, once touching the west bluffs at Jay's Bluff. Yellow Lake and Mile Bayou join the river from the east, but have no current. They are but old river channels. Mile Bayou, with a 3-foot rise, forms a navigable connection with Middle River. The channel is everywhere more than 8 feet deep at low-water, but logs and trees must be removed in several places to make good low-water navigation. Indian Village is a single street, bordered with houses for a mile or more; quite an amount of wood, staves, and tan-bark was on the bank for shipment. Schooners run up almost constantly to the junction of West Pearl. The river below here has sea-marsh on its right bank and cypress swamp on the left bank. The water is deep; bends are wide and few obstructions are found. Near the end of the 307th

mile is Deer Island, on the right bank; it is but a piece of outlying bluff-land in the sea-marsh. With the 309th mile the river enters sea-marsh on both sides; it is covered with water at high-tide, and occasional clumps of cypress are found for a mile farther. The cross-section is here 1,680 square feet at low-water, and it is nowhere less than 10 feet deep in channel and 150 to 200 feet wide.

At the middle of the 311th mile Salt Bayou leaves to westward and joins Lake Pontchartrain, but it is only 55 feet wide at Pearl River, and there is hardly skiff navigation through it. At the beginning of the 313th mile is an old shell-bank, on the right bank, composed of gnathodon shells, bones, broken pottery, &c., and kitchen refuse. At the end of this mile is an island formed by the entrance of Isham Bayou and East Pearl from the east; here was once a large saw-mill, but the place is now abandoned. Just above the entrance of East Pearl a crib-work was made across the channel during the war, to prevent gunboats from running up the river by West Pearl, leaving them at liberty to go by East Pearl as far as they could.

The left bank has cut out so that there is a channel 50 feet wide and 20 feet deep past the end of the crib, which does not now in the least obstruct the navigation. Vessels run up East Pearl to Pearlington and Gainesville, but there is no navigable connection with upper Pearl River. Abolo Chitto is said to be navigable up to Kimball's store, about 60 miles from the Gulf by the channel. Pearl River enters the Rigolets at the 315th mile, over a bar which is so situated that it has an 8½-foot channel at low-tide. The current of the wide, deep connection between Lake Pontchartrain and Lake Borgne is very strong and 30 to 50 feet in depth, and at the place where the true bar of Pearl River would be, did it enter a lake or the Gulf, the Rigolet channel of 35 feet is found. This must always give good navigation at its entrance, as is found at either end of Rigolets or in the river above. Exactly opposite the entrance is Rigolet's light-house, and a mile to eastward is the draw-bridge, over which the New Orleans and Mobile Railroad runs.

For the first 40 miles from Jackson, removal of snags, overhanging trees, and logs, and of fish-traps, will cost about $200 per mile. For the second section, from the 40th to the 250th mile, there are very few overhanging trees, but many logs and trees in the river, which must be removed, and a small amount of fascines or crib-work will be needed in a few places. No estimate for this crib-work is made, as its amount and position will depend on the action of the current after the removal of logs and snags, which now, perhaps, are the real obstructions causing the bars. Probably for this 210 miles $150 per mile will be sufficient. The third section from the 250th to the 282d mile will need or should receive a careful examination before beginning any work, as it is quite possible that some better route can be found than the present one; but with present knowledge of it an estimate of less than $1,000 per mile would probably be too low, and it might very likely exceed that. The fourth section of 33 miles could probably be cleared for $150 per mile.

Jackson to 40th mile, at $200	$8,000
40th to 250th, 210 miles, at $150	31,500
250th to 282d, 32 miles, at $1,000	32,000
282d to 315th, 33 miles, at $150	4,950
Add for engineering and contingencies, 20 per cent	15,290
	91,740

This would be for but clearing out the river, and beyond this an appropriation would be needed annually to the amount of 20 per cent. of this amount for several years to keep the navigation good until the river had regained its normal length; as until that time it would certainly wash in many trees. Provision would also be necessary to prevent malicious mischief in way of cut-offs, and probably one of the greatest helps would be the entire exclusion from the river of all side-wheel steamboats, as by their greater swell they wash the banks far more than stern-wheel boats do. The productions of the country are already very great, but they are very small compared with what it is capable of producing. The climate is such as to allow of work being done at all seasons for the entire year.

For a great part of the distance the river is the only means of communication, and for the whole distance its easy navigation would so reduce the cost of freights as to many times repay its cost.

Very respectfully, your obedient servant,

H. C. COLLINS,
Assistant Engineer.

Major C. W. HOWELL.

I give the reports of Mr. Collins in all their detail, because I find it very difficult, if not impossible, to condense and at the same time give as good an idea of Pearl River and its valley, its obstructions, their causes and effects, as may be obtained from perusal of his reports.

Perhaps no stream in this country has had its character so entirely changed within the past 50 years as this. Not later than 50 years ago it was known as an excellent, navigable, clear-water stream, and up to about 1860, while gradually changing its character because of increasing cultivation of its bottom lands and of efforts to straighten its course, it yet remained one of the principal commercial arteries of the State of Mississippi. This much would be inferred from its known character and central location in Mississippi if it were not known in fact.

The stream is now as muddy as the Mississippi River; its length has been shortened fully one-tenth by cut-offs, and its banks in nearly every bend are annually caving in with their load of trees to form obstructions to navigation. As natural sequences, the planters have been driven by flood from the bottom lands, which they denuded of their protecting forests and undergrowth, and the commercial value of the river has been virtually destroyed, for a time, by the attempts made to improve it by shortening it.

In fact the two interests suggested have blindly acted together to place the river in its present condition; such is the present condition that the commerce of the river, above its delta, is now represented solely by one 400-bale steamboat, which with difficulty plies its trade during the high-water season, sometimes as high up as Jackson. The planters of the valley are thus forced to haul their products and exchanges for long distances over the clay hills to the railroads on either side at great expense.

The general description of the river and its obstructions above Jackson, Miss., as given in my preliminary report, will sufficiently answer for the river below Jackson, as far as the head of West Pearl River, or what may be described as the head of the delta, for at this point the river is divided into two main branches—that on the west emptying into the Rigolets, and that on the east, following higher ground, empties into Mississippi Sound, and before 1860 was the main navigable channel.

From the head of the delta down the conditions now observed, in a very marked degree, resemble those found in the Red River Raft region above Shreveport.

East Pearl has been gradually blocked up by rafts of logs (as described by Mr. Collins), until it has been completely choked at low-water, and the water above the raft has been diverted to the westward through a great number of small bayous, discharging at various points into West Pearl and gradually enlarging the latter into a navigable stream.

The lowest one of these bayous is known as "Home Bayou," and is the one now used for passing vessels from Lower West Pearl into the navigable waters of East Pearl above the raft and on up the river.

This line is evidently the natural one to follow in making improvements below the head of the delta, for it appears on drawing a straight line from the head of the delta to the mouth of West Pearl that the route does not vary from the line on either side more than one mile. Home Bayou also appears to be steadily enlarging.

If we accept this as the route through the delta, then the work of its improvement will be the same as that required above, viz, the removal of snags and overhanging trees, but in much larger quantity than found above.

The continued shifting of the river-bed where it leads through wooded lowlands suggests the impracticability of making accurate estimate of cost of removing obstructions.

When each flood adds some new obstructions and removes some old ones, it is evident that estimate made for the future must be based