As it is not possible to estimate the time required to complete the work, I assume four months as a working-season and as the maximum time required for the work, which gives the following estimate:

| | |
|---|---|
| Outfit | $1,000 |
| Four months' labor and provisions | 5,540 |
| | 6,540 |
| Add 10 per cent. contingencies | 654 |
| | 7,194 |

Which amount, it is thought, will complete the work recommended.

The work is located in the collection-district of Indianola, Tex., and the nearest light-house is at Pass Cavallo, Texas.

## S 8.

### SURVEY OF THE BRAZOS RIVER BELOW WACO, INCLUDING THE BAR AT ITS MOUTH.

This survey, authorized by act of Congress approved June 23, 1874, was intrusted to Assistant Engineer R. B. Talfor, and commenced in July, 1874.

His instructions were to run a transit and stadia line, following the banks of the river from Waco to its mouth, and to check this work wherever practicable by triangulation across bends; to examine all obstructions to navigation and report their character, extent, &c.; to sound and cross-section the river at intervals; to note high and low water marks; to ascertain the general character of the country traversed and its commercial requirements; to note the stone and timber along the banks of the river, with a view to their possible future use on works of improvement at the river's mouth; and, finally, to make an accurate survey at the mouth of the river, measure the velocity of the river-current, and collect information from persons residing in the vicinity regarding past changes in the bar at the river's mouth.

Mr. Talfor, on conclusion of the work, reports as follows:

REPORT OF MR. R. B. TALFOR, ASSISTANT ENGINEER.

GALVESTON, TEX., *June* 19, 1875.

SIR: In accordance with your instructions, I left New Orleans July 14, 1874, with a party of three men for Waco, Tex.; the outfit and stores having been forwarded on the 11th instant.

We arrived at Waco at 9 p. m. of the 16th instant. The outfit and stores not having arrived, I procured board and lodgings for myself and party.

*July* 17.—As no boats could be obtained suitable for the work, I therefore engaged a carpenter to build three of the following dimensions: Two skiffs 15 feet long and 2½ feet wide, and one bateau 18 feet long and 5 feet wide, to be used in transporting equipage.

*July* 18.—The outfit having arrived, we went into camp on the east bank of the river, one-half mile below Waco. From this date until the 25th instant no progress was made beyond measuring a base-line of 1,000 feet and adjusting the instrument, (a Gurley transit,) also making several cross-sections of the river at this point.

*July* 26.—The boats being finished and ready for work, we began operations from the west tower of the Waco suspension-bridge, this being the initial point of the examinations. The method of operations being a transit and stadia line, the stadia adjustment being frequently tested on a base measured with a steel tape. Whenever an opportunity offered, lines were run across the bends, and thus the work was checked. From this date until August 15 our progress was very slow, owing to the extreme low stage of water in the river and the numerous shoals and bars over which the boats had to be dragged, the time lost during this interval being fifty-nine and a half hours; the number of shoals and bars eighty-eight, these obstructions averaging from 60 to 3,000 feet in length, with from 1 inch to 1 foot of water on them. The most notable of these obstructions are—

1*st. Rock Dam, situated in the thirtieth and a quarter mile of this examination.*—A

formation of limestone bowlders, extending across the bed of the river, rising in some places to the height of 5 feet. A channel of about 40 feet wide was found, but very much obstructed with loose rock, the fall at this point being about 4 feet in 100, approximately.

2*d. Falls of the Brazos.*—From the Brazos bridge (marked No. 2 on chart No. 1) to the Gassaway plantation in the forty and three-quarter miles, the river is free from obstructions; but at this point the channel of the river turns almost at a right angle, and is but about 40 feet wide, with a fall of 4 feet in 500 (approximately) over a gravel shoal.

At Hallworth's plantation an almost complete barrier is found, consisting of a flat limestone bed, extending across the whole bed of the river and for a distance of one mile below, where it terminates in an abrupt fall of 5 feet, (approximately,) the crest of which is 1,285 feet from bank to bank. (See chart No. 1 in the forty-third and one-half mile.)

The depth of water on the shoals above the falls being only from 2 inches to ½ a foot, necessitated a portage of the boats and outfit to the nearest point below the falls, which was at Jones's crossing, a distance of two and one-half miles. This portage occasioned a delay of one day.

3*d. Upper Blue Shoals, (fifty-first mile.)*—The river-bed at this point is 300 feet wide, and for a distance of 1,400 feet is one continuous shoal of soft limestone, over which was from 1 to 3 inches of water. The bank being from 30 to 40 feet high, prevented our making a portage around this obstruction; but by skidding and hand-spiking we succeeded in four hours in getting the boats over, but leaking very badly; an additional delay of two and one half hours was occasioned in caulking the boats. From this point to the Lower Blue Shoals (seven and one-fourth miles) was a succession of rock shoals and sand and gravel bars.

One of the party succumbed to the effect of heat and overexertion, which reduced my force to two men. The sick man not being able to walk, had to be conveyed in the large boat. This additional load, with the numerous shoals and bars that had to be pried over, in the bed of a river whose high banks excluded any breeze that might have been stirring on the prairie above, greatly added to the difficulties of the progress of our work. During this month (August) a delay of one and a half days was caused by the loosening of the cross-hairs in the telescope on account of the extreme heat.

4*th. Lower Blue Shoals, fifty-eighth and one-fourth mile.*—This obstruction is 1,200 feet long, and similar to the one above, with the exception of its being interspersed with gravel and sand. A delay of two and one-half hours in getting the boats over.

5*th. Curley Shoals, seventy-second mile.*—This obstruction is unlike those already passed. Here the bed of the river is blocked with very large lime and sand stone bowlders for 600 feet, giving in some places a passage between them from 5 to 30 feet wide, the fall being about 3 feet (approximately) in 600, and the channel winding, making the passage of our boats extremely difficult and dangerous. Went into camp at this point to rest the party and overhaul the boats, they being in a very damaged condition. As our supply of provisions was nearly exhausted, I hired a team and wagon and drove over to Calvert, on the Texas Central Railroad, distant six miles from the river. The following day, August 11, renewed operations. Mr. Douglass still too weak to assist.

6*th. Calvert Shoals, seventy-fifth mile.*—These shoals present an entirely different appearance from those above, for scattered over its entire length, 3,000 feet, are piles of drift-wood and ridges of sand-stone bowlders. The hand-spikes and skids were resorted to, and with the assistance of two negroes hired for the occasion, we succeeded, after four hours' work, in getting the boats over, but in a very damaged condition, and leaking badly.

*Herndon's Shoals, seventy-seventh mile.*—These shoals are in some respects like Curley Shoals, an indiscriminate pile of large bowlders, blocking up the entire bed of the river, with hardly space enough for a skiff to pass between, in some places a passage having to be made by removing the rocks. The shoals extend for a distance of about one mile from the head to the foot, with an intervening space of about one-quarter of a mile clear from rock, but very much obstructed with sand and gravel shoals, a succession of falls from the head of this obstruction to the foot, averaging from 1½ to 3 feet. At this point an additional man was engaged to assist in running the line, Mr. Douglass being still too sick to assist.

8*th. Port Sullivan Shoals, eighty-sixth and one-fourth mile.*—This obstruction presents a more formidable appearance than any above, its length from the head to the foot being 3,700 feet. At its head the bed of the river is 750 feet wide, gradually narrowing to 200 at the foot of the shoals. The banks are nearly vertical and about 40 feet high.

The upper end of the shoals presents the appearance of a stone-quarry; large bowlders from 4 to 12 feet high block up the entire bed of the river.

The assistance of four negroes, who were hired for the occasion, in addition to my party of three men, was found inadequate for the work, the boats having to be worked through between these rocks, and shooting the numerous falls and rapids met with in

working through. In several instances the falls were too abrupt, necessitating the unloading of the boats and carrying the outfit to a point below. After a delay of four hours in making this passage, I went into camp one-quarter of a mile below Port Sullivan. Mr. Douglass returned to New Orleans from this point.

*9th. Niblins's Shoals, (one hundred and twelfth mile.)*—This obstruction consists of a bed of limestone, intermixed at intervals with a species of coal, (lignite,) and terminates in an abrupt fall of about 2 feet, the crest of the fall extending nearly across the bed of the river. (One-half hour delay.)

*10th. Munson's Shoals, (one hundred and twenty-first mile.)*—No detention of the boats at the upper end of these shoals, the water being of sufficient depth (1 foot) to float the boats over. The river is divided at this point by a rock-island 800 feet long. The best passage was found on the left bank, the one on the right bank being blocked with huge bowlders and drift. Here the drift that has accumulated is one mass of petrifaction, covering a distance of about one-half mile. At no other point of this examination could any specimen of petrifaction be found. The total length of these shoals is one mile. A delay of two and one-half hours was occasioned at the lower end in prying the boats over.

*11th. Hidalgo Shoals, (one hundred and sixty-seventh mile.)*—At this point the bed of the river is 750 feet wide, and very much obstructed with sand and lime stone bowlders for a distance of 1,800 feet, then clear river for 750 feet, when another shoal is met with, with an irregular fall of from 4 to 6 feet. From the head to the foot of the shoals, a distance of about one-half mile, the fall is 10 feet, (approximately.) These shoals are situated six miles above the town of Washington, and were, in the years 1851–'52–'53, the head of steamboat navigation, although the steamer Belle Sulphur during that time had made several trips to Port Sullivan, seventy-nine miles above during the prevalence of a very high rise in the river. (Three hours' detention.)

*12th. Gates's Ferry, (one hundred and ninety-fifth and three-fourths mile.)*—A ledge of soft rock had formerly spanned the bed of the river, through which, in the year 185–, a steamboat-channel of 150 feet long and 80 feet wide had been cut. Twelve feet of water was found in it this date, (August 31.)

*13th. Cochrane's Shoals, (two hundred and twenty-six and three-fourths mile.*—A succession of falls and rapids over a sandstone bed. Length of shoals 1,000 feet. Total fall 3 feet, (approximately.) No detention, as from 4 to 11 feet of water was found over this obstruction. This depth of water was attributed to a slight rise in the river.

From the time of leaving the crossing of the Austin tap of the Houston and Texas Central Railroad, September 4, until the 12th September, progress was very slow owing to the heavy rains. The river having risen 7 feet, no additional shoals (if any) were seen. We arrived at San Filipi, two hundred and sixty-sixth and one-fourth mile on the 12th.

*September* 19.—Arrived at Richmond, three hundred and twenty-eighth and one-quarter mile, situated on the west bank of the river, and on the line of the Galveston, Henderson and San Antonio Railroad.

*September* 27.—Reached Bolivar Landing, three hundred and eighty-first mile, head of the present steamboat-navigation and tide-water.

*September* 29.—Reached Columbia, three hundred and ninety-fourth and one-half mile, situated on the west bank of the river, and the present terminus of the Brazoria tap of the Great Northern Railroad.

*October* 3.—Passed Brazoria, in the three hundred and ninety-fourth and one-half mile. The river for the past few days has been nearly bank-full, and carrying considerable drift. Our progress, in consequence, was very much retarded, as considerable chopping had to be done to enable me to get sights. This part of the work was cheerfully and expeditiously done by my rodman, Mr. L. A. Rymer, to whom I am indebted for the valuable assistance rendered during our arduous journey, especially when the party was reduced in its number by sickness, which necessitated double duty from him in our hurried examination.

*October* 6.—At 3 p. m. we arrived at Quintana, on the west bank of the river, one-half mile from its mouth. As your instructions were to make as complete a survey as possible of the mouth of the river and its bar, the following extracts from the journal of operations, kept during the whole time of the examination from Waco to the Gulf, will explain the method of conducting the survey and the time employed in making it:

*Wednesday, October* 7.—A tide-gauge made and established on the northwest-corner spile of Metcalf's Wharf. Through the politeness of Mr. John Brougham, customs-officer at this point, who kindly placed his cutter at my disposal, I was enabled to make a reconnaissance of the bar, and placed four temporary buoys on the extreme limits of the bar. Established a base-line of 1,100 feet, the initial point of which is on the superior slope and salient angle of the fort on south point.

*Thursday, October* 8.—Verified the lead-line, and getting the batteau ready for sounding. Lieut. James B. Quinn, Corps of Engineers, United States Army, arrived by the steamer George W. Thomas with twelve can-buoys, anchors for the same, and floats for current-measurements.

*Friday*, 9.—Rained all day. The men engaged in preparing the buoys, anchors, flags, &c.

*Saturday*, 10.—Continued the line of survey from Quintana and connected with the initial point of the base-line. Located several points on the north shore by triangulation. Azimuth taken this evening. Var. 8° 28′ east.

*Sunday*, 11.—Located range-stakes on right and left banks of the river for cross-sectioning, (see chart No. 4.) Wind strong from the northeast. Heavy breakers on the bar.

*Monday*, 12.—Wind still from the northeast; too rough to sound the bar or the river. Lieutenant Quinn returned to Galveston.

*Tuesday*, 13.—Wind still northeast, (strong;) unable to set up the transit for taking additional topography.

*Wednesday*, 14.—Took cross-sections of the canal. Sea too high to sound at the mouth of the river.

*Thursday*, 15.—Wind east-northeast. Thirty-five feet of the east end of the base-line washed away during the night.

*Friday*, 16.—Wind fresh from east-southeast. No change in the condition of the bar; river smoother. Completed cross-sections and soundings of the river.

*Saturday*, 17.—Wind northeast, (strong.) Bar still too rough.

*Sunday*, 18.—Wind northeast, (strong.)

*Monday*, 19.—Wind north-northeast, (light.) Heavy sea on the bar. Took current-measurements in the canal and the river.

*Tuesday*, 20.—Wind still light from the northeast; toward evening it veered to the southeast. Succeeded, with the revenue-cutter, in placing ten buoys out on range, over and across the bar, but could not sound, as the bar was too rough for a small boat.

From this date until the 30th of the month, several attempts were made to sound the bar, but, owing to the heavy sea breaking over it, it was found impossible to do so. In the mean time several of the buoys, becoming chafed from their anchors, were washed ashore. As the prospects of the bar becoming sufficiently smooth to sound were extremely uncertain, and having received orders from Lieutenant Quinn that after the completion of this survey I was to proceed at once with my party and make a survey of Cedar Bayou entrance and bar in Galveston Bay, I deemed it advisable to abandon this work for the present and proceed to Cedar Bayou. Accordingly, on the 2d of November, 1874, I took passage, with my two men and the outfit, on the steamer George W. Thomas, Jenkins master, for Galveston, at which place I arrived the following day and reported to Lieut. J. B. Quinn. The survey of Cedar Bayou Bar was made, and the chart and report on the same you have already received.

Plotting the field-notes of the Brazos examination was continued until April 3, 1875, at which date I returned to the mouth of the Brazos with a party of two men.

Additional help was engaged at that point for the work.

It was not until the 13th of April that the bar became smooth enough for sounding, and then only for a few hours.

The same opportunity presented itself on the 14th. The results of the soundings of these two days are represented on chart No. 4.

In the interim I recross-sectioned the river over the same lines that were made last October, and a decided change in the depth of the water and general contour of the bottom was found. These differences are indicated on chart No. 4 in red dotted lines. This change is due to a very high rise in the river that occurred during the time that elapsed between October, 1874, and March, 1875.

Current-measurements were again made in the river and the canal. No current-measurements were made over the bar, as no favorable opportunity presented itself.

The current-measurements, as observed at the mouth of the river and in the canal, are as follows:

The greatest observed velocity of current of ten observations was 2.4 feet per second of surface-float, started from cross-section No. 1 to cross-section No. 4, mouth of river. (See chart.) Mid-depth float, 1.9 feet per second. These measurements made during ebb-tide.

From cross-section No. 4 to cross-section No. 1 greatest velocity at flood-tide surface-float, 2.1 feet per second. Mid-depth, 1.8 feet per second.

Current-velocity in the canal toward the river: Float at 3 feet depth, 1.4 feet per second; float at 5 feet depth, 1.2 feet per second.

Current-velocity in the canal from the river: At 2 feet depth, 1.2 feet per second; at 5 feet depth, 1.2 feet per second.

THE BAR.

The depth of water on it is undergoing a continual change, due to the winds and tide and different stages of water in the river. For instance, in October, 1874, only 2½ to 3 feet were to be found.

In April, 1875, and subsequent to a rise in the river, and the effect of a "norther" at the

same time, the bar deepened to 6 feet, but this depth was of short duration, and was reduced to its normal depth of about 3½ feet by the first east or southeast wind.

The soundings made on the bar and at the mouth of the river, as indicated on the chart, are reduced to the plane of mean low-tide, as deduced from half-hourly observations from October to November, 1874, and during the month of April, 1875.

The Galveston and Brazos Canal is the inland water-connection between Galveston and the Brazos River, distance forty-five miles. Its width and depth at its junction with the Brazos River are shown on chart No. 4.

Two steamboats, the George W. Thomas and the Beardstown, make semi-weekly trips from Columbia to Galveston, through this canal.

THE RIVER,

throughout its entire length, is very tortuous, and at several places where the distance around the bend is from two to three miles, the distance across the neck of the bend is only from 300 to 500 feet. (For example, see chart No. 2.) The banks ranging from 10 to 50 feet high, covered with cottonwood and willows in the upper river, the middle river being timbered with post-oak, ash, hackberry, and elm. On the lower river to within eight miles of the mouth are vast quantities of live-oak, suitable for ship-building, and which may be obtained within a short distance of the river.

At the beginning of this examination, (July 26, 1874,) the river was at an extremely low stage, and in some places on the upper river was nearly dry. No water was found in the numerous creeks that are tributary to it, with the exception of Little River, which had a depth of 19 feet at its junction with the Brazos, and an approximate current of one mile per hour.

The Little Brazos had only 3 feet of water at its mouth, with no perceptible current out of it.

Yequa Creek, another of the main tributaries to the Brazos, had but 3½ feet of water in it, and no current. The absence of water in these streams may be attributed to the long drought and the extreme heat of that season.

During a conversation with Capt. William Jenkins of the steamboat George W. Thomas, who was one of the first pilots that navigated the Brazos from the mouth to Washington, a distance of two hundred and fifty-five miles, he informed me that if the bridges that now span the river were such that he could take a boat through, and if some of the snags that have accumulated since the closing of navigation were removed, he would again run his boat to those points on the river from which he is now excluded, as long as the stage of water in the river would admit, which would be, on an average, about eight months in the year. From personal observation, I think that the navigation of the Brazos to Washington can be accomplished at a stage of river at, say, one-third bank-full; to Richmond and San Filipi at even a less stage of water; but as to the duration of the above stages of water, I am not informed, as the information on this subject was very conflicting.

At Gates's Ferry, twenty miles below Washington, a steamboat-passage had been cut through the rock shoal at that point.

Cochran Rock Shoals, fifty-one miles below Washington, appears to me to be a barrier to low-water navigation, but it is easy of removal, or a channel cut through it, as it is of a very soft nature. No other obstructions were seen in the shape of shoals, until at a point four miles above Richmond, called Ferris's Shoal. These, like the above, are easy of improvement. Beyond these nothing but some snags were seen, as the river had taken a rise.

Not being able to gather any special statistics in regard to the amount of agricultural products and the cost of transportation of the same to market, I cannot say that the expense necessary to make the river navigable will be warranted.

The exhibits are three sheets, 49 by 59 inches, and plotted to a scale of 2 inches to one mile; also one sheet 49 by 59 inches, showing the mouth of the river and its bar, scale of which is $\frac{1}{5000}$.

*Table of distances.*

| Name of place. | Miles between. | Total miles. | Name of county. |
|---|---|---|---|
| Waco | ..... | ..... | McLennan. |
| Port Sullivan | 87½ | 87½ | Milam. |
| Nashville | 4½ | 91½ | Do. |
| Washington | 83½ | 175½ | Washington. |
| San Felipe | 90½ | 266½ | Austin. |
| Richmond | 62 | 328½ | Fort Bend. |
| Columbia | 66½ | 394½ | Brazoria. |
| Brazoria | 8½ | 403½ | Do. |
| Gulf of Mexico | 26½ | 430 | Miles. |

*Table of obstructions.*

| Between— | Shoals and bars. | Snags. |
|---|---|---|
| Waco and Port Sullivan | 88 | 41 |
| Port Sullivan and Washington | 35 | 252 |
| Washington and San Felipe | 19 | 1,540 |
| San Felipe and Richmond | 2 | 760 |
| Richmond and Columbia | High river.. | 48 |
| Columbia and Brazoria | ....do ..... | ..... |
| Brazoria to the mouth | ....do ..... | ..... |
| Total | 144 | 2,641 |

Average number of miles run per day, 7½.

Very respectfully, your obedient servant,

R. B. TALFOR,
*Assistant Engineer.*

Maj. C. W. HOWELL,
*Corps of Engineers.*

This report was accompanied by a number of articles cut from newspapers published in 1858 and preceding years, in counties bordering on the Brazos, and showing the importance in their time of improvement of the river-navigation. From these we learn that, in 1857–'58, the State of Texas undertook the improvement of the river from Washington to its mouth, a distance of two hundred and fifty-five miles, $60,000 being appropriated for the purpose.

The following advertisement of the work explains what was undertaken:

OFFICE OF STATE ENGINEER,
*Galveston, April* 15, 1857.

Sealed proposals will be received at this office until the 14th day of May inclusive, for making certain improvements on the Brazos River, from the town of Columbia to Washington. The same to be done in accordance with specifications thereof on file in this office, copies of which are furnished to the editors of the Washington American, Richmond Reporter, and Columbia Democrat, for the inspection of bidders. The work to be done within a reasonable time, to be mentioned in the contract. Separate bids will also be received for portions of said work, in sections, as follows:

Section 1. From Columbia to Richmond.

Section 2. From Richmond to San Felipe, including most of the rock shoals.

Section 3. From San Felipe to Washington.

WILLIAM FIELDS,
*State Engineer.*

*Specifications of work to be done on the Brazos River, for the purpose of improving the navigation thereof, under the provisions of certain acts of the legislature making an appropriation for said purpose, viz:*

The rock shoals which so completely obstruct low-water navigation are to be removed, or so changed as to throw the entire volume of water into one channel, thereby making a narrower and deeper bed. It is not expected or intended that the shoals shall be entirely removed, but only the loose and other projecting rocks taken from where the channel is to be made, and placed on either side in such manner as to confine the water, as above mentioned. Said opening or channel through the shoals to be of sufficient width to answer the purposes of navigation, not less than 50 feet.

Where there are two channels, as is now the case at nearly all the shoals, one to be closed by a substantial dam.

The principal rock shoals are at Hall's Point, McDade's Ferry, Cochran's, Cooper's, Randon's, Thompson's, and another a few miles above Bolivar.

The same kind of work is needed at perhaps all of them; that is, filling or damming up one channel and throwing the water into the other, out of which the rocks are to be removed. Generally it will be best to make the channel where the current would naturally flow if permitted to have its course. For instance, at Cochran's, I think it will be better to dam up the channel next the left bank, and thus give the bed of the river a gentle curve instead of such a sudden change of course as that channel now makes. The current will then more likely do its part in keeping a channel open, and it will be much easier for steamboats to make the turn going up or down.

At Cooper's Shoals the channel should be made straight in or near the middle of the river. At Thompson's the current should be allowed a gradual curve, instead of passing so suddenly round and under the point as it does now.

Randon's, and those at Hall's Point, McDade's Ferry, and above Bolivar, to be operated upon according to the judgment of the contractor, or the superintendent in charge, if there be one present.

Besides the above-mentioned shoals there are many gravel islands, (generally immediately below a sudden bend in the river,) with a channel on each side, thus dividing and shoaling the water; one of these channels to be closed by a dam, which may be made, where rock is not convenient, of logs, brush, gravel, &c., properly secured. As it is difficult to define the different places of this kind that need improvement as above, it will be left to the judgment and discretion of the superintendent in charge. I mean, however, such places as Christmas and Cottonwood Points.

In other portions of the river, indeed for the entire distance from Washington to Columbia, many sand-bars are to be found in the river, showing above water, and growing into small islands, formed in every instance, no doubt, by sunken logs and drift. These need not be removed where there is sufficient width and depth of channel without doing so. All snags and logs, however, upon such sand-bars that are calculated to interfere with high-water navigation, must be removed, and the bed of the river to be cleared of all obstructions, so as to accommodate low-water navigation.

The river, from Bolivar to Washington, exhibits, at low water, a greater number of snags than I recollect to have seen elsewhere upon any stream. They are to be found at all elevations, ready to rake a boat at every stage of water, from the present stage to the top of a rise of 15 feet. We must get rid of these dangerous impediments. Those in the channel, or where the channel is to be made, must be taken out entirely, and all others outside of the low-water channel, must be trimmed off from bank to bank, so as not to interfere with navigation during a rise in the river, where boats may not follow the low-water channel. Snags and logs that may be cut and floated off instead of being taken out of the river, must not be allowed to form rafts elsewhere. All logs, &c., floated below Columbia will be considered sufficiently out of the way.

There are, at several places, large rocks in the bed (sometimes in the middle) of the river. These must be removed if requisite to give a good channel, or if the superintendent in charge may consider it necessary for greater safety in navigating the river at a higher stage.

As I deem it impossible to control quicksands, I scarcely know what to say in the contract about requiring a certain depth of water at lowest stage of the river. I do not wish to require an impossibility, and yet I am anxious to have as good low-water navigation made as the river will admit of, and the amount of funds justify. There are many places where sand-flats extend entirely across the stream, to attempt any improvement of which, with our present means, seems wholly useless. I shall, therefore, only require as great a depth of water in a channel 50 feet wide, at least, for the whole distance, as these bars or sand-flats have on them at low-water.

There is scarcely any overhanging timber in the way; yet some places need a little trimming, which the contractor will no doubt see the propriety of, and to show his desire to improve the river as much as possible, will have done without being required in and by his contract. And as everything that ought to be done cannot easily be specified, I shall expect a contractor, in good faith, to execute his contract, and make navigation as safe and certain as the river and the amount to be expended on it will allow. And I shall require him to show such a piece of work as any river-navigator or a sensible man will consider a compliance with the intent and meaning of the contract.

The improvement to extend from Columbia to Washington. There is so little to be done below, and so much above Columbia, I have concluded to commence at that place.

Twelve months will be allowed to complete the contract. Payments made for the same as the work progresses, but never more than three-fourths of work actually done to be paid for until the whole is finished.

WILLIAM FIELDS,
*State Engineer.*

The work effected some improvement in the rock shoals below Washington, while some snags were removed from the lower river.

The amount of improvement could not be ascertained, but there was general complaint of its insufficiency.

These papers further show that as early as 1832 the river sustained a very considerable commerce, which until 1858 grew in importance. During this time the high-water navigation of the river extended to Washington, and the low-water navigation to Columbia.

About 1858, inland navigation was secured between the river and

Galveston Harbor by a canal, which promised to increase the commerce of the river by giving it a better harbor than it before had. Shortly afterward, however, the city of Houston began to tap the trade of the Upper Brazos country, and has now entirely drawn it away from the river above Columbia. Two small steamboats yet run as high as the latter place, which now represent the entire commerce of the river.

It is claimed that these boats would yet run to Washington for about eight months of each year, were it not for the bridges across the river above Columbia.

It is also claimed that the re opening of navigation, now suspended because of these bridges, would be of benefit to the people living on the upper river, as giving a route to compete with the railroads to Houston.

This claim is set forth in a petition from citizens of Washington County to the State legislature, of which the following is a copy:

*To our honorable Senators and Representatives:*

We would beg leave to represent to you that the Brazos River was surveyed by officers of the United States Government, and classed on record at Washington City as a navigable stream, and it is well known that said river was successfully navigated for a number of years from the Gulf to Washington, Tex., and that, but for the unlawful and unwarranted erection, by railroads, of solid bridges across it, thereby preventing navigation, there would be boats running it now.

The freight and charges from Galveston to Washington, Tex., at present, via railroad to Navasota, and thence by wagon to Washington, are as follows: On barrel flour or sack salt, $2; on hogshead sugar or bacon, $10 to $12; barrel of cement or molasses, $5, and other freights up or down in proportion.

We know that boats can carry our freights for one-half the above charges, and the people will thereby save at least one-half cent per pound on most of their necessaries, and also be enabled to send much surplus produce to market, which would not bear the charges by present conveyance.

We therefore request our Senators and Representatives to lay this matter before the legislature, and urge that all obstructions to navigation by bridges be removed, and that the river be left open to commerce as heretofore.

The bridges of which complaint is made are three in number:

1st. At the crossing of the Austin Tap of the Houston and Texas Central Railroad, forty-three miles below Washington by river.

2d. A toll-bridge fifty-two miles below Washington.

3d. At the crossing of the Galveston, Henderson and San Antonio Railroad at Richmond.

These bridges are without draws, and consequently cannot be passed by steamboats when the river is at a navigable stage.

It appears proper that the companies owning the bridges should be obliged, under the laws governing the bridging of navigable streams, to provide them with suitable draws. After this is done, making navigation possible from Richmond to Washington, the removal of snags from the river-channel would no doubt be desirable, and it is thought that an appropriation of $15,000 should cover the expense of removal, but for such work no exact estimate can be made.

Low-water navigation is now found as far up as Columbia. Above that point, if desirable, it is evident it would cost more than it would be worth.

From Washington to Waco, except at extreme high-water, navigation may only be obtained by locks and dams.

## MOUTH OF THE BRAZOS.

The survey of the bar at the mouth of the Brazos was delayed for several months after completion of other portions of the survey, for reasons given by Mr. Talfor in his report.