

(editor's note: This paper was transcribed from a handwritten cursive copy with various difficulties. For a perfect rendition, the reader might wish to consult the original, itself a copy, in the volume entitled *Literary Club Papers* 2, 1886 – 1887 June 5, '86 to May 21, '87)

The Mississippi River in its Alluvial Region

Early in the year 1541, a daring band of Spanish adventurers, after two years of wanderings in the wilderness in search of gold, sent hither and thither by false reports of the Indians, whose only desire was to get rid of their troublesome visitors; worn out by starvation, and by marches through the dense forests and tangled morasses of what is now Georgia, Florida, Alabama, and Mississippi; their numbers thinned by the battles they themselves provoked, – at last neared the banks of a mighty river.

Ferdinand De Soto, the commander of the little band of explorers, being in advance of his party, was the first European to look upon the Mississippi. He saw it in all its majesty, for, according to the season of the year, the river must have been at flood height.

For ages it must have coursed its 4200 miles to the sea unknown to the nations of the Eastern world. The rude tribes who lived in its valley recognized its greatness above all the rivers of the continent, for they called it the “Father of Waters.”

Disheartened but not despondent, the gold-seekers found their progress impeded by a great barrier of water. The iron-willed commander immediately began his preparations for the passage of the stream. With a month's labor, and with the few crude instruments left after many losses and disasters, he built rough barges in which he ferried the expedition to the west bank. Where this first discovery and passage was made, cannot with certainty be told; but in all probability a little below Memphis.

The adventurers passed on, but their progress through the swamps was slow and tedious, and, on reaching the Ouachita, less than 100 miles west of the Mississippi, the brave leader gave up the search. He rested his party for the winter, on the west banks of the Ouachita, and returned to the Mississippi just above its junction with Red River in May or June 1542. Here, sick in body and in mind, weary and despairing, the brave commander died. Such a terror had his name become to the natives, that his followers, dreading to have his death made known, feared to give him ordinary burial, and for concealment floated his body out to mid-stream, in the dead of night, and committed it to the water, –the priests who accompanied the expedition performing the last rites of the church.

The burial of De Soto in the river of his discovery has been a theme for many writers. He had accomplished the greatest act of his adventurous life, although he knew it not himself. Penetrating the mysteries of the North American Continent, and revealing to the world the existence of its noblest stream, has preserved his name and life-history for all time. The Mississippi is his monument. It's more fitting that it should be his tomb than his cenotaph. – The remnant of his band, under Moscoso built boats, and, in abandoning the country, made the first exploration from the junction of the Red River to the Gulf in a voyage of 19 days. Several generations of aborigines lived and died, and the story of the visit of the cruel Spaniards doubtless passed into a tradition among them.

In a visit I once made to the country of the far North-Western Indians, I had an opportunity to realize how quickly a momentous event with these people who have no written records, can be forgotten. About 65 years after the famous expedition of Lewis and Clark, I found myself on the very trail that they had traveled, and, desirous of learning something directly from the Indians concerning the men of that party, was rather surprised to find that all they could tell was that a lot of men with hair on their faces had come into the country at a time when some of their now very old people were children.

The story of the disasters of the De Soto expedition, and what was worse, the failure to find gold, deterred the Spaniards from seeking to explore the river farther. At least the French, pushing their way across Canada, began to occasionally examine the Mississippi, and on the 9th of April 1682, LaSalle, having explored it from the junction of the Illinois to its mouth, planted the arms of France on one of the marshy tongues of land which project into the Gulf of Mexico, and took possession of the river and country in the name of the King of France. The complete exploration and settlement of the banks of the river is a long and interesting history full of stirring incidents; but we must pass it by and take a glance at the river itself.

Many of our members may doubtless recollect a feeling of disappointment with which they first viewed Niagara. If so, they will also remember that the longer they looked upon the great cataract surrounded by its beautiful scenery, the more the tremendous power of the falling water grew upon them, until they realized its full sublimity. – I have often heard the same feeling of disappointment expressed by people when they had their first look at the Mississippi River. I recollect my own. But it takes longer to appreciate the grandeur of our great River than of our great cataract; and a year spent upon its waters has given me a true sense of its magnitude. Returning from a year's absence, the Ohio seemed a trifling little stream, although from boyhood it had been to me the type of a grand river. Measured from the head of one of the small streams in Wyoming which spring from the Rocky Mts. In Yellowstone Park, down through its mis-named [] Missouri, and thence on to the Gulf of Mexico, its length is approximated at 4200 miles. Measured from the lakelet emptying into Itasca down through the branch called the Mississippi to its junction with the true Mississippi and thence on to the Gulf, its length is 3200 miles.

One of our members* has recently in a scientific magazine exposed the fraud of Mr. Glazier in proclaiming himself the discoverer of the true source of the false Mississippi. If he wants fame of that kind wherein no one will dispute him, let him reveal the true source of the true Mississippi. Little argument is needed to prove that the Missouri should never have been so named. It is an axiom among geographers, that the length of the river is measured from its mouth to the head-waters of its longest branch. Applying this rule to the Mississippi, we must follow the Missouri up to its head.

Aside from question of length, the Missouri partakes more of the nature of the Mississippi as found from the mouth of the Missouri to Cairo, while the so-called Upper Mississippi is totally unlike in physical characteristics. The upper river is a stream of clear water with banks as permanent as those of the Ohio. The Missouri is a muddy

* Russell Henman. "Science,"

stream like to the river below the junction. The clear waters of the upper Mississippi rush against the current of its formidable rival, but in a short distance the large river has swallowed up the inferior one, and there is not even a perceptible change in the color of the muddy water after the mingling. The so-called upper Mississippi adds volume but nothing more, and has lost its identity.

From the junction of the two streams the river flows in a narrow valley rebounding from bluff to bluff, until at Cape Girardeau, a short distance above Cairo, it begins to flow through the alluvial bottom-lands of its own formation. Thence in its course of 1120 miles to saltwater, its banks are cut in this formation. It receives the contribution of one river after another, but strangely does not increase its average width of about 3/4 of a mile, but enlarges its volume by deepening its channel.

An impression is extant to the effect that the Gulf of Mexico once reached to Cairo, and that the entire alluvial region is the delta of the river. Elaborate investigations have demonstrated this idea to be erroneous, and that from Cairo to Red River to Plaquemine, although the banks are alluvial, the bed belongs to a much older formation. The head of bayou Plaquemine or the mouth of Red River is considered the head of the true Delta. Bayou Plaquemine is about 220 miles above the mouth, and Red River 316.

The scenery from Cairo down is monotonous. There are only 14 points where the 1100 miles of river touches land not subject to overflow. The first of these is the high conspicuous bluff at Columbus; the last of the low hills on which Baton Rouge is built. The bluffs vary in height from 15 to 300 feet. In a voyage along the river little more than a glimpse of the high lands his hand. Although not particularly remarkable for scenic beauty, the view of the Bluffs is a refreshing break in the monotony of the flat landscape. – The river rolls on, eddying and boiling between its banks; the channel changing from one side to the other, but always keeping close to the concave shore in bends; – the current always cutting the bank on that side, and building it up on the other.

Willow bars, low islands, dense forests, or open plantations succeed each other as mile after mile is passed. The plantations are mainly of corn, until Memphis is reached; then cotton to the mouth of the Red River, and below that sugar-cane, which alternates with rice on the lower portion. Orange groves begin to make their appearance on nearing New Orleans, and are found interspersed among the sugar and rice-fields as far down as cultivation extends.

Above Red River, the quantity of forest on the banks exceeds that of the fields; but below that point the open country becomes more frequent; the woodland gradually disappears from the banks until one arrives at the “coast” as the inhabitants called this section of the river belonging to the delta below Plaquemine from that point on, the entire river-front, all the way to the marshes, is under cultivation. The forest is cleared to the swamps and forms the back-ground view of the country. On the “Coast” all houses are built close to the river bank, it being the highest ground. Of towns, save Donaldsonville and New Orleans, there are none worthy of the name.

Almost the entire population of the parishes being crowded to the river, gives the settlements the appearance of continuous villages. Each land-owner has a front on the

water, even if it is not more than 100 feet; but his lands may extend for miles into the swamps in the rear. – All large sugar-plantations are provided with extensive buildings for the reduction of their product and the numerous tall chimneys noted at intervals give the impression of manufacturing establishments strangely scattered in a rural region.

The dwellings in the Coast region are none of them remarkable for architectural effect. They are generally one or two stories in height surrounded by verandas or “galleries” as they are called, built more for comfort than show. The only distinguishing feature of the dwellings of the wealthy planters over that of their more humble neighbors is their spaciousness. Most of them are built of wood, and a very common style of architecture is the Grecian temple, en vogue among the builders in this country some 40 or 50 years ago.

The dwellings of the negro laborers are small cabins of two rooms, generally of rough plank, but sometimes more highly finished, each provided with a kitchen-garden in the rear. All the houses are grouped so as to form a street on which they front, distant not many yards up or down the river from the residence of the proprietor.

About 50 miles from the sea the swamp in the rear of the plantations has approached so close to the river, and the land has sunk in height so near to the level of low water, that plantations no longer exist. Scattering huts of small rice-farmers occupy the narrowing strip of dry ground for a few miles more but at last these are crowded out, and a desolate marsh of grass as tall as corn forms the shore of the remainder of the river. Alligators bask in the sun, on the edge of the oozy mud. Flocks of pelicans or sea-gulls fly about, and these are the only visible signs of life.

The Mississippi has reached out into the Gulf, and is shut out from it for 35 miles by marshy strips of ground overflowed sometimes by the river and again by the sea.

The river empties through four branches from its 14 to 17 miles radiating from the head of the passes, and through these branches pushes its waters far out into the Gulf.

About the passes are the lighthouses and keepers' dwellings. At South Pass stands the new pilots-village of Fort Eads, and at South West Pass the old one called Pilot Town, the only American Venice. I do not know how Pilot Town flourishes since Fort Eads was built, but it is still in existence. I spent a night once at that doleful place. The town was built on a small bayou of the South West Pass, cutting eastwardly through the tongue of land to the Gulf. This bayou was its main and only street. The surrounding land was a marsh on which you might sometimes walk when the season was dry, the river low, and the wind from the north kept the sea away. The reeds of the marsh grew close up to the buildings which were raised on piles. There was only one residence that made any pretense of being substantial or elegant. It stood on the corner of the Mississippi River and Main Street, and was two or three stories high. On each front of the Venetian street, side-walks on stilts formed the only roadway.

Communication between the two parts of the town was by the skiffs with which each resident was provided. The inhabitants were principally pilots. It was one of the roughest and most profane towns I was ever in, not excepting the mining towns of the far West. The bar-rooms were filled with sailors from vessels at anchor, while waiting for

quarantine or revenue inspection.

We have noted in our ride down the river the changeable nature of its banks from Cape Gerardeau to the river "Coast." It is continually destroying its islands, adding to them or building new ones, or joining them to each other or to the main-land.

The islands, considerably more than a hundred in number were once numbered consecutively from Cairo downwards. The original numbering still holds, but there are now several gaps in the series, some single islands have a double number, and new islands are named.

What the River destroys at one place it builds on another. The concave bank recedes, the opposite point advances. A deposit of mud and sand gradually shoals the water, until the point has a sufficient accumulation to exhibit the bar at both stages. A few weeks exposure above water is sufficient to encourage a growth of Willows. At the next rise, young willows increase the deposition of sediment by retarding the flow of the current. The willows then raise themselves above the new deposit. It is now less subject to inundation, and a growth of cottonwood is started. This rapidly grows into a forest, while the river gradually, but more slowly with each returning flood, raises the land. In time, the cottonwoods give way to the oak, the cypress, the sycamore, and other slow growth timbers until the land assumes the form and appearance of the land generally of the alluvial region.

Sometimes, however, for one cause or another affecting the current, the river does not complete a work which it has undertaken but destroys with equal rapidity the uncompleted land. The story of a Mississippi River captain is a good illustration of this characteristic of the stream. He was one of the best-hearted men; and I do not know that he had a fault except a proclivity for spinning sailors' yarns, in which there was always a foundation of fact, with a superstructure of fiction.

A steamer proceeding on her way from St. Louis to New Orleans struck a snag and sank with only her chimneys visible. A wrecking boat was sent for, but by the time she arrived, the river had completely buried the boat in its sediment. Seeing the hopelessness of the task, the wreckers abandoned the steamer to her fate.

The River continued to deposited sediment, and in course of time, the young willows appeared, then the cottonwood, which growing into a forest at length covered by dry land above the boat in place of the stream that once flowed there. By a whim of the river, it then began the process of destruction, and again the site when the steam boat had been lost was covered with water. For the second time a wrecking boat was sent for, and 30 years after the sinking of the steamer, the lost cargo of lead was recovered.

I cannot vouch for the truth of the story, but I can readily believe that such a thing could have happened, and if the tale had been told by any other than the narrator, would not think of doubting it. I am only surprised that the captain said 30 years. It was more like him to put it at three.

A beautiful story in "Old Creole Days" by Geo. W. Cable called "Belles Demoiselles Plantation" is another illustration of the remorselessness of the current of the Mississippi

in the destruction of the banks which enclose it. — — — — —

A map of the alluvial region indicates many crescent-shaped lakes scattered through the country a short distance away from each side of the river in the stretch from Cairo to Plaquemine. These lakes are remnants of the old river which had changed its course through "cut-offs." A "cut-off" occurs when a river sweeping around a bend forms a peninsula, the isthmus of which has one or both shores exposed to the scouring action of the river. Cave after cave narrows the width of the neck until the river finally breaks through with resistless force, as the natural channel of the river always requires the water to travel several miles from above to below the isthmus, and this distance represents a fall of several feet since the slope of the surface is from two to 6 inches, depending upon the locality and the stage of the river, the water pours thro' the cut-off in a resistless flood, and quickly scours for itself a channel as wide as the original river. The two ends of the abandoned channel silt up very quickly. The willow, the cottonwood, and the heavy timber appear in succession. The muddy water left in the old channel having a current no longer, to keep the sediment in suspension, is clarified by its precipitation and a permanent lake of clear water is formed.

Some of the cut-offs are of quite recent occurrence. I passed through that of Palmyra Bend about 20 miles below Vicksburg, shortly after its formation. As near as I can remember without having access to notes, the distance around the bend was 18 miles, and through the cut-off less than one fourth of a mile. The ends of the abandoned part of the river had not yet silted up, and the current had not yet adjusted itself to the new condition of its fall, for the shorter distance it had to travel, so that the velocity was greater than any I had witnessed on the whole length of the river.

The most noted of the recent cut-offs is that at Vicksburg; General Grant in the siege of the city endeavored to make an artificial one. For safety from the enemy's artillery, he selected a locality farther west than that of the eventual cut-off, a site badly chosen, and only warranted by the exigencies of the occasion.

Much time and labor was expended in digging a canal to start the water through. But the river refused to be enticed that way, and the project was abandoned. Since then the canal has been filling up and all that remains of it now could readily be mistaken for a plantation ditch.

Many years before Grant made his attempt, the river began to work surely towards the object is finally attained in 1876. In 1828 the neck of the peninsula was 3000 yards wide. I saw it five years before the cut-off, and it had dwindled to a few hundred yards.

As the river showed no disposition to change its action, and the time approached when the date could almost be computed for the final obliteration of the isthmus, the city of Vicksburg became alarmed and petitioned the Government to come to its relief. An examination demonstrated that it would require an expenditure of two millions in protective works, sufficient to prevent the disaster. The current was left to work its will, and Vicksburg is now on Centennial Lake, the river flowing in view of the hills of the city, but being some two miles below its wharves.

Two cut-offs were made by artificial means. A theory once held that they had a beneficial effect in preserving the country from overflow. The supposition has been demonstrated to be erroneous as to the effect below the cut-off, and the aim is not to prevent, rather than to encourage them.

An opinion held by many is that the river after having made a cut-off, immediately sets to work to regain its lost length.

The accurate knowledge of the changes of the river is too recent to prove the truth of this assumption, but from the data we possess, there seems to be strong grounds that it is a fact.

Although not apparent to the eye, the Mississippi through its alluvial region follows the summit of a ridge. The capacity of a stream for holding solid matter in suspension, depends upon the velocity of the current. The flow of muddy water over its banks is naturally with a much less velocity than in the channel. The heaviest particles settle nearest the shore, and the quantity of material precipitated diminishes rapidly until only the finest clay is carried to any great distance. The result is that the land adjoining the banks, receiving the greatest deposit, is raised higher than the general level of the country than the more distant land. Above Red River, the surface of the soil slopes away from the banks for five or six miles at the rate of three or four feet per mile.

The settlement of the country has required its embankment against floods, by the building of levees. They are placed a short distance from the borders of the stream, and in form resemble a railroad embankment; but are narrower on top and have flatter slopes. As they perform the same office as a reservoir dam, they are very carefully constructed to prevent any percolation of water.

It is frequently said that the alluvial lands of the Mississippi were settled just 100 years too soon; and that the consequent building of levees has prevented the raising of the surface to a plane above ordinary floods. The idea is a most erroneous one. – The quantity of sediment carried by the river which would be distributed over the land by floods, if evenly spread over the 30,000 square miles of country subject to inundation is just sufficient to raise it one foot in 800 years.

As it is found necessary to build levees from six to twelve feet high on the elevated borders of the river it is apparent that many thousands of years must elapse before the whole country could be raised above all but extreme floods.

The Mississippi is a great river, but still its power is limited. One of the enemies destructive to the power of the levees, is the common craw-fish, which bores a little tunnel sufficiently large for the river to push a streamlet through. The levy may be built of tenacious clay, and the rill of water may continue to run for some time without serious damage. Again, the little tunnel may be made in friable soil. In that case, if immediate attention is not given to the danger, the water rapidly enlarges the hole into a break, and then a crevasse is formed.

But the worst enemy of the levees is the criminal negligence of the people who are dependent upon them for their homes. They witness from the cross-fish holes with apathy

as long as the danger is not very imminent. They allow them to get out of repair from washings of rains; and with the flood within six inches of the top, make no effort to raise the height of the embankment, so long as they think that the river has reached its maximum. A common cause of the breakage of levees in the rice-growing districts of Louisiana comes from rice-flumes. – As rice requires an abundance of water for its cultivation, wooden sluices, provided with gateways, are inserted in the levees for the purpose of flooding the fields at will, during high water. The neglect of these wooden sluices is the source of a great amount of damage from breaks.

The most destructive crevasse in Louisiana was caused by an old flume in the year 1882. The cultivation of rice was abandoned for that of sugar on a certain plantation about 20 miles above New Orleans on the opposite bank of the river. The old flume was filled in without removing all the timbers, which in time became rotten and allowed the percolation of water, which on a stormy night at last made a breach in the levee. It might have been stopped in its incipiency, but for the indifference of the negroes, after the break was first made. The little aid they lent to the few white people availed nothing, and the celebrated “Davis Crevasse” became a fact. Before the crevasse was a hundred yards wide, two railroad companies, both of whose tracks were within a mile of the river became alarmed for the safety of their roads, and sent large forces of men, and material and tools to close the gap. The work was prosecuted for several days without success and finally abandoned as a hopeless task. I visited the crevasse when it had cut the levy for a length of 700 feet, and a month later when it was 1200 feet. At this time it was pouring a volume of water over cultivated fields equal in quantity to that of the Ohio at mid-stage. The height of the levee was 8 feet, and the river was within six inches of the top. It was like the bursting of a dam. The water rushed in its descent upon the land, with a force like that of the Niagara rapids. The river continuing at flood-height for months, the surrounding country became a lake. The slope of the land being from the river, eventually drained all the crevasse water into the Gulf by way of Barrataria Bay. But during the time of the flood-height of the river, whole parishes remained submerged. It reached the outskirts of Algiers opposite New Orleans, and rendered the town of Gretna uninhabitable. A steamer passing down the river quite close to the crevasse, was drawn through in spite of efforts to stem the current. She shot over the rapids in safety on to the newly-formed Lake, and then returned to the Mississippi River via plantations and swamps, the Barrataria Bay and the Gulf of Mexico, it being impossible to return to the river through the torrent of the crevasse. It was only after the river fell within its banks that the levee was repaired.

The occurrence of the Davis Crevasse was a most natural thing, considering the condition of the levees. I walked along them in the vicinity for some distance, and observed them to be in a dilapidated condition. A levee fronting a plantation that had 900 acres of sugar under cultivation in one field, was no better than the rest. The apathy of the people was surprising. But familiarity with danger had made them indifferent to it.

The Great Bonnet Carré crevasse flowed for years six miles across the country into Lake Pontchartrain, and turned that arm of the sea into a fresh-water lake. It was closed in 1882 by the building of a railroad across the crevasse, and in the course of a few months thereafter the lake contained salt water.

The Mississippi receives no tributaries below Baton Rouge not even the smallest creek. As it is on a ridge, all drainage is away from the river. Accordingly the drainage of the streets of New Orleans is not into the river, but to the sea-level at Lake Pontchartrain. High water at the city is 16 feet above the sea, and the levees are but a foot higher. The Sanitary Association of the city has established pumping stations along the river-front, which throw the water into the gutters to flush them. In times of very high flood, the expense of pumping is saved by allowing the water to run through sluices at the top of the levee.

Below Red River, the only branches of the Mississippi are the bayous. Bayou being a local term for a branch of a stream flowing away from it. The most important bayou is the Atchafalaya, its head being near the mouth of Red River. It was formerly rather insignificant; but of late years has been enlarging its channel, and having a shorter distance to travel to the sea with the same amount of fall, threatens to become the main river. The city of New Orleans is alarmed that it will meet with a worse fate than Vicksburg; and unless something is speedily done to check the steady increase in the growth of the bayou, the present generation may yet know it as the Mississippi.

The problem of governing it is a difficult one. In fact, the problem of what to do with the Mississippi River in the control of its forces to serve the best interests of the country, is an enigma. It is no disparagement of the gentlemen composing the Mississippi River Commission to say that their work, for the several years that their board has been in existence, notwithstanding the millions they have spent, has been chiefly experimental.

The controversies concerning the plan of Eads to deepen the mouth of the Mississippi, are yet fresh in the mind. Some of the ablest men who had made the subject of river hydraulics a specialty differed about the probable success of the plan proposed, many of the specialists denouncing it as being more likely to do harm than good, or at best having no effect whatever. His experiment was a successful one: all honor to him.

The jetties were built at the shallow South Pass, the Government refusing to allow Eads to experiment with the principal one for fear of the possible injury to it, claimed by many whose opinions were considered valuable. The South Pass, since the improvements were made, has become the main one and the largest vessels enter where formerly there were only 12 or 14 feet of water.

Below Plaquemine, the character of the river differs somewhat from that above. No islands exist, the banks are lower, the rise of high water gradually inferior, and the slope of the surface much less. It resembles somewhat a long, narrow lake. The banks are not subject to the sudden changes of the upper river, and although they cave sometimes, the amount of the caving can not be compared to that above. Sand-bars are unknown.

The soil of the adjacent country from New Orleans down to the mouths is sandy or hard clay on the immediate banks, then a dry crust superimposing a boggy strata, and farthest back the cypress swamps or sometimes the grassy marshes locally known as "trembling prairies." The city of New Orleans is built out from the river on the dry crust. Two or

three feet of digging brings the workman to soft, black mud. From this peculiarity of the subsoil, burials in the cemeteries are in brick tombs above ground; cisterns are wooden tanks, and cellars are unknown. Buildings of any considerable height or weight are subject to settlement, the architect making allowance in establishing the height of the door-still, for the subsequent sinking of the building. The Custom House and the St. Charles Hotel have each settled three feet since they were finished and, being pretty old structures, appear to have reached the limit. But the tall Cotton Exchange building being only four years old, is still very slowly sinking.

The “trembling Prairies” found in tracts miles in extent about Lakes Pontchartrain and Borgue, and also about the Passes as well is along the whole Gulf Coast of the Delta, seem to be of the same nature as the substratum on which New Orleans is founded; but not being covered with a dry crust of land, have a strangely different appearance. They are but a foot or two above sea-level, and are sometimes covered with water. The roots of the high grasses and the matting of the dead stocks form an insecure footing. One may walk across these prairies when by the absence of high tides and the drying action of the sun, a carpet of dry mud has been formed. The ground shakes beneath one's foot-steps, and from this feature the marshes have derived their name of “trembling prairies.” They are a desolate waste, the favorite haunt of the alligator and the water-fowl. None visit them except hunters, who penetrate in boats by way of the small bayous with which they are intersected.

At the passes of the river are found the “mud lumps” the origin of whose formation has been a puzzle to geologists, some going so far as to attribute them to volcanic forces. They are in size from a mere spot to several acres in extent, and rise sometimes to the height of 15 feet above the water. Their formation is still going on. Every mud-lump has a crater from which a spring of water trickles much more salty than that of the Gulf.

The mouths of the river are provided with light-houses which, being sea-coast lights, require a considerable elevation. The question of obtaining a foundation was naturally a troublesome one. The light-house at Pass á la Outre built 30 years ago with what was considered a good foundation has sunk several feet, and settled out of the perpendicular.

The keeper's dwelling of the old South West Pass Light was built as a two-story brick house some 50 years ago. When I saw it, it was a one-story dwelling; the original first story having settled out of sight, some of the windows of the old second story had been enlarged into doors to suit the new conditions.

The building of a new skeleton iron tower as a light house at South West Pass was the subject of many plans and much discussion during a period of ten or more years. But a plan of foundation was finally agreed upon and at an unusual cost the tower was completed.

It has been noted in the beginning of this paper that in the year 1541 De Soto, arriving on the banks of the Mississippi found the great torrent a barrier to his progress, which with much labor he overcame. More than 300 years have passed, and the populations now living on each side of the stream still find the river an obstruction. A great highway throughout its length, it resists, with all its mighty power the desire of its new rival, the

railroad in its right to obtain a crossing, notwithstanding it is powerless to prevent its occupancy of a parallel right-of-way through the land of the river's construction.

The obstacles to bridging the Mississippi in the alluvial region above the Delta, although not insurmountable entail such great cost that no Company has considered itself financially able to undertake the work. Within the past year a project for spanning it at Memphis has been broached, which has taken no more definite shape than the making of some surveys. The low banks require long approaches to a bridge. The rise of floods above low water ranges from 34 to 52 feet between Cairo and Baton Rouge. The shifting nature of the bed of the river may leave the draw-span on a sand bar, and the piers in the middle of the channel before the bridge is completed; while protective works to prevent this may be as costly as the bridge itself. Notwithstanding these obstacles, bridges are only a question of time.

Strange as it may appear, the river in the vicinity of New Orleans does not present any serious difficulties for the construction of a bridge. Why none have been built is noticed in the odd expression of the prayer-book which says: "We have not done those things which we ought to have done."

A bridge at New Orleans can be built above or below the city in water from 60 two 70 feet deep. There, the flood tide rise is only 16 feet, and a bridge 30 feet above low-water would give sufficient height, while the descent to the land could be made with a half-mile length of approaches. Sudden changes in the shores or the bed of the river are unknown. No silting up sufficient to obstruct navigation can possibly occur. It is unimportant where the draw-span of the bridge is placed, as the 60 or 70 ft. depth reaches from bank to bank. It is foreign to this paper to enter into a discussion of the reasons, but it is a fact that piers can be built at an infinitely less cost in, than at points above, the Delta. The amount of money spent on the St. Louis bridge would build three or four in the neighborhood of New Orleans.

In conclusion, it may be stated that the subject of "The Mississippi River in its Alluvial Region" covers such a variety of interesting historical and physical facts that its treatment in a paper of this nature must necessarily be cursory and meager. – It can scarcely be more than an incomplete table of contents of what might be written. An [addenda] of disconnected facts may not be without interest.

Although the Mississippi is apparently erratic, in the use of its forces, it is governed in all its actions by fixed laws. The distance from Cairo to the Gulf measured on the straight lines of the general courses of the river is 650 miles, and by its meanderings 1100 miles.

The width of the river between banks at high water varies considerably being at:

Cape girardeau	2500 ft.
Cairo below the junction of the	
Ohio	4000 "
Memphis	2800 "
Below the Arkansas	3700 "
Foot of Island 76	7800 "

Below vicksburg		4300	"
Below Grand Gulf		5900	"
Red River Landing		3600	"
Baton Rouge		2500	"
New Orleans	1600and	2600	"
Above Head of Passes		2400	"
some sample depths of the River at high water are:			
Cape Girardeau		66	ft.
below the junction of the Ohio		71	"
Memphis		102	"
Vicksburg		150	"
Red River landing		118	"
Plaquemine		126	"
New Orleans	60 to	200	"
At Head of Passes		50	"

The area drainage of the Mississippi basin is 1,244,000 square miles or little more than one third that of the area of the entire United States, and a little less than a third of Europe. The annual quantity of water discharged into the Gulf amounts to 19,600 billions of cubic feet. The sediment deposited in it not including the deposit on the Delta proper amounts to two billion cubic feet per year or sufficient to cover a square mile 268 feet high. The total amount of excavation of all kinds required in the building of our Southern Railway was 350,000,000 cubic feet. So that the yearly quantity of sediment carried into the Gulf mighty Mississippi is nearly six times as great.

Large as these figures appear, they sink into insignificance by comparison with other vast features of our globe.

If the Gulf of Mexico was enclosed and empty, it would take the Mississippi 4000 years to fill it with water, or 11,000,000 years to fill it with settlement. The annual rate of progress of the land into the Gulf is 368 feet; but as the Gulf deepens in advancing, it would require a century to build 5 miles.

The tides in the Gulf seldom exceed 12 or 18 inches so that they are effect in checking the current for any considerable distance is slight.

All the bayous of the Delta like the Mississippi, have their banks higher than the surrounding country.

The mean temperature of the river is 4 1/2 degrees colder than that of the land.

G. B. Nicholson

October 16, 1886