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FORT ST. PHILIP CANAL.

Speech of Hon. L. A. Sheldon on the Bill in Relation to the Improvement of the Mouth of the Mississippi River.

THURSDAY, June 14, 1874.

Mr. Lewis, of Tennessee, having spoken in behalf of the Eads jetty scheme, General Sheldon replied:

Mr. Sheldon—I am greatly surprised when the gentleman from Tennessee (Mr. Lewis) denounced the army engineers he should quote General Barnard, the oldest and in consequence of his age the feeblest in the service, and who is therefore assigned to no active duty. I agree with the gentleman in the importance of an open mouth, but he utterly fails to show how that can be secured. If I can get the ear of the gentleman I think I will be able to convince him his idea is entirely utopian.

Mr. Dawes—Before the gentleman proceeds further I would like to call his attention to a remark he has just made in reference to General Barnard, who he says is the oldest and therefore the feeblest of these engineers.

Mr. Sheldon—I said in consequence of his age.

Mr. Dawes—The gentleman said he was the oldest, and therefore the feeblest—so feeble that he is relieved from all duty.

Mr. Sheldon—I said active duty; and that is the fact.

Mr. Dawes—General Barnard has the misfortune to have a defect in his hearing. I do not conceive that that would disable him from the discharge of any duty of this kind. I wish to do justice to General Barnard, for he is a constituent of mine, and a native of my own county. He stands among the very first—

Mr. Sheldon—I do not consent that this shall come out of my time, which is limited. I do not intend to do General Barnard any injustice.

Mr. Dawes—I would leave it exactly in that way. It does not do to whistle a man down the wind and allow nothing to be said in his behalf.

Mr. Sheldon—What I said was simply because of age.

Mr. Dawes—I suppose he is about the age of the gentleman from Lousiana (Mr. Sheldon) himself. He is probably between the age of that gentleman and my own. I remember him when he was a boy.

Mr. Sheldon—I was saying, and if I can get the hearing of the gentleman from Tennessee I think I shall be able to convince him that his idea of an open mouth is utterly utopian. The very question at issue is, can there be such a thing as an open mouth? It involves most important engineering principles. I solicit the attention of the gentleman to what I am about to say, and I ask if he can dispute it?

Mr. Speaker, the subject under consideration is not an ordinary one. The beneficial effect of so improving the outlet to the sea by the way of the Mississippi river as to adequately supply the demands of commerce, will be so great and wide spread that the project must be regarded as more completely national in its character than any similar one ever before Congress. It should command a thorough study from every gentleman on this floor, not merely because it is important, but it involves principles of engineering concerning which we can not afford to be mistaken. Members of Congress are not usually engineers, and in order to act intelligently upon this question, considerable investigation is required, or they must act upon the views of those belonging to that profession as a matter of faith. The great interest of my constituents in this improvement has compelled me to give study to the subject, and because I have done so, though not an engineer, I shall risk the appearance of impudence by asking the House to listen to and weigh the argument I propose to make. And let me assure gentlemen that, although I come to the investigation of this subject with the strongest desire to see this improvement made, yet I have been and am without the slightest proclivity as to the mode of its accomplishment, provided the work shall be ample and permanent.

The first question which arises is, shall we undertake this improvement? Are the interests to be promoted of sufficient magnitude to justify the necessary expenditure? If upon this point the decision is in the negative the discussion of methods is unnecessary. It would seem that the country had been educated enough through the agencies of chambers of commerce, boards of trade and commercial conventions to leave no doubt as to the propriety and necessity of this improvement, but in these times of exacerbated economy everything relating to the expenditure of money is uncertain, even for the most meritorious measure, and I am induced to present the reasons why this work should be undertaken, because its transcendent importance when considered must overcome the indisposition to expend the public funds.

It has been often said that transportation is the most important question of the day. The whole people are considering the subject with an intense feeling. Every man is affected by the cost of carrying, whether he be producer or consumer. The people on the Atlantic coast are fed and supplied with raw materials to a considerable extent from the Mississippi valley, and in turn commodities manufactured in the East or imported from foreign countries are conveyed to the interior for consumption. The North and the South mutually supply one to the other many articles of necessity or luxury. Domestic commerce in its extent and ramifications should be the subject for a book rather than of a speech. But general facts may be stated to show the outlines of this trade.

The Mississippi river and tributaries contain 16,000 miles of navigable water, entering into eighteen States and several Territories, and drain a domain of nearly a million square miles. The population inhabiting this region approximates 20,000,000, nearly one-half the numerical strength of the nation. It is probable that at this time the production of wheat, corn, rye, oats, buckwheat, barley and potatoes equals 1,500,000,000 bushels, two-thirds of which is sufficient to supply consumption in this section. The markets of the country are supplied from the Mississippi valley with fully 1,500,000 cattle, 2,000,000 sheep and 5,000,000 hogs. The surplus of food products alone can not be less than $1,000,000,000 in value, which must find Eastern and foreign markets or be wasted at home. More than one-half the cotton is produced here, and for want of local manufactures must be transported to the East or to Europe, to be wrought into fabrics and in part retransported for consumption. Population and production are more rapidly on the increase in the Mississippi valley than elsewhere, and the more trade develops the more grievous will become the charges for transportation.

It is no wonder that the present and prospective burdens imposed for carrying products to market have caused the formation of a party powerful in numbers and earnest in purpose, who make relief from them the cardinal principle of their platform. The greatest strength of this party is in the Mississippi valley, because there the burden is most felt. Agriculturist more sensibly feel this grievance from the bulky nature of their productions and the small profits of their business. Besides, capital invested in railroads is largely owned in the East, and the profits in the main inure to the people of that section. As railroads furnish the chief means for commercial intercourse, it is quite natural that attention should be first turned to them, and that the plan of reducing freight charges by legal means should be resorted to as an initial and practical measure.

In obedience to a resistless and popular sentiment, this branch of Congress consumed many days in the discussion of a bill to regulate railroad transportation. Although it passed this body, it can not be denied that, in the opinion of many men, grave constitutional questions were involved, and still more serious doubts as to the practical benefit which would result from it or any similar measure. Under the constitution it is clear that navigable waters within the limits of the United States are under the control of Congress, while it is not controverted that each of the thirty-seven States in their own way and manner may charter and control railroads within their respective limits and so far as relates to the inhabitants of such State. If Congress can exercise any control, it must be limited and inadequate.

Competition is the best regulator of prices. Experience has shown that as a rule competition among railroad companies ends in combination. The track and rolling stock are private property; none but the owner can use or control them. Nobody will assert that the government of the nation or of the State, or both together, can deprive the owner of the occupation of his property and throw it open to the public use. The subject of cheapening transportation by railway through the power of legislation is surrounded by legal and practical difficulties. If the charges of carrying upon a public highway are unacceptable, the dissatisfied party may put on his own team and lessen the cost by his own competition. The rivers and the lakes are the common roadways of the people, open to receive the vehicle of any one. Then competition may be effectual. Upon them there can be no monopoly, no exclusive right. Moreover, the river and lakes are given to the people free of the cost of construction, and almost expenseless in repair and maintenance, while the building and preservation of railroads cost large sums of money, and they must be managed to pay expenses and a reasonable profit upon the capital invested. Enough has been said to make it apparent that the true method of cheapening the cost of transportation is to improve water lines wherever practicable and throw them into competition with land lines. Public attention is already turned to this subject, and thoughtful men believe that the adoption of this policy can not be long postponed.

The physical characteristics of the country invite the adoption of this policy. Nature seems to have been mindful of the wants of the interior. Little of this great section lies remote from some navigable water channel, or one which can be made navigable at a small expense as compared with the benefits which will result. The channels through which the water of the interior finds its way to the sea indicate the routes of transportation. The extreme northern portion of the Mississippi valley has its chain of lakes, and a little canalization will enable ships to reach the Atlantic coast without change of cargo. The Canadian government have utilized these advantages more than we have, and there is great danger that by the execution of further designs the commerce of much of the Northwest will pass through foreign waters and pay tribute to foreign people. It will cost little time and money to connect the lakes with the Hudson river, which would give us all the profits of this trade, and it can be conducted more cheaply and expeditiously than through the waters of the British Dominion.

The James and the Kanawha rivers are separated by but a narrow space, and the same is true of the Tennessee and the rivers of Georgia. A little artificial aid will create water channels in these directions, and their utilization must soon become necessary to accommodate increasing population and production in their vicinity.

While all these lines are of great value to large and productive sections, there is another channel whose improvement to the extent of supplying every demand of commerce will cause the expenditure of less time and money than any other, and will benefit the whole population from the Rocky mountains to the Atlantic sea. It is never closed by ice, and when the mouth of the Mississippi is made navigable for the largest ships, the Mississippi valley will be accessible to all nations and all ports of our own, and the trade of our interior cities may be direct with all the world.

The cereal producers of the West are most vitally interested in this improvement, because it opens a direct route to the peoples who do not produce breadstuffs, and who ought to and soon must obtain their supplies in this country. We must rely upon Mexico, the West India islands, and the Northern States of South America to consume our surplus. This can not become the channel of exportation for the West without acquiring the control of larger importations to supply the people of the eighteen States into which its navigable waters extend. This route will furnish competition to the railway lines the whole of the year from Cairo southward, and for eight or nine months even as far up as Cincinnati on the Ohio, and Keokuk on the Mississippi, while the lake channel is closed by ice for five out of the twelve months.

It is important to inquire whether transportation by this line is or will be cheaper than by railways, and will it pay the expense of opening and keeping open. No plan of improvement contemplates the expenditure of more than $10,000,000 to complete, and the one which I favor will cost much less to maintain, as I shall hereafter show, than to continue the ineffectual process of dredging now practiced.

It is estimated that the Atlantic States buy of the West 30,000,000 bushels of wheat and 80,000,000 bushels of corn annually for consumption, and our export of breadstuffs averages about $75,000,000 per annum, the bulk of this being raised in the West. It is safe to say that there is transported from the Mississippi valley to the East for exportation or domestic consumption not less than 150,000,000 bushels of food products each year. From five leading points in the West to New York the cost of transporting a bushel of corn, wheat or oats by rail is forty cents, more than twice the average cost of production. At the present time, with all the delays and perplexities caused by the obstruction at the mouth of the Mississippi river, the cost of carrying from the same points to New York is twenty-four cents, or a difference of sixteen cents. On 100,000,000 bushels of grain sent by rail to the seaboard the saving annually would be $6,000,000, more than the expense of the improvement contemplated. The present depth of water on the bar will not pass a ship carrying more than 40,000 bushels, while with a depth of twenty-three feet there may be carried from 75,000 to 90,000 bushels, and this increase of load will justify the belief that the price of freight could be reduced. The facts stated will enable us to make some estimate of the whole saving which would result from this improvement. And the saving will inure to the benefit of consumer and producer, and will be enhanced in the same ratio that population and production increase.

It has been a question of some doubt whether wheat or corn can be carried by the way of the river and Gulf in warm weather to foreign countries without damage. Without the presence of dampness, heat of atmosphere does not damage these grains. If damp and confined, injury will result in any climate and at any season. The experience of the farmer shows that his corn keeps as well in summer as in winter with the same care. But the solution of this question is not left to argument. That it can be carried with safety has been demonstrated by thorough and continued experience. It is shown that corn shipped from New Orleans to any foreign port reaches the point of destination in just as good condition as from any port in the United States. Grain is shipped from Europe to Brazil and other warm countries at all seasons, traversing the torrid zone, and no complaint of damage is made caused by warm weather. The grain merchants of St. Louis are particularly satisfied upon this point, as is shown by their efforts to establish steamship lines to the countries south of us.

The people of this country begin to feel some solicitude on the subject of adverse balances of trade to be paid in coin. It is seen that the desire to resume specie payment can not be gratified unless some steps are taken to retain the coin productions in the country until the quantity will enable us to resume naturally and easily. Hence there is a growing disposition to do something to increase exportation. We export all the cotton and petroleum we can spare. It at once occurs to a thoughtful man that our facilities for producing breadstuffs should cause us to endeavor to increase their exportation. This we can not successfully do unless the cost of transportation to the seaboard is cheapened. The development of water lines is the only means by which it can be accomplished; and the improvement of the mouth of the Mississippi river will put us in the most direct communication with the people who will be most likely to demand our surplus.

Since 1824 the government has expended more than $40,000,000 for the improvement of rivers and harbors, and three-fourths of it east of the Apalachian mountains. Considerable liberality has been displayed toward the Northern lakes. I do not find fault with this, for these expenditures were useful, and it is proper that attention should be given first to the localities settled and developed earliest. The people of the South and West do not wish other sections neglected, but they do think, when they present the greatest and least expensive work, as regards the interests involved, ever placed before the American Congress, it should not be postponed for others, but should be preferred rather, inasmuch as other sections have had their full share, and at a time when it would most encourage development. We want this now. We most need it now. For the money expended in this enterprise we will return a hundred fold to the treasury; we will return to the people of the East more than they lose by taxation in the reduced price at which we will sell them our products. My constituents are vitally interested; but I do not ask this work for them, not alone for the great Northwest, but for the entire nation; for every man, woman and child will be benefited.

The importance of this subject must be too well understood and appreciated to need extended argument or presentation of facts. Hoping and believing that it is the purpose of Congress to do this work in some way, I shall address myself to the plans suggested.

It need not be said that the generation which preceded us saw this subject looming up in all its present prominence, and took steps to understand the laws which govern bar formations and the means to obviate them. The practical result thus far has been to apply dredging, mainly because of the inexpensive character, and as an experiment, until some other plan could be devised. It is now conceded that dredging can never procure more than eighteen to twenty feet of water, and that not continuously, when commerce demands twenty-seven feet permanently. So that we are now driven to content ourselves with an inadequate and uncertain channel, at a considerable annual expense, or adopt some other plan which will give an ample and certain channel, even though abstractedly the cost may seem something of a burden. Two plans have been presented to Congress—one by means of jetties to remove, the other by means of a canal to flank, the bar.

Before entering directly upon a discussion of the merits of the two plans, it is well to describe the character of the obstruction to be removed or flanked. It is believed by some that the mouth of the Mississippi river was at one time as high up as the point of confluence with the Ohio, and that it has pushed the bar to the present location, filling up the vast alluvial regions bordering on either side. However this may be, careful measurement extending through a series of years demonstrates that the bar advances into the Gulf about one mile in fifteen years. The volume of the Mississippi is not excelled by that of any other river in the world, and the quantity of sediment carried along by its current exceeds in proportion to quantity of water that of any other river of magnitude. This sediment is composed of sand, mud, vegetable matter, and minerals in particles and in solution. So soon as the river water comes in contact with the still and heavier water of the Gulf the current is retarded and the sedimentary substances begin to fall to the bottom. By chemical action the saline element of the Gulf water combines with some of these substances, and the result is a tough, adhesive material or earth, difficult to disunite or cut away. Large masses form and constitute "mud lumps," which through the power of gas or some other cause rise to and above the surface and obstruct the channel, and thus far have proved destructive to any work of man. An obstruction composed of such material is ever forming, always advancing, and will continue to form and advance so long as this mighty river and tributaries continue the process of leveling down the continent; and this bar which exists at every mouth furnishes a depth of about fifteen feet of water on an average and at the most favorable pass. At the Southwest Pass, which is the largest and deepest, for one and a half miles the water is generally no more than fifteen feet deep. The bottom is uneven, unstable and changeable, like all newly formed earth, subject to the influence of currents and storms.

Thus far in the discussion, the advocates of the jetties and the friends of the canal substantially agree. It is now that the divergence commences—a divergence in philosophy, in professional opinion, and in precedent. There may be some disagreement as to the manner in which the sediment reaches the Gulf, but this is immaterial, as it finds its way there by means of some force or other, and forms the obstruction I have described.

The philosophy of jetties is that by narrowing the channel or confining the current a greater velocity will be secured, which will accomplish the removal which before there had been a failure to do, because the obstruction will be moved against by a greater perpendicular force. There is some force in theory as an abstraction. That the bar is gradually pushed out further into the gulf by the current of the river is undoubtedly true, and that the river provides its own walls or jetties so fast as the earth acquires foundation and solidity is a fact demonstrated to common observation. Nature takes its own time and does its work very slowly and as well as possible under the circumstances and with the material at hand. But this process does no good in accomplishing what commerce demands. As nature's jetties advance the bar advances, ever rearing its obstruction across the pathway of ships. Like the ghost of Banquo, it will not down.

Artificial jetties are designed to assist nature to build where nature had made no attempt. They must be structures of considerable weight in order to have sufficient strength to withstand the pressure of the volume of water within and the force of waves and storms without. Nature's jetties do not extend beyond the bar; on the contrary, the bar constantly maintains an advanced position. Hence to remove the obstruction temporarily artificial structures must be built beyond the crest, for so soon as the current passes beyond the point of confinement it looses velocity, and consequently its eroding power. To build them on this soft and treacherous foundation is to hazard their sinking or their overthrow by storms or "mud lumps." They will not be a house founded on a rock by any means. Jetties were once attempted here; and while I consider this experiment no test as to their general efficiency, yet the fact that structures of a light character can not be maintained was illustrated by their early demolition. The Spanish once built a fort near the mouth, but it was out of sight so long ago that the oldest inhabitant is unable to point out the spot where it stood; and it was built not upon earth so newly formed as the bar, nor where storms and waves could disturb. If jetties were constructed with such deep foundations as to resist all disturbing forces they might stand for a time at least. It seems preposterous to me to attempt to acquire a depth of twenty seven feet by building jetties on the bar where the water is but fifteen feet deep; for if erosion takes place to the extent desired there would be great danger that they would slide into the center and form a more difficult obstruction to remove than the bar itself.

The bar is composed of such material in part at least as to require a decided increase of velocity to remove it within a reasonable time. Whether such increased force can be obtained, to cut away to a depth of twenty-seven feet is not entirely free from doubt. It is a well known law that the narrowing of a channel obstructed at its mouth will cause the water to set back and seek escape where there is less resistance. The Mississippi river has seventeen mouths, of all sizes, through which the water would pass, and for many miles above the banks are low and narrow, and no great elevation would be required before the water would pass out over the banks, cutting away new avenues of escape. The recent overflow causes apprehensions of danger arising from further obstructing any one of the many mouths now existing.

Whether jetties can be made to stand or not, or whether the velocity of the current will speedily or leisurely erode a channel through the bar, is not the great question upon which the case is to be decided. The bar does extend constantly, and jetties to be permanently effectual must keep pace with it. The bar extends now 338 feet annually, and if the channel is narrowed and the same quantity of water continues to debouch into the sea, a fact not denied, the same amount of sediment must be precipitated to the bottom as before, and so soon as the same cause is applied. To narrow the channel will reduce the width of surface over which the water will spread, and the bar must advance more rapidly than at present. An enhanced velocity may prolong at first the distance over which the deposit may take place, but in brief time the advance of the bar will assume its logical and natural extension. General Humphreys estimates the annual advance under the jetty plan proposed to be a thousand to twelve hundred feet per annum. This will compel an extension of jetties at the same rate at a cost which the government has no right to endure, if a better and cheaper plan can be devised. Jetties can not be extended indefinitely. In time they must be abandoned after having incurred vast expense, and the obstruction will rear its head again, and become at once as hideous as we now see it. It was a wise thought in Captain Eads to limit his responsibility to ten years.

It has been said that the extension of the bar will not take place at all, or but slightly at the worst, for the reason that there are currents which will bear the sediment away to some remote place. It would not be good logic to say that the Gulf currents would do for artificial jetties what has never been done for those formed by nature. The mouths of the river have advanced into the Gulf far beyond all the surrounding land. For fifty miles beyond everything else have they gone seaward, the bar holding the same relative position at every step in advance. This is unanswerable proof that there is no littoral current there, or if existing at all, it is so slight as not to produce any appreciable fact. But beyond this the study of this subject by engineers and scientists has continued for more than forty years, and repeated examinations have been made and tests applied, and no evidence of a littoral current has been discovered, nor has its existence ever been claimed until the jetty project was invented.

The fact that a bar does not form in front of the jetties at the Sulina mouth of the Danube is made the basis of the theory that it will not form at the mouth of the Mississippi river. When conditions are identical the application of a principle will be followed by the same results. Sir Charles Hartley was careful to find out the existence of a littoral current before he attempted the construction of jetties at the Sulina. Its existence was apparent, because the banks were already eroded and the shore at the point in its general outline was concave. At the mouth of the Mississippi there is no evidence of erosion; on the contrary the shore or bank is sharply convex. The bar has not formed at the mouth of the Sulina after a test of two years or thereabouts, and whether ultimately it will is not entirely certain; but as a different condition exists at the mouth of the Mississippi it is as certain that the bar will extend there as it is certain that the bar has not formed at the mouth of the Sulina. I send to the clerk's desk a letter from the Chief of Engineers, addressed to me on this subject, which I desire to have read.

The clerk read as follows:

WASHINGTON, April 15, 1874.

SIR—I have received your letter of the tenth instant, asking for my reasons in full for considering the plan of obtaining a deep channel between the Mississippi river and the sea by canal preferable to the plan of obtaining that deep channel by constructing jetties at the mouth of the river.

A discussion of the engineering questions involved in the use of jetties to deepen the mouth would be out of place in this letter, and is rendered unnecessary by my having this day submitted a report on the subject to the Secretary of War, which will, I presume, be transmitted to Congress as forming a sequence to the report of the Board of Engineers upon deepening the entrance to the Mississippi river by a canal and by jetties.

There is no question as to the practicability of constructing the canal; and when constructed its maintenance will cost a comparatively small sum, probably not exceeding one per cent of the first cost. That first cost, along the route surveyed, is estimated by the majority of the board of engineers to be $10,273,000—an estimate which is entitled to confidence, the officers composing that majority being among the ablest and most experienced in the corps of engineers.

The canal, as proposed to be constructed, will afford ample facilities for all the commerce of New Orleans for many years.

In my report to the Secretary of War of to-day's date I have submitted an estimate of the cost of constructing jetties at the mouth of the Southwest Pass to deepen the channel to twenty-seven feet at low water, the structures to be carried down to the full depth of the channel throughout their length; the whole to be of a permanent character. This estimate amounts to $7,000,000. If the jetties were simply built upon the surface of the bar and not extended downward, their cost would be about one-half that sum. This mode of construction has been suggested by some engineers, and would be suitable if a long time were allowed for the erosion of the channel way to the required depth. But this erosion must take place in a short time and must be controlled by the jetty structures. Hence the necessity of their being carried down to the depth of the intended channel.

The bar of the Southwest Pass in its natural state extends annually into the gulf an average distance of 338 feet. This annual extension takes place at high water, when the sediment is swept by the current along the bottom of the river and over the surface of the bar into the still salt water of the Gulf. The width of the bar where this annual growth takes place is about 12,000 feet. The jetties will reduce this width to 3000 or 4000 feet, and as the quantity of earthy matter annually swept to the Gulf in the manner stated will be on the average the same, and as the jetties will force it to form on a width one-third or one-forth of the width it formed on in the natural state of the bar, its length must, of course, be three or four times greater than in the natural state of the bar; and we shall thus have the annual growth of the bar from 1000 to 1200 feet.

Now the depth of water on this annual addition to the bar would not be the same as that between the jetties, but less, because the annual addition will lie along the upward slope upon which the fresh water rises on the salt water. Hence the necessity of extending the jetties as fast as the bar is extended, if we wish to maintain a uniform depth of water at the entrance.

This extension of the jetties must be made in from thirty to forty feet water, and will cost in the case of the Southwest Pass about $1,000,000 annually.

We have, then, for deepening to and maintaining the depth of twenty-seven feet at low water a capital of $23,000,000.

Applying the jetty system to the Southwest Pass for the same depth the estimate will amount to—First cost of jetties, $4,150,000; annual cost of maintenance, including dredging through shoals in the pass, $780,000; which together represent a capital of about $17,000,000.

I am aware that Mr. Eads states that it will not be necessary to extend the jetties after they have once deepened the bar to the desired depth, and presents the grounds of his conclusion substantially as follows:

The Mississippi river, he says, carries in suspension a certain amount of earthy matter, which is fixed and unvaried for each velocity of current; when the velocity is decreased the sediment is at once reduced in quantity, some of it being dropped to the bottom; when the velocity is increased the quantity of suspended sediment is at once increased by the current picking up earthy matter.

He next states that the current of the river being suddenly and largely checked where it meets the Gulf at the outer edge of the bar, its suspended matter is dropped there in large quanties and forms the annual addition to the bar.

His proposition is directly contradicted by the observed conditions existing on the Mississippi river, and, indeed, everywhere else. It was found by a long series of measurements on the river near New Orleans and at Columbus, twenty miles below the mouth of the Ohio, that when the velocity of the current was greatest the quantity of earthy matter was about the same as when the velocity was least; and that the greatest quantity of suspended earthy matter found near New Orleans was at a time when the velocity of the current was two feet per second less than the greatest velocity.

Similar results were found at Columbus, one of them being that when the velocity of the current was only two and a half feet per second the quantity of earthy matter in suspension was about equal to the maximum quantity. In short, there was no direct relation between the velocity of current and the quantity of earthy matter suspended; the latter depending upon the tributary river which at the time furnished the chief volume of the Mississippi, and being kept in suspension by the stirring up process, caused by the great irregularities in the bed of the Mississippi. Mr. Eads refers to the Bonnet Carre crevasse as furnishing an instance in point of the deposit of earthy matter when the current decreased in velocity, but the bottom of the river where it was said this deposit had occurred was found by the Mississippi Delta investigation to be hard blue clay, which had been there for centuries. In fine the facts developed by the investigations of the Mississippi Delta survey prove this proposition of Mr. Eads to be utterly unfounded.

His second proposition, that the current of the Mississippi river receives a sudden check upon meeting the salt water of the gulf, is as unfounded as his first. Personal observation alone, without the use of instruments, would make this plain to one accustomed to the observation of currents, but these currents have been measured, and it is found that there is no sudden check to the current of the river where it enters the gulf; on the contrary, it decreases so slowly that repeated nice measurements over long distances are required to detect any decrease in the velocity of the current, and in fact it decreases very slowly from the point where the pass begins to widen until it finally ceases, in the case of the Southwest Pass, at the end of twenty or thirty miles.

The bills I have seen proposing to contract with Mr. Eads to deepen the entrance to the Mississippi river to twenty-eight feet at high water are based, I understand, upon the adoption of his view that there will be no necessity for extending the jetties after they have once deepened the entrance to the required depth, although it is explicitly stated in these bills that $5,000,000 is to be paid to Mr. Eads for deepening the entrance to the required depth, and another $5,000,000 subsequently for deepening and maintaining the depth a certain time. After the last annual payment to him of $1,000,000, under the second clause, what security is there that he will continue to maintain the depth if he should find that he was mistaken in his views, and that it will cost him $1,000,000 annually to maintain the depth? None is proposed in the bills I have seen, and it is manifest that in reality the United States takes all the risk of his views and project, and if he should be found to be mistaken the United States will be in the condition of having expended $5,000,000 for jetties and $3,000,000 for their maintenance, and then be obliged either to abandon the work or go on with a perpetual annual expenditure of about a million. Now the canal once built is permanently useful at a small expenditure, and the sums involved by the differences of opinion respecting its cost are small compared to the magnitude of those resulting from the differences of conclusion respecting the permanent effects of the jetty system; the adverse conclusion respecting the use of jetties being based upon carefully observed facts and investigations, and the other upon suppositions in direct conflict with the conditions known from investigation to exist.

There is one feature in these bills which, if it could be introduced in the appropriations for river and harbor improvements, would conduce to great economy. I refer to the provision that is made for a permanent fund for the construction of the work. Such a provision would save the cost of outfit from each annual appropriation for a work, since under existing laws every improvement must be carried on by contract with the lowest responsible bidder as each annual appropriation is made.

Very respectfully, your obedient servant,
A. A. HUMPHREYS,
Brigadier General, Chief of Engineers.

Hon. L. A. Sheldon, House of Representatives.

Mr. Sheldon—Jetties, as a plan for deepening rivers, have no history. In few cases only have they been tried. No river of magnitude has ever been jettied. They have never been attempted except in rivers comparatively small. And so unsuccessful have been the experiments that engineers of ability and reputation have never resorted to them except under the most favorable circumstances; and so signal have been the failures that a single precedent is cited to sustain the theory of their application to the mouth of the Mississippi river. To say that because jetties have proved efficacious at the mouth of the Sulina, therefore they will be successful at the mouth of the Mississippi, would be like saying that because a suit of clothes will fit a mere child, therefore it can be put on a full-grown man. The conditions are all unlike, in magnitude of river, in volume of water, in character and quantity of sediment, in the matter of a littoral current, in exposure to storms, and in the character of earth upon which the structure is to be founded.

It will serve to enlighten us if we examine the opinions of the engineering profession upon this subject. And it is not a new question. For forty years it has been under investigation. The government has expended considerable sums of money for the purposa of having the subject of improving the mouth of the Mississippi river understood. The ablest of our official engineers have been assigned to the work, and think I am safe in saying that not one of those who have a personal knowledge of the phenomena of the bar and the surrounding country favor jetties. The board lately assigned to the duty of considering the report of Captain Howell on the feasibility and project of a canal ably and fully considered every plan yet suggested, and reported unfavorably on the jetty plan. This board was composed of seven officers, and was probably the ablest of the kind ever assembled on the continent—one only dissenting. The chief of engineers, who has given more personal observation and study to the subject than any other man, concurs emphatically with the majority; and no man on this continent stands higher in the profession. The dissentient has no acquaintance with the mouth of the river as a subject of special study. Governor Hebert and Professor Forshey, able and experienced engineers, and who have spent their whole lives in dealing with this great river and in studying its laws and forces, unite in the opinion that the jetty plan is an empiricism. These gentlemen are familiar with every experiment ever made, and have a practical knowledge better than all theories. General Humphreys was a witness in an official capacity to the experiment and failure of Craig and Righter, who attempted to jetty Pass-a-l'Outre, under a contract with the government, and manifested a liendency towards the contractors which evinced a desire to see the experiment thoroughly made. The prostration of their structures from time to time by the forces which I have attempted to describe, probably did much to produce the opinion that if jetties can be made to stand at all, they must be deeply founded and strongly built, and that their extension must be continual and at an expense that the government cannot afford.

It is claimed that there is engineering opinion on the other side. General Barnard believes in jetties, but has no special knowledge of the Mississippi river. Captain Eads argues for jetties, and bases his opinions upon general laws and makes facts for their application which do not exist. He has never acquainted himself with the character and conditions of the river he proposes to improve. He is more acquainted with Sir Charles Hartley's description of his work at the Sulina mouth of the Danube than he is with the forces and phenomena of the Mississippi mouths. He does not and can not deny the necessity of perpetual extension of jetties, and that they must at some time be abandoned. To do so would be to deny the plainest principles of philosophy and facts as palpable as that there is a bar that seriously embarrasses the commerce of the whole Mississippi valley. I would much rather risk his judgment as a gunboat builder or bridge constructor than on the subject of removing the bar at the Southwest Pass by means of jetties. The Rev. Mr. Fontaine, I believe, has re-enforced Mr. Eads. The argument of this new luminary in the engineering profession is a rehash of what Eads had been trying to say, and is novel only in the fact that he has discovered a littoral current. This discovery is simultaneous with the advent of this reverend gentleman into the engineering world. Not one other engineer has attempted to make an argument on the jetty side. A few gentlemen have expressed an approval of Eads' theory, but their letters remind me of a practice among politicians who recommend applications for office by subscribing to the words "I concur," and none of them are familiar with the subject from observation and study. Lawyers soon learn that a legal opinion is only valuable after it has been well considered. It is a good principle to apply everywhere. Under government direction we have obtained an official opinion on which the utmost reliance should be placed, because the subject has been thoroughly examined by experienced and able men in the profession. The board of engineers, in their report, make use of the following language:

This yearly progress of the bar demands corresponding extension of the jetties into the deep water exposed to the severe storms of the Gulf, and consequently of great cost. The difficulties at the mouth of the Mississippi, so far as concerns the improvement by jetties, resolve themselves into three sources: first, the absence of a littoral current; second, the yielding nature of the banks and shoals; third, the abundance of the deposits. The first and third combine in the yearly and rapid extension of the bar, and compel the works of improvement to continue at a heavy annual cost until their entire abandonment. The second makes their construction difficult and their maintenance improbable unless deeply founded at a very heavy expense.

The canal plan will flank the bar. None question its feasibility; hence it is unnecessary to make an argument upon it. About forty miles from the mouth, on the left bank, by cutting a channel about seven miles long, the deep water of the Gulf can be reached. By the construction of a lock at the river entrance water will be excluded except when ships are passed through. This will be so trifling that a very small quantity of sediment will be deposited in the canal, and which can be thrown out with little labor and small expense. Captain Howell says it can be done in a few days in each year. The gulf terminus will be in a land-locked harbor, where ships may find shelter in the severest storms. It will not cost more than $10,000,000 to make it a complete and ample channel for the largest ships, and $50,000 or $100,000 annually will take care of it and keep it in repair. Thorough investigations show that the earth is solid enough to sustain the locks and to preserve the sides of the canal with slight revetments, and perhaps with none at all. If the bar has advanced at the rate of a mile in fifteen years, which has been demonstrated by actual measurement, the earth at this point is 600 years old. If the newly formed earth at the bar has strength and solidity enough to maintain jetties, which must be of great weight to be permanent, surely a canal with a lock can be maintained where the earth is of such old formation. The engineers have settled this question beyond controversy. With such provisions for making payments that the work can be continuously carried on, the canal and all its appurtenances can be completed in three years. When finished commerce will be amply provided for, and the distance for all ships coming from or destined to ports east of the mouth will be shortened sixty miles. The light draft ships can pass through the natural channels as they now do, and the heavy ones through the canal. The expenses of lightering, towing and piloting will be greatly reduced, and commerce will be freer and cheaper.

It is a patent fact that while no engineer, not even Eads himself, questions the practicability or utility of a canal, no one who has thus far participated in this debate has assailed the plan of a canal as an engineering question or as a useful and certain mode of getting out to sea. It is also to be observed that no one, whether he be engineer or an Eads advocate on this floor or elsewhere speaks of the jetty plan as other than an experiment, and the whole argument shows that the construction of a canal is contemplated if jetties should prove a failure. The point that a sufficient survey has not been made to locate a canal is a mere technicality. Its feasibility has been determined, but the precise point of location has not. The canal bill provides for that location and for all surveys that are necessary. And this is enough, as the main facts are determined. The advocates of the canal are opposed to delay; and the reason assigned by the jetty advocates for postponing the canal is as flimsy as is the philosophy by which the jetty theory is sustained.

The gentleman from Missouri [Mr. Wells] is afraid of the terrible cyclones in their effect upon the canal. Severe storms do happen once in a great while. But I am not aware that they have a particular appetite for canals. Breton harbor, the gulf terminus of the proposed canal, has never been disturbed or filled up. The increased height of the bank by the excavated earth will secure the canal against all the imaginary danger suggested. But no such danger exists. However, if the canal will be liable to dangers of the character depicted, how will it be with jetties? Will they not fill up, and will not Captain Eads be compelled to bring up his currents, and probably dredgeboats, to remove the obstructions thrown into the channel by the cyclones? They, I believe, visit the mouths of rivers quite as often as the mouths of canals. And at the mouths of rivers the loose earth is much more abundant than elsewhere. The whole thing about cyclones of the character described is a chimera, a scarecrow worthy only of a cause that has no philosophy to rest upon.

The plan of a canal it is said will absolutely require an expenditure of the public money. Undoubtedly; but the result is beyond a peradventure. Captain Eads proposes to risk his money and that of his friends upon an experiment. I admit the proposition is somewhat seductive. If his experiment succeeds you give him $10,000,000 for ten years, and then the government is saddled with the expense of extension, which General Humphreys thinks will not be less than $1,000,000 a year, and at some day not very