

Thirty lines of soundings were made in Garrows Bend, to ascertain the present condition of what is known as the "Poor Man's Channel."

Borings were made in Mobile River and Bay from a point opposite Government street, near the center of the city front, through the dredged channel previously referred to, and in the prolongation of its lower end, a distance of $16\frac{1}{4}$ miles. In this distance 43 borings were made to a depth of 26 feet below the surface of the water at mean low tide. It has been ascertained from these soundings that the depth of water for navigable purposes in Mobile River below Beauregard street has not materially changed since 1871, except at its mouth, where the water seems to be increasing in depth on the east bank at Pinto Point, and decreasing on the west bank at Choctaw Point, outside of the dredged channel however.

From this point, through Choctaw Pass dredged channel to the Upper Gap stake, near and a little south of Battery Gladden, the deepest water is found on the north side. Throughout the whole length of the dredged channel there is as great depth as at the completion of the work in 1877, and in many places there is greater.

The condition of the banks of the dredged channel was found unchanged, and in only four places, and those of limited extent and all on the west bank, were they found to be washed. At these places I think it more than probable vessels have run out of the channel on the bank. There is now a navigable channel of 13 feet way through.

Through the Poor Man's Channel the water is found to be shoaling rapidly at Choctaw Point, and from there for three-quarters of a mile the water gradually increases in depth to 6 feet and then to 9 feet near the western shore.

The borings show the material below the bottom of the dredged channel and to a depth of 26 feet below the bottom of the bay in a prolongation of the lower end of it, for a distance of $16\frac{1}{4}$ miles, to be as follows:

From Government street to the Upper Gap stake there is an upper strata of sharp sand, mixed more or less with soft mud and shells, about $1\frac{1}{2}$ feet thick; below this there is about 8 feet of mud of greater stiffness and tenacity.

From the Upper Gap stake, for a distance of nearly 4 miles down the bay, the material is about the same, consisting of stiff, dark-blue mud, free of any other substance, and very tenacious.

For the remainder of the distance covered by borings the material was found to be similar to the former, except that at a depth of 20 feet more or less shells were found mixed with it.

There remains about 11 miles, to the 21-foot curve, where no borings have yet been made.

From the fact that the old dredged channel, $10\frac{1}{2}$ miles in length (portions of which have not been touched for 7 years), has retained its depth, and the character of the material below, indicated by the borings, I think it safe to assume that the present ship-channel can be deepened by the same system as was followed in obtaining the 13-foot channel, and estimate as follows:

For a channel 17 feet depth and 200 feet width, there would require to be excavated about 3,933,846 cubic yards, which, at 21 cents per cubic yard, would amount to \$825,107.66.

For a channel 21 feet depth, 200 feet width, there would require to be excavated about 9,943,758 cubic yards, which, at 21 cents per cubic yard, would amount to \$2,088,187.18.

The lowest contract was let on the previous work at 17 cents per cubic

yard, but I have placed it at the above figures to cover all engineering expenses and contingencies.

The above estimates are based on the supposition that appropriations of at least \$100,000 should be made; and I think, if the work is undertaken, as large an appropriation should be made for the work as the importance of the harbor would justify. It is certain that smaller appropriation would increase the cost above the estimate.

As the statistics of the port are contained in my last annual report, I do not deem it necessary to repeat them. I would state, however, that the receipts of cotton at Mobile during the last year amounted to over 400,000 bales, and that the future commerce of the city, owing to its proximity and easy access to immense supplies of coal, iron, and lumber, is, in my opinion, just what its people choose to make it.

Respectfully submitted.

A. N. DAMRELL,
Captain Engineers

Brig. Gen. A. A. HUMPHREYS,
Chief of Engineers, U. S. A.

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IMPROVEMENT OF HARBOR AT PENSACOLA, FLORIDA.

HISTORY.

Under an appropriation of \$20,000 for the removal of wrecks in this harbor, a contract was entered into with Mr. George W. Le Gallais, of Warrington, Fla., for the complete removal of the wrecks of the bark Ada, the ship Miles, the steamer Conroy, and the pilot-boat Nettle, for the consideration of the sum of \$8,600; work to commence on or before the 15th day of November, 1878, and to be completed on or before the 1st day of May, 1879.

On the 11th of November the contractor commenced operations, breaking up the hulls and sides by blasting with powder and dualin, and removed the pieces to Santa Rosa Island.

The engine and machinery and one-half of the hull of the steamer Conroy were taken up and removed to Fort Pickens wharf and broken up.

Work on the wreck of the pilot-boat Nettle was finished April 30, 1879, the contractor having removed one anchor, a small piece of keel, a few pieces of timber and planking, and about eight tons of iron ballast; and the diver, stating that no more could be found of her, reported this wreck completely removed.

Work on the removal of the wreck of the bark Ada was steadily prosecuted whenever the weather permitted, and the contractor removed a large quantity of timber and planking, iron knees, bolts, rigging, ballast, &c., &c. He reported the complete removal of this wreck on the 6th of June, 1879.

Owing to stormy weather, causing heavy seas to run, the contractor was unable to complete the work at the time specified, 1st of May, 1879, and applied for and was granted an extension of time of two months until the 1st of July, 1879.

The weather still continuing boisterous and stormy, enabling the contractor to work only one or two days each week, another extension of

time of six weeks, until the 15th of August, 1879, was asked for and granted.

The progress of this work has been very slow from the very commencement, owing to unfavorable weather.

Very little work was done at the wreck of the ship Miles, only a few iron knees, a few pieces of broken timbers and planking, and a few tons of rock ballast being removed.

PRESENT CONDITION OF THE WORK.

The pilot-boat Nettle and the bark Ada have been reported by the contractor as completely removed. There still remains to be removed nearly all of the wreck of the ship Miles and the boiler and one-half of the hull of the steamer Conroy, which it is expected will be accomplished on or before the 15th of August next.

To determine accurately and without doubt whether the wrecks are entirely removed when the contractor claims them to be so, it will be necessary to make an examination of the grounds by a diver.

The completion of this work will remove the wrecks at this harbor, but it will not remove the principal obstructions to the commerce, which is a shoal that has been forming for several years inside the outer bar.

A careful examination and partial survey was therefore made to ascertain, if practicable, the cause of this shoaling, and what further work might be necessary to restore the old channel depth, with the following results:

The shoals named in the Coast Survey charts of 1859 "Middle Ground" and "Caucus" were found to have joined across the main ship-channel, forming an inner bar with only 22 feet depth at mean low-tide, where formerly there was 30 feet.

The shore on the west side of the entrance, extending north and south from Fort McRee, has washed away very considerably, so that now the general direction of that shore is materially changed. This erosion is still going on.

An extensive scour has taken place on the north side of Santa Rosa Island, opposite the navy-yard and also in the bottom of the bay near the Fort Pickens wharf.

Santa Rosa Island has extended well in a westerly direction, and has gained very considerably on its south beach near the west end.

Other slight changes in the beach line have been discovered, but are not considered of much importance.

In the upper part of the bay are the following wrecks: The Preble, the German bark Ferdinand, burned in 1873, the English ship Tipposaib, and several long wharves which have been constructed since 1859.

A reckless use of the ballast, large amounts of which are brought to this port each year, has been reported.

Some of these items have no doubt had a direct or indirect influence in causing the formation of the new bar, and others have been merely accompaniments.

Without a full discussion of this point, it is believed that the changes in the shore-line at the entrance of the bay, by erosions and deposit, admit of a corresponding change in the tidal currents, both ebb and flood, and are therefore indicated (the capacity of the tidal basin not having been diminished) as producing the conditions which were necessary to form the bar. As a necessary consequence, the improvement suggested would be to re-establish the old shore line, so far as may be necessary to restore the former direction of the tidal currents. Though

this might not be sufficient to remove the bar, it would probably keep the necessary depth of water, when once obtained by dredging.

This improvement could be made by dredging a channel of 300 feet width through the bar to give immediate relief to the commerce of the port, and then by building a training-wall of brush and stone on the old shore line nearly to form the west line of the entrance, or by running jetties out from the shore at intervals and reveting the beach, as it formed between, with a brush apron. The former plan is believed to be most economical. The wall would require to be about 4,000 feet long and is estimated to cost as follows:

17,800 square yards, mattress foundation, at \$1.50.....	\$26,700
20,100 cubic yards, riprap, at \$5.50.....	110,550
Contingencies, &c.....	20,000
Total.....	\$157,250
Dredging in main channel, 300 feet wide, 36,000 cubic yards, at 50 cents.....	\$18,000
Superintendence and inspectors.....	2,000
	20,000
Total.....	\$177,250

The estimate might be considerably diminished if the material in the ruins of Fort McRee could be made use of.

An appropriation of \$100,000 is respectfully recommended for this work.

A copy of the report and maps of Mr. Haines, who made the survey, is transmitted herewith.

Pensacola Harbor is situated in the collection-district of Pensacola, Fla. Pensacola is the port of entry.

STATEMENT OF AMOUNT OF REVENUE COLLECTED, AMOUNT OF COMMERCE, NUMBER OF VESSELS ENTERED AND CLEARED DURING THE FISCAL YEAR ENDING JUNE 30, 1879, IN THE DISTRICT OF PENSACOLA, FLA.

Amount collected for duties on imports.....	\$13,222
Amount collected for tonnage dues.....	34,820
Amount collected for hospital tax.....	1,773
Amount collected for official fees.....	2,843
Amount collected for steamboat inspector.....	400
Amount collected for fines, penalties, &c.....	530
Total.....	53,588
Amount of exports to foreign countries.....	2,102,477
Amount of shipments coastwise.....	594,349
Total.....	2,696,826

	Vessels.	Tons.	Men.
Foreign vessels entered.....	228	160,907	3,419
American vessels entered from foreign ports.....	86	24,913	645
American vessels in coastwise trade.....	167	42,004	1,431
Total.....	481	227,824	5,495
Foreign vessels cleared.....	214	159,224	3,332
American vessels cleared for foreign ports.....	62	17,744	467
American vessels cleared in coastwise trade.....	172	41,987	1,364
Total.....	448	218,955	5,163

Money statement.

July 1, 1878, amount available.....	\$20,000 00	
Amount appropriated by act approved March 3, 1879.....	10,000 00	\$30,000 00
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July 1, 1879, amount expended during fiscal year.....	4,620 52	
July 1, 1879, outstanding liabilities.....	8,600 00	13,220 52
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July 1, 1878, amount available.....	16,779 48	
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Amount originally (estimated) required for completion of existing project.....	20,000 00	
Amount (estimated) required for completion of existing project.....	1,000 00	
Amount (estimated) required for completion of proposed project.....	160,470 52	
Amount that can be profitably expended in fiscal year ending June 30, 1881.....	100,000 00	

Abstract of bids received and opened September 14, 1878, relating to removal of wrecks at and in Pensacola Harbor, Florida.

Number.	Name of bidder.	Price.				Total.	Time of commencing work.	Time of completing work.
		Ship Wm. Miles.	Bark Ada.	Steamer Convey.	Pilot boat Nettle.			
1	James E. Slaughter.....	\$6,000	\$4,000	\$2,000	\$1,999	\$13,999	On or before the 1st day of December, 1878.	On or before the 1st day of July, 1879.
2	S. N. Kimball.....	7,000	4,000	4,000	2,000	17,000	On or before the 15th day of November, 1878.	On or before the 15th day of November, 1879.
3	George Wm. Le Gallais.....	1,700	3,400	2,600	900	8,600	On or before the 15th day of November, 1878.	On or before the 1st day of May, 1879.
4	Sowell C. Cobb.....	5,300	5,300	4,200	1,700	16,700	On or before the 15th day of October, 1878.	On or before the 1st day of June, 1879.

SURVEY OF ENTRANCE TO PENSACOLA HARBOR, FLORIDA.

REPORT OF MR. HIRAM HAINES, ASSISTANT ENGINEER.

MOBILE, ALA., July 7, 1879.

SIR: I have the honor to transmit herewith a field map of the entrance to Pensacola Harbor, showing the results of the survey made in obedience to your instructions of the 5th of March, together with a reduced copy of the same, exhibiting plans, for your consideration, of permanent works for the improvement of the harbor.

The work of examination was commenced about the 15th of March with the establishment of trigonometric stations and signals for the hydrographic work and the determination of the shore lines.

The survey of the middle ground and inner or new bar, and the tentative observations relating to the direction and velocity of the currents, succeeded. The changes which have taken place in the beach lines, either by encroachment or erosion, since the survey of 1856 are indicated by dotted lines, which conform to the chart of that survey. The expansion of the middle ground and formation of the inner bar across the channel, which will be observed by comparison with the Coast Survey chart, presents a change in the hydrography no less remarkable than that of the shores. The direction and velocity of the tidal current at its reflux is shown by the blue lines on the field map. In the reduced map the current lines shown upon either side of the bay indicate the direction of that part of the current contiguous to them, the line of current conforming to these lines according to its proximity to one or the other. The shaded lines marking the curve of the tidal ripple as it enters and leaves the bay show that a reflux continues along the Santa Rosa shore during the first stage of the influx, and that an influx continues along the opposite side of the bay after the reflux has commenced. This action is evidently the effect of the projection of the point of Santa Rosa Island in one case, and that of the navy-yard in the other.

The rapid erosion of the McRee Beach contemporaneously with the formation of the new bar has given rise to the conjecture that the material removed from this point is that of which the bar is formed; but this view is not sustained by the observations I have made.

The direction of that zone of the current which is doing the work of erosion upon the McRee point diverges, as will be seen, very widely from a course toward the bar, and I have sought in vain for any evidence that would support such a conjecture. There is no doubt, however, in my mind, that the enlargement of the water-way to the westward, by the erosion of this point, promotes the encroachment that is going on across the entrance from the opposite shore, and I regard the protection of this point as indispensable for the preservation of the harbor. On the other hand, I find that considerable erosion has also taken place along the north shore of Santa Rosa Island, opposite the navy-yard, and that an extensive scour has been going on upon the south side of the bay adjacent to Fort Pickens wharf, forming a basin of considerable area. The chart of 1859 gives 5 to 7 fathoms as the depth of that part of the bay embraced in this area, where I now find 7 to 10 fathoms of water. The material removed from this basin in following the course of the current had, necessarily, to pass over the middle ground, where it was deposited, and caused the enlargement of this shoal. At the same time a denuding action around the *débris* of the two wrecks that lay near the southern border of this plateau took place, and the material thus disturbed has again been taken up by the current, carried forward, and deposited, forming the narrow prolongation across the channel that constitutes the new bar, and which lies in a direction coincident with that of the zone of the current passing over the wrecks during strong ebb-tides. The greater the oscillation of the tide, the more westerly I find the direction of the reflux current to be, due probably to the greater force with which it is projected from the bay.

The plans of improvement of the entrance that have suggested themselves to me are—

1. The entire removal of the inner bar by dredging, and the construction of the jetty A to arrest denuding action upon the middle ground.
2. Dredging a channel 300 feet wide for temporary relief, and the construction of the jetties, A and B.
3. Extending the jetties A and B across the Caucus Shoal to deep water.
4. Removing the bar across the swash channel by dredging, and constructing the east line of jetty A, and the shore jetty C, along the point of Santa Rosa Island.

The first proposition would afford immediate relief in the removal of the bar. The middle ground would continue to fill up, probably more rapidly than heretofore, on account of a reversion of the current that would take place around the ends of the jetty, and the eddy that would be formed between the wings, while its extension in the direction of the main channel would, I believe, be in a large measure, if not entirely, arrested and controlled by this effect upon the current.

The second proposition involves the construction of the jetty B, partly to protect the McRee shore, and to train the current in the direction of the inner bar. The contraction of the water-way of the entrance by these two works would doubtless give sufficient force to that part of the volume directed toward the bar to dislodge it; but it might be only to transfer it to another part of the channel, and thus fail in affording permanent relief.

The third proposition, which is designed as an alternative in case of the failure of the preceding, consists in the extension of the jetties across the Caucus Shoal to the deep water of the Gulf, in a direction corresponding with that of the natural flow of the main body of water leaving the bay. This plan of jetties is the only one, in my opinion, that can in this case be regarded free from contingencies likely to prevent its success and permanent usefulness. The position of the different shoals at the entrance of the bay, the rapid extension of Santa Rosa Island in the direction of the east bank and middle ground, and the normal direction of the volume of water as it leaves the bay, all conspire to establish this impression. If the current is to be employed to dislodge the bar, I conceive it to be an essential feature in whatever arrangement that may be adopted that the material should be transported beyond the outer line of shoals that encompass the entrance, and where the redeposit is likely to be prevented by lateral currents. That such currents exist along the water edge of east bank and Caucus Shoal is rendered probable by the development of the cotidal lines of the Gulf along the coast. Entering the Gulf by the Straits of Florida, the height of the tide first increases and then decreases. Passing into the bight at the upper end of the peninsula, the rise is the greatest; west of Saint George's it diminishes, to rise again in the bight formed by the southern coast of Louisiana and eastern coast of Texas. Unlike the tidal wave of the Atlantic, that of the Gulf is doubtless rendered to a certain degree one of translation by the contraction of the entrance; and such a movement as would be acquired in this manner, and possibly by the difference of elevation of the wave at the two extremities of the coast line, would be apt to take the form of currents along the shore.

The fourth proposition embraces the construction of the east wing of jetty A and the jetty C along the point of Santa Rosa Island. There is already a sufficient depth of water on either side of the narrow bar crossing swash channel for the passage of the largest vessels entering Pensacola Bay, and I find from 4 to 5 fathoms of water connecting the main channel with swash channel, from buoy No. 2 to V. S. buoy, in an almost direct line. The reduction of Swash Channel Bar, as proposed by dredging, to prevent its removal to another part of the channel, and the construction of these works, would afford a relief, with a limit to its permanency, dependent upon the encroachments before referred to. The operation of the volume passing between these jetties would, however, have a tendency resistive to such encroachment, and might suspend it altogether. Beside the lead used in sounding, which gives the superficial character only, I was unprovided with appliances for ascertaining the geognostic properties of the bottom along the lines of the proposed works, but, so far as I was able to discern, its composition consists of heavy beds of sand, intermingled occasionally with fragments of shells, and probably underlaid with strata of pliocene clays and deposits of gravel quite capable of sustaining the pressure of the works.

The form of jetty preferred consists of *pierres perdues*, with a foundation, and, where admissible, an interior filling of fascine mattresses, and with a coping on the exposed slopes of concrete blocks of sufficient size to resist the force of the waves. The outer jetties are designed to be 15 feet wide at the top, which is brought within 1 foot of the surface of the water at mean low-tide, and with slopes 2 to 1; the object of the submergence being to diminish the weight and cost of the work, and to leave the tidal movement upon the surface as unrestricted as possible. The height of the work in deep water might, perhaps, be still further reduced with advantage, both in respect to cost and its interference with the tidal movements. A cross-section of the jetty C and that part of jetty B along the McRee Beach present steeper slopes on the land side, with a view to their ultimate connection with the shores. The crest of jetty C and a portion of that of B rises 2 feet above high-water. The accompanying profiles show the extent of these works.

The following are detailed estimates of the cost of these works in several forms. In estimating the quantity of material for the jetties an allowance of 2 feet has been made for subsidence. No allowance has been made for compression of mattresses used as partial filling, as the diminution of the weight of the structure thereby obtained would probably diminish the subsidence of the foundation to a degree equal to that produced by the compression.

The estimates for the concrete facing provides for the entire coping on the following slopes, the blocks to be 3 feet thick, and of such other dimensions as may be rendered necessary by the situation: The channel slope of the west line, and exterior slope of the east line, and exterior slope of the extension of jetty A; the channel slope and 2,000 feet of the exterior slope, and the exterior slope of the extension of jetty B; the channel slope of jetty C.

The proportions of the concrete estimated for is as follows: 1 cubic yard (7 barrels) cement, $1\frac{1}{2}$ cubic yards sand, 3 cubic yards gravel = 3 cubic yards concrete.
An addition of 20 per cent. should be added to the cost of the jetties for false work, piling, and contingencies.

ESTIMATE FOR JETTIES OF PIERRES PERDUES WITH MATTRESS FOUNDATIONS.

Jetty A (west line):	
22,244 square yards mattress foundation, at \$1.50.....	\$33,366 00
68,707 cubic yards riprap, at \$5.....	377,888 50
	411,254 50
Jetty A (east line):	
15,711 square yards mattress foundation, at \$1.50.....	\$23,566 50
49,000 cubic yards riprap, at \$5.50.....	269,500 00
	293,066 50
Jetty B:	
41,866 square yards mattress foundation, at \$1.50.....	\$62,799 00
117,096 cubic yards riprap, at \$5.50.....	644,028 00
	706,827 00
Extension of Jetty A:	
81,811 square yards mattress foundation, at \$1.50.....	\$122,716 50
262,363 cubic yards riprap, at \$5.50.....	1,442,996 50
	1,565,713 00
Extension of jetty B:	
52,411 square yards mattress foundation, at \$1.50.....	\$78,616 50
159,177 cubic yards riprap, at \$5.50.....	875,473 50
	954,090 00
Jetty C:	
8,655 square yards mattress foundation, at \$1.50.....	\$12,982 50
14,961 cubic yards riprap, at \$5.50.....	82,235 50
	95,268 00

ESTIMATE FOR JETTIES WITH FOUNDATION AND PARTIAL FILLING OF MATTRESSES.

Jetty A (west line):	
38,744 square yards mattress foundation and fill, at \$1.50.....	\$58,116 00
57,707 cubic yards riprap, at \$5.50.....	317,388 50
	375,504 50
Jetty A (east line):	
27,711 square yards mattress foundation and fill, at \$1.50.....	\$41,566 50
41,000 cubic yards riprap, at \$5.50.....	225,500 00
	267,066 50
Jetty B:	
64,366 square yards mattress foundation and fill, at \$1.50.....	\$96,549 00
102,096 cubic yards riprap, at \$5.50.....	561,528 00
	658,077 00
Extension of jetty A:	
144,811 square yards mattress foundation and fill, at \$1.50.....	\$217,216 50
220,363 cubic yards riprap, at \$5.50.....	1,211,996 50
	1,429,213 00
Extension of jetty B:	
94,411 square yards mattress foundation and fill, at \$1.50.....	\$141,616 50
131,177 cubic yards riprap, at \$5.50.....	721,473 50
	863,090 00
Jetty C:	
10,905 square yards mattress foundation and fill, at \$1.50.....	\$16,357 50
13,461 cubic yards riprap, at \$5.50.....	74,035 50
	90,393 00

ESTIMATE FOR JETTIES WITH MATTRESS FOUNDATION AND CONCRETE FACING.

Jetty A (west line):	
22,224 square yards mattress foundation, at \$1.50.....	\$33,336 00
55,907 cubic yards riprap, at \$5.50.....	307,488 50
12,800 cubic yards concrete, at \$8.....	102,400 00
	443,224 50
Jetty A (east line):	
15,711 square yards mattress foundation, at \$1.50.....	\$23,566 50
39,600 cubic yards riprap, at \$5.50.....	217,800 00
9,400 cubic yards concrete, at \$8.....	75,200 00
	316,566 50
Jetty B:	
41,866 square yards mattress foundation, at \$1.50.....	\$62,799 00
75,096 cubic yards riprap, at \$5.50.....	413,028 00
42,000 cubic yards concrete, at \$8.....	336,000 00
	811,827 00
Estimate of jetty A:	
81,811 square yards mattress foundation, at \$1.50.....	\$122,716 50
210,763 cubic yards riprap, at \$5.50.....	1,159,196 50
51,600 cubic yards concrete, at \$8.....	412,800 00
	1,694,713 00
Extension of jetty B:	
52,411 square yards mattress foundation, at \$1.50.....	\$78,616 50
126,677 cubic yards riprap, at \$5.50.....	696,723 50
32,500 cubic yards concrete, at \$8.....	260,000 00
	1,035,340 00
Jetty A:	
8,655 square yards mattress foundation, at \$1.50.....	\$12,982 50
10,656 cubic yards riprap, at \$5.50.....	58,608 00
4,305 cubic yards concrete, at \$8.....	34,440 00
	106,030 50

ESTIMATES FOR JETTIES WITH MATTRESS FOUNDATION, AND PARTIAL FILLING AND CONCRETE FACING.

Jetty A (west line):	
38,744 square yards mattress foundation and fill, at \$1.50.....	\$58,116 00
44,907 cubic yards riprap, at \$5.50.....	246,988 50
12,800 cubic yards concrete, at \$8.....	102,400 00
	407,504 50
Jetty A (east line):	
27,711 square yards mattress foundation and fill, at \$1.50.....	\$41,566 50
31,600 cubic yards riprap, at \$5.50.....	173,800 00
9,400 cubic yards concrete, at \$8.....	75,200 00
	290,566 50
Jetty B:	
64,366 square yards mattress foundation and fill, at \$1.50.....	\$96,549 00
60,096 cubic yards riprap, at \$5.50.....	330,528 00
42,000 cubic yards concrete, at \$8.....	336,000 00
	763,077 00
Extension of jetty A:	
144,811 square yards mattress foundation and fill, at \$1.50.....	\$217,216 50
168,760 cubic yards riprap, at \$5.50.....	928,180 00
51,600 cubic yards concrete, at \$8.....	412,800 00
	1,558,196 50

Extension of jetty B:	
94,411 square yards mattress foundation and fill, at \$1.50.....	\$141,616 50
98,677 cubic yards riprap, at \$5.50.....	542,723 50
32,500 cubic yards concrete, at \$8.....	260,000 00
	944,340 00
Jetty C:	
10,905 square yards mattress foundation and fill, at \$1.50.....	\$16,357 50
9,156 cubic yards riprap, at \$5.50.....	50,358 00
4,305 cubic yards concrete, at \$8.....	34,440 00
	101,155 50

The amount of material required to be removed to afford a depth of 24 feet across the inner bar, which is the maximum depth on the outer bar, is 110 cubic yards per foot of width of channel opened. Owing to the exposed situation of this work the dredging would probably cost 50 cents per yard.

For the line across the Caucus Shoal, the cutting would be about 1,000 cubic yards per foot of width, the average depth of cut being 8 feet, and the distance about 3,500 feet from the main channel to 4½ fathoms water outside.

For the Swash Channel Bar, the amount of dredging required would be for the central 300 feet in width 185 cubic yards per foot, and for each additional foot in width, 311 cubic yards.

The position of piers and wharfs built subsequent to the last survey will be seen upon the map.

The situation of the wrecks in the upper part of the bay has been approximately laid down. The Preble lies directly between the end of Palafox street wharf and the navy-yard chimney, and about ¼ of the distance from the wharf to the navy-yard. About ½ of the wreck remains with 23 feet of water over it. Its position is almost immediately in the track of shipping, and renders the ground in the vicinity unsafe for anchorage. A buoy placed over the wreck to mark its position is all, I think, that is necessary.

The Ferdinand (German bark), burned in 1873 at anchor off Perdido Wharf, sunk in 13 feet water, about 400 feet west of the end of the wharf, where the hull now lies with 3½ feet of water above it at low tide.

The Tipposaib (English ship of 800 or 900 tons) first got aground abreast of Fort McRee, but was hauled off and towed to Navy Cove, where it sunk. Some work has been done in removing this wreck, but the principal part of the hull remains with about 4 feet of water above it.

Neither of these wrecks are generally regarded as serious obstructions; the deep water of this part of the bay is spacious and affords ample sea room for shipping.

There appears to be a want of proper regulations and restrictions in regard to discharge of ballast.

The establishment of a signal station at Warrington, with special duties assigned to the officer in charge, in regard to the determination of the tidal phenomena of the bay, would be of great service in connection with the construction of any permanent harbor works. It is especially desirable that there should be an instrumental determination of the direction and force of the prevailing winds in this locality, and their effect upon the tides and in the propagation of waves. The diagrams of wind curves previously sent you were projected from a mere estimation of the force of the winds during the years 1847 to 1849, and of course are but approximate.

COMMERCE AND NAVIGATION.

The following are statements respecting the commerce and navigation of the port of Pensacola, derived from the official records of the collector, for the fiscal years ending June 30, 1877 and 1878, and from private and reliable sources for the commercial year ending August 31, 1878, and to June 1, 1879:

For the fiscal year ending June 30, 1877.

	Number of vessels.	Tonnage.	Number of men.
ENTERED.			
Foreign.....	270	194,801	4,183
United States from foreign ports.....	110	34,560	872
Coastwise.....	210	49,208	2,098
Total.....	590	278,569	7,133
CLEARED.			
Foreign.....	278	200,455	4,181
United States to foreign ports.....	84	26,153	689
Coastwise.....	225	50,116	1,956
Total.....	587	276,724	6,826

Import duties.....	\$7,049 49
Tonnage dues.....	44,116 11
Hospital money.....	2,342 94
Official fees.....	2,500 00
	56,008 54

VALUE OF EXPORTS.

To foreign ports.....	\$1,861,820 00
Coastwise.....	415,100 00
	2,276,920 00
Timber exported..... cubic feet..	9,375,423
Lumber exported..... board measure, feet..	67,787,222

For the fiscal year ending June 30, 1878.

	Number of vessels.	Tonnage.	Number of men.
ENTERED.			
Foreign.....	297	198,603	4,395
United States from foreign ports.....	117	36,058	801
Coastwise.....	165	61,702	1,766
Total.....	579	296,363	6,962
CLEARED.			
Foreign.....	314	210,263	4,628
United States to foreign ports.....	59	19,247	481
Coastwise.....	223	76,680	2,137
Total.....	596	306,190	7,246

Import duties.....	\$10,217 49
Tonnage dues.....	48,926 70
Hospital money.....	2,182 75
Official fees.....	2,500 00
	63,826 94

VALUE OF EXPORTS.

To foreign ports.....	\$2,063,986 00
Coastwise.....	511,110 00
	2,575,096 00