

SUMMARY.

Name.	Distance from Augusta.	Shoal.	Clear river.	Linear rock.	Gravel.
	Miles.	Miles.	Miles.	Yards.	Yards.
Foot of Trotter's Shoal	64	10.63	53.37	1,920	3,760
to					
Foot of Gregg's Shoal	21½	8.10	13.40	2,570	400
to					
Andersonville	22	9.80	12.20	4,037	1,050
to					
Head of Guest's Shoal	7	3.12	3.88	1,630	2,510
to					
Brown's	36½	3.00	33.25	795	3,585
Total	150½	34.65	116.10	10,852	11,305

COUNTRY, POPULATION, AND PRODUCTION.

The country on each side of the river from Augusta to Knox's Bridge, 124 miles, is cultivated for cotton; with the present careless mode of cultivation it produces on an average half a bale to the acre or about 3 to 7 bales to the hand. It is well adapted to the production of tobacco, grain, indigo, silk, and vine culture.

Above Knox's Bridge to the mountains corn is the principal crop, the average production bring 35 bushels to the acre. Tobacco grows well. The country is well timbered and is well adapted for grazing. During the winter the hillsides are covered with a short growth of green cane.

In Lincoln County, 4 miles west of Goshen, the Sale and Lamar mine has been recently opened with a plant costing about \$4,000; the yield from January 1 to November 15, 1878, was \$12,000 in gold. The ore assays \$20 per ton and is mined and worked for \$3.50 per ton.

There are several mines in the neighborhood. On the dividing line between Edgefield and Abbeville is the well known Dorn's mine, not worked.

At Colonel Calhoun's, at Trotter's Shoal, there is another mine very well spoken of. In Anderson County, 15 miles northeast of Andersonville, extensive arrangements are being made for hydraulic mining. In fact, there are pockets of gold all through the country, and in Oconee County there are extensive beds of good iron ore, with abundance of fuel and limestone near at hand.

At Panther Creek limestone crops out, and there are a few kilns that supply the neighborhood. Occasionally it is sent down the river to the lower counties.

The different points on the river are distant from the railroads as follows, viz: Petersburg to Washington, Georgia, 20 miles; Petersburg to Abbeville, South Carolina, 25 miles; Andersonville to Anderson, South Carolina, 13 miles.

The Air-Line Railroad crosses the river at Fort Madison, 144 miles above Augusta, 9 miles west of this point, at Toccoa City, a narrow-gauge road runs south 51 miles to Elberton, which is 12 miles west of the Savannah River.

A road is being constructed from Greenwood, S. C., to Augusta. It will run at a distance of 8 miles from the river for 25 miles in South Carolina, and then it will cross into Georgia 15 miles above Augusta.

We will suppose the production of the country which will be affected by the river to extend on each side half the distance to the nearest railroad point above Augusta.

15 × 1 = 15 Georgia.	15 × 8 = 120 South Carolina.
78 × 10 = 780 Georgia.	25 × 4 = 100 South Carolina.
61 × 6 = 366 Georgia.	53 × 10 = 530 South Carolina.
	61 × 6 = 366 South Carolina.

154 miles. 1161 Georgia. 154 1116 South Carolina.

Total number of square miles in Georgia and South Carolina 2,277
As the upper portion of the river on both sides produces but little cotton for 30 miles, we deduct (30 × 2 × 6) 360

Therefore the area of cotton land = square miles 1,917

County and State.	Area.	Per cent of improved to unimproved land.	Population.	Population per square mile.	Wheat, bushels.	Wheat, bushels, per square mile.	Corn, bushels.	Corn, bushels, per square mile.	Tobacco, pounds.	Tobacco, pounds, per square mile.	Cotton, bales.	Cotton, bales, per square mile.	Wool, pounds.	Wool, pounds, per square mile.	Cotton, 1876, 1877, 1878—number of bales.	Cotton, bales, per square mile.
Edgefield, S. C.	1,153	23	42,486	36	52,157	452	412,259	17,553	9,981	21.7	17,553	15.2	9,981	15.2	40,000	36.77
Columbia, Ga.	349	46	13,529	38	4,610	121	121,160	7,434	3,124	8.9	7,434	21.2	3,124	21.2	12,000	36.77
Lincoln, Ga.	212	21	5,413	25	10,113	47	75,606	2,587	2,353	11.1	2,587	12.0	2,353	12.0	5,000	36.77
Elbert, Ga.	317	31	9,214	29	29,736	93	140,435	3,035	2,800	8.8	3,035	9.5	2,800	9.5	10,000	36.77
Abbeville, S. C.	777	33	31,129	40	62,092	140	315,399	13,924	4,087	28.9	13,924	17.8	4,087	17.8	34,000	36.77
Anderson, S. C.	629	24	24,049	38	67,109	107	409,688	5,274	4,381	7.0	5,274	8.4	4,381	8.4	20,127	36.77
Hart, Ga.	188	31	6,783	36	18,683	112	112,007	1,320	4,725	25.4	1,320	7.0	4,725	7.0	6,000	36.77
Franklin, Ga.	286	20	7,893	27	18,893	67	138,003	810	2,927	35.9	810	2.8	2,927	2.8	7,000	36.77
Oconee, S. C.	321	13	10,536	32	10,590	32	138,003	79	25,127	78.4	79	0.2	25,127	0.2	6,000	36.77
Habersham, Ga.	66	48	6,322	48	10,204	155	132,824	2,031	37,794	571.5	2,031	30.8	37,794	30.8	143,727	36.77
Total	4,298	26	157,354	36	278,442	64.7	2,031,937	473	37,794	19.5	52,653	27.2	72,939	27.2	143,727	36.77

Extracts from the census of 1870.

NOTE.—This information was obtained from the best informed people along the river and in the towns.

From the census the population per square mile is 36. Then the people who will be benefited by opening the river are $2,277 \times 36 = 81,972$ —population.

The census report of the production is far below the actual condition at present. We shall, therefore, use the statistics compiled from the testimony of the best informed citizens, which give us instead of 12.2 bales of cotton 36.77 bales produced per square mile. Therefore, the average yearly production of cotton may be considered as $1,917 \times 36.77 = 70,498$ bales of cotton.

Statement showing the present trade by pole-boats on the Savannah River above Augusta, from the records kept at the Canal Basin.

	1876.		1877.		To November 9, 1878.	
	Received.	Shipped.	Received.	Shipped.	Received.	Shipped.
Bales of cotton	13,176		11,700	7,500		
Merchandise, packages	50	20,550	80		40	
Cattle	35		30			
Phosphate, bags				21,200		18,000
Wood, cords	401		500		350	

A package of merchandise is supposed to weigh 100 pounds, so that the up freight may be considered as 2,000 to 2,500 tons, and the down freight 12,000 bales cotton per year.

The following is the present charge on a bale of cotton from the various points to Augusta, yearly shipments, and days to make the round trip, viz:

	Bales.
Above Craftsville, 10 days, \$2.75 per bale	200 to 400
Craftsville, 9 days, \$2.25 per bale	2,000
Cherokee Shoal, 8 days, \$1.75 per bale	3,000 to 4,000
Petersburg, 6 days, \$1.50 per bale	1,200 to 1,600
Barksdale Ferry, 4 days, \$1.50 per bale	600 to 800
Little River, South Carolina, 3 days, \$1 per bale	300 to 500
Fury's Ferry, 1 day, 50 cents per bale	

The amount of freight distributed through the year is as follows, viz:

	Per cent.
October to February, 4 months	82
February to April, 2 months	9
April to October, 6 months	9

From the records kept at the Cotton Exchange for the months of September, October and November, the total receipts of cotton were 87,138 bales; of this amount, 21,561 bales, or 2.47 per cent. of the whole, were freighted by wagon from the surrounding country, extending as far back as Newberry and Laurens Counties, South Carolina. It is unfortunate that this record has only recently been kept. The average yearly receipts of cotton at Augusta from all sources amount to 180,000 bales.

The aneroid was compared before starting with the mercurial barometer at the signal station at Augusta, and the difference of reading noted; it was out of order the last few days of the trip, so could not be compared on the return to Augusta.

A copy of the record of the signal station at Augusta is used to compute the difference of altitude; the observations taken at Atlanta have not yet been obtained. They would have greatly added to the value of the computed heights of all the stations above Knox's Bridge. The elevation of the railroad-bridge of the Augusta and Charleston Air-Line Railroad, across the Tugaloo River, above the sea, and also of Andersonville, has not yet been procured.

The observations have been corrected for instrumental error, reduced to 32°, and computed by Williamson's tables.

The results were, as usual, very erratic, and out of over a hundred two-thirds have been rejected; the remainder that appear most in accord and rational are shown in the inclosed tables, and are as reliable as one can expect to obtain with the use of an aneroid barometer.

All of the observations for the first 75 miles gave results entirely absurd, so are not shown.

The foot of Cherokee Shoal is 75.5 miles from Augusta; the difference of level is 153.74 feet. The head of Trotter Shoal is 71 miles from Augusta; it is 7 miles long, and the fall, determined accurately by spirit-level, was found to be 74.88 feet. Neglecting the 4.5 miles between these points, we have: Foot of Cherokee Shoals, 153.74 feet, 75.5 miles, less fall of Trotter Shoal, 74.88; foot of Trotter Shoal, 78.86 feet above Augusta; distance 64 miles. The fall per mile to the canal lock, 57 miles, will be 1.38 feet per mile.

Name.	Distance from Augusta.	Date.	Hour.	Aneroid barometer.	Thermometer at Augusta.	Thermometer.	Difference of altitudes.				Remarks.
							Between stations.	Mean.	Between points.	Above Augusta.	
Cherokee Shoal	75.5	Nov. 20	1.15 p. m.	29.582	29.702	66	124.82	131.24		153.74	Angusta is above sea 148 feet. Barometer station is above the level of the city 24 feet.
Do	76.0	Dec. 6	11.43 a. m.	29.927	30.077	53	137.96	144.13	12.89	166.63	Aneroid barometer above the surface of river, 1.5 feet.
Bowman's Ledge	83.0	Dec. 5	4.56 p. m.	29.922	30.081	52		140.65	4.77		Instrumental error. Barometer + .031 from standard. Aneroid — .098 from standard.
Do	85.5	Dec. 5	4.54 p. m.	29.872	30.081	52		146.55			
Gregg Shoal	85.5	Dec. 5	3.53 p. m.	29.847	30.081	54		146.55			
Do	86.5	Dec. 5	3.40 p. m.	29.832	30.081	54		162.40			
Do	86.5	Nov. 21	2.10 p. m.	29.817	30.081	57		176.46			
Middleton Shoal	88.5	Nov. 21	3.05 p. m.	29.812	30.081	56		177.83	22.88	191.93	
Do	89.5	Dec. 5	3.06 p. m.	29.822	30.081	54		171.63	12.82	206.95	
Do	89.5	Dec. 5	2.50 p. m.	29.802	30.081	54		184.45			
McDaniel's Shoal	95.5	Dec. 5	4.15 p. m.	29.812	30.081	55		173.85			
Do	95.5	Dec. 5	12.37 p. m.	29.765	30.081	54		217.05			
Do	100.5	Dec. 5	11.40 a. m.	29.752	30.081	53		236.29			
Do	100.5	Nov. 23	4.05 p. m.	29.502	30.081	55		211.67	28.98	246.48	
Andersonville, S. C.	107.5	Nov. 23	4.15 a. m.	29.432	30.081	52		279.13			
Do	107.5	Nov. 25	11.15 a. m.	29.682	30.081	70		233.02			
Do	107.5	Dec. 4	1.24 p. m.	29.397	30.081	60		246.18			
Do	107.5	Dec. 5	9.15 a. m.	29.762	30.081	44		231.10	247.57	270.07	
Do	110.0	Dec. 5	1.30 p. m.	29.602	30.081	58		267.83			
Hatton Shoal	110.0	Dec. 4	12.42 p. m.	29.862	30.081	60		276.32			
Do	111.5	Dec. 4	12.10 p. m.	29.822	30.081	64		310.81	39.24	333.31	
Do	111.5	Nov. 26	9.30 a. m.	29.542	30.081	64		310.81			
Guest Shoal	112.5	Dec. 4	9.30 a. m.	29.822	30.081	64		308.75			
Do	113.5	Dec. 4	10.55 a. m.	29.812	30.081	57		318.99			
Do	113.5	Nov. 26	3.45 p. m.	29.527	30.081	66		332.51	17.00	348.25	
Knox's Bridge	124.0	Nov. 26	12.10 p. m.	29.432	30.081	65		341.97			
Do	124.0	Nov. 29	9.15 a. m.	29.722	30.081	64		356.12			
A. & C. A. L. R. R.	144.0	Nov. 29	9.15 a. m.	29.402	30.081	46		352.90			
Do	144.0	Dec. 3	11.40 a. m.	29.772	30.081	56		404.90			
Do	148.0	Nov. 30	11.40 a. m.	29.772	30.081	45		378.87			
Smith's Ferry	148.0	Nov. 30	11.40 a. m.	29.727	30.081	55		383.81			
Panther Creek	153.5	Nov. 30	6.30 p. m.	29.747	30.081	53		343.03			
Do	153.5	Dec. 2	3.30 p. m.	29.352	30.081	50		332.85			
Do	156.5	Dec. 2	11.45 a. m.	29.252	30.081	51		376.35			
Junction of Tallulade and Chalooga Rivers	156.5	Dec. 2	11.45 a. m.	29.252	30.081	51		351.04			
								484.07			Bridge 37.12 feet above river.

IMPROVEMENT OF THE RIVER.

The average depth of water on the shoals is about 18 inches, and from the fact that the depth of water above the shoals varies from 6 to 15 feet, we shall consider that the river may be deepened its whole length to an average depth of 3 feet by the removal of 18 inches of rock.

For a pole-boat the channel should be 10 yards wide, and for a steamboat 30 yards wide, at the minimum.

A side-wheel steamboat with independent engines, capable of going 8 miles an hour, can ascend any of the shoals on which the current has a velocity of 10 feet a second or 6.81 miles an hour.

As the displacement of a parallelepipedon of 100 tons would be, length 100 feet, and beam 17 feet, with a depth of 2 feet, allowing 10 per cent. for bow and stern, and that the engine and boiler would weigh 30 tons 60 tons would remain for freight, which is equal to 300 bales of cotton.

The cost of opening the river so as to have a channel on the shoals 3 feet deep and 10 yards wide will be as follows, viz:

Augusta to foot of Trotter's Shoal, 64 miles.

Rock blasting, $1,920 \times \frac{1}{2} \times 10$ yards = 960 cubic yards, at \$2.50	\$24,000
Gravel dredging, $3,720 \times \frac{1}{2} \times 10$ yards = 18,600 cubic yards, at 25 cents	4,650
Wing-dam, 2,640 yards, at \$1.50	3,960
	<u>32,610</u>

Cost per mile, \$509.

Foot of Trotter's Shoal to Foot Gregg Shoal, 21½ miles.

Rock blasting, $2,570 \times 5$ yards = 12,850 cubic yards, at \$2.50	\$32,125
Gravel dredging, 400×5 yards = 2,000 cubic yards, at 25 cents	500
Wing-dam, 3,960, at \$1.50	5,940
	<u>38,565</u>

Cost per mile, \$1,800.

Foot of Gregg Shoal to Andersonville, 22 miles.

Rock blasting, $4,037 \times 5 = 20,185$, at \$2.50	\$50,462 50
Gravel dredging, $1,050 \times 5 = 5,250$, at 25 cents	1,312 50
	<u>51,775</u>
Wing-dam, 3,520, at \$1.50	5,280
	<u>57,055</u>

Cost per mile, \$2,593.

TUGALOO RIVER.

Andersonville to head of Guest's Shoal, 7 miles.

Rock blasting, $1,630 \times 5 = 8,150$, at \$2.50	\$20,375 00
Gravel dredging, $2,510 \times 5 = 12,550$, at 25 cents	3,137 50
	<u>23,512 50</u>
Wing-dam, 3,696, at 1.50	5,544 00
	<u>29,056 50</u>

Cost per mile, \$4,151.

Guest's Shoal to Brown's, 36½ miles.

Rock blasting $795 \times 5 = 3,975$, at \$2.50	\$9,937 50
Gravel dredging, $3,585 \times 5 = 17,925$, at 25 cents	4,481 25
	<u>14,418 75</u>
Cost per mile, \$398.	
Total, 150½ miles	171,705 25
Add 10 per cent. for contingencies	17,170 52
	<u>188,875 77</u>
Cost per mile, \$1,253.	

The river can be opened for steamboat and pole-boat navigation as follows:

Augusta to foot of Trotter's Shoal, 64 miles, channel 3 feet deep by 30 yards wide—

Rock and gravel	\$85,950
Wing-dam	3,960

\$89,910 00

Guest's Shoal to Brown's, 36½ miles, channel 3 feet deep by 30 yards wide..

43,286 25

100½ miles steamboat navigation

133,196 25

50½ miles pole-boat navigation

125,977 50

259,173 75

Add 10 per cent. for contingencies

25,917 37

Total cost, 150½ miles

285,091 12

Cost per mile, \$1,891.

Estimating only the down freight on cotton, and placing that at 35,000 bales instead of 70,000 bales, at \$1 per bale, it will amount to \$35,000, which will amply repay the interest on the money invested in the improvement, and these improvements will be of inestimable advantage to the States of South Carolina and Georgia, and the general country.

Very respectfully,

J. P. CARSON,
Assistant Engineer.

General Q. A. GILLMORE,
Lieutenant-Colonel of Engineers.

I 3.

IMPROVEMENT OF SAINT AUGUSTINE CREEK (THUNDERBOLT RIVER), GEORGIA.

The sum of \$5,000 was appropriated by the act approved March 3, 1879, this being the first appropriation ever made for the work. It was estimated that this amount would be required to remove a heavy timber dry-dock sunk in the channel during the civil war. Since the estimate was made, however, a practicable channel, or what promises to become so, has been created by scour around the obstruction. It may be only necessary, therefore, to erect a frame-work beacon on the wreck, thus obviating the expense of its removal, and this course will be adopted should further examination indicate it to be the proper one. Otherwise, the wreck will be removed.

This improvement is located in the collection-district of Savannah. Savannah is the nearest port of entry.

Amount of revenue collected for the past fiscal year, \$59,152.05.

Money statement.

Amount appropriated by act approved March 3, 1879	\$5,000
July 1, 1879, amount available	5,000

I 4.

IMPROVEMENT OF THE HARBOR AT DARIEN, GEORGIA.

The amount appropriated for this improvement, \$8,000, was applied exclusively to dredging under a contract made with the American Dredg-

ing Company of Philadelphia, Pa. Assistant Engineer S. L. Fremont was in immediate charge of the work, which was commenced December 26, 1878, and completed April 24, 1879.

Channels 50 feet in width and 10 feet in depth at mean low-water, and aggregating 500 yards in length, were dredged through two shoals north of General's Island in the Darien River; in the North River below the Union Island saw-mills a channel 75 feet wide, 14 feet deep at mean low-water, and 500 yards long, was dredged, and at the point at the confluence of the North and Darien Rivers, known as the "Break," the channel was deepened from 8 feet mean low-water to 12 feet, and the width was increased to 75 feet.

The quantities of material removed from the several points above named aggregated 51,041 cubic yards, and the increase of depth obtained on the different shoals varied from 2 to 4 feet. The increase may or may not be permanent.

This work is located in the collection-district of Brunswick. Darien is the nearest port of entry.

The amount of revenue collected for last fiscal year, import and tonnage duties, at Brunswick and Darien, was \$19,766.57.

Sapelo light, on the southern end of Sapelo Island, is the nearest light-house.

The appropriation of \$8,000 by act approved June 18, 1878, was the first ever made for this locality.

Money statement.

July 1, 1878, amount available	\$8,000 00
July 1, 1879, amount expended during fiscal year	8,000 00

Abstract of proposals for dredging in the harbor of Darien, Georgia, opened November 26, 1878.

Names of bidders.	Address.	Price per cubic yard.	Remarks.
George C. Fobes & Co	Baltimore, Md	15 cents....	Provided contract for dredging in the Savannah River is also awarded them.
John F. Gaynor	Manlius, N. Y.	35 cents....	
American Dredging Company	Philadelphia, Pa.	14½ cents....	

Abstract of contract for dredging in the harbor of Darien, Georgia.

Contractor.	Address.	Date of contract.	Nature of work.	Price per cubic yard.	Date of completion.
American Dredging Company	Philadelphia, Pa. .	Dec. 16, 1878	Dredging..	14½ cents..	Aug. 31, 1879

COMMERCIAL STATISTICS.

Entrances and clearances, foreign and coastwise, at the port of Darien, Georgia, for the years 1877 and 1878.

Year.	Vessels entered.		Vessels cleared.		Value of exports.
	Number.	Tonnage.	Number.	Tonnage.	
1877	216	107,610	217	99,213	\$666,727
1878	190	96,103	178	90,209	614,462

I 5.

IMPROVEMENT OF BRUNSWICK HARBOR, GEORGIA.

The sum of \$20,000 was appropriated for this work by the act approved March 3, 1879. The only appropriation previously made for Brunswick Harbor was one of \$10,000 in the year 1836.

Before submitting a plan for improving this harbor, I deem it necessary to have an examination made of the locality, and perhaps to have the streams gauged.

It is proposed to expend a sum not exceeding \$1,000 in this preliminary work.

This improvement is located in the collection-district of Brunswick, which is the nearest port of entry.

The amount of revenue collected for the last fiscal year was \$19,766.57.

Money statement.

Amount appropriated by act approved March 3, 1879	\$20,000
July 1, 1879, amount available	20,000
Amount that can be profitably expended in fiscal year ending June 30, 1881, in the execution of such project for permanent improvement as may be adopted	25,000

COMMERCIAL STATISTICS.

Entrances and clearances, foreign and coastwise, at the port of Brunswick, Georgia, for the years 1877 and 1878.

Year.	Vessels entered.			Vessels cleared.			Value of exports.
	Number.	Tonnage.	Crew.	Number.	Tonnage.	Crew.	
1877	241	71,674	1,906	233	70,909	1,836	\$656,469
1878	192	61,810	1,613	199	62,971	1,643	415,312

Import and tonnage duties collected, including port of Darien.

1877	\$14,707 21
1878	19,766 57

I 6.

INSIDE PASSAGE BETWEEN THE SAINT JOHN'S RIVER AND FERNANDINA, FLORIDA.

An appropriation of \$10,000 made by act of Congress approved June 23, 1874, was applicable either to the improvement of the mouth of the Saint John's River, or to dredging out the inside passage between the Saint John's and Nassau Inlet; \$2,627.60 of the amount was expended in making a survey of the passage and in the preparation of a project for its improvement between the Saint John's River and Fernandina. The balance of the appropriation was expended in dredging in the Sister's Creek, at Gunnison's Cut, in Sawpit Creek, and at other shoals, during the fiscal year ending June 30, 1876. No work has been done

during the past three years for want of funds, and considerable shoaling has occurred in the dredged channels.

An appropriation of \$7,000 for improving this passage was made by the act approved March 3, 1879. It is proposed to expend this amount in dredging at Gunnison's Cut, possibly to a limited extent also at Kingsley's Cut, and at such other points as may be necessary to secure, as nearly as possible, a uniform low-water depth over all the shoals.

This work is located partly in the collection-district of Fernandina, and partly in that of Saint John's.

Fernandina and Jacksonville are the nearest ports of entry.

The original estimated cost of the project submitted June 14, 1875, for obtaining channels from 11 feet deep at high-water and 80 feet wide to 13 feet deep and 125 feet wide, varied from \$160,000 to \$370,000.

The only appropriation since made for the work was that of March 3, 1879, \$7,000. The passage ought to be enlarged for the use of light-draft steamers.

Money statement.

Amount appropriated by act approved March 3, 1879.....	\$7,000
July 1, 1879, amount available.....	7,000
Amount that can be profitably expended in fiscal year ending June 30, 1881..	25,000

I 7.

DEEPENING THE BAR AT THE MOUTH OF SAINT JOHN'S RIVER, FLORIDA.

Appropriations aggregating \$50,000 were made for this work in the years 1870 to 1873 inclusive, which amount was expended in dredging the bar channels, and in surveys.

By the act of Congress approved June 18, 1878, the sum of \$10,000 was appropriated "for deepening the bar at the mouth of Saint John's River, Florida."

From the amount appropriated the sum of \$2,523.74 was expended in making an examination and partial survey of the lower part of the stream and of the bar at its mouth, in order to obtain the requisite data for a project for works of permanent improvement. A report on the general results of this examination, with a project for improving the channel of entrance by jetties, is herewith transmitted together with the report of Mr. George Daubeney, assistant engineer in charge of the field-work.

The United States dredge steamer Henry Burden was employed in deepening the bar channel, at times when the weather permitted, from August 1, 1878, to March 15, 1879. A large proportion of the time was lost owing to heavy or foggy weather. The dredge worked in the South Channel until December 25, when a new channel broke out to the northward of Pelican Bank, about on the line of that of 1853, and the South Channel began to shoal up. The dredge was at once transferred to the new channel, and continued at work until the appropriation was expended in March, 1879. At this time the mean low-water depth was about 8 feet.

No appropriation was made for the fiscal year ending June 30, 1880, and no work is contemplated during the year.

This improvement is located in the collection-district of Saint John's. Jacksonville is the nearest port of entry.
The amount of revenue collected for the last fiscal year was \$839.92.

Appropriations for improving the bar at the mouth of the Saint John's River have been made from time to time as follows:

By act of Congress approved July 11, 1870.....	\$15,000
By act of Congress approved March 3, 1871.....	15,000
By act of Congress approved June 10, 1872.....	10,000
By act of Congress approved March 3, 1873.....	10,000
By act of Congress approved June 23, 1874.....	10,000
By act of Congress approved June 18, 1878.....	10,000

The appropriation of June 23, 1874, was under the terms of the act applicable for continuing the improvement at the mouth of the river, or for dredging out the inside passage between the Saint John's and Nassau Inlet, and was expended wholly upon the latter object.

Money statement.

July 1, 1878, amount available.....	\$10,000 00
July 1, 1879, amount expended during fiscal year.....	10,000 00
Amount (estimated) required for completion of appended project,*	
\$750,000 or.....	1,142,295 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.....	400,000 00

COMMERCIAL STATISTICS.

Entrances and clearances, foreign and coastwise, at the port of Jacksonville, Florida, for the fiscal year ending June 30, 1879.

Vessels entered:	
Number.....	315
Tonnage.....	154,267
Crew.....	4,863
Vessels cleared:	
Number.....	331
Tonnage.....	157,212
Crew.....	4,819
Value of exports.....	\$86,821 71
Value of imports.....	15,996 74
Duties collected.....	839 92

NOTE. The above does not include the arrivals and departures of steamers using the inland route between Jacksonville and Savannah, the number of which is estimated to be 180.

The shipments of lumber from the port of Jacksonville are estimated to be about 50,000,000 feet annually.

EXAMINATION, SURVEY, AND PROJECT FOR THE PERMANENT IMPROVEMENT, BY MEANS OF JETTIES, OF THE SHIP CHANNEL ACROSS THE BAR AT THE MOUTH OF THE SAINT JOHN'S RIVER, FLORIDA.

UNITED STATES ENGINEER OFFICE,
New York, June 30, 1879.

GENERAL: I have the honor to submit below a project for the permanent improvement by means of jetties of the ship channel across the bar at the mouth of the Saint John's River, Florida.

No general description of this river and bar is deemed necessary here, previous reports having sufficiently covered this ground. Attention is therefore invited to the report of Lieut. (now Brig. Gen.) H. G. Wright to General J. G. Totten, dated May 24, 1853, published in the Annual Report of the Chief of Engineers for 1878, Appendix H 6, and to my report dated January 29, 1869, and printed in the Annual Report of the Chief of Engineers for that year.

* The project submitted embraces two plans estimated to cost \$750,000 and \$1,142,295 respectively.

The tidal wave is slightly felt as far up the Saint John's River as Little Lake George, 115 miles from its mouth.

At Jacksonville, 24½ miles from the mouth measured along the channel, the river has a width of 2,390 feet, an average depth at mean low tide of 21¾ feet, with a channel depth of 66 feet, and a mean rise and fall of about 1 foot.

Near Dame's Point, 11½ miles from the mouth, the river is divided into two branches by Radcliffe Island. The width of the northern or navigable branch is about 2,100 feet, the average low-water depth of profile 7.7 feet, with a practicable channel 10 feet deep, and a mean rise and fall of 2 feet.

The southern arm or branch has a width of about 1,640 feet, an average low-water depth of 9.4 feet, and a maximum depth of 19½ feet. A deep-water pocket runs through this branch of about 5 miles length, ending in shoal water above and below Dame's Point.

At Dame's Point the channel has less depth than at any other point below Jacksonville except on the bar at its mouth.

At Mayport, near the mouth of the river and only 3¼ miles from the crest of the bar, the mean rise and fall is 4.3 feet, the width at low-water 1,735 feet, the average low-water depth of profile 19 feet, and the mid-channel depth 21 feet. The maximum depth, in or near the north bank, however, is 28 feet.

The water of the river being clear at all seasons the bar which obstructs its passage into the ocean in no degree owes its formation and maintenance to materials brought down and deposited by the stream. It is a drift and wave bar in its strictest sense.

From shore to shore, measured along its crest or line of least soundings, the bar is about 3½ miles long, the most salient portion of this crest line being about ⅝ of a mile to the seaward of the straight chord joining its shore ends.

The coast-line of North Carolina, South Carolina, Georgia, and Florida forms a decidedly re-entering curve, that portion to the northward of Saint John's River having a general trend about north 55 degrees east, while that to the southward trends south 13 degrees east.

A straight line drawn tangent to the eastern coast of the Florida Peninsula and to the coast of North Carolina at Cape Hatteras, will have a direction north 21 degrees east, will be 720 miles long between the points of tangency, and will pass 184 miles to the seaward of the mouth of the Saint John's River.

It happens therefore that the prevailing heavy storms, those from the northeast, sweep the coast of Georgia and the Carolinas at an acute angle, thus producing a comparatively quick and rapid movement of the drift material from the windward to the leeward sides of the harbor inlets and lessening the duration and amount of drift obstruction.

At the mouth of the Saint John's River, however, as well as to the southward of that point, these northeasterly storms bear more directly upon the coast—nearly at right angles to it, indeed, in many cases—and the result is that the tendency to heap up the drift material across the mouths of the inlets rather than to carry it past them, is greater than at points farther north.

In consequence of these conditions rather excessive variations of bar-channel depths might be expected as the direct and immediate result of on-shore storms, and these variations would doubtless be more pronounced in an improved channel where the tidal basin is filled and emptied through a single contracted passage than they would be when the ebb and flow takes place over the broad expanse of a bar in its natu-

ral state. At the Saint John's River, the reduced depth resulting from storms might last for some weeks before the normal channel would be re-established by scour, and therefore is an important factor in the navigation of the bar. It puts a practical limit to the draft of vessels seeking this passage, as vessels loading to a deeper draft would incur the risk of having the passage closed to them during no inconsiderable portion of the time.

The examinations made during the fiscal year were entrusted to Assistant Engineer George Daubeney. They comprised—

1. Soundings upon the bar with the object of ascertaining the depth of water at a sufficient number of points to answer the purpose of an estimate for jetties.
2. The determination of the current velocities in the main channel across the bar.
3. A few borings to determine the character of the material of which the bar is composed.
4. Gauging the stream at Mayport, near its mouth.

FIRST. THE RECENT SOUNDINGS TAKEN ON THE BAR.

As was to be expected from the well-known shifting character of the shoals and channels at the mouth of this river, the soundings as far as they go indicate many changes, whether compared with the chart of the survey made under my direction in 1868, or with the Coast Survey chart of 1856.

From Mayport to within 1,000 feet of the site of the old light-house, a distance of nearly a mile, the shore-line is practically the same as in 1868, with the exception of a recess opposite Pilot Town, which has filled up.

From 1,000 feet west of the old light-house to 1,500 feet east of it the shore has washed from 0 to 200 feet in center.

From the eastern end of the last-named line to South Run, a distance of 1,500 feet, the shore-line has remained unchanged.

From South Run for a distance of 3,200 feet the shore has washed; as much as 500 feet at the center of the line near General's Mound.

From the eastern end of that line where the shore-line assumes the southerly direction of the main coast the shore has made out from 200 to 300 feet.

The opposite shore-line of Fort George Island, which has been examined for a short length only, shows equally marked variations from the line of 1868.

The middle ground, called Pelican Shoal or Pelican Island, which always exists upon the inner slope of the bar, was found in December, 1878, at a distance of 2,000 feet in a direction south-southeast from its position in 1868.

In 1877 two sailing channels existed, of which only the South Channel was in use at the close of 1878. This channel crossed the bar in a direction about east 26 degrees south, passing about 800 feet to the northward of General's Mound. In August, 1878, it was examined and showed a minimum depth of 6 feet at low-water on the bar, the shoalest place having a width of about 150 yards, while on either side of the bar the water rapidly deepened to 3 or 4 fathoms.

The North Channel of 1877 passed out in a direction almost due north and was for some time the main channel. Since November or December, 1877, it had ceased to be so, having only 4 feet at low-water in the shoalest places when soundings were taken in November, 1878.