COMMERCIAL STATISTICS.

Number of vessels at Point Breeze from July 1, 1878, to June 30, 1879, and total shipments of petroleum within same period.

Steamers	2
Ships	114
Barks	316
Brigs	18
Schooners	39
Sloops	8
Barges	25
Total vessels	522
Total barrels	1,555,203

Number of vessels at and shipment of grain from Girard Point elevator, from July 1, 1878, to June 30, 1879.

Steamers	91
Ships	44
Barks	206
Brigs	17
Schooners and barges	141
Total vessels	499
Total bushels	13,717,709

Number of vessels and estimated shipments of petroleum from Gibson's Point, from July 1, 1878, to June 30, 1879.

Ships	11
Barks	56
Brigs	4
Schooners	2
Sloops	1
Barges	9
Total vessels	83
Total barrels	120,250

E 5.

IMPROVEMENT OF DELAWARE RIVER BETWEEN TRENTON AND WHITE HILL, NEW JERSEY.

The earlier appropriations for this improvement, in 1872, 1873, and 1874, were limited by their terms to that portion of the river between Trenton and Bordentown, and were, therefore, applied to the construction of a channel through the gravel and bowlder bar at Periwig Island, 3 miles below Trenton. That of 1875 was also expended upon the same locality, with the result of obtaining a 6-foot channel 125 feet in width.

No further appropriations were made until June 18, 1878, when $10,000 were granted for this work, with the limits extended to White Hill, the next point below Bordentown.

In July and August, 1878, a careful survey was made from White Hill to a mile above Bordentown, and an examination also made of the Periwig channel. This was found to have decreased since the suspension of work to 75 feet width and 4 to 4½ feet depth. It was evident that dredging alone would not suffice to maintain a good channel in this vicinity.

Furthermore, the river between Trenton and Bordentown is only used by one steamboat and by rafts, and the business was not increased while the Periwig channel was kept open to 6 feet, while the Delaware and Raritan Canal, debouching into the Delaware at Bordentown, is the highway of a heavy and valuable traffic.

The river in front of Bordentown is divided by a bar into 2 channels, of which the eastern one leads to the entrance to the canal. It was desirable in the interest of commerce to increase the depth of this channel, and inasmuch as a greater flow of water through it was needed to maintain the increased depth, it was necessary to open the upper end as well as the lower.

A project to this effect was submitted in September, and after approval by the Chief of Engineers and advertisement, contract was made with the American Dredging Company.

Operations continued until December 14, when a heavy freshet, followed by the formation of ice, suspended further work. About 8,000 cubic yards of sand were removed from the channel between the mouth of the canal and deep water at White Hill. Operations were under the immediate supervision of Assistant A. H. Fisher.

During the winter two ice-gorges formed, one from the Pennsylvania shore to Duck Island, that forced the water through the slough back of Duck Island, cutting it out, and making considerable deposits in the eastern channel above the mouth of the canal; the other dammed the lower part of the eastern channel and diverted the water across the bar into the western one.

In consequence of the changes to be anticipated from these gorges, an examination was again made in April, the survey showing a shoaling and contraction of the water-way just below the gorge, but that the deep water from below had pushed up for a distance of 250 feet.

Dredging was resumed May 9, and by June 30 this portion of the work was nearly completed, affording a channel 200 feet wide and 7 feet deep at mean low-water.

For the first time in many years the numerous vessels engaged in the canal and river traffic, which draw about 7 feet loaded, have been able to enter and leave the canal without delays from grounding or waiting for the rise of tide.

During the ensuing season it is proposed to complete the survey now in progress from White Hill to and above Periwig Island, and to continue the improvement in progress by dredging a 7-foot channel from above the canal into the deep water abreast of Duck Island, applying thereto the appropriation of $6,000 of March 3, 1879.

To give permanency to this improvement it is essential to secure a greater volume of water by constituting the eastern channel the principal one, and for this purpose, in addition to the dredging operations, the construction of a submerged dike or deflector, extending down stream from some point on the Pennsylvania shore near Collins's house, will in all probability be required, in addition to closing the upper end of Duck Island Slough opposite Periwig.

It is expected that by aid of the present survey and that of last summer, with the experience gained of the action of ice and freshets, a project can be submitted before fall for the satisfactory improvement of this part of the river. The navigation will then be free from Bordentown to Philadelphia, with two exceptions, viz, at Five Mile Point (below Bridesburg) and at Kincora Bar, at the lower end of Newbold's Island, about 3½ miles below Bordentown. The former is provided for in the general appropriation for the Delaware River; for the latter no appropriation

has ever been made. There are but 6 feet of water at low-water on Kincora Bar, and delays are frequent. It is recommended that an appropriation of $3,000 for the improvemeet of this locality be added to the appropriation for the Upper Delaware, and its limits be extended to "between Trenton and Philadelphia."

For the continuance of this improvement during the year ending June 30, 1881, there will be required:

At Periwig	$5,000 00
At Kincora	3,000 00
At Bordentown	6,000 00
For deflecting dike above Bordentown, roundly estimated	4,500 00
For dike closing Duck Island Slough	1,500 00
Total	20,000 00

The amount of commerce to be benefited is shown in the accompanying schedule.

This work is in the collection-district of Burlington, which is also the nearest port of entry.

The nearest light-house and fort are, repectively, Fort Mifflin Light and Fort Mifflin.

Money statement.

July 1, 1878, amount available	$10,000 00	
Amount appropriated by act approved March 3, 1879	6,000 00	
		$16,000 00
July 1, 1879, amount expended during fiscal year	4,023 95	
July 1, 1879, outstanding liabilities	1,410 79	
		5,434 74
Amount available		10,565 26
Amount that can be profitably expended in fiscal year ending June 30, 1881		20,000 00

COMMERCIAL STATISTICS.

One of the outlets of the Delaware and Raritan Canal is at Bordentown, N. J., and the navigation of the Upper Delaware depends chiefly upon the business of the canal.

The number of vessels passing in and out of the canal at Bordentown during the fiscal year ending June 30, 1879, was 16,332, and tonnage 1,619,044. The amount of coal shipped during the same period through the canal from the Delaware River was 1,300,000 tons, valued at $4,650,000.

There are 5 lines of steamers, employing 19 steam-vessels, that ply regularly on the Upper Delaware, carrying general merchandise. From reports received from the agents, the value of the merchandise carried aggregates $60,000,000 annually.

Abstract of proposals received by Col. J. N. Macomb, Corps of Engineers, at Philadelphia, Pa., 12 m., October 5, 1878, for improvement of Delaware River between Trenton and White Hill, N. J.

No. of bid.	Name of bidders.	Residence.	Dredging channel near Bordentown, N. J.	Remarks.
			Rate per cubic yard.	
1	Edgar M. Payne	Albany, N. Y	$0 15⅞	
2	John McDermott	Cohoes, N. Y	23¾	
3	E. Brainard, jr.	Albany, N. Y	17½	
4	M. and I. Herron	Fieldsboro', N. J.	22	
5	American Dredging Company	Philadelphia, Pa.	14⅜	Lowest bidder.
6	Franklin B. Colton	do	17	

Abstract of contract entered into by Col. J. N. Macomb, Corps of Engineers, during the fisca year ending June 30, 1879, for improvement of Delaware River between Trenton and White Hill, N. J.

Name of contractor.	Residence.	Dredging channel near Bordentown, N. J.	Date of contract.	Remarks.
		Rate per cubic yard.		
American Dredging Company.	Philadelphia, Pa.	$0 14⅜	October 9, 1878	In force June 30, 1879.

E 6.

IMPROVEMENT OF DELAWARE RIVER BELOW BRIDESBURG, PENNSYLVANIA.

Philadelphia, about 100 miles from the sea, is practically at the head of navigation on the Delaware River for sea-going vessels, and its rapidly extending commerce, calling constantly for larger vessels of deeper draught and greater capacity has had the effect to increase relatively the known obstructions to navigation and demonstrate the existence of others to which special attention had not been attracted. Whereas in former years depths of 18 and 20 feet sufficed, at the present time ships are loaded with valuable cargoes to a depth of 25 feet and over and sent to sea.

Without the aid of the general government, which, through the custom-house, directly profits to the extent of between $9,000,000 and $10,000,000 annually from the foreign portion alone of this commerce, the necessary modifications of the channel, demanding large expenditures, could not be made.

The depth of water now required approaches the probable ultimate capacity of the river, since there are long stretches of the existing channel where the depth does not exceed 27 and 28 feet, and in fact there are few portions of the river exhibiting a depth greatly in excess of these.

It is therefore in a condition demanding the greatest attention to its requirements, both general and special, and the exercise of the best judgment in the application of remedial measures and agencies.

The points at which obstructions to navigation exist are as follows:

1. *Near Richmond.*—In the upper part of Philadelphia the 24-foot mean low-water channel curve disappears, and the depth decreases to 18 feet. The large and increasing commerce at this point is therefore seriously inconvenienced.

2. *The Horse Shoe Shoals.*—The obstructions here are chiefly due to the heavy drift ice, that in severe winters forms a gorge. The river between Gloucester and League Island curves through an angle of nearly 90 degrees in 2½ miles and widens to over double the width above and below. The ice accumulates in this enlargement, and gorges on both ebb and flood tides. In ordinary seasons the ice-boats owned by the city of Philadelphia suffice to keep a channel open through the "shoe," but in such winters as the last these are themselves locked up in the ice for hours at a time, until freed by the change of tide loosening the jam.

The requisite measures for the improvement of this portion of the river have been the subject of investigation by officers and Boards of Engineers, and permanent works of a somewhat extensive character have been found to be necessary.

3. *Mifflin Bar, 9 miles below the old navy-yard, Philadelphia.*—A report of this obstruction and the work upon it during the last year is appended. The existence of the Mifflin light-house near the upper end of this bar is believed to have an important influence upon it. The light-house stands in mid-river on the eastern side of the main channel, and on a solid crib 90 feet by 65 feet, opposing its longer dimensions to the currents, which thence lead directly to the artificial channel through the bar below. The maintenance of this cut is so important, and the works to secure it are of so extensive a character, as to justify the recommendation that this crib should either be removed, or, if it be found necessary to retain the light, that it be built upon piles sufficiently open to offer no obstruction to the movements of the water.

4. During the last winter season, which was one of great and continued cold, the ice gorged almost as heavily between Billingsport and Maiden Island, 1 mile below Mifflin Bar, as at the Horse Shoe, but the channel depth is ample.

5. *Schooner Ledge*, 18 miles below Philadelphia, between Chester and Marcus Hook, has a special appropriation for beginning its removal, and is elsewhere reported.

6. *The Cherry Island Flats*, opposite Wilmington, and 27 miles below Philadelphia, have also a special appropriation and report.

7. The report on *Bulkhead Shoals*, 36 miles below Philadelphia, is appended.

8. *The Dan Baker Shoals*, about 49 miles below Philadelphia, have been the subject of considerable complaint on account of the insufficient draught and narrowness and too rapid change of direction in the channel.

The channel depths in the bay below are sufficient, and the difficulties therein encountered by vessels are chiefly due to imperfect information, suggesting the necessity for accurate and recent charts. These, when made, may, however, show that at some points improvements are practicable.

9. *Wrecks.*—These obstructions, sometimes slight and occasionally formidable, are from their nature liable to occur at any point, and especially at those where difficulties and dangers already exist.

The unsatisfactory nature of the existing laws on the subject of their removal is illustrated in the report on the *Addie Walton*, which has for years been a peril to the commerce of the bay, while the United States seem powerless to remove it in the absence of authority to do so from owners whose very names it is impossible to ascertain.

I respectfully beg to renew my recommendation for such general legislation as may be necessary to provide for the removal of wrecks within a reasonable time from all navigable streams and channels.

ICE HARBORS.

The existence on the Delaware of conveniently situated and sufficiently capacious ice-harbors is of great importance to shipping, and the facilities afforded by those now in existence should be increased to meet the demands of the growing tonnage of the river. At the same time some regulation of their use appears to be required. At some of them the limited area inclosed is decreased and in some cases entirely occupied by vessels using it not as a harbor of refuge but as a snug and convenient berth for the winter, where they lie up comfortably from fall until spring.

It is not believed that this is a legitimate use of a harbor constructed at the cost of the general government for vessels which while on their journey encounter or are caught in ice too heavy and dangerous to contend with, and which are frequently practically forbidden to seek refuge in the very places intended for them.

In addition to the works elsewhere reported, a shoal of limited area in front of the city, and outside the port-warden's line, was removed. This was a small shoal about 50 feet out from the end of Christian-street wharf, Philadelphia, with only 16 feet upon it at mean low-water. It was a great inconvenience to the large vessels having their docks in the immediate vicinity, and they frequently touched upon it in swinging into and out of their berths. As it was reported to contain rock, an examination of it was made with a pointed iron sounding-rod and nothing found but a coarse gravel. It was therefore dredged in December, 1878, to 25 feet at mean low-water by the removal of about 2,100 cubic yards of material.

Tidal stations have been established at Lewes Pier, Fort Delaware, Marcus Hook, and Fort Mifflin, and current observations have been made at the various points needing improvement, and the movements of the ice, the location of gorges, and the limits of the fast ice at several points have been noted.

Numerous reports were collected, through the kindness of shippers, of the logs of vessels during the ice season. These constitute a valuable mass of information, which will hereafter be of great use.

A partial examination was also made of the wreck of the *Ironsides*, formerly a United States vessel, which burned at the Leage Island wharf, and now lies at the lower end of Horse Shoe Shoals. The wreck was much silted, and little but projecting pieces could be found by the diver.

It is proposed during the ensuing fiscal year to continue work upon Mifflin Bar, to recommence upon Bulkhead Shoals, and to begin the improvement of the river below Bridesburg, as may be found necessary (these in addition to the works at Schooner Ledge and Cherry Island Flats, which are specially appropriated for); to continue the tidal observations, and connect the gauges by a line of levels for the purpose of ascertaining the slope of the river and the velocity of the tidal wave between certain points, and the study of other phenomena, in order to combine the works at various points into a consistent and comprehensive scheme for the improvement of the river as a unit.

For continuing these works and for including such others as may require attention an appropriation of $150,000 will be required for the fiscal year ending June 30, 1881.

The commercial statistics and statements of duties collected through the custom-house of Philadelphia are appended. The tonnage statements are very imperfect, for the reason that from the absence of records the heavy coastwise traffic cannot be accurately ascertained.

MIFFLIN BAR.

Eight and one-half miles below the old navy-yard at Philadelphia, and between Fort Mifflin and Billingsport, N. J., which are apart $2\frac{1}{4}$ miles, the river is about 1 mile in width. The main channel passes the fort on the Pennsylvania side, and continuing downward the 24-foot curve closes at a point $1\frac{3}{4}$ miles below. Opposite Billingsport the main channel is on the New Jersey side, and the 24-foot curve forms a pocket about $1\frac{3}{8}$ miles above.

The two deep-water areas therefore overlap about 1 mile, but are separated some 1,200 or 1,500 feet by the Mifflin Bar, which, composed of fine sand and mud, lies in mid river, following the slightly double curve of its axis from above Fort Mifflin light to Maiden Island.

Vessels navigating the Delaware to and from Philadelphia must, therefore, cross this bar, upon which in 1873 were only 18 feet at mean low-water, and the heaviest ships could only pass on the top of the tide.

The improvement of the bar was begun in 1873 and continued yearly thereafter, by dredging a cut diagonally through it, to connect the two channels. The cut was at first to 20 feet, and this being found insufficient, to 22 feet. Notwithstanding the use of the channel by deep propellers, the cut exhibited a tendency to fill, due to several causes, two of which seemed capable of modification. One was the too great angle made by the axis of the cut with the direction of the currents, which caused the sides of the cut to fall into it; the other was the insufficient depth of the cut, which prevented the curves deeper than 22 feet from entering it, and the beneficial effect of the energetic scour was thereby lost.

During the last fiscal year, therefore, with an allotment of $20,000 from the general appropriation of $100,000 made for the Delaware River in act of June 18, 1878, a contract was made with the Morris & Cumings Dredging Company to make a cut 500 feet wide and 26 feet deep at mean low-water to connect with corresponding depths in the two channels, and the axis of the cut was so directed as to be nearly on the prolongation of the axis of the river above. This secured an almost direct flow through the cut of, at any rate, the lower strata of water, and presented also a favorable line upon which to construct the range-lights in contemplation by the Light-House Establishment. A full survey was made of the locality in July, previous to beginning operations, and another in May, 1879, by which time about 80,000 cubic yards had been dredged. The results shown by a comparison of the two charts are interesting, and justify the anticipation of favorable results from deep dredging. Although the sides of the cut fell into the dredged areas, so that in May the actual width of the 26-foot channel was only about one-third that intended, the scouring action that appeared inert with depths of 20 and 22 feet had developed in a marked degree, and had continued the deepening below the depth reached by the dredge-dipper to 28 feet, 29 feet, and in some places 30 feet; so that the actual draught through the bar approximated closely to that in the channels thereby connected.

Owing to the pressure of other work, no opportunity was had to re-examine the bar at the close of the year, when 98,000 cubic yards had been dredged; but the reports of the dredging inspectors show that the same forces were still acting, and the material removed by scour was, under the preponderating influence of the ebb tides, gradually working its way downward into the deep water off Billingsport and below.

During the ensuing season it is proposed, with the allotment from the $45,000 appropriated in act of March 3, 1879, for the improvement of the Delaware, to continue work upon Mifflin Bar and to widen the cut to its intended dimensions.

It is believed that the experience gained during the season will justify some conclusions with regard to the necessity or otherwise of permanent works which have appeared hitherto to be strongly indicated in attempting to render this improvement permanent. It is therefore not possible at the present time to estimate its future cost, but as the maintenance of a 25-foot channel through Mifflin Bar is absolutely indispensable to the most valuable part of the Delaware commerce, an appropriation of not less than $25,000 should be available for the year ending June 30, 1881.

The effects attributed to Fort Mifflin light-house, and some suggestions in connection therewith, have been previously noted.

Operations were under the immediate supervision of Assistant Thomas Valentine.

BULKHEAD SHOALS.

About 4 miles above Fort Delaware the river changes its direction through an angle of about 68° from southwest to south-southeast, and divides into two channels, which unite again about 2 miles below the fort.

The western channel, following the concavity of the shore and diminishing in width and depth, leads to the entrance to the Delaware and Chesapeake Canal at Delaware City, and is principally used by the canal traffic, by steamboats, and by the lighter-draft vessels, especially in winter, when the prevailing northerly winds drive the floating ice into the eastern or main channel. This retains its position under the New Jersey shore, and after rounding Goose Island Bar passes between Finn's Point and Fort Delaware. It has a depth about a fathom greater than the western channel, is usually navigated by all vessels, and is lighted by two sets of range-lights, viz, the New Castle and Deep Water Point ranges.

The two channels are separated by the Bulkhead Shoals, which, following the curve of the river, connect with Pea Patch Island and the bar below. Near the upper end of the shoals the main-channel depth decreases from 4 and 5 fathoms to 22 and 23 feet, while the straight course lighted by the Deep Water Point range is limited to about 21. This diminution in depth is a serious obstruction to vessels of large size and deep draft.

Upon the recommendation of Lieutenant-Colonel Kurtz, an appropriation of $27,000 which had been made for the improvement of Horse Shoe Shoals was applied to this work, and in 1875 98,000 cubic yards of sand and mud were dredged from the projection of Goose Island Bar toward the "elbow."

In July last a resurvey was made of the locality and a chart prepared, which developed the fact that the dredged area at the elbow had resumed its former depth, but that the channel above had deepened somewhat from the running of the Deep Water Point range by deep-draft propellers. A long, narrow elevation, however, exists parallel to this range and within 200 feet of it to the westward, having only 18 to 20 feet of water upon it. It is proposed to remove this ridge by dredging over an area about 1,700 yards by 100 yards to a depth of 24 feet at mean low-water. The average cut is 3 feet, and the amount of material to be removed is 170,000 cubic yards, at an estimated cost of 40 cents per yard.

The removal of this area will effect the uniting of the channel with the deep pocket to the westward of the ridge and make the range line the axis of the channel instead of its boundary. As a secondary but important effect it is probable that the projection of Goose Island Bar into the elbow, hitherto dredged unavailingly, will be reduced by the natural action of the currents.

The ultimate improvement of Bulkhead Shoals requires that the 26-foot curve of mean low-water should be made continuous through the channel.

An estimate of the cost of this work calculated from the present chart is necessarily but the roughest approximation, since it is impossible with the imperfect insight afforded to estimate closely the future effect of winds and currents. According to the chart the amount of material to

be removed is about 700,000 cubic yards, and an annual allotment of from $25,000 to $30,000 should be available for the engineer officer in charge to apply in such manner as he may from time to time find necessary, with the aid of close observation and frequent examinations.

The following appropriations have been made by Congress for the improvement of this river:

By act approved March 3, 1873, at Mifflin Bar	$50,000
By act approved March 3, 1873, at Horse Shoe Shoals, transferred to Bulkhead Shoals	50,000
By act approved June 23, 1874, at Mifflin Bar	50,000
By act approved March 3, 1875, at Mifflin Bar	20,000
By act approved August 14, 1876, below Petty's Island	40,000
By act approved June 18, 1878, below Bridesburg	100,000
By act approved March 3, 1879, below Bridesburg	45,000
Total	350,000

Money statement.

July 1, 1878, amount available	$106,140 85	
Amount appropriated by act approved March 3, 1879	45,000 00	$151,140 85
July 1, 1879, amount expended during fiscal year	23,943 29	
July 1, 1879, outstanding liabilities	5,824 19	29,767 48
July 1, 1879, amount available		121,373 37
Amount that can be profitably expended in fiscal year ending June 30, 1881		150,000 00

Abstract of proposals received by Col. J. N. Macomb, Corps of Engineers, U. S. A., at Philadelphia, Pa., at 12 m., September 27, 1878, for the improvement of Delaware River at Fort Mifflin Bar.

No. of bid.	Name of bidder.	Residence.	Dredging the channel of Delaware River at Fort Mifflin Bar.
			Rate per cubic yard.
1	American Dredging Company	Philadelphia, Pa	$0 23½
2	M. F. Brainard, agent	Albany, N. Y	13
3	F. B. Colton	Philadelphia, Pa	13 5/16
4	Morris & Cumings Dredging Company	New York City	15

Abstract of contract entered into by Col. J. N. Macomb, Corps of Engineers, U. S. A., during the fiscal year ending June 30, 1879, for improvement of Delaware River below Bridesburg, Pa.

Name of contractor.	Residence.	Dredging the channel of Delaware River at Fort Mifflin Bar.	Date of contract.	Remarks.
		Rate per cubic yard.		
Morris & Cumings Dredging Company.	New York City	$0 15	October 16, 1878	In force June 30, 1879.

COMMERCIAL STATISTICS, TAKEN FROM THE BOOKS OF CUSTOM-HOUSE AND REPORT OF MARITIME EXCHANGE, FROM JULY 1, 1878, TO DECEMBER 31, 1878.

American vessels entered from foreign ports.

Cargo:	
Vessels	506
Tons	245,212
Ballast:	
Vessels	26
Tons	27,402

American vessels cleared for foreign ports.

Cargo:	
Vessels	460
Tons	227,913
Ballast:	
Vessels	30
Tons	4,533

Foreign vessels entered from foreign ports.

Cargo:	
Vessels	412
Tons	320,409
Ballast:	
Vessels	63
Tons	562,887 8

Foreign vessels cleared for foreign ports.

Cargo:	
Vessels	1,111
Tons	848,973
Ballast:	
Vessels	21
Tons	13,943

Number of coastwise arrivals.

Steamers	1,780
Ships	8
Barks	11
Brigs	10
Schooners	4,070
Barges	73

Number of coastwise departures.

Steamers	1,733
Ships	12
Barks	6
Brigs	17
Schooners	3,809
Barges	56

Exports to foreign countries from the port of Philadelphia during 1878.

Bacon and hams	$7,782,550
Beef (salt)	225,851
Beef (fresh)	541,187
Boards, lumber, &c	710,307
Butter	241,670
Cars, carriages, &c	219,611
Chemicals and drugs	116,171
Cheese	228,745
Coal	241,413
Corn	10,416,842
Cotton	1,746,942
Fruits and vegetables	49,631
Furs	30,635
Indian meal	77,380
Iron and iron manufactures	1,129,254
Lard	1,325,844
Lard oil	135,451
Leather and hides	251,559
Live stock	401,783
Miscellaneous articles	664,909
breadstuffs	93,353
manufactures	522,330
Molasses	233,303
Naphtha, &c	220,598
Oats	31,068
Petroleum (crude)	220,598
Oil cake	248,350
Petroleum (refined)	7,470,699
Pork	68,356