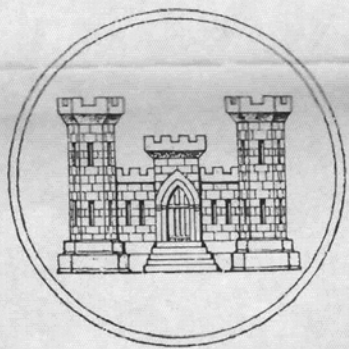


February, 1975

THE DISTRICT

A HISTORY OF THE PHILADELPHIA DISTRICT U. S. ARMY CORPS OF ENGINEERS 1866 - 1971

by Frank E. Snyder and Brian H. Guss



**U. S. Army Engineer District Philadelphia
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ICE HARBORS

Among the earliest works of Harbor improvement undertaken in the District were the ice piers at New Castle, Delaware, built in 1803. They were rectangular, four in number, of stone-filled wooden crib construction.¹ Available records do not reveal the name of the engineer in charge of this project. A drawing in the District's historical files bears a legend stating simply that the piers were built by the United States. They were apparently among the first federally-supported non-military works of improvement.

Major Samuel Babcock is credited with construction, in 1827, of timber piers which joined two of the ice piers to the wharves and filled up two sluiceways. "The effect," according to Major John Sanders, "was to fill the harbour with mud²." Harbor configuration had changed by 1835 when Major Delafield³ started construction of two hexagonal ice piers farther offshore. He razed to low water the two outermost of the original, rectangular piers and rebuilt them with cut stone superstructures. The 1827 timber connecting structures were removed at this time and the sluiceways reopened. One of the two ice piers begun in 1835 was completed by Major Delafield in 1837. The other remained unfinished for lack of funds.

A plan of New Castle Harbor dated 1854 shows it several feet shallower than in 1835 and proposes construction of three additional ice piers. The plan bears the signature of Major John Sanders, who since 1848 had supervised the reconstruction of Fort Delaware. A crib pier, built in 1853-1854, is shown about 200 feet south of Major Delafield's unfinished pier. Major Sanders proposed cannibalizing the unfinished pier to provide materials for the construction of

another according to his revised harbor plan.

Appropriations for harbor repair and construction of new ice piers at New Castle were approved almost annually from 1826 to 1838. Starting again in 1852, eleven separate appropriations provided a total of \$148,100 for the improvement of New Castle harbor. The last, in 1890, defrayed costs of dredging and repair of the piers. Dredging in the spring of 1887 had removed 30,015 cubic yards of material. By then, the wharflines had advanced to absorb two of the oldest piers and the ice harbor had reached its final pattern.

Although the oldest, New Castle was not the only ice harbor in the Delaware River. Crib piers at Port Penn, Delaware received benefits annually from 1828 to 1835 in appropriations which provided also for improvement of the harbors of Marcus Hook and Chester, Pennsylvania. A chart of Port Penn Harbor, dated 1882 shows investigation of the remains of six old ice piers of various sizes and proportions; all had been worn away as much as seven feet below low water.

Congress authorized construction of an ice harbor on the east side of Reedy Island in August, 1852 with an appropriation of \$51,090. Major John Sanders, then in his fifth year as Resident Engineer at Fort Delaware, received approval of his plan for the harbor on 9 April 1853. Dubious of the adequacy of available funds, Major Sanders produced a design which envisioned a final development through future appropriations, since in his words, "*permanent structure and small outlay are incompatible in works of such unavoidable magnitude.*" His scheme for a harbor of about 15 acres was detailed at a cost estimated to fit within the budget, accompanied

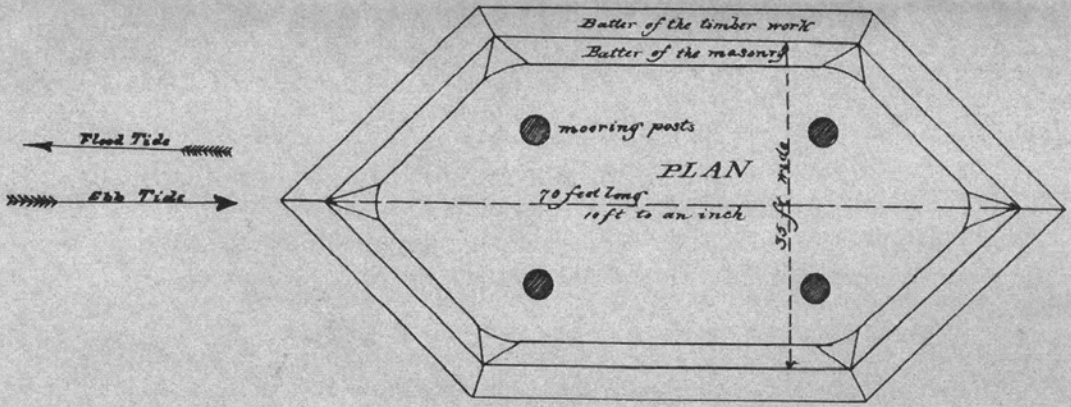
A Platform
 B Temporary
 C Stone work

Platform for working the timber work
 gullies or passages for the
 foundations for the
 masonry

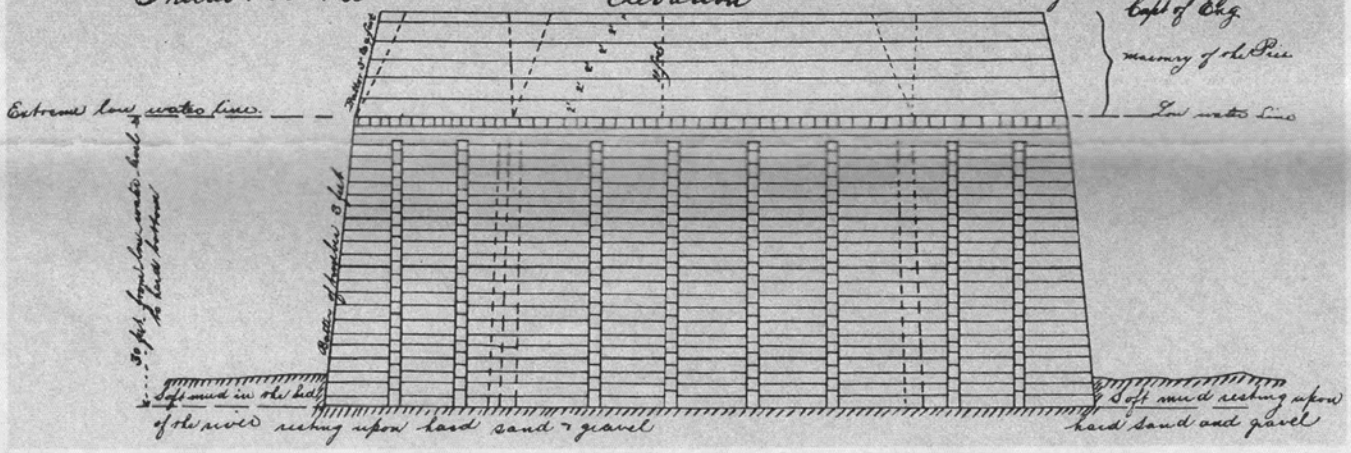
Chamotte brick
 Ornament and coping

Dimension work from
 from station low
 water level to bed
 of river

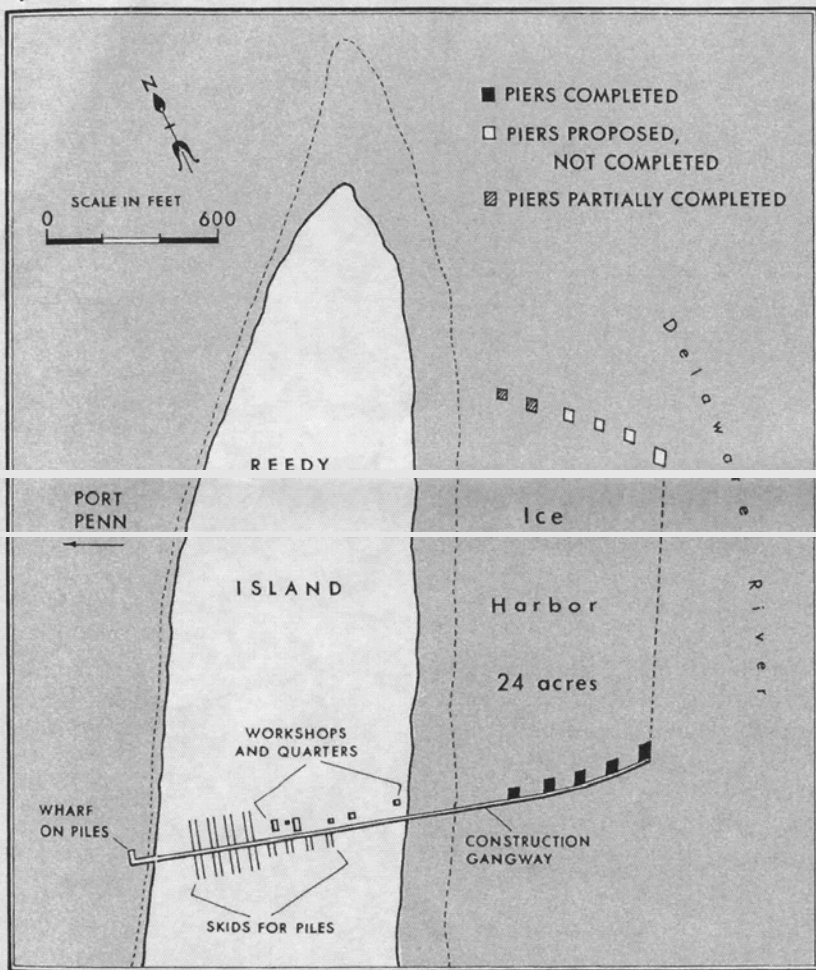
Plan of pier at
 New Castle Del
 Oct 1835
 Capt of Eng
 Date 22/10/35
 (Rev)



Plan, elevation and section of the Piers designed as Icebreakers
 for the Harbour of New Castle (Delaware)
 projected by the formation of said harbour, according to the act of the State of Delaware
 extending the harbour and piers to the U.S. and the act of Congress accepting the cession
 Philad. Oct. 1835
 Elevation
 Capt of Eng
 Richard Delafield



Plan, elevation and section of the piers designed as icebreakers for the harbor of New Castle, Delaware. Signed, Richard Delafield, Captain of Engineers, Philadelphia, October 1835.



Harbor, East Side of Reedy Island
Construction of 1853-54

“... Solely to offer and furnish ample shelter readily accessible to vessels when stopped or endangered in their passage up or down the river by fields of running ice . . .”—John Sanders, *Bvt. Maj., C. of E.* The harbor, with depths ranging from six to twenty-one feet, was considered adequate to admit the largest vessels then sailing on the Delaware River. It was intended that the piers eventually should be cut off at the low water line, capped with solid timber grillage and topped with cut stone.

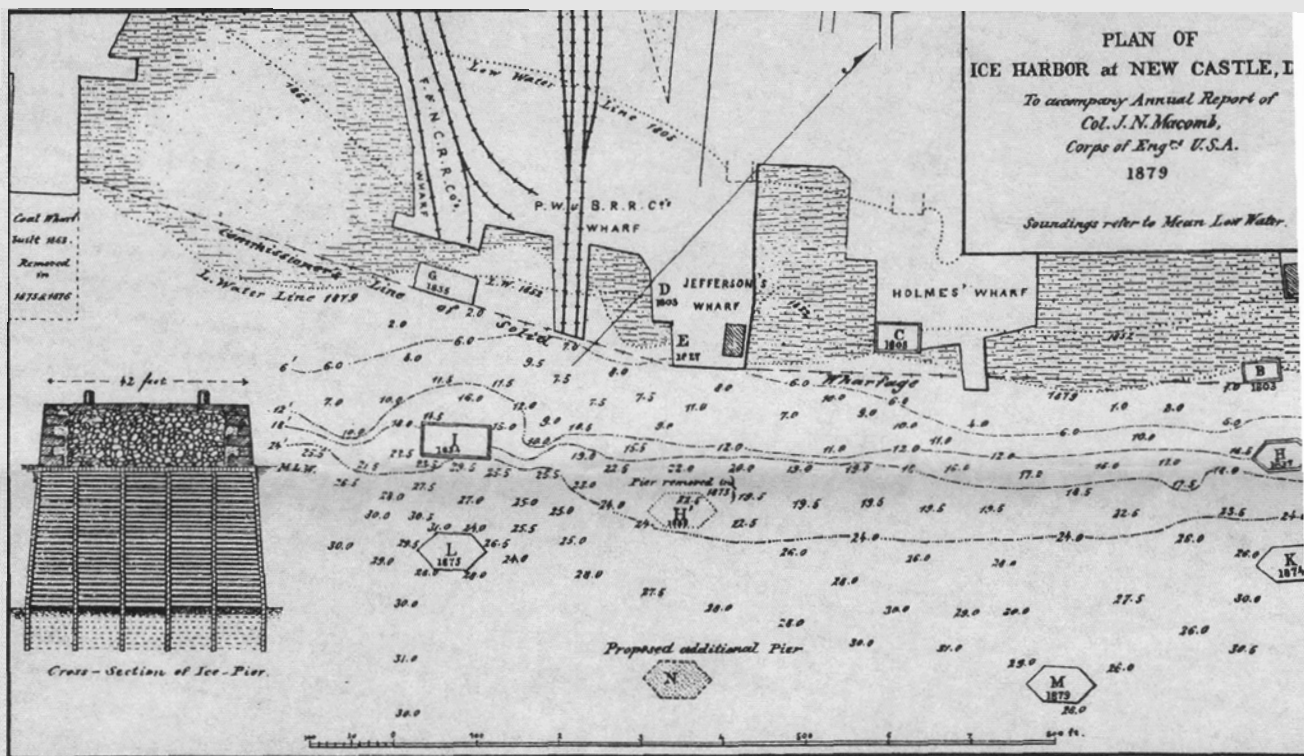
by misgivings for the “unforeseen expenses which to the disappointment and mortification of engineers so often arise in carrying out new and untried plans.”

The plan called for twelve piers arranged in two lines to extend from the island channelward at converging angles. Work was started in early May, 1853 with construction of shops, workmen’s quarters and a gangway extending across the island and over the beach and water. White oak and yellow pine logs 60 feet long were floated in rafts through the Chesapeake and Delaware Canal from Chesapeake Bay to the work site. In his report of June 30, 1853 Major Sanders wrote: “I must now candidly state it (the appropriation) will not suffice for the construction of the twelve piers I projected.”

Two steam engine pile drivers were brought from Fort Delaware and an engine platform requiring 56 piles was built out from the bluff

shore in four and one half feet of water. The first pile for ice pier No. 1 was driven the first week of July, 1853. The yellow pine and oak logs, hewn to twelve inches square at the butt end, were punched into the deep mud in eight parallel rows about three feet apart. An average of 150 piles were driven for each pier. Ice piers previously built in the Delaware were of stone and stone-filled crib construction; Major Bache had proposed using hollow cast iron screw piles for Reedy Island Harbor and, as recently as January, 1853 Major Sanders had sought information upon which to estimate the probable cost of wooden piers filled with stone. Undoubtedly, the simple arrangement employed, of wood piles clamped and braced, was never regarded as more than an initial phase of the installation.

The work season carried late into cold weather to complete driving the piles for the lower harbor line and for piers No. 1 and No.



Chief of Engineers Annual Report, 1879

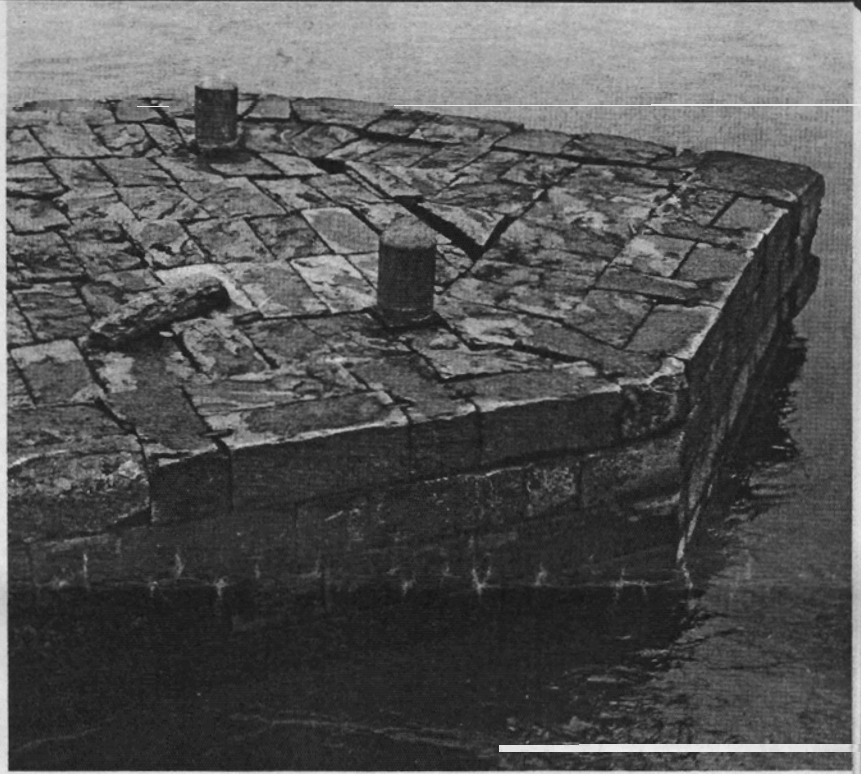
2 of the upper line. All work was suspended two days before Christmas and the crew of 70 workmen departed the island, leaving only a watchman. A balance of \$3,611 remained for for the project. In summing up the year's ^o ^p ^t ⁱ ⁿ Major Sanders wrote: "This ice harbor in its present incomplete and unfinished state will prove to be, if the present winter should turn out to be a rigid and severe one, the most useful work ever built on the Delaware."

The winter of 1853-54 was the most severe in many years. By February Reedy Island was completely submerged, the harbor works subjected to the severest battering of gales and ice; 100 vessels sought shelter below the piers. When work was resumed by a twelve man crew in April it was observed that while some valuable planking stacked on the island had floated away, the wooden piers had survived the winter with no perceptible damage. The

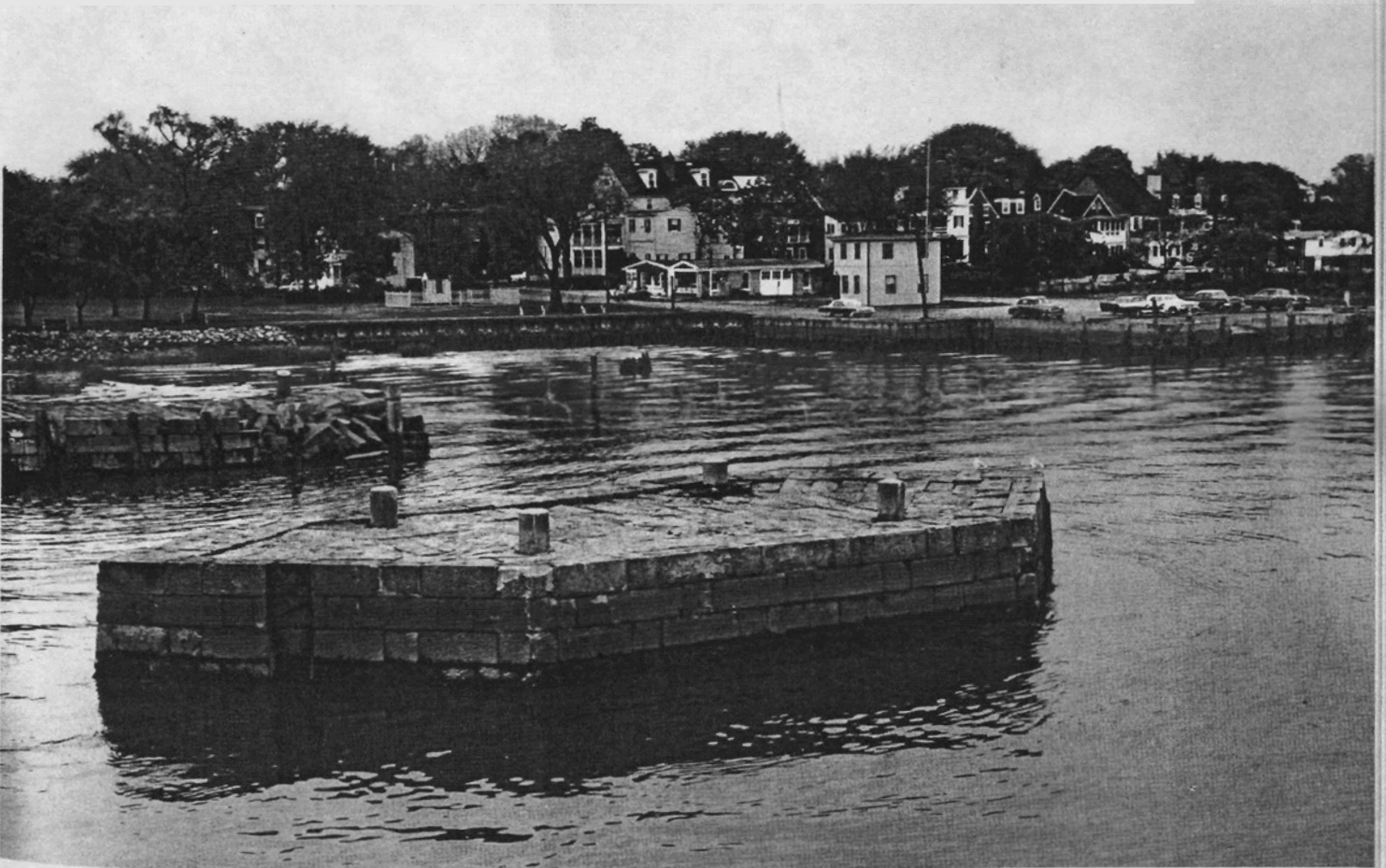
small work force continued clamping and bracing until 22 July when operations were closed, applicable funds having dwindled to a balance of \$600. The two piers of the upper line remained unfinished.

A final report headed "Condition of Piers" dated 21 Feb. 1855 lists some damage to all but three of the seven piers. No mention is made of repairs and no further appropriation was designated for the construction of Reedy Island Ice Harbor. In lieu of corroborative records one may only conjecture as to the reason for abandoning Reedy Island Harbor in a time when appropriations were being continued for New Castle, Chester and Marcus Hook. Compelling factors may have been its extreme susceptibility to shoaling and the prohibitive cost of the deep water dredging necessary to maintain its usefulness. A chart of Reedy Island dated 1872 demonstrates the harbor's obsolescence after only 18 years; seven "old piers" are located in depths which, according to the updated soundings, render the area useless as a haven for shipping.

Typical top course features are the mooring posts, butterfly key headers and wrought iron ties for the outside stones.



Twentieth century Newcastle Harbor has 1875 ice pier in the foreground, 1854 pier at left beyond.



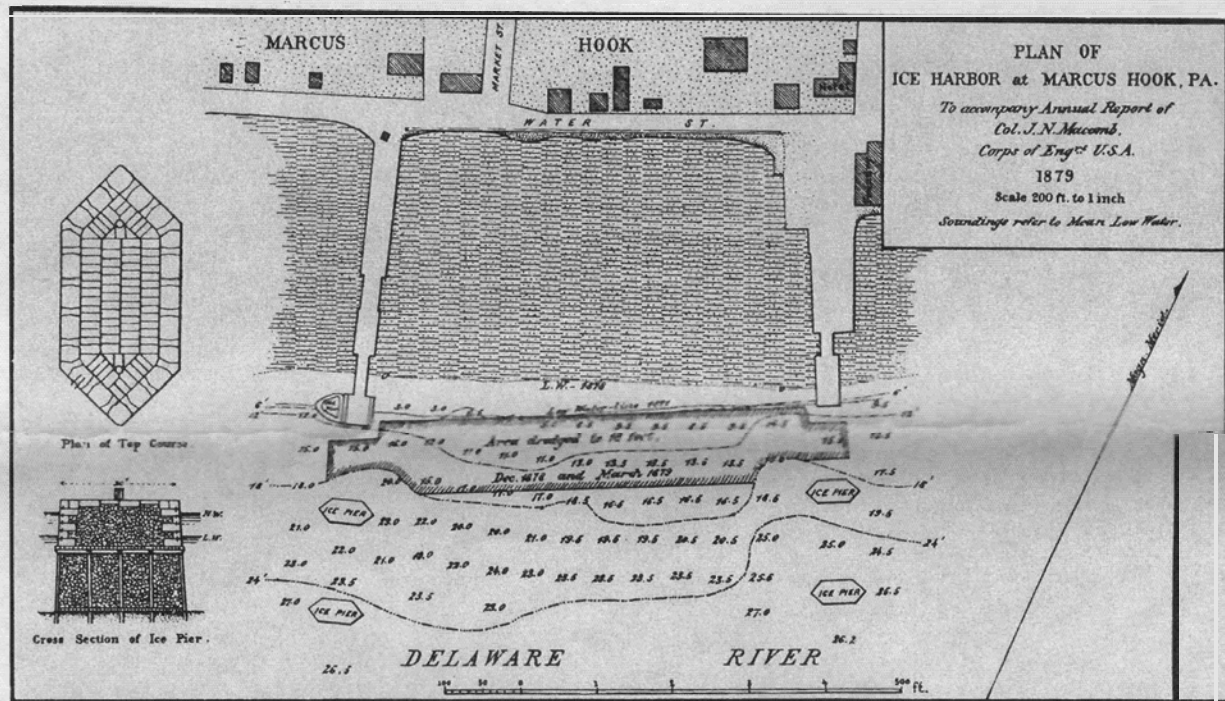
The ice harbors at New Castle and Marcus Hook appear to have been the most useful of those built on the Delaware. Construction of a final pier for New Castle Harbor was proposed in 1879; Marcus Hook Harbor was considered to be complete in 1889. The annual costs of maintaining the two were deemed trifling compared to the benefits rendered to shipping. The first harbor works at Marcus Hook were installed by the Commonwealth of Pennsylvania in 1785 in the form of continuous timber piers extending out from shore. These works were ceded to the United States prior to 1829, in which year the Engineer Department executed repairs and harbor clearance at a cost of \$5,000. Construction of detached, masonry-capped piers was begun in 1866.

As late as 1882, funds were appropriated for "commencement of work on an ice harbor at the head of Delaware Bay." Twenty five thousand dollars was expended on surveys and removal of sunken piers, remnants of John Sanders' old Reedy Island ice harbor and some ancient crib piers in the back

channel off Port Penn. Site plans shifted about and became lumped together with considerations for a proposed Reedy Island dike, a project which aroused much opposition from riparian Delawareans. By 1885 no site had been selected; the estimated \$406,000 cost loomed large and the District Engineer proposed postponement until "the Reedy Island dikes are completed and the river in their vicinity has reached its fixed regimen."

This final ice harbor did not materialize; the Delaware River navigation channel took preference in the planning of subsequent years, with highest priority for appropriations. Ice Harbors were anachronisms in the lexicon of an approaching twentieth century.

Not for many years has the Delaware River frozen over between Philadelphia and Camden. Steel-hulled vessels incur little or no risk of damage from running ice in the Delaware today. The surviving ice piers are rugged relics of another time, other values, and just occasionally with a heavy fog are a navigational nuisance.



Chief of Engineers Annual Report, 1879