THE PENNSYLVANIA NAVY
1775–1781

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THE DEFENSE OF THE DELAWARE

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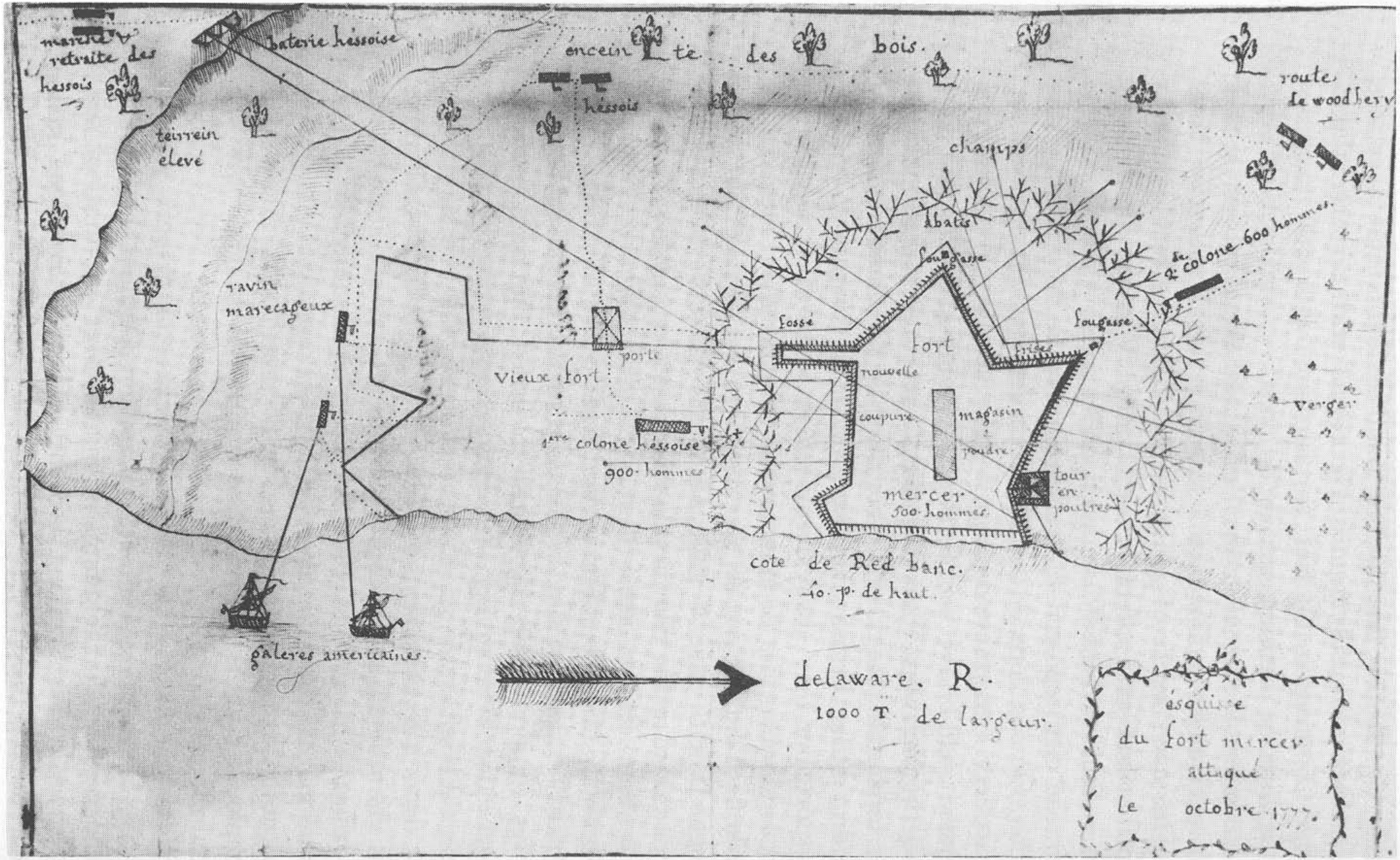
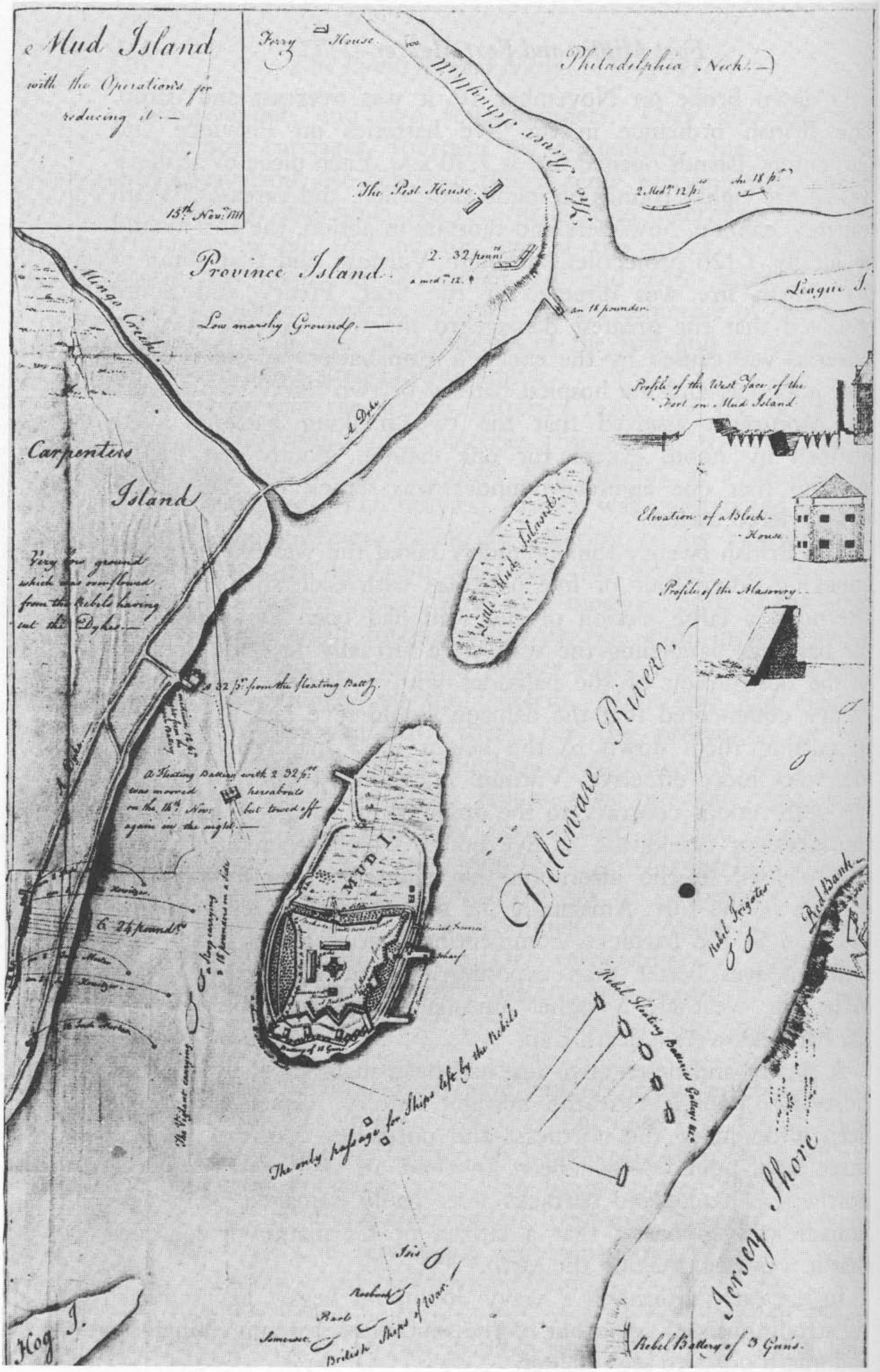


Plan of Fort Mercer by Mauduit du Plessis. Mauduit's map is the most accurate extant depiction of the fort. *Courtesy Historical Society of Pennsylvania.*


Mud Island
with the Operations for
reducing it —
15th Nov: 1777
Ferry House
Philadelphia Neck
The Post House
2. Mod. 12 pr.
18 pr.
2. 32 pounders
a mod. 12.
Province Island
Low marshy Grounds —
Mingo Creek
A Dyke
Carpenters
Island
Very low ground
which was overflowed
from the Rebels having
cut the Dykes —
a 32 pr. from the floating Battry.
A Floating Battery with 2 32 pr.
was moored
on the 15th Nov.
again on the night. —
but towed off
MUD I.
Redoubt
6 24 pounders
Magazine
Main
Store House
Hospital
Bake House
Barracks
Officers Barracks
Well
Platform
Ravelin
Ditch
Glacis
Counterscarp
Covert Way
Palisades
Parade
Gate
Bridge
Draw Bridge
Sally Port
Ramp

"A Plan of the Attacks Against Fort Mifflin on Mud Island." This map is attributed to Ensign Wheeler, although Captain John Montresor's name is stamped on the verso of the original map. Wheeler's map presents a "List of the Rebel Fleet," which incorporates many errors. Unfortunately, the use of this inaccurate inset by other contemporary British cartographers has misled many historians. A copy of this plan, with some variations, may be seen in the collections of the Historical Society of Pennsylvania. *Geography and Map Division, Library of Congress.*

Appendix B

Chevaux-de-frise

Chevaux-de-frise, translated literally, means Friseland horses. They were machines used by the people of Friseland, a section of eastern Holland and western Germany, to offset their deficiency of cavalry. Normally used as land obstructions, they were sometimes placed in shallow streams.[1]

In the American Revolution, chevaux-de-frise were sunk in the Delaware and Hudson Rivers to prevent passage of British men-of-war. The inspiration for these river "stackadoes," as the British termed them, originated in Philadelphia, and the first model was built by a Philadelphia architect, Robert Smith. Specialists in the construction and sinking of these obstructions were sent to assist the Continental and New York authorities in 1777 and 1778.

The basic construction of all chevaux-de-frise were similar, but varied in size and detail. Because of the greater depth of the Hudson River near West Point and the New York Bay between the Battery and Governor's Island, larger chevaux-de-frise were built and sunk to obstruct those water passages. This has occasionally led to a misrepresentation of the size of those constructed for the Delaware River.

Notorious for its changing channels, shoals, sand bars, and appearing and disappearing islands, the Delaware offered navigational problems not present in the Hudson. Two distinctly different situations were

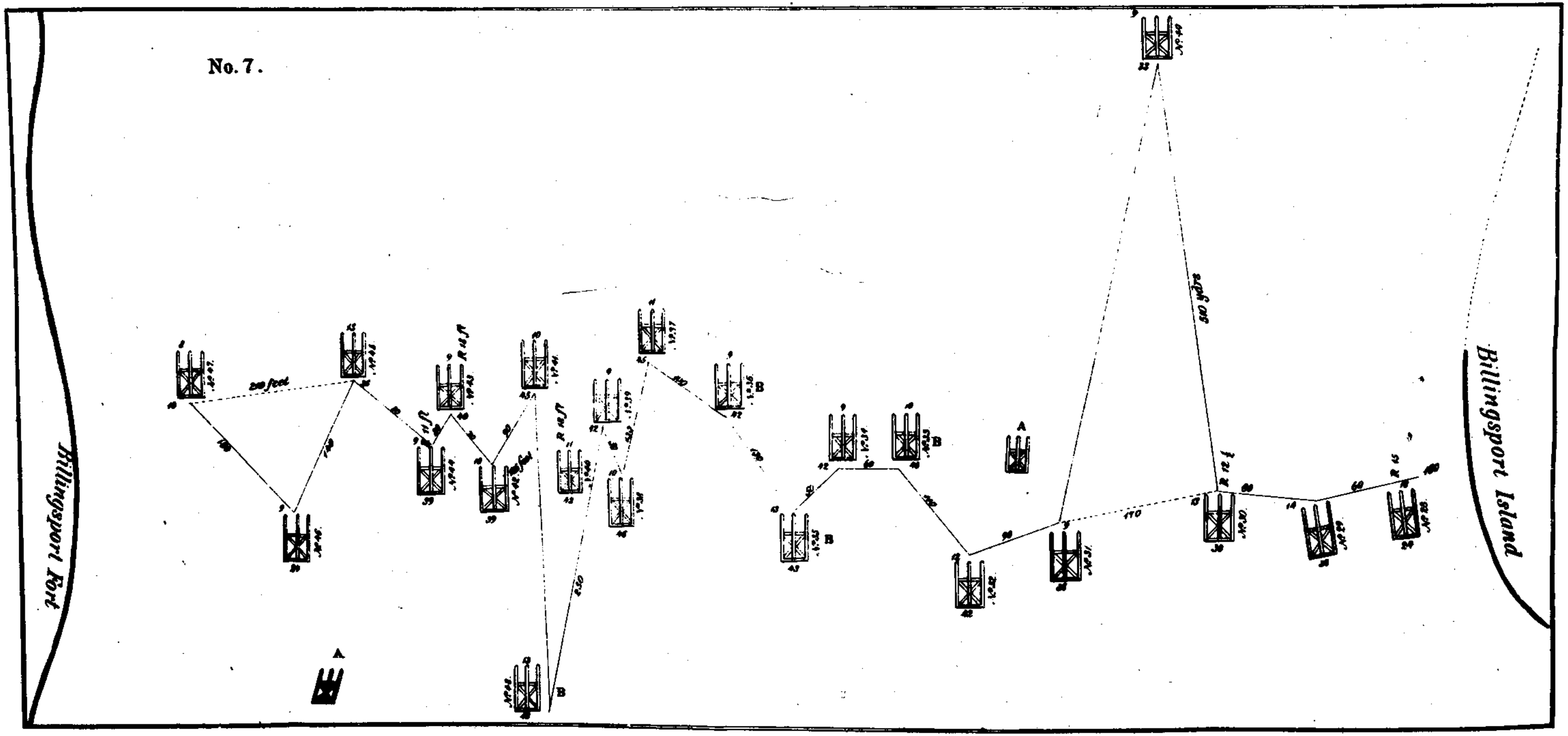
evident in the building of the chevaux-de-frise. The pass between Billingsport and Billings Island was narrow but somewhat deeper than the second line of defense between Fort Mifflin and the New Jersey shore. At the latter defense line, the river was wider but contained two prominent sand bars which created a main channel between Hog and Fort Islands on the west and the large shoal on the east. East of this shoal was a secondary channel with another sand bar near the New Jersey shore. The main channel was sufficient to permit passage of any eighteenth-century ship, but slightly shallower than the pass at Billingsport. In the beginning, it was believed that no British man-of-war could come up the east channel, a point graphically disproved by Washington and du Coudray, explaining that up to three frigates could approach close enough in this channel to enfilade the works at Fort Mifflin. On their recommendations, a belated effort was made to block the eastern channel.

No contemporary drawing of the Delaware River chevaux-de-frise has survived. However, sufficient information can be gathered from those engaged in their construction and removal in 1784 to establish reasonably accurate dimensions. Old prints of plans and profiles reproduced in early histories and a few sketches found in contemporary letters vary in some detail.[2]

The design for the chevaux-de-frise has been popularly credited to the venerable Benjamin Franklin. The search for some means of obstructing the river navigation unquestionably originated with the Committee of Safety, and, with his creative genius, Franklin may have conceived the idea of the chevaux-de-frise. Search of all published editions of Franklin's writings reveals a paucity of his papers for the period during which he served on the Committee. Only two references to his activity as a Committee member were located. On July 7, 1775, he wrote Joseph Priestly: "My time was never more fully employed. In the morning at six, I am at the Committee of Safety, appointed by the Assembly to put the province in a state of defence; which committee holds till near nine, when I am at the Congress, and that sits till after four in the afternoon. . . ." [3] There is no evidence that Franklin ever claimed credit for designing the chevaux-de-frise.

Franklin did present a model for a pike which was used on the galleys. Often accused of old-granny ideas, he suggested the use of bows and arrows to Charles Lee. The scarcity of muskets and ammunition prompted him to observe that an arrow was as accurate as a musket shot; that four arrows could be discharged in the same time as one bullet; that a flight of arrows was more terrifying and could as easily put a man *hors du combat*.[4] More likely, the idea that the river obstructions were his invention originated with his colleagues

No. 7.



Plan of the lower chevaux-de-frise between Billingsport and Billings Island, removed and destroyed by Levi Hollingsworth and Arthur Donaldson in 1784. The dotted lines represent the distance between frames. The numerals above the spears indicate their depth in feet below the surface of the river, and the figures at the base of the frames indicate the water they lay in at low tide. The frame numbers assigned by Hollingsworth and Donaldson are shown alongside the frames. Those frames marked A were unknown to the Port Wardens; those marked B were either partially removed or destroyed by the British or through natural causes. Pennsylvania Archives, *Second Series, Vol. 1.*

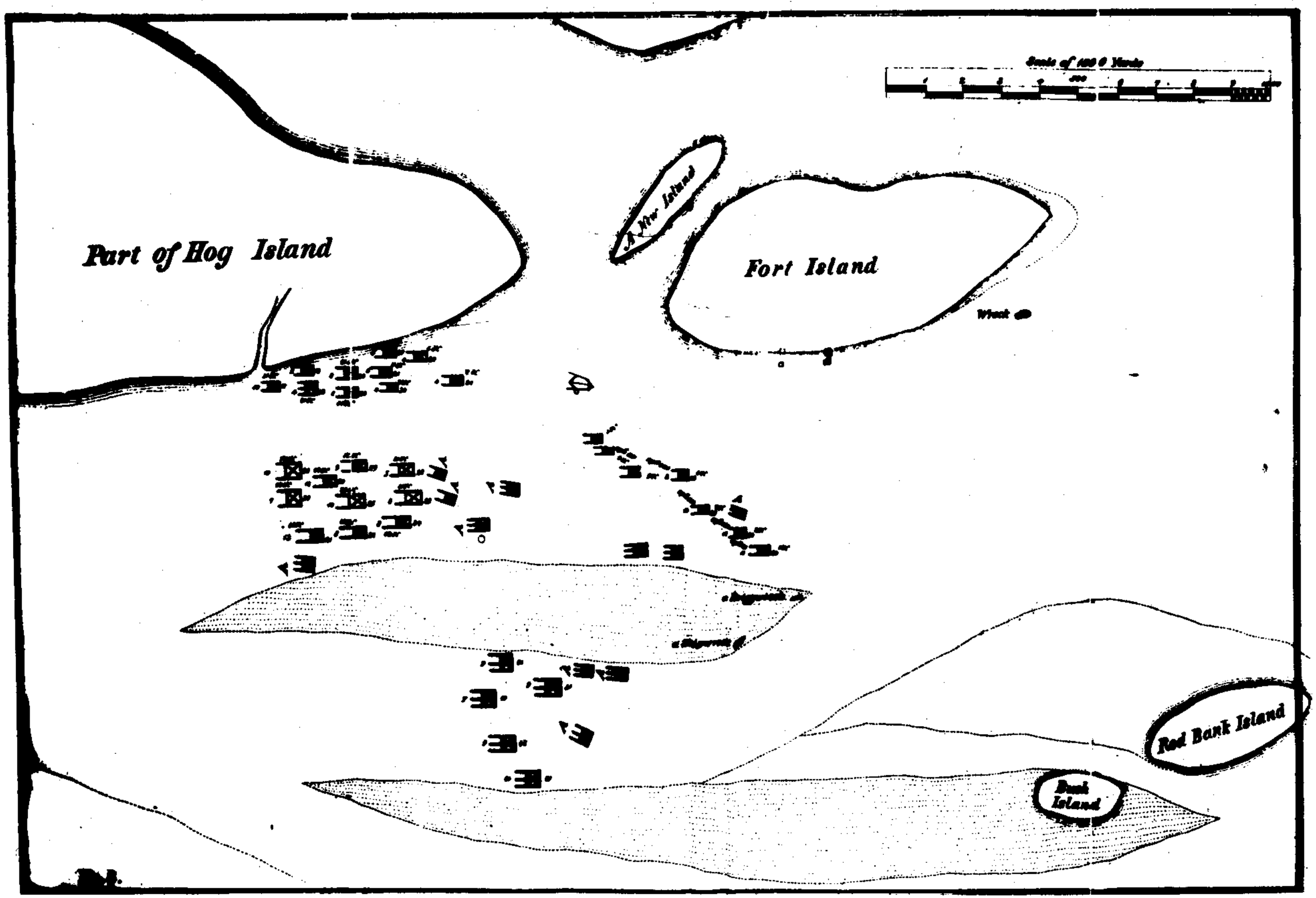
in the Continental Congress. Knowing of their effectiveness, he probably urged their consideration for the river and harbor defense of other states. Letters of various contemporaries of Franklin occasionally refer to "Dr. Franklin's boats" and "Dr. Franklin's Chevaux-de-frise." [5]

The adaptation of the European chevaux-de-frise to naval warfare was, in any case, an American idea, and it is likely that the man who built the first model, Robert Smith, was also its originator. Smith, born in Scotland about 1722 came to Philadelphia about 1750. He designed St. Peters Church and the "Old Pine Street" Presbyterian Church, in Philadelphia, and Nassau Hall at Princeton. He also designed the Zion Lutheran Church and the Old Walnut Street Prison, both since razed in the interest of progress. The original design for Carpenters' Hall was submitted by Smith, who also served on the building committee. Franklin, as President, presided over the Committee which on July 24, 1775, approved Smith's model and design for river obstructions. Smith's apparatus was the only one accepted by the Committee, while at least five others were rejected.[6]

Smith also volunteered to supervise the construction of the chevaux-de-frise. Several contractors were employed and at least seventeen frames were completed by August 24, 1775. Smith expressed concern that the completed frames were not as sturdy as had been planned. A report prepared by Captain Robert Whyte and Samuel Morris, Jr., and signed by Franklin, was submitted to the State Assembly, estimating the initial costs of building the fleet and chevaux-de-frise to September 29, 1775. These costs included an estimate of £1,700 for building seventeen chevaux-de-frise. Smith's audit of the contractor's accounts were included in this report and indicated the construction cost was approximately £700. Other costs included stones for ballast; ferrying stones and frames; sinking of frames; logs, planks, scantling, chain and iron spears.[7]

The designation of these machines of obstruction as chevaux-de-frise is first recorded in the minutes of the Committee of Safety on August 5, 1775.[8] The repeated references to chevaux-de-frise in the minutes disprove the accepted belief that this term was first used by French engineers in 1777. It is a more typical bit of Frankliniana, as the eminent Doctor Franklin was, at this time, President of the Committee of Safety. Prior to August 5, 1775, they were referred to as "Machines for defense of the River," or "Machines for Obstructing the Navigation of the River."

Robert Smith with Arthur Donaldson figured prominently in the early construction and sinking of the obstructions. Smith died on February 11, 1777, before the effectiveness of his river obstructions



Plan of the upper chevaux-de-frise between Hog Island and Fort Mifflin on the west and the sandbar and the New Jersey shore on the east. These frames were also removed by Hollingsworth and Donaldson. See plan of the lower chevaux-de-frise for details. Pennsylvania Archives, *Second Series, Vol. I.*

could be tested. Later Captain du Plessis Mauduit, the engineer who played a major role in the defense of Fort Mercer, is credited by several historians with supervising the construction of several of the chevaux-de-frise. With the death of Smith, Mauduits' assistance may have been enlisted to supervise the sinking of the last two rows of obstructions at Billingsport and Fort Miffiin. No contemporary citations can be found to support this statement, but he may have been one of the engineers assisting du Coudray in the summer of 1777.

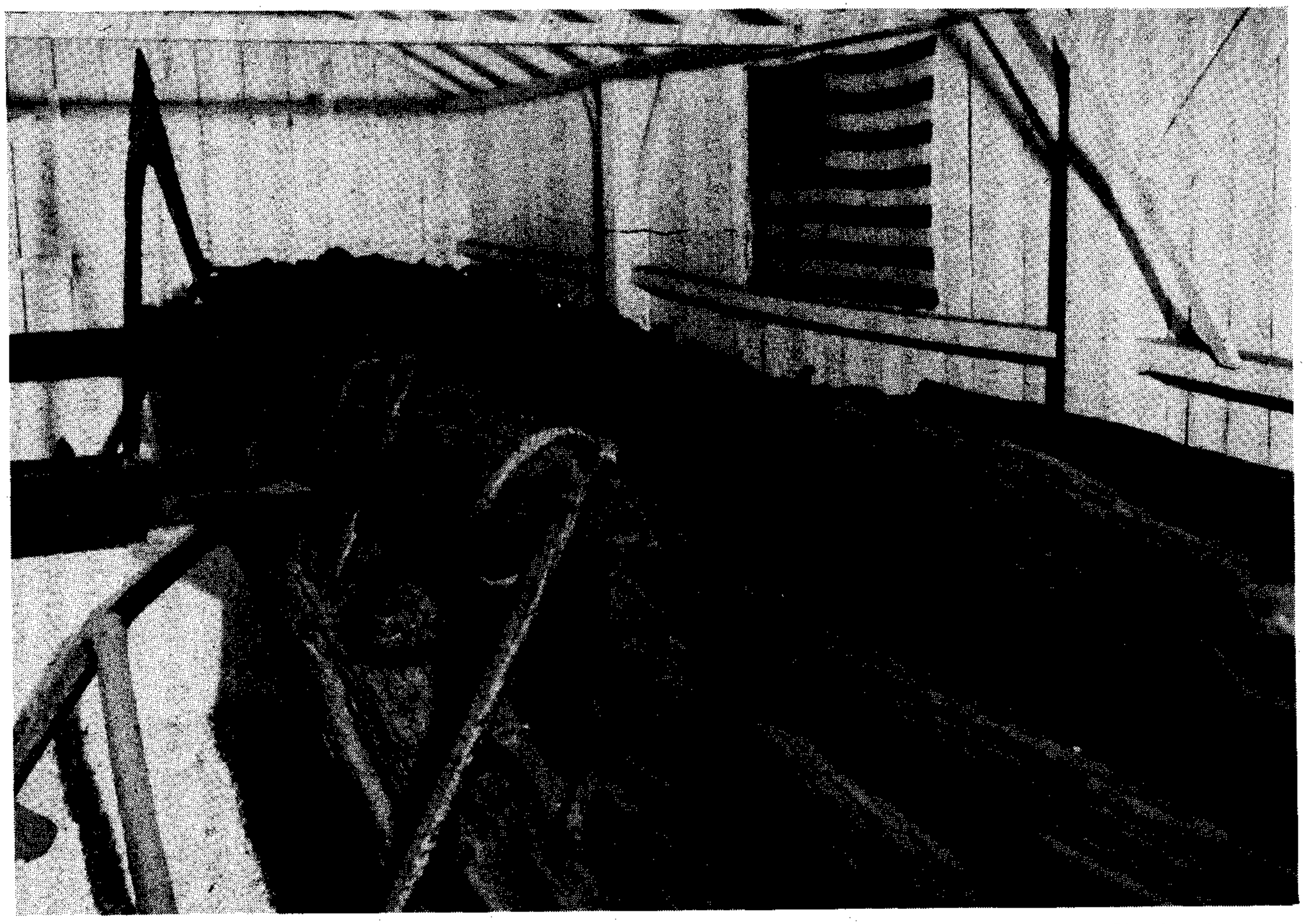
Only three records have survived which offer dimensions to indicate the size of the frames. In reporting on the removal of the chevaux-de-frise in 1784, they were found to be thirty feet wide.[9] As these obstructions were built and sunk over a twenty-seven-month period, variations may have resulted. A few frames were prepared and may have been sunk in 1779.

In June 1776, Robert Smith was ordered by the Council to see "That a Number of Chevaux-de-frise be sunk as soon as possible across the Channel of the River at Billingsport, to be placed sixty feet distance from Center to Center of each of them, and of such height that there will not be more than six feet of Water over them at low tide." [10]

Also in June 1776, the Continental and New York authorities requested assistance in the construction and sinking of chevaux-de-frise in New York Bay between the Battery and Governor's Island. A Pennsylvanian, Colonel Stephen Moylan, stationed with the Continental army in New York, was solicited for assistance. He wrote to the Committee of Safety and they immediately dispatched Arthur Donaldson with several carpenters to Manhattan. Donaldson, an authority on construction, was exceptionally well qualified in the sinking of the frames. To aid Moylan in having an adequate supply of logs and timber available when Donaldson arrived, the Committee wrote: "It takes about 25 or 30 logs from 40 to 65 feet in length, from 12 to 26 inches thick in the Butts for each of the Chevaux de Freize sunk in our River." [11]

These citations furnish some idea on the construction of the frames. Additional data is found in Robert Smith's audit of the carpenters' accounts and in two plats prepared at the time of removal in 1784.[12]

Smith, on August 24, 1775, had advised the Committee that Guion had built four frames fourteen to twenty feet high; Govett seven, thirteen to twenty-three feet nine inches; Robinson four, fourteen to nineteen feet; Tew one of twenty feet. These frames were built at Gloucester and were to be floated and sunk in the main channel near Hog Island and Fort Mifflin (at that time called Fort Island). The varying heights were to ensure the minimum exposure of the spears at low tide.



Remnants of chevaux-de-frise dredged from the Delaware River off Fort Mifflin in the 1930's by the Army Engineer Corps. Note the size of the timbers used to build the frames; the anchors employed to hold the frames in place until filled with stone; chains which were attached to adjoining frames to make canting more difficult; and the iron spike attachment which was affixed to each projecting timber. These relics are on display near the Whitall mansion on the Fort Mercer battlefield. *Courtesy Board of Chosen Freeholders, Gloucester County, New Jersey.*

The plats were prepared to assist in the removal of sixty-three chevaux-de-frise in 1784. Twenty-four frames, in two slightly irregular lines, were located between Billingsport and Billings Island. The spears are shown to be from eight to fifteen feet below water. The frame bottoms are depicted as resting on the bottom in mid-channel from thirty to forty-six feet, at low tide. Those near the shore were at a depth of ten to twenty-four feet.

This plat supports the two lines of chevaux-de-frise, although some were canted and moved aside or destroyed by the British to provide passage for their ships. Others were moved out of position by the action of the water. One frame was 510 yards downstream in 1784 and would have opened a passage of about 140 feet. It was either towed downstream or forced there by the action of ice and tides.

Further upriver, ten chevaux-de-frise were found off Hog Island, fifteen directly opposite near the sand bar, and ten more were located at the upper end of the sand bar and opposite Fort Mifflin. These latter frames served as the river anchor for the piers which were sunk to permit a chain to be stretched across the channel near Fort Mifflin.[13] Between the two sand bars, eight additional frames were found, making a total of forty-three. The frames found in the upper defenses were seated on the river bed at depths varying from thirteen to thirty feet. Those in the channel were mostly in the range of twenty-two to thirty feet with one at thirty-three feet. Near the shoal and Hog Island they averaged thirteen to twenty feet. With one exception, the spears were all four to ten feet below water.

Accounting for sixty-seven frames, all but four were removed by Hollingsworth and Donaldson. The British or the river probably destroyed the other four and possibly a few more. In the 1930's, the Army Engineers removed parts of two or three frames from the river off Fort Mifflin. These may be seen today at Fort Mercer.

In removing them, many were found to have disintegrated in the water with only the bottoms and the spear posts remaining. The upper chevaux-de-frise have been described as being sunk in four rows and are so placed on the map prepared by Commodore Hazelwood in 1779.[14] In surveying the river preparatory to their removal, the frames were found grouped in four areas, not in rows. Staggered and sunk so as to effectively obstruct the river, they gave no evidence of having been placed in four regular rows across the channel.

What did these large frames of destruction look like? Although no contemporary plans have been found, it is possible to offer a reasonable description of a chevaux-de-frise. Large hoppers, boxes, frames or bin-like containers were built approximately thirty feet square. The bottoms of the frames were constructed of huge timbers and floored

with two-inch pine plank. On the side, logs were used to build a sturdy frame and lined with pine plank to provide a perfect box for the stone ballast. Stone was ferried in flat boats from quarries on the upper Schuylkill River. Long posts were placed obliquely, mounted with large iron spears facing downstream to rip out the bottom of an enemy ship unwary enough to run upon them. The hypotenuse of these spear posts varied with the depth of the river. Some chevaux-de-frise were known to possess four spear posts. However, the Delaware River frames had only two or three posts; no four-post frames were found. Placed sixty feet center to center, they were chained together to prevent their being easily canted to discharge their ballast or towed away by the British.

The frames were floated to the spot where they were to be sunk, with the use of heavy anchors. Anchors were used to lower the empty frames to the river bed and secure them in place while the stone ballast was lowered into the hopper of the frame. Anchors were not used to permanently moor the chevaux-de-frise to the river bottom. It was reported that fifteen to twenty tons of stone were used to ballast the smaller frames, with greater quantities in the larger frames. Captain Hamond of the British frigate *Roebuck* wrote that forty to fifty tons were placed in the frames. The exact quantity required to safely anchor the chevaux-de-frise was probably determined by trial and error. In January 1776 it was reported that twenty-two chevaux-de-frise were moved from their moorings by the action of the ice.[15]

In November 1776, two crews of workmen—the majority were sailors from the galleys—were engaged in sinking the chevaux-de-frise. A record of the equipment used in this endeavor shows each crew was furnished:

> 2 Anchors from 11 to 13 or 1400 weight each; 2 cables about 11 inches each; 4 Buoy Ropes about 6 inches & 20 fathoms long; 2 Hedges Anchors 150 to 300 wt. & 2 Towlines of 6 Inches, & 1 towline of 7½ Inches to Heave off by, each 100 to 120 fathoms long; 2 large long Boats with Windlass's & David's [davits], & a Sheave forward in each; 1 Six or Eight Oar'd Barge; Sundry Coils of Rigging 2½ to 3 Inches & 30 or 40 Good Water Cask & Two Shallop.

Anchors weighing 1700 pounds were used in the sinking of the piers at Fort Mifflin.[16]

Other theories as to the size and design of the chevaux-de-frise have been advanced. However, no citations have been offered, nor does search of the Pennsylvania archives support these claims. They are usually based on those built for the Hudson River, and conform to

their general design, but are much larger than those sunk in the Delaware River.

Correspondence of Continental statesmen, city residents, and British intelligence officers, emanating from Philadelphia, refer to the sinking of the chevaux-de-frise and their destructive capabilities. With one or two exceptions, they offer little to increase our knowledge of the machines.[17] It is possible that these vague reports, coupled with Captain Hamond's healthy respect for the obstructions, influenced Sir William Howe's decision to land at the head of Chesapeake Bay rather than in the Delaware River.

One British officer has left an interesting and reasonably accurate description of the chevaux-de-frise. Although there are some mistakes in detail, it is the best British version. Roger Lamb recorded in his journal:

> Two ranges of Chevaux de frise were also sunk into the channel; these consisted of large pieces of timber, strongly framed together in the manner usual for making the foundation of wharfs, in deep water. Several large points of bearded iron, projecting down the river, were annexed to the upper parts of these chevaux de frise, and the whole sunk with stones, so as to be about four feet under the water at low tide. Their prodigious weight and strength, could not fail to effect the destruction of any vessel which came upon them. Thirty of these machines were sunk about three hundred yards below Mud Island, so as to stretch in a diagonal line across the channel. The only open passage left was between two piers lying close to the fort, and that was secured by a strong boom [chain], and could not be approached but in a direct line to the battery [Fort Mifflin].[18]

To provide a sketch of the activities surrounding the building of chevaux-de-frise, a series of selected passages from the Archives may be of interest: [19]

July 4, 1775:
The Committee of Safety resolved to "go to Red Bank tomorrow to take a view of the River and Islands."

July 6:
Committee "went to Red Bank, Mud or Fort Island, & viewed them and several parts of the River, and find the Channel from the Fort to the Barr to be 150 fathom or there about. . . . [A]t present impracticable to lay a Boom across that part of the River."
Resolved "that Robert White [Whyte] & Owen Biddle be a Committee for the Construction of Boats and Machines."

July 11:
Committee for Construction of Boats and Machines "have been viewing a number of Pine Loggs."

July 13:
Ebenezar Robinson thanked for his plan to stop the river channel.

July 15:
Committee to immediately employ all necessary carpenters and workmen to construct as many machines as necessary to interrupt navigation.

July 19:
Fourteen prominent Gloucester County, New Jersey, citizens contributed 296 logs toward the building of the machines.

July 24:
Robert Smith, architect, appeared before Committee of Safety "with a model of a machine for observing the Navigation of the River Delaware and explained the Construction of it, which was approved of. . . ."

August 5:
Model of machine for lowering and raising ballast into and out of chevaux-de-frise submitted by Robert Smith.

August 24:
Robert Smith reported on condition of seventeen chevaux-de-frise finished and ready for sinking.

September 14:
Chevaux-de-frise [17] to be sunk in river opposite the Fort [Mifflin]; Robert Whyte and Samuel Morris, Jr. appointed Committee to supervise this work.

September 29:
Whyte and Morris ordered to estimate cost of frames sunk; estimate of £1700 for 17 chevaux-de-frise.

October 11:
Ten chevaux-de-frise pilots appointed, all others dismissed.

November 3:
Whyte and Morris ordered to provide logs and plank to build a third tier of chevaux-de-frise.

November 8:
Whyte, Owen Biddle and George Clymer to consider the most effective method of connecting the chevaux-de-frise with chains.

November 16:
Whyte and Morris to purchase logs to build three tiers of chevaux-de-frise, one additional line at Fort Island, two at Marcus Hook.

March 13, 1776:
Arthur Donaldson to launch the frames built at Gloucester, John Cobourn employed to sink them when launched. Captain Rice of the State navy instructed to assist in the sinking of the frames.

March 26:
Donaldson to build two piers to sink in the passage at Fort Island. It was planned to attach a boom to the piers; later this was deemed inadvisable and a chain was stretched between the piers.

March 30:
Whyte, Howell and Nixon to procure two vessels to sink in the passage between the chevaux-de-frise.

June 15:
A number of frames are to be sunk across channel at Billingsport, to be placed sixty feet distance center to center and with not more than six feet of water over the spear points at low tide.

July 16:
Captain Whyte given £150 for outstanding services in connection with building and sinking the chevaux-de-frise. On July 19, Morris was awarded a similar amount. (Whyte attended his last meeting of the Council of Safety on July 1, 1776.)

October 15:
Major Proctor reporting from Fort Island said, ". . . floating Chevaux-de-frise were moored at proper place ready for sinking. Further the boom is worthless, large ships can pass between east pier and observations with ease. East Channel should be blocked with additional Chevaux-de-frise building at Gloucester as enemy ships can go through unchallenged."

December 31:
Some examples of construction costs of the chevaux-de-frise are: for iron work and construction at Billingsport from June to December, 1776, to Robert Smith £2558 15s 2d; to Samuel Morris, Jr., for miscellaneous services and disbursements at same location from April,

1776, to July, 1777, £3,465 8s 11½d. These are relatively minor when compared with the numerous expenditures represented in the next entry.

January 1777; to September 1, 1777:
Many entries during this period reflect the feverish activtiy of ensuring that the channels were effectively closed to shipping. Numerous entries show the purchase of several hundred logs; thousands of feet of two-inch pine plank (two entries for 30,000 and 23,702 feet with several others for 2,000 and 3,000 feet were noted); many receipts for stone, such as nine and six flat loads another for 180 perch of stone; several miscellaneous payments for cables, six-inch spikes, bolts, spears and iron work were recorded. Also, several surveys of the river were conducted during this period.

February 24, 1777:
James Rhoads was requested to report the current status of planned and finished chevaux-de-frise at Billingsport. One additional tier of frames would be sunk at Billingsport and the same at the Fort Mifflin line of defense. It was recognized that any delay gained at the former location would facilitate the strengthening of the Forts Mifflin and Mercer line. His report stated:

That there are Eight Frames finish'd & plank'd; Eight more to finish, part not rais'd.
He thinks there is as much Plank as will finish two of the Latter, & consequently Plank for 6 Wanted.
There are 42 Loggs at the Water side; and a Certain Woulfe who lives at the place, informs that there are several Loggs along shore.
There are 36 Small Loggs on the ground, which will make floor Timbers, as also Some Scantlings and Boards.
He thinks there are Bolts, Straps, & pins Enough to finish the above frames.
There is One Barrel of Spikes; not sufficient to finish the Frames begun
The Spear Irons are all on.

April 21:
A Committee to repair to Billingsport to decide on width of passage through chevaux-de-frise.

June 6:
Captain Blewer and Joseph Marsh of Navy Board were instructed to survey the obstructions and sound the middle channel. They reported that there was sufficient water for a ship drawing twelve to eighteen feet.

August 29:
Chevaux-de-frise pilots discharged as of this date. Channels closed to all shipping.

October 1:
Fall of Billingsport.

October 4:
Captain Hamond of the British frigate *Roebuck*, with several other men-of-war, began work on the removal of the chevaux-de-frise. For fifteen days they labored at this task and finally effected a passage on October 21.

October 21:
First British ships warped through the chevaux-de-frise. Disagreement as to the size of the opening has persisted for nearly two hundred years, some authorities estimate seven feet, others seventeen. Both measurements of the opening seem too small for a ship like the *Roebuck*. If one frame was removed, and it is known that the Billingsport chevaux-de-frise were thirty feet wide and placed sixty feet center to center, a space of approximately ninety feet would have been made. The plat of the chevaux-de-frise shows three frames from the main channel destroyed or removed, although not necessarily this early in the campaign. On October 13, William Bradford reported that one frame had been removed and another "rumored" removed, but he doubted that the latter was true.

October 22-November 21:
This period saw the assault on Fort Mercer, the burning of the *Augusta* and the *Merlin* and the final glorious six-day defense of Fort Mifflin, events in which the State navy and the chevaux-de-frise played prominent roles.

November 28:
Two channels were discovered near Fort Mifflin permitting passage of small transports carrying provisions, stores, and other supplies up to Philadelphia. Later, with the removal of some chevaux-de-frise frames, the larger ships-of-war reached the city.

August 18, 1778:
John Dickinson, President of the Supreme Executive Council, advised the Assembly that they had requested proposals for removing the chevaux-de-frise, but would not proceed further without Assembly approbation. This resolution was never acted upon.

March 23, 1779:
Colonel John Bull was ordered to have six chevaux-de-frise built for sinking at different depths near Mūd Island.

April 19:
A master workman named Francis McClester was authorized to build one frame.

July 9:
Colonel Bull was employed to raise fortifications and prepare chevaux-de-frise for sinking at Billingsport.

July 20:
Bull advises frames are ready and requests advice and assistance; Captain Boys of the State Navy ordered to assist Bull. Little is known of the numbers, or if these frames were eventually sunk in the river.

These are the last recorded chevaux-de-frise authorized to be built or sunk in the river. The great majority of them would be removed or destroyed in 1784.

June 3, 1783:
Thirteen chevaux-de-frise, lying on the New Jersey shore, were ordered removed. Could these have been those Colonel Bull was ordered to build in 1779, but possibly never sunk?

June 10:
Council ordered the Wardens of the Port to adopt some plan for the removal of the obstructions in the river.

August 5:
Wardens were ordered to make exact survey of the river bed to determine the number of chevaux-de-frise to be removed so that a channel could be opened for commerce to the city.

August 10:
Council advertised for proposals to remove the chevaux-de-frise. By the 26th only one man had submitted a plan and that as superintendent at a per diem rate of one guinea.

August 22:
Assembly appointed members to form a joint committee with Council for reviewing subject of removing river obstructions.

November 4 and 11:
de Brussine [sic] and N. Garrison proposed two plans for removing all chevaux-de-frise. One plan was to cut each obstruction down to

the ballast, without removing the stones. Under this plan they would pay all expenses, assume all risks for a consideration of £4,000. The second proposal called for an experiment to completely remove one frame. They were to be advanced £1,200 and if successful £2,000 for the entire removal. While Council approved the first plan, no work was ever done.

November 7:
Francis Gurney claimed £400 was due him for the purchase of a vessel to remove the chevaux-de-frise. He also claimed amounts for buoys, anchors, and chains, and for making a survey of the river near Fort Mifflin.

November 14:
Council instructed de Brussine and Garrison to proceed with the first plan. Payment to be made when Council was satisfied that all frames had been removed. This proposal seems to have ended on this note. Possibly the contractors were dissatisfied with the method of payment.

February 21, 1784:
Merchants exert pressure on Council to have chevaux-de-frise removed. A memorial was presented outlining effect of the obstructions on the economy of the city.

February 24:
Dickinson advised Merchant Committee that plans were going forward to open river.

March 6:
Merchants expressed gratitude and offered assistance.

March 13:
Merchants' advice solicited.

March 19:
Recommended that Wardens of the Port be assigned responsibility for removal.

April 16:
Wardens of the Port again instructed to obtain proposals for removal of the obstructions.

April 20:
Proposals were received from Arthur Donaldson and Levi Hollingsworth and read to Council. Donaldson, having been engaged during the war in placing the chevaux-de-frise in the river, was eminently qualified to be engaged in their removal.

May 1:
Formal agreement was made with Hollingsworth and Donaldson. The Supreme Executive Council agreed to provide the contractors with the vessel purchased by the Wardens (see entry of November 7, 1783) and with any spare timber on Mud Island to a value of twenty pounds, and also the frames of chevaux-de-frise lying on the Billingsport shore. They were to receive £6,000 for removing and destroying forty-nine chevaux-de-frise. Advance of £1,500 was to be made to enable them to purchase needed materials (£400 advanced on April 30 and £1,100 on May 3), £1,500 when the Wardens were satisfied that ample progress had been made (paid June 30);—£1,500 when thirty-six frames had been removed and destroyed (paid September 30); and a final £1,500 when the forty-nine frames were removed and destroyed (authorized payment October 26).

July 23:
Wardens advised that fifteen frames have been removed and are located at: Billingsport, 3; Fort Island, 1; Red Bank, 1; Eagle Point, 2; Gloucester, 3; below Thompson's Wharf, 1; Windmill Island, 1; League Island, 1; buoyed off Timber Creek, 1; 1 cut up by Mr. Conarroe.

September 4:
Wardens advised Dickinson that nearly all chevaux-de-frise were removed; however, they ordered the State sloop, with a skillful pilot and diver, to sweep and carefully examine the river to determine if some frames remained undetected. They added that five previously undiscovered frames remained in the eastern channel preventing navigation.

September 23:
Fourteen chevaux-de-frise not previously discovered were found. Hollingsworth and Donaldson apparently removed most of them before agreeing upon compensation. Those in shallow east channel could not be canted to discharge ballast; they had to be floated into the main channel where the ballast could be removed by canting the frames.

Thomas Conarroe and several associates criticized the efforts of Hollingsworth and Donaldson. They described the ease with which the frames could be removed, saving a considerable sum of money for the State. Donaldson and his partner asked these "Pretenders" to demonstrate but only Conarroe agreed. He spent a considerable amount of money and after several weeks had not raised one chevaux-de-frise. After this failure, criticism stopped and the partners agreed to remove the last fourteen for £1,400.

October 12:
The last of the sixty-three frames was removed on this date.

October 26:
From early September through October 14, pilots and divers had been busy sweeping the river and were satisfied that all obstructions had been removed. The Wardens advised the Council that both channels were now open to navigation and that the contract with Hollingsworth and Donaldson had been fulfilled.

The contractors had removed and destroyed sixty-three chevaux-de-frise; others were destroyed on the shore—apparently never sunk in the river. A few fragments were removed by the Army Engineers in the 1930's. The exact number built and sunk cannot be determined but those removed by Hollingsworth and Donaldson were the major obstacles to commerce.

To retrace our steps, on October 11, 1775, the Committee of Safety appointed ten chevaux-de-frise pilots to conduct ships through the serpentine channel created by the obstructions. All other pilots were forbidden to attempt to bring vessels above Chester. Appointed were Michael Dawson, Joseph Gamble, Daniel Gordon, William Marshall, Nehemiah Maul, William Molletson, James Roberts, William Ross, John Schneider, and Matthew Strong.

The pilots made a proposal to the Committee to work for a monthly wage of £10. They apparently were advised that this amount was excessive, as their demands were lowered to £7 6s, and then a day later to £6. On October 12, they took an oath of office pledging not to reveal any information concerning the chevaux-de-frise, and to avoid any indiscretion which might place them in a position to be taken prisoner. They also agreed to serve until discharged by the Committee.

Rules governing their conduct were released on November 3 and read into the Committee minutes on the 7th.

One incident where an unauthorized pilot successfully brought a ship through the chevaux-de-frise is recorded on November 11, 1775. A John Saunders was ordered taken into custody and confined in the city gaol; after being incarcerated for seventeen days, he was released. He took a solemn oath before a justice of the peace not to reveal how he discovered the passage through the obstructions.

By mid-December 1775, the pilots petitioned the Committee for a salary increase, as they were unable to meet expenses. On December 18 their rate was raised to £7 a month, and on March 19, 1776, to £10. On May 20, 1777, their wages were again increased to £18 a month with three rations a day.

On September 19, 1776, James Maul was appointed a pilot to replace Daniel Gordon, deceased. Matthew Strong's name appears on the early oath but is subsequently omitted from the roster of chevaux-

de-frise pilots in the printed archives. These same archives list a Nathan Storey appointed February 20, 1776—possibly a replacement for Strong.

The Supreme Executive Council declared the chevaux-de-frise pilots supernumerary on August 29, 1777, and they were called before the Council the next day and officially discharged.

The rules governing the conduct of the chevaux-de-frise pilots released by the Committee of Safety on November 3, 1775 were:

The Committee of Safety having order'd & directed that ten Pilots only be employed in Conducting all Vessels between Philadelphia & Chester whether Inward or Outward bound, The following are the Rules & Regulations concerning them viz

1st That five of the said Number of Pilots be in readiness at Philadelphia to carry Vessels down to Chester & having performed that Service are immediately to return by land or in their Skiffs to Philadelphia.

2nd That the other five be at Chester to bring Vessels up from thence to Philadelphia & are to return in like manner to Chester.

3rd That no Pilot be allow'd to return to his Station otherwise than as above, unless where it happens that any Vessel shall be in want of a Pilot and there is none other on the Spot, in which case he may take charge of her—

4th That each set of Pilots change their Stations, every ten days unless it be otherwise agreed among themselves—

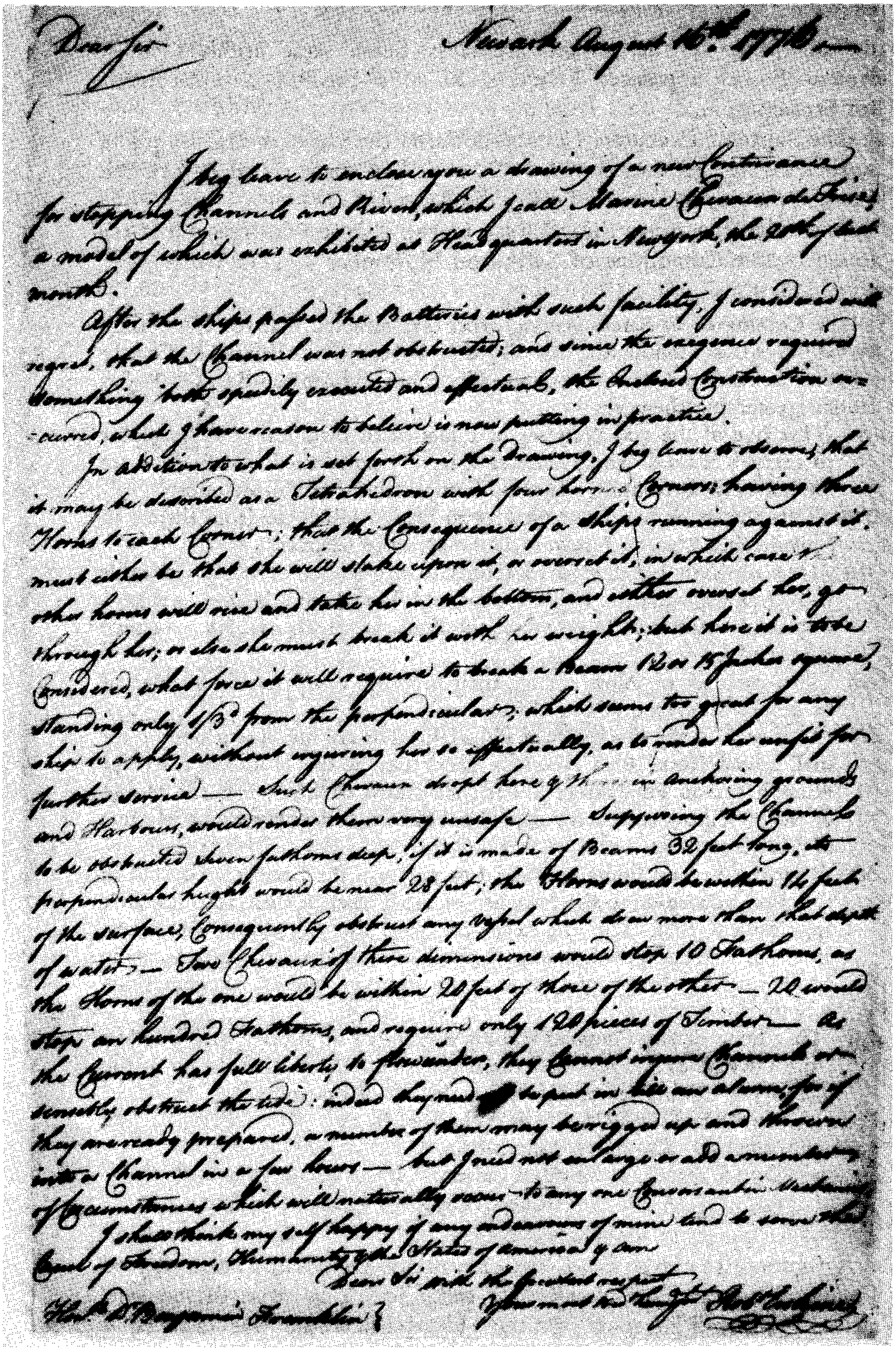
5th That such of the five pilots at Philadelphia as are not absent upon duty shall attend from 10 to 1 o'clock every day at the House of Clement Humphreys on Pine Street Wharf, and those at Chester at the House of Mrs. Whitby, to receive their Applications from Owners or Masters of Vessels—

6th That the Several Pilots be oblig'd to perform the Services required in Rotation, according to the Number of the Ticket or Certificate of their appointment that each one received from the Committee of Safety unless otherwise agreed among themselves—and that applications made by Owners or Masters of Vessels at the aforesaid houses, be deem'd due & Sufficient Notice—

7th That none of the Pilots so employ'd demand or receive any Pilotage from Owners or Masters of Vessels for such Service, they being in the pay of the Committee of Safety for this Special purpose.[20]

Philad: November 2nd 1775 Thos. Wharton, Jr.
John Nixon
Geo. Clymer
Robert Whyte

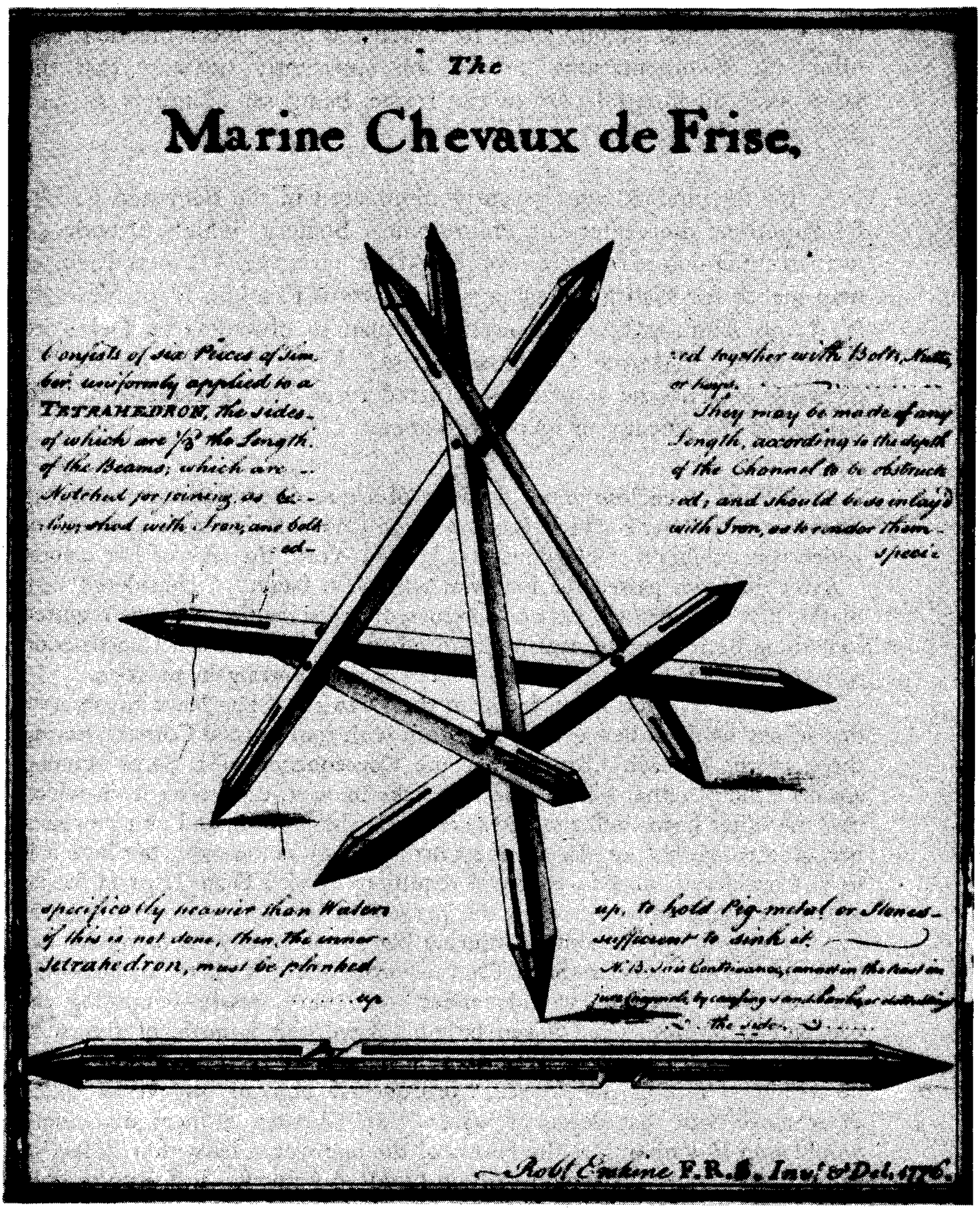
A footnote to the story of the chevaux-de-frise is the statement of Francis B. Lee that poles thirty to forty feet long were driven into the mud near Billingsport. At the top of each pole was fastened a long sharp piece of iron. Because these poles would have been easily



Courtesy American Philosophical Society.

The

Marine Chevaux de Frise,



Courtesy American Philosophical Society.

removed, he claimed that they were strengthened by sinking frames with stone ballast behind them to which the poles were chained. Lee offers no documentations and he was apparently unaware that the poles were an integral part of the frame, being set obliquely to face downriver.[21]

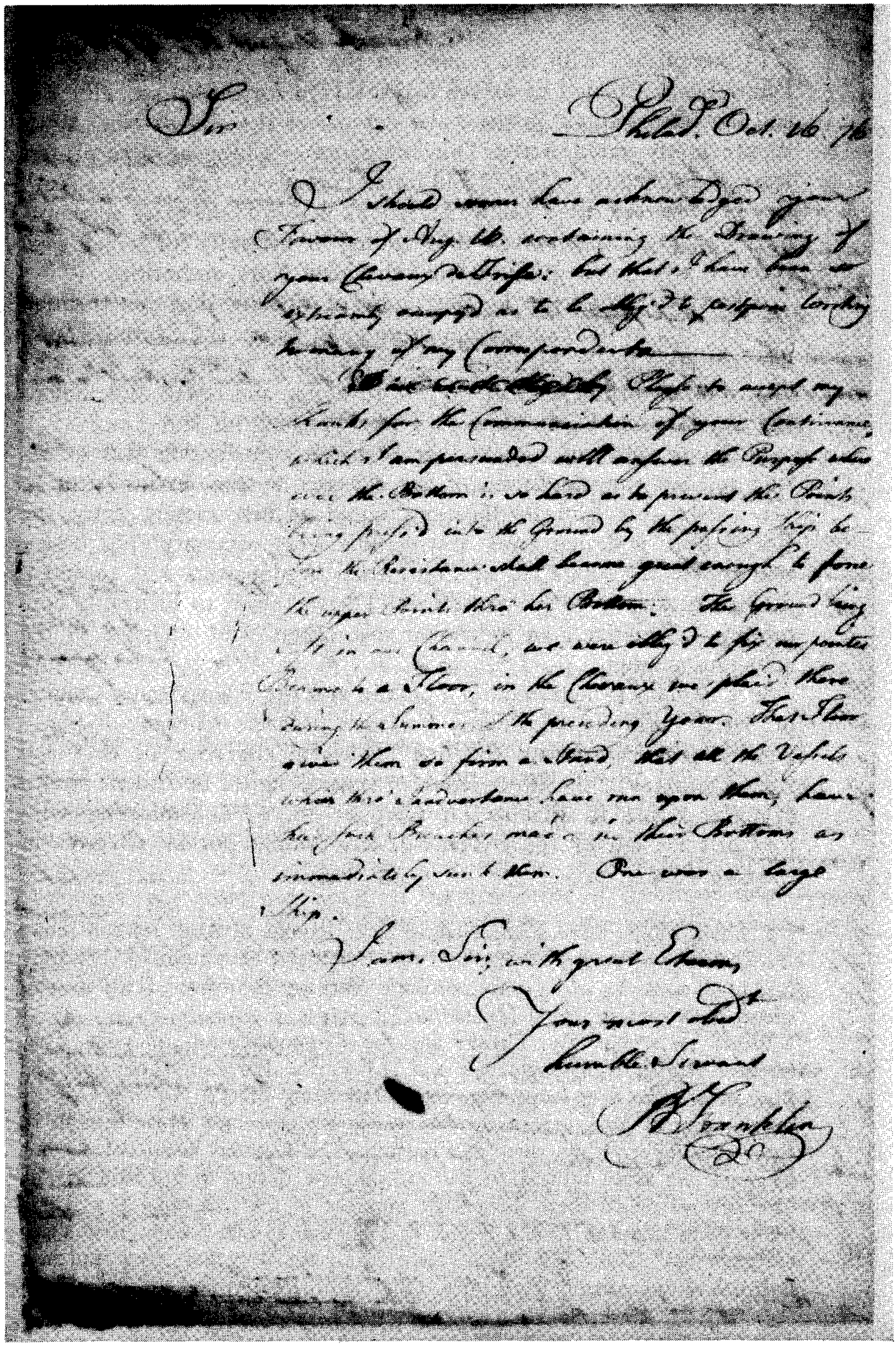
A few documents were recently discovered in the Benjamin Franklin Papers at the American Philosophical Society, which provide an interesting epilogue to the chevaux-de-frise narrative.[22] Robert Erskine, map maker for George Washington, wrote to Franklin from Newark, N. J., on August 16, 1776, offering a plan to obstruct the Delaware River with a "Marine Chevaux-de-frise." Erskine's letter included a drawing of what he sometimes referred to as his "Tetrahedron" and a detail of the efficacy of its performance:

I beg leave to enclose you a drawing of a new Contrivance for stopping Channels and Rivers, which I call Marine Chevaux de Frise; a model of which was exhibited at Headquarters in New York, the 20th of last month.

After the ships passed the Batteries with such facility, I considered with regret, that the Channel was not obstructed; and since the exigence required something both speedily executed and effectual, the Enclosed Construction occurred, which I have reason to believe is now putting in practice.

In addition to what is set forth on the Drawing, I beg leave to observe, that it may be described as a Tetrahedron with four horned Corners; having three Horns to each Corner; that the Consequence of a Ships running against it, must either be that she will stake upon it, or overset it, in which case the other horns will rise and take her in the bottom, and either overset her, go through her; or else she must break it with her weight; but here it is to be Considered, what force it will require to break a Beam 12 or 15 Inches square, standing only ⅓^{d} from the perpendicular; which seems too great for any ship to apply, without injuring her so effectually, as to render her unfit for further service—Such Chevaux dropt here & there in anchoring grounds and Harbours, would render them very unsafe—Supposing the Channel to be obstructed Seven fathoms deep, if it is made of Beams 32 feet long, its perpendicular height would be near 28 feet; the Horns would be within 14 feet of the surface, Consequently obstruct any vessel which drew more than that depth of water—Two Chevaux & there dimensions would stop 10 Fathoms, as the Horns of the one would be within 20 feet of those of the other—20 would stop an hundred Fathoms, and require only 120 pieces of Timber—as the Current has full liberty to flow under, they Cannot injure Channels or sensibly obstruct the tide: indeed they need not be put in till an alarm, for if they are ready prepared, a number of them may be rigged up and thrown into a Channel in a few hours—but I need not enlarge or add a number of Circumstances which will naturally occur to any one Conversant in Mechanics.

I shall think my self happy if any endeavours of mine tend to serve the Cause of Freedom, Humanity & the States of America.



Courtesy American Philosophical Society.

In compliance with the request of the New York legislature, the Pennsylvania Council of Safety in June 1776 forwarded specifications and technicians to aid in the water defense of the city of New York. As previously stated, Arthur Donaldson and a contingent of carpenters were dispatched to construct and install chevaux-de-frise in New York Bay between the Battery and Governor's Island. Hazelwood accompanied Donaldson to supervise the building of fire-rafts for which each received a generous gratuity from the New York authorities.

Albert H. Heusser, in his biography of Erskine, does not mention the activities of the Pennsylvanians, nor did he see the Erskine-Franklin correspondence. He does give a splendid account of Erskine's contributions in the summer of 1776 to design and install obstructions for the Hudson River between Forts Washington and Lee.[23]

However it would appear that Erskine's contribution was in design and not the installation of the chevaux-de-frise. In his letter he was aware that land fortifications could at best merely delay the British fleet, and that river obstructions were necessary. His design was apparently submitted at Continental headquarters and accepted. As late as August 16 he wrote that "I have reason to believe is now putting in practice," an indication that others were engaged in the actual installation.

It is difficult to determine if Franklin and the Pennsylvania Council of Safety seriously considered Erskine's "Marine Chevaux-de-frise." Pennsylvania had placed the first frames in the river in 1775 and were cognizant of the effectiveness of those designed by Robert Smith. Franklin wrote to Erskine on October 16, 1776, explaining why Erskine's version of the chevaux-de-frise would not be effective in the Delaware River:

> I should sooner have acknowledged your Favour of Aug. 16, containing the Drawing of your Chevaux de Frise; but that I have been so extreamly occupy'd as to be oblig'd to postpone Writing to many of my Correspondents
>
> Please to accept my Thanks for the Communication of your Contrivance, which I am persuaded will answer the Purpose where ever the Bottom is so hard as to prevent the Points being press'd into the Ground by the passing Ship before the Resistance shall become great enough to force the upper Points thro' her Bottom. The Ground being soft in our Channel, we were oblig'd to fix our pointed Beams to a Floor, in the Chevaux we plac'd there during the Summer of the preceding year. That Floor gives them so firm a Stand, that all the Vessels which thro' Inadvertance have run upon them, have had such Breaches made in their Bottoms as immediately sunk them. One was a large Ship.

Emanuel Eyre, October 15, 1777; *PMHB*, Vol. VI, p. 50, "Montresor"; *P.A.*, First Series, Vol. V, p. 668.

64. "G.W. Papers," Reel 44, Smith to Washington, October 14, 1777.

65. *Ibid.* Fleury frequently signed his name "Lewis Fleury." Some scholars have mistakenly read his signature as "Lewis Henry."

66. Washington, *Writings*, Vol. IX, pp. 369, 370; "G.W. Papers," reel 44, State Navy Board (Joseph Blewer) to Washington, October 14, 1777.

67. *Ibid.*, Benjamin Eyre to Washington, October 16, 1777.

68. *Ibid.*, "Resolution signed by Charles Thomson, October 17"; Worthington C. Ford, ed., *Journals of the Continental Congress*, Vol. IX, p. 813.

69. "G.W. Papers," Reel 44, Greene to Washington, October 10, 1777, Hamilton to Newcomb, October 10, 1777.

70. HSP, "Maps and Plans of the Revolution, Willard Estate," map of Fort Mercer by Captain Mauduit; Alfred M. Heston, *Red Bank: Defense of Fort Mercer*, p. 10, "Plan of Fort Mercer drawn by T. S. Saunders, 1842"; Gloucester County Historical Society, "Plan of Fort Mercer by E. W. Bowden, circa 1895"; HSP, "Plan of the Attacks against Fort Mifflin. . . ." (This map is obviously a variant of the Ensign Thomas Wheeler drawing in the Library of Congress.) As the engineer responsible for the construction of the new redoubt, Mauduit's delineation of the fort is the most reliable. However, his main intent was to depict the redoubt's shape and detail its features, without any effort to relate the measurements of the redoubt to the original fortification. Other contemporary and nineteenth-century maps were consulted; unfortunately, in the majority of them no effort had been made to draw the fort to scale. This was characteristic of early cartographers and military engineers like Mauduit. Many map makers omitted details of the lines of the fort. A survey of the area was made by the author in an effort to identify the lines of the original fort and redoubt with the present terrain.

71. James Whitall filed a certificate for damages and theft (Greene would have called this an appropriation for the defense of the garrison) with the State Adjutant General on April 17, 1779, claiming that American troops caused losses to his property of £5,760 1s.

		£	s	d
April 16, 1777	"First Breaking the ground which is Rendered'd unfit for tilling	300	0	0
	Cutting and Destroying the Timber	1200	0	0
	Pasturing Cattle and horses for the use of the Army	26	13	0

		£	s	d
October 12, 1777	To Pasturing Continental Cattel & Horses while Colonel Green Ocupy'd Fort Mercer	100	0	0
	To 15 Ton of Hay at 30 £ per Ton	550	0	0
	To 63 Bushel of wheat at 6 £ per Bushel	378	0	0
	To 1000 feet of Cedar Boards at 40 £ per Thousand	40	0	0
	8550 Rails at 12 £ per Hundred	1026	0	0
	2048 Stakes also at 4 £ per Hundred	81	18	0
	50 Whiteoak Posts at 3s per piece	7	10	0
	To one Barn & Hayhouse totally Destroy'd & Damages done to Sundry other Buildings	350	0	0
	To two pailed Gardens Cut down and carried to fort Island	200	0	0
	To an orchard near 300 trees all Grafted trees	1500	0	0
		£5760	1	0"

Frank H. Stewart was unable to find any record that restitution for these losses was made to Whitall. Stewart, *Notes on Old Gloucester County*, Vol. II, p. 167.

72. Heston, *Red Bank*, p. 3.

73. Interview with John G. Whitall on December 2, 1914, conducted and recorded by Frank H. Stewart.

74. There are conflicting reports as to the exact number of men in Greene's regiment when he arrived at the fort on October 11. Greene, writing to Washington on October 14, mentioned enclosing a return of the garrison, but this return does not appear in the Washington Papers or in Sparks' *Correspondence of the American Revolution*. The earliest extant return lists 244 officers and men present and fit for duty in Greene's regiment, the First Rhode Island. Colonel Angell's Second Rhode Island had 227 and Captain Cook's Continental Artillery Company sixty-three. Mauduit and the French Artillery and engineer personnel are not listed, although eyewitnesses remembered seeing a number of Frenchmen in the garrison on the day following the battle. Washington's instructions to Greene also mention the dispatch of Mauduit with officers and men to direct the artillery (Washingon, *Writings*, Vol. IX, p. 334).

To add to the confusion, a letter from Washington to General Israel Putnam dated October 8 mentions sending Greene and his regiment of *about 212 effective privates* to Fort Mercer (*ibid.*, p. 350). This is a figure difficult to reconcile unless Washington included sergeants, drummers, and fifers. Greene listed 213 in these classifications, and with

17. *P.A.*, First Series, Vol. VII, pp. 263–264, 291, Resolution of Congress, March 24, 1779, St. Clair to Reed, April 4, 1779.

18. *Ibid.*, pp. 302–303, Value of Rations, 1779.

19. *C.R.*, Vol. XII, p. 134; *P.A.*, First Series, Vol. IX, pp. 330, 554, Wm. Hammel to Reed, August 3, 1781, Matlack to Justices of Gloucester, New Jersey, May 13, 1782.

20. *C.R.*, Vol. XII, pp. 187–188, 190 (34 from the *Franklin*, 23 *Hancock*, 21 *Chatham*, 12 *Lion*, and 9 *Viper*. Others including the crew of the *Fame* had been released at various times during the year).

21. *Ibid.*, pp. 192, 194–195, 227.

22. *Ibid.*, pp. 226–227, 251.

23. Penna. MSS, Military Accounts, Navy, 1775–94, RG–4, "A Return of the Officers and Men belonging to the State Fleet . . . from May 6 to June 3 [1780]."

24. *C.R.*, Vol. XII, p. 627.

25. *Ibid.*, Vol. XIII, p. 151.

26. *P.A.*, Fourth Series, Vol. III, p. 880, Dickinson to Assembly, January 23, 1783.

27. *Ibid.*, pp. 922–923, Dickinson to Assembly, September 9, 1783; *PMHB*, Vol. XLI, p. 468, 472; Vol. XLII, pp. 34, 36, 158, 168, 262, 267, 274, "Pensioners of the State Forces."

28. Penna. MSS, Military Accounts, Navy, RG–4, Box 2, State of the Accounts of Henry Fisher, Esq., November 28, 1786.

APPENDIX B

1. Wallace McGeorge, *The Chevaux-de-Frise in the Delaware*, p. 1.

2. Lossing, *Pictorial Field Book*, Vol. II, p. 86; I. P. Strittmatter, *The Importance of the Campaign on the Delaware During the Revolutionary War, 1777*, P. 13; *Naval Documents*, Vol. IV, p. 1314, illustration, "from a Gentleman of Credit at Philadelphia"; *ibid.*, pp. 163–164, Charles Carroll to Charles Carroll, Sr., March 4, 1776.

3. Benjamin Franklin, *The Writings of Benjamin Franklin*, Albert Harry Smyth, ed., Vol. VI, p. 409.

4. *Ibid.*, pp. 438–439.

5. *Naval Documents*, Vol. II, p. 177, Josiah Quincy to George Washington, October 3, 1775; *P.A.*, Second Series, Vol. I, pp. 750–754.

6. *C.R.*, Vol. X, p. 290; Malone, ed., *Dictionary of American Biography*, Vol. XVII, pp. 335–336.

7. *C.R.*, Vol. X, p. 290; *P.A.*, Second Series, Vol. I, pp. 754–755; *P.A.*, Fourth Series, Vol. III, pp. 572–576; Penna. MSS, Military Accounts, Navy, RD-4, Box 1.

8. *C.R.*, Vol. X, p. 299, "Mr. Owen Biddle presented to this Board, from Mr. Robert Smith, a Model of a Machine for lowering and raising balace [ballast] into and out of the Chivaux de Freis. . . ."

9. HSP, Thompson Westcott, Extra Illustrated set of *History of Philadelphia*, Vol. VI, p. 507, Stauffer Collection, Levi Hollingsworth and Arthur Donaldson to John Dickinson, President, Supreme Executive Council, September 23, 1784; *P.A.*, First Series, Vol. X, p. 607, Wardens of the Port to Council, September 23, 1784.

10. *C.R.*, Vol. X, p. 603.

11. *P.A.*, First Series, Vol. IV, p. 774.

12. *P.A.*, Second Series, Vol. I, pp. 754, 755, and plates between pp. 769 and 771.

13. *C.R.*, Vol. X, p. 750.

14. *P.A.*, First Series, Vol. V, facing p. 721.

15. *Naval Documents*, Vol. IV, p. 1314, illustration, "from a Gentleman of Credit at Philadelphia"; pp. 151–152, Captain Andrew Snape Hamond to Vice Admiral Molyneux Shuldham, March 3, 1776.

16. *P.A.*, First Series, Vol. V, p. 66; HSP, Westcott, *History of Philadelphia*, Vol. VIII, p. 542, Stauffer Collection, "A List of Such articles as are absolutely necessary to Expedite the Sinking Cheveaux de Frize at Billingsport, November 13, 1776"; Woodhouse Collection, Committee of Safety to the Commissioner of Naval Stores, December 14, 1776.

17. *Naval Documents*, Vol. I, p. 929; Vol. II, pp. 342, 661, 757–758, 760–761, 1163–1164; Vol. III, pp. 653–654, 834, 941–942, 1258–1259, 1322–1323; Vol. IV, pp. 151–152, 163–164; *PMHB*, Vol. 85, "A British Spy in Philadelphia [Gilbert Barkly] 1775–1777 by Geoffrey Sand."

18. R. Lamb, *An Original and Authentic Journal of Occurences during the Late American War, from Its Commencement to Year, 1783*, p. 232; David Ramsay in his *History of the American Revolution* copied this description verbatim, p. 29.

19. The chevaux-de-frise diary citations are taken from *P.A.*, Second Series, Vol. I; *C.R.*, Vols. X, XI, XIII, and XIV; *P.A.*, First Series, Vols. IV, V, VII, and X; *P.A.*, Fourth Series, Vol. III; Penna. MSS, Delaware Fortification Accounts, Box 1; HSP, Dreer Collection, Soldiers of the Revolution, Vol. II, Soldiers of the American Wars, Vol. V; Westcott, *History of Philadelphia*, Stauffer Collection, Vol. VI, p. 607, L. Hollingsworth and A. Donaldson to Supreme Executive Council, September 23, 1784; Vol. VII, p. 542, "Situation of the Chevaux de Frize that have been Weighed"; McGeorge, *Chevaux-de-Frise*.

20. *C.R.*, Vol. X, pp. 363, 372, 375, 376–377, 396–397, 402, 416, 430, 520, 723; *P.A.*, Second Series, Vol. I, pp. 163, 214, 215, 359, 501.

21. Francis B. Lee, *New Jersey as a Colony and as a State*, Vol. II, p. 190.

22. I am indebted to Murphy Smith and Willman Spawn of the American Philosophical Society for advising me on the existence of this correspondence.

23. Heusser, *George Washington's Map Maker*, pp. 150–156.

APPENDIX C

1. *P.A.*, Fourth Series, Vol. III, pp. 570–571; *C.R.*, Vol. X, p. 329.

2. *C.R.*, Vol. XI, p. 132; Penna. MSS, Various (Minutes, 1777), RG-4, Records of the Comptroller General, Records of the Navy Board. Preliminary drafts of this pay scale with some changes may be found in *P.A.*, Second Series, Vol. I, p. 394; *C.R.*, Vol. XI, p. 8 (galleys only); Penna. MSS, Various (Minutes, 1777) RG-4, "A List of the Pay of the Fleet in the Services of the State of Pennsylvania"; Military Accounts, Navy, RG-4, Box 2.

3. These junior and petty officer classifications apply to the ship *Montgomery*.

4. In accordance with the agreement between Drs. Rush and Duffield, they each received sixteen dollars per month.

5. On July 2, 1777, the Commodore's salary was raised to $125 per month and Hazelwood, as second in command, to $100, both inclusive of rations. *P.A.*, Second Series, Vol. I, pp. 180–181; *C.R.*, Vol. XI, p. 323.

6. See text for description of chief surgeon's activity.

7. *C.R.*, Vol. X, p. 584, 597.

8. *Ibid.*, pp. 585, 586.

9. *Ibid.*, p. 594.

10. *Ibid.*, p. 650.

11. *P.A.*, Fourth Series, Vol. III, pp. 570–571; *C.R.*, Vol. X, p. 329.

12. *C.R.*, Vol. XI, p. 202.

13. *Ibid.*, p. 720.

14. *Ibid.*, pp. 757–758; Philadelphia Maritime Museum, J. Welles Henderson Collection, Recruiting Instructions to Captain Caldwell, April 26, 1779; *P.A.*, First Series, Vol. VII, pp. 266–267.

15. HSP, Stauffer Collection, interleaved in Westcott's *History of Philadelphia*, Vol. VI, p. 488.

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