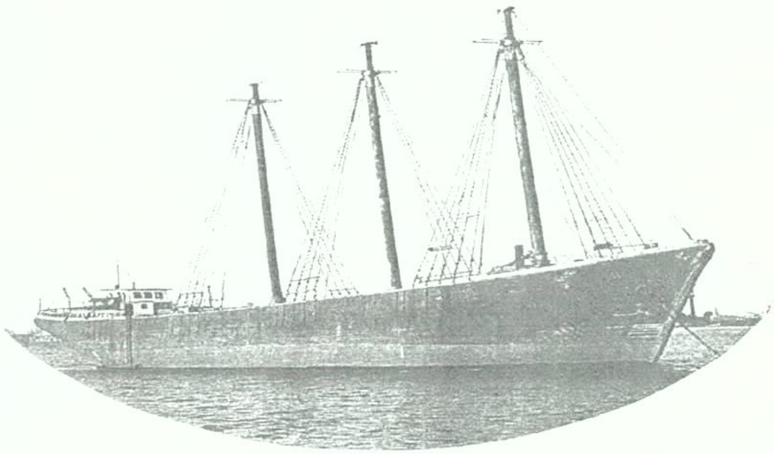
Contract No. DACW51-01-D-0015-8a
Delivery Order No. 0023

U.S. Army Corps of Engineers
New York District

RECORDATION OF SIX (6) VESSELS IN CONNECTION WITH THE NEW YORK AND NEW JERSEY HARBOR NAVIGATION STUDY UPPER AND LOWER BAY PORT OF NEW YORK AND NEW JERSEY STATEN ISLAND, RICHMOND COUNTY, NEW YORK ELIZABETH, UNION COUNTY AND BAYONNE, HUDSON COUNTY, NEW JERSEY



PREPARED FOR:
U.S. Army Corps of Engineers
New York District
New York, New York

UNDER SUBCONTRACT TO:
Matrix Environmental and
Geotechnical Services, Inc.
East Hanover, New Jersey

PREPARED BY:
Panamerican Consultants, Inc.
Memphis, Tennessee

VOLUME I: DRAFT REPORT
MAY 2007

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Authored by:
Andrew Lydecker

Prepared for:
**U.S. Army Corps of Engineers,
New York District**

**Contract No. DACW51-01-D-0015
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MAY 2007

ABSTRACT

From late July to mid-September, 2004, maritime archaeologists from Panamerican Consultants, Inc. (Panamerican) of Memphis, Tennessee, conducted archaeological recordation of six historic wooden watercraft in and along the shores of the Kill Van Kull waterway, north of Staten Island, New York in connection with the New York District (District), U.S. Army Corps of Engineers' New York and New Jersey Harbor Navigation Project Study. The overall Navigation Project plan is to deepen the main channels in the harbor to 50 feet, and to do so will require widening of the channels. The widening is anticipated to be approximately 30 feet on each side of the channel, and this action has the potential to impact any historic shipwrecks that might be located along the current channel edges.

Two of the six vessels in question, Shooters Island V2, a sectional floating drydock; and Shooters Island SS16b, a composite-hulled tug boat, are located on Shooters Island just north of Staten Island, while the remaining four, including KVK V36, the menhaden trawler *Fish Hawk;* KVK V37, the four-masted schooner *Paul E. Thurlow*; KVK V39, a hydraulic cutterhead dredge; and KVK V38, a balanced floating drydock, are located on the Kill Van Kull (KVK) shoreline of Staten Island. Shooters Island V2 is located in New Jersey waters, while the remaining five vessels are located in New York waters.

Designed to mitigate the adverse effects of the New York and New Jersey Harbor Navigation Project on the six historic watercraft, the current investigation was performed under subcontract to Matrix Environmental and Geotechnical Services, Inc., of East Hanover, New Jersey (Matrix), and was conducted for the New York District in response to their Scope of Work (SOW) entitled *Recordation of Six (6) Vessels In Connection with the New York and New Jersey Harbor Navigation Study Upper and Lower Bay Port of New York and New Jersey Staten Island, Richmond County, New York Elizabeth, Union County and Bayonne, Hudson County, New Jersey*, under Contract No. DACW51-01-D-0015, Delivery Order No. 0023.

Comprised of historical background research, digital as well as 35mm and video photography, and measured drawings for each vessel, the current investigation was completed in February of 2005.

ACKNOWLEDGEMENTS

This report represents one of a series of ongoing investigations detailing the results of intensive systematic cultural resources surveys along the waterfronts and shorelines that comprise the New York Port area. Conducted as a component of the New York Harbor Navigation Study, the current investigation deals specifically with six derelict and abandoned vessels in the Kill Van Kull and Shooters Island areas. It is safe to say that the Port of New York retains one of the last surviving wooden ships graveyards in existence, and that the project area represents the largest and most diverse collections of wooden watercraft in the country.

The watercraft documented within the project area represent not only the final century of wooden ship construction within the United States, but represent emerging technologies such as steam propulsion, both of which were eclipsed by the employment of iron hulls and the diesel engine. Reflecting vessels involved in interstate and intrastate commerce as well as more mundane working vessels, the assemblage features construction and design features directly associated with the emerging commercial and industrial complex of the Port of New York and surrounding areas. Though lacking "historical glamour," the six vessels documented during the project nonetheless provide artifactual information on a commercial system central to New York's development as the world's chief port and harbor, and data on the zenith of wooden ship construction.

The current report was the product of numerous individuals, without whose help its successful completion would not have been possible. Among these were Lynn Rakos with the New York District, U.S. Army Corps of Engineers. The staff at the Daniel S. Gregory Ship Plans Library at Mystic Seaport was instrumental in the acquisition of vessel plans and photographs. The folks at the Elizabeth Marina in Elizabeth, New Jersey are thanked for the use of a boat slip and launching facilities. Archival research and field investigations were directed by Mr. Andrew D. W. Lydecker, the field crew was composed of Mr. James A. Duff, Mr. Michael C. Krivor, Dr. Michael K. Faught, Mr. Matthew Elliott, and Mr. Justin McNesky. Authored by Andrew Lydecker, and with contributions from Steven James, the report was edited by Ms. Jessie Flanders. Vessel plans were completed by Andrew Lydecker. The authors are indebted to each one. In closing, the crew wishes to extend their gratitude to the people of New York and New Jersey for the hospitality shown to them during their stay.

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1. INTRODUCTION

From late July to mid-September, 2004, maritime archaeologists from Panamerican Consultants, Inc. (Panamerican) of Memphis, Tennessee, conducted archaeological recordation of six historic wooden watercraft in and along the shores of the Kill Van Kull waterway, north of Staten Island, New York in connection with the New York District (District), U.S. Army Corps of Engineers' New York and New Jersey Harbor Navigation Project Study. The overall Navigation Project plan is to deepen the main channels in the harbor to 50 feet, and to do so will require widening of the channels. The widening is anticipated to be approximately 30 feet on each side of the channel, and this action has the potential to impact any historic shipwrecks that might be located along the current channel edges (Figure 1-01).

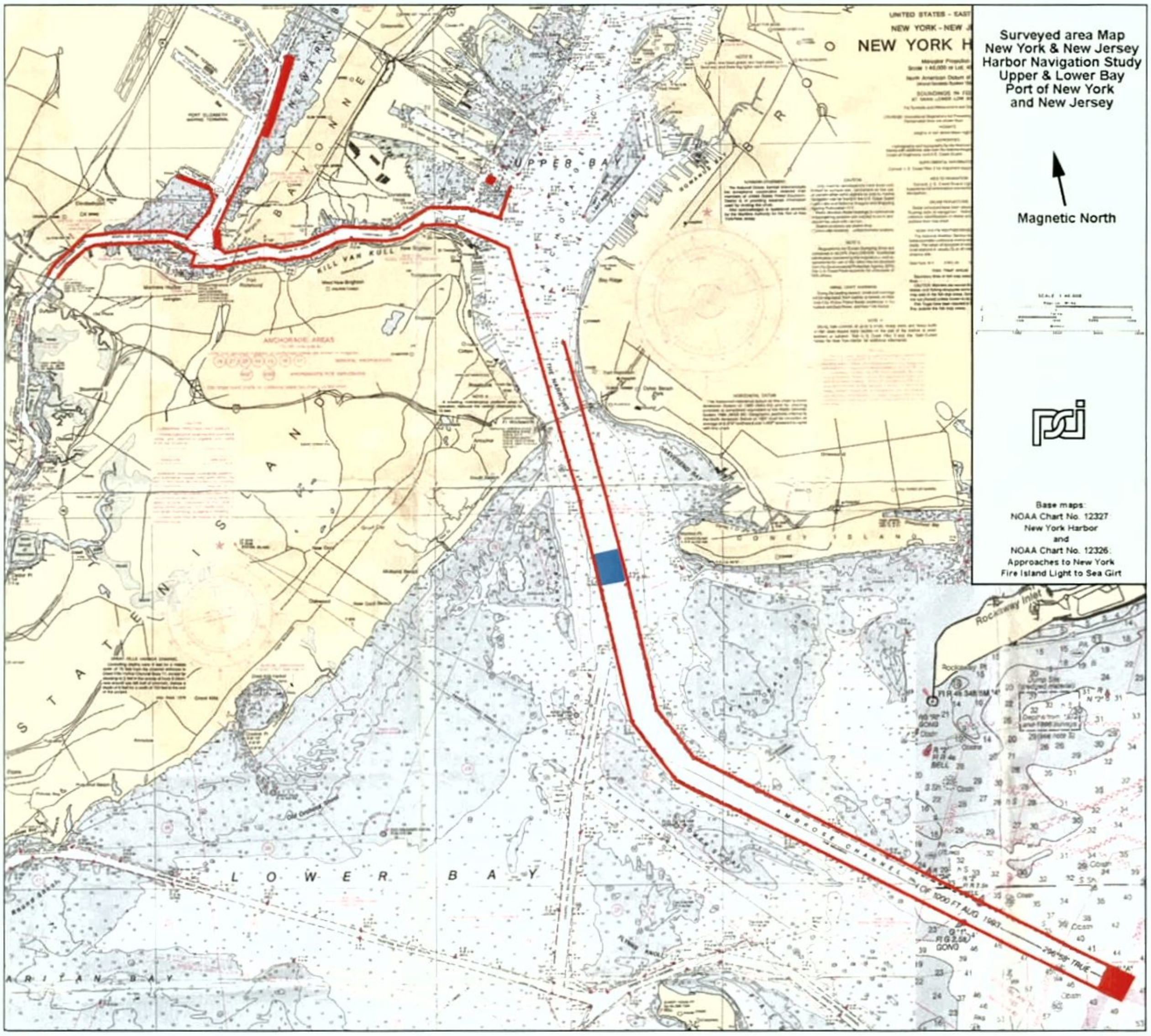


Figure 1-01. New York and New Jersey Harbor navigation project study area (base map: NOAA navigation chart Nos. 12327: New York Harbor, and 12326: Approaches to New York Fire Island Light to Sea Girt).

As an agency of the federal government, the District is entrusted with the protection and preservation of all historically significant cultural resources that may be adversely affected by their project activities. The federal statutes regarding these responsibilities include: Section 106 of the National Historic Preservation Act of 1966, as amended; Executive Order 11593; the Advisory Council on Historic Preservation Procedures for the Protection of Historic and Cultural Properties (36 CFR Part 800); and the Abandoned Shipwreck Act of 1987. In fulfilling these responsibilities, the District initiated a series of investigations to determine if any potentially significant submerged cultural resources were present in the project area and that might subsequently be adversely affected by their proposed undertaking. Listed in Table 1-01, the investigations identified the remains of six historically significant watercraft that could not be avoided through project redesign and subsequently were recommended for recordation. Of the six vessels in question, two, Shooters Island V2 and Shooters Island SS16b, are located on Shooters Island just north of Staten Island, while the remaining four are located on the Kill Van Kull (KVK) shoreline of Staten Island. Shooters Island V2 is located in New Jersey waters, while the remaining five vessels are located in New York waters (Figure 1-02).

Table 1-01. Six investigated historic watercraft.

Vessel	Vessel Type	Vessel Name
KVK V33	Menhaden Fishing Trawler	*Fish Hawk*
KVK V36	Cutterhead Dredge	N/A
KVK V37	Four-Masted Schooner	*Paul E. Thurlow*
KVK V38	Floating Drydock	N/A
Shooters Island V2	Floating Drydock	N/A
Shooters Island SS16b	Composite-built Tugboat	Unknown

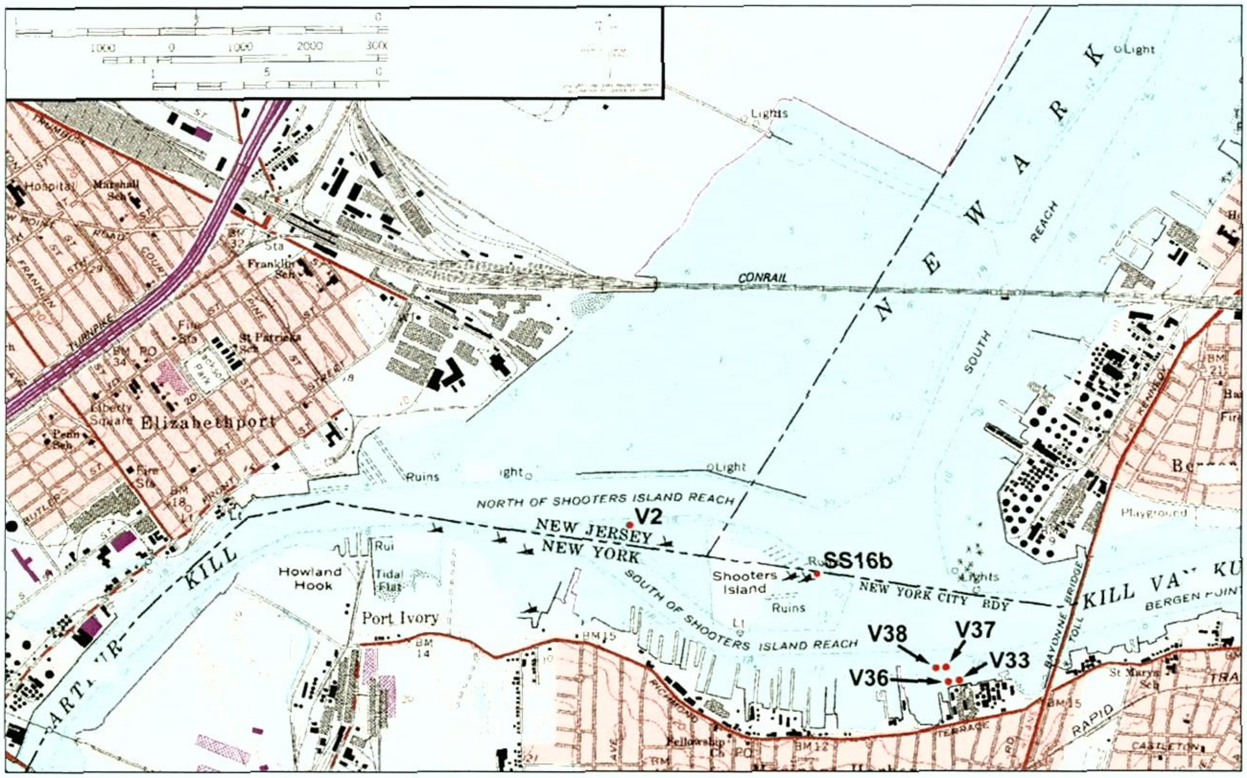


Figure 1-02. Location of six vessels recorded during the current project (USGS 7.5 quadrangle *Elizabeth, N.J.-N.Y.*, photorevised 1981).

Vessels KVK V33, KVK V36, and KVK V37 were initially surveyed as part of the Corps' Collection and Removal of Drift Project and were determined significant (Raber et al. 1996c; James 1999). Shooters Island V2, a floating drydock, was evaluated in the late 1970s and early 1980s (Brouwer 1981; Kardas and Larabee 1985) and was at that time determined not significant, but as 20 years had passed, the vessel was re-evaluated and determined significant. All six vessels were re-evaluated by Panamerican in the summer of 2002, and with the exception of SS16b, were determined to meet eligibility criteria for listing on the National Register of Historic Places (Lydecker and James 2004). Based on a request by the New York State Historic Preservation Office to reconsider the evaluation of SS16b, it too, was determined significant.

Designed to mitigate the adverse effects of the New York and New Jersey Harbor Navigation Project on the six historic watercraft, the current investigation was performed under subcontract to Matrix Environmental and Geotechnical Services, Inc., of East Hanover, New Jersey (Matrix), and was conducted for the New York District in response to their Scope of Work (SOW) entitled *Recordation of Six (6) Vessels In Connection with the New York and New Jersey Harbor Navigation Study Upper and Lower Bay Port of New York and New Jersey Staten Island, Richmond County, New York Elizabeth, Union County and Bayonne, Hudson County, New Jersey*, under Contract No. DACW51-01-D-0015, Delivery Order No. 0023 (Appendix A).

Comprised of historical background research, digital as well as 35mm and video photography, and measured drawings for each vessel, in addition to a salvage and conservation plan for SS16b (Appendix B), the current investigation was implemented by the New York District in partial fulfillment of their obligations under various federal statutes and per stipulations of a signed Memorandum of Agreement (MOA) between the District and the State Historic Preservation Officer of both New York and New Jersey (Appendix C). Level of recordation stipulations in the MOA designed to ensure the mitigation of impacts to the six historic vessels included:

- KVK Vessel V33. *Fish Hawk*. Menhaden Fishing Trawler. Accessible only by water and best at low tide, it is recommended that Vessel V33 receive complete recordation. Architectural documentation should include the profile, the plan view of the deck, and the longitudinal cross section of the vessel, all of which can be obtained during low tide by non-diving personnel. Diving aspects of the recordation should include recordation of the stern, including rudder and propulsion, and the bow. Photo documentation in the form of 35 mm film and video should also be undertaken. Archival research specific to Vessel V33 should also be included.

- KVK Vessel V36. Cutterhead Dredge. Accessible only by water and best at low tide, it is recommended that Vessel V36 receive partial recordation. Architectural documentation should include recordation of basic dimensions. Photo documentation in the form of 35 mm and video should be undertaken.

- KVK Vessel V37. *Paul E. Thurlow*. Four-Masted Schooner. Accessible only by water and best at low tide, it is recommended that Vessel V37 receive complete recordation. Architectural documentation should include a plan view of the hull outline, deck stanchions, and holds. Diving aspects of the recordation should include recordation of the stern, including rudder and the bow. Photo documentation in the form of 35 mm and video should also be undertaken.

- KVK Vessel V38. Floating Drydock. Accessible only by water and best at low tide, it is recommended that Vessel V38 receive complete recordation. Architectural documentation should include major dimensions, a plan view of the remaining hull, deck stanchions, bulkheads, framing and the location of any remaining machinery. Since most of the original deck planking is no longer in place, thus allowing access to the internal structure of the pontoon, at least one cross section including internal strengthening of the pontoon should be included. Photo documentation in the form of 35 mm and video should also be undertaken.

- Shooters Island Vessel V2. Floating Drydock. Accessible only by water, it is recommended that Vessel V2 receive complete recordation. Architectural documentation should include the profile, the plan view of the deck and longitudinal cross sections of the vessel along both the centerline and through at least one of the wings. Also, at least one cross section should be obtained including both wings and the location of internal bracing, and remaining machinery, if safe access is possible. Most of the above documentation should be obtainable by non-diving personnel. Photo documentation in the form of 35 mm and video should also be undertaken.

- Shooters Island Vessel SS16b: Unidentified Type; Composite Construction. Accessible only by water, it is recommended that Vessel SS16b should be fully recorded. Photo documentation in the form of 35 mm and video should also be undertaken.

2. HISTORICAL OVERVIEW

General Navigation History of the Project Area

Europe's first exposure to the New York Bay was during the voyages of Verrazano. An Italian from Florence sailing for Francois I, the king of France, he left European waters in January 1524 to find a route to China. His vessel, *La Dauphine*, named after the French heir to the throne, measured 100 tons and was manned by a crew of 50. In early March, after a tempest-tossed crossing, he came close to Cape Fear, North Carolina. By mid-April Verrazano had coasted far enough north and east to enter New York Bay, passing Sandy Hook en route. After some brief reconnaissance he continued on his voyage and returned to France in July. Being a competent seaman and navigator, Verrazano was able to conclude that he did not reach China, but rather a new world (Morison 1971:314). However, the French did not follow up on Verrazano's discovery of the best harbor in the Americas.

Henry Hudson, an Englishman in the employ of the Dutch East India Company, investigated portions of the American east coast in 1609 (Labaree et al. 1999). Hudson was the next European to enter New York Harbor; he then sailed 150 miles up the river that was to bear his name. The Dutch were a bit more industrious and inaugurated European control of the region. Headquartered at Manhattan, private trading operations were established on the Hudson in 1613. Numerous exploratory ventures occurred after the founding of the trading post, and by the mid-1610s much of the area was well known. The Dutch named this region the New Netherlands in 1614, with private fur-trading operations expanding into the surrounding country. In 1623, the Dutch West India Company took over trading operations of the region, and the town of New Amsterdam was founded in 1625 (Roberts et al. 1979:A-12, A-13).

Dutch expansion caused conflict with the English by extending east toward New England. To the south, the Dutch absorbed the Swedish settlement at present-day Wilmington, Delaware. Trade connections were established with Chesapeake Bay colonists, South America and Europe. New Amsterdam was growing and rivaled Boston as a center for maritime trade, with furs, fish, beef and flour exported; tobacco, slaves and sugar trans-shipped; and European goods imported. New Amsterdam appeared to be the rising star of American colonial ports. However, with the restoration of Charles II in England and a more aggressive colonial policy, the English took the colony in 1664 (Labaree et al. 1999).

Soon after the beginning of English rule, New Amsterdam was renamed New York, and flour replaced furs as the port's main export, shipped mainly to the West Indies. In the eighteenth century, exports included whale oil, beaver pelts, and some tobacco to England; and flour, pork, bread, peas and horses to the West Indies. Imports from England and the West Indies included manufactured goods and rum, molasses, and sugar respectively (Watts 1986:11-12). Shipping increased considerably by the mid-1700s. Imports included "fish oil, blubber, whale fins, turpentine, seal skins, hops, cider, bricks, coal, lamp black, wrought iron, tin, brasury [*sic*], joinery, carriages and chairs. Exports included chocolate, lumber," and import goods from both the West Indies and Europe (Roberts et al. 1979:B-9).

New York did not confine her shipping activities to trade; her vessels were also heavily involved in privateering. Preying on enemy commerce led to the inevitability that some would turn to the often-glamorized activity of pirating. The infamous Captain Kidd and various lesser-known pirates made New York a rendezvous around 1700 (Albion 1984:2-5). Not only was New York a rendezvous, her merchants supported trade and reaped a profit by supplying pirates inhabiting such far-off places as Madagascar in the Indian Ocean (Cordingly 1995). Frederick Philipse, a merchant of New York, loaded ships with clothing, liquor, naval stores, guns, and ammunition, and had his local agent, Adam Baldridge, sell them to the pirates in return for their ill-gotten gain (Ritchie 1986). Commerce, with varying levels of ethics, was driving the growth of the port.

By the second decade of the eighteenth century, the interior settlements surrounding New York were sufficiently established to allow for the production of significant amounts of export goods. As a result of the increased trade, the port expanded accordingly, as did its need for larger, more economical vessels with which to ship goods (Watts 1986:11-12). Port records indicate that prior to 1720, few vessels entering the port registered over 100 tons. Larger vessels became more common within the next few years (Watts 1986:11-12). In 1770, New York stood fourth after Philadelphia, Boston, and Charleston among the American ports in total tonnage arriving and clearing (Albion 1984:2-5). Data relative to the increase in number and nationalities of vessels entering New York throughout the eighteenth century are presented in Table 2-01.

Table 2-01. Eighteenth-century shipping data for the Port of New York.

Destination/Origin	**Year**				
Outward bound (Clearances)	**1726**	**1739**	**1754**	**1768**	**1772**
Great Britain	12	9	31	56	39
Ireland	--	15	23	30	19
Europe	8	21	19	45	48
Africa	--	4	2	--	9
Bahama Islands	--	1	3	4	5
Bermuda	3	3	3	7	3
Caribbean	95	113	180	156	199
Thirteen Colonies	90	97	51	125	324
Other American Colonies	5	10	12	55	54
	213	**273**	**324**	**478**	**700**
Inward bound (Entries)					
Great Britain	31	27	28	79	61
Ireland	1	. 4	10	15	11
Europe	10	22	25	31	38
Africa	--	--	5	2	--
Bahama Islands	--	1	6	9	11
Bermuda	9	14	3	3	5
Caribbean	85	105	177	158	208
Thirteen Colonies	69	93	23	139	352
Other American Colonies	5	11	7	26	24
	210	**277**	**284**	**462**	**710**

(as presented in Roberts et al. 1979:B-13)

With intercolonial trade well established and foreign imports and exports on the increase, the port of New York continued to grow. By the last decade of the eighteenth century, the port of New York had surpassed Boston in importance; by the first decade of the nineteenth century, the port was larger than Philadelphia. Two-thirds of all the nation's imports and one-third of its exports went through the port by 1860, with only London and Liverpool exceeding the port in the volume of shipping and value of imports and exports (Albion 1984:336; Ferguson 1986:17). Population growth mirrored the increase in shipping activities, declining only through war and epidemics. Associated reductions in maritime commerce occurred while the British occupied the port during the Revolutionary War, the yellow fever epidemics of 1795 and 1798, the Embargo Act of 1807 and the British closure of the port during the War of 1812 (Ferguson 1986:17).

During the nineteenth century, sailing vessels of varying sizes and shapes entered and exited the port of New York. These vessels included sloops, coastal schooners, merchantmen and packet ships, which increased in size as time and technology progressed. The late 1840s and 1850s saw the famous clipper ships entering the port, to be followed in the 1890s by the last of the American square-rigged, deep-water sailing ships (the "down easter"). These were followed by large, multi-masted schooners–the largest sailing vessels ever constructed. In addition to these major vessel categories, other vessel types present in the area included schooner barges, pilot boats, lighters, fishing boats and other types of small craft (Morris and Quinn 1989:87-88).

The invention of the steam engine in the late eighteenth century and its application on vessels at the turn of the century played a profound role in the history of the port, and cut into the trades previously controlled by sailing vessels. After Fulton's *North River Steam Boat* completed its successful voyage from New York to Albany in 1807, steam power became the dominant method of vessel propulsion and would form the catalyst for the evolution of not only vessel shape and type, but trade and economics as well (Brouwer 1987).

The advent of steam heralded the creation of the famous river and coastal sidewheeler steamers, several of which are listed as having wrecked near the approaches to New York. Huge transatlantic liners followed in the wake of the sidewheeler steamers, making New York the center for passenger travel to and from foreign ports. Steam also allowed the ever-important "tugboat" to evolve. After 1860, the tugboat industry expanded rapidly, with steam being employed on the tugs until just after World War I (Morris and Quinn 1989:87-88).

With the port of New York immediately to the north, some of the many vessels transiting the waters were wrecked by storm, accident, or poor seamanship. It is known that numerous vessels wrecked while approaching or leaving New York. Long Island, to the east, and the shores of New Jersey, to the south, act as a funnel through which vessels enter New York Harbor. During the age of sail, vessels were dependent on the capricious winds for motive force; many were reported lost due to contrary winds. However, early steam vessels, without modern navigation aids such as radar, loran, or GPS, have had accidents in the ever-confining waters that mark the approaches to New York. In the modern era, technology has yet to abolish accidents caused by human error.

To ameliorate the affects of maritime disasters, numerous organizations were incorporated around the coasts. Local organizations took the responsibility of aiding the victims of shipwrecks. In an era of a small federal government, each locality took responsibility for situations occurring within its immediate jurisdiction. However, during the mid-nineteenth century, the port of New York rose to such prominence in commercial and emigration activities that the local resources could not sustain a full service for wrecked mariners and passengers. A Congressman from New Jersey, William Newell, once witnessed a shipwreck where no effective rescue was possible. In 1847, he persuaded Congress to appropriate money to provide lighthouses with lifeboats. However, the money was not spent for that purpose. The next year he obtained more funds for life saving equipment to be used between Sandy Hook and Little Egg Inlet, New Jersey, under the direction of the Revenue Marine (Bennett 1998). The following year Congress extended the network of stations to include the rest of the New Jersey shore and the coast of Long Island, New York; thus, the federal government took its first tentative steps toward a remedy for mariners in distress.

Maritime History of the New York Harbor Area

Unlike early colonial enterprises founded on political or religious principles, New York's development was prompted by trade. Early maritime commerce in the New York Harbor area began in the early 1600s, centering on the limited trade and barter of fur, probably beaver (Bank of Manhattan Company 1915). After the area was discovered by Italian explorer Verrazano in 1524, the Dutch began the initial colonization of Manhattan Island, with the Dutch West India Company establishing a trading post of eight men in 1625 to help develop the fur trade (Shumway 1975). By 1650, New Amsterdam featured peoples speaking some 18 languages:

> This broad-minded tolerance, which was the universal Hollandish custom, attracted from Europe bold adventurers bent upon making their fortune. In spite of the interruption of the change from Dutch to English rule, in spite of the constant warfare of the eighteenth century and the British occupation during the Revolution, New York's commerce grew steadily. By 1800, eleven years after the adoption of the Constitution...New York had outstripped its rivals...and had taken the foremost place as the seat of American commerce...[Bank of Manhattan Company 1915:5].

The fledgling colony was replaced by British rule when a naval squadron appeared in 1664 off New Amsterdam and demanded its surrender. Renamed "New York," the colony was taken back in 1673 but was returned to the British as terms of a treaty in 1674.

In 1683, there were 3 ships, 3 barks, 23 sloops, and 41 small boats noted as being at New York. In 1696, there were 62 sloops, 40 square-rigged vessels, and 60 small boats. The single-masted sloop was the most extensively employed vessel type during the early years of the colony. Thought to have developed from the Old Dutch yacht, the sloops had the broad beams and round, full bottoms that characterized seventeenth-century Dutch vessels. The universal boat for traveling and freighting on the river, the sloop's light draught was well suited to floating over the shallows of the Hudson River. By 1771, the Hudson River sloop was a large and powerful boat (Hall 1884:115).

The rise of New York commercial activity was slow, and while merchants traded to the West Indies, they neglected the trade of Europe until after the Revolutionary War. Prior to the war, privateering and the slave trade were practiced. The port was especially known for privateering, and during the French War and prior to 1758, 48 privateers, 695 guns and 5,660 men were sent out from the port until the advent of the Revolutionary War. Fast-sailing brigs and schooners had sharp floors and sat low in the water; these vessels were seldom captured. A few of this same class of vessel also participated in the slave trade (Hall 1884:115).

Part of the British strategy during the Revolution was to take control of New York Harbor, with their first landing on Staten Island. Although the major battles of the war were fought outside the state, the British continued to hold New York as a main naval base. The end of the war brought restrictions against trade with the West Indies; however, the trade was revived in 1793 when France and England went to war. Becoming the leading seaport in 1797, the port was idled for over a year with the passage of the Embargo Act of 1807. Just four months prior to the Embargo, Robert Fulton successfully tested the steam-propelled *North River Steam Boat*, an event that signaled a revolution in marine transportation and waterborne commerce. Built in an East River yard and powered by an imported British steam engine, the vessel ran between New York and Albany in 1807. Although earlier steamboats had operated both in the U.S. and abroad, it was Fulton and his partner Robert Livingston whose success with the *North River Steam Boat* "marked the beginning of the unbroken development of steam navigation in America" (Ringwald 1965:1). In 1812, Fulton built the first "double-ended" ferryboat, *Jersey*, which operated between Jersey City and Manhattan. In 1814, he established the first steam ferry between Brooklyn and Manhattan (Brouwer 1990:20-26).

The development of the steamboat was impeded by the monopoly awarded to Fulton (actually awarded to Livingston, a state political power) for steamboat operation in the state of New York. Struck down in 1824 by the U.S. Supreme Court, the removal of the monopoly brought significant changes to local waters, both in vessel types employing steam propulsion and the engines themselves, as well as waterborne commerce affected by the introduction of these vessel types. A general type evolved that would come to typify the larger Hudson River steamboats (Ringwald 1965:2), as well as the Long Island Sound and Chesapeake Bay steamboats.

After the War of 1812, the Port of New York increased its role in the sailing packet industry, both in the construction and in the commercial aspects of the vessels. Like the *North River Steam Boat*, the packets were built in East River yards. Packets bound for Liverpool, London, and

Harve would make their eastbound crossing with cotton or grain and return with immigrants and European luxury goods. By 1850, New York was a center of clipper ship construction with between 50 and 100 vessels built yearly. Mostly built for New York owners, the packets and clippers were launched for the packet, China tea or California trades (Hall 1884:116).

After the Civil War, the American shipbuilding industry saw not only the final development of the American square-rigged ship, but in New York, where builders specialized in expensive packets and clippers, a dramatic decrease in production. Production of New York-built boats dropped from 40 in 1855 to zero in 1862, averaging only four per year over the next decade (Hutchins 1948). The completion of the trans-continental railroad and the opening of the Suez Canal spelled doom for the fast sailing vessels by the 1870s (Brouwer 1990:46).

The industry also witnessed a change in the way it conducted business. Before the Civil War, shipbuilding usually consisted of a small group of shipwrights headed by a master shipwright. Shippers, on the other hand, had little to do with shipbuilding. After the war, however, capitalists sought out the industry on a large scale. The master shipwright became an employee as the result of declining activity in the ship market and the increased cost of ship construction (decreased timber supply) (Hutchins 1948). By 1880, the economies associated with the free market system dramatically modified, if not replaced, the old apprenticeship system.

The opening of the Erie Canal in the fall of 1825 was perhaps the greatest stimulus to the growth and success of the Port in the early nineteenth century. Extending from Buffalo on Lake Erie to Albany on the Hudson River, the canal runs a distance of 365 miles. Reducing shipping times and costs of inland produce and commodities to the Port, the Erie Canal caused interior towns to thrive due to increased commerce, and ensured New York's leadership among eastern ports because of its access to markets and goods of the interior of the continent (Brouwer 1990:29-34; Hall 1884:224; Morison 1958:539).

Soon other canals were constructed throughout New York, as well as in Pennsylvania, Maryland, and Delaware. Navigation improvements in connecting inland waterways by canals in the 1820s and 1830s resulted in new commerce opportunities and increased maritime traffic. The Delaware & Raritan Canal, the company by the same name receiving its charter in 1830, was the conduit for Pennsylvania coal to New Brunswick, New Jersey on the Raritan River, and the Morris Canal carried coal across New Jersey to Newark from the mouth of the Lehigh River (Albion 1939:134-137; Morison 1958:172; Raber et al. 1995b:25). A crucial corridor around Staten Island for waterborne commerce in the early nineteenth century traveling between Upper New York Bay to Raritan Bay, the importance of Kill Van Kull and Arthur Kill increased throughout the nineteenth century with the construction of the Delaware and Raritan Canal and the attendant expansion of the coal trade. With later direct railroad connections from Elizabethport to Phillipsburg, New Jersey on the Delaware River, and a new coal terminal at Port Johnson, Bayonne on the Kill (constructed in 1865), shipments of coal on the kills increased dramatically in the 1850s and 1860s (Albion 1939:134-137; Morison 1958:167-189; Raber et al. 1995b:25).

The construction of canals brought an attendant boom in the construction and use of canal boats or barges, as well as a reduction in the number of schooners involved in the same trade. The importance of the canal use in the waters of New York Harbor is indicated by the frequency with which they appear in historic photographs of the area (see Johnson and Lightfoot 1980). Either decked or open, the canal barges were towed through the Erie and Champlain Canals by horses and mules walking along towpaths. Arriving at the Hudson River, they would require other means of propulsion. Coinciding with the construction of the canals and the canal barge, the advent of steam power produced the towing vessel, the predecessor of the modern-day tugboat. The first vessel built for this general service appears to have been the *Hercules*, constructed in 1832 in New York by a company that ran a line of coastal packets (Morison 1958:540).

At the same time steam propulsion was making inroads into maritime construction and commerce, it was also having a profound effect on land in the form of railroads. By the 1870s, railroads would shape the way the Port area handled goods by effectively creating the lighterage system. Of the dozen major lines that serviced the port, only two directly serviced Manhattan Island. With the exception of the Baltimore & Ohio, which entered Staten Island, most railroads ended at the New Jersey shore of the Hudson River. These lines were forced to transport their cargoes of passengers and products over the last remaining leg of the journey by water. However, there remained a far greater tonnage of waterborne freight requiring discharge along piers and waterfront slips than land-conveyed freight (Harding 1912). Some freight cars crossed the waterways on long barges called car floats, while the contents of other cars were offloaded or transferred onto lighter barges in the form of sailing craft, deck scows, and hold and covered barges; steam lighters carried priority cargo such as mail.

Servicing the geographic and commercial needs of the harbor required a "railroad navy." Some 1,500 tugboats, car floats, covered lighters, express lighters, floating grain elevators and other craft loaded and unloaded freight at specially designed rail-to-water transfer piers (Table 2-02). This transportation network offered: (1) access to the water (slip) side of steamships, and (2) access to parts of the harbor not accessible by rail.

Table 2-02. Craft in New York by class and percent in each class, 1916.*

Vessel Class	Vessels		Tonnage		Value of	
	No.	**%**	**Gross**	**%**	**$**	**%**
Tugs/towboats	559	9.1	57,687	3.2	13,153,417	21.7
Ferryboats	125	2.0	115,363	6.4	11,406,584	18.9
Municipal	16	0.3	15,471	0.9	2,107,199	3.5
Railroad	59	1.0	68,881	3.8	6,779,130	11.2
Other	50	0.8	31,011	1.7	2,520,255	4.2
Unrigged craft	5,433	88.8	1,641,694	90.4	35,938,792	59.4
Total	**6,117**	**100.0**	**1,814,754**	**100.0**	**60,498,793**	**100.0**

*adapted from Squire 1918

Historically, New York's leadership position in general cargo portage depended on its ability to move or "lighter" goods from ship to pier or ship to ship. The term "lighter" describes a small boat utilized as an intraport cargo carrier. These lighters, sail or steam propelled, handled all types of agricultural and commercial goods, including mail. The usual lighter transported between 500 and 800 tons of freight (Harding 1912).

In New York Harbor, the term also applies to cargo ferrying via scow, barge, derrick, carfloat, or grain elevator, vis-à-vis waterfront terminals or anchored ocean vessels. The breadth of New York's lighterage activity "reflected America's full scale entry into the industrial age, with its ever increasing demand for imports of raw materials and foreign markets..." (Brouwer 1987:30).

The harbor's vast waterways and dense population initially hindered centralized railroad service. "In response to these challenges, many major railroads established inter-modal networks designed to meet and beat their competitors" (Dibner 1994:6). Of the dozen or so railroad lines built in the mid-1800s, only one, the New York Central, provided direct rail freight service to Manhattan (Brouwer 1987). From 1835 to 1865, tracks progressively penetrated the harbor, terminating at the nearest navigable waterway. Most came no closer to Manhattan than Jersey City.

In the 1870s, railroads adopted the carfloat interchange system. Cars from southern areas reached New England-bound railroads by flotation barge. Around 1900 in Manhattan—and later in Brooklyn and the Bronx—float bridge stations (inland freight stations) provided mechanisms for freight marine/terrestrial interchange. Beginning around 1860, railroads delivered (at no charge) a carload or more of incoming freight to waterfront locations within a designated harbor boundary (free lighterage limits).

Waterfront destinations received the same rate "as though it were physically on the line of the railroad" (Flagg 1994:7). Railroad owners had no choice but to provide free lighterage since the free service directly competed with canal boat carriers who delivered goods directly to ships or terminals, and charging for the service would drive shippers to other East Coast ports. When later investments included port facilities, railroad owners "did not want New York to be placed at economic disadvantage in competition with East Coast ports where goods did not have to be lightered" (Brouwer 1987:31). By the 1920s, railroads owned outright large lighterage fleets.

By 1885, New York Central Railroad maintained 92 lightering boats, and the Pennsylvania Railroad maintained 104 vessels. In 1908, the Lehigh Valley Railroad had 250 craft, while the Baltimore and Ohio had 142 (Harding 1912). Three other railroads had fleets numbering more than 200 (Brouwer 1987). In 1907, the New York Central fleet moved 304,372 cars on float, or about 1,000 per day, in addition to 1,402,358 lightered tons of bulk freight, or some 5,000 tons per day (Harding 1912). In 1917, all railroad freight shipped to or from Manhattan Island (apart from New York Central's track) arrived by lighter or carfloat (French 1917).

Table 2-03. Railroad tonnage in 1914 by commodity, percentage, and local movement.*

Commodity	Carfloat		Lighter		Total	
	Tons	%	Tons	%	Tons	%
Grain and mill products	593,000	14.0	3,232,000	76.1	4,244,000	100
Foodstuffs	2,714,000	42.1	1,195,000	18.6	6,442,000	100
Fuel and ores	568,000	1.6	31,903,000	90.9	35,101,000	100
Building material	829,000	17.0	2,323,000	47.8	4,865,000	100
Miscellaneous	6,100,000	49.0	2,607,000	20.9	12,463,000	100

*adapted from New York, New Jersey Port and Harbor Development Commission 1920

Expansion of the free lighterage system allowed waterfront industries to develop floating sidings. Terminal companies took advantage of the situation by developing ports within ports, providing steamship piers; loft buildings and freight stations, all served by private rail networks connected by carfloat. Companies set up special terminals for bananas, coal, grain, and perishables. A Merchant's Association of New York representative described the waters of Manhattan as "an interior belt line employed in switching cars between the terminals on the New Jersey shore and the industries...in various parts of the harbor" (Squire 1918:3).

The water belt line or lighterage and carfloat system came under attack around 1910. Independent cost analysis suggested that the system suffered from cost overruns, particularly delay and damage to freight. These allegations, however, often originated from rival ports. Objections also came from urban planners, who complained about the disproportionate amount of waterfront occupied by railroad marine operations. Supporters recognized that if operations moved elsewhere in Manhattan, companies would occupy space even more valuable.

The New York Port Authority (est. 1923) tried to carry out a comprehensive plan of replacing marine operations with land-based belt lines. Railroad executives refused to cooperate with one another; despite studies showing increased revenue by unifying terminals and belt lines, rail companies preferred the traditional lighterage/carfloat system (Flagg n.d.). The Port Authority modernized pier and vehicular crossings, eventually substituting motor trucks for lighterage.

Modern containerization and trucking diminished the importance of the lighterage system by 1960. The system's demise came with the advent of the modern standardized freight container, which is adapted for quick transference from and onto train, truck and specially adapted ships (Brouwer 1990:54). By 1976, railroads no longer provided lighterage service. Hundreds of abandoned wooden vessels associated with this industry now litter the port's shoreline. Flagg et al. (1992) accurately noted that steel barges contain valuable scrap and are less likely abandoned. Some derelicts served as storage units for a time, but eventually lost any useful function.

The lack of railroad initiative aided Manhattan's port decline. Marine business slowed to the point that railroads found it cheaper to transfer freight in New Jersey by truck rather than by lighter. By the early 1970s, most free railroad lighterage in New York's port ended. The last carfloat operation in Manhattan ended in 1976.

STATEN ISLAND

Relative to the New York-New Jersey metropolitan area, Staten Island is both water-bound and isolated. Historically, the island's western border, the Arthur Kill channel, and its northwestern border, the Kill Van Kull, played vital roles connecting New York with New Jersey, Philadelphia and Long Island Sound. Staten Island rests between New York Bay and New Jersey's northwestern shoreline, the Arthur Kill channel separating the Island from the latter. The Island's geographical center is situated 11 miles southwest of New York City. The Kill Van Kull extends from Newark Bay to New York Bay and separates Staten Island's northwestern shoreline from New Jersey at Bergen Point. Bayles (1887) states that the Island's name is an English rendering of the Dutch form *Staaten Eylandt*, meaning "Islands of the States."

The name "Kill Van Kull," historically known as the Kills, is apparently Dutch for "Kill of the Cul" (*Het Kill van het Cul*) (Bayles 1887). *Kill* is a Dutch word for "creek," while *Cul* is possibly French for "bay," thus, "the creek of the bay." *Achther Cul*, the Dutch rendering for Newark Bay, meant "Back Bay," the Dutch word *achter* meaning "after" or "behind" (Clute 1877).

De Vries (1655), as cited in Wacker (1975), comments on the immense numbers of water fowl on the Achter Cul, stating:

> There are great numbers...of geese, which stay here through the winter, by the thousands, and which afford fine sport with a gun...Land birds are also very numerous, such as wild turkeys...taken by the savages with their hands, who also shoot them with bows and arrows...There are different kinds of fine fish...haddock, plaice, flounders, herring, sole, and many more kinds...There are fine oysters, large and small, in great abundance. In the summer time crabs come on the flat shores, of very good taste [Wacker 1975:23-24].

The description offered by De Vries is a far cry from the fouled and polluted waters of the modern Arthur Kill and Kill Van Kull channels.

Initially, Native American conflict hampered European development of Staten Island. As part of the Province of New Netherland, the Island fell under the jurisdiction of the Dutch West India Company (1621 to 1664) (Black 1982). In 1661, French Waldenses and Huguenots established a modest village near South Beach, apparently the Island's first permanent European settlement (Steinmeyer 1950).

The Dutch surrendered its Island claim to England in 1664. Native American conflict culminated in the "Peach War" of 1655, which depopulated the Island where "settlement had to be recommenced" (Bayles 1887; Black 1982). Staten Island became part of the shire of Yorkshire. Francis Lovelace, who purchased Native American land rights to the island in 1670, laid out lots on the Island's north, south and west sides. In 1675, the Island obtained separate jurisdiction, and in 1683, a separate county, Richmond.

Demographically, seventeenth-century Staten Island mirrored early Dutch and subsequent English settlements. Under English domain, the Island witnessed the arrival of fugitive French Huguenots in significant numbers. By the mid-1700s, Staten Island included Dutch, French, Belgian, and English populations (Bayles 1887).

Between 1790 and 1810, the Island featured a rural population subsisting on farming, fishing, and maritime commerce. The population (5,347) increased more than 39 percent by 1810 (Sachs and Waters 1988). Agriculture (beef, pork, wheat, rye, apples) and seafood (fish, clams, oysters) sustained the Island's population (Cotz et al. 1985). The community also harvested salt hay from the extensive salt meadows in Northfield, Southfield, and Westfield townships (Akerly 1843).

Commercial oystering dates from the earliest Dutch settlements. The industry even advertised in early Dutch journals (Powell 1976). Considered a staple in the eighteenth century, oysters were shipped locally and abroad. Beds thrived in the Arthur Kill's deeper waters, Princes Bay, the mouth of the Raritan River, and the Kill Van Kull (Hine and Davis 1925; Sachs and Waters 1988).

Extensive marshes north of later Rossville, coupled with the Island's remoteness (relative to New York City and Philadelphia markets), slowed coastal development. There was little settlement east of Palmer's Run (later called Bodine Creek); this area was part of a large area owned by John Palmer and Thomas Donegan, who built several mills in Palmer's Run in the 1680s. These mills, particularly a gristmill built by Donegan where Richmond Terrace crosses Bodine Creek, served a wide area, including farmers as far away as Bergen Point, until 1795. This mill was replaced by a new flourmill just west of Broadway, built by John McVickar, who had recently purchased the Donegan estate. This mill was powered by a diversion of Palmer's Run to a pond, which fed the mill's race. This system of waterpower powered the island's first large industry after 1819.

Furthermore, large land grants encompassing the Island's southern end restricted settlement. Mark Dusachoy, described in a seventeenth-century deed transaction as a "planter," held some 823 acres in the Smoking Point area (Schneider 1977). Christopher Billopp received about 1,600 acres on the Island's southwest corner. Begun circa 1709-1716 and running between Perth Amboy and the end of Amboy Road, the earliest ferry across the Arthur Kill was included in Billop's grant. Besides local ferry service, given opportunity, the Billopp ferry probably served as a link between New York City and Philadelphia. The ferry operated intermittently from the Amboy Road site until the beginning of the Civil War, when the landing moved a half mile north (Raber et al. 1995a:24).

By the end of the colonial period, subdivided Billopp grants, together with other smaller grants, led to increased farming near the Arthur Kill, south of Fresh Kills. Eventually, smaller communities emerged north of the Billopp grant boundaries as New York/Philadelphia markets expanded. The initial franchise, Old Blazing Star (now Rossville), is located in an area north along the south side of what is now Arthur Kill Road (prehistoric Smoking Point). The name "Blazing Star" apparently originated from taverns at each ferry site. Old Blazing Star remained the project area's principal settlement until after the American Revolution. The New Blazing Star Ferry at Tompkinsville (Linoleumville) opened around 1757, and by 1764, it featured a stagecoach connection.

One of the earliest ferries to cross the Kill Van Kull, the Port Richmond-Bergen Point ferry, dates to the 1690s. Jacob Corsen petitioned the New York Governor's Council in 1750 for a patent stating that he had operated a ferry between Staten Island and Bergen Point for some 60 years. His request, to "erect" his vessel into a public ferry, grew out of fear of competition as a result of increased population. Corsen received the patent, operating the ferry until 1764. New owners took over the operation the same year (Reed 1959). Isaac Decker took over the ferry in

1774, and operated it until 1780. During this time he added a direct freight and passenger ferry to New York City. Another early ferry operating in the area was the Howland Hook ferry, which was built on the edge of a large marsh, and was accessed via a causeway. It was operated by one Adoniah Schuyler from 1736 until the Revolution.

The New Blazing Star route began in New York City and crossed the North River by ferry to Powle's Hook (Jersey City), to Bergen Neck (Jersey City and Bayonne), to Bergen Point, where the ferry carried passengers and freight across the Kill Van Kull (Reed 1961). The New Blazing Star differed from the Blazing Star Ferry that ran from modern Rossville, Staten Island to the opposing New Jersey shoreline. The New Blazing Star did not operate during the Revolutionary War.

British forces occupied the island during the Revolutionary War. Up to 40,000 garrisoned British and Hessian troops occupied the island, many stationed near the western shore (Sachs and Waters 1988). This was perhaps due to the location of the Old Blazing Star ferry and its subsequent access to Philadelphia and New Jersey (Schneider 1977). After the war, local officials confiscated and subdivided the grant's remaining acres. Development of the island's hamlets, villages, and industry depended in part on transportation networks (i.e., ferries, landings and roads).

Ferry service provided early links with the mainland. By 1816, Daniel Tompkins' Richmond Turnpike Company opened a road connecting the northeast shore (Tompkinsville) with the New Blazing Star Ferry west in Linoleumville. Tompkins then offered steamboat service between Tompkinsville and Manhattan, establishing a direct route between New York and Philadelphia (Cotz et al. 1985). The ferry at Tottenville linked Staten Island with Perth Amboy, and the one at Holland or Howland Hook with Elizabeth, New Jersey. Another ferry ran across the narrows to Brooklyn. Kill Van Kull service ran between Bergen Point and Port Richmond (Leng and Davis 1930). In the 1830s, a horse ferry operated across the Kill Van Kull. The vessel, known as Coyles' horseboat, ran during the late 1830s and early 1840s. The project lasted only a few years, with the service replaced by rowboats or scows (Reed 1959).

Despite New York Harbor expansion, the Arthur Kill's marshy shoreline continued to hamper large-scale commercial development. In 1810, the Island's primary industries included two textile carding machines, two tanneries, three distilleries, and 59 looms producing some 23,100 yards of flaxen fabric, 12,000 yards of woolen fabric, and 7,000 yards of blended cloth (Sachs and Waters 1988). Even as the channel itself became an increasingly important commercial route, communities along the Arthur Kill remained largely agrarian.

Early industrial development began on the north shore at Factoryville, now West New Brighton. In 1819 Barrett, Tileston, and Company established a dyeing and printing house there (Leng and Delavan 1924). Port Richmond served as the location for the Staten Island Whaling Company and later the Jewett White Lead Works (1842).

The Island's rich clay and kaolin deposits on the southwest shore along the Fresh Kills and lesser deposits on the north shore led to an emerging brick-manufacturing industry (Sachs and Waters 1988). German immigrant Balthazar Kreischer, knowledgeable in the construction trades, built a Manhattan brickworks in 1845, and in 1852 built the International Ultramarine Works on the Arthur Kill south of Smoking Point.

In 1854, Kreischer established a clay and firebrick works on the Island that operated in several locations, the earliest and largest located along the Arthur Kill south of Rossville (Sachs and Waters 1988). In 1873-1874, he moved the entire manufacturing operation to a 3-acre site just north of the Outerbridge Crossing. In the 1880s, the family-owned plant produced an estimated

3.5 million bricks annually. Kreischerville became an industrial community. The plant shipped all products by water, building a steam lighter in 1880 (Raber et al. 1995a).

Transportation improvements during the last half of the nineteenth century accelerated Staten Island's industrial growth. The first railroad linked Clifton with Tottenville in 1869 (Leng and Delavan 1924). Small communities developed around the rail stations. Immediately after the Civil War, heavy industry expanded, especially after the 1880s. The emerging transportation industries and the subsequent communities built near their local hubs brought new occupations and services, providing opportunities for blacksmiths, coopers, wheelwrights, grocers, bakers, and printers (Sachs and Waters 1988).

The Staten Island Rapid Transit Railway Company opened a train bridge over the Arthur Kill in 1889. Coaches and horse cars linked north and east shores with Richmond and Linoleumville to the west (Leng and Delavan 1924). By 1880, Staten Island's population totaled approximately 40,000, 90 percent clustering in villages along the northern and eastern shorelines. The rest of the island remained rural farmland, swamp, salt meadow, or beach. The Island featured 100 manufacturing plants employing some 1,550 people, mostly young men, though the plants employed 88 females over 15, and 30 children (Sachs and Waters 1988).

By the mid-1900s, agricultural chemical production facilities, metallurgic industry plants, clay and brick production facilities, building material factories, copper refineries, shipyards, and emerging petroleum industries lined the Arthur Kill's western shoreline. At Staten Island only a few small industries appeared: the American Linoleum Manufacturing Company, Atlantic Terra Cotta Company, Kreisher Brick Works, and Tottenville Copper.

During the early twentieth century, New York's port handled 40 percent of all U.S. foreign trade; the average annual value of imports and exports during 1911-1913 totaled $1,809,358,239, or 46.2 percent of that for the U.S. (Squire 1918). In 1920, nearly half of all foreign commerce for the U.S. entered through the Port of New York. Some eight million people lived within a 25-mile radius of the Statue of Liberty (New York, New Jersey Port and Harbor Development Commission [PHDC] 1920), yet the Arthur Kill waterfront remained underdeveloped.

Local economic fallout following World War I, limited access and pollution governed the Island's future. When the Department of Health traced typhoid fever to Staten Island oysters, the department condemned the industry (Bureau of Curriculum Research ca. 1980s). Water pollution destroyed oyster beds, and by the early twentieth century, the local fishing business little resembled its admirable past.

Chemical and copper refineries along the Jersey shoreline released gaseous contaminants into the atmosphere. Prevailing westerly winds, in turn, pushed contaminants across the island, ruining agricultural production. Industrial waste eventually made Staten Island's real estate less than desirable. New York City started dumping garbage on the Island in 1916. Initial operations failed in 1918, but in 1946 dumping resumed. Following a series of land transfers, the present Fresh Kills Landfill on Staten Island is considered the largest landfill in the world.

The disposal of garbage, particularly during the nineteenth century, created special problems for local residents. Until 1934, ocean dumping was commonplace. Shoreline residents from Long Island to New Jersey complained of nasty beaches and shorelines. Dead cats, dogs, and chickens, and putrid fruits and vegetables lined the area shoreline. The problem, recognized by local officials, proved difficult to correct (Corey 1991).

The garbage scow, a barge filled with garbage, became commonplace on the rivers and channels. An article in the *New York Times* (*NYT* 1880) noted that the amount of garbage dumped in the harbor actually filled certain channels (as presented in Corey 1991). In 1871, the New York legislature enacted laws prohibiting the dumping of garbage into the waters of the North (Hudson) and East Rivers, Upper New York Bay, and parts of Raritan Bay (Corey 1991). As a result, legal dumping moved to southeastern Staten Island.

STATEN ISLAND SHIPYARDS

The scarcity of timber following the American Revolution somewhat diminished the Staten Island shipbuilding trade. After the war, the U.S. shipbuilding industry thrived because of low-cost construction made possible by cheap timber (Hutchins 1948). The growth of the fishing and oystering industries following the War of 1812, and later the expansion of recreational boating industries, brought a revival in wooden boat/ship construction and repair.

By 1855, shipwrights in Tottenville (particularly in an area called Unionville), many of Scandinavian descent, produced sloops, schooners, propeller yachts, and coal barges. At one time stores stocked Norwegian newspapers because Staten Island had so many Scandinavian ship carpenters (John Noble Collection 1973). The William H. and James M. Rutan Shipyard built nearly 100 sloops and schooners (manuscript on file, Staten Island Institute of Arts and Sciences). Jacob Ellis operated a shipyard near the foot of Tottenville's Main Street. At the south side of the Ellis yard stood a blacksmith shop (A.E. Rolles) where Ellis's vessel fittings were probably wrought. Before mid-century, sailing lofts, which later manufactured building awnings, established services on the north shore. Rope walks appeared in Rossville and Richmond in the late 1850s (Sachs and Waters 1988).

One of Ellis's shipwrights, Chris Brown, eventually opened a business at the foot of Amboy Road, later building the oceangoing tug *Cyclops*, renowned for towing huge rafts of lumber from Nova Scotia to New York (*Staten Island Advance* March 24, 1968). By 1880, Staten Island had 17 shipbuilding firms, eight in Tottenville. These latter eight yards included eight marine railways. Described by Henry Hall in 1880, "this is a fishing locality, with coal depots in New Jersey, and the work is largely for smacks (fishing), tugs, and coal barges" (Hall 1884:119).

From the middle to late nineteenth century, shipbuilding industries played a major role in Staten Island's maritime economy. Staten Island shipbuilding dramatically increased during WWI. Stephen Cossey operated a 20-acre plant that during its 22-year history constructed 1,149 boats. The $30,000,000 industry produced lighters, tugs, dredges, coastwise vessels, and dry docks. More than anything else Tottenville celebrated its shipyards and the quality and quantity of work done in them. The yards planned and built tugs, schooners, oyster boats, sloops, yachts, and all conceivable craft of ordinary tonnage, besides the work of overhauling, rebuilding, refitting, altering, etc. that is always ongoing. Competent mechanical work gave Tottenville shipyards an excellent reputation all along the coast.

Staten Island's shipbuilding tradition continued into the twentieth century. The Staten Island Shipbuilding Company (est. 1895) is historically known for its steel hulls and diverse designs. The early hulls built by the yard included tugs, carfloats, scows, barges (oil and coal), yachts, schooners, ferryboats, steam and derrick lighters, dredges, drill boats, and in recent years, mine sweepers, cargo freighters, and tankers (Allen 1922). There is a distinct probability that some of the derelict sites associated with the project area are vessels built by the Staten Island Shipbuilding Company.

BAYONNE

The Bayonne peninsula, to the north of Staten Island at the junction of Newark Bay, Kill Van Kull, and Arthur Kill, experienced a restricted amount of large-scale waterfront development due to shallow water surrounding the area. Development was concentrated on the Kill Van Kull until navigation improvements in the early twentieth century opened Newark Bay to larger vessels. Due to its central location, the Bayonne peninsula benefited from increasing maritime traffic and was eventually transformed from a rural destination of wealthy New Yorkers in the nineteenth century to an urban industrial center in the twentieth century.

Inland navigation improvements in 1825-1835, along with rail connections, including the Elizabeth-Somerville (later the Central Railroad of New Jersey), were responsible for an increase in vessel traffic in the early nineteenth century. Such traffic carried coal from Pennsylvania, clay products from New Jersey, and manufactured goods from the surrounding area, and soon made cities like Jersey City and Elizabethtown into new industrial centers. In 1864, the Central Railroad of New Jersey opened the railroad bridge across Newark Bay and enabled coal to reach Jersey City via Bayonne.

Rail links through Bayonne resulted in its incorporation as a town in 1861 and as a city in 1864. The Port Johnson terminal, at which was transshipped large amounts of coal, was the first sizeable industrial development, and set the stage for Bayonne's rapid growth as a center of industry. By 1875, the population growth of New York had increased the demand for kerosene used for lighting. Petroleum companies, seeking more inexpensive and larger areas than could be had in Brooklyn and Queens, soon relocated to the peninsula. Standard Oil completed the first long distance pipeline to Bayonne from oil fields in Texas, and Bayonne became a national center of petroleum refining. By the end of the nineteenth century, industrial activity had filled most of the Bayonne peninsula to somewhere east of Port Johnson.

Concurrent with the rise in demand for gasoline to power automobiles and generate electricity, production switched from kerosene to gasoline. This increasing demand resulted in the construction of new and bigger plants. This second wave of industrial expansion extended to 1917. By this time, most of the marshlands had been filled in.

Maritime traffic began to diminish after WWI, and many waterfront industries disappeared during the Great Depression. Today, petroleum refining continues to form a large sector of the local economy, but not to the extent of the early twentieth century.

Shooters Island

The known history of Shooters Island, so called because the Dutch supposedly went there to shoot wild geese (Leng and Davis 1930:120), begins in the mid-nineteenth century and continues to the present. Its industrial use resulted in filling and expansion of the area of the island from its original six acres to upwards of 42 acres today. The first firm use of the island was by the Shooters Island Petroleum Refining and Storage Company. This company erected several buildings on the island including a refinery, storage building, a cooper and barrel house, engine rooms, still, and other smaller buildings. The island's use as a refinery continued through the second half of the nineteenth century, when, in 1898 or 1900, Townsend and Downey opened their shipyard. The primary product of this shipyard was cruising and racing yachts, including the *Atlantic*, which set a transatlantic record in 1905, and the *Meteor*, which was built for Kaiser Wilhelm of Prussia. Morten and Downey operated this shipyard until 1906. At the start of WWI, Standard Shipbuilding Corporation began building steel cargo ships. Before suspending operations in 1920, this shipyard constructed some 29 vessels.

Since the Standard Shipbuilding Corporation closed, there has been no formal use of the island, although it continued to be occupied and used in a casual manner. Most notably, Shooters Island has been used as a dumping ground for abandoned, disused, and obsolete vessels. Today it has been reserved as a bird sanctuary.

3. INVESTIGATIVE PROCEDURES

FIELD INVESTIGATIONS

The six vessels were recorded using a combination of measured drawings, photography, video and a Total Station. Recordation was accomplished through the use of both diving and surface work from a small boat. Two vessels, V38 and SS16b, were entirely submerged and were recorded in their entirety by archaeologists using surface supplied air (SSA). Submerged portions of two other vessels (V33 and V37) were examined and recorded using the same method. The remaining vessels were accessible to surface crews working from a small boat.

ENVIRONMENTAL CONDITIONS

Water depths at the dive sites ranged from 2 to 10 feet. Water temperature was in the mid-70° range throughout the project. There was no thermocline. Air temperatures ranged from 80° to 90°. Surge and surf were minimal, although boat wakes were frequent. Rain was encountered on several days but did not hamper the diving operations.

SMALL BOAT OPERATIONS

Archaeologists from Panamerican used a small johnboat to access the above water portions of V2, V33, V36, and V37. The boat was tied to a section of the wreck protected from the direction of wake and wind action, and equipment was transferred to the deck of the vessel being recorded. A baseline was placed along the centerline of each vessel, and offset and trilateration measurements were taken to various vessel components. Photography was used to record construction details.

DIVE EQUIPMENT

Vessels V38 and SS16b were entirely submerged, and were recorded in their entirety by divers. Throughout the diving phase of the investigation, operations utilized surface supplied air (SSA) due to its inherent safety and efficient operations. SSA provides direct diver-to-surface air and communication. The system contains two complete diving sets, each with a dive helmet and 200-foot surface-to-diver air supply umbilical, polypropylene rope safety line, communications cable, and pneumatic hose. The Kirby-Morgan Superlite 17 helmets (Figure 3-01) are equipped with speakers, microphones, regulators and, at the air intake, a non-return safety valve. The communications components, regulators and non-return safety valves of the dive masks are checked for proper functioning prior to each dive. In addition, divers using SSA wore safety equipment including a harness, quick-release attachments connecting the diver to the surface umbilical, a 50-cubic foot auxiliary air tank, quick-release weight belts, and protective gear including wet suits, boots, and gloves, which were worn during all diving operations.

A cascade air system for SSA diving provided no less than two 200-cubic feet 2100 PSI commercial K-bottles of certified breathing air. The system included a 50-cubic foot 3000 PSI backup cylinder worn by the diver and connected to the dive helmet as an emergency air source in the event of primary air failure. The diving supervisor monitored the air supply system during each dive to ensure correct air pressure. Air supply hoses consisted of Gates 33HB commercial dive hoses with a rated bursting pressure of at least 1000 PSI. A 3/8-inch polypropylene rope safety line secured the air supply hoses. The communications cable integrated into the diver umbilical included a 16-gauge four-conductor cable with oil resistant jacket. The diver umbilicals consisted of Synflex 3630-4 × 1/4-inch 300 PSI working pressure pneumo hoses.

Dive length time corresponded to that prescribed by the standard Professional Association of Diving Instructors (PADI) SCUBA table.

Figure 3-01. Panamerican diver readies to go in the water.

Archaeological dives were conducted from a 35-foot fiberglass fishing vessel (Figure 3-02). The vessel meets all applicable Coast Guard standards for inland waterways.

Six dives were conducted between February 15 and February 23, 2005, with one on V33, one on V37, and four on V38 (Appendix D). Much of the underwater work on V38 consisted of running a baseline down the centerline of each vessel, and taking trilateration and offset measurements based on this baseline. Work on V37 and V33 included examination of the stern areas on each vessel, including taking measurements and other data. At the end of each day's diving operations, archaeologists plotted their measurements on the master site plan in Microstation 95. Errors in measurements were corrected or reconciled the next day. As a result, the final site plan exhibits a high degree of accuracy in representing the layouts of the vessels.

Figure 3-02. Dive vessel *Southern Yankee*.

Total Station Mapping

A Leica TC-600 Total Station was used to record the locations of various components of V33 vessels in three dimensions (Figure 3-03). An archaeologist placed the prism on various features while the Total Station operator recorded the points with the instrument from the deck of V36. The measurements taken were transferred to the master site plan in Microstation 95 and used to check the accuracy of the hand measurements. The Total Station was also used to record the outer hull in three dimensions, as well as points on the main deck. The hull measurements were used in Microstation 95 to create a rough three-dimensional model of V33, which was used to create the detailed cross sections of V33 and V37 presented in Appendix E.

Video Equipment

Video plays an important role in underwater investigations of this type. An accurate record of the entire site, recorded on video, is invaluable during data analysis. It enables the researcher to revisit the site without having to actually return to the site, and lets him or her add details to the measured drawings that would have been difficult or impossible to add during the dive itself. The video equipment used during this project was a Sony DCR-PC100 1-megapixel-per-frame digital video camera, using a MiniDV format and housed in a Light and Motion Mako aluminum submersible housing. A pair of 50-watt lights provided lighting for close-up shots. In addition to video capture, the PC100 camera is capable of 1-megapixel digital still photography, with the photos being stored on a small memory chip for later retrieval. Digital video allows playback using a Firewire-equipped Macintosh computer running OS 9.1 and iMovie. Clips can be imported and saved in a number of formats, and reviewed frame by frame. Still frames can be exported in a number of digital formats. The versatility of digital video and the ability of the camera to save still photos as well as video eliminate the need to use a still camera.

Figure 3-03. Project archaeologists using Leica Total Station.

Video photography played an important aspect in recording each site. In all instances, the camera provided enhanced visibility and revealed structural aspects that the diver could not see underwater. The video camera was equipped with a wide angle lens, which had a much wider field of view than the human eye and enabled the visualization of larger sections of the structure. The entire submerged structure within the project area was videotaped, with additional time spent on the areas of special interest that were identified during the first dive.

Digital and Film Photography

In addition to video, color digital photography and black and white film photography were used to document details of the above water portions of the vessels. Kodak Black and White 400 ASA film was used with a Pentax K-1000 SLR camera. For digital, an HP C500 Photosmart camera producing images of 1600 × 1200 pixel resolution was used. Photos were processed and contact sheets were made of each roll. Negatives were scanned for use in the report. A color digital photo and a black and white film photo were taken of each subject at the same time whenever possible. Detailed photo logs were kept and are presented in Appendix F.

Software

Vessel site plans and 3-D models were developed using a combination of Microstation 95 and AutoCAD 2002. Measurements were plotted daily to the master site plan to ensure accuracy.

4. VESSEL V36: CUTTERHEAD DREDGE

General History of the Dredge

The earliest accounts of dredges date to the early 1500s, when craft were outfitted with machinery used to deepen waterways and mooring areas. Mounted to any hull available, the simplest device was a scoop mounted to a long beam, which used the vessel's rail as a pivot. A windlass with a line attached toward the scoop end of the beam was used to raise and lower the scoop, or spoon, as it was called. A heavy bag was substituted for softer material.

Leonardo da Vinci designed a wheel dredge around 1500. Positioned between two identical hulls, the wheel consisted of four beams, each with a scoop or spoon at the end. As the wheel rotated, it dumped its contents into a boat placed between the hulls just behind the wheel. By the 1600s, wheel dredges with as many as eight scoops were being built, with double hulls or single hulls with "moon pools" for the wheel. Initially powered by men or horses working a capstan, in the 1800s they began to be powered by steam.

Among the earliest accounts of dredging in the present-day United States are attempts by the French in the eighteenth century to deepen the mouth of the Mississippi River. In 1718, the Company of the Indies, the French enterprise then in control of the Colony of Louisiana, sent several iron harrows from France, which were dragged across the river bars to help remove them. These harrows were unloaded and lost in Mobile, and the plan was never implemented. Several years later, in 1729, a scraper or harrow-like implement was finally built and dragged across the bar at Belize Pass, successfully deepening the channel by loosening the sediment and allowing it to be carried away by the current. In Philadelphia in the 1770s, a grab dredge, consisting of two moveable jaws or shovels, was used to clear slips, and in 1784, a man-powered treadmill machine fitted with dippers was used to remove sediment. By the end of the eighteenth century, other similar types of crude dredging devices were in use in North America (Bastian 1980:1-3).

While patents were issued for wheel dredges as late as the end of the nineteenth century, by that time more efficient systems had begun to replace the wheel dredge. One of these, the clamshell dredge, consists of a clamshell bucket suspended from a boom projecting over the bow of the dredge vessel, usually a scow. When the open clamshell is lowered to the bottom, a second cable pulls the clamshell shut. The bucket is then hoisted with a winch and the boom swings over to a holding barge where the material is released.

In the early nineteenth century, improvements began to appear in dredging technology and several patents were issued for mechanical dredging machines. Among the earliest was one issued in 1804 to Oliver Evans of Philadelphia for his machine called the *Orukter Amphibulos*. Apparently the first self-propelled wheeled vehicle in the U.S., the *Amphibulos* was described as a "large flat, or scow, with a steam engine of the power of five horses on board to work machinery to raise the mud into flats" (Bastian 1980:3). Little is known about Evan's machine, but Oliver Evans himself became one of the most important figures in the development of steam engine technology and steam navigation in the United States. With the continued development of steam power, a variety of technological improvements in dredging machines appeared. However, Bastian (1980:5) suggests that the real impetus to dredging and the corresponding advancements in dredging machines in the U.S. resulted from the passage of the General Survey Act of 1824 and the fact that the Army Engineers were given the responsibility for its implementation. Under the authority of the Act, the Engineers began to acquire, develop, and build dredges for use on a variety of harbor and inland river projects. John Grant of Baltimore built a steam-powered ladder bucket dredge for the Army Engineers in 1827 for use at Sacketts Harbor, New York (Bastian 1980:1-3). Illustrated in Figure 4-01 is an 1830s ladder bucket dredge; although employed at Ocracoke Inlet, North Carolina, it is thought to be similar to the one employed in New York.

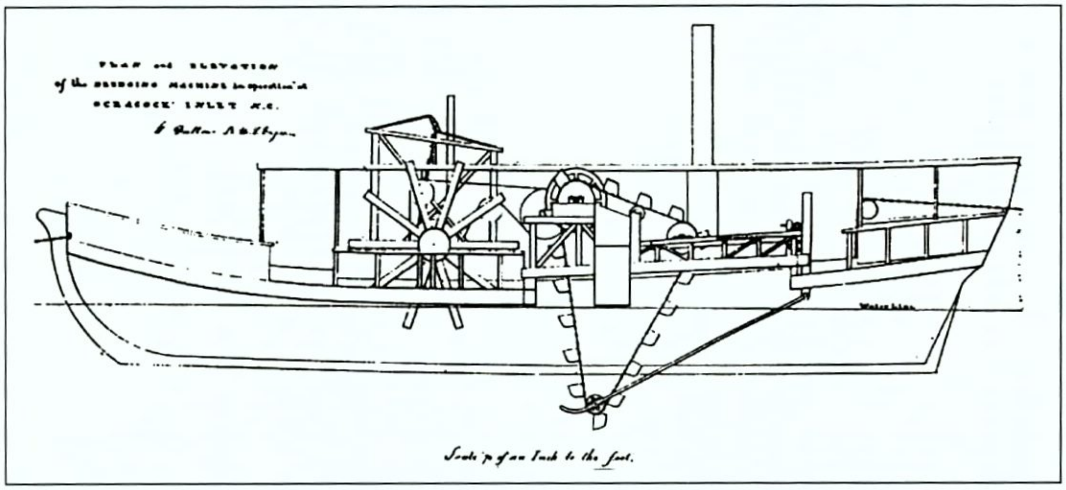


Figure 4-01. 1830s ladder bucket dredge (as presented in Bastian 1980:Figure 2).

By the early 1900s, bucket and hydraulic cutterhead dredges were the most common and extensively employed types in the dredging of harbors and navigation channels. The bucket dredge (historically related to the spoon dredge) had a simple scoop design and typically had a boom extending from its bow (Figures 4-02, 4-03, and 4-04). The boom was supported by an A-frame or mast. Another boom, equipped with a large bucket at its pivot end, rested near the midpoint of the first boom. The first boom has a cable running through a sheave at the head of the first boom. At the head of this boom is a bucket used as a scoop. In 1990, the Great Lakes Dredging Corporation used a bucket dredge in the channel at Newark Bay, off Staten Island, New York (Brouwer 1990; Mavor 1937:43).

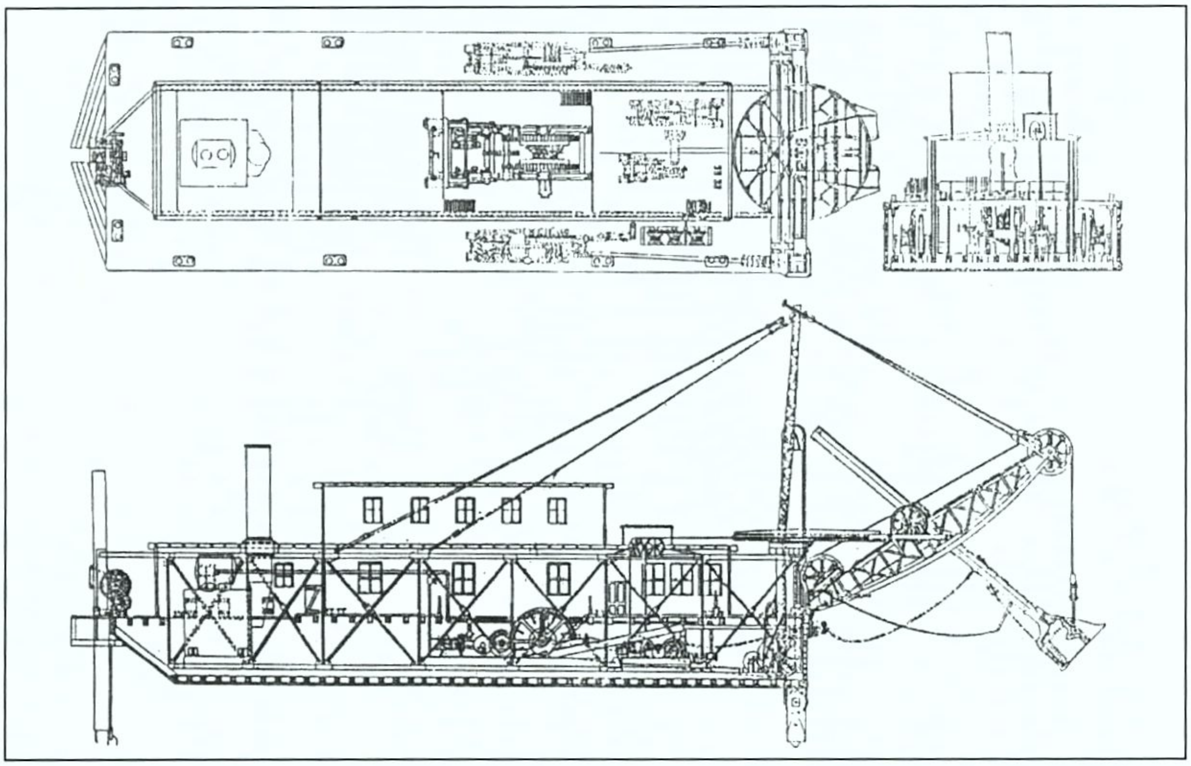


Figure 4-02. Inboard profile, deck plan, and cross section of wood-hulled bucket dredge *Toledo*. Note the spuds, legs that raise/lower and anchor the dredge (as presented in Int'l Marine Engineering 1920).

Figure 4-03. Bucket dredge in operation on the Caloosahatchie River, circa 1909 (photo courtesy of the Florida Photographic Collection).

Figure 4-04. Close-up of bucket dredge *Miami* at work on the Miami River, circa 1910 (photo courtesy of the Florida Photographic Collection).

A modern version of the wheel dredge is a ladder dredge. The ladder dredge consists of a boom, supported by a cable from an A-frame, which is raised and lowered through a well in the front of the dredge vessel. The boom is fitted with a continuous belt of large steel buckets. The tip of the boom is lowered to the bottom, and the buckets pass under the lower end of the boom, picking up material in the process. The material is dumped when the bucket reaches the top of the boom.

The subject of this study, V36, is of a cutterhead or hydraulic suction dredge type. The cutterhead dredge differs from the bucket dredge in that it suctions sediments through a pipe, the sediments having been loosened or cut by the cutterhead. The boom is usually lowered by a lift rig supported by an A-frame. The boom, or ladder, is lowered by the A-frame through a well in the front of the vessel (Figures 4-05 and 4-06). The hollow boom contains a pipe leading to a large hydraulic suction pump. The working end of the pipe usually has a rotating head fitted with cutting blades (Figure 4-07). The cutterhead loosened bottom material, which was subsequently sucked into the pipe. The material is either discharged into a waiting barge or through a floating pipeline to a point some considerable distance aft of the dredge vessel (Figures 4-10 and 4-11).

International Marine Engineering (May 1912) published data on a 20-in. Morris hydraulic suction cutterhead dredge owned by the American Pipe and Construction Company used on the New York State Canal Barge system. The hull was wooden with two heavy steel girders running fore and aft. Powered by a triple-expansion Morris engine (750 hp. at 225 revolutions/minute), the main hydraulic dredge pump, steel constructed, had a 20-in. diameter suction/discharge. The power plants utilized a surface condenser, with vertical air pumps and centrifugal circulating pumps, boiler feed pumps, and service pumps. The cutter shaft measured 8.5 in. in diameter. The cutter-drive engine (12 × 12-in. double-cylinder horizontal engine) sat on deck.

Hydraulic dredges used early this century worked extensively during construction of the New York State Barge Canal system. Stationary vessels, these dredges had no propulsion systems; they reached their destinations by tug (Brouwer 1990). As depicted in the figures below, many dredges employed vertical timbers termed "spuds" to anchor themselves in place. Raised and lowered by winches, the spud legs traveled through vertical guides called spud boxes that were built through or on the exterior of the hull. Examples of nineteenth- and twentieth-century cutterhead dredges can be seen in Figures 4-12 through 4-17. No photographs of V36 have been identified.

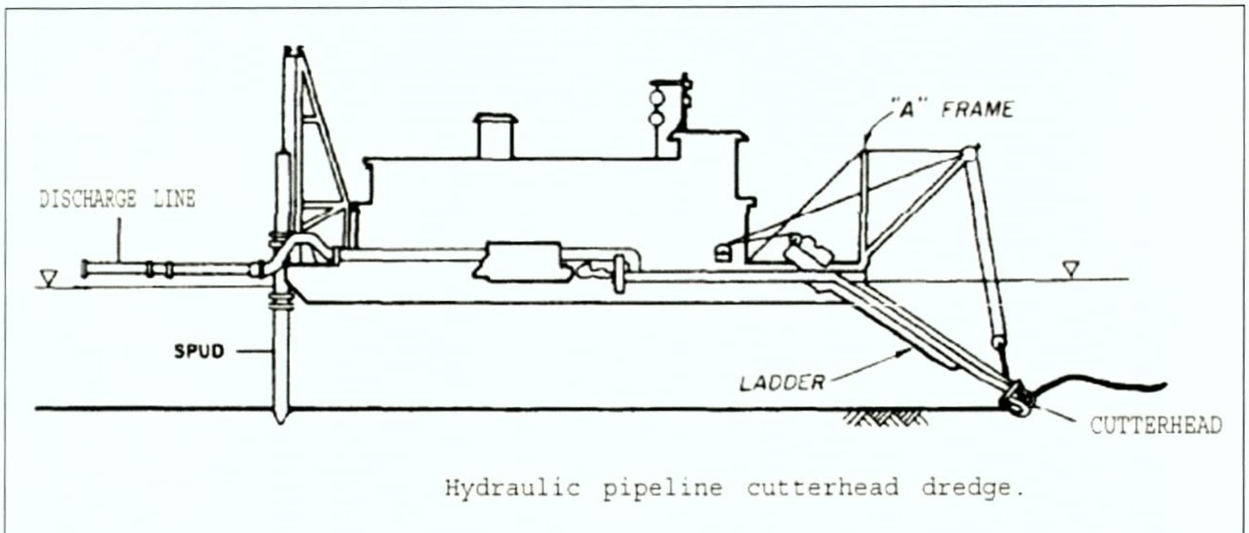


Figure 4-05. Basic cross section of a cutterhead dredge showing locations of major machinery components (as presented at www.globalsecurity.org military/systems/ship/dredge-cutterhead-pics.html).

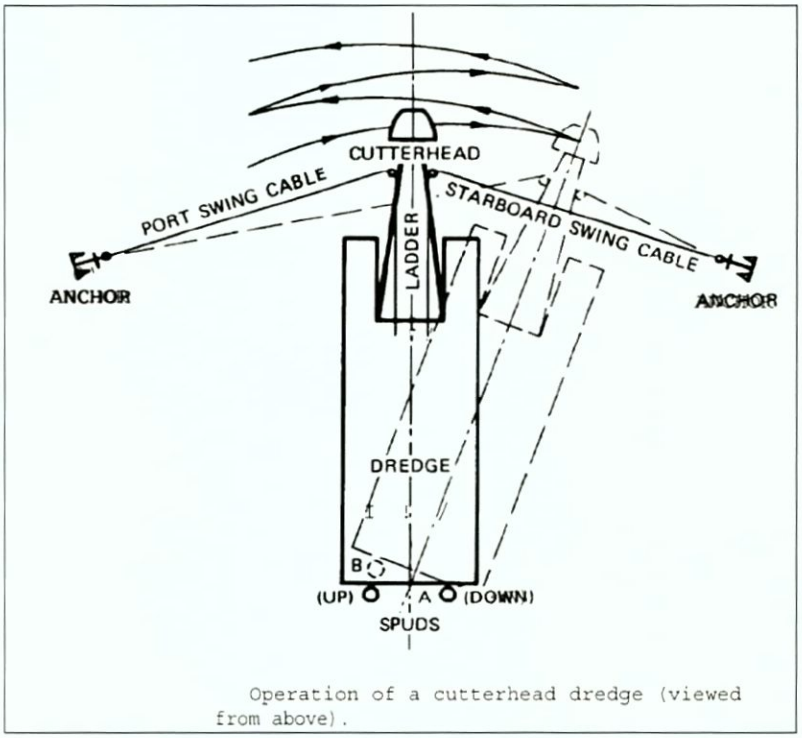


Figure 4-06. Diagram of cutterhead dredge operation (as presented at www.globalsecurity.org military/systems/ship/dredge-cutterhead-pics.html).

Figure 4-07. Dredge boom, showing cutterhead. Note also the cable system (photo courtesy of the Florida Photographic Collection).

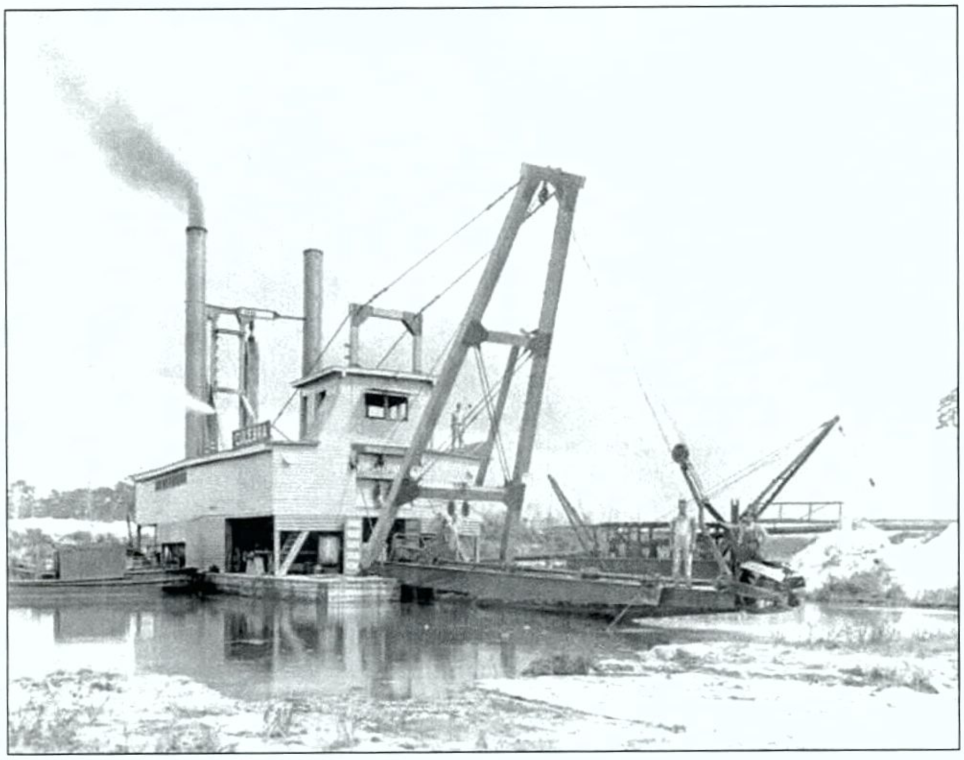


Figure 4-08. Wood-hulled dredge *Culebra,* similar to V36, showing cutterhead, A-frame, cable system and machinery cabin, St. Lucie Canal, Florida, circa 1921 (photo courtesy of the Florida Photographic Collection).

Figure 4-09. Dredge *Culebra* with boom lowered into working position (photo courtesy of the Florida Photographic Collection).

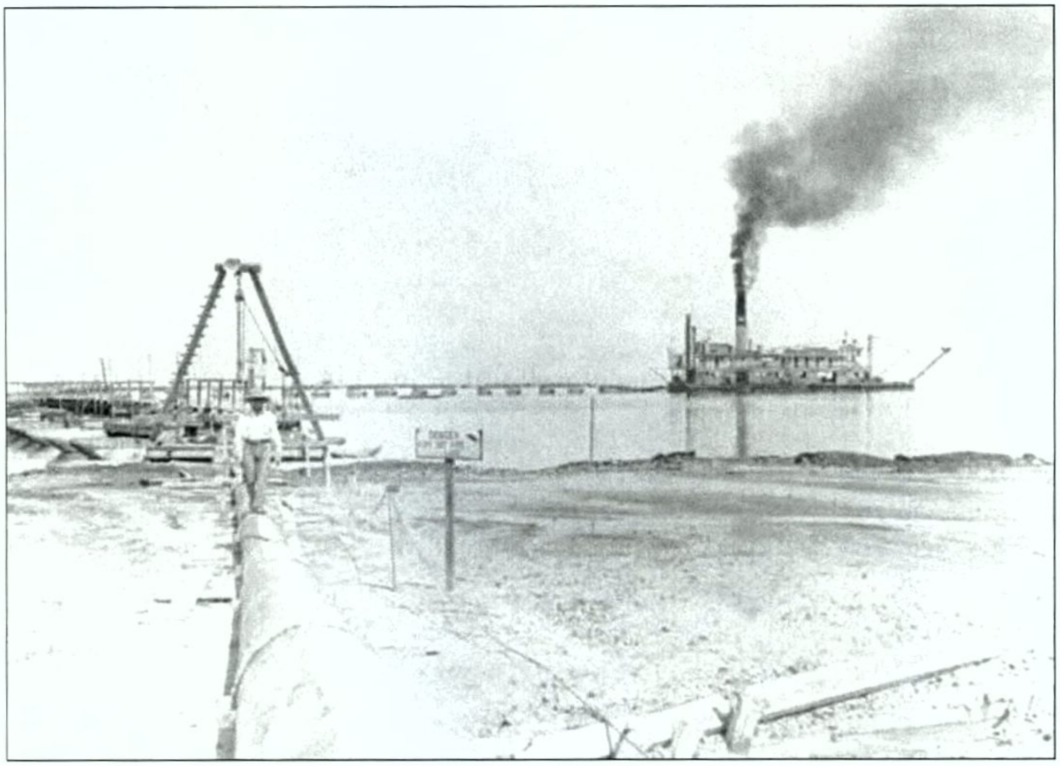


Figure 4-10. Suction dredge similar to V36 at work in levee construction on Lake Okeechobee, Florida, circa 1935. Note discharge pipe extending aft (photo courtesy of the Florida Photographic Collection).

Figure 4-11. Discharge end of discharge pipe, Lake Okeechobee, Florida, circa 1935 (photo courtesy of Florida Photographic Collection).

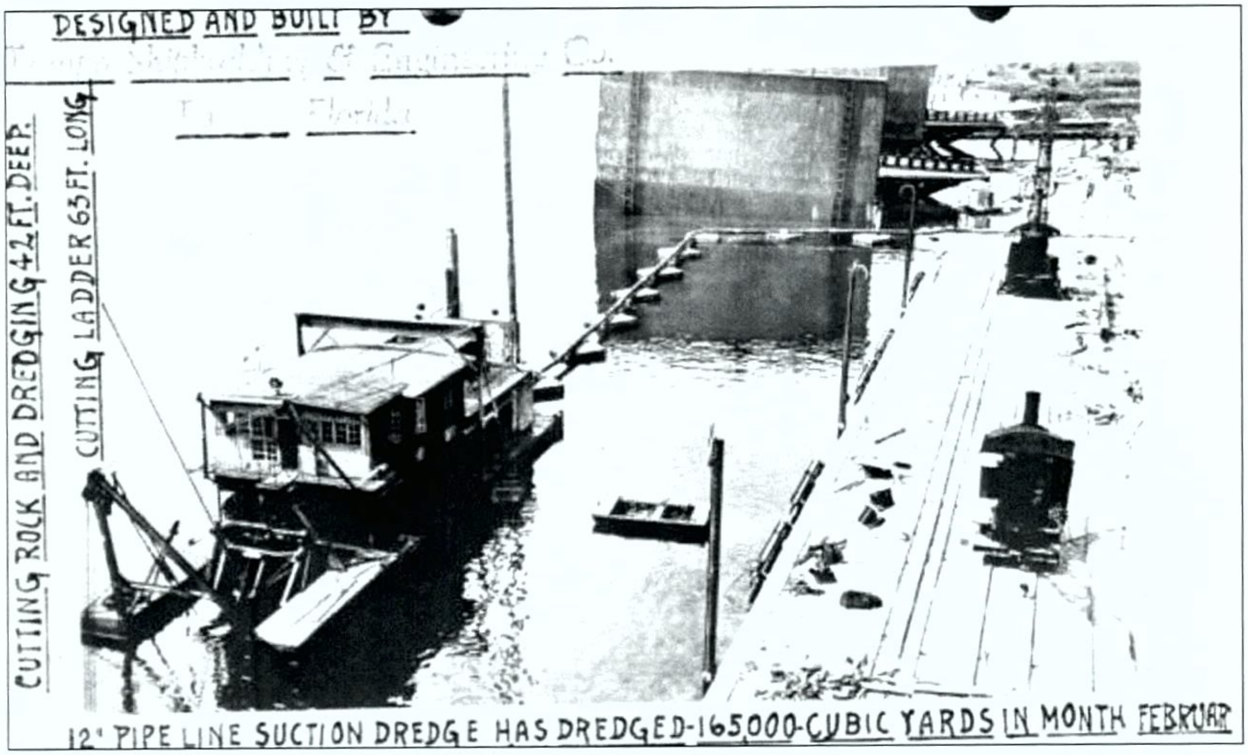


Figure 4-12. Small suction dredge at work in Tampa. Built by Tampa Shipbuilding and Engineering Company, this dredge had a 12-inch suction pipe with a 63-foot long cutting ladder (photo courtesy of the Florida Photographic Collection).

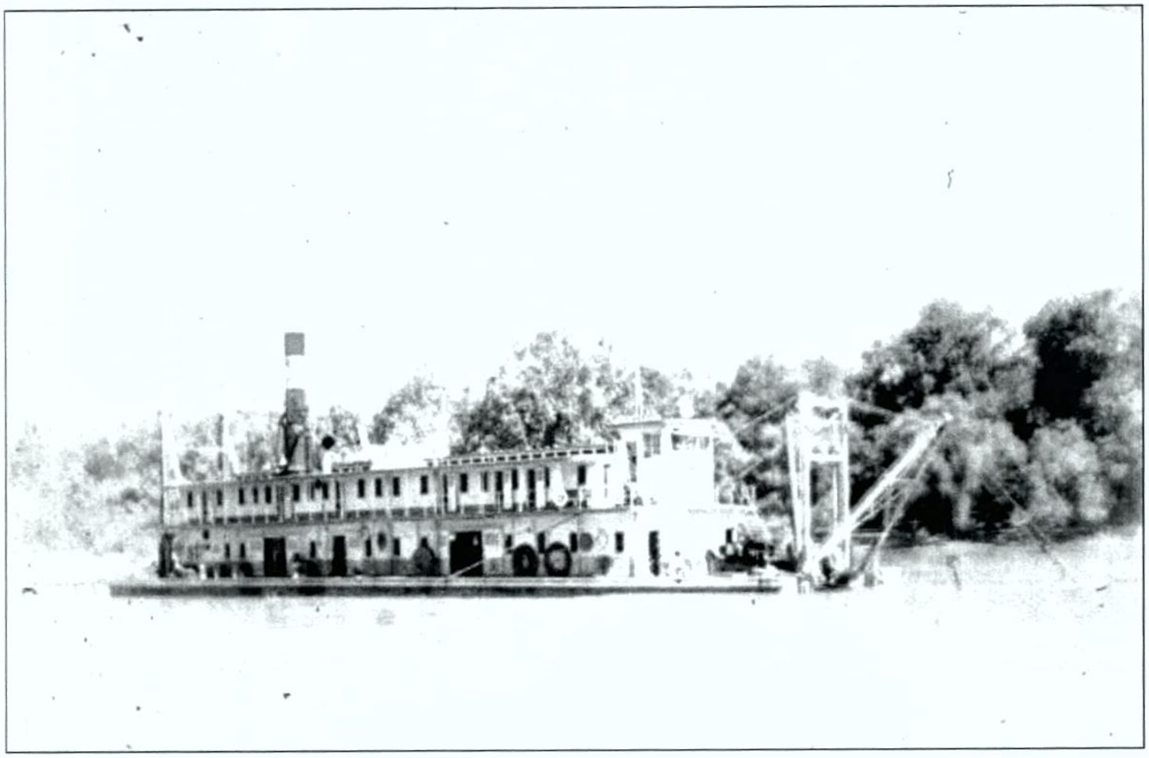


Figure 4-13. Dredge *Blackwater* at work in the Apalachicola River, circa 1920 (photo courtesy of the Florida Photographic Collection).

Figure 4-14. Dredge *William T. Guthrie* at work on the Apalachicola River, circa 1900 (photo courtesy of the Florida Photographic Collection).

Figure 4-15. Sternwheeler dredge *Montgomery* on the Apalachicola River, November 1965 (photo courtesy of the Florida Photographic Collection).

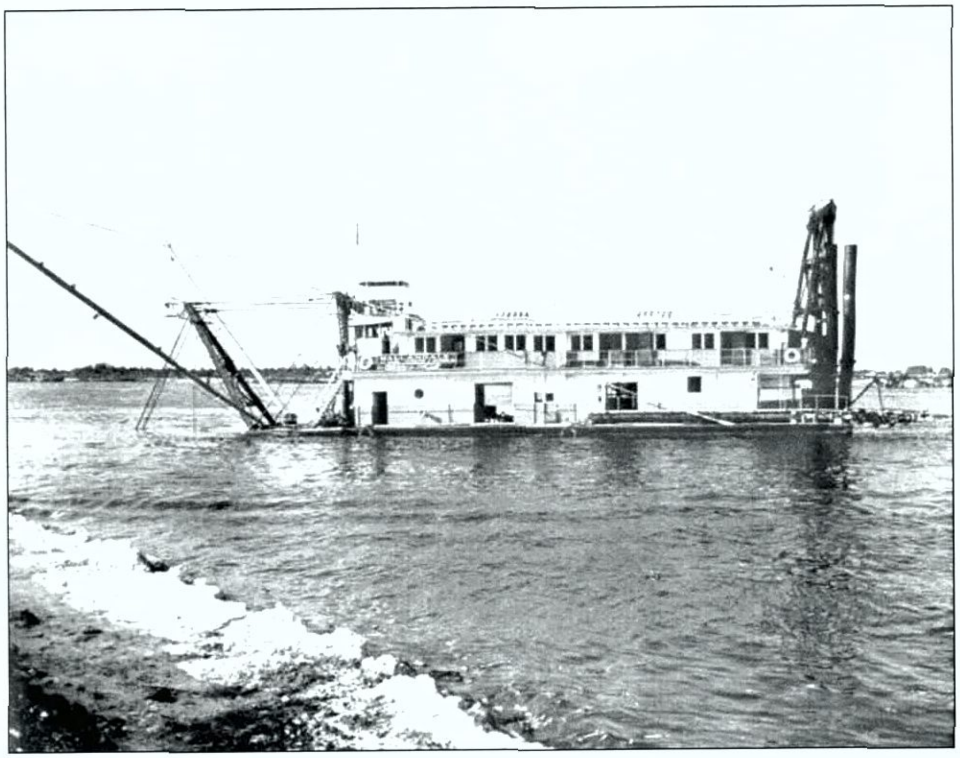


Figure 4-16. Cutterhead dredge *Hallandale*, similar in form and size to V36, at work in the Intracoastal Waterway, Fort Lauderdale, Florida, circa 1954. Note A-frame at bow and spuds at stern (photo courtesy of the Florida Photographic Collection).

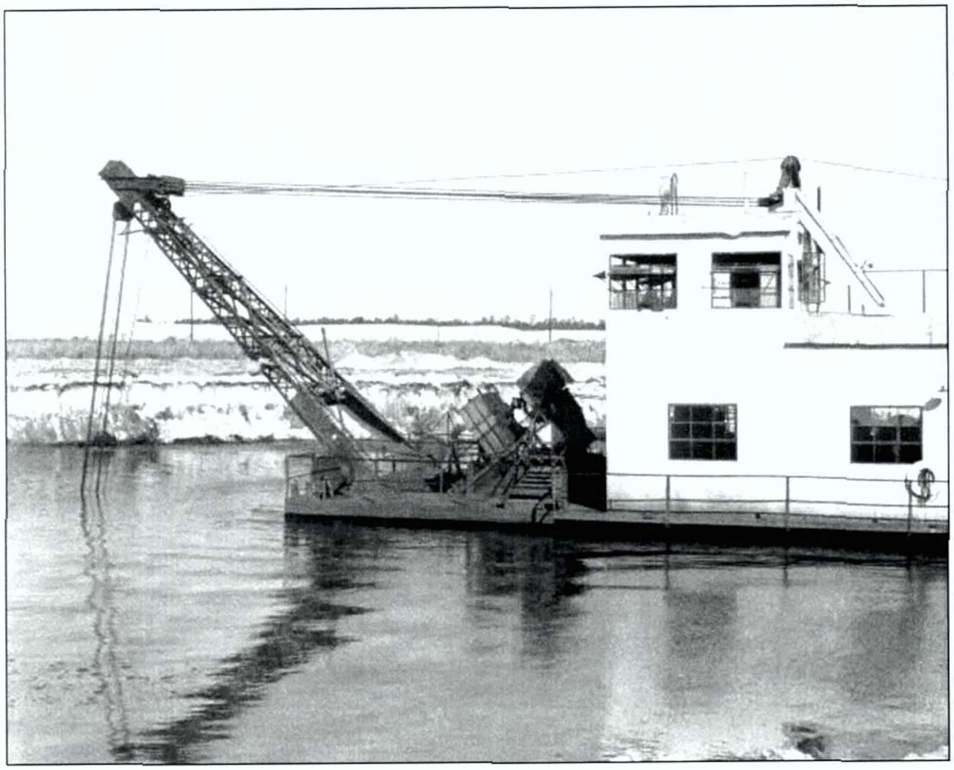


Figure 4-17. Detail of bow of cutterhead dredge *Starke*, Florida, circa 1957. Note well and cable arrangement for raising and lowering the boom (photo courtesy of the Florida Photographic Collection).

HISTORY OF VESSEL V36

Archival research turned up very little information specifically regarding V36. The best information is obtained from aerial photographs taken in 1940, 1951, 1960, 1974, 1984, and 1994 (Figures 4-18 through 4-23). Analysis of the aerial photos indicates the vessel appears to be located in its current position by 1951 (Figure 4-19), and in its present condition by 1984 (Figure 4-22). The 1940 photo (Figure 4-18) shows a vessel of similar size in the vicinity, but the resolution of the photo does not allow for the definite identification of the vessel as V36.

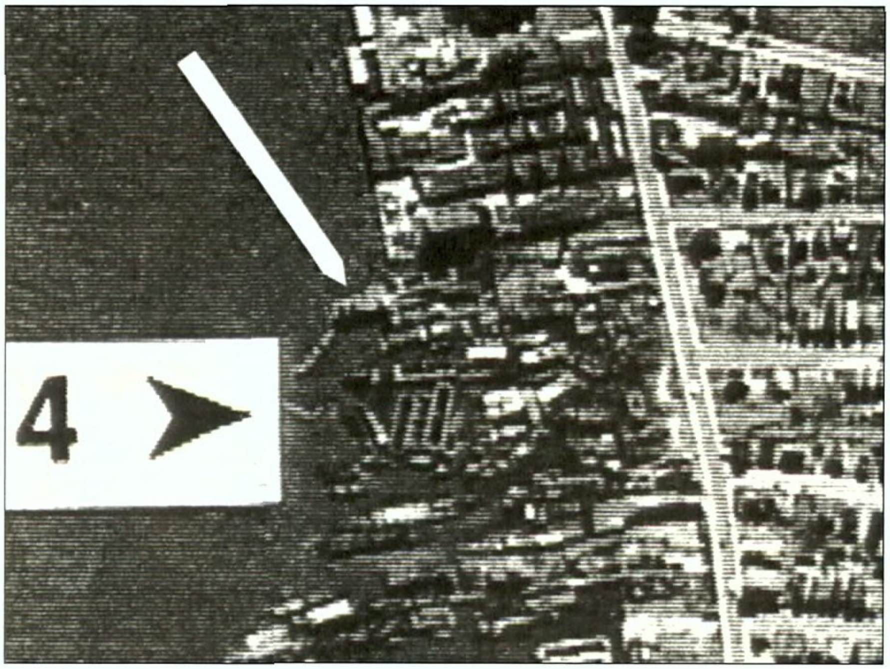


Figure 4-18. 1940 vertical aerial photo of Cluster 4, showing vessel of size similar to that of V36.

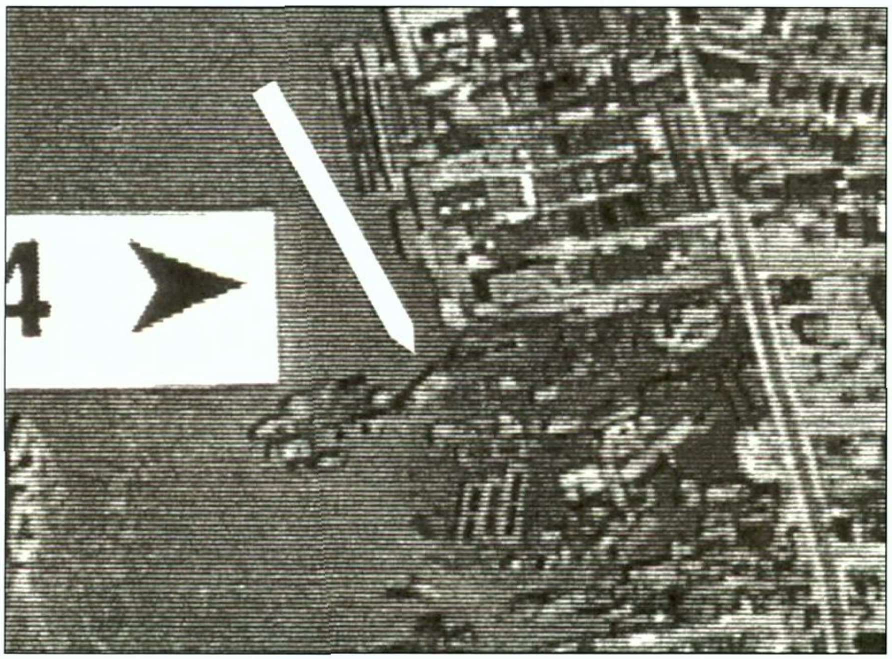


Figure 4-19. 1951 vertical aerial photo of Cluster 4, showing V36 in its current location.

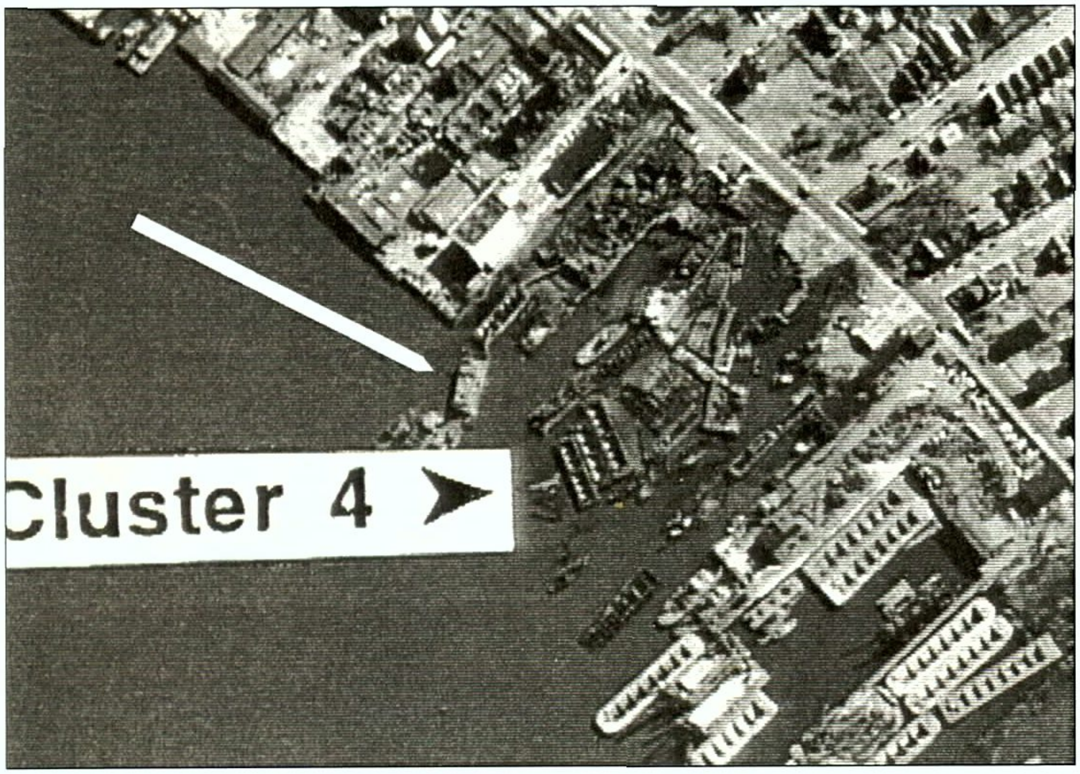


Figure 4-20. 1960 aerial photo of Cluster 4, showing V36 in its current location.

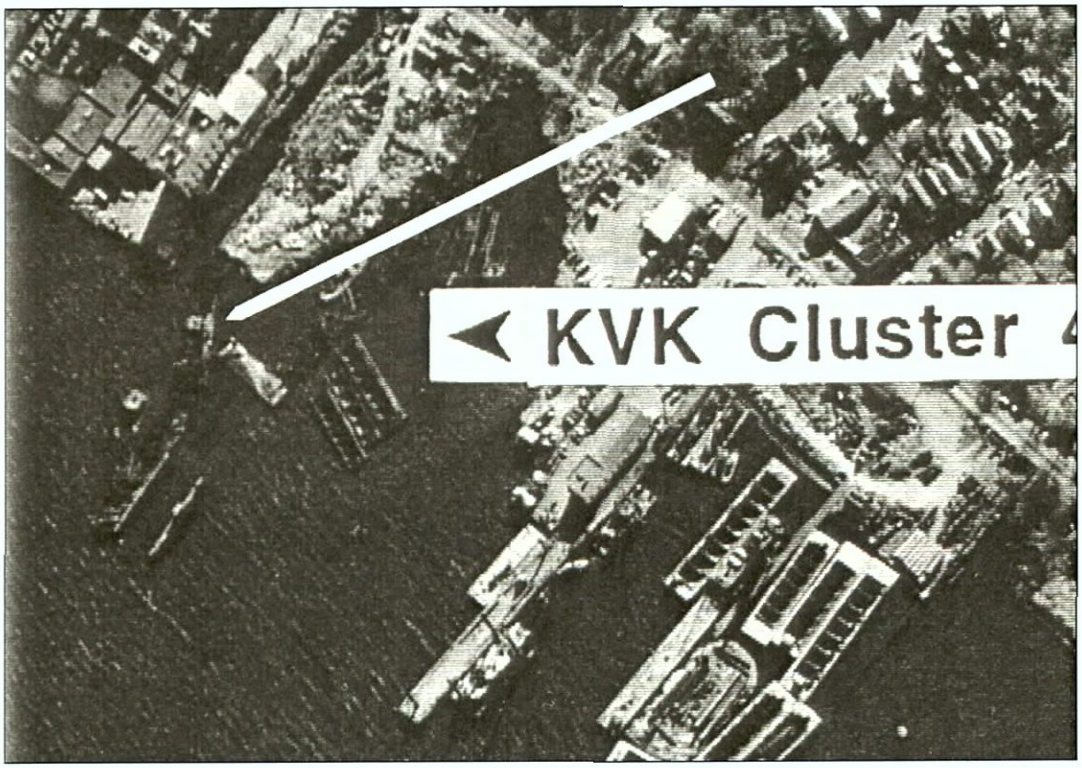


Figure 4-21. 1974 vertical aerial photo of Cluster 4, showing V36 in its current location.

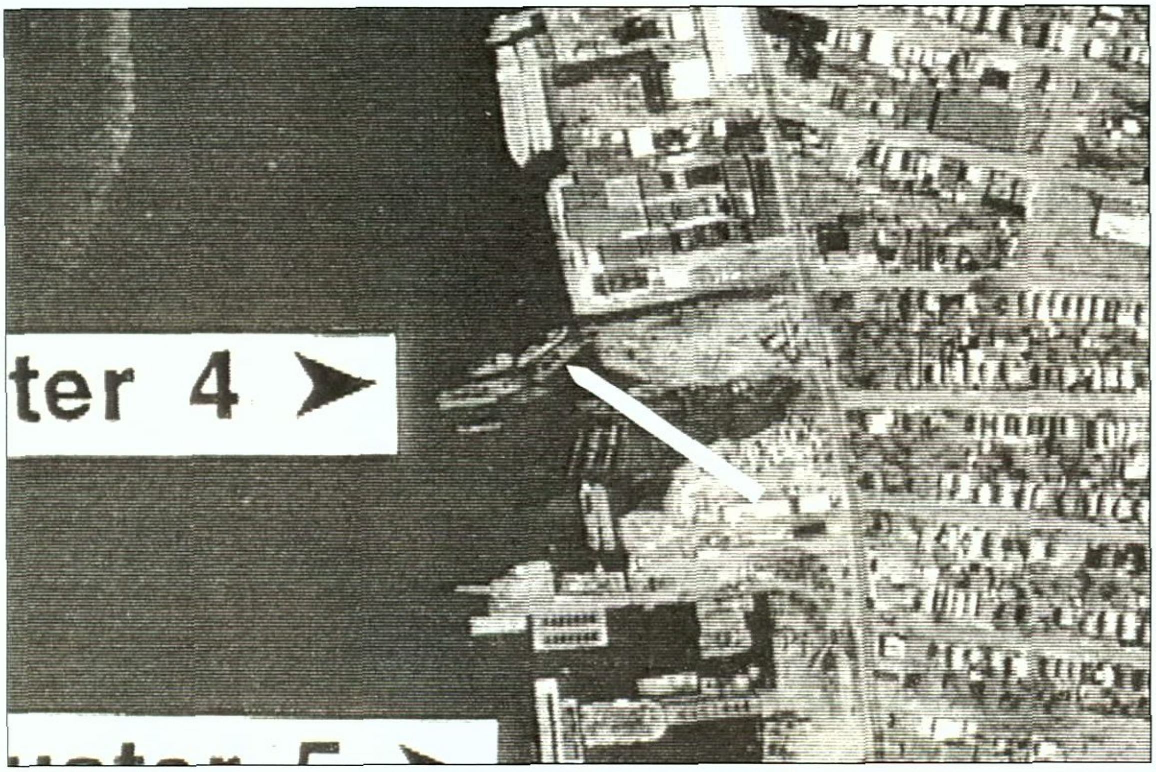


Figure 4-22. 1984 vertical aerial photo of Cluster 4, showing V36 in its current location.

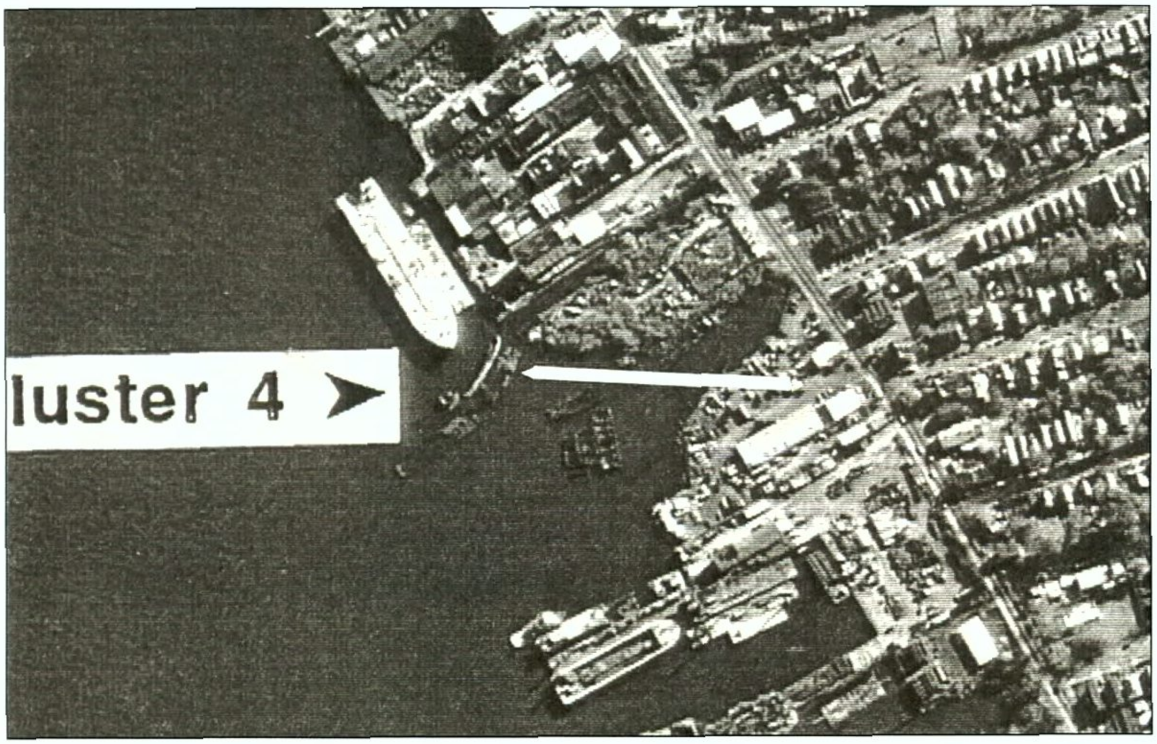


Figure 4-23. 1994 vertical aerial photo of Cluster 4, showing V36 in its current location.

PREVIOUS INVESTIGATIONS

Raber and Associates (1995) inventoried over 500 derelict vessels in Kill Van Kull and Arthur Kill, including V36. They recommended each vessel be assessed as to its National Register eligibility and that field investigations be undertaken to collect basic measurements, photographs, and registration numbers, as well as basic historic background research (159).

In 1995, Panamerican Consultants, Inc., in its Phase II assessment of wrecks in the Arthur Kill, assessed V36 as historically significant and recommended photo documentation of main structural elements and recording of basic dimensions.

REMAINS OF VESSEL V36

The remains of V36 represent a scow-hulled, suction type, hydraulic cutterhead dredge. The vessel lies in a north-south direction (Figures 4-24, 4-25, and 4-26), with the bow to the south. Vessel 36 shows signs of fire damage, and it no longer retains any of what was likely a fairly extensive superstructure. Decking remains only in a small section of the vessel, toward the bow. Two spuds are evident at the stern, projecting through two spud guides. Adjacent to the spuds is the large collapsed A-frame hoist used to guide the spuds. Numerous pieces of machinery associated with the hydraulic pumping mechanism, steam power plant, and A-frame cable system are evident as well.

The hull is laid out in three sections, defined by the presence of athwartships, bulkheads, or trusses. This division is not likely for the purpose of subdividing the hull into machinery and/or crew spaces, but relates to the framing of the hull and support of the main deck, which is likely where the machinery spaces were on this vessel, as they are in most dredges. The hull is rather lightly framed for a vessel of this size.

Figure 4-24. V36 starboard side, looking forward. View to the south.

Figure 4-25. V36, general view of the main deck. View to the north (aft). Note spuds and collapsed A-frame.

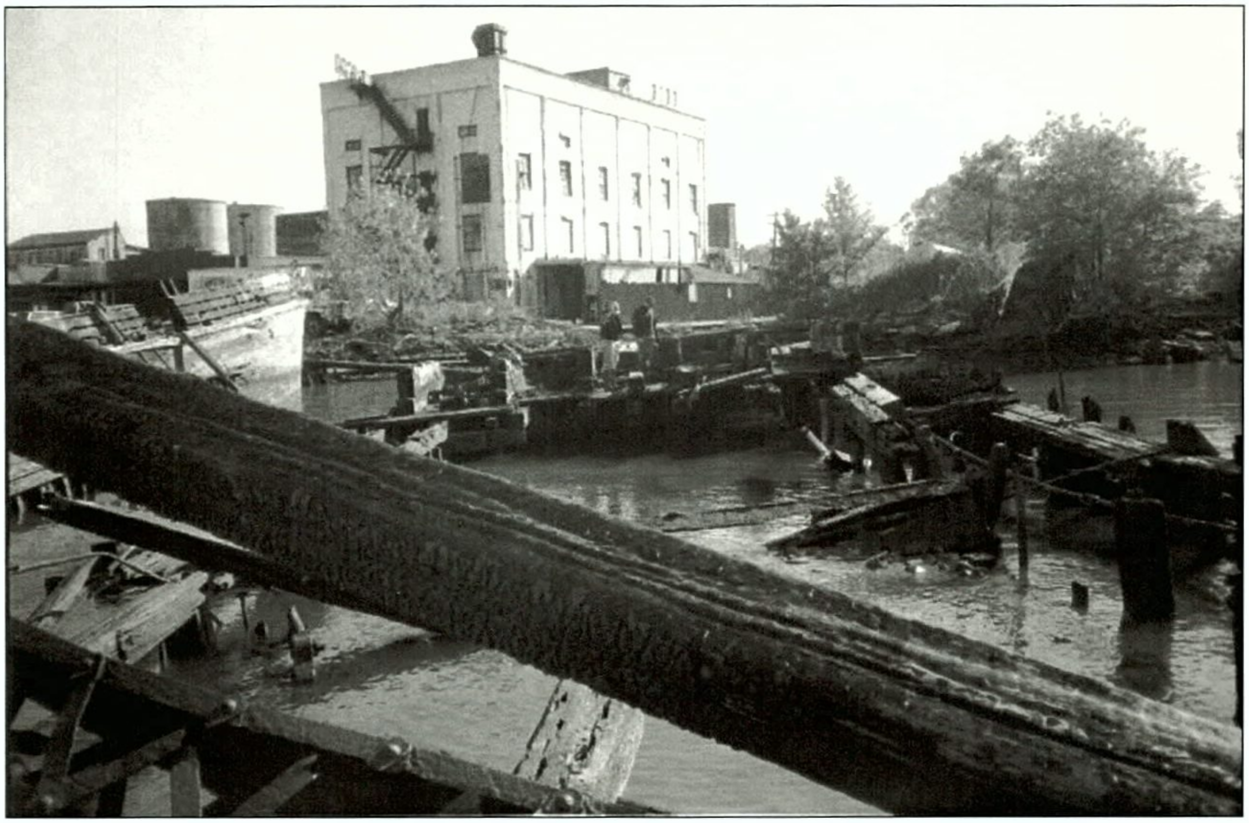


Figure 4-26. V36 main deck. View to the south (forward). Note collapsed A-frame in foreground.

The forwardmost section of V36 includes the remains of the suction pipe and ladder machinery, mounts for the A-frame and anchor booms, and the main deck area, with the bearing bulkheads for the hoisting drum bearings. The middle section is empty, but it possibly contained the steam machinery, while the after section contains the spuds and brick pile, which is indicative of the location of the boiler. The boiler would have been placed just aft of the center of the vessel. Figure 4-27, while illustrating a self-propelled dredge designed for use on western rivers, is also illustrative of the typical placement of machinery aboard a suction/cutterhead dredge.

A full plan view of V36 is shown in Appendix E. The hull construction is similar to that of a basic scow, with a few important differences related mostly to the size and placement of machinery and also to the stresses the vessel would have been subject to. The two biggest differences are a large well at the bow, through which the suction hose was deployed and recovered (Figure 4-28), and a generally lighter construction, not in terms of scantlings, but the spacing of large structural timbers (see Figures 4-25 and 4-26). Plans for a similar dredge built in the early twentieth century and owned by the Osgood Dredge Company are provided in Figures 4-29 (profile and deck plan), and 4-30 (bearing bulkhead profile and plan) for reference purposes.

Lower Hull Framing

Due to inaccessibility, the lower hull framing of the vessel was not examined. It is likely similar to a scow of comparable size in terms of stringers, frames, and keelson, as well as bottom and chine logs. A fairly sizeable vessel—like V36—is likely to have chine and bottom end logs on the order of 10 × 10 or 12 × 12, with floors and stringers at least nine inches molded and six inches sided, and bottom planking that is similar in size to both the side planks and the deck planks.

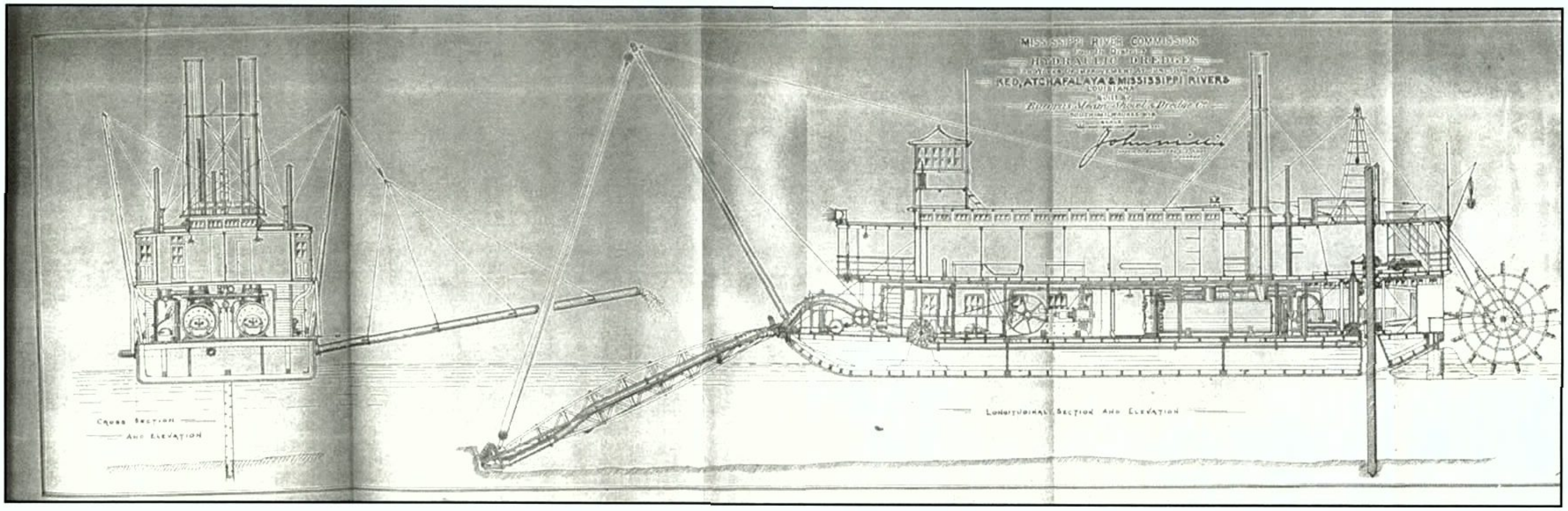


Figure 4-27. Cross section and elevation of western rivers dredge built by Bucyrus Steam Shovel and Dredge Company.

Figure 4-28. Ladder well in the bow of V36. Note remains of A-frame attachment. View to the south (forward).

Upper Hull Framing

The main hull of V36 is similar in construction to a scow hull, but contains some important differences. The main difference is in the number of structural members used to create longitudinal and athwartships stability in the hull. While a scow hull, which is designed to support cargo on its main deck, uses many longitudinal structural members, the main longitudinal hull support in V36 apparently consisted of two fore-and-aft trusses and two carlings supported by stanchions at even intervals across the vessel. The number and spacing of these longitudinal members coincides closely with those found in the Osgood dredge, shown in Figures 4-29 and 4-30. The stanchions would have been inboard of the trusses, directly in line with the inner face of the hose well, and, in fact, are also the top and bottom stringers for this part of the hull, but are no longer *in situ*, with the exception of remnants at the vessel's aft end (can be seen in Figure 4-25 and under the remaining main deck in Figure 4-26), and the inner faces of the hose well. Trusses and stanchions would have formed the main longitudinal support for the vessel while leaving a large amount of space below the main deck. While this would theoretically create a weaker hull structure, a dredge was not subject to the load stresses of a scow (i.e., it did not have to hold 300 tons of crushed rock), it would also create open spaces below deck that were possibly necessary for the vessel's operation, although historic plans such as the one in Figure 4-27 do not show any space below deck being used in performing the vessel's task.

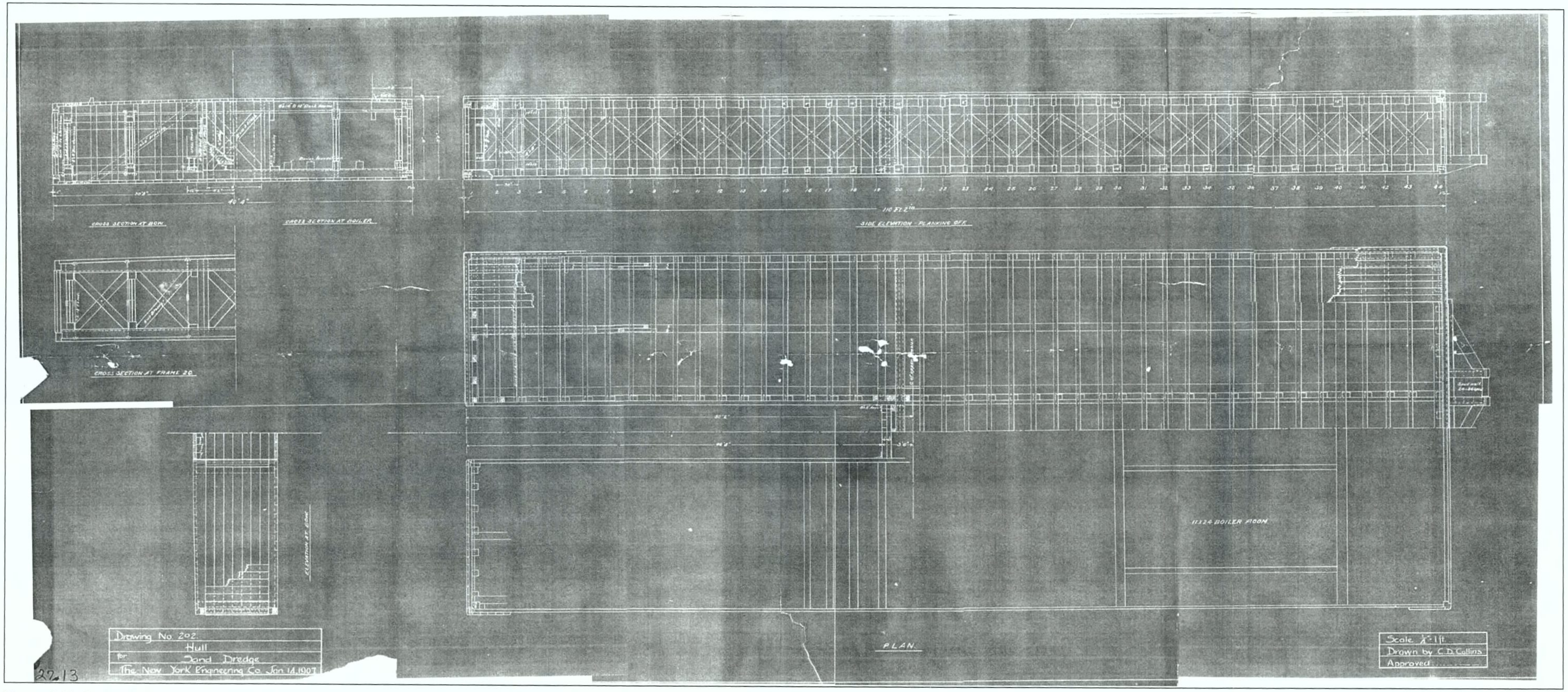
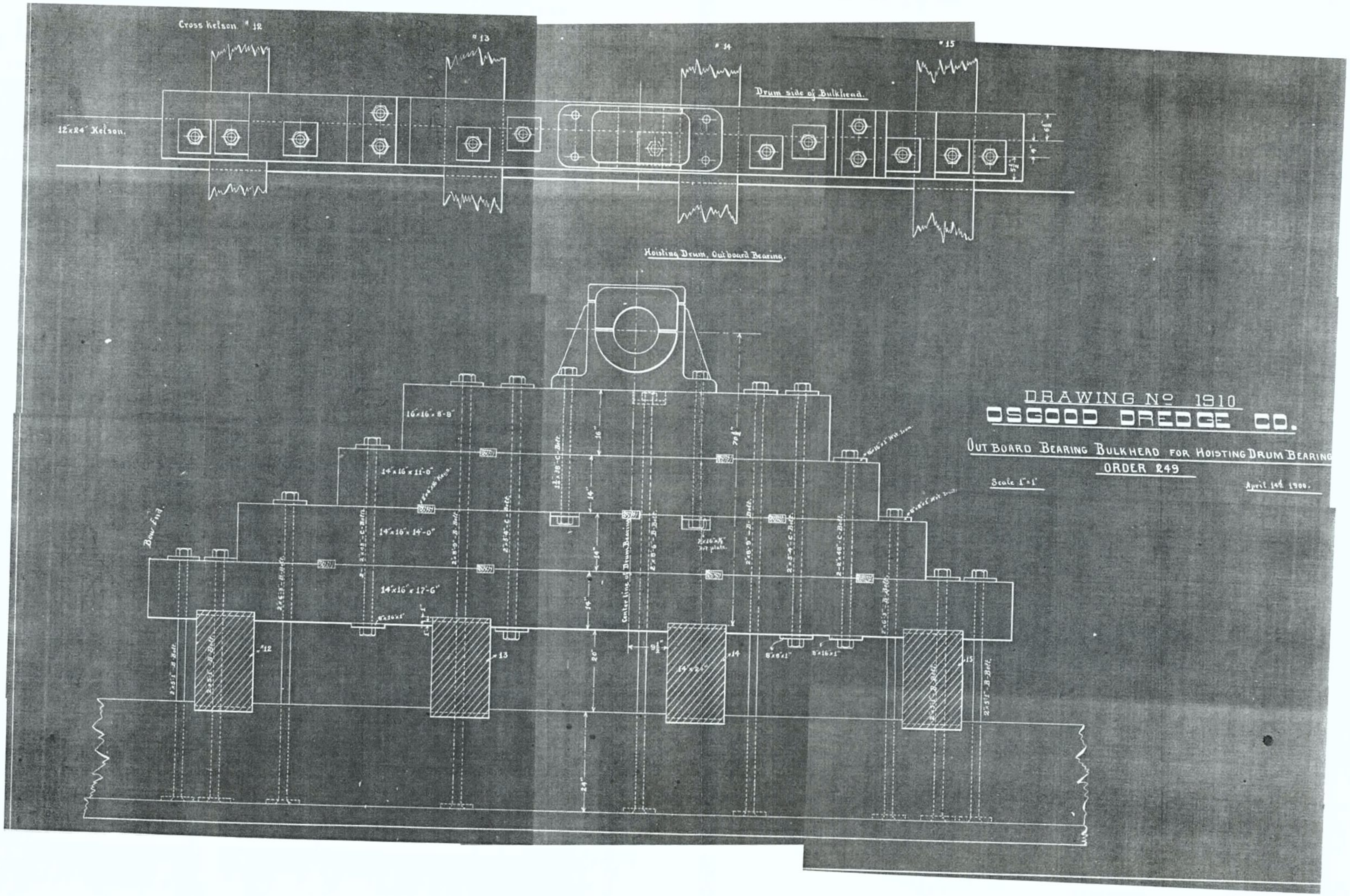


Figure 4-29. Elevation and deck plan of Osgood dredge, circa 1900 (courtesy of Mystic Seaport Ship Plans Library).



4-30. Bearing bulkhead profile of Osgood dredge, circa 1900 (courtesy of Mystic Seaport Ship Plans Library).

Of the four main support members, the port side truss remains the most intact. The starboard side of V36 is heavily deteriorated, but the port side is fairly whole, enabling an examination of construction details. Each truss consists of a double set of 12 × 12 beams with crossed supports and stanchions (Figure 4-31) similar to that found in the Osgood dredge (Figure 4-32). It appears that the intermediate stanchions seen in the Osgood dredge are not present in V36, although the heavy deterioration of the truss makes an ironclad determination difficult. Each A-frame support consists of four main units: a vertical stanchion, two diagonals, and an athwartships beam, tying the truss in to the side of the vessel and the two other longitudinal beams on each side of the vessel. The vertical and diagonal members consist of two timbers, 5 × 12 in dimension. The athwartships beams, measuring 12 × 12, are placed at the tip of the frame, directly below the longitudinal top beam, and are fastened to both the diagonals and the beam. The athwartships supports rest atop the verticals.

Immediately outboard of the truss on each side of the vessel is another longitudinal beam at deck level. This beam is supported at the same locations as the inboard beam, but uses only vertical stanchions (eliminating the crossbracing) as a means of support. The stanchions measure 12 × 5 inches and are fastened using through-bolts.

Main Deck

The main deck of V36 is heavily deteriorated. Deck beams measuring 12 × 12 are present across the width of the vessel and under the existing main deck. They rest atop the carlings and the outer hull stringers, fastened with one-inch drift bolts. One interesting note is that additional intermediate carlings are present just under the existing machinery deck (can be seen in Figure 4-50). They do not extend past the aft edge of this deck, and are characterized by flat cut ends, suggesting they did not continue past that point (see Figure 4-50). There is also no evidence of collapsed deck beams in the large empty space aft of the existing deck area. Deck beams are also present between the outer hull and the outermost longitudinal truss aft of the existing main deck. Although plans of the Osgood dredge (see Figures 4-28 and 4-29) indicate deck beams extending across the width of the vessel from stem to stern, it appears the deck beams ended at the outer longitudinal truss in the area aft of the existing machinery deck and forward of the spud area at the stern of the vessel. No collapsed deck beams are present in the center section, and no broken beam-ends extend into the center space from the sides of the vessel; all beams are cut flush with the outer longitudinal trusses. This, along with the apparent lack of longitudinal members in the same area, implies an open space in the center of the hull.

Outer Hull

The outer hull is framed and planked in typical box-hull, or scow, fashion. Vertical frames measuring 5 × 8 are faced with 12 × 4-inch outer hull timbers that are fastened with spikes. The stringer immediately inboard of the frames is fastened to the frames via one-inch through-bolts. The deck beams sit atop this stringer and are fastened to the frames and to the stringer via through-bolts.

Forward and Aft Ends of the Vessel

Both the forward and the aft ends of the vessel differ from a typical scow hull in that they were designed to support machinery specific to the function of V36 as a dredge (Figures 4-34 through 4-37). The forward hull framing is characterized by a central well that measures 9 feet, 5.5 inches wide, and extends 16 feet, 8 inches into the hull of the vessel. This same well is illustrated in the plan of the Osgood dredge (see Figure 4-28), although that particular well extends further into the hull. Both the function and the framing are similar, however. The main longitudinal support members of the main hull perform the same function for the hull extensions on either side of the hose well, with the inner longitudinal beams forming the inner side of each extension (Figure 4-34). The outer longitudinal truss runs roughly down the center of each extension, with the outer hull of the vessel forming the outer side of the extension (Figure 4-34). In addition, the inner face of each hull extension is reinforced by hull planking in the well, which measures 12 × 12, as opposed to the 12 × 4-inch planking that is found on the rest of the outer hull.

Figure 4-31. Port side framing. Note aft bulkhead, center left. View to the north (aft).

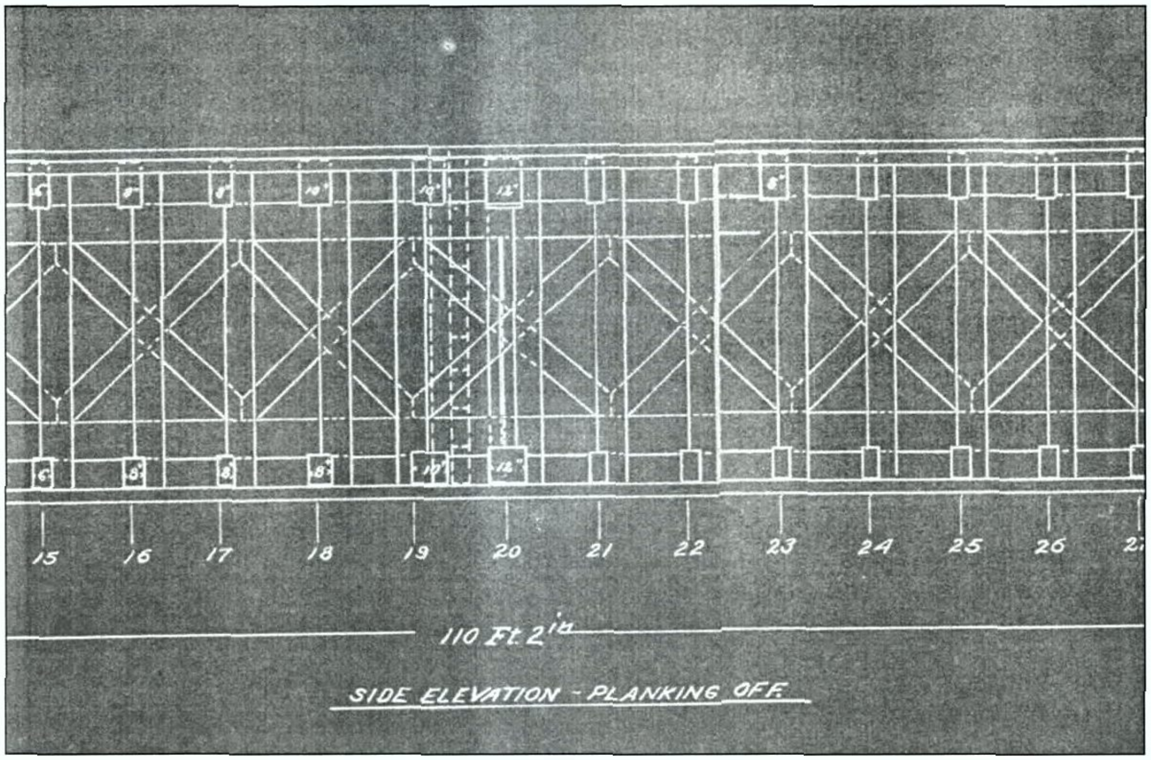


Figure 4-32. Section of Osgood dredge plan, showing a portion of the side elevation. Note diagonal bracing.

Figure 4-33. Starboard side, view to the southwest. Note diagonal truss timbers, vertical stanchions, and athwartships beams tying the trusses in to the side of the vessel.

Figure 4-34. Port hull extension. View to the southeast (port).

Figure 4-35. Starboard side hull extension framing. View to the south (forward).

Figure 4-36. Starboard hull extension framing. View to the south (forward).

Figure 4-37. Starboard hull extension framing and planking. Note also suction pipe along centerline of vessel. View to the north (aft).

MACHINERY

By far the most prominent and intact aspect of the vessel is the machinery, which appears typical of a suction/cutterhead dredge. Although apparently heavily salvaged, enough remains to determine where the various components were located. Figure 4-38 shows a typical early-twentieth-century suction type dredge. Remnants of the components shown in the figure are readily apparent on the deck of V36.

LADDER, A-FRAME, AND H-FRAME

At the forward end of the vessel was the system for raising and lowering the ladder and suction hose/cutterhead unit. This consisted of an A-frame, a vertical H-frame, a pivot point for the ladder, and an inlet for the suction unit. The bases for the A-frame are still in place, as is the starboard H-frame mount (Figures 4-46 through 4-49). Both types of mounts were made of iron, and fastened to the deck with carriage bolts of one-inch diameter. The existing bases are highly corroded and deteriorated.

The ladder assembly is no longer present, although a portion is evident on the starboard hull extension, along with the mounting/pivot point on the inboard side of each hull extension. Figures 4-40 and 4-41 illustrate the remaining ladder hardware.

The ladder formed the frame or cradle for the suction pipe, and on the end of the suction pipe was the cutterhead. Mechanically, the ladder was raised and lowered and the cutterhead spun to provide the cutting action. The two systems controlling these actions were a deploying and recovery system for the ladder and a drive system for the cutterhead. Part of the deploying system for the ladder is the aforementioned combination of A- and H-frames and cables, along with the hoisting drums mentioned below. The other mechanical system drove the cutterhead. The remaining evidence of this system consists of two driveshafts with attached drive gears. These shafts, in addition to providing rotational force to drive the cutterhead, also served as the pivot or anchor point for the ladder. The shafts are mounted through bearings mounted to extra framing in the hull extensions. Figures 4-42 through 4-44 illustrate the cutterhead drive shafts.

Also evident is the end of the suction pipe and the entry point into the hull (Figure 4-45). The pipe diameter is 24 inches, and is made of iron. Remnants of the pipe are also evident in the main part of the hull (Figure 4-45b).

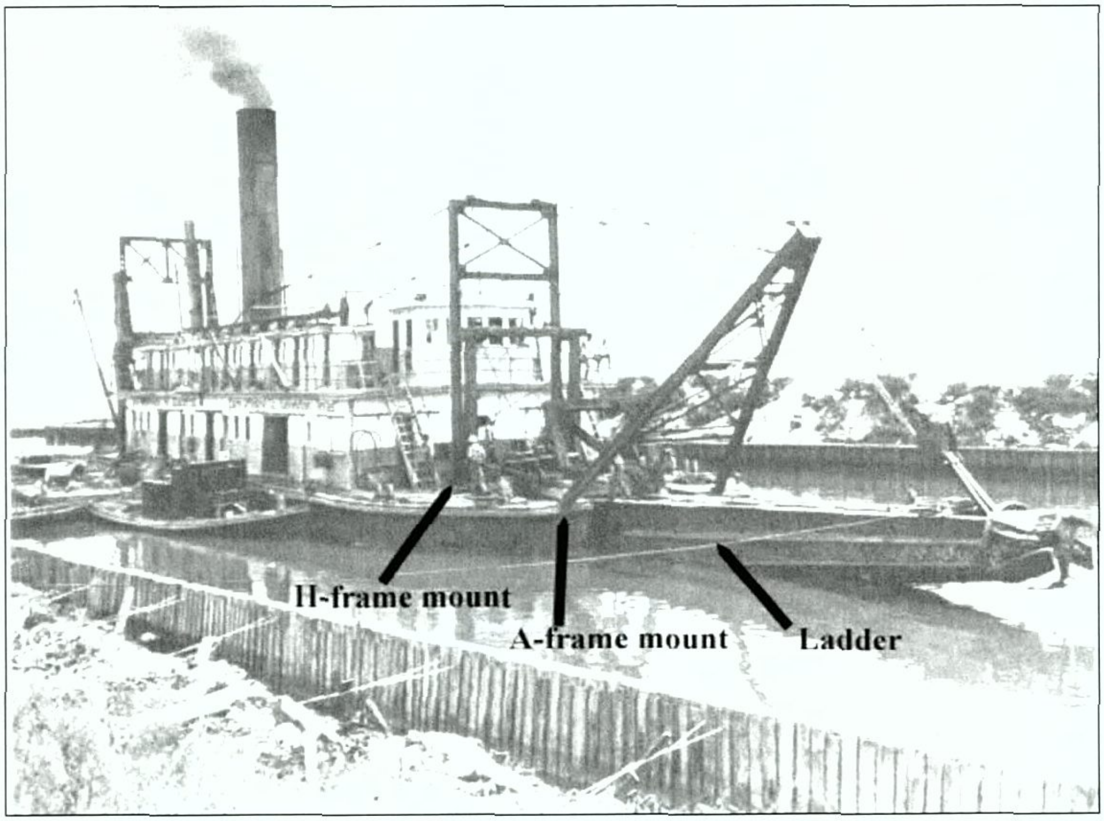


Figure 4-38. Early-twentieth-century suction dredge, showing locations of machinery observed on the deck of V36 (photo courtesy of the *Florida Photographic Collection*).

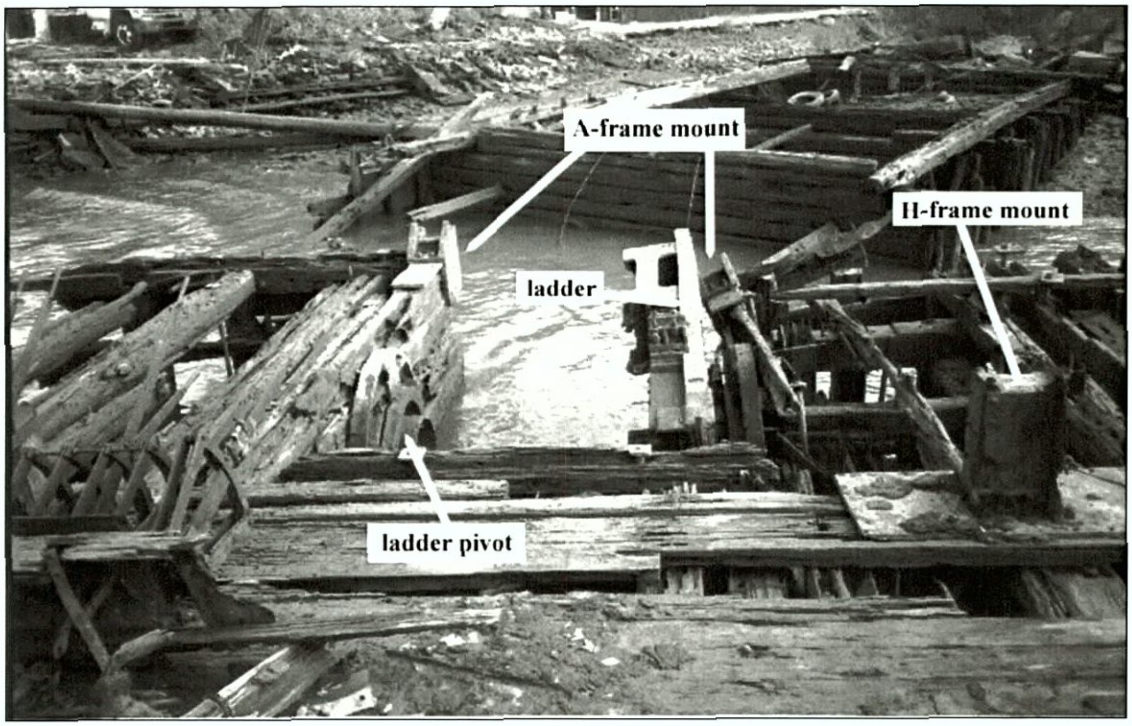


Figure 4-39. Forward hull extensions of V36, showing locations of machinery remnants. View to the south (forward).

Figure 4-40. Remains of ladder assembly. View to the southwest (starboard forward quarter).

Figure 4-41. Remains of ladder pivot. View to the southeast (port forward quarter).

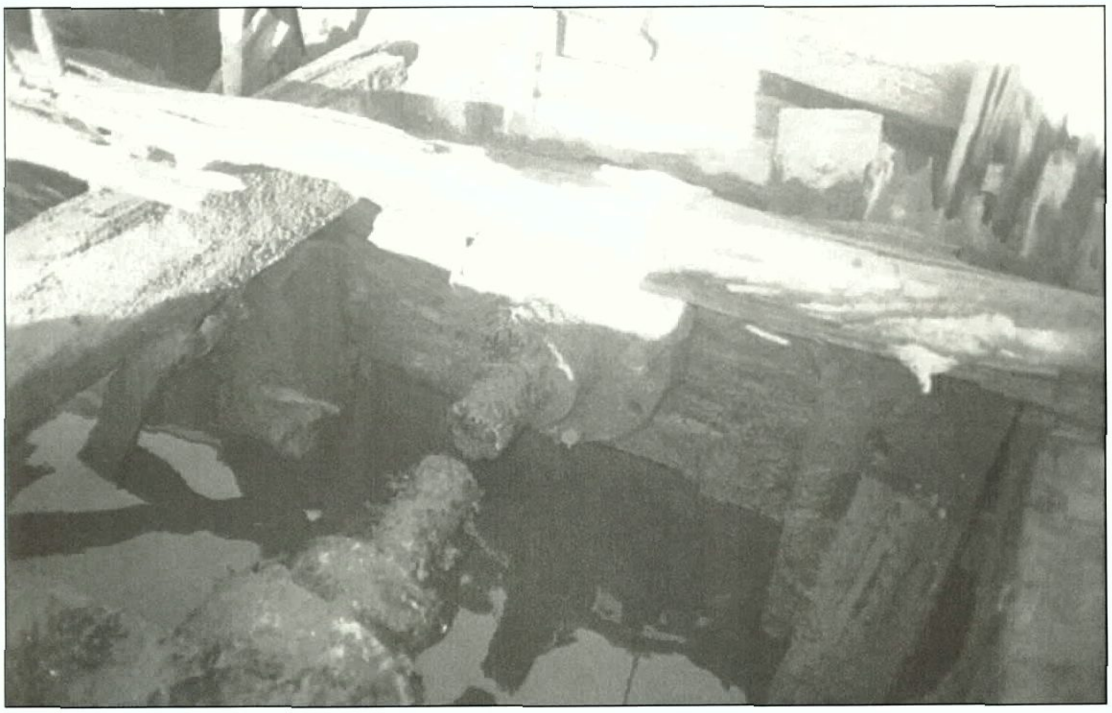


Figure 4-42. Remains of port pivot shaft. The shaft extends through the hull at center of photo. The companion shaft on the starboard side of the vessel terminates in the gear seen in Figures 4-40 and 4-45. View to the southwest (starboard).

Figure 4-43. Pivot/cutterhead shaft drive gear (starboard).

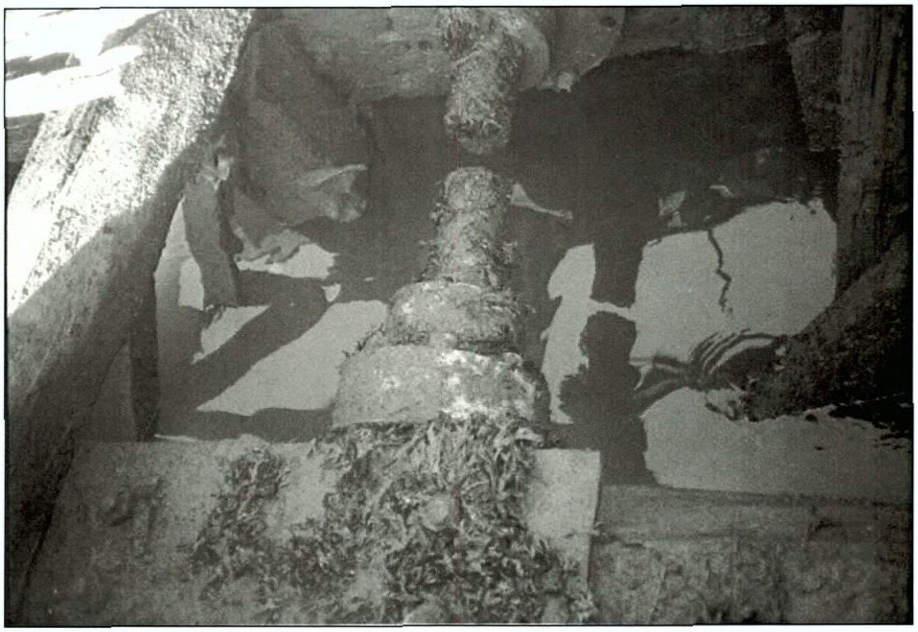


Figure 4-44. Remains of port pivot shaft. The shaft extends through the hull at center of photo. Companion shaft on the starboard side of the vessel terminates in the gear seen in Figures 4-40 and 4-45. View to the southwest (starboard).

Figure 4-45. Remains of suction pipe. View to the southwest (starboard).

Figure 4-45b. Remains of suction pipe. View to the southwest (starboard).

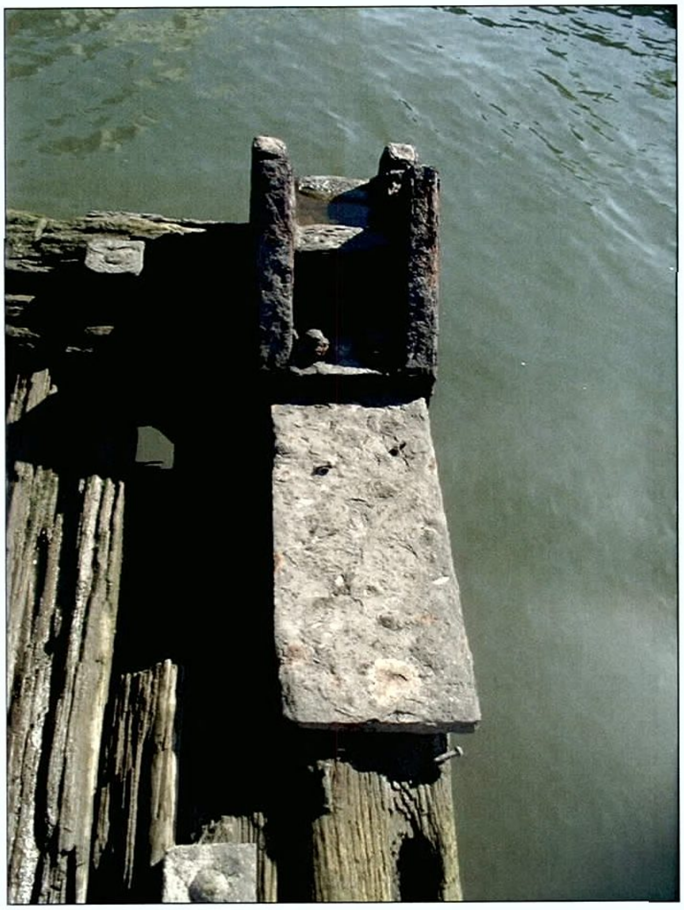


Figure 4-46. Port A-frame mount on starboard hull extension. View to the south (forward).

Figure 4-47. Profile view of port A-frame mount. View to the east (port).

Figure 4-48. Starboard H-frame mount. View to the south (forward).

Figure 4-49. Starboard H-frame mount. View to the west (starboard).

MAIN DECK MACHINERY

Remains of hoisting drums on the main deck are visible in the form of wooden mounts, referred to as "bearing bulkheads," (Figures 4-50 and 5-51). The bulkheads, totaling six, consist of three 12 × 12 timbers fastened to each other and to the main deck beams with 1-inch drift bolts (Figure 4-51). A similar configuration is seen in the blueprints for the Osgood dredge (Figures 4-29 and 4-30). The timbers in each bulkhead are shorter in length toward the top of the bulkhead. The bulkheads are of differing size and position relative to the other bulkheads. Mounting pads for the bearings, including the tips of iron bolts used to fasten them to the bulkheads, are evident atop each bulkhead. Each bulkhead has two pads, indicating two cable spools on each side of the vessel.

Several mechanical aspects of the hoisting drums remain. The drums themselves have been removed, but a diameter of 48 inches can be interpolated from rotary wear marks on the bulkheads (Figure 4-54). Figures 4-55 and 4-56 illustrate two of the numerous shafts between the bearing bulkheads. Their number equates to one per drum. Their function is not completely known, but considering their position relative to the locations of the drums, they were likely part of a brake or a lock to hold the drums in position. Each one consists of a shaft, two bearings attached to the deck, and an actuator arm measuring 24 inches in length.

Also located on the main deck is the hoisting drum control box (Figures 4-59 and 4-60). The control box, measuring 8 feet in length by 6 feet in height, contains 12 levers, or two for each hoisting drum.

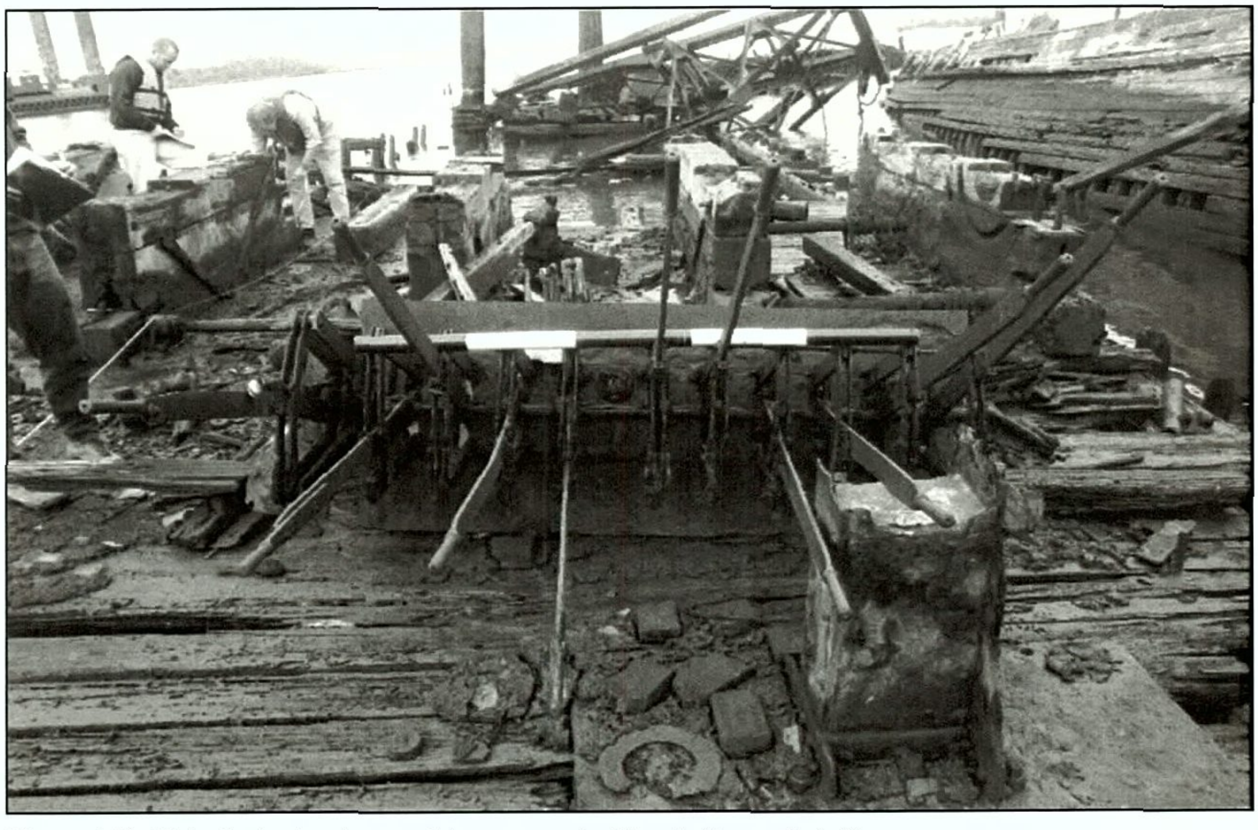


Figure 4-50. Main deck, showing machinery mounts. View to the north (aft).

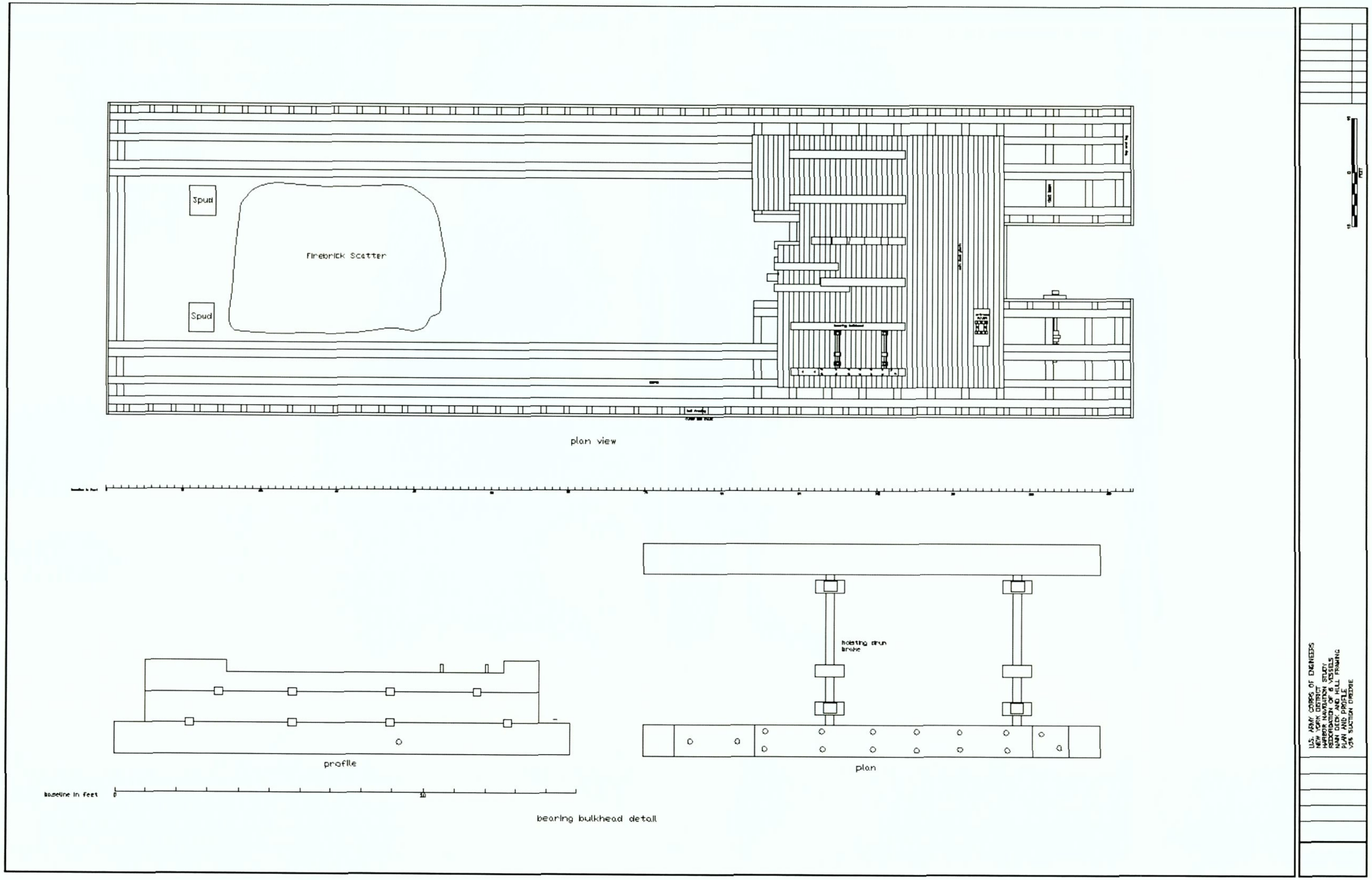


Figure 4-51. Plan view of V36, including plan and profile of bearing bulkhead.

Figure 4-52. Main deck showing machinery mounts. View to the east (port).

Figure 4-53. Close-up of port side cable mount. View to the northeast (port aft).

Figure 4-54. Close-up of port side cable mount, showing circular wear from cable spool. View to the east (port).

Figure 4-55. Port-most machinery mounts on main deck. View to the north (aft).

Figure 4-56. Close-up of hoisting drum brake. View to the south (forward).

Figure 4-57. Close-up of Figure 4-56.

Figure 4-58. Close-up of Figure 4-56.

Figure 4-59. Hoisting drum control box. View to the north (aft).

Figure 4-60. Hoisting drum control box. View to the east (port).

AFT MACHINERY

Remaining at the aft end of the vessel are the twin spuds and spud boxes (Figure 4-61), the A-frame support for the spuds, which has collapsed (Figures 4-61 through 4-63), and a pile of firebrick (Figure 4-64).

Figure 4-61. Spud box and a pole, and collapsed A-frame at the aft end of the vessel. View to the southeast (forward).

Figure 4-62. Aft end of V36, showing collapsed A-frame and spud poles. View to the north.

Figure 4-63. Close-up of collapsed A-frame. View to the southeast (port).

Figure 4-64. Close-up of firebrick scatter in aft section of vessel. View to the west (starboard).

Firebrick

Three brands of firebrick were found associated with the site. Two of the three are listed in Bricks and Brickmaking (Gurcke 1987), which includes an alphabetical listing of brick brands as determined by the markings on each brick. The two listed are the "RESIST" marked brick and the "W.W.C.O." marked brick. According the Gurcke's list on page 193, the RESIST brand was manufactured by the Hammond Firebrick Company of West Virginia between 1935 and 1942. The WWCO brand was manufactured by the Robinson Clay Products Company of Ohio between 1921 and 1942. The remaining brick, marked C.R. No 1, was manufactured by the Jersey City Brick Company, but the date range is not listed in Gurcke.

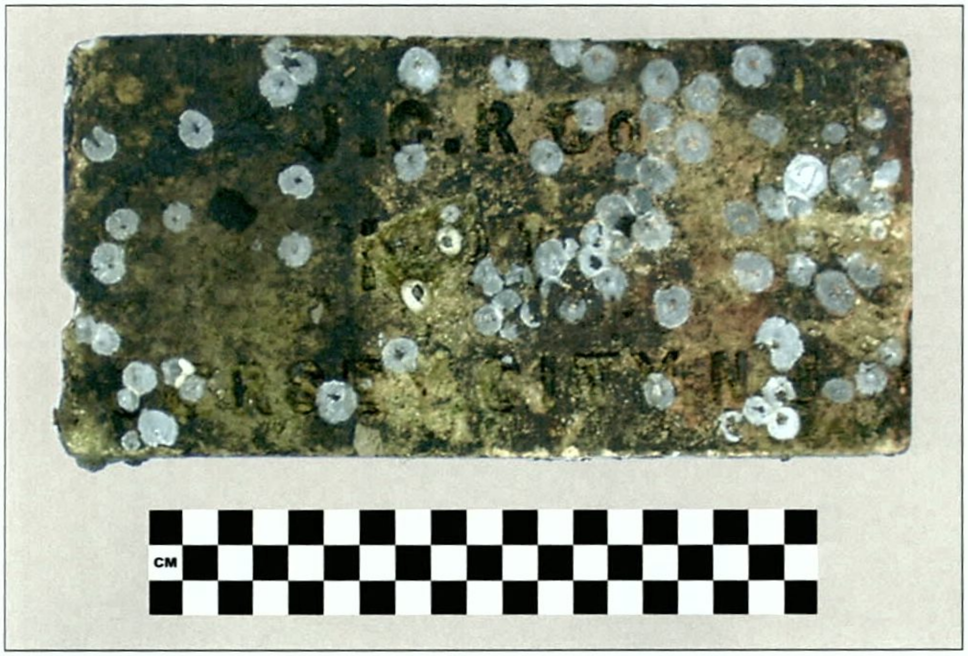


Figure 4-65. Firebrick from V36.

Figure 4-66. "RESIST" firebrick from V36.

The date ranges of the identified bricks suggest a date of installation between 1935 and 1942. While it is certainly possible the vessel was built somewhere between those dates, the presence of the bricks is not conclusive evidence of a date of construction, as the bricks may have been salvaged and reused, or taken from an existing stockpile, indicating a construction date later than that of the bricks, or the bricks may have been replacements installed during an equipment upgrade or boiler replacement, in which case an earlier build date is indicated.

Figure 4-67. "W.W.C.O." firebrick from V36.

MISCELLANEOUS MACHINERY

Various small fittings, belts, and other objects that were part of or otherwise used on V36 were noted as part of the investigation (Figures 4-68 through 4-71).

Figure 4-68. Pile of miscellaneous debris and machinery parts noted on the deck of V36.

Figure 4-69. Miscellaneous parts of unknown function found on the deck of V36.

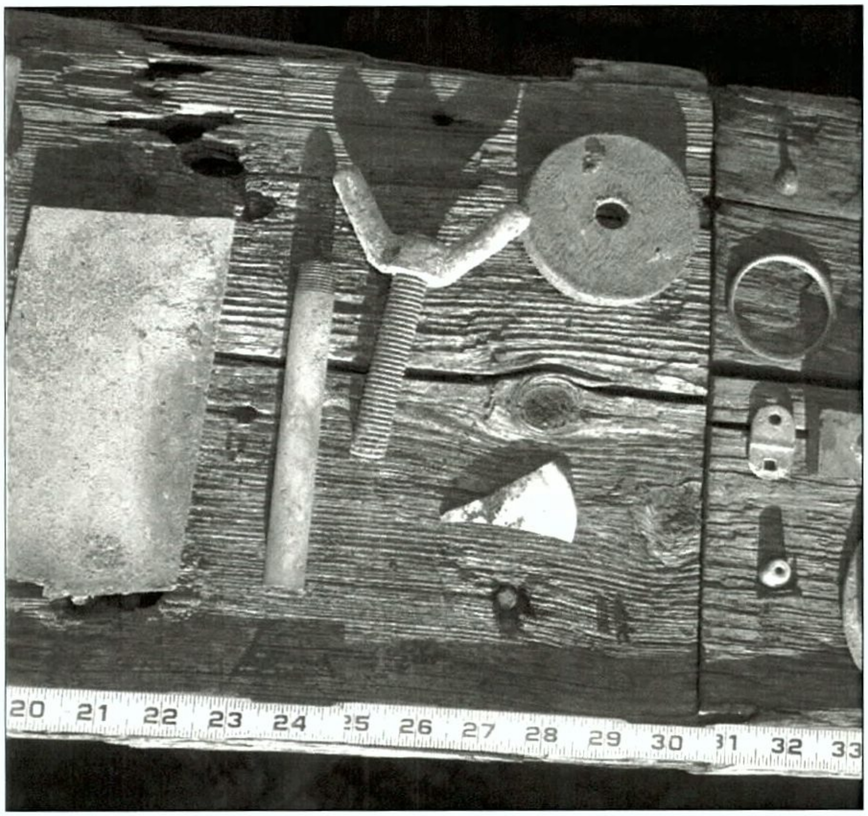


Figure 4-70. Miscellaneous parts of unknown function found on the deck of V36.

Figure 4-71. Canvas and rubber belt noted coiled *in situ* on the deck of V36.

5. VESSELS V2 AND V38: FLOATING DRYDOCKS

GENERAL HISTORY OF THE DRYDOCK

The floating drydock is generally considered an American invention. It is basically a large floating structure, "so large that it can not only float itself, but the largest vessel for which it is designed" (Donnelly 1905:312). The U.S. issued a floating drydock patent to J. Adamson in 1816. Donnelly (1905:316) suggests that the design (Figure 5-01) originated from "the wreck of an old hull laying on some slope beach, which was used by cutting out the stern and making gates to close the opening...similar to...a canal lock." In 1849, Abraham Lincoln invented a hollow structure designed to provide extra buoyancy for vessels in shallow water (Figure 5-02). The U.S. government issued a patent for the design, but apparently nothing ever came from it.

The Brooklyn Erie Basin drydock, built 1845-1850, was the oldest and largest known wooden drydock in 1905 (Donnelly 1905). Known as the Old Balanced or Box Dock, the structure (Figure 5-03) measured 330 ft. long by 100 ft. wide. Managing the combined weight of dock and vessel proved difficult. To compensate, builders connected smaller sectional docks together with locking logs.

The next development of drydock construction, the early sectional drydock (Figure 5-04), provided alignment stability while restricting the amount of motion between sections. The sway between sections required some means of flexible power from one section to another. For this purpose, designers invented a double universal joint, with a slip or extension joint between. The design, wrought with complications, proved popular. Built with three to seven 25-ft. sections, the structure measured 200 ft. in length.

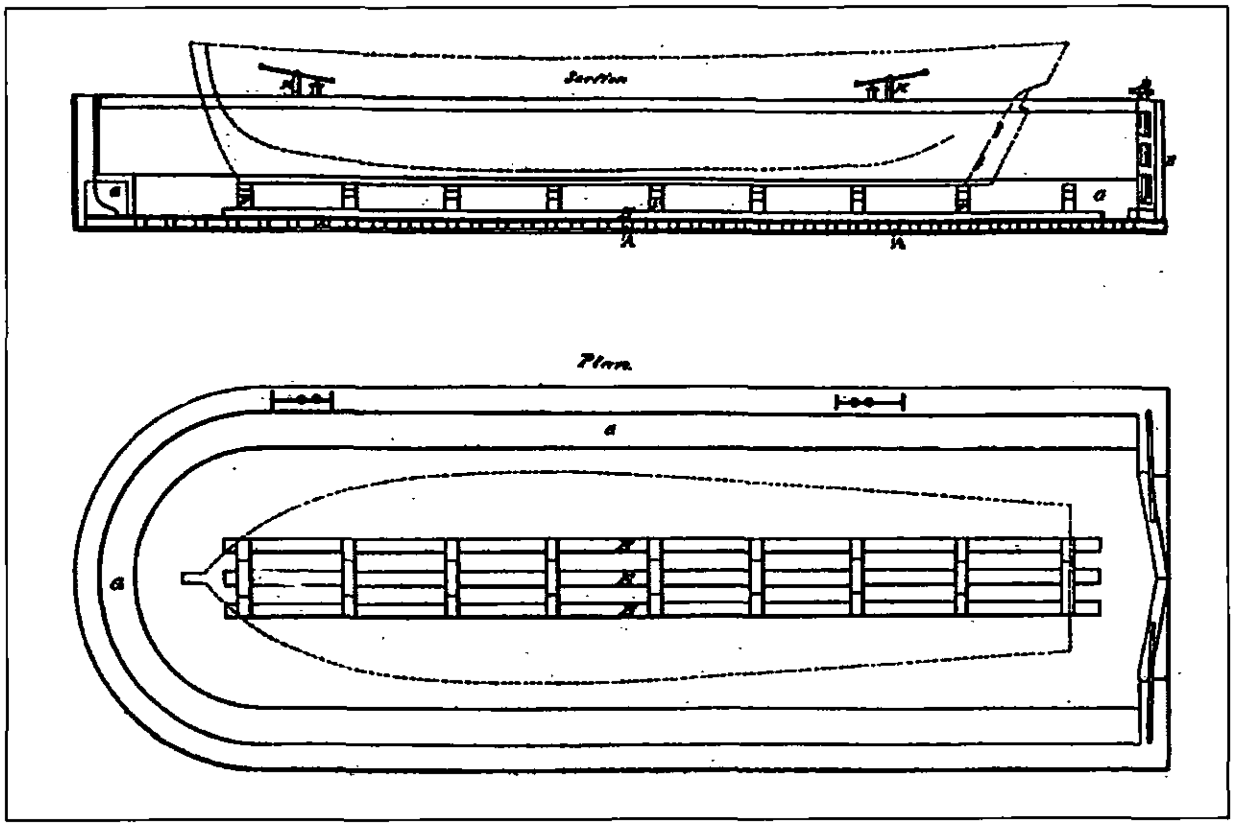


Figure 5-01. First U.S. floating drydock, patent issued to J. Adamson in 1816 (as presented in Donnelly 1905).

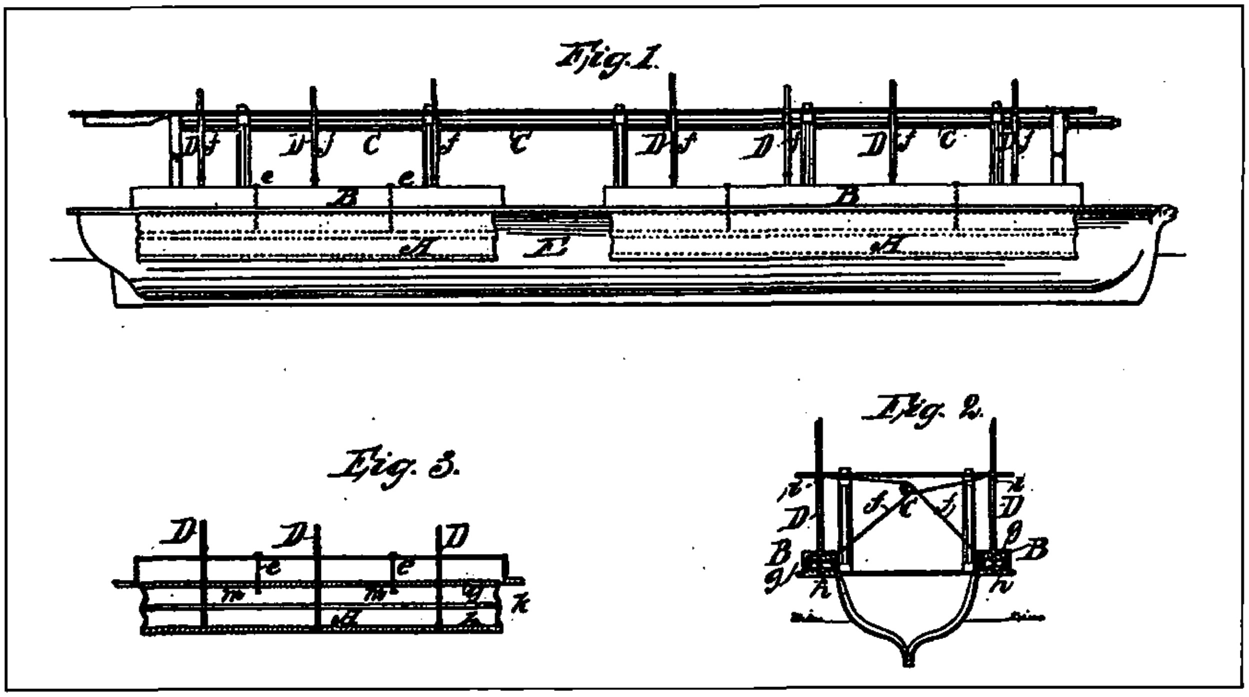


Figure 5-02. Floating drydock patent issued to Abraham Lincoln (as presented in Donnelly 1905).

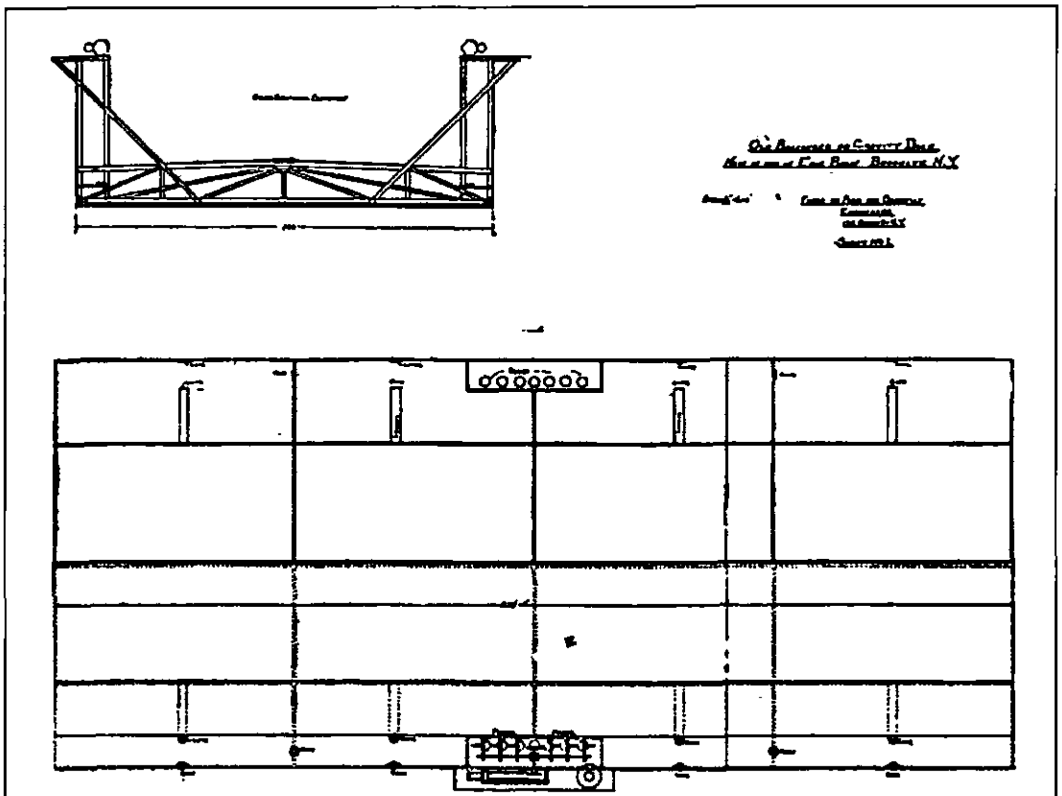


Fig. 4.—Old Balanced or Gravity Floating Drydock.

Figure 5-03. Old balanced or gravity floating drydockas presented in Donnelly 1905).

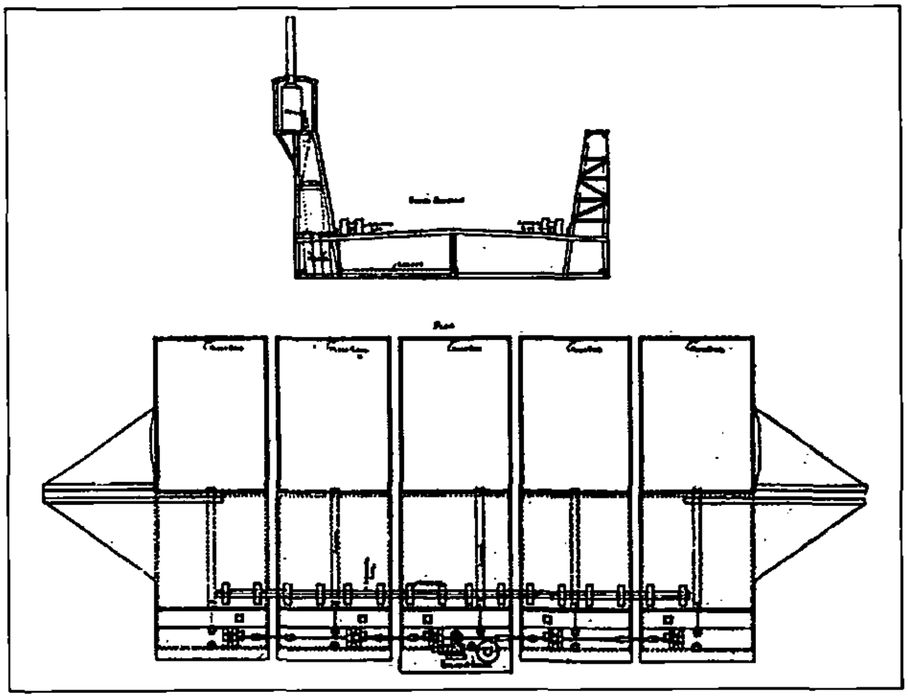


Figure 5-04. Old sectional drydock style (as presented in Donnelly 1905).

The Dodge-Burgess Sectional Floating Dock (Figure 5-05), patented in 1841, generally featured 10 pontoons. Connected by a locking log, the dock lost the wings typical of the earlier (and later) sectional drydocks. The framework's roof housed pumping machinery. The framework fastened to the central pontoon, lifting or lowering. Power is distributed along the top by a shaft with flexible couplings, in the same manner described for the sectional dock. Two of these docks were located for years near the Catherine Street Ferry (Donnelly 1905:320-321).

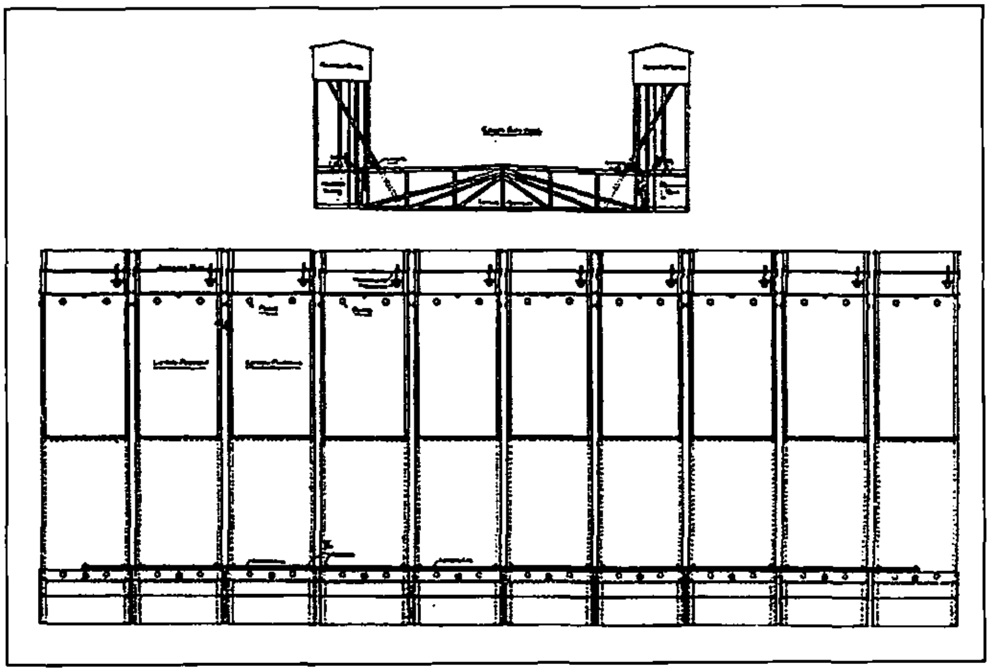


Figure 5-05. Dodge-Burgess sectional floating drydock (as presented in Donnelly 1905).

Built in one piece, the box or balanced drydock (Figure 5-06, 5-07) represents the next phase in drydock construction evolution. The dock was built as a single rigid structure, and to limit the flow of water from one end of the interior to another, builders added watertight bulkheads, feature not seen until this point. These cross-bulkheads, "together with the center longitudinal bulkhead, divide the dock into...independent watertight compartments" (Donnelly 1905:322). The pumping machinery was located on one side only. Gates controlled the flow of water from compartments to the pumps, balancing the dock and vessel. The balanced drydock design appeared near the end of the Civil War and continued to be built through the turn of the century. The smaller sizes, with lifting capacities of 500 to 3,000 tons were more prevalent.

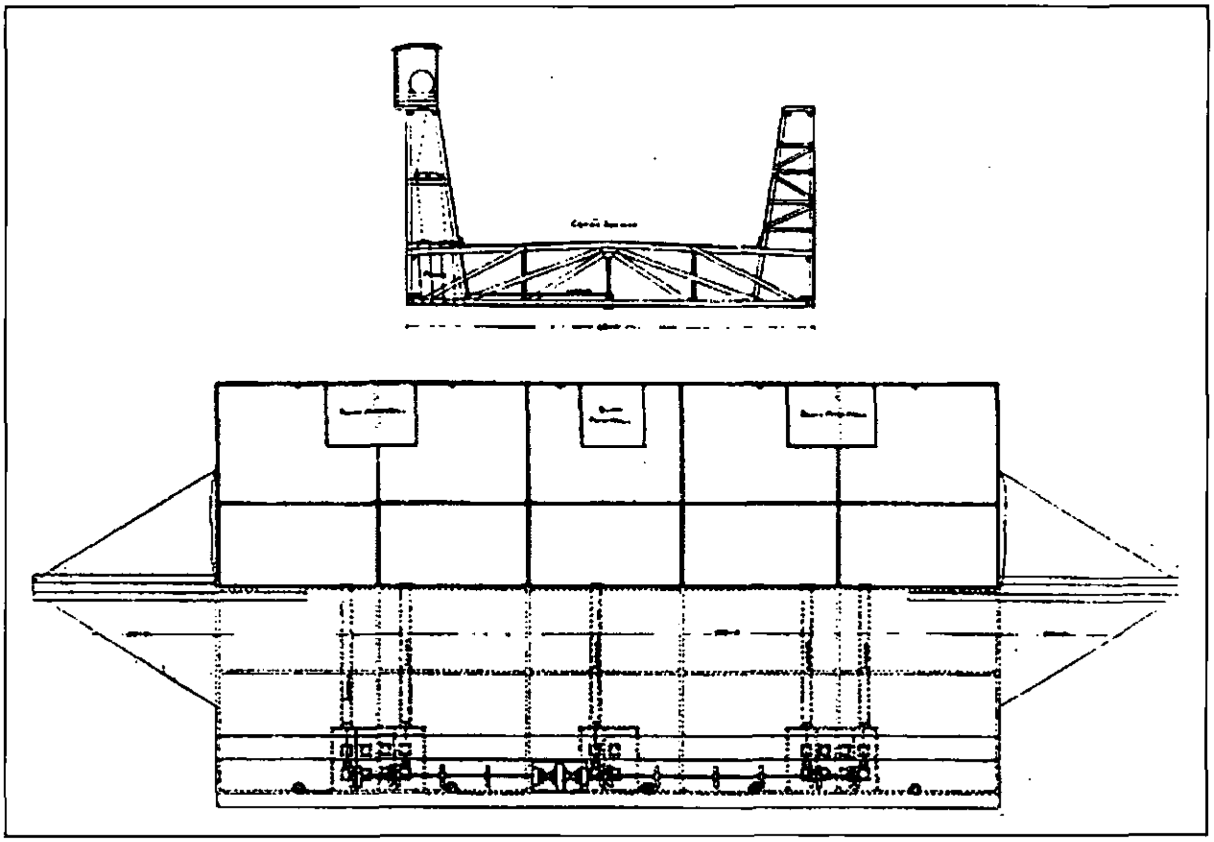


Figure 5-06. Cross section of the box or balanced drydock, as well as a plan view of its pump layout (as presented in Donnelly 1905).

At the turn of the century, the balanced sectional floating drydock represented the largest development in commercial drydocks. Illustrated in Figure 5-07b, with an overall length of 468 feet, a width of 110 feet, the five-section dock had a lifting capacity of 10,000 tons, and the height of the wings could allow vessels with drafts up to 21 feet. Combining the best characteristics of the two drydock types in use at the time, the balanced sectional floating drydock possessed all the advantages of a balanced drydock with its cross and longitudinal bulkheads, separate gates, and independent means of admitting and removing water, and the sectional dock with its freedom from both internal longitudinal strains and self docking. Differing from the balanced drydock, machinery—in the form of a boiler and an engine—was placed on each side of the pontoon in the wings. Each of the five sections was divided into six compartments, with 60 pumps, 12 to a section (Donnelly 1905:322-323). This dock was significant in its lifting power, and, patented to Frederic Lang in 1900, it replaced the Dodge-Burgess Sectional Docks as the drydock with the largest lifting capacity at the time. However, the section drydock would be contemporaneous with the newer balanced sectional type.

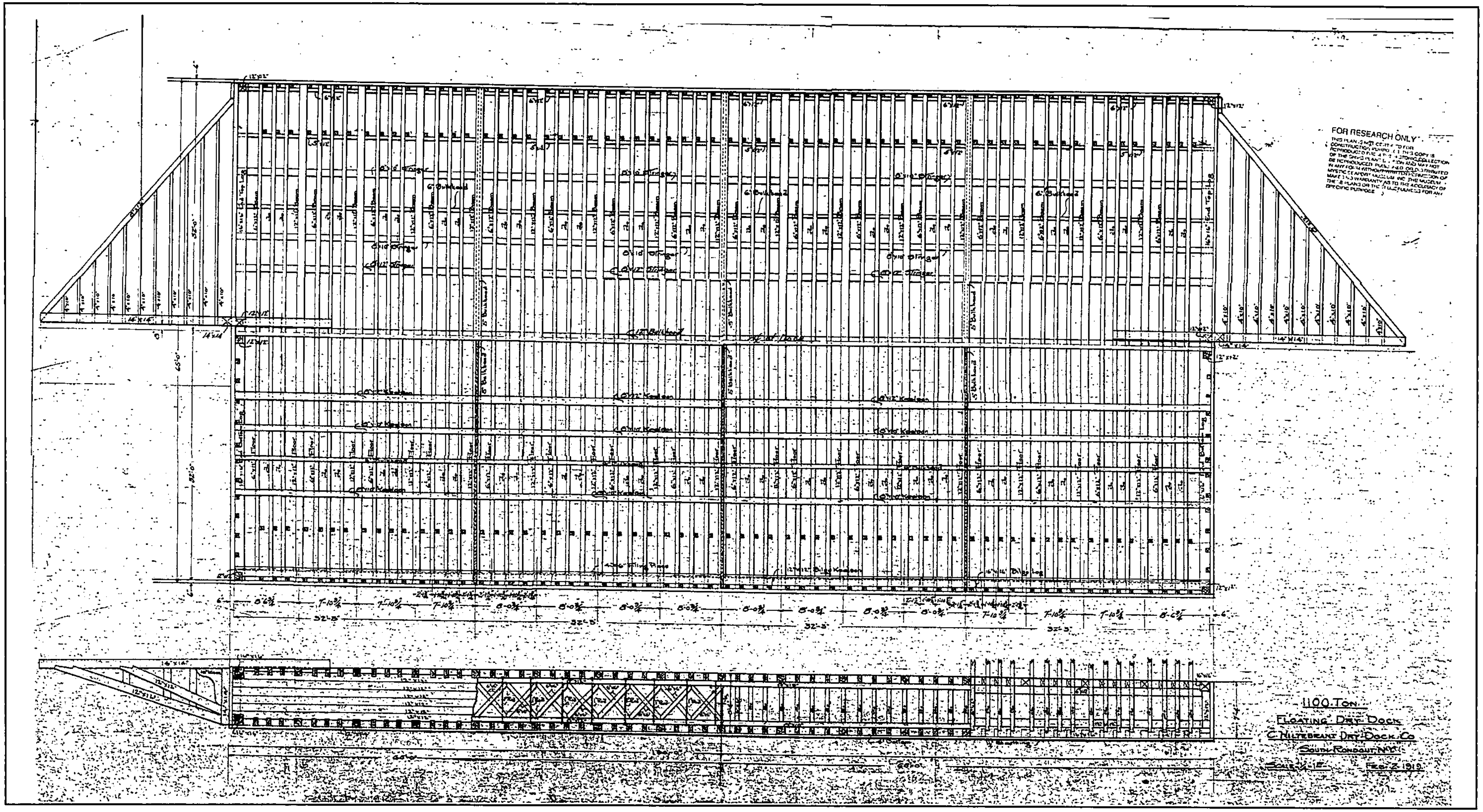


Figure 5-07. Plan and structural elevation of a balanced floating drydock, similar in size and design to V38, designed for the C. Hiltrbrant Dry Dock and Construction Company in South Rondout, New York, 1919 (courtesy of Mystic Seaport Daniel S. Gregory Ship Plans Library).

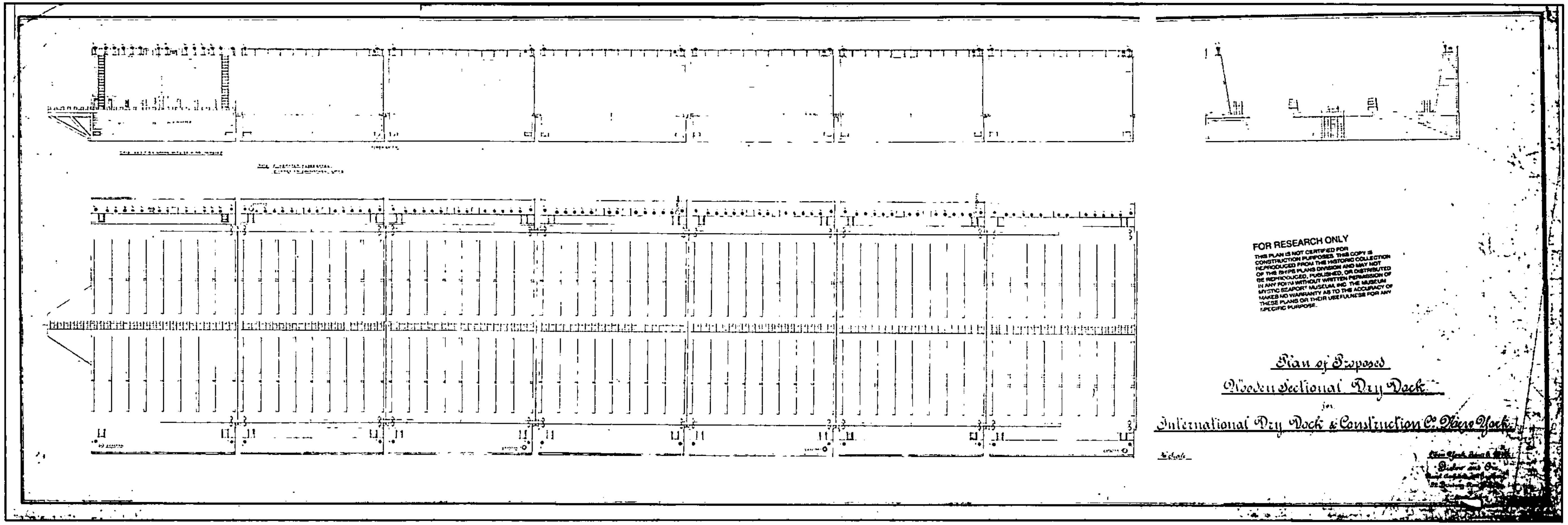


Figure 5-07b. Plan and structural elevation of a balanced sectional floating drydock designed for the International Drydock and Construction Company in New York, New York, 1916 (courtesy of Mystic Seaport Daniel S. Gregory Ship Plans Library).

There was discussion as to constructing this dock with wood, steel, or a composite. Wood was chosen, as it was half the cost. In order to protect the below water portions from the teredo navalis (a wood eating bivalve often called a worm), the bottom was coated with coal tar, then sheathed with creosote saturated hair felt, and then covered with 1-inch thick boards (hemlock or spruce) treated with creosote and arsenic (Donnelly 1905).

A cross section of a sectional balanced drydock showing internal construction, fastening patterns and timber sizes, is illustrated in Figure 5-08. Constructed in 1919, the wooden example was built in Seattle, Washington. Its truss system is identical as the Lang model, although it is rated for 15,000 tons. The illustration, with its detailed scantling measurements, indicates that excellent plans for these drydocks do exist.

The complete cross section presented in this illustration shows the identifiable features of the drydock. The drydock has two wings on either side of the main float or pontoon. The side wings, wider at the base than at the top, house the pumping machinery, with the pump wells at their base, and the engines and boilers on top. Also watertight and airtight in construction, the height of the wings gives an indication of the maximum ship drafts it could accomodate. The main float platform or watertight pontoon hull, as stated, was divided into numerous watertight compartments on both the balanced, and balanced sectional drydock. In operation, keel and bilge blocks were prepared for the vessel to be docked, and water was let into the pontoon and eventually the wings through floodgates. The drydock then slowly settled evenly down into the water, the deck of the pontoon (with its keel blocks) submerging to a depth that would allow the vessel to float freely atop the blocks (either motored or towed). At this point, only the wing tops with the machinery protruded from the water. Pumping machinery then slowly removed the water from the pontoon hull, floating both the drydock and the vessel to be repaired.

Nine floating drydocks were previously recorded in the New York Harbor area. Four of the vessels, 215, 254, 68, and 69 represent balance or through type drydocks. The remaining five appear to be sectional drydocks and most likely represent balanced sectional types as discussed above (as typed by Raber et al. 1995:67, and 1995b:107). Presented in Table 5-01, these vessels are grouped according to their respective subtype as previously identified.

Table 5-01. Summary of previously investigated drydocks in the New York Harbor area.

Vessel	Reach	Subtype	Recommendations
Vessel 215	AKNY	balanced	Recordation of major dimensions (i.e., length)*
Vessel 254	AKNY	balanced	Recordation of major dimensions (i.e., length)*
Vessel 68	KVK	balanced	Recordation of major dimensions (i.e., length)*
Vessel 79	KVK	balanced	Complete recordation*
Vessel 88	KVK	sectional	Complete recordation of most intact section of 88, 89, or 90
Vessel 89	KVK	sectional	See above
Vessel 90	KVK	sectional	See above
Vessel 99	KVK	sectional	Complete recordation of most intact section of 99 or 100
Vessel 100	KVK	sectional	Same as above

*Working examples of these exist.

HISTORY OF VESSELS V2 AND V38

Drydocks are not registered in the same fashion as conventional powered vessels and barges, and so the same type of information regarding their history is not available. Drydocks of this time period were not given registration numbers, and so information about each dock is not available in the annual list of merchant vessels for the U.S. The publication does list companies owning drydocks for the year covered by the publication; however, no specific information is given that can connect the listings in the publication to the existing drydocks examined in this study. The publication does, however, give vessel-specific items such as length, width and draft, as well as location, which can narrow the field of candidates. In addition, aerial photo examination serves to establish a timeframe of use and abandonment that can be used to further narrow the field.

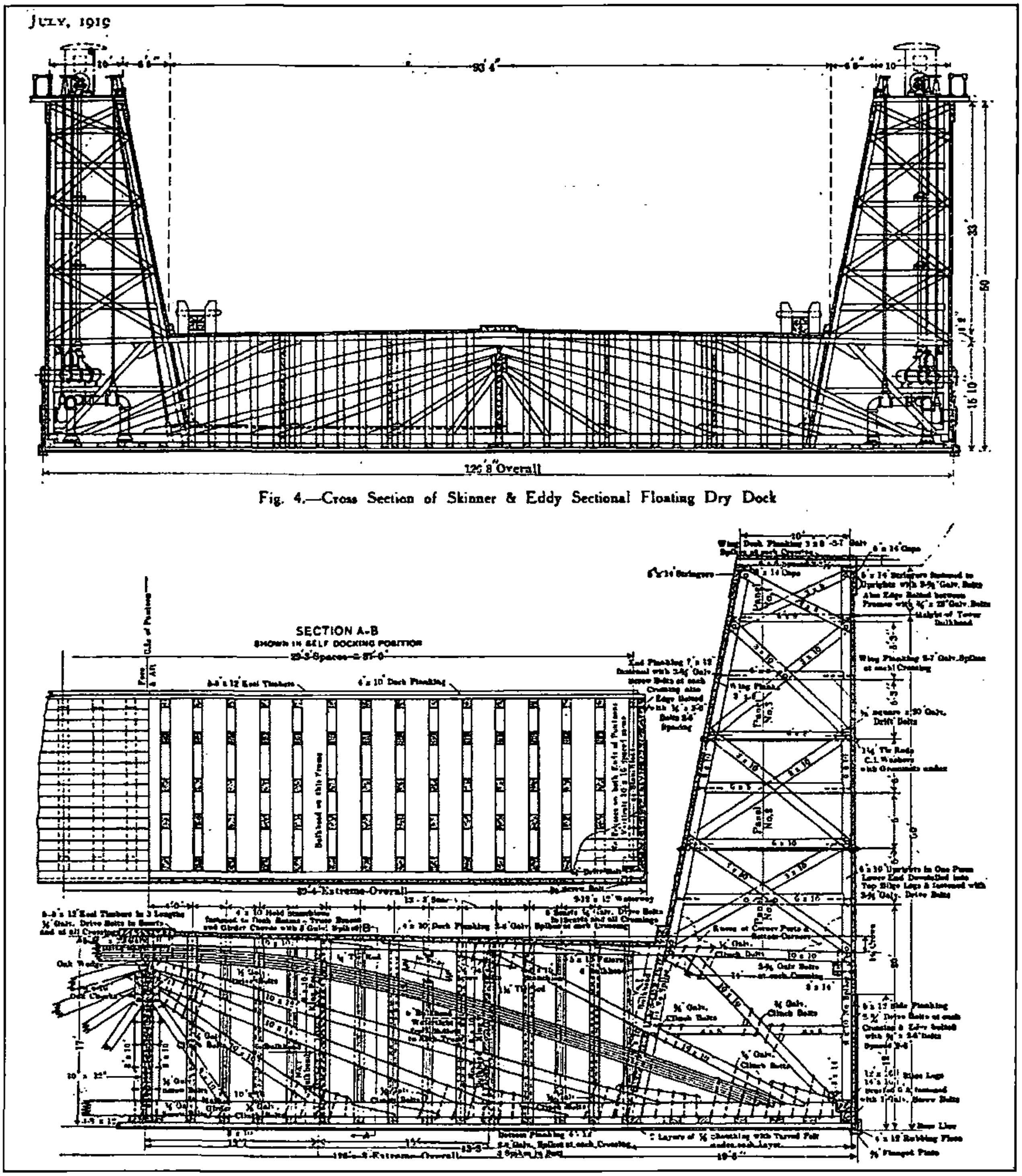


Figure 5-08. Cross section (above) and detailed scantling of a midship cross section (below) of a sectional drydock (as presented in International Marine Engineering 1920:466).

VESSEL V2

Measured dimensions of V2 along with aerial photo examination were combined to attempt to narrow possible drydocks in use in the immediate area during the given time frame. Aerial photo examination of V2 (Figures 5-09 through 5-13) indicates the vessel was abandoned in its current location after 1961 (Figure 5-11) and by 1969 (Figure 5-12). The dimensions of V2 as measured in the field indicate a length of each section of 80 feet, and a width of 114 feet, 6 inches as measured to the extent of the pontoon. Dimensions as given in the official vessel register do not indicate whether the given dimensions include just the pontoon structure or length overall, which would also include the spuds. Inclusion of the spuds would add 3-5 feet to the width. In addition, official records do not give the length of each section of a sectional drydock, but rather include the length of the entire dock and give the number of sections. While it would seem logical to simply divide the overall length by the number of sections, this would be inaccurate as the overall length also includes the added prow at each end of the complete dock. As a result, determination of which drydock in the register may be represented by V2 based solely on measurements will lead only to a list of possibilities that fall in a range of measurements. Still, the list can be narrowed to those docks shown in Table 5-02. This does not take into account the possibility that, although the drydock sections were abandoned at Shooters Island, they may have not been used in the area but brought in from elsewhere in New York Harbor or even from outside the harbor. However, it stands to reason that something as large as a sectional floating drydock would not be moved far simply to be abandoned.

Table 5-02. List of drydocks possibly represented by V2 (Annual List of Merchant Vessels).

Year	Company	Location	Length	Width	No. of Sections
1930	Todd Shipbuilding Company	Staten Island	428	114	4
1925	Alderton Dock Yards Ltd.	Brooklyn	459	120	5
1965	Brewer Drydock Company	Mariner's Harbor, Staten Island	494	120	5
1965	Brewer Drydock Company	Mariner's Harbor, Staten Island	388	120	4

Figure 5-09. 1940 aerial photo showing the eastern end of Shooters Island showing only one vessel.

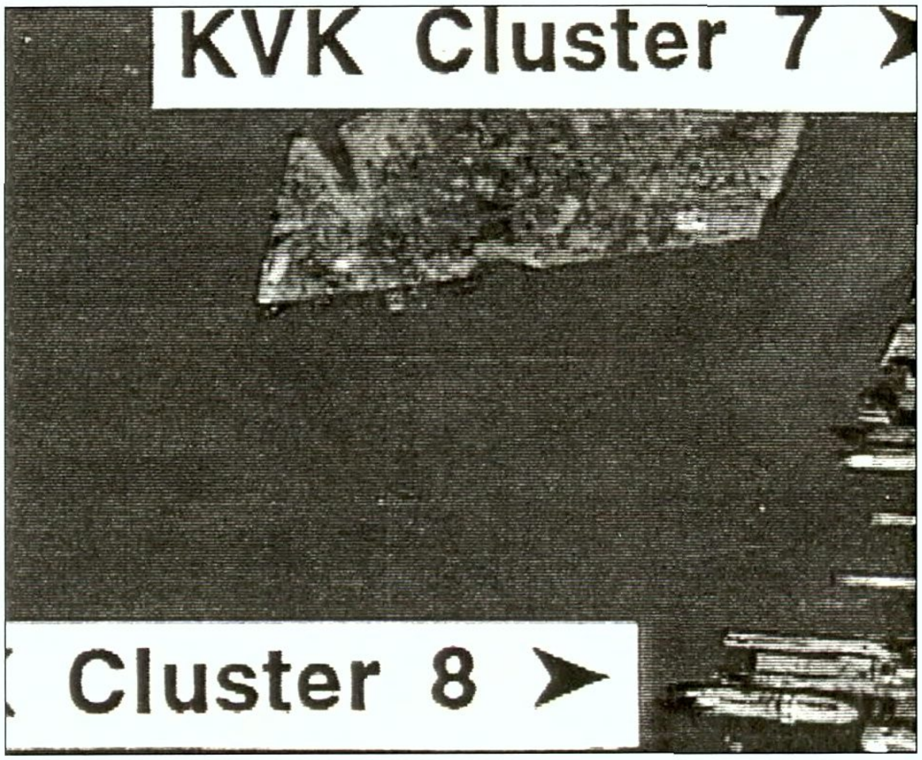


Figure 5-10. 1951 aerial photo of east end of Shooters Island.

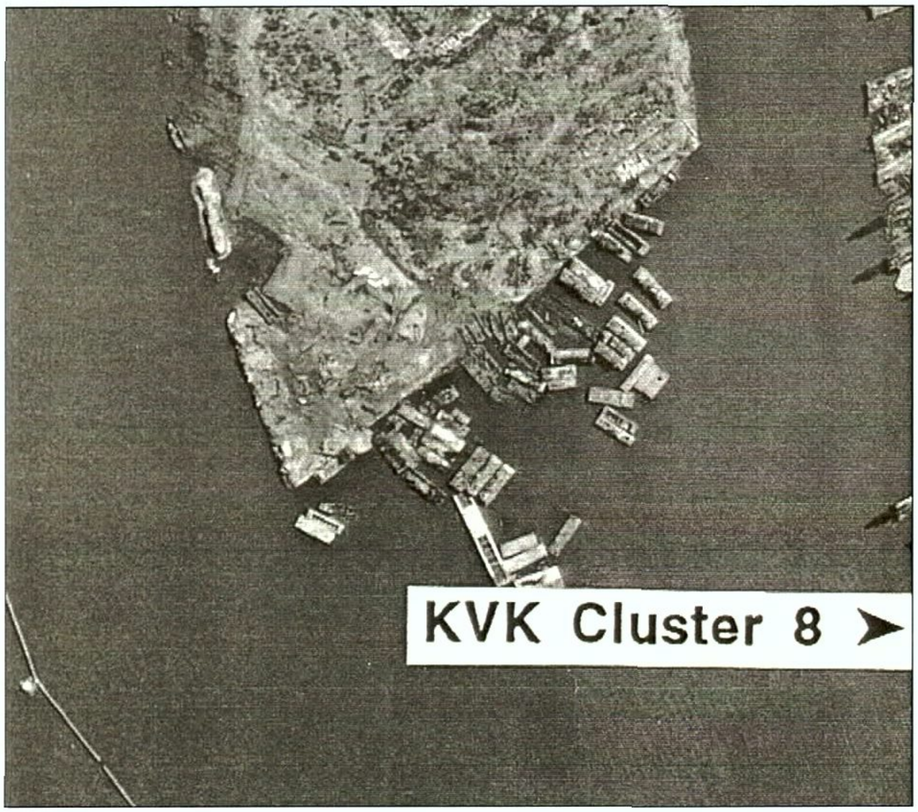


Figure 5-11. 1961 aerial photo showing east end of Shooters Island.

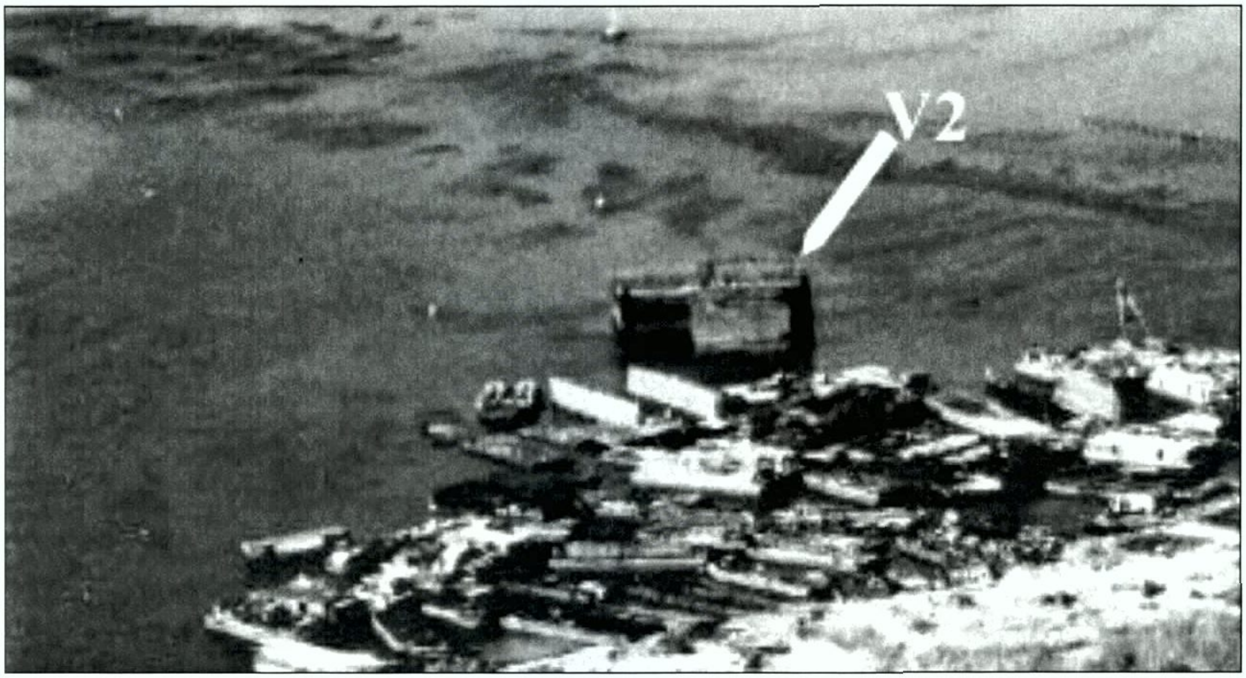


Figure 5-12. 1969 oblique aerial photo of east end of Shooters Island showing V2 in its current location.

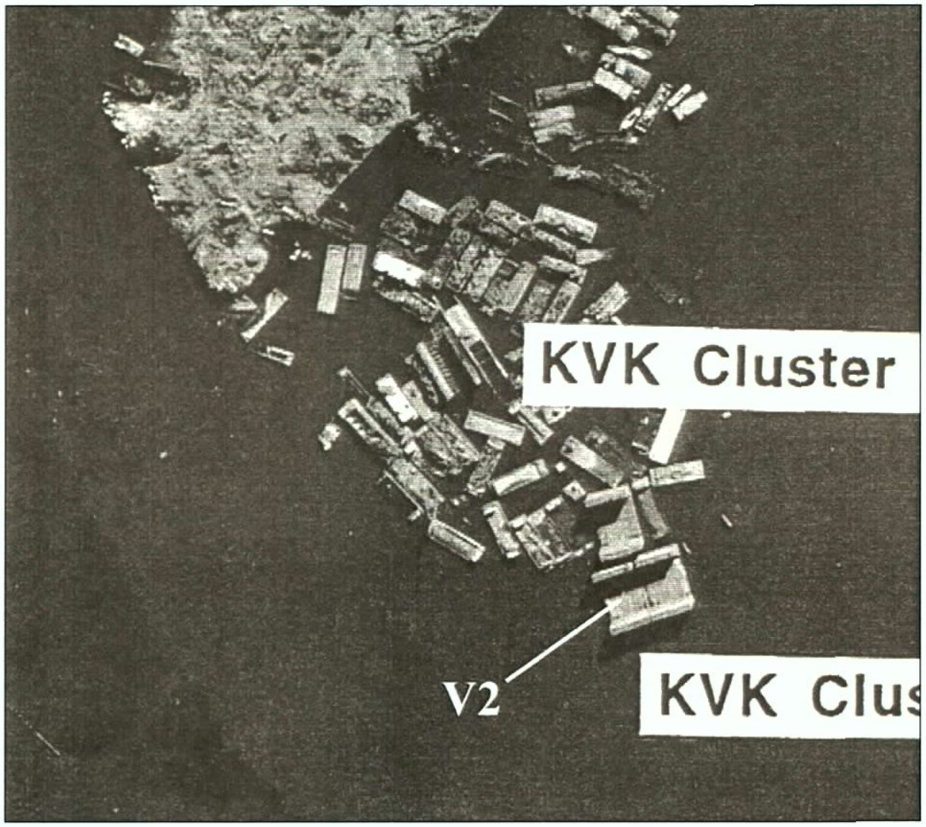


Figure 5-13. 1974 aerial photo of east end of Shooters Island showing V2 in its current location.

VESSEL V38

Aerial photo examination of V38 indicates abandonment some time between 1951 and 1974, with a slight bias toward the earlier part of that range given the condition of V38, sunken with decks awash, in the 1974 photo (Figures 5-14 through 5-16).

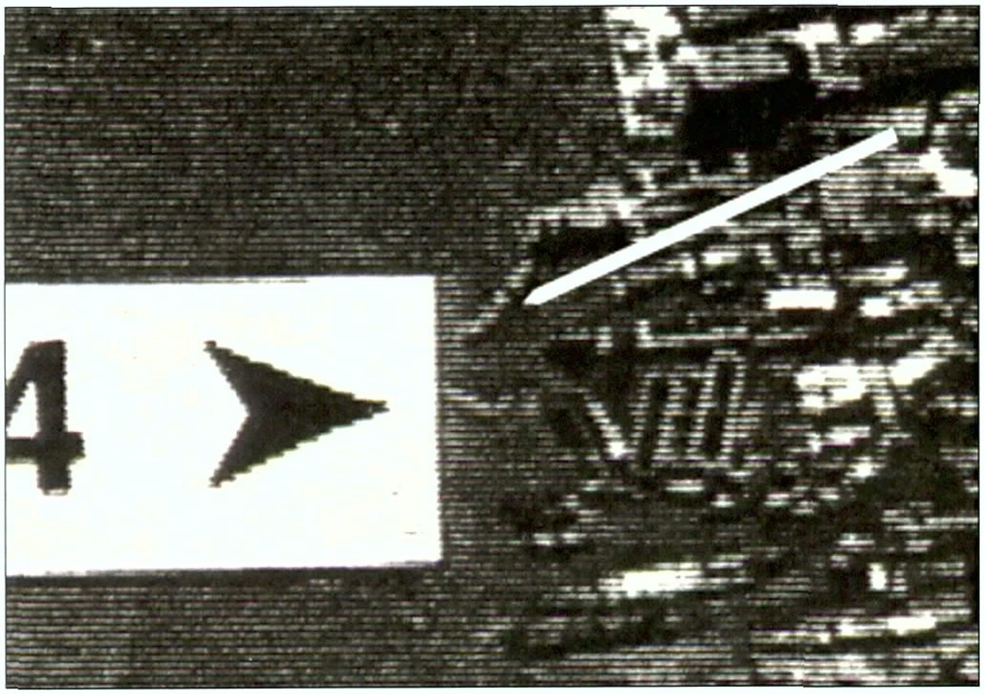


Figure 5-14. 1940 aerial photo indicating absence of V38 in the current location.

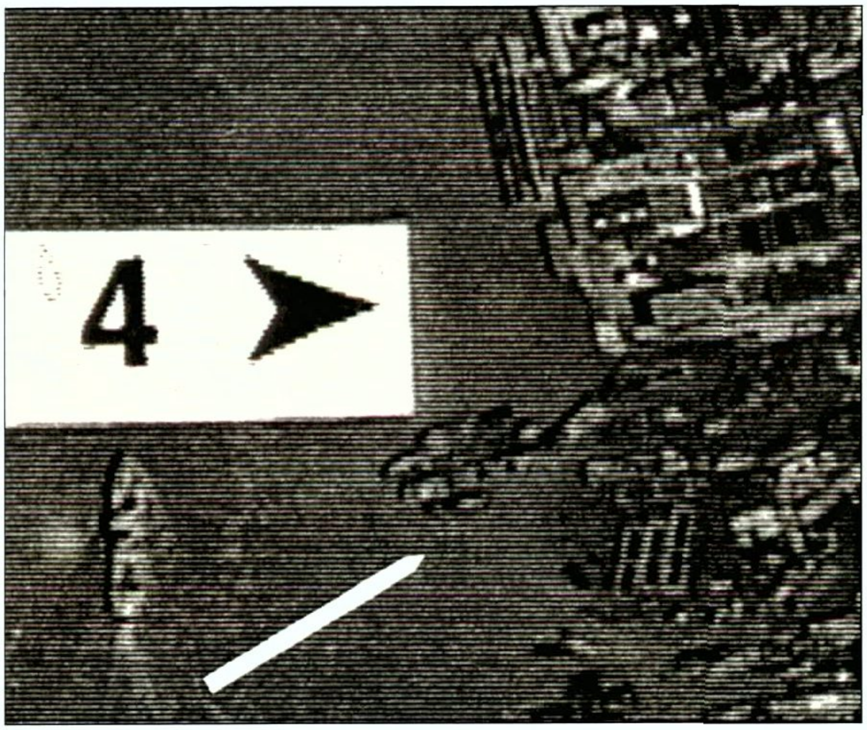


Figure 5-15. 1951 aerial photo indicating absence of V38 in its present location.

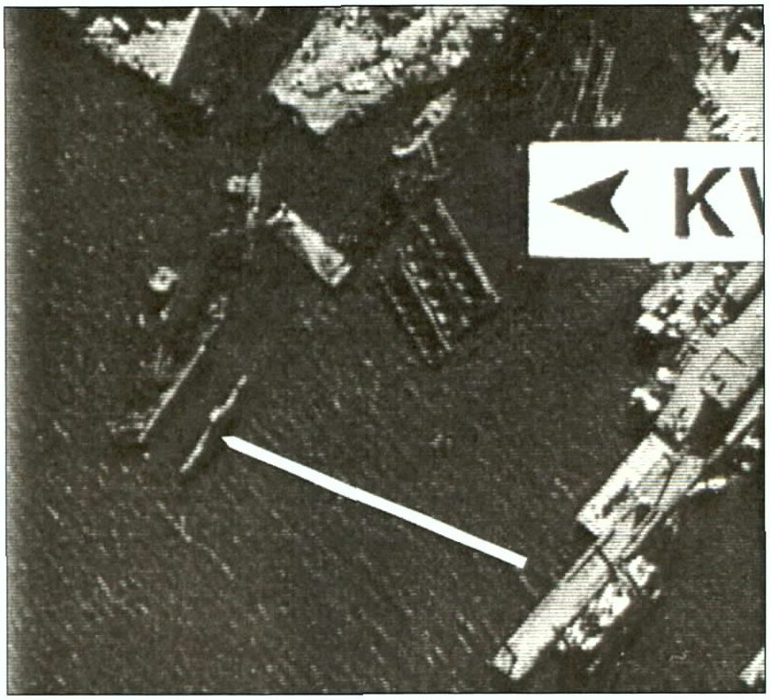


Figure 5-16. 1974 aerial photo indicating V38 in its present location with deck awash.

Examination of the Annual List of Merchant Vessels indicated that there were five balanced drydocks in use in the vicinity of Shooters Island in the year 1950 that match the general dimensions of V38. These vessels are listed below in Table 5-03. All five docks listed do not appear in the annual list after 1950.

Table 5-03. Balanced drydocks matching the general dimensions of V38 in the vicinity of Shooters Island, 1950 (Annual List of Merchant Vessels).

Year	Company	Location	Length	Width
1950	Brewer Drydock Company	Mariner's Harbor, Staten Island	182	73
1950	Caddell Drydock and Repair Company, Inc.	West Brighton, Staten Island	163	67
1950	Costagleola Drydock Company	Greenport	165	65
1950	Frank McWilliams	West Brighton, Staten Island	180	66
1950	Jersey City Drydock Company	Jersey City, New Jersey	181	66

PREVIOUS INVESTIGATIONS

In 1979, Rockman and Rothschild completed a preliminary assessment of cultural resources on and around Shooters Island. They noted the large number of abandoned vessels on the island, and noted that a large number of them may be eligible for National Register status under Criteria A and C (1979:15). They further recommended a complete inventory and evaluation of the cultural value of the Shooters Island vessels.

In 1981, Norm Brouwer conducted a survey and inventory of Shooters Island vessels. He concluded (1981:4) that none of the vessels in Area I of Shooters Island (the west side) were of sufficient age or historic value to qualify for National Register status, including V2. He also recommended that selected vessel fittings be removed and preserved.

In 1995, Panamerican Consultants, Inc., in its Phase II assessment of wrecks in the Arthur Kill, assessed V38 as historically significant and recommended photo documentation of main structural elements and recording of basic dimensions (James 1999).

In 2001, Panamerican Consultants conducted a Phase I remote sensing survey of the channel edges under the current Corps project (Lydecker and James 2002). The survey identified V2 and V38 as being potentially historic submerged cultural resources and recommended they be assessed against National Register criteria.

In 2002, Panamerican Consultants conducted a Phase II assessment of targets identified during the previous Phase I survey (Lydecker and James 2004). Although previously determined not historically significant, both V2 and V38 were identified as being eligible for National Register status, as more than 20 years had passed since the initial assessment. Panamerican recommended that both V2 and V38 receive complete documentation.

REMAINS OF VESSEL V2

GENERAL DESCRIPTION

The remains of V2 represent one section of a balanced sectional floating drydock (Figures 5-17 through 5-25). The vessel is mostly intact with the exception of portions of the wings, which have been burned. The vessel is resting on the bottom of the mud flat, with most of the pontoon submerged at high tide, with the lower eight feet of hull full of mud. The vessel measures 80 feet in length by 114 feet, 6 inches in width. The hull is divided into 24 watertight compartments of approximately equal size. The pump and gate machinery is located in the pontoon, directly below the wings. Scantlings of this vessel are large, as is to be expected from a drydock with a 10,000-ton lifting capacity.

Unlike a conventional vessel, drydocks have no bow or stern in the conventional sense. However, for the purposes of discussion, the end facing north will be considered the bow, with the aft end to the south, port to the west, and starboard to the east. Complete plan and profile drawings of V2 are presented in Figures 5-18, 5-19, and 5-20, as well as Appendix E.

V1, identical to V2 and immediately adjacent, was examined in instances where its deterioration allowed greater access to various elements that were not as easily accessed on V2.

Figure 5-17. V2. View to the south.

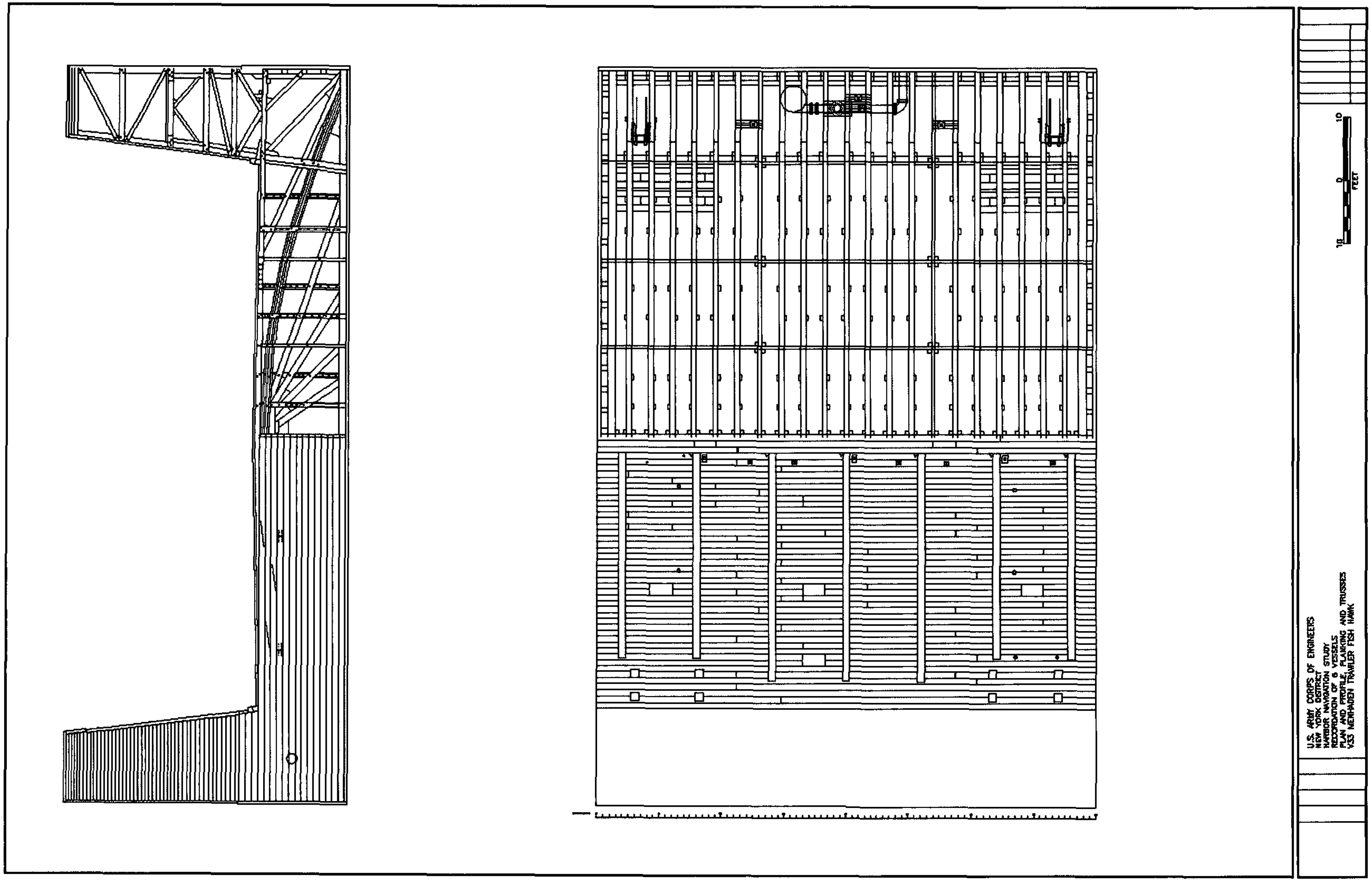


Figure 5-18. Plan and profile of planking and trusses, V2 sectional floating drydock.

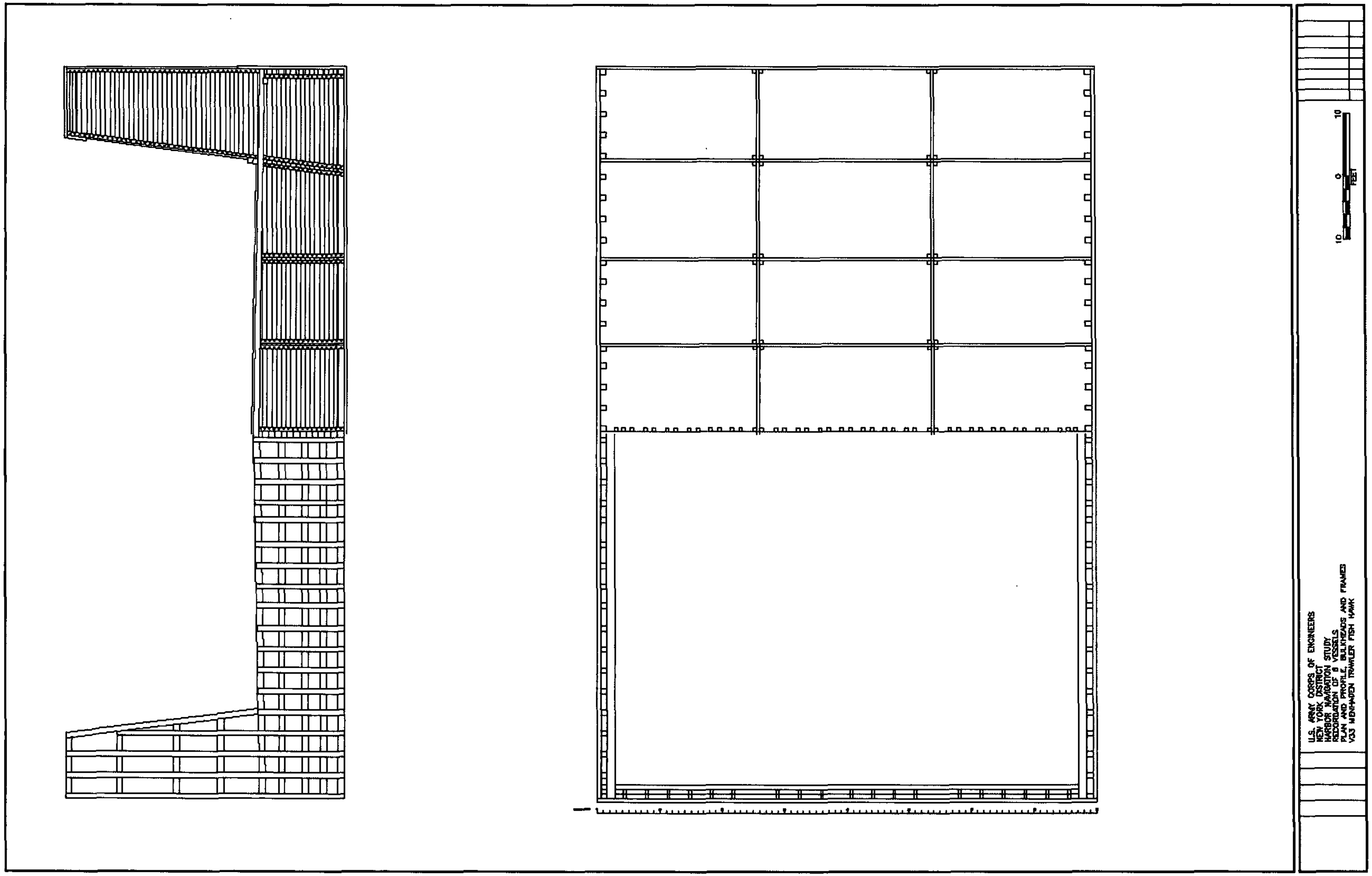


Figure 5-19. Plan and profile of bulkheads and outer hull framing, V2 sectional floating drydock.

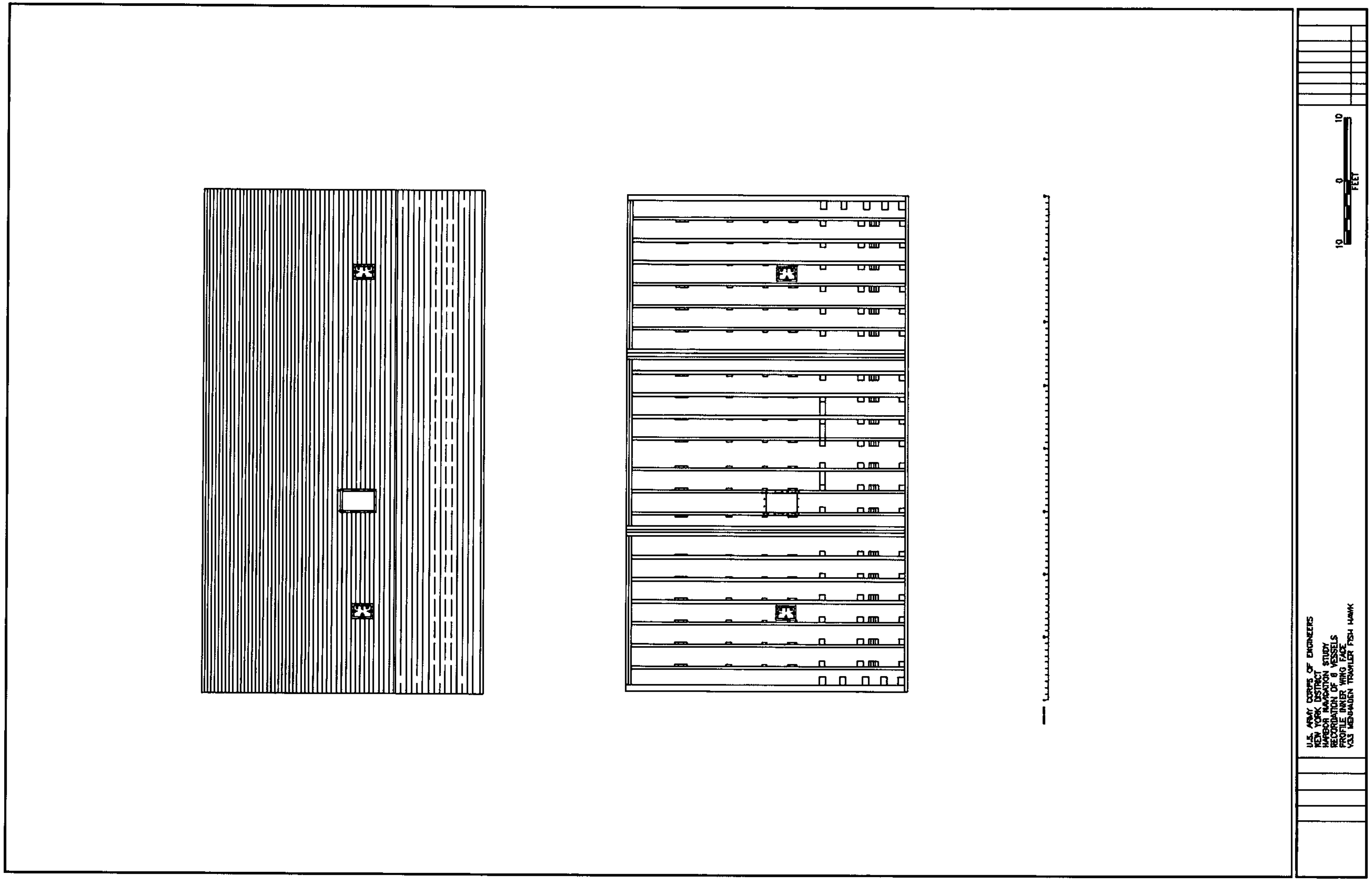


Figure 5-20. Profile of wing showing inner face planking and framing, V2 sectional floating drydock.

Figure 5-21. Aft edge, with V1 on the left and V2 on the right. View to the west.

Figure 5-22. Main deck port side. View to the north.

Figure 5-23. Main deck starboard side. View to the south.

Figure 5-24. Port side. View to the east.

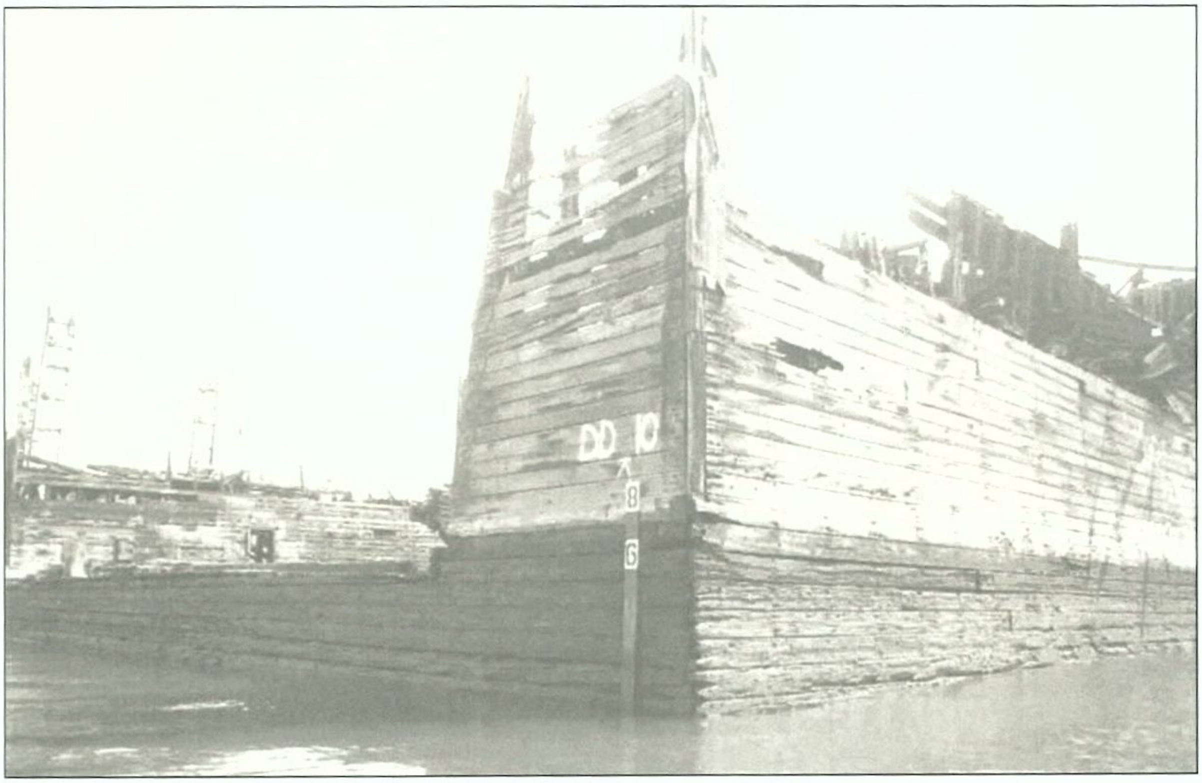


Figure 5-25. Forward port corner. View to the southeast.

LOWER HULL

The lower hull was inaccessible. However, like V38, the main hull of V2 is a large scow-type box, very similar in construction to a barge, and it is likely the lower hull construction will be very similar to the upper. This is reflected in the drawings in Appendix E.

Keel, Keelsons, and Floors

Exact configuration and dimensions of the timbers of the lower hull is unknown due to the inaccessibility of that area. However, by examining available plans for docks of similar size and construction, we can get a basic idea of the likely configuration of V2. Most drydocks of this size did not have a keel extending below the hull bottom. Neither was there a dedicated centerline keelson, although a stout central bulkhead, in this case made up of 12 × 12 timbers, provided adequate longitudinal structural support along the centerline (see Appendix E).

Various sectional drydock plans were examined for vessels of similar size to V2. These included one built for Theodore A Crane of Brooklyn with a lifting capacity of 10,000 tons in six sections (see Appendix G). Each section was 90 feet long and 120 feet wide—slightly larger than V2. In this vessel, the floors are longitudinal and the keelsons athwartships. The keelsons are shown to be slightly smaller in the sided dimension than the corresponding deck beams (9 in. vs. 12 in.), but there is no way to confirm this for V2. Regardless, is it certain they are fairly stout timbers, as are the floors.

Logs

As a sizeable vessel with a flat bottom and sides, it is a certainty an equally sizeable bilge log was used in its construction. Similar size vessels utilize timbers of 16 × 16 or comparable dimension. It is also likely that this area of the vessel received additional rider logs of similar size placed directly atop the bilge log. Some sectional drydocks have as many as three stacked bilge logs, with the third log usually referred to as a bilge keelson. Dimensions are similar (12 × 16, 14 × 16, or 16 × 16), with the main log being the largest. Although the exact configuration of V2 was not observed, given its size it is safe to say it has at least one rider log in addition to the main bilge log.

It is not known if V2 has an end bottom log. Plans of similar vessels such as the Crane and Sons dock indicate an arrangement that differs slightly from the sides of the vessel, with an end keelson atop the longitudinal floors. The larger sectional drydocks usually have two athwartships timbers that are more akin to large hull planks in that they are exposed on the outside and not planked over like the chine or bottom logs. Nevertheless, they serve the same purpose. The timbers in the Crane and Sons drydock are 12 × 16 below a 12 × 12, with the upper timber notched to receive the frames.

UPPER HULL

Outer Hull Planking

Two different sizes of outer hull planking were used in V2, with larger planking used on the pontoon than on the outside of the wings (Figures 5-26 and 5-27). Outer hull planking of the pontoon measured 5 inches thick and 12 inches wide (Figure 5-28). Individual timbers were joined via both a standard scarph joint on the ends of the vessel (Figures 5-30 and 5-31), and a butt joint on the sides of the vessel (Figure 5-32) that was reinforced from inside the vessel with the addition of a chock between frames. Hull planks were spiked to the frames with a quad pattern (see Figure 5-28), and also edge fastened with 3+-foot long drift pins (Figure 5-35). The hull to just about the empty waterline shows remnants of a sacrificial wooden layer of what appears to be 1-inch thick planking, likely added to protect the hull from wood-boring organisms (Figure 5-36).

Figure 5-26. Port forward corner, view to the south, showing thicker pontoon planking.

Figure 5-27. Aft starboard quarter, showing transition from the thicker planking of the pontoon to the thinner planking of the wing.

Figure 5-28. Outer planking of pontoon.

Figure 5-29. Starboard quarter forward, view to the southwest (aft), showing transition between hull planking and wing planking.

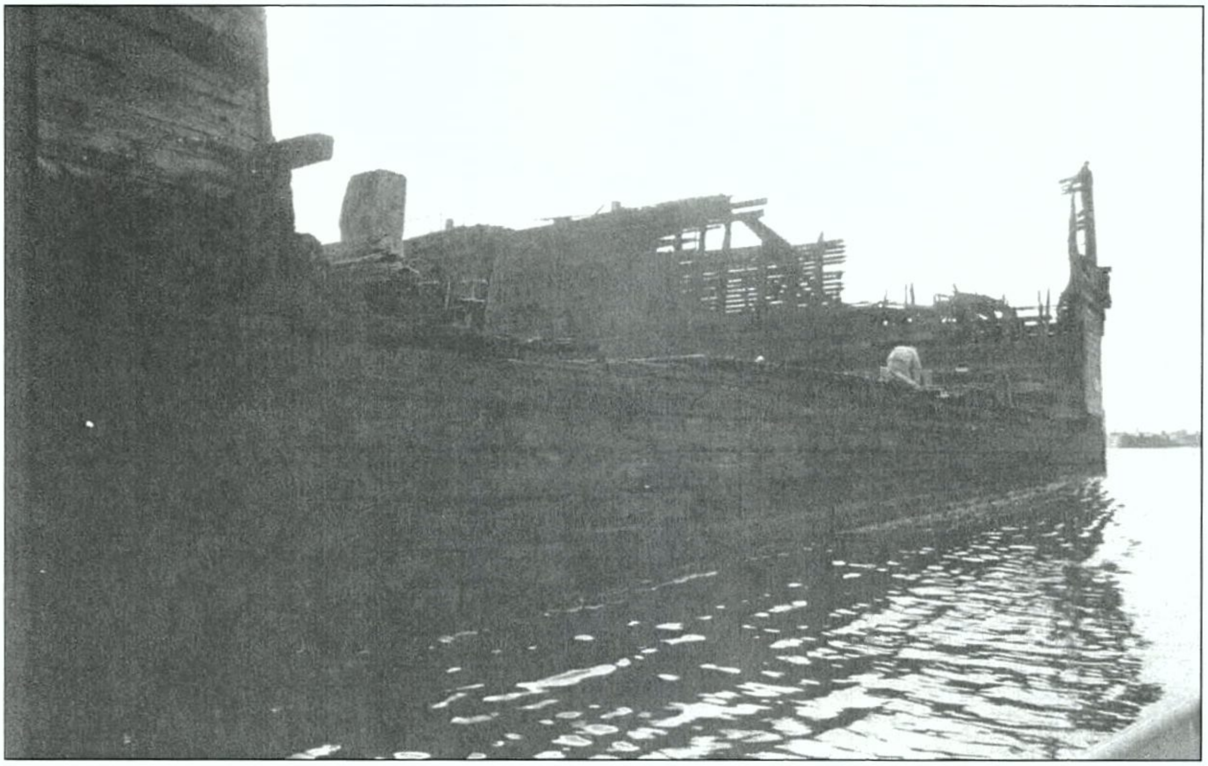


Figure 5-30. View of forward end of vessel, looking west.

Figure 5-31. Outer hull plank with scarph joint. Forward (north) end of vessel, view to the south.

Figure 5-32. Close-up of starboard side, view to the southwest. Note outer hull planking with butt joints.

Figure 5-33. Close-up of butt joint. Note array of fasteners joining chock on inboard side of joint.

Figure 5-34. View of chock reinforced butt joint. View to the east (starboard).

Figure 5-35. Outer hull planking with drift pin edge fasteners.

Figure 5-36. Sacrificial wooden planking added to hull of V2 below waterline.

Deck Beams, Stringers, and Top End Logs

V2 lacks a top end log as such. In its place is a larger deck beam, measuring 16 × 10 to the deck beam 10 × 10, which is placed inboard of the hull frames (Figure 5-37, right of center). Although similar in size to what would be expected of a top end log, a top end log would be notched to receive the frames and place directly above the frame tops, rather than inboard. It is fastened in the corner to both the corner post (which extends upward as the wing corner post as well) and to the outermost longitudinal stringer, which measures 9 × 8 and is fastened to the underside of the deck beams and the end top log (Figure 5-38). In addition, chocks are used between the frames at the deck beam level. Sections of the top end log are joined with a basic reinforced scarph (Figure 5-39). There are no other stringers used under or over the deck beams, save for the wing chine, which will be discussed later. Presumably, the three longitudinal watertight bulkheads provided sufficient longitudinal strength. Although no deck stringers were used in construction, there are stringers along the sides and ends of the vessel, directly below the top end log and deck stringer. Although they were below the water- and mud lines and were not directly measured it is likely they are similar in size to the longitudinal deck stringer mentioned above. Probing along the sides of the vessel indicated a total of five stringers, including the top and bottom. The longitudinal stringers appear to be placed atop the athwartships stringers in the corners and fastened both to each other and to the corner post.

The deck beams measure 10 × 10, are generally placed on 42-inch centers, and extend across the entire width of the vessel from outer hull planking to outer hull planking (Figures 5-41 and 5-42). At the edges, they are placed atop the longitudinal stringer adjacent to the frames (see Figure 5-40). They are fastened to the inboard side of each frame. At the midships line they switch sides, so this remains true for the opposite end of the vessel, as well. Deck beam timbers were joined using a reinforced butt joint (Figure 5-43). Deck beams were omitted over the athwartships bulkhead locations.

Figure 5-37. Northern exposed end of V1, showing top end log (right of center) and chocks between frames. View to the west (port).

Figure 5-38. Northern exposed end of V1, showing top corner construction. View to the east (starboard).

Figure 5-39. Top end log scarph joint, fastened with four bolts. View to the west (port).

Figure 5-40. Deck beams at starboard side. View to the east.

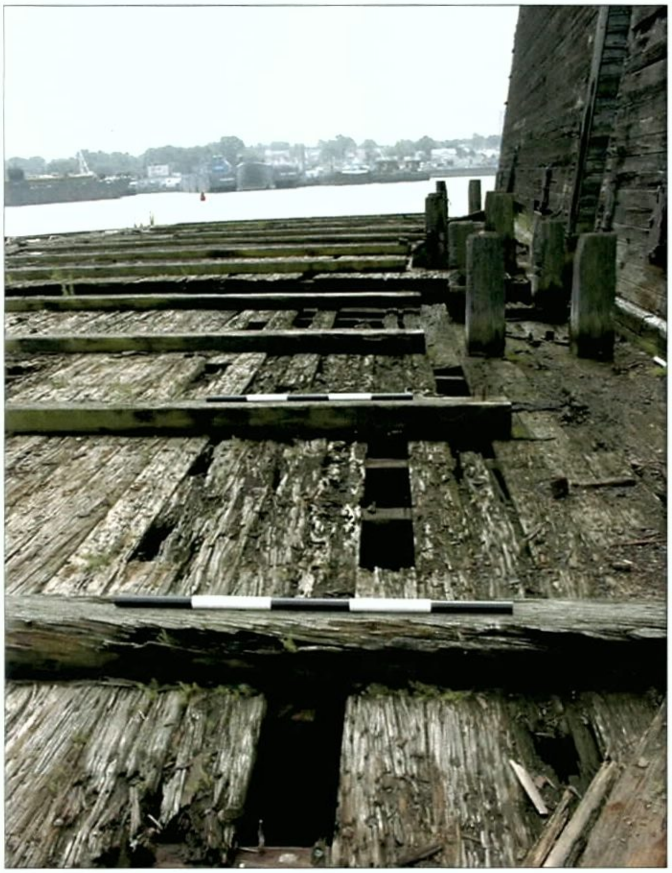


Figure 5-41. Main deck. View to the south (aft). Note exposed deck beams.

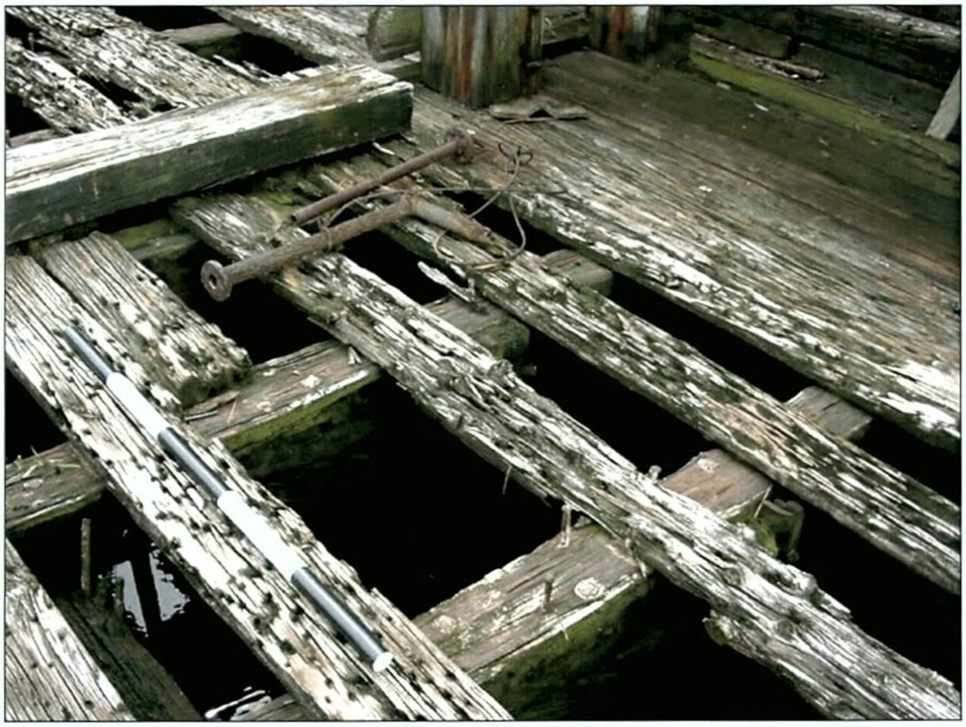


Figure 5-42. Detail of exposed deck beams. View to the southeast (port).

Figure 5-43. Reinforced butt joint on deck beam. View to the north (forward).

Main Hull Structural Members

There are several main structural members of the hull that are dedicated to supporting the hull, transferring the weight of a loaded vessel to the water, trimming the vessel, and tying the drydock sections together. These components include stanchions, frames, the truss system, and the bitts.

Watertight Bulkheads

The pontoon of V2 is divided into 24 watertight compartments of roughly equal size (Figure 5-19, Appendix E) extending from the bottom of the hull to the tops of the wings. They are constructed of timbers 6 inches sided and 11.5 to 12 inches molded (Figures 5-44 through 5-47). Vertical timbers measuring 8 × 8 are used to reinforce the junction of each bulkhead with the perpendicular bulkheads and with the sides of the vessel, as well as with the central bulkhead and trusses (Figure 5-48). Deck beams are notched to fit over the top timber in the longitudinal bulkheads. Extant fasteners indicated chocks were used between the deck beams, but are no longer present (Figure 5-49).

Figure 5-44. View of forward side of watertight bulkhead in starboard wing. Pontoon bulkheads are of similar construction.

Figure 5-45. View starboard wing showing placement of watertight bulkheads, noted at opposite ends of photograph. View to the west.

Figure 5-46. Bulkhead timbers. View to the east (starboard).

Figure 5-47. Central bulkhead. View to the east (starboard).

Figure 5-48. Intersection of bulkhead and outer hull in port wing. View to the northwest (port forward).

Figure 5-49. Top of longitudinal bulkhead showing exposed fasteners.

Main Deck Support

The main deck is supported by stanchions at regular intervals along each and every deck beam, with two per watertight compartment. There are no stanchions along the longitudinal or transverse bulkheads although that is the location where they would be. There are vertical structural members associated with the bulkheads and these will be discussed below and shown in Figure 5-48. The stanchion scantlings are generally a consistent 10 inches sided and 4 inches molded. They are offset from the deck beam and fastened to the side of the deck beam, as well as to the sides of each truss member below (Figure 5-50). The space directly under the deck beam is supported by a chock of 10-inch depth and 5-inch width, which is fastened to the stanchion (Figures 5-51 and 5-52). The stanchions are placed to alternating sides of the deck beam with the exception of the first two outboard of the centerline, which are on the same side. This placement is consistent on every pair of deck beams, and reverses for every pair along the length of the vessel. The exception to this is deck beam 8, which is a single, as there are an odd number of deck beams.

Figure 5-50. Deck stanchion.

Figure 5-51. Example of chock between hull structural members.

Figure 5-52. Opposite side view of chock between hull trusses.

Frames

The outer hull is supported by a series of regularly spaced vertical frames extending from the end bottom log to the deck level. The scantlings vary according to location; the frames of the vessel ends are of considerably heavier dimension that those that make up the sides of the vessel. It should also be noted that the side frames continue past the main deck level to become frames for the outboard side of the wings. The end frames are 12 inches molded and 10 inches sided, and placed on 42-inch centers (Figure 5-53). A chock measuring 12 inches molded and 10 inches sided fills the space between each frame (Figure 5-54). The side frames total 18 inches in a molded dimension and are made up of two futtocks edge fastened rather than side by side. The outboard futtock measures 10 × 5 while the inner member measures 8 × 5. The side frames are located on the outboard side of each deck beam, again with the exception of the bulkhead locations, which employ a different vertical reinforcement that will be discussed below. The space between the frame and the next deck beam is filled with a chock at deck beam level (see Figure 5-54). The inner futtock extends to just above main deck level, where it terminates in a bevel cut, with the remaining futtock forming the frame of the wing structure (Figures 5-55 and 5-56). Several feet above the main deck the inner futtock is added again to support the wing framing structure.

Figure 5-53. Vessel end frames on northern exposed end of V1. Note spacing and chocks. View to the east.

Figure 5-54. Vessel side framing on northern exposed end of V1. Note spacing and chocks. View to the east.

Figure 5-55. Side frame detail. Note edge fastened futtocks, deck beam, and longitudinal stringer under deck beam. Outer hull planking is left. View to the north (forward).

Figure 5-56. Side frame detail just above main deck, port wing. Note termination of inner futtock.

Trusses

The tremendous weight of the vessel sitting in the drydock is distributed equally to the surrounding water via a series of diagonal and arched trusses. A total of eight timbers, including one large curved laminated truss, make up each truss system. There is one located at each deck beam, again with the exception of the transverse bulkhead locations. The largest member, a giant curved laminated beam consisting of four 4-inch by 10-inch timbers fastened together to form one 16-inch beam, extends from the lower side of the main hull across the central bulkhead (Figure 5-57). It is fastened to each deck stanchion and rests on the aforementioned chock placed directly below the deck beam.

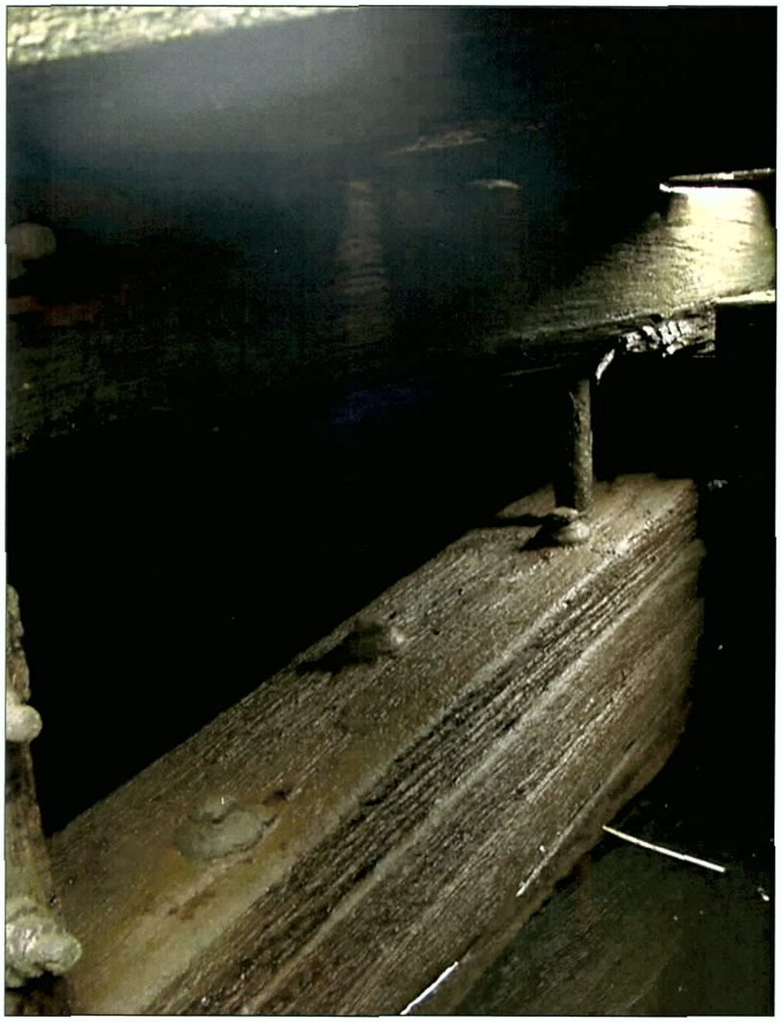


Figure 5-57. Main 16-inch laminated arched truss (T1). View from port toward vessel centerline (east).

Four other angled truss timbers radiate from the central bulkhead under the major truss (T1). While their points of attachment to the lower hull were not observed directly, they were inferred from the angle of each member (Figure 5-59). It is assumed each truss meets the bottom of the vessel at or about either a longitudinal bulkhead or stanchion, as this would give the most strength to the truss arrangement, and other similar sized vessel plans indicate a similar arrangement. The vessel profile (Figure 5-18) illustrates the four angled trusses and their interpolated termination points. Three more angled truss timbers are placed at various points along the hull outboard from the centerline. These all begin and terminate above/outboard of the main truss. Truss 6 is fastened to the deck beam at the outboard side of bulkhead L4 (and L5 on the opposite side of the vessel). A triangular shaped chock fills in between the truss and the beam to give additional strength to the joint (Figure 5-60). Its angle suggests it meets the bottom of the vessel in the outside corner directly above the main truss. Truss 7 it fastened to the conjunction of the inner wing frame, wing chine, and deck beams at the inner wing wall (Figure 5-62). Its angle suggests it meets the bottom atop Truss 6. Truss 9 is notched to the underside of the deck beam at the midpoint of the wing—its angle suggests it meets the outer hull midway between the main deck level and the vessel bottom (Figure 5-63).

Figure 5-58. Main 16-inch laminated arched truss (T1). View toward southeast (aft starboard corner).

Trusses are fastened to the deck beams with a combination of mortise joint and triangular chock, with 1-inch drift pins.

The trusses intersect the longitudinal watertight bulkheads in several places. Where this occurs, the bulkhead timbers are fitted around the trusses. Figure 5-64 illustrates the main truss (T1) over a secondary truss (T2) at the juncture of the second longitudinal bulkhead (L2 and L3). As can be seen in Figures 5-64 and 5-65, the trusses are connected to one another via a 2-inch diameter vertical tie-rod.

Figure 5-59. Confluence of trusses at centerline bulkhead (T1). View from port toward centerline, to the southeast.

Figure 5-60. Truss 6 at main deck beam. Note triangular chock between truss and beam, and narrow vertical chock below truss opposite stanchion. View to the north (forward).

Figure 5-61. Truss 6 at main deck. Note end of triangular chock at left. View to the north (forward).

Figure 5-62. Northern exposed end of V1 showing Truss 7 at main deck.

Figure 5-63. Exposed northern end of V1, showing Truss 8 and main deck beam. Note truss attachment under deck beam at center of photo. Also note use of triangular chock. View to the south (aft).

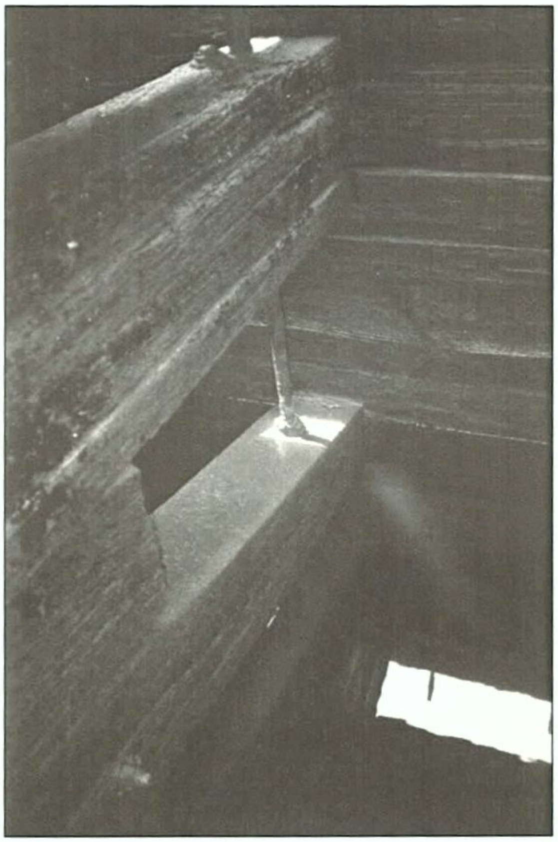


Figure 5-64. Main truss (T1) (top) and secondary truss (T2) meeting longitudinal bulkhead. The third truss (T3) is barely visible below the water. View to the south (port side).

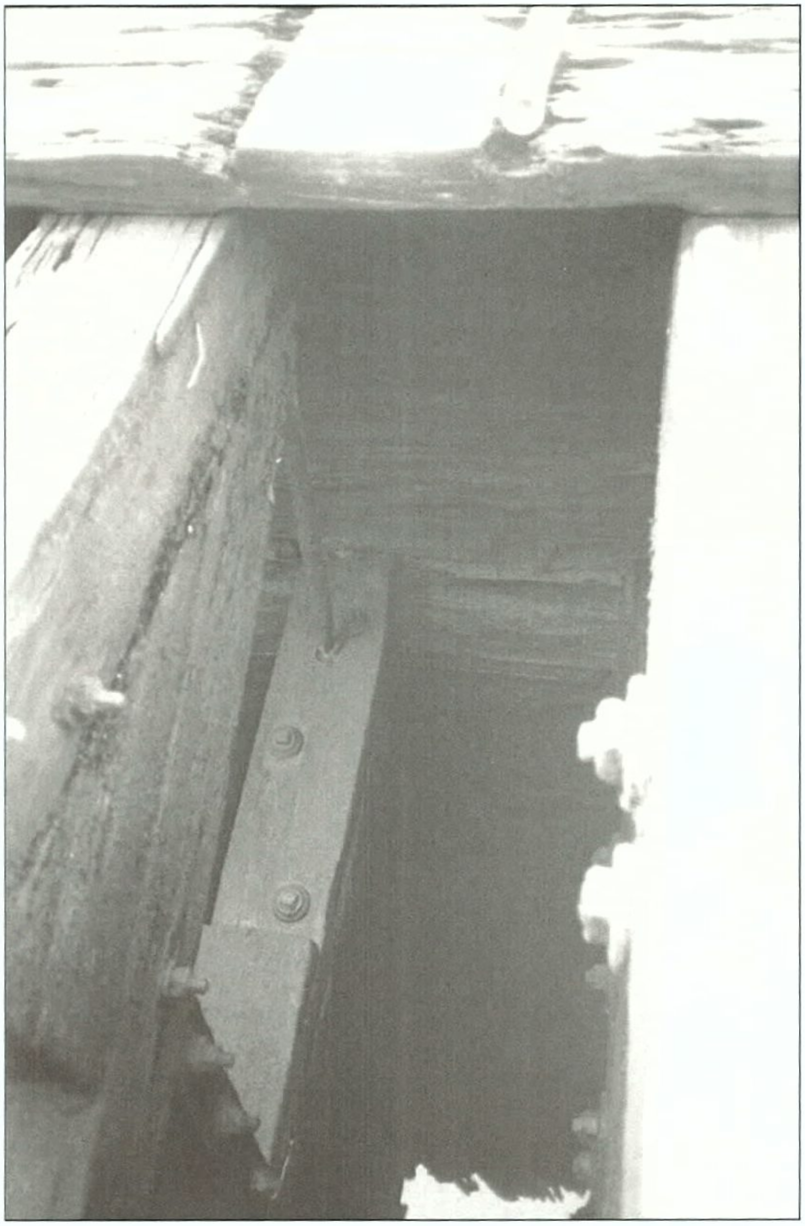


Figure 5-65. Third longitudinal bulkhead (L4) showing Truss 1 and Truss 6. View from port toward centerline of vessel.

Bitts

Each section of a sectional drydock contained four large bitts, one at each corner of the vessel, which were used to link the sections together. The bitt consists of four vertical timbers measuring 15 × 15 (Figures 5-66 and 5-67) that extend down into the hull, perhaps as far as the bottom, two cradles, and four cinch bolts. At each end adjacent to the vertical timbers is a cradle for the coupling timber (Figure 5-68), which consists of four individual 15 × 15 timbers fastened together to make one unit that measures 30 inches square (Figure 5-69). Associated with each side of the cradle is a lag bolt extending from the framing below up through the cradle. This is the mechanism by which the coupling timber was cinched to the cradle; nuts were tightened on the lag bolts, which in turn cinched a plate over the timber (Figure 5-70), tightening it to the cradle (Figure 5-71).

Figure 5-66. Port forward bitt. View to the north.

Figure 5-67. Port aft bitt. View to the north.

Figure 5-68. Bitt cradle. View to the north (forward).

Figure 5-69. Section of remaining coupling timber in port forward bitt. View to the north.

Figure 5-70. Cinch plate.

Figure 5-71. Cinch bolt on forward port bitt. Cradle has eroded or been removed. Lag bolt extends to framing below. View to the west.

Subdeck Bitt Framing

For this discussion, specific locations will refer to the forward port bitt, but the other three bitts are essentially identical although mirrored. There is extensive support framing below deck. The four vertical timbers are placed adjacent to the deck beams and trusses, with the aft pair placed on the forward side of deck beam 6, and the forward pair placed on the aft side of deck beam 1 (deck beam 1 is also the end top log). The vertical bitt timbers are fastened to the deck beams as well as to each truss with 1-inch drift bolts. It is not known if they extend completely to the bottom of the vessel, but considering the amount of twisting and sheer forces these timbers would be subject too it is likely they do, and are probably fastened to the floors and keelsons. Additional strength is added to the bitt structure through the use of four 12-inch square stringers extending from deck beam 1 to deck beam 6 (Figures 5-72 and 5-73). They are placed to either side of each vertical bitt timber. Directly below these are two transverse timbers of similar size extending across all four stringers and placed to the side of the vertical bitt timbers opposite the deck beam and trusses, and fastened to the stringers and to the bitt timbers (Figure 5-74). In addition, noted in Figure 5-74 are chocks between the stringers and atop the transverse timbers through which the cinch bolts pass. The cinch bolts terminate on the underside of the transverse timbers.

Figure 5-72. Starboard aft bitt structure showing vertical bitt and longitudinal stringer. View to the east (starboard).

Figure 5-73. Starboard aft bitt structure detail. View to the east (starboard).

Figure 5-74. Detail of structure of aft starboard bitt showing stringers and, directly below, transverse bracing. View to the east (starboard).

Figure 5-75. View of bitt structure at deck beam 6. View toward northwest (forward port). Note stringer to right of vertical stanchion, chock to right of stringer, and transverse support below stringer and chock.

MAIN DECK

The main deck, being the main working area of the vessel, contains sufficient details to discuss it as a separate section. Several elements are evident, including construction details, hatches, hardware, and evidence of repair and modifications (Figures 5-18).

The deck plank consists of longitudinal timbers between 11 and 12 inches in width. The 4-inch thick timbers are fastened with rose head spikes in an alternating pattern (Figures 5-76 and 5-77). Down the centerline of the vessel are five 12 × 10-inch keel block stringers (Figures 5-78 and 5-79). Extending outward from the keelsons in an athwartships direction are seven bilge block stringers on each side of the vessel of varying lengths. Measuring 12 × 6, these timbers are placed atop the deck planking, unlike the keel block stringers, which are fastened directly to the deck beams (Figures 5-80 through 5-81). The bilge block stringers extend almost to the base of the wing, except for the outer two on each side of the vessel, which extend to just inboard of the bitts, located at the four corners of the vessel.

Characteristics of the main deck indicating its use take the form of various fittings, hatches, and other items. The most prominent features are those associated with the stabilization and leveling of the vessel in the dock. This was accomplished through the use of keel blocks and bilge blocks. Keel blocks supported the keel of the vessel and were adjusted longitudinally along the keel block stringers while the bilge blocks supported the vessel in the athwartships direction and were adjusted along the bilge block stringers. Both types of stringers would have had a track and associated hardware allowing the blocks to be moved easily and locked into place. No evidence of such tracks is apparent on V2.

Figure 5-76. Deck plank. Port side, view to the south (aft).

Figure 5-77. Deck plank fastener pattern detail.

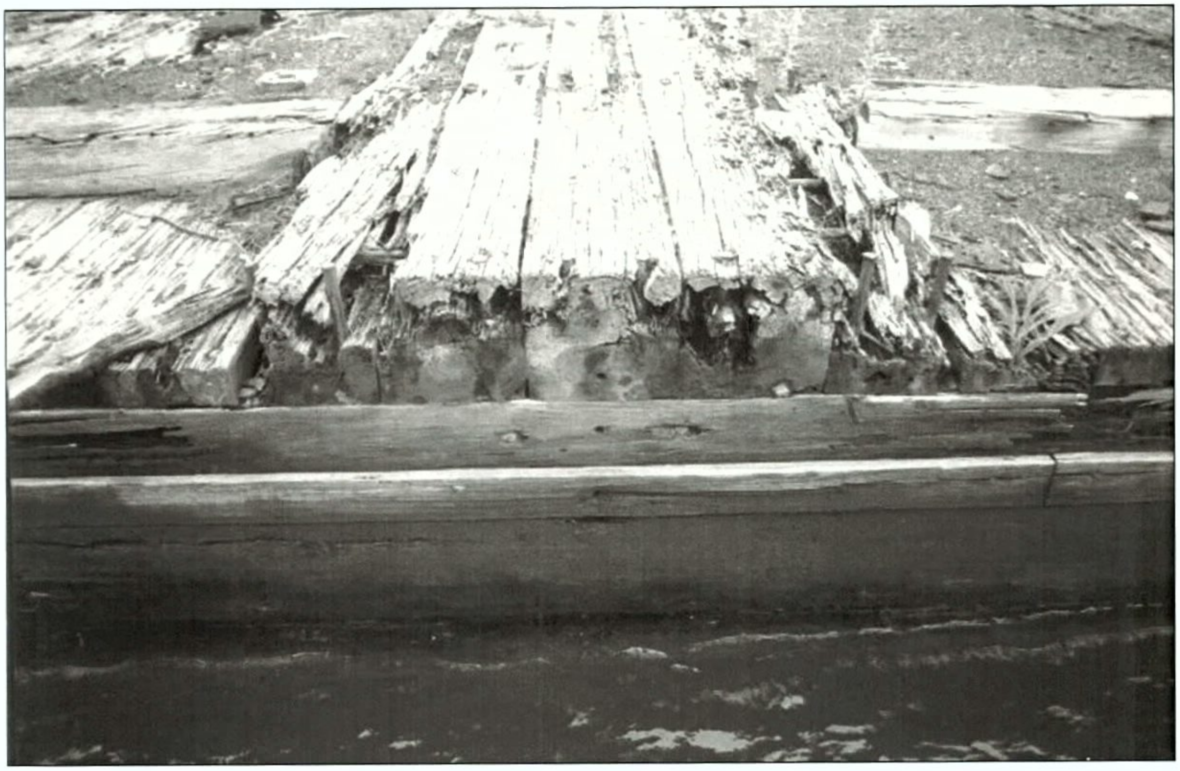


Figure 5-78. Forward edge of V2, showing keel block stringers.

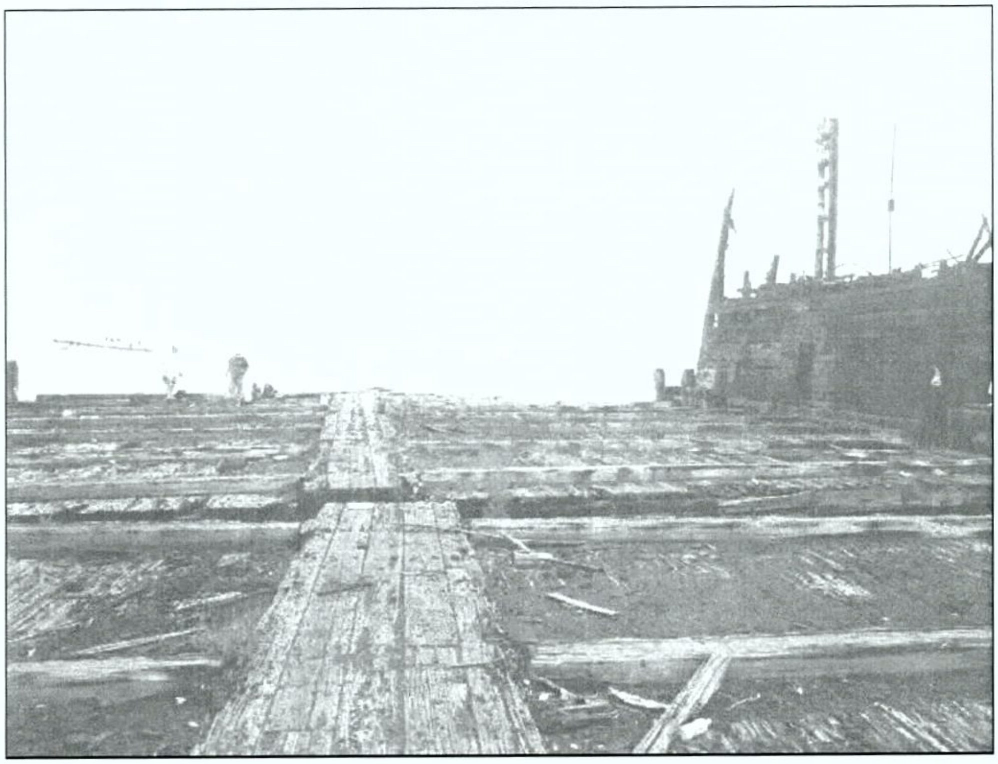


Figure 5-79. Keel block stringers (fore and aft). Also note bilge block stringers (athwartships). View to the north (forward).

Figure 5-80. View from aft looking toward port bow, showing placement of bilge block stringers and port aft bitt.

Figure 5-81. View aft (south), showing bilge block stringers in relation to wing and bitt.

Figure 5-82. Bilge block stringer detail, aft port. Note placement of stringers over deck beams. View to the north (forward).

Figure 5-83. Bilge block stringer fastener pattern detail.

Other evidence of hardware and deck fittings related to the vessels use is present on deck. Most notably are 12 fittings that appear to be drains (Figures 5-84 through 5-86) located on each side the keel block stringers and immediately adjacent to the forward side of each bilge block stringer. Each drain consists of a hole through the deck, a screen covering the hole, and an iron cover. Most of the iron covers have been removed or rotted but remnants can be seen.

Figure 5-84. Deck drain. View to the east (starboard).

Figure 5-85. Deck drain with cover and straining screen removed. View to the south (aft).

Figure 5-86. Main deck looking starboard (southeast). Note location of drains, bottom center.

Also observed at various places close to the centerline but most often on the side of each bilge block stringer opposite the drain is a square fitting with a circular tapered hole of unknown function (Figures 5-86, lower left, and 5-87). Measuring 9 inches square and 2 inches tall, with a 3-inch diameter hole tapering to 2 inches at the bottom, it would appear some kind of receiver fitting for a vertical pole.

Figure 5-87. Deck fitting with tapered hole.

Also present, although highly deteriorated, are several hook-and-eye fittings, perhaps part of the bilge block track system (Figures 5-88 and 5-89).

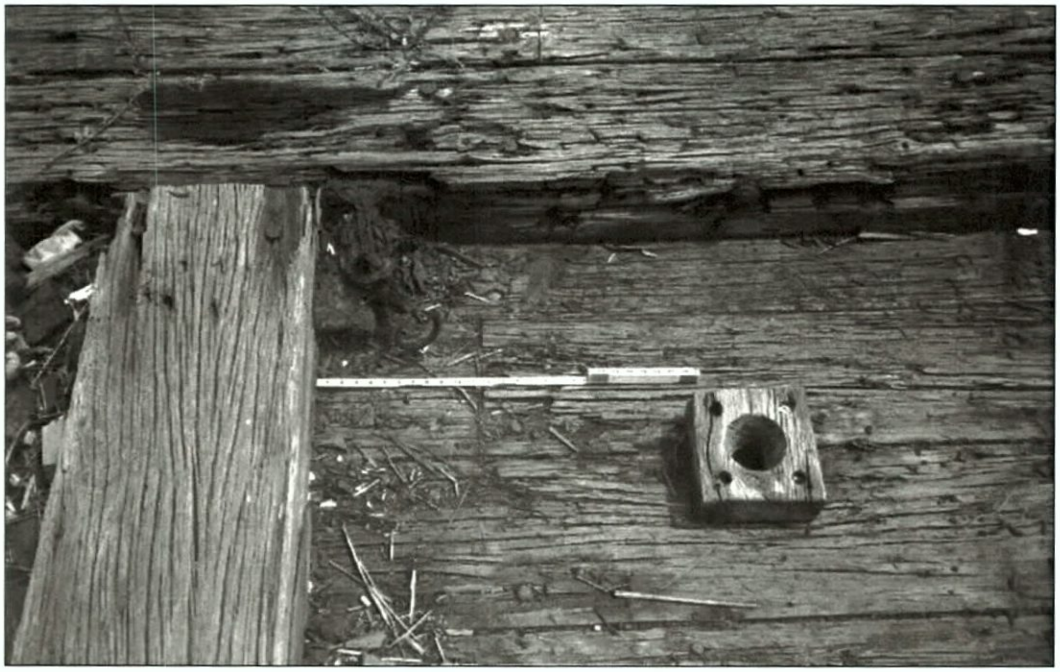


Figure 5-88. Square deck fitting in relation to bilge block and keel block stringers.

Figure 5-89. Loose hook and eye, highly deteriorated and concreted.

Lower Deck Access

Also present on the main deck were numerous lower deck access hatches, referred to in period plans as manholes. There are four on each side, placed to access different watertight compartments for servicing machinery in the hull. Each hole is one deck beam interval long and two deck planks wide, or 42-inches long and 24-inches wide. Lack of an access hole in every compartment indicates either no need to access that compartment or access to adjacent compartments is gained below the main deck.

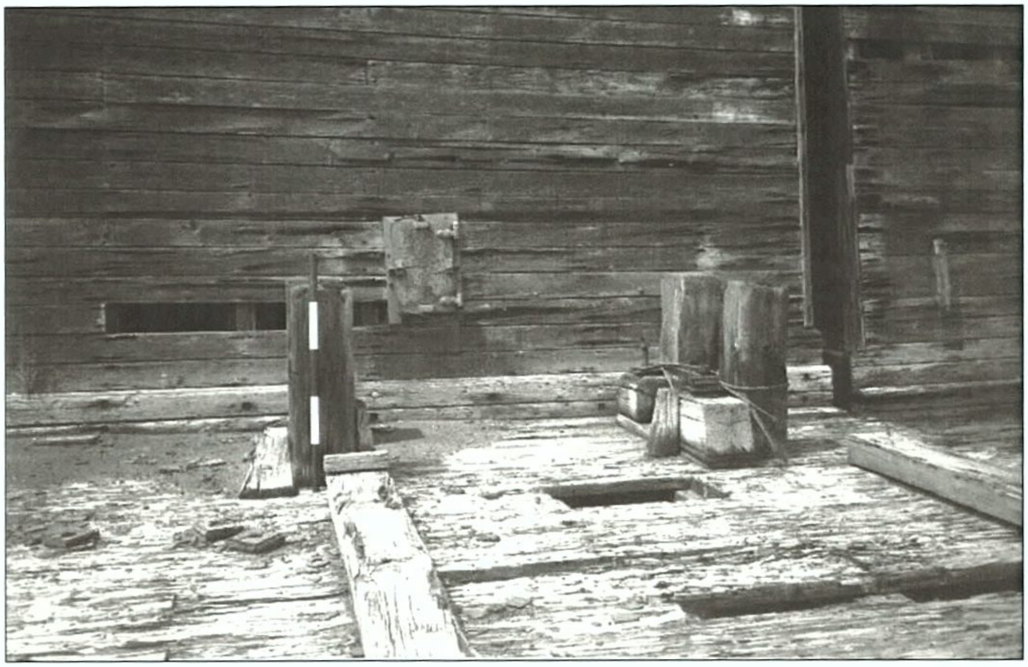


Figure 5-90. Forward looking port (west). Note access hole right of center.

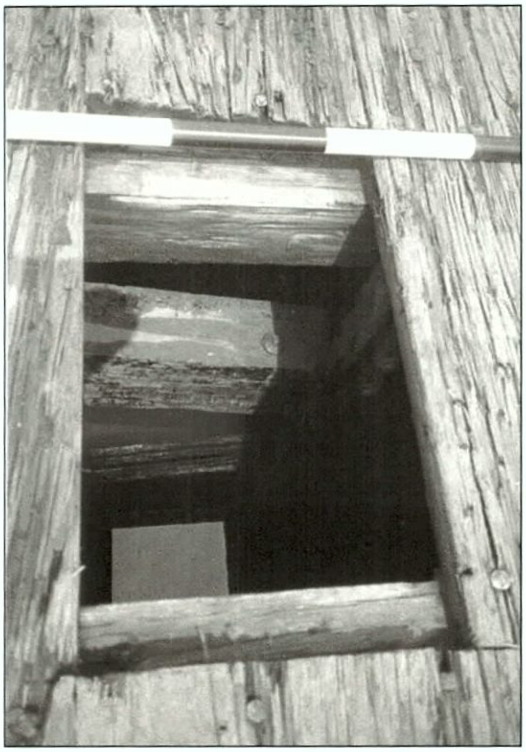


Figure 5-91. Access hatch detail.

Wings

Prominent features of the drydock are its two large wing structures. These parts of the vessel were exposed even when the dock was fully submerged, and as such, contained all the working machinery that would have been sensitive to water, such as generators and transformers, as well as pilot houses (Figures 5-92, 5-93, and 5-94). Basic structure includes an inner and an outer wall, with the inner wall, facing the interior of the vessel, slanted at a slight angle to the outside. A planked deck supported by deck beams is placed halfway up the wing. The top of the wing served as another deck, and it is here that the machinery and crew space is placed.

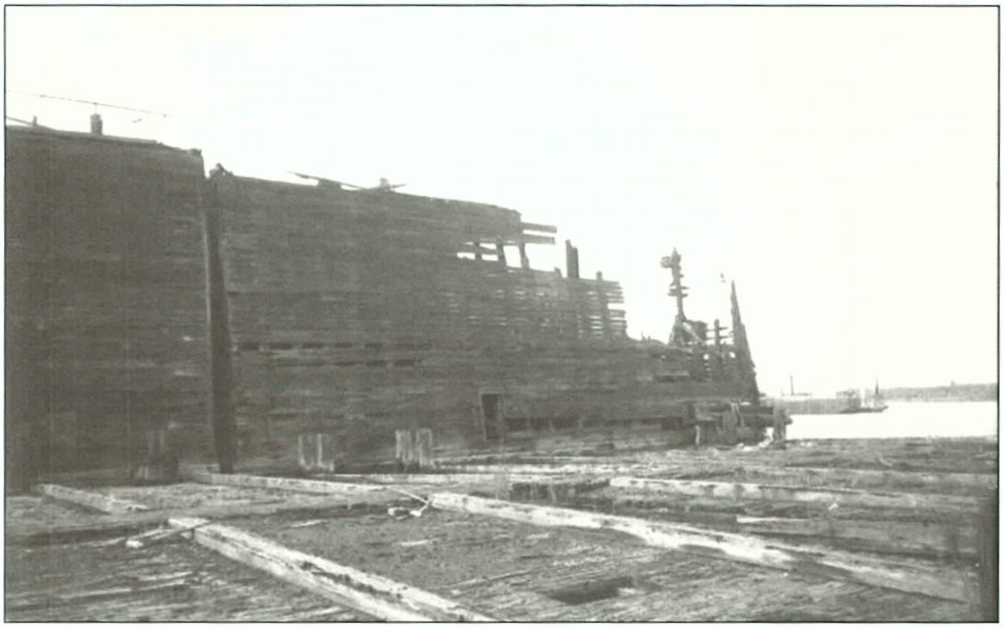


Figure 5-92. Port wing structure. View to the northwest.

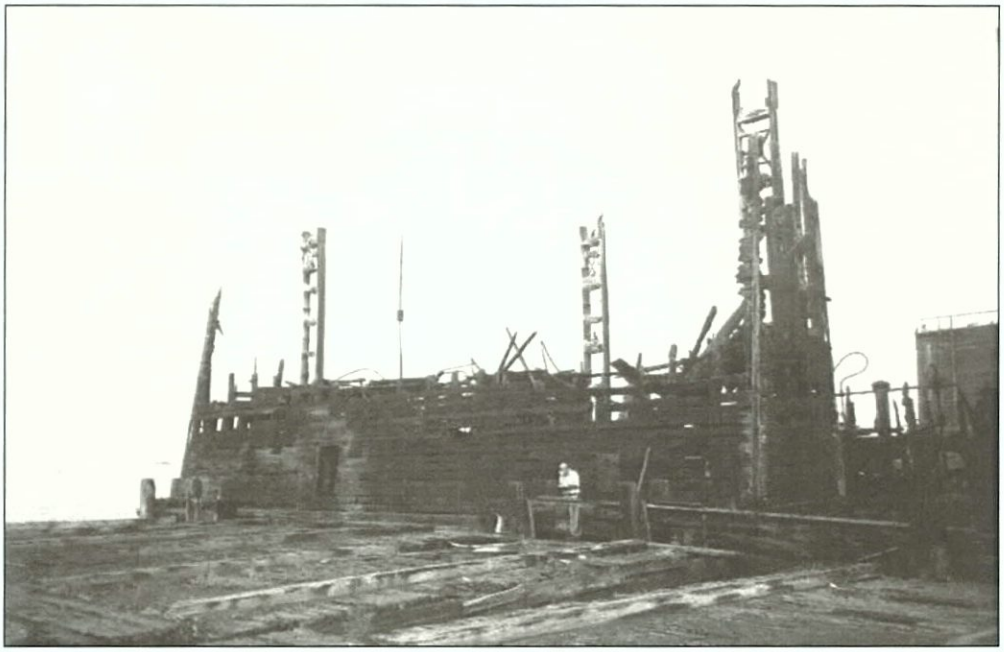


Figure 5-93. Starboard wing structure. View to the northeast.

Figure 5-94. Aft end starboard wing. View to the northeast. Note angled inner wall.

Framing

Being that the wings did not need to support the weight of a vessel, the framing is not nearly as heavy as the pontoon. However, basic elements are still similar in size. The main framing of the wings consists of timbers 8 inches molded and 5 inches sided. The outer wall frames are a continuation of the outboard futtock of the hull frames. As mentioned previously the inner futtock of the outer hull frames terminates in a bevel just above deck level. The outer futtock is continuous to the top of the wing. An inner futtock is added to the outer wing frames about 3 feet above the termination of the inner futtock of the outer hull frames, making the outer frame 18 inches in a molded dimension (Figures 5-95 and 5-96). This inner terminates at the upper wing deck beams (Figure 5-97) and provides support for the second deck beams. The inner wall frames extend from the bottom of the pontoon, where they are presumably fastened to the floors or keelsons, to the top of the wing. A second futtock is added between the main deck and the second frame deck, which terminated in a bevel just below the main deck level. Total frame molded dimension at this point is 17 inches (Figure 5-99). The inner wall frames also provide framing for the outer watertight bulkhead, with the bulkhead timbers fastened to the inside of the frames.

Figure 5-95. Detail showing outer wing frame. Note second futtock location. View to the east (starboard).

Figure 5-96. Outer wing frame detail, port wing. View to the northwest (port).

Figure 5-97. Outer wing frame at second deck, port wing.

Figure 5-98. Outer wall wing framing at upper deck, port wing. Note deck planking.

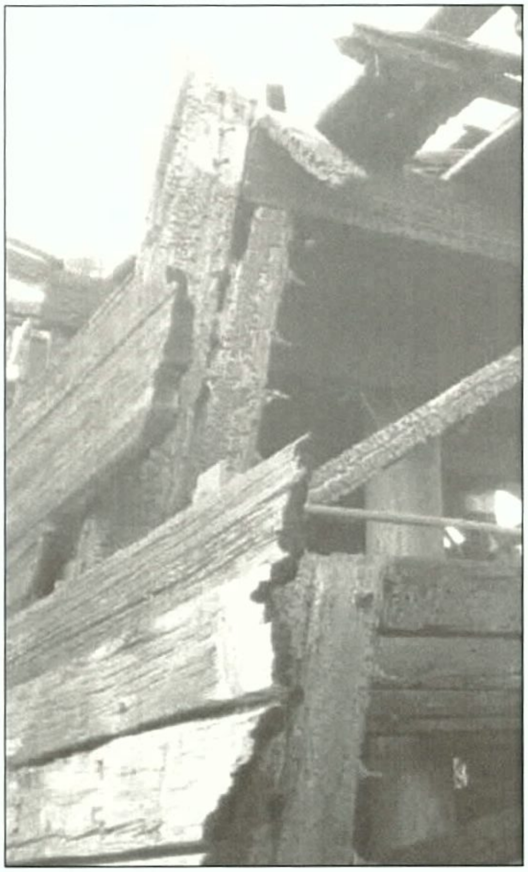


Figure 5-99. Inner wing frame. Note upper deck at top of photo, also seen in Figure 5-96. Starboard wing view to the north (forward).

Additional stiffness of the wing is provided by a series of horizontal and diagonal beams, which basically create a truss at each frame location. This is a common construction technique for wooden drydocks, and variations of it can be seen in every historic plan. It consists of six horizontal timbers, including the main pontoon deck beam, with diagonal trusses between (Figure 5-100 through 5-103). Timber sizes vary considerably, from as large as 10 inches × 10 inches down to 5.5 inches square. Timbers are generally built up from smaller dimension stock, with the added timbers used primarily for strength at the joints with the frames, although main structural members like deck beams are single element. The largest beams are the deck supporting timbers; with the main deck level beams 10 × 10 and the second deck beams 11.5 molded and 6 inches sided. Truss timbers are 7 inches molded by 8 inches sided composite, as are the two horizontals between the deck beams.

Figure 5-100. Wing truss at main deck level. Starboard wing. View to the northeast.

Figure 101. Wing truss above main deck level. Starboard wing. View to the northeast.

Figure 5-102. Wing truss at upper deck level. Starboard wing. View to the northeast.

Figure 5-103. General view of wing truss. Starboard, view toward aft quarter of V1 (southeast).

Trusses were located on every deck beam and frame interval with the exception of the bulkhead locations (Figure 5-104). Detailed examination of the wing truss system was limited to below the second deck for safety reasons. Photos of the trusses above the second deck were taken where possible and configuration of this area was interpolated based on the photos and basic other basic measurements. Discussion of the truss will begin at main deck level. Two diagonal timbers extend from the deck beam outward to the wing frames. They are fastened to the deck beam with iron drifts, and chocks are used as bracing (Figures 5-105 and 5-106). The joining of this timber to the wing frames is also a junction for two other timbers, the next horizontal truss member and the following diagonal truss member, which extends across to meet the outer wing frame. As shown in Figures 5-107 and 5-108, the truss timbers are either notched to fit around the frame, as in the case of the diagonals discussed above, or composite beams with one element butted to the frame and the other fastened to the side of the diagonal and the frame.

Directly opposite the joint in Figures 5-107 and 5-108 is a similar joint on the outer wing wall frame (Figure 5-109). The diagonal truss timber meets the frame in a similar way as discussed previously and is fastened with similar bolts. The third horizontal truss timber, directly below the second deck beam, is also a composite measuring 7 inches molded and 8 inches sided. Individual timbers are 5 inches and 3 inches sided and about 7 inches molded. At the joint of this horizontal and the frame, the 5-inch timber abuts the inner frame surface while the 3-inch timber extends to the outer wing planking (Figures 5-110 and 5-111). The joint is fastened with 1-inch bolts. Paralleling the horizontal truss timber on top is an iron tie rod (Figures 5-110, 5-112, 5-114, and 5-115).

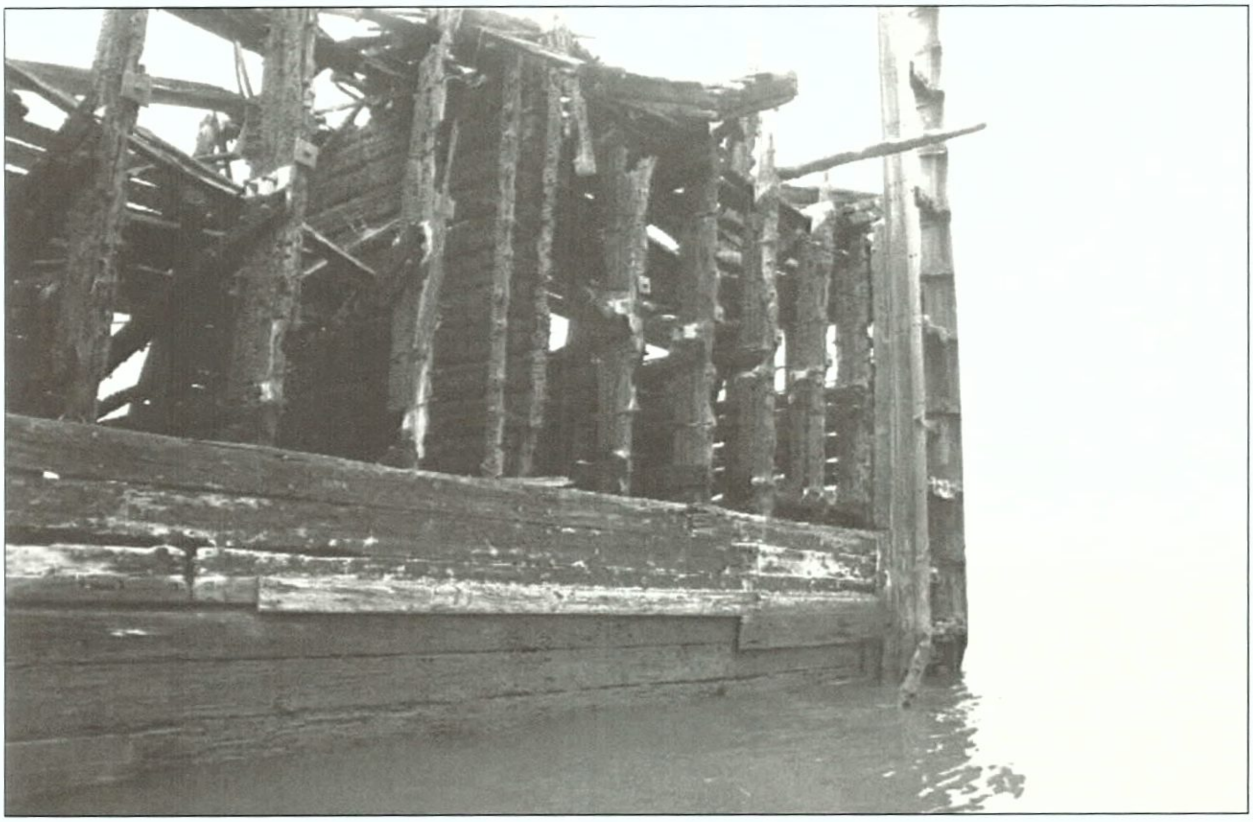


Figure 5-104. Outer wall of starboard wing. View to the northwest. Note locations of wing trusses and bulkhead.

Figure 5-105. Port wing trusses, with bulkhead in background. View to the north (forward).

Figure 5-106. Detail of main deck beam showing truss chocks and fasteners. Starboard wing, view to the south (aft).

Figure 5-107. Inner wing wall frame with truss timbers fastened. Note lower timber is notched rather than composite. View of starboard wing, view to the south (aft).

Figure 5-108. View of wing frame directly forward of frame in Figure 5-107, but showing opposite side. View to the north (forward).

Figure 5-109. Starboard wing outer wall, view to the east. Note joint against outer hull, at center of photo.

Figure 5-110. Port wing, inner wall truss joint. Note composite horizontal beam. View to the southwest (aft).

Figure 5-111. Opposite side of joint in Figure 5-110. Note iron fastener. View to the northwest (forward).

Figure 5-112. View of horizontal truss beam tie rod and joint, outer wall of starboard wing. This joint is directly opposite that shown in Figures 5-109 and Figure 5-110. View to the northwest (forward).

The next set of diagonal truss timbers extend between the outside ends of the third horizontal beam to the center of the second deck beam. This beam is solid, rather than a composite, and it is fitted to both the inner wall frame and the outer wall frame with a mortise and tenon joint (Figure 5-113) rather than a side lap. This beam appears to be held in place with merely the fit of the joint and the weight of the above structure (Figures 5-113 through 5-115). The diagonal truss timbers meet the second deck beam in the center of the underside, fastened with bolts (Figure 5-116).

The wing truss framing above the middle deck level was not examined directly due to safety reasons. However, indications are that similar joint and framing techniques to the ones used below the middle deck were used. Figure 5-117 shows this area.

Figure 5-113. Mortise and tenon joint. Port wing. View to the south (aft).

Figure 5-114. Mortise and tenon joint, outer wall, port wing. View to the southwest (aft).

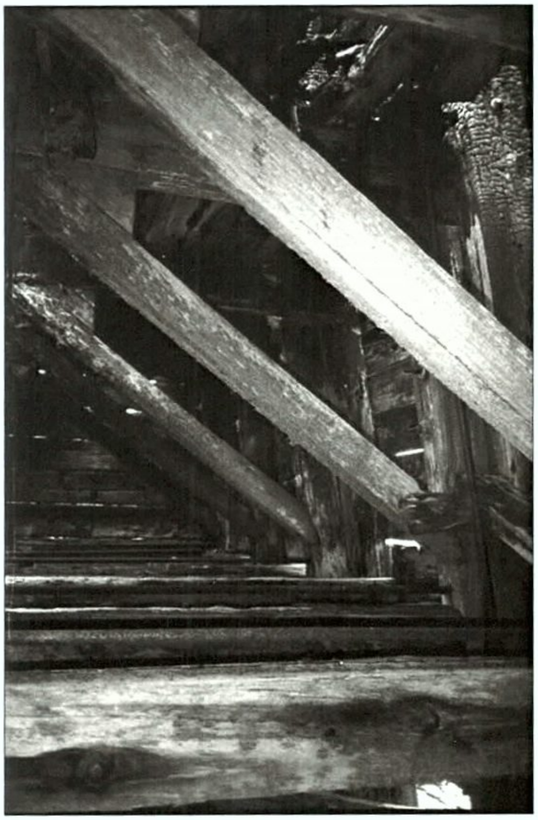


Figure 5-115. Upper diagonal wing truss beams. Note chocks at joint with second deck beams, upper left. Port wing. View to the north (forward).

Figure 5-116. Second wing deck beam. Note chocks and fasteners. Starboard wing. View to the north (forward).

Figure 5-117. Starboard wing of V1, upper wing framing. View to the southeast (aft).

Wing Planking

The outside of each wing is planked with timber of differing sizes, with wider planks below the level of the middle deck (Figure 5-118). These timbers measure 3 × 9. Above the middle deck, they reduce in size to 7 × 3. The top two tiers of planks on the inner wall are estimated to be 10 × 6, although this was not measured directly due to safety reasons. At the base of the wing wall are two 9 × 9 chine timbers. The lower chine timber is bevel cut to match the angle of the inner wing wall and fastened directly to the deck beams (Figures 5-118 through 5-122).

Wing wall planking is fastened using spikes in an alternating pattern at each wing truss location. A differing pattern, including both spikes and carriage bolts, is used to fasten the planking at bulkhead locations. Fasteners are placed into the frames to either side of the vertical bulkhead timbers (Figures 5-123 and 5-124).

Figure 5-118. Port wing showing inner wing wall planking. Note change in dimension toward top. View to the west (port).

Figure 5-119. Port wing showing wider inner wing plank below level of middle deck. Note also chine logs. View to the southwest.

Figure 5-120. Port wing aft. Note chine logs at base and differing size planking, especially larger scantling planks at top. View to the southwest (port).

Figure 5-121. Port wing aft showing wing chine logs. View to the northwest (port).

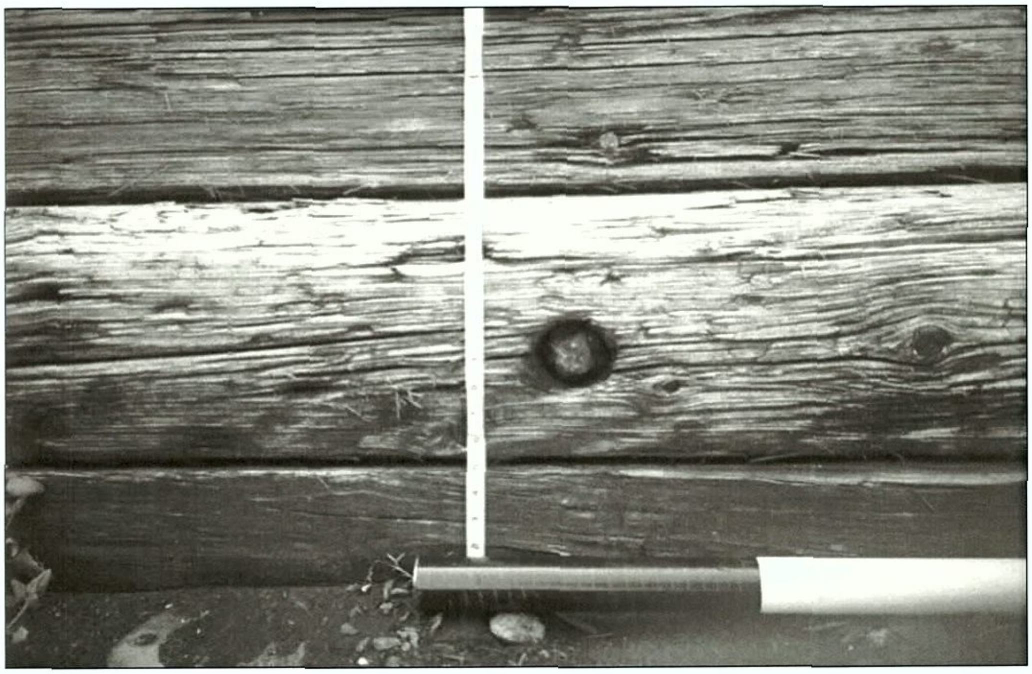


Figure 5-122. Close-up of wing chine logs, port wing. View to the west (port).

Figure 5-123. Port wing inner wall showing fastener pattern. Note differing pattern for bulkhead location, right of center. View to the west (port).

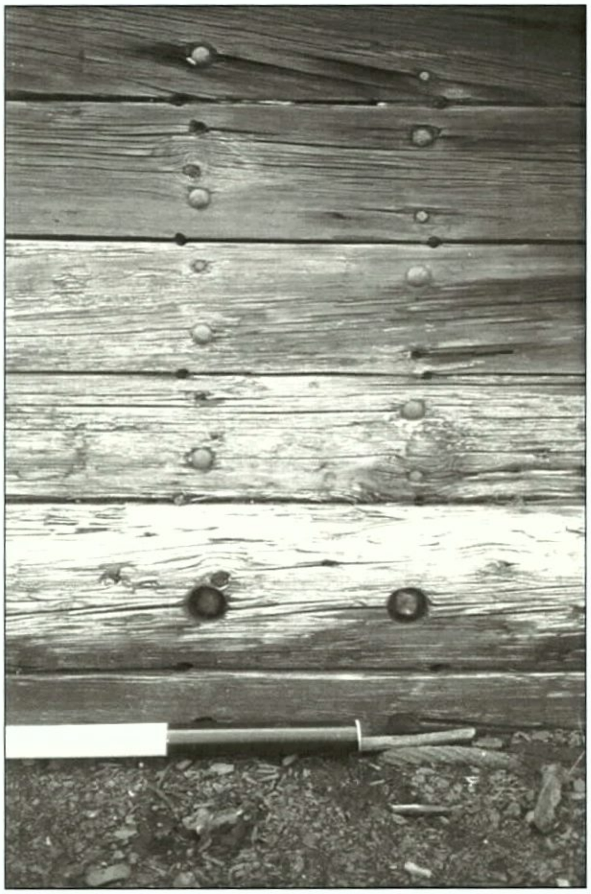


Figure 5-124. Wing chine and wing plank fastener pattern at bulkhead location. Note two types of fasteners. View to the west (port).

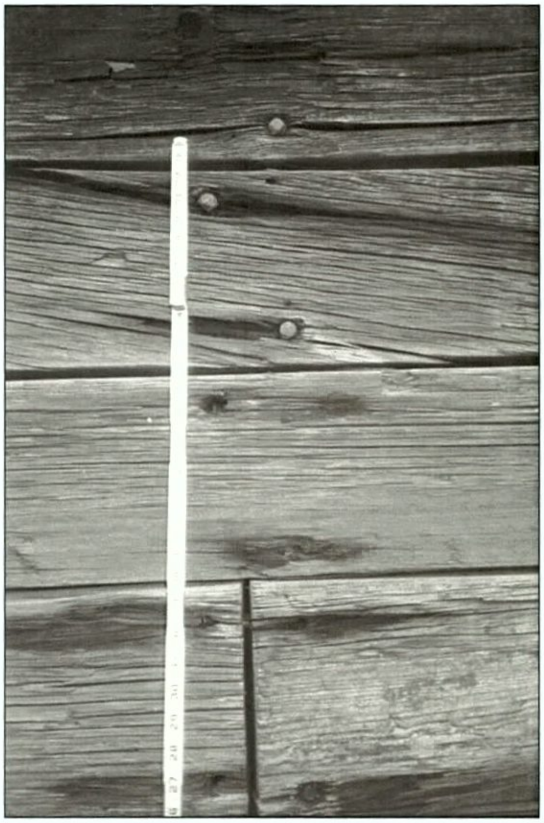


Figure 5-125. Port wing planking showing pattern of spikes. View to the west (port).

Planking on the outside of the wings is similar in dimension to the inner, although limited access hampered efforts to determine exact measurements (Figures 5-126 and 5-127). Planking on the ends of the wings was similar in dimension to both wing faces (Figure 5-128).

Figure 5-126. Outer wall, port wing. Note planking dimensions. View to the east (starboard).

Figure 5-127. Detail of port wing, aft corner. Note change in plank sided dimension similar to the inner wing wall. View to the east (starboard).

Figure 5-128. Forward end of port wing. Note planking. View to the south (aft).

The corners of the wings are given a finished look through the addition of a 5.5 square half round timber with a 2.5-inch radius. This timber extends vertically along each corner from the top of the pontoon hull planking to the bottom of the larger dimension planking at the top of the wing, and is fastened to the edges of alternating wing planks. The larger planking transitions to the smaller with a 2.5-inch radius round on the top edge of the top hull plank, and also on the end of the matching wing planks (Figures 5-129 through 5-132). The corners were originally covered with a sheet of tin or galvanized steel extending about 20 inches down each side (Figure 5-133).

Figure 5-129. Port wing, aft inner corner, showing half round corner post. View to the west (port).

Figure 5-130. Close-up of forward inner corner of port wing, V1. View to the west (port).

Figure 5-131. View of forward inner corner of port wing, V1.

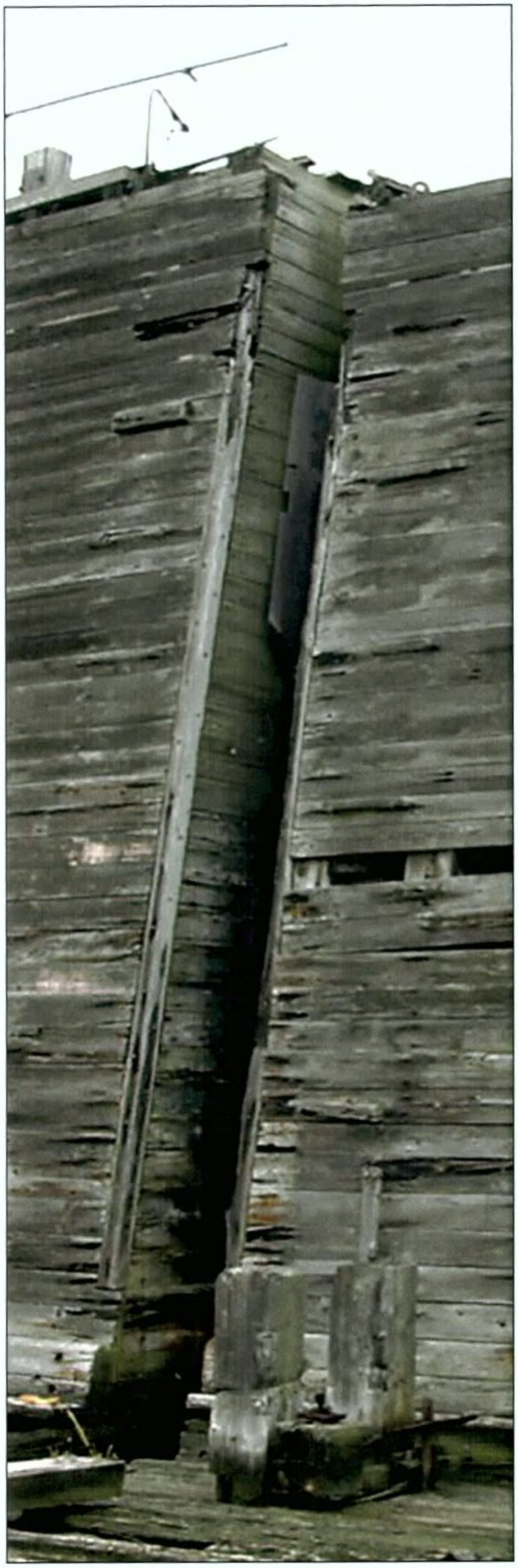


Figure 5-132. Port wing aft corner showing vertical half round.

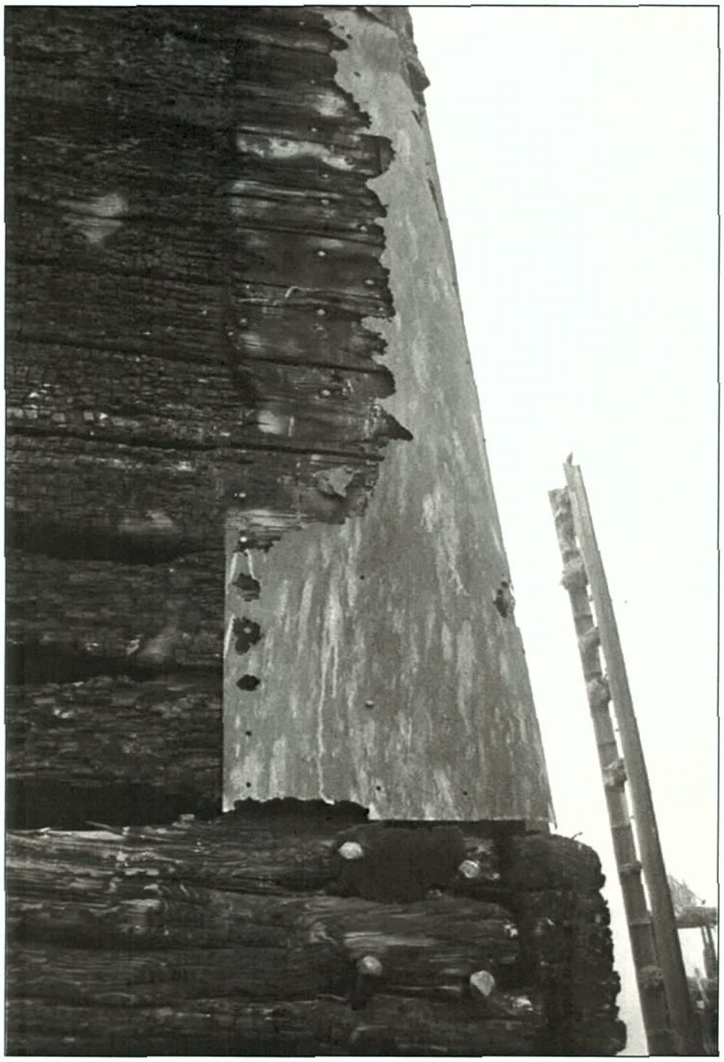


Figure 5-133. Starboard wing aft showing metal sheathing. View to the north (forward).

Other Wing Features

Other items relating to the usage of a drydock are present on the outside and top of the wings. These include ladders, hatches, pumps, railings, and other objects that reflect its working capacity. They will be discussed in turn.

Hatches

There are several access hatches in the inner face of each wing (Figures 5-134 and 5-135). These allowed access to the inner wing structure and machinery below the upper (middle) deck. The center hatch, which is also the largest of the three, is 26 inches wide by 60 inches tall, with the overall frame 45 inches by 69 inches. It exactly spans one wing frame interval and is fastened with carriage bolts to the adjacent planking. The hatch dogs, now rusted in place, have handles 9 inches in length. The outer two hatches, both identical to each other and smaller than the center hatch, still retain their doors, which are dogged in place and rusted shut (Figures 5-136 and 5-137). The small hatches measure 45 inches tall by 31 inches wide overall, with an opening and hatch size of 39 inches tall by 25 inches wide. It is centered between frames and fastened to the planks with carriage bolts.

Figure 5-134. Port wing showing hatch locations. View to the northwest (port).

Figure 5-135. Port wing forward showing hatch location. View to the west (port).

Figure 5-136. Port wing central hatch. View to the west (port).

Figure 5-137. Detached iron door for hatch in Figure 5-136.

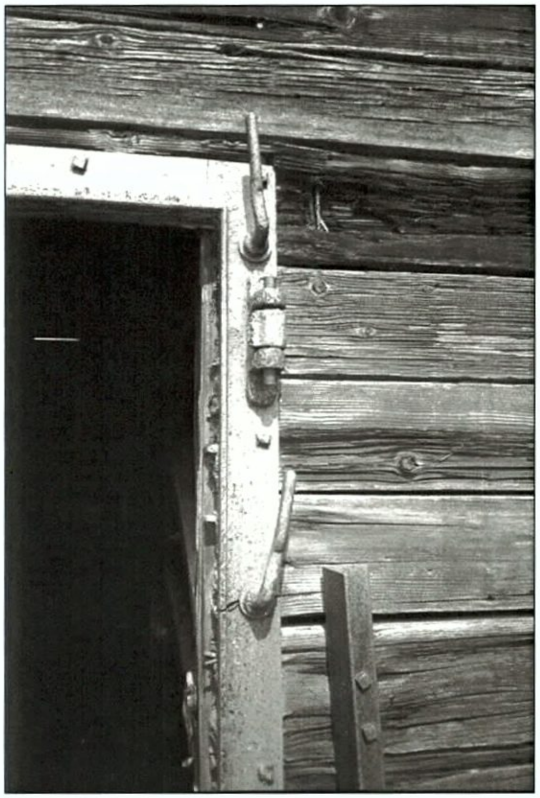


Figure 5-138. Hatch frame detail. Note hinge, hatch dogs, and fasteners. Port wing, view to the west.

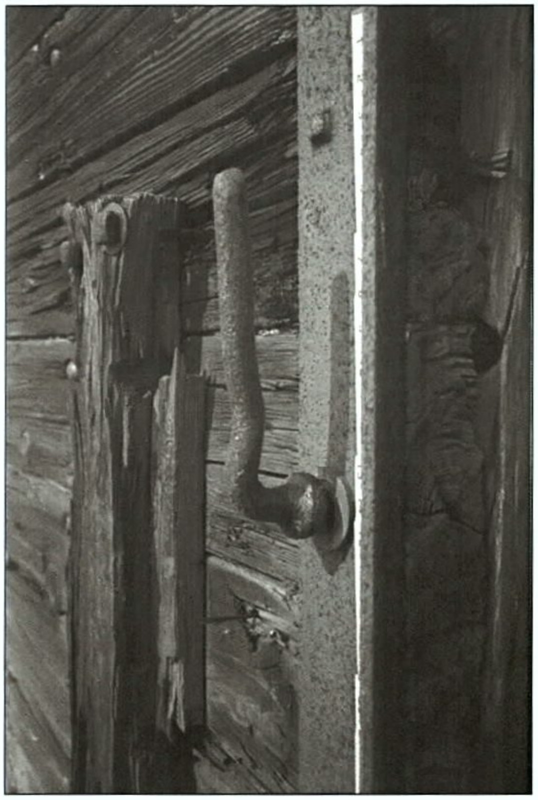


Figure 5-139. Hatch dog detail. Port wing, view to the southwest (aft).

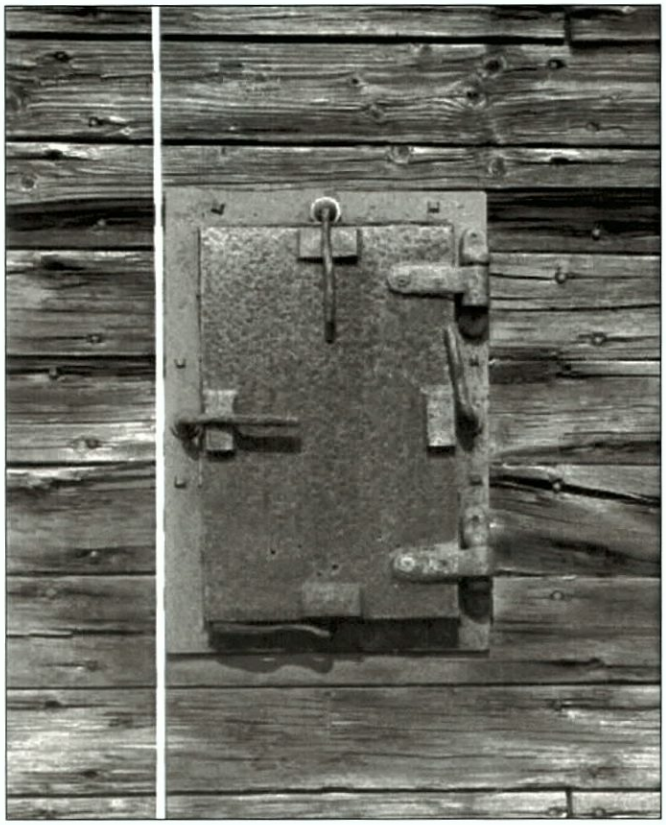


Figure 5-140. Forward small hatch. Note frame, hinges, dogs, and fasteners. Port wing, view to the west (port).

Figure 5-141. Small hatch reverse side. Starboard wing, view to the west (port).

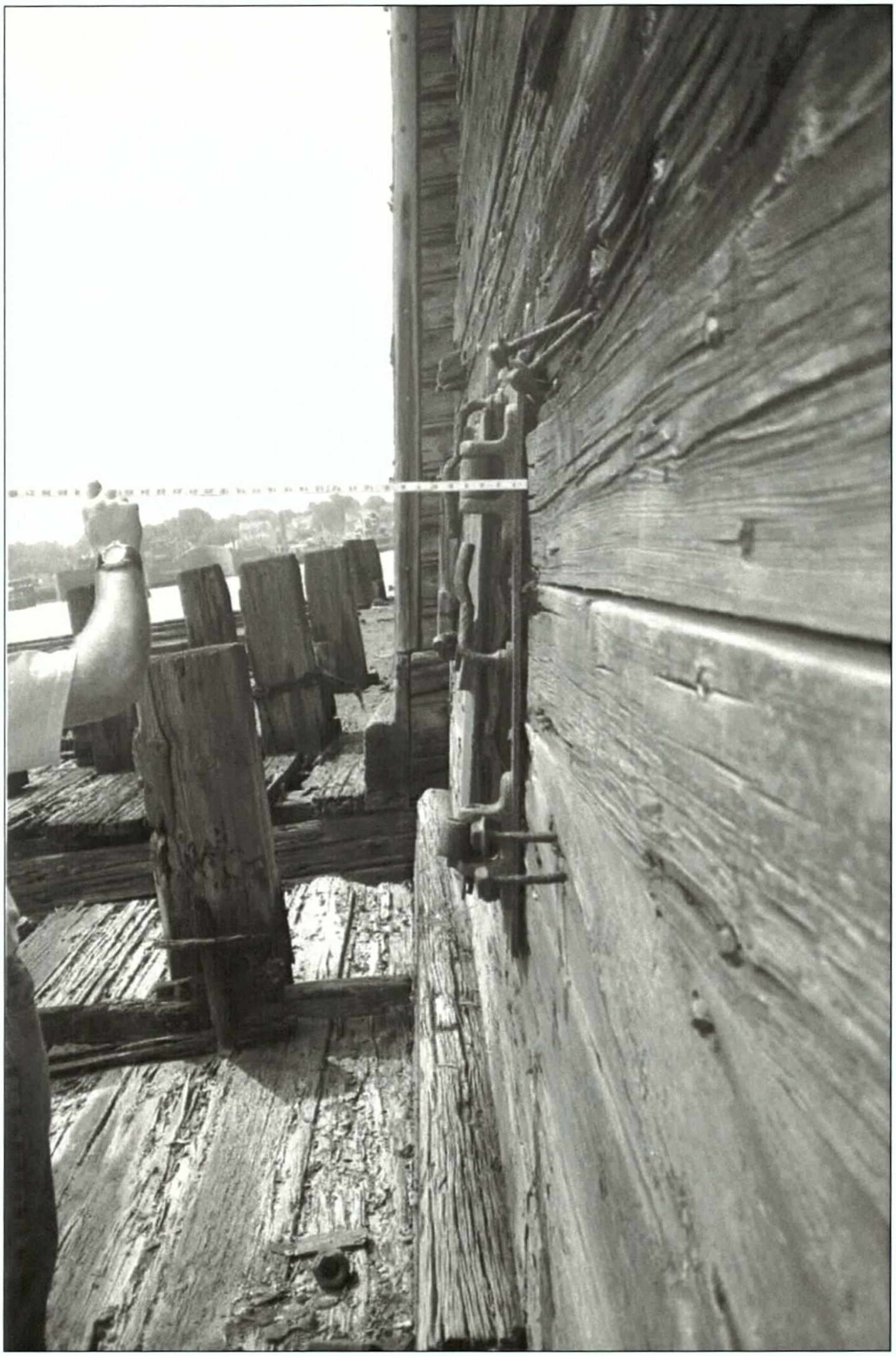


Figure 5-142. Aft small hatch, port wing side detail. View to the south (aft).

Ladders

Several ladder or ladder remnants remain on the inside wing wall. They are limited to fasteners and fastener holes, and mounting blocks (Figure 5-143).

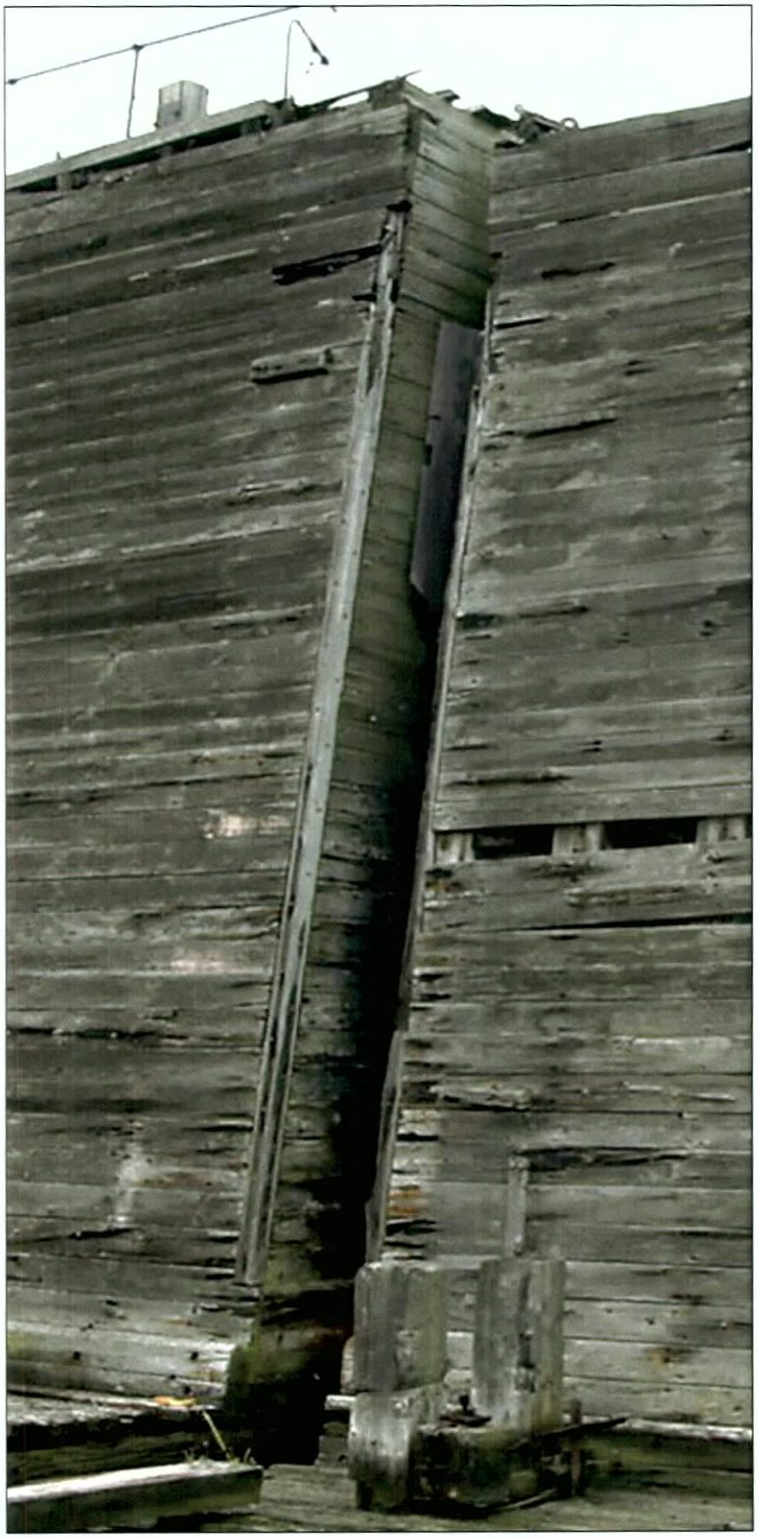


Figure 5-143. Aft area of port wing showing remnants of ladder mount. View to the southwest (port).

Railings, Motors, and Valves

At the very top of the wing, broken sections of railing can be seen, along with motors for the opening of flood valves. A section of broken railing was noted on deck at the base of the port wing (see Figure 5-137). It appears to be constructed of standard 2-inch plumbing pipe, elbows, and tees. Also on the top deck are several bollards (Figure 5-147).

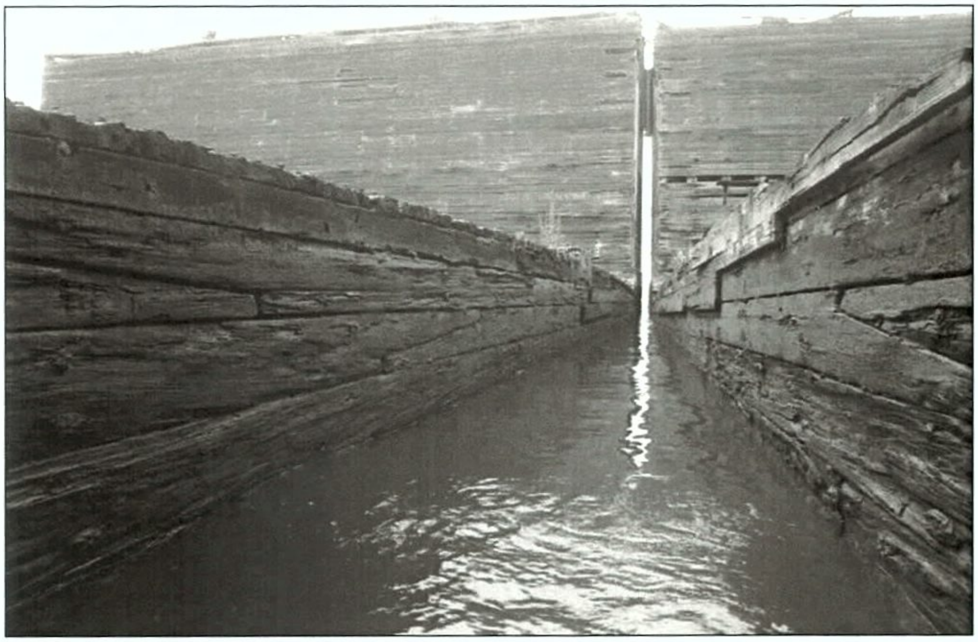


Figure 5-144. Port wing. Note railing and valve motors atop V2 and adjacent dock.

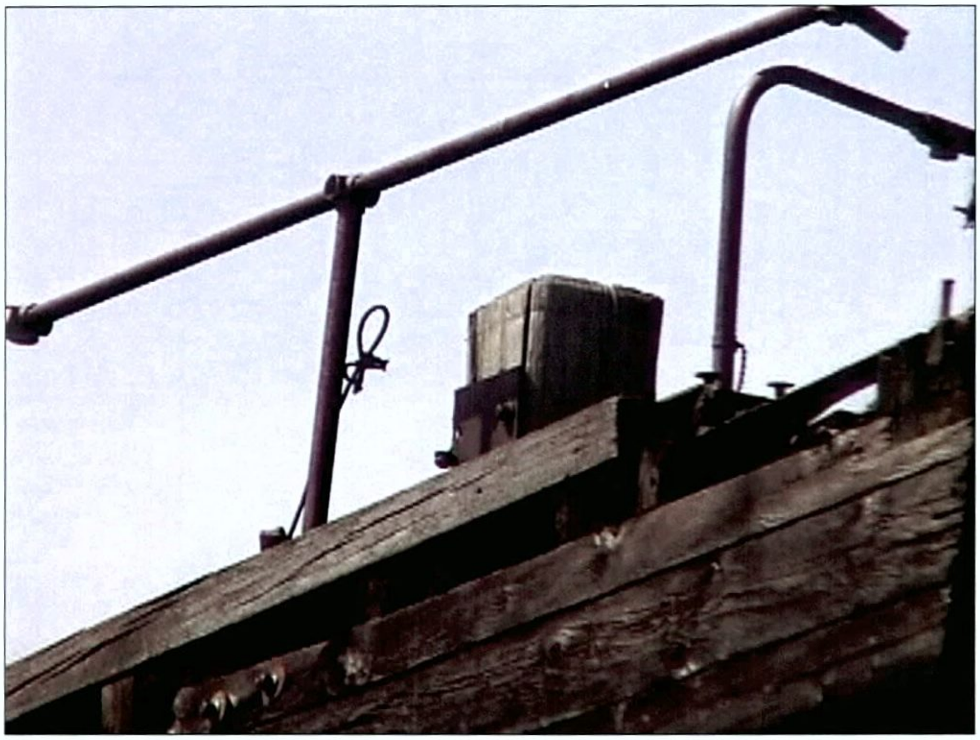


Figure 5-145. Valve motor.

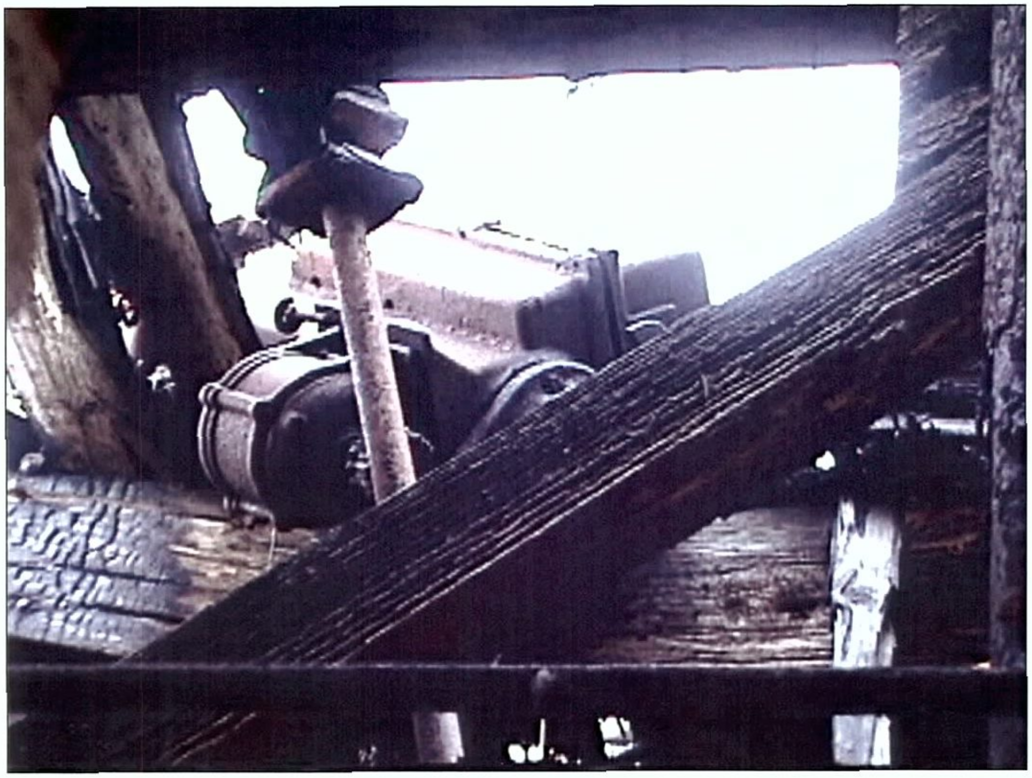


Figure 5-146. Valve motor and shaft.

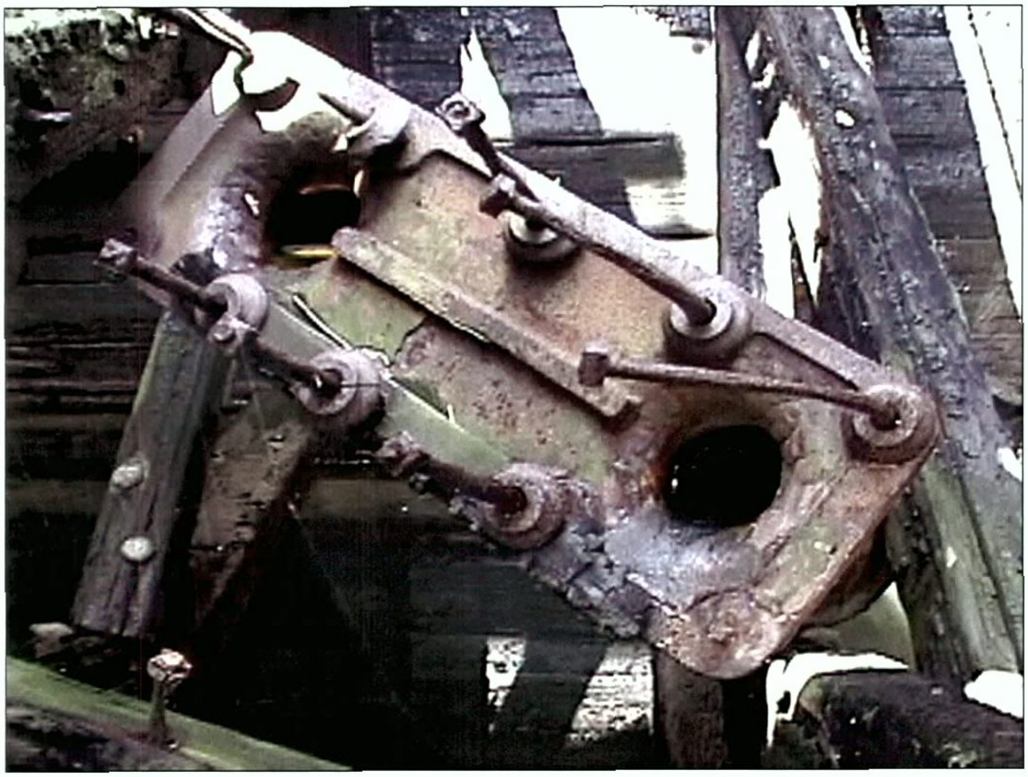


Figure 5-147. Underside of a bollard that has fallen through the upper deck. Starboard wing, view to the south (aft).

Machinery

The primary machinery onboard a drydock is that which is devoted to filling and emptying the vessel during the submerging and lifting operations. Ample *in situ* evidence of this operational machinery is present in the hull and wings, and includes pumps, valves, intakes, outlets, and plumbing.

Pumping system

The largest mechanical devices in the vessel are associated with filling and emptying the pontoon. This system consists of a series of floodgates in the outer hull as well as between the various watertight compartments, centrifugal pumps, valves, and discharge pipes that are designed to control the amount of water entering/leaving each compartment. Adjacent compartments are interconnected in an athwartships direction, but the compartments are isolated from each other in a fore-and-aft direction. The port and starboard halves of the vessel are also isolated.

The dock is flooded through the use of gravity. Floodgates in the outer hull and between each compartment opened via manually operated handwheels concentrated in one area on the top deck of the dock and connected via a series of rotating shafts and universal joints. Flooding is controlled to the various sets of interconnected compartments by adjustments to the floodgates (Figure 5-148).

Figure 5-148. Remnants of starboard wing, showing pump, valve, and floodgate actuator rods.

There are two pumps in each drydock section, one in the hull beneath each wing. The pumps are of a bottom inlet, side discharge, circular casing, centrifugal type (Figure 5-149). The inlet is placed at the bottom of the hull directly below the casing, while the outlet is placed on the outer hull just above the unladen waterline (Figure 5-150). Centrifugal pumps can be either radial flow or axial flow type. With a radial flow, the pumping action stems strictly from the centrifugal force of the water moving from the center of the impeller to the outside. Axial flow pumps derive their pump action from the impeller blades actually pushing the water. It is not known of which type the pumps in V2 are.

Figure 5-149. One of two impeller casings with vertical drive shaft connected to electric motor on top deck of wing. Port wing, view to the west (port).

Figure 5-150. Pump outlet on outer hull.

This particular centrifugal pump arrangement has three separate inlet pipes, one in each watertight section below the wing. The three pipes join just below the pump casing. Each inlet pipe contains a gate valve, which is operated by a motor from the top deck via a vertical shaft (Figures 5-151 and 5-152), so that outflow from each of the three athwartships sections may be individually controlled in addition to the control afforded by the floodgates. There are also two separate outlet pipes, although only the outlet to the lower hull has a gate valve. Again, this valve is controlled by a motor and vertical shaft from the top deck.

The pumps function in much the same way as a water pump on a car engine functions, and each one consists of three parts. The impeller housing (see Figure 5-149) contains the impeller blade, which is driven by an electric motor mounted on the top deck of the wing and powered by the vessels diesel generator. The motor and impeller are connected by a vertical drive shaft (Figures 5-153 through 5-155). The outlet pipe extends out the side of the casing about 10 feet (see Figure 5-151), where it makes a 90° turn out the side of the vessel (Figure 5-156). The vertical pipe (Figures 5-148, 5-157, and 5-158) is likely a secondary outlet rather than a priming inlet since the pump inlet likely contains a foot valve, which would maintain water in the impeller casing, eliminating the need for priming.

Figure 5-151. Gate valves in inlet (below) and outlet (center) pipes. Port side, view to the west.

Figure 5-152. Gate valve actuator motor. Note shaft.

Figure 5-153. Impeller drive shaft.

Figure 5-154. Impeller drive shaft coupling.

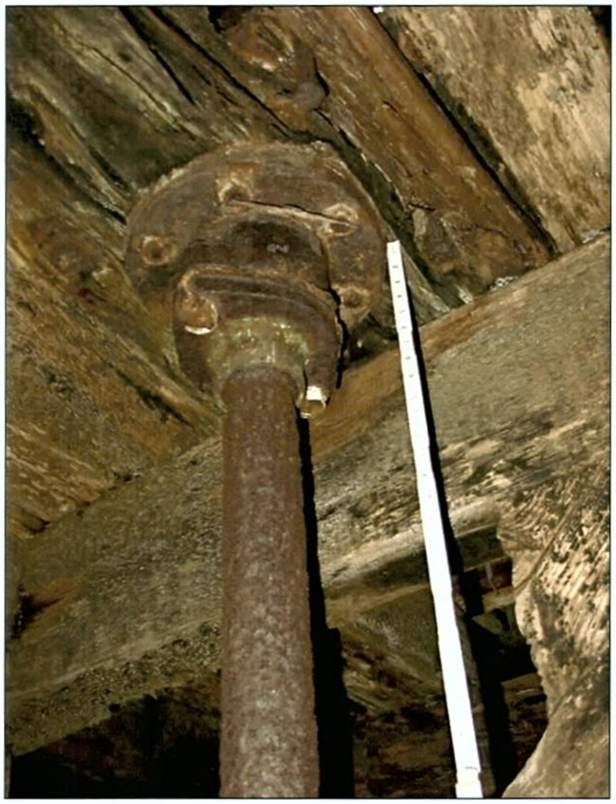


Figure 5-155. Impeller driveshaft pass-through fitting in upper wing deck.

Figure 5-156. Outlet pipe. Outlet in upper right of image corresponds with the outer hull fitting in Figure 5-148. Port wing, view to the west (port).

Figure 5-157. Vertical discharge pipe. Starboard wing, view to the east (starboard).

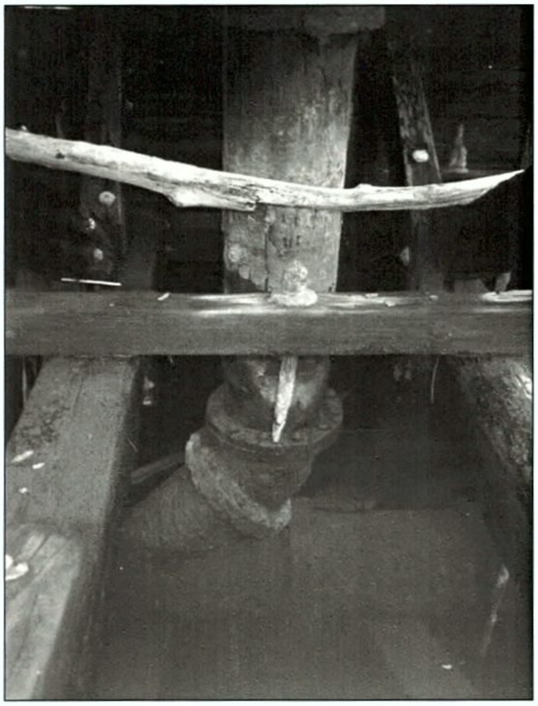


Figure 5-158. Base of vertical discharge pipe. Port wing, view to the west (port).

Pump and Valve Framing

Additional framing, although not structural in nature, was added to support machinery placement for the pump, pipes, and actuator shafts. Consisting mostly of 5.5-inch square timbers fastened to and between existing structural members, this extra framing is secured primarily with small bolts, and in the case of longitudinal stringers, vertical tie rods (Figures 5-159 through 5-163).

Figure 5-159. Longitudinal stringer providing stability to vertical supports, which, bolted to the wing truss, support the weight of the vertical discharge pipe. Note vertical tie rods, which fasten the stringer to the pontoon framing. Port wing, view to the north (fore).

Figure 5-160. Longitudinal stringers spanning one pair of wing frames provide platform to support the vertical discharge pipe. Extra vertical timbers distribute weight of pipe to other horizontal timbers in the wing truss system. Longer longitudinal stringers like that shown in Figure 5-156 provide lateral support to vertical timbers. Port wing, view to the north (forward).

Figure 5-161. A pair of longitudinal stringers spanning two frames provides support for the vertical actuator shafts for the gate valves, floodgates, and pump.

Figure 5-162. Close-up of support structure for pump drive shaft.

Figure 5-163. Close-up of support structure for gate valve drive shaft.

SPUDS

Each drydock section has four spud poles—one at each corner—to hold it in position during various operations (Figure 5-164). Each pole mechanism consists of the spud pole, the frame or track that the pole rides in, and the attachment to the dock. The spud would be lowered to the river/bay bottom and locked into position. They have apparently been removed from V2 as well as the two other identical sections in the vicinity. The frame is a ladder-like track (Figures 5-165 through 5-167). Remains of the tracks that the pole would have been fastened to can be seen clearly in Figures 5-166 and 5-167.

Figure 5-164. Starboard wing showing spuds. The rightmost spud belongs to another dock. View to the northeast (starboard forward).

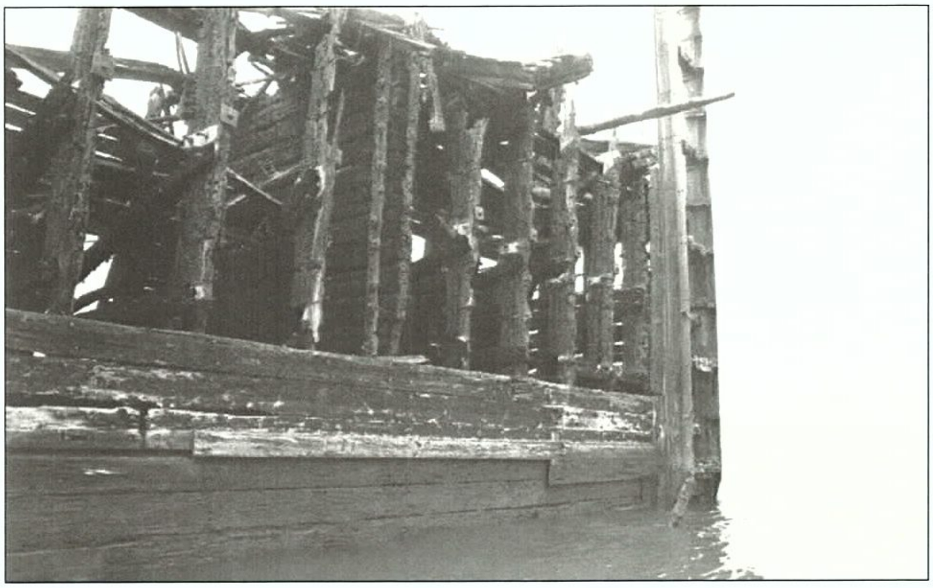


Figure 5-165. Starboard forward spud. View to the north (forward).

Figure 5-166. Starboard forward spud. Note trucks. View to the northwest (port).

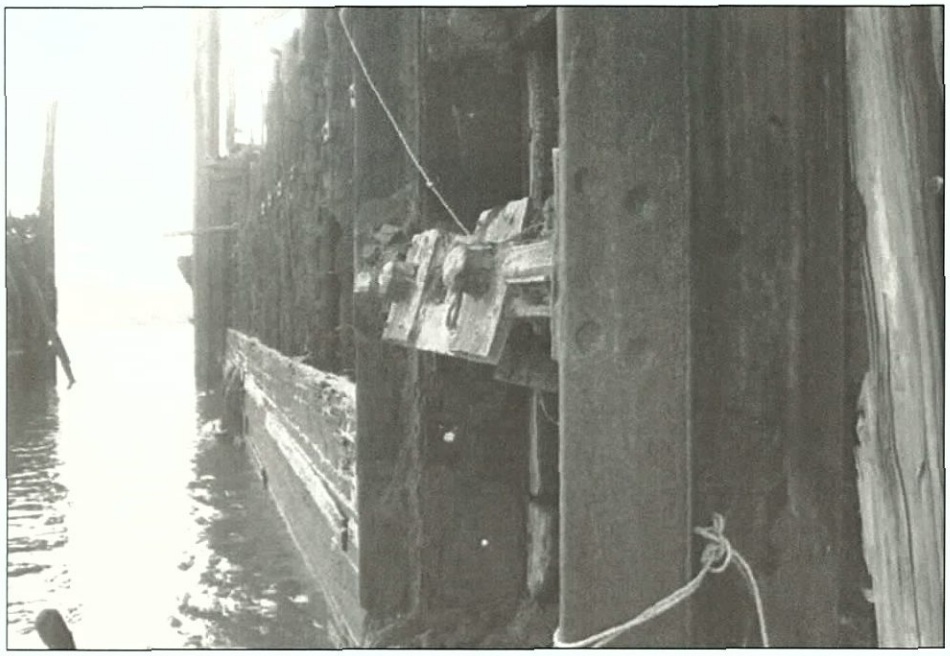


Figure 5-167. Close-up of starboard forward spud. Note truck. View to the south (aft).

The track was probably attached to the dock at various positions on the hull. Obviously, the most likely places would be the bottom of the hull and the top of the wing. Neither location was observable for various reasons. However, there was also an attachment at main deck level (Figure 5-168). This attachment consisted of four threaded shafts with turnbuckles, and an inboard anchor point. The anchor consists of an iron plate with holes that is notched into the main deck beams. The end of each adjustment rod, which is threaded, passes through the holes and is fastened in place with a nut (Figure 5-169). The turnbuckles provided a means of either tightening spud track to the hull if it loosened up over time, locking the spud in place after it was dropped into position, or adjusting the position of the track to eliminate binding of the spud.

Figure 5-168. Anchor and turnbuckles for starboard forward spud on V1. View to the east (starboard).

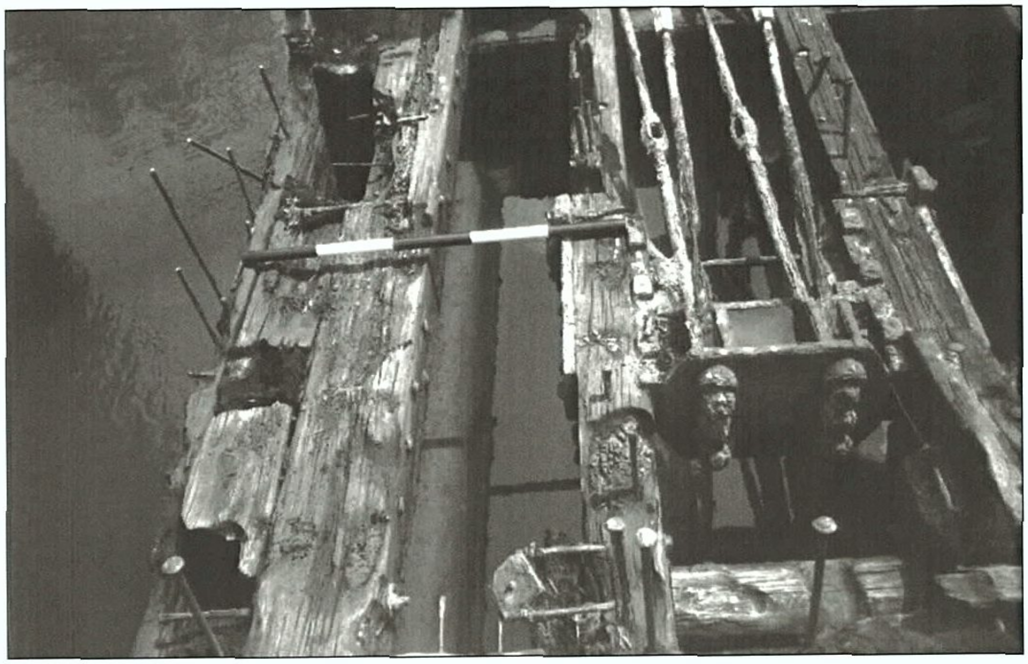


Figure 5-169. Turnbuckle anchor. Starboard forward, view to the east (starboard).

Historical Repairs

Like any wooden hulled working vessel with a 50+-year career, V2 exhibits evidence of repairs. Surprisingly, the evidence appears limited to repairs of the hull and deck. The outer hull shows various locations where tin patches were used to cover joints between hull planks (Figure 5-170).

Several locations on the main deck exhibit areas where replacement of small sections has occurred (Figures 5-171 and 5-172).

Figure 5-170. Port wing showing tin patches covering plank joints. View to the southeast (starboard).

Figure 5-171. Small section of replaced deck plank on main deck. Note different fasteners on patch.

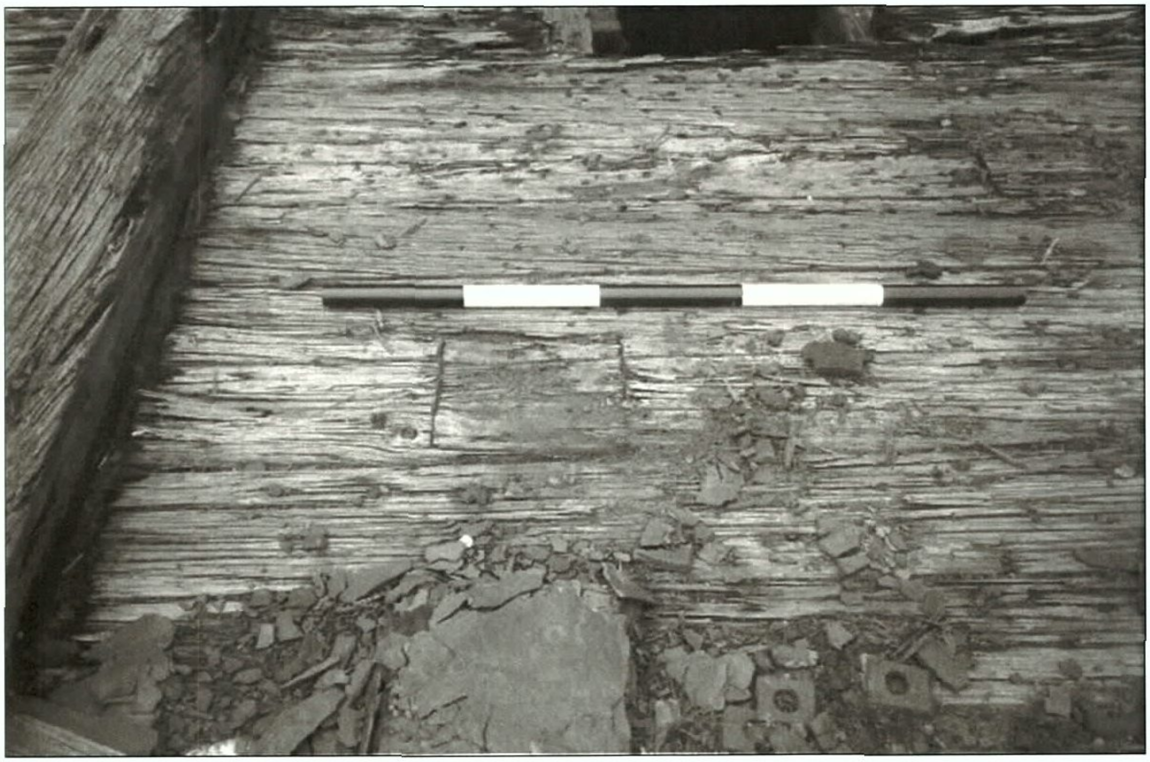


Figure 5-172. Small plug repair on main deck.

FASTENERS

Fasteners have been discussed in various sections, but this section will attempt to summarize the various fasteners used in the construction and repair of V2. Fasteners seem to be divided into four types: 1-inch bolts, with a square head on one end and threads for a nut on the other; 1-inch carriage bolts; 1-inch iron drift pins; and spikes.

Bolts

The framing was fastened using two sizes of bolts. The primary fastener used in the framing of V2 are one-inch diameter bolts with square heads, while the smaller framing members were fastened with 5/8-inch bolts (Figure 5-173). In high traffic areas like the main deck, bolt heads were countersunk (Figure 5-174), and possibly plugged, although no *in situ* wooden plugs were observed.

Figure 5-173. Truss and stanchion showing 1-inch and 5/8-inch bolts.

Figure 5-174. Port wing chine logs and outer planking. Note countersunk bolts and carriage bolts. View to the west (port).

Drift Pins

Keel block stringers, outer hull planks, and bulkhead wall timbers are all edge fastened using 1-inch diameter iron drift pins (Figure 5-175). Fasteners generally pass through a rolling tier of three timbers.

Spikes

Spikes are primarily used to attach the planks to the deck beams or frames. Not actually measured for length, but likely 8-10 inches long, these are applied usually in an alternating pattern but occasionally two across (Figure 5-176).

Carriage Bolts

Carriage bolts, which differ slightly from the bolts discussed above in that the head of the bolt has a smooth round surface rather than a nut, were used in several locations (see Figures 5-174 and 5-177). Generally, their use seems limited to areas of high traffic, such as the working deck and outer hull, presumably to provide a cleaner appearance to the finished surface and reduce snagging hazards.

Figure 5-175. One-inch drift pins in outer hull timbers.

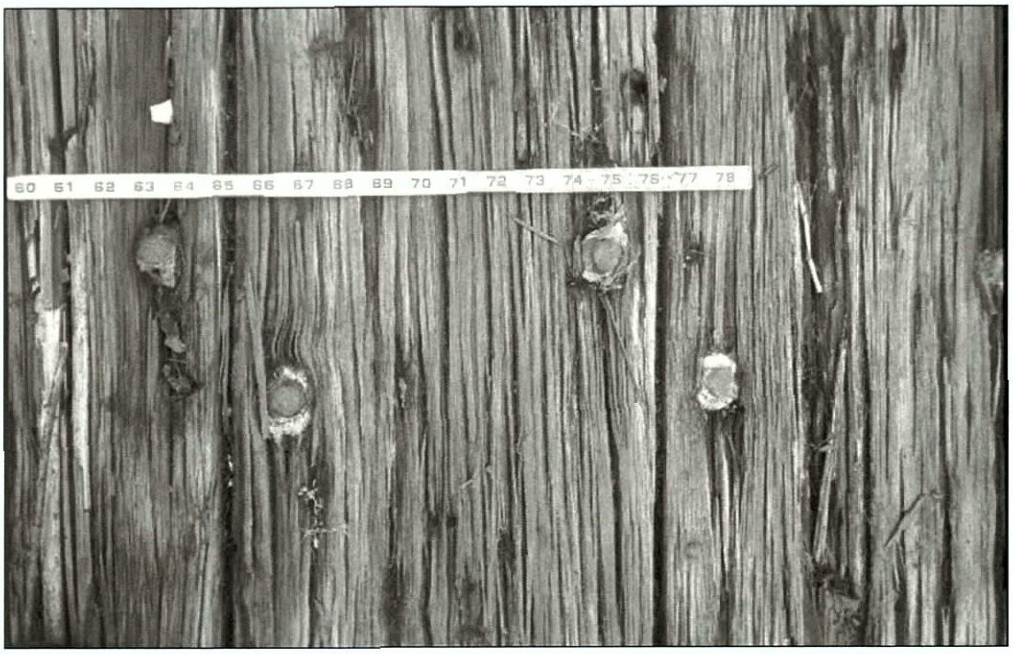


Figure 5-176. Deck plank detail showing staggered fasteners.

Figure 5-177. Port wing outer surface, showing carriage bolts at bulkhead (right) and the inter-frame plank joint (reinforced by a chock on the interior of the vessel). View to the northeast (starboard forward).

DEBRIS

The main deck of V2 and much of the wings are covered/filled with all manner of flotsam and debris, some of which was not part of the vessel structure, but is indicative of work that took place onboard.

Figure 5-178. Main deck looking aft (south). Note large amount of debris.

Figure 5-179. Iron or steel vent cover.

Figure 5-180. Iron bar.

Figure 5-181. Iron block with iron sheave.

Figure 5-182. Pile of debris including coupling cinch plate, various pipes, and flanges relating to the railing. The piece of iron with the hole in it is a temporary tie down welded to the side of the vessel being repaired.

Figure 5-183. Temporary tie downs, removed and discarded after use.

Figure 5-184. Welding or cutting slag.

REMAINS OF VESSEL V38

GENERAL DESCRIPTION

V38 is a balanced-type floating drydock. It is oriented in a general north/south direction, with the stern to the shore (south). Like other vessels in this location, V38 appears to have been heavily salvaged. The remains are completely submerged even at low tide, with the exception of the eroded tips of a number of wing frames. The vessel has deteriorated significantly, with the most intact portion being the northwest corner, which is considered the port bow for the purposes of this investigation. The dock has deteriorated in general to a point below the main deck. The wings are completely gone, save a few of the frames, which are highly eroded. The deck planking is eroded or has been removed, with the exception of a few planks in the port bow area. The deck beams are also eroded, with many deteriorated to the point where only the ends and portions across the central bulkhead remain, although enough remains intact for reconstruction and documentation. The large diagonal trusses characteristic of a drydock are also present, but are highly deteriorated in the same manner. Like the deck beams, enough remains for reconstruction and documentation. The longitudinal and transverse bulkheads are also intact, although the individual timbers are eroded in places. There does not appear to be much left in terms of machinery, although the vessel has been filled by debris and sediment to a point 24-30 in. below the deck level, sloping to deck level in the wing areas, where the majority of the pumps would have been located.

The extant remains measure 155 feet in overall length by 67 feet in overall width. Like most examples of balanced drydocks, V38 has a framed prow on the north end (bow). However, unlike most balanced drydocks, V38 does not appear to have a matching prow at the stern. Examination of the stern of the vessel revealed no evidence of timbers or fasteners that would indicate one had been removed. This is curious and could possibly indicate this vessel was actually part of a sectional rather than a balanced drydock. However, no other matching sections are located in the vicinity now, nor are they noted on historic aerial photos of V38. Highly eroded, only the prow is framed, with no deck planking or hull planking. It may have had deck planking originally although no evidence was found as either remaining planks or fasteners. It is likely the prow did not provide any flotation.

The vessel is divided into eight watertight compartments, each separated by a timber bulkhead. Machinery and crew operating areas would have been located in two wings extending upward from each side of the vessel.

For illustration of details mentioned below, refer to Figure 5-185 and Appendix E.

LOWER HULL

V38 used construction methods similar to other flat-bottomed and flat-sided vessels, such as barges and riverboats. The lower hull framing consists of large edge timbers, called logs, which are the main structure connecting the flat bottom with the flat sides. Floors, vertical frames, corner posts, and keelson timbers form much of the rest of the framing structure. See Figure 5-07 for the illustration of a historic plan and structural elevation of a balanced floating drydock that is similar in size and design to V38.

Keel and Keelsons

As with previous vessels, much of the lower hull of V38 was inaccessible due to coverage by debris or silt overburden. However, an idea of the construction can be gained via analogy to comparably sized vessels constructed during a similar time period. In addition, since a drydock hull is basically a large box, very similar framing techniques and timber sizes were used on both the top and bottom of the hull. There is no keel, per se, on this particular vessel. The centerline timber, running for and aft, is the lowest timber in the central bulkhead, with an estimated measurement of 12 × 12.

Although not exposed, the vessel likely had keelsons located directly below the corresponding deck stringers that sit atop of and are fastened to the floors and logs. A total of three keelsons are likely present on each side of the vessel, each measuring 8 × 12 or 10 × 12. It is probable that all keelsons extend unbroken from bow to stern of the central hull structure. A fourth keelson, referred to as a bilge keelson and likely measuring 12 × 12, is located against the outer hull just inboard of the frames and atop the bilge log, discussed below.

Floors, Bilge Log, and End Bottom Log

These two timbers form the bottom edges of the main hull of the drydock. The bilge log is a longitudinal timber, likely measuring 16 × 12, while the end bottom log is an athwartships timber with similar dimensions. These timbers provide the tie-in between the flat bottom and the flat sides of the box like structure, and are a common feature on flat-bottomed vessels including barges and riverboats. They are typically notched to fit the vertical frames and are cut to fit around the corner posts, although this cannot be confirmed for this particular vessel. Tying into the bilge logs are the floors, which are the main structural members of the flat bottom. Measuring 6 × 12, these timbers are notched to fit the bilge logs, which are also likely notched to receive the floors.

Frames

The frames generally measure 6 × 6, with a few exceptions where 12 × 12 or 12 × 6 timbers were used. On the bottom of the vessel, the frames are likely notched into the bilge and end logs, although this was not confirmed in this instance. Most frames were 6 × 6, and placed generally on a 30-inch center (Figure 5-186), although this interval varied slightly to accommodate the placement of various other timbers such as deck beams and trusses on the sides and keelsons and bulkheads on the ends. Two 12 × 12 frames were placed to either side of the central bulkhead. The corner posts measure 6 × 12.

Upper Hull

The upper hull is framed much the same fashion as the lower hull, with a few exceptions.

Deck Beams, Stringers, and Top End Logs

The top end logs measure 16 × 12, and extend the entire width of the vessel (Figure 5-187). The tops of the frames were obscured by the logs, but it is likely they were notched on the underside to receive the tops of the frames. The end top logs are notched to fit around the corner posts. The deck beams (Figure 5-188), extending across the full width of the vessel, are likely placed directly above the floors, although this was not confirmed by direct observation at the site. The top timber of the central bulkhead is notched to receive the deck beams, which are not notched (Figure 5-189). Beams of two different sizes (6 × 12 and 12 × 12) were used in a repeating pattern along the deck of the vessel, with every third beam being the large size. They were generally placed on 30-inch centers, although this does not hold true for the entire vessel, as this dimension seems to change, increasing to 32 inches and then to 34 inches approaching the midship area of the vessel. Although not measured due to the extreme deterioration of the main deck, it is likely that the main deck was built with a slight crown that would place the centerline of the vessel 3 to 4 inches higher than the sides, based on observations of other similar vessels and vessel plans. This possibility is not reflected in the reconstruction in Figure 5-185, but can be seen in the historic plan of a nearly identical drydock in Figure 5-07.

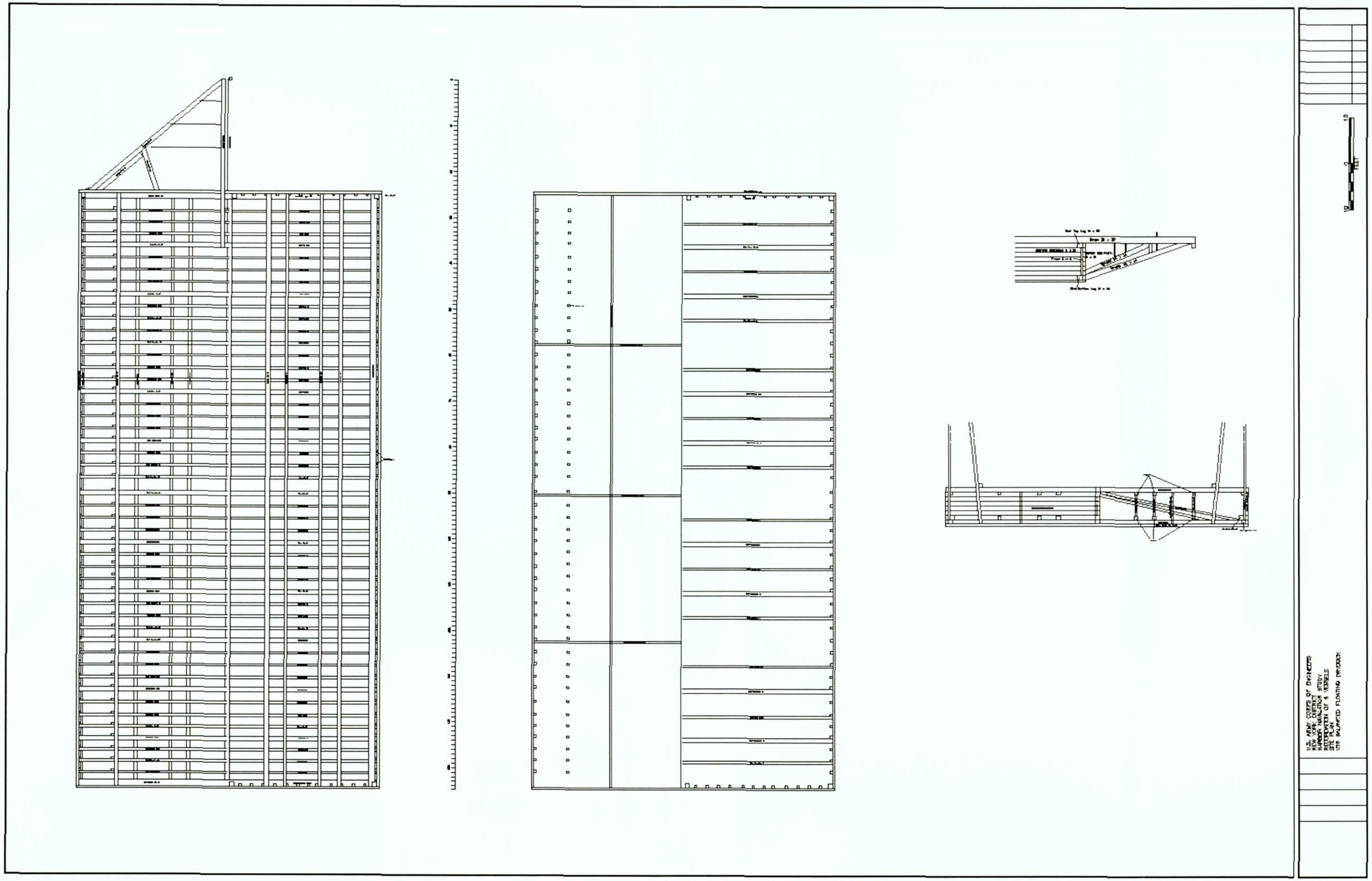


Figure 5-185. Plan and profile of V38 balanced floating drydock.

Figure 5-186. Port forward, showing extant frame, outer hull planking, and deck beam. View to the south (starboard aft).

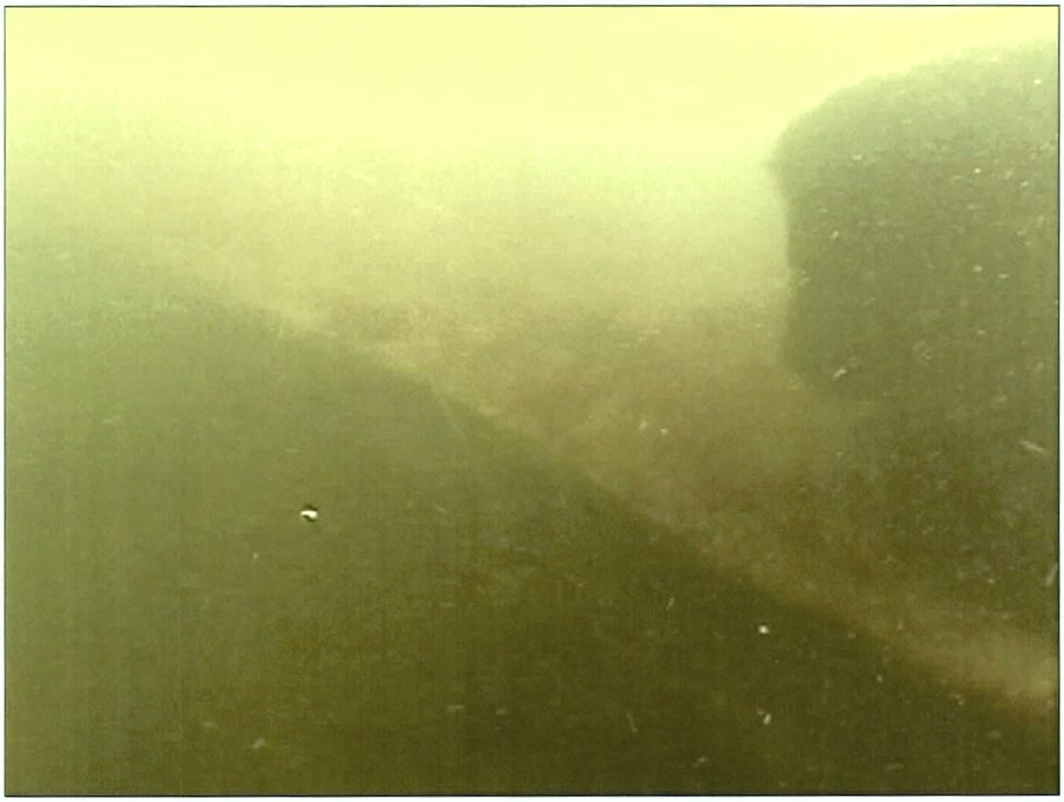


Figure 5-187. Forward top end log. View to the southeast (starboard).

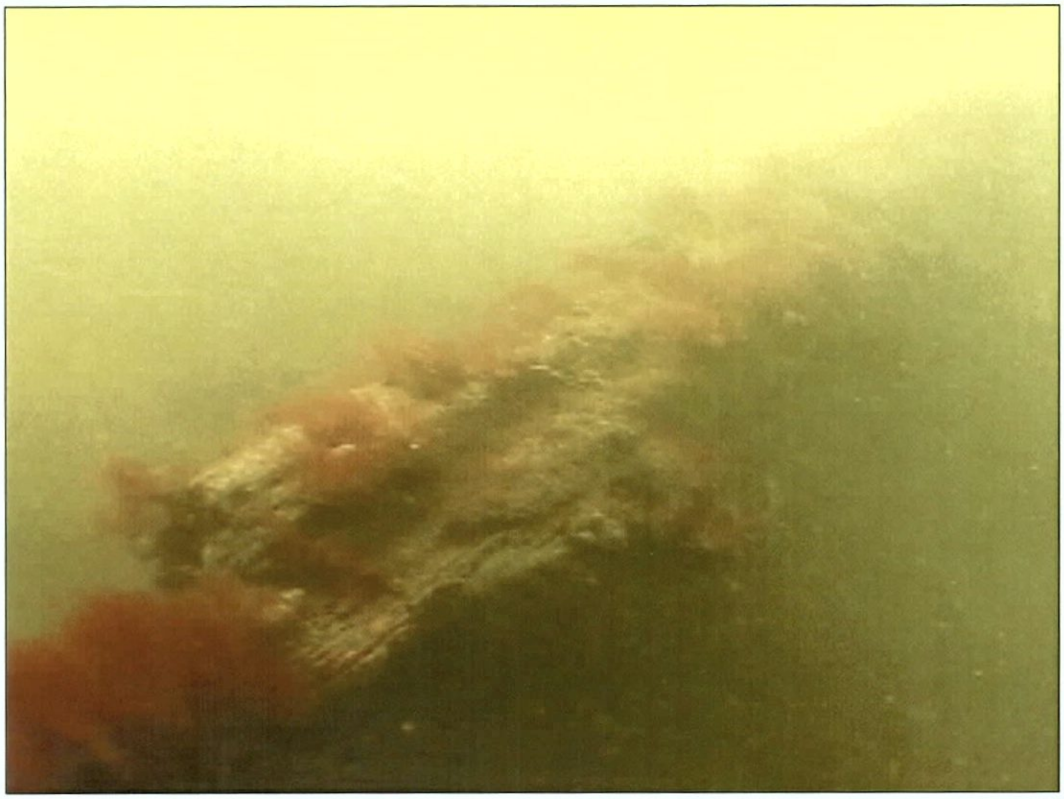


Figure 5-188. Deck beam.

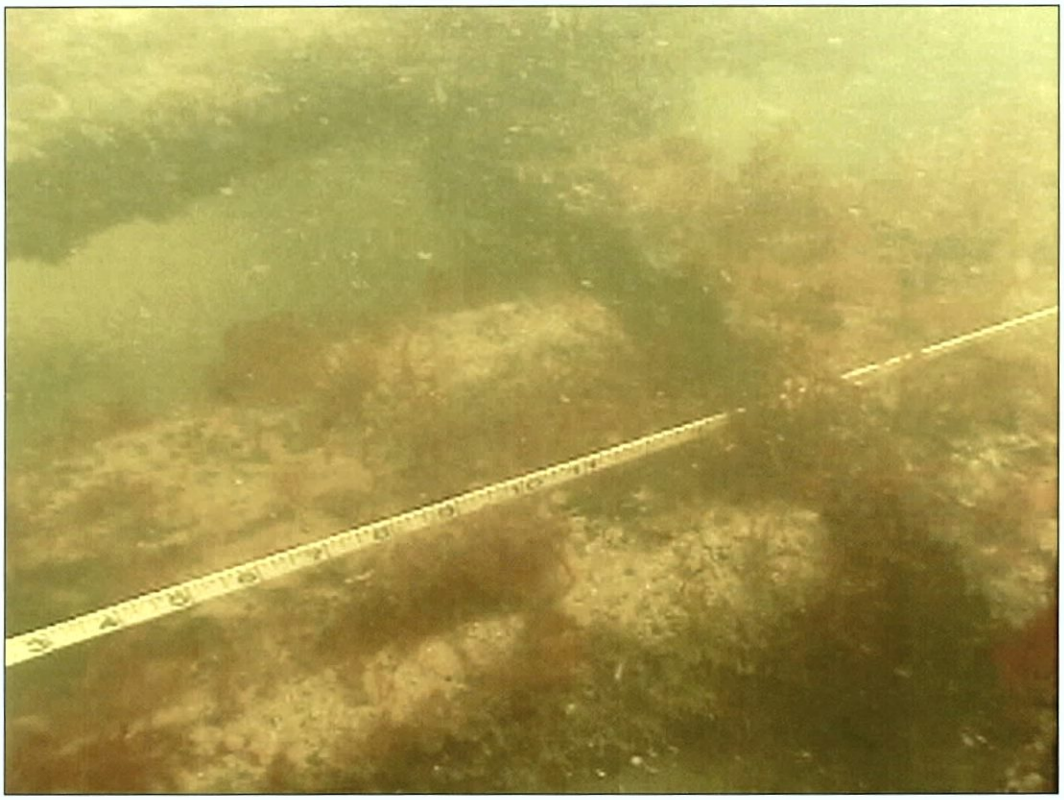


Figure 5-189. Central bulkhead deck beam intersection.

The stringers are longitudinal timbers fastened to the underside of the deck beams with the exception of the wing chine log (Figure 5-190). There are three total on each side of the vessel, with the outer two measuring 8 × 8 and the inner measuring 10 × 10. The wing chine log, which is actually the outermost stringer, measures 10 × 10 and is beveled on the outer side to match the angle of the inner wing frames.

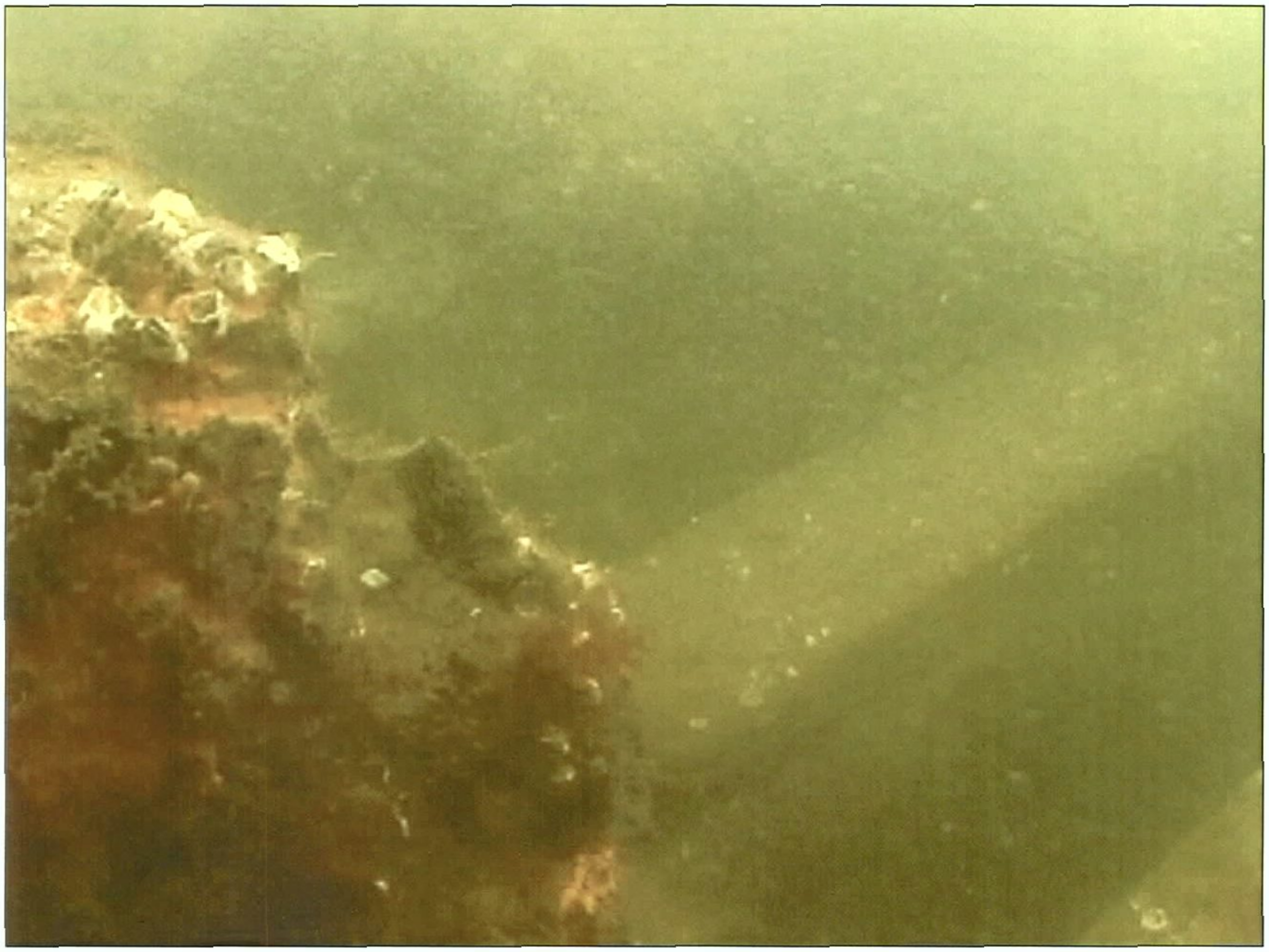


Figure 5-190. Outermost longitudinal stringer, port side.

Trusses

The main structural elements of a drydock are the large timbers that form the athwartships truss system. This vessel, which is smaller than V2, lacks the large laminated central curved truss that is characteristic of the larger sectional drydocks, due to its much smaller size and designed lifting capacity. The truss in V38 is still evident, although highly eroded, and is observable only along the centerline of the vessel (Figure 5-191). It consists of two diagonal timbers on each side. The top timber angles downward at an angle that indicates it would likely intercept the bilge log at the bottom of each side. The lower truss was measured at several locations, and these measurements seem to indicate it would intercept the bottom of the hull at a point directly under the inner wall of each wing. Although the reconstruction of V38 reflects this, most drydocks of this size seem to have the lower truss timber meeting the bottom at the port or starboard longitudinal bulkhead, which is closer to the vessel centerline than the base of the wing frame. Neither location can be confirmed due to the overburden of sediment and debris at the site. The reconstruction was based on limited information gathered during the investigation.

Figure 5-191. Athwartships truss.

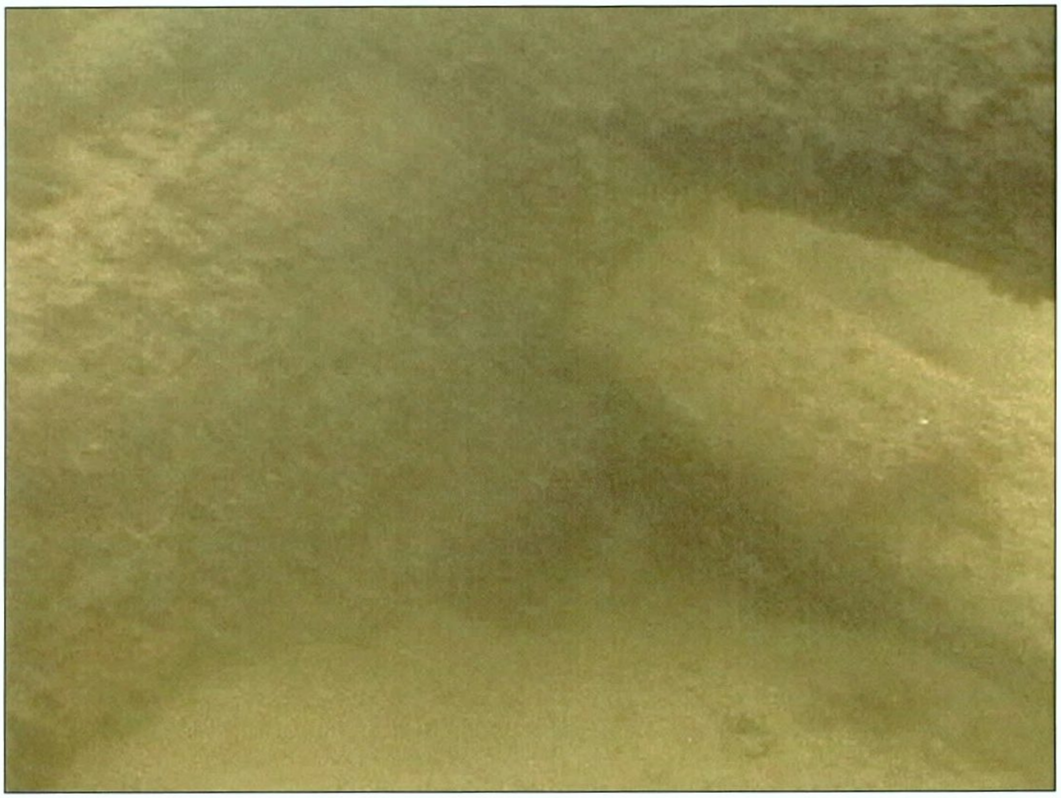


Figure 5-192. Athwartships truss in Figure 5-191 where it intersects the central bulkhead.

The trusses are located directly below the deck beams and were installed in two sizes, 6 × 12 and 12 × 12, which were spaced in a regular and repeating pattern corresponding to each watertight compartment. Large trusses consisted of 12 × 12 timbers and numbered 8, while the smaller trusses, constructed of timbers measuring 12 inches molded but 6 inches sided, numbered 12. As can be seen in the site plan in Appendix E, the trusses alternated between large and small, beginning and ending with the small truss, within each watertight section.

Watertight Bulkheads

The vessel was divided into eight equally sized watertight compartments, which presumably were controlled separately to control trim as the dock was pumped out during a vessel lifting operation. They are separated by timber bulkheads with individual members measuring 5 × 12 except for the central bulkhead, which is made up of 12 × 12 timbers. The three athwartships bulkheads correspond to floor and deck beam locations and replace the truss at each location. The three longitudinal bulkheads correspond to keelsons with the exception of the central bulkhead, which, as mentioned above, does not really have a keel or keelson. Studies of other larger drydocks, such as V2, have indicated the use of vertical reinforcing timbers at points where the longitudinal and athwartships bulkheads intersect. The bulkheads on V38 were heavily deteriorated, and the intersecting areas were either buried or eroded. However, plans of balanced drydocks of sizes similar to V38 (see Figure 5-07) do not indicate the use of such timbers.

Hull Planking

Being basically a scow-hulled working vessel, there is no ceiling plank, as the buoyancy is contained entirely within the outer hull plank. Although most of the existing outer hull was below the mud line, enough was exposed in the port bow area to determine that the planking appears to be a uniform 6 × 12 (Figure 5-193). Although the bottom planking was inaccessible, it seems likely to speculate that it was of similar dimension.

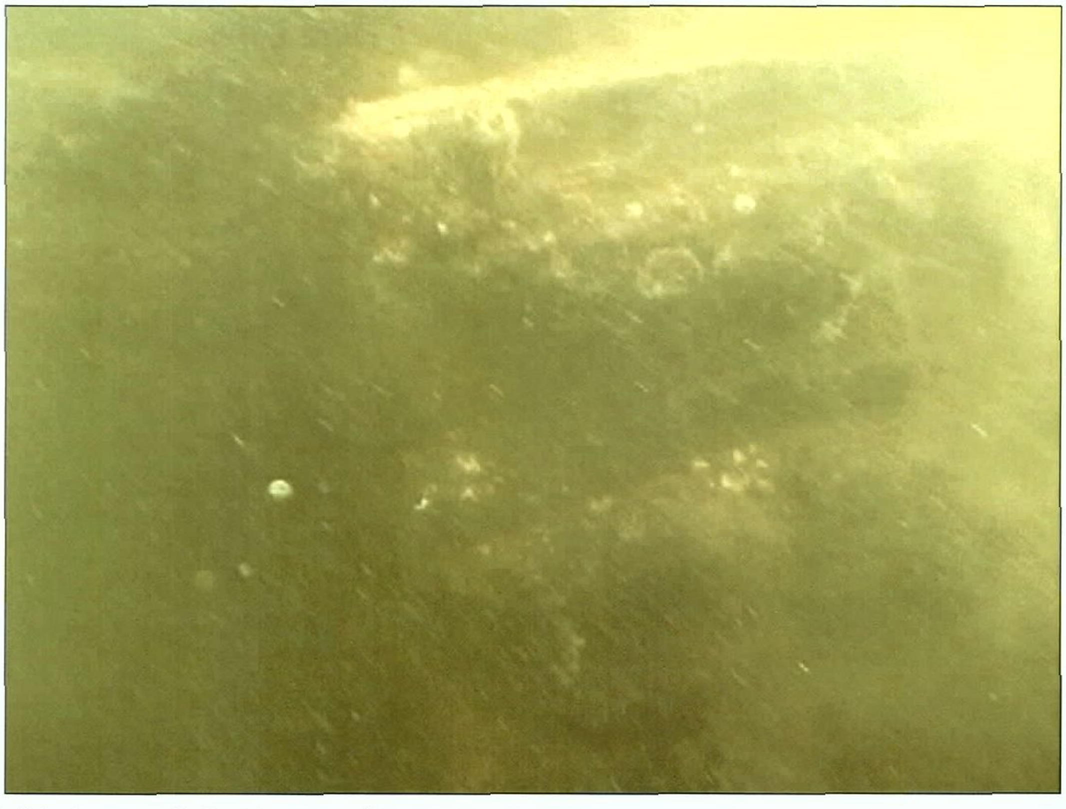


Figure 5-193. Outer hull planking, port forward corner.

Wings

Very little remains of the wings. The only extant components are a number of highly eroded frames. Enough remained to gain an idea of the angle of the slope of the inner wing wall, and basic scantlings, but nothing more. All upper structure has been salvaged, removed or deteriorated, and very little remains, even disarticulated. Wing frames measure 8 inches molded and 5 inches sided.

Prow

The prow is a heavily framed, bow-like structure affixed to the forward bulkhead of the vessel. Most balanced drydocks have one at each end of the vessel. However, V38 exhibits no evidence of one at the opposite end. This is not to say it never had one, although one would expect there to be some evidence of fasteners or mounting points evident if a prow had been removed or had deteriorated. This could indicate V38 was part of a sectional rather than a balanced drydock, but this seems unlikely, as sectional drydocks typically had the prow as a separate unit.

The main structure of the prow, which is highly deteriorated, consists of three timbers at deck level, two diagonal trusses along the centerline, and two diagonal timbers from the extreme bow to the forward corners. Minor bracing timbers are apparent at various points, but much of the smaller timbers have eroded or been removed. The centerline timbers consist of a trio of timbers, one on the centerline (10 × 18) and two offset (11 × 14) (Figure 5-194). The centerline timber appears to be an extension of the top timber of the central bulkhead, while the two rider timbers are above deck level. They extend aft to the fourth deck beam and the first large truss. Their purpose seems to be to provide additional vertical support to the prow structure.

Figure 5-194. Starboard bow rider.

The diagonal trusses are 12-inch square straight timbers. They are fastened to the underside of the centerline beam, one at the tip, and one about 10 feet aft. Both extend below the silt line toward the hull but it is presumed they meet at or near the end logs and are fastened there. Several 1-inch iron pins extend from the central beam through the trusses, and a vertical post is located directly forward of where the second truss joins the central beam. This beam is fastened to the top of the first truss.

The main bow waterway timbers are 12 × 12 in size and extend unbroken from the bow to the forward edge of the vessel (Figure 5-195). At a distance of 12 feet, 6 inches from the forward corners, a rider is fastened to the inside edge of the waterway, making the total width 24 inches. At the point of fastening, a truss angles down toward the forward lower edge of the main hull, and presumably fastens at or around the end bottom log (Figure 5-196). The waterway timbers are fastened to the top end log and rest on a shelf measuring 6 inches deep.

There is no evidence of deck planking in the bow, although examples of similar vessels show planking in these areas.

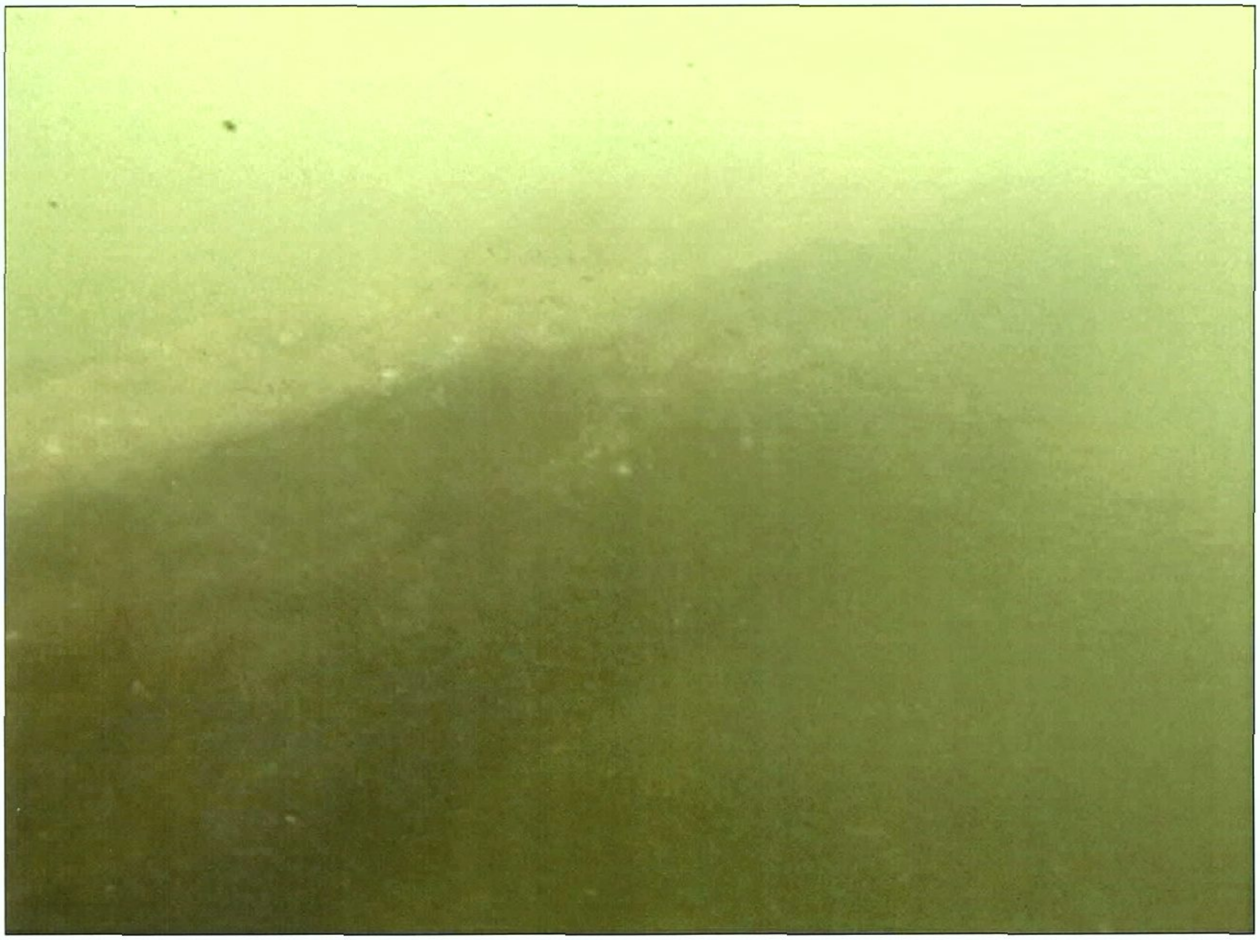


Figure 5-195. Bow waterway timbers, port side. View to the southeast (aft).

Figure 5-196. Secondary bow truss, port side. View to the southeast (starboard).

6. VESSEL V37: FOUR-MASTED SCHOONER *PAUL E. THURLOW*

HISTORY OF THE SCHOONER IN THE COASTING TRADE

COLONIAL PERIOD

Since the establishment of the earliest colonies in the Northeast, transportation of goods and people has centered on the water. For over a century after the *Mayflower* voyage in 1620, there were very few settlements further than 30 miles from either the sea or a body of water connected to the sea. Colonies' output of agricultural or manufactured goods, often destined for Europe, was sent via small craft to a larger center—such as Boston—for shipment across the ocean. It is in this practice that the origin of coasting lies. As a natural outcome of this shipping method, many of the vessels were locally constructed and designed. Early vessels were small, including types like the shallop (Figure 6-01), pinnace, sloop, ketch (Figure 6-02), pink, galley, and skiff. Sailing rigs initially took the form of those found in England, including triangular sails with varying boom lengths and names like "leg-of-mutton," "shoulder-of-mutton," and "gaff-sail," as well as lateen sails. Larger vessels tended to be square-rigged, as ships or brigs.

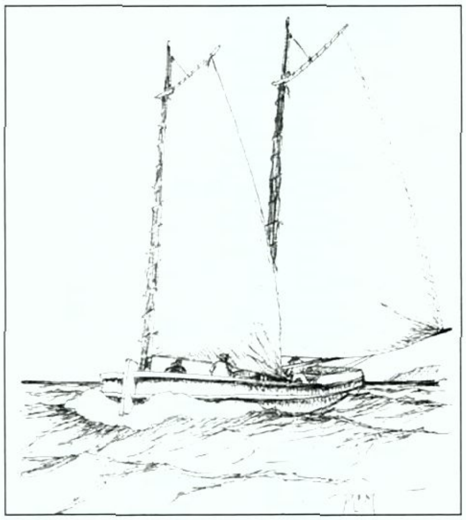


Figure 6-01. Shallop (as presented in Morris 1973).

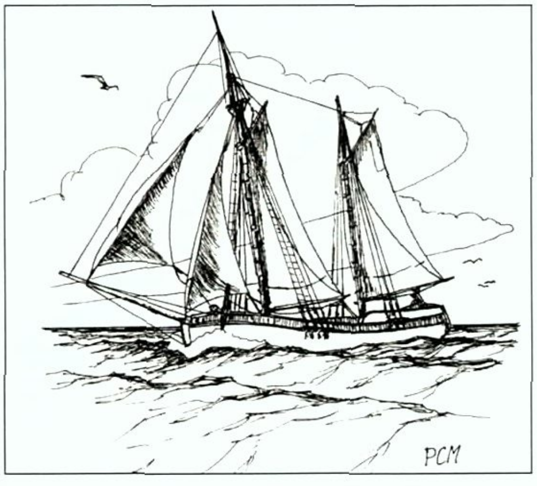


Figure 6-02. Ketch (as presented in Morris 1973).

Coastwise shipping favored the fore-and-aft rig for its simplicity, ease of use, speed, and reduced crew requirements. Sloops, consisting of single-mast vessels, 20-50 feet in length and displacing 25-70 tons, were used in all manners of coastal trading as early as 1690 (Morris 1973:3) (Figure 6-03). According to Chapelle (1935:11), the rig consisted of a single fore-and-aft mainsail, two or three headsails, and a square topsail. According to Morris (1973:3), this conforms to a type commonly known during the period as a Jamaica sloop, which, originating on the island of Jamaica, was considered a fast sailer, larger versions of which were used for deep-water travel. Although the popularity of the rig waned after the turn of the nineteenth century, the sloop is considered one of the workhorses of early American shipping.

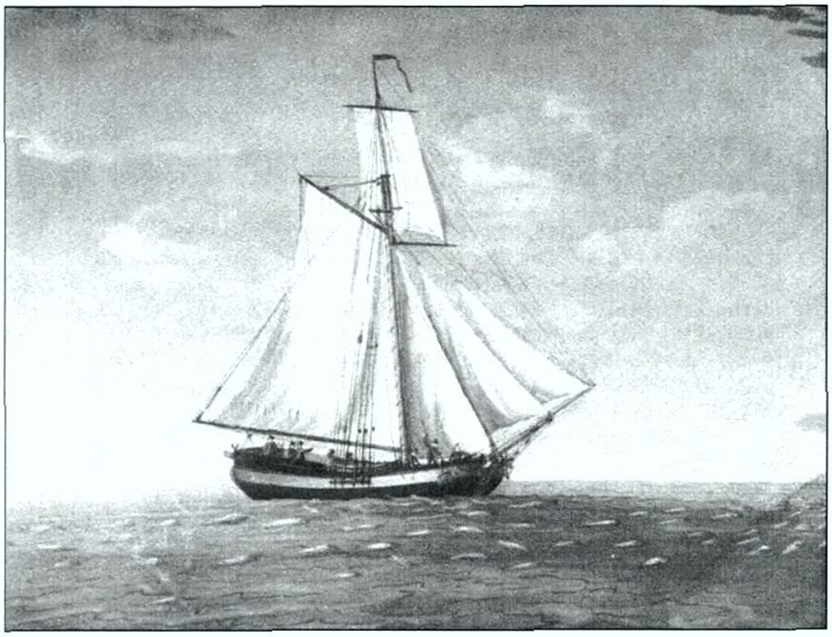


Figure 6-03. Late-eighteenth-century topsail sloop (as presented in Albion et al. 1972).

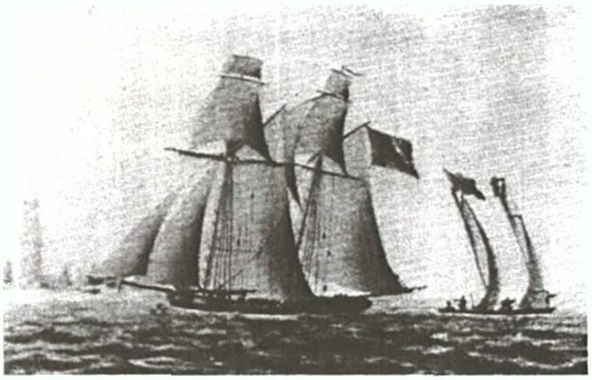
The development of the schooner is a little more problematic. Conventional wisdom has suggested that the schooner rig was developed as a fishing vessel in Gloucester, Massachusetts, by Captain Andrew Robinson in 1713. However, according the Chapelle (1935:32), and E.P. Morris, there are numerous examples of the rig, including several American-built men-of-war in the British Navy prior to the Revolutionary War, including the *Falkland*, a fourth-rate built at Portsmouth, New Hampshire in 1690. In any case, it is generally accepted by the historical community that the schooner rig has its roots outside America. Regardless, by the late eighteenth century, the schooner had become the rig of choice for merchant transportation in the U.S. and Canada. Larger sea going versions during this time were rigged with square topsails, while the generally smaller coastal traders and fishing vessels tended to lack this feature.

During the late eighteenth century, political considerations in Europe caused a reduction in trade, with the slack taken up by increased trade with the West Indies. Commodities were exchanged between the northern and southern colonies, as well as with the Caribbean. Local produce was exchanged for needed supplies that were not available locally, and so Virginia exchanged tobacco with New England for salted fish, and so forth. The average size of coasting vessels increased as trade volume increased.

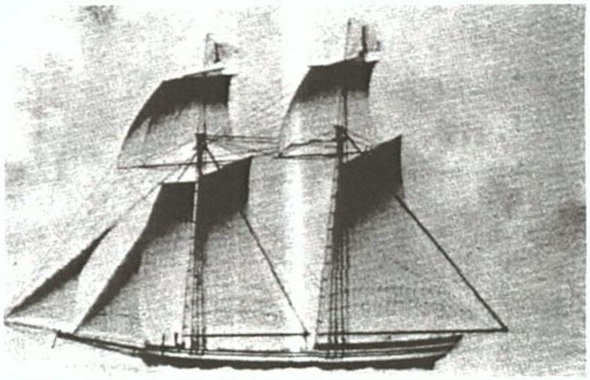
Rise of the Packets

The American Revolution was as disastrous for coastal shipping as it was for the transatlantic trade. Many vessels were captured, sunk, or laid up and deteriorated over the seven years of the conflict. Within five years of the surrender of Lord Cornwallis at Yorktown, American shipping was back on its course of growth. By 1800, it was apparent that the schooner was the vessel of choice for coastwise shipping. Also, a new class of coasting vessels called packets, or vessels maintaining a regular sailing schedule between ports or between smaller towns and regional shipping centers such as Boston or New York, emerged. Representing a fundamental shift in the employ of coastal vessels, packets carried passengers and cargo supplied by the general public rather than cargoes purchased solely by the owner and/or operators of the vessels. For example, the town of Plymouth, Massachusetts, with a population of 500, had six sloops at 60 tons each running to Boston, and two schooners of 90 tons each running regularly to Nantucket, New Bedford, and New York, as well as several other vessels bringing lumber from Maine. These vessels regularly advertised as taking passengers and cargo from the Boston area to points south.

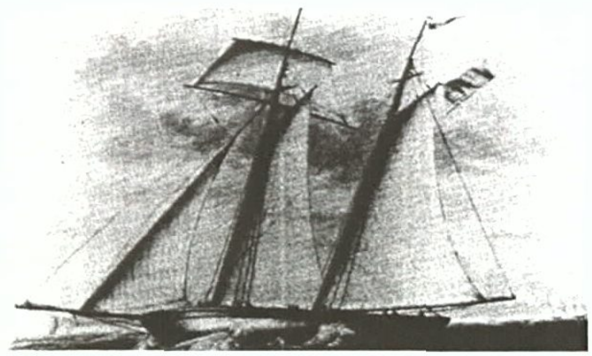
While speed was an important development in West Indies trade, given the preponderance of pirates in the region as well as the jump in trade volume represented by the packets, it became much more important around the turn of the nineteenth century. While the vagaries of the wind and weather often wreaked havoc with sailing schedules, generally, faster was better. The packet era saw the rise of vessels that, either built specifically for that purpose with speed in mind, or brought in from some other trade as a result of having earned a particular reputation for speed, were definitely fast sailers. The famed Baltimore clipper falls into this category (Figure 6-04). Most of these vessels were less than 100 feet in length (Morris 1973:11), and while they often had sleeping areas for passengers, the passengers were expected to supply their own food and frequently had to share births with animals or other cargo.



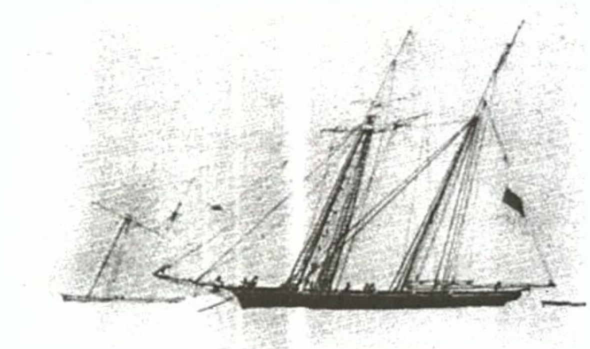
Baltimore clipper schooner and pilot-boat off Cape Henry. Water color by Captain George Tobin, 1794, owned by The National Maritime Museum.



Schooner *Federal George* of Baltimore, built at Duxbury, Mass., 1794. Water color owned by the Peabody Museum, Salem.



Baltimore clipper schooner reefed down. Lithograph by J. Rogers, 1825, owned by The National Maritime Museum.



Baltimore clipper schooners. Acquatint by W. J. Huggins, ca. 1825, owned by The National Maritime Museum.

Figure 6-04. Baltimore clippers (as presented in Brewington 1966).

NINETEENTH CENTURY

No sooner had American shipping recovered from the Revolutionary War when hostilities broke out again with Europe. In response to unfavorable treatment of American sailors by the French and the British navies, President Jefferson signed the Embargo Act of 1805, which made it illegal for any vessel to carry cargo from an American port to a foreign country. While this would seem self-destructive, Europe relied heavily on American goods, and Jefferson hoped this would coerce the warring nations of Europe to let American vessels ply the oceans unmolested. Predictably, though, U.S. transoceanic shipping took a downhill slide. Coastal shipping continued to thrive, however, carrying goods brought in by foreign vessels as well as vessels carrying local cargoes. With the onset of the War of 1812 however, British blockading vessels took their toll on this trade as well. This war fortunately did not last long; by 1814, coastwise shipping was headed into a period of sustained growth and prosperity. This was helped by the Navigation Act of 1817, which closed U.S. coastal trade to foreign-registered vessels, and still remains in effect today.

By the 1830s, coastwise trade had exceeded the tonnage of vessels engaged in foreign trade, with the former being driven by a strong flow of coal, cotton, and grain from the south to New England, to fuel the latter region's growing industrial base. In 1822, four coasting vessels left the Delaware River bound for northern ports carrying coal. By 1827, that number had increased to 397 vessels with an aggregate tonnage of 3,900. By 1837, Philadelphia was shipping 350,000 tons of coal in 3,225 vessels (Morris 1973:18).

During the early nineteenth century, New England schooners engaged in coastal trade were two-masters not exceeding 75 feet in length. While a few carried topsails, most carried a plain fore-and-aft rig with a number of jibs. During the heyday of the two-masted schooner (1825-1885), increased demand for bulk cargoes such as lumber and coal fueled a gradual increase in size; thus, by the middle of the century, two-masters as large as 100-135 feet in length were in regular service. While not the longest, *Oliver Ames* was the largest two-master, at 435 tons and 124.4-feet long. This seems to have been the upper size limit for the two-master, as larger vessels required larger sails that became unwieldy, requiring larger crews, and thus were more expensive to operate.

At the apex of two-masted schooners in the last quarter of the nineteenth century, there were two basic types. A shallow-hulled centerboard model, often used in estuarine and river environments, and the deeper-hulled versions with hulls similar in form to the great clippers of the mid-nineteenth century. While well appointed, with good cargo capacity and excellent sailing characteristics, there was an upper limit to the size of these vessels. Once that limit had been reached, the next step was to add a third mast.

Contrary to what the above paragraph may imply, the first three-masted schooner in American waters appeared in Chesapeake Bay around 1795. Known as a Virginia pilot boat, these vessels became the basis for the so-called Bermudan schooners after the English acquired one, took her lines, and had six versions built for the Royal Navy in Bermuda. Locals soon adapted this design for their own uses. Various modifications included the leg-of-mutton sail, which was largely responsible for its reputation for speed.

While the U.S. version, which retained its gaff rig, eventually evolved into the renowned Baltimore clipper, this design—due to its small hull—was inadequate for the coastal shipping trade, where cargo capacity was as important as speed. This type evolved into a deep-hulled schooner with three masts of equal height that combined ease of sailing with a large cargo capacity. Because of this gradual evolution, the exact date the first true coastwise three-master was built is unknown. "American Neptune" (Vol. 1, No. 2) lists 18 three-masters built before 1850, with the earliest being the *Harmony*, built in 1799. The *Magnolia* was one of the first to do away with the single topsail on the mainmast, while W.L. Parker credits the *Kate Brigham*, at 546 tons and built in Greenport, New York in 1853, as the first true three-masted coastal schooner (Parker 1948).

By 1864, there were only 39 three-masted schooners registered in the United States, and only four of those were greater than 500 tons. After the Civil War, however, these numbers began to increase. As with the two-masted schooners, there were shallow water centerboard versions along with the deepwater clipper-hulled versions. While the centerboard schooners, with their large spread of sail and relatively small hull were fast sailers; they lacked the cargo capacity to compete in the coastal trade with their deeper hulled brethren. The addition of a centerboard to the deep-hulled vessels, which tended to have poor sailing qualities when empty due to their large freeboard, created a vessel that had both excellent sailing qualities and good cargo carrying capacity. Initial versions of these schooners had a long quarterdeck, running to forward of the mainmast. This was eventually replaced with the more common quarterdeck, which extended to just forward of the mizzenmast, and remained consistent until the end of the sailing era. The centerboard eventually lost popularity, perhaps due to additional crew requirements, massive centerboard trunk that occupied valuable cargo space, or less time spent sailing empty; after 1890, few were built.

The development and use of the large schooner on the east coast is inextricably linked to the industrial expansion of the northeast, beginning after the Civil War. The rise of such industries as textiles and shipbuilding created the need for additional power. Prior to the Civil War, the requirements of mills were easily met by the use of waterpower. However, in the latter half of the nineteenth century, the requirements far outstripped the ability of this source to provide enough power to fuel the expansion. In addition, New England has no useful deposits of coal. Couple this with the introduction of electric utilities (which used coal), streetcars, residential use of coal for heating, and increasing use of railroads for moving goods and people, and there existed a massive demand for coal at a constantly increasing rate. A greater demand for coal in turn fueled the drive for larger and larger vessels. From the first stirrings of demand for bituminous coal in the 1840s, the wooden-hulled schooner was nearly the ideal carrier.

Three-masted schooners ranged in size from the diminutive *Maple Leaf*, at 21 tons and 48 feet in length, to the *Bradford C. French*, built in 1884 at 968.82 tons and 184.3 feet in length. The *French* could carry 1,700 tons of coal and was larger than many later four-masters. Her career lasted until July 1916, when she broke up in a hurricane on a voyage from San Juan to New Orleans with a load of molasses and alcohol. Three-masters, many of which were large and could compete successfully and economically with the larger four- and five-masters, continued in use until well into to twentieth century.

According to Morris (1973:28), there were more schooners built in 1885 than any other rigs combined. While the three-masted schooner had reached its practical limit in terms of size (and subject to the same limitation as the two-masted schooners; namely, that to move that large of a vessel with three masts would require sails so large as to threaten the integrity of the rigging), the demand for bulk cargo, namely coal to fuel industrial expansion in the Northeast, created the need for larger vessels than could be accommodated by the three-masted rig. Experimentation had begun not long after the Civil War, when the former gunboat *Osceola* was purchased from the Union Navy in 1868 and converted. At 643 tons, she was not large, and according to Morris, her career was short. Lasting a bit longer was the 630-ton *Weybosset*, a former sound steamer built at Mystic and converted to a four-master in 1879 (Figure 6-05). She was stranded off Cape Cod in 1890, so apparently she was manageable enough as a cargo vessel to provide 11 years of presumably profitable service in the coal trade.

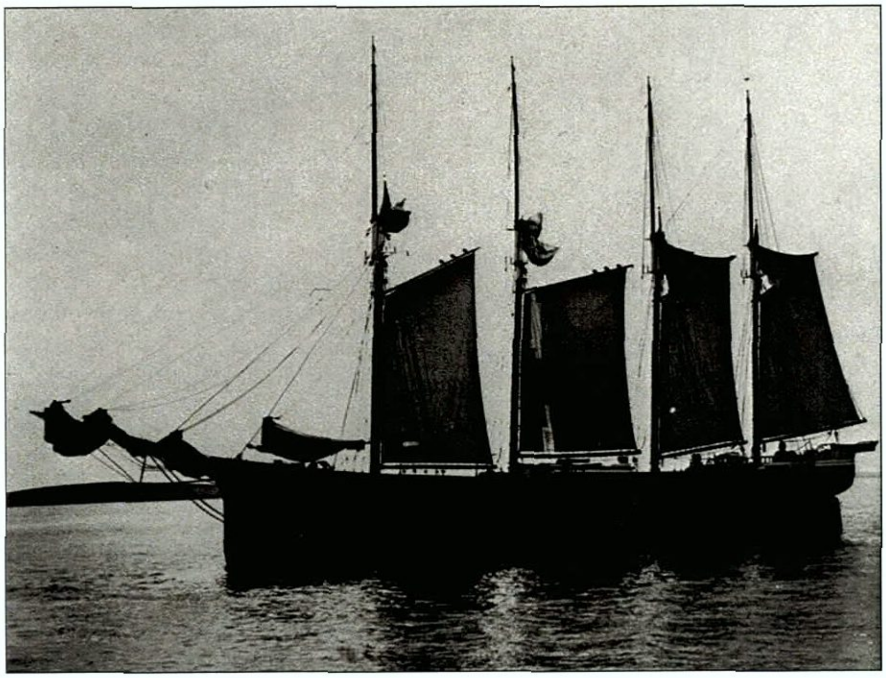


Figure 6-05. Odd-looking *Weybosset*, a converted Long Island Sound steamer (as presented in Morris 1975).

The first vessel actually constructed as a four-masted schooner was the *William L. White*, built in Bath, Maine, in 1880 by Goss, Sawyer and Packard (Figure 6-06). The managing owner of the new vessel was Jacob B. Phillips, of Taunton, who also managed the *Bradford C. French*, as well as a number of other big schooners in the coal trade. The vessel was 205 feet on deck, 40 feet in beam, 17-foot depth of hold, with a length overall of 209 feet. At 996 tons, she could carry 1,450 tons of coal, and required a crew of only five in addition to the officers. The captain was Henry Babbett, whose son Emmans would later become the first captain of the *Thomas W. Lawson*, the only seven-masted schooner ever built. Mr. Philips would purchase several other vessels from the Gross, Sawyer, and Packard yard, including the *Elliott B. Church*, which at 1,137 gross tons was the first four-master to exceed the 1,000-ton burden.

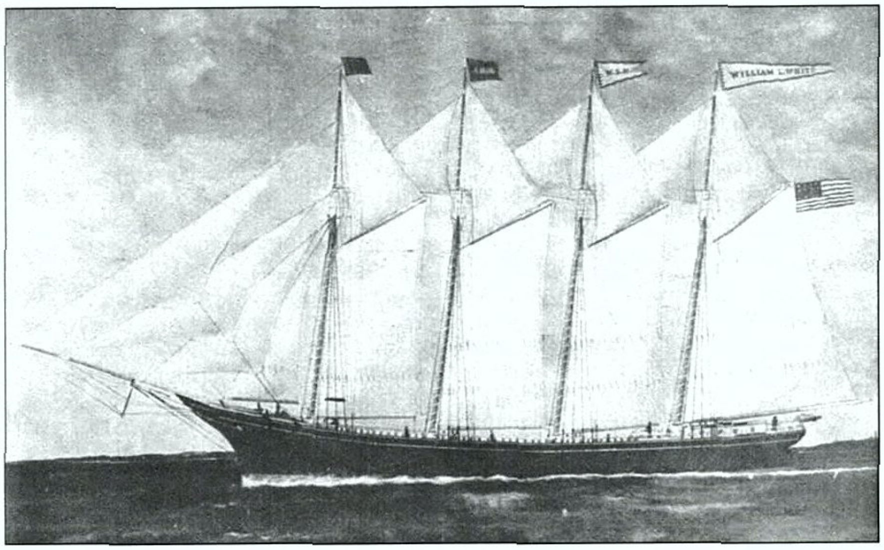


Figure 6-06. Four-masted schooner *William L. White* (as presented in Morris 1975).

The appearance of four-masters also brought about the appearance of small boilers, called donkey boilers, which were used for hoisting the sails. Although a specialized hand—an engineer—was required to maintain and operate the equipment, the monetary savings in terms of reduced crew requirements and time more than paid for them. By the end of the century donkey boilers were standard equipment of newly built vessels, and many older vessels had been retrofitted.

The four-masted schooner is likely the apex of wooden ship construction in the United States. While there were larger vessels built (see below), nothing topped the four-masted schooner in terms of tonnage and numbers. From the period 1880-1889, there were 68 four-masted schooners built, 48 of which were constructed in Maine, with 35 in Bath. Forty-eight of those 68 were constructed in the last three years of the decade, and another 73 in the first two years of the 1890s. From 1879 to 1910, there were a total of 311 four-masted schooners built, with an additional 118 built in the war years of 1917-1919. In all, there were 450 constructed through 1921, with the last generally being accepted as the *Laura Ann Barnes*, a relatively small vessel at 698 gross tons. In general, four-masted schooners ranged from 170-230 feet in length and 900-1,800 gross tons. The biggest four-master was the *Frank A. Palmer* (Figure 6-07). Intended for the coal trade, this schooner was 2,014 gross tons and 274.5 feet in length with a 43-foot beam. While not as long, the *Northland*, built by Cobb, Butler, and Company of Rockland, Maine in 1906, was 2,047 gross tons and 242.2 feet in length with a 44.1-foot beam and 22-foot depth of hold, and was among the first sailing vessels to be equipped with an auxiliary engine; in this case, a 500-HP six cylinder gasoline engine. The engine was later removed after proving impractical, but she continued her sailing career until 1921 when she was lost off the coast of Brazil. According to Morris (1973:32), over one-third of the four-masted schooners built exceeded 200 feet in length; and contrary to what one might expect regarding the general progression of size and carrying capacity noted so far, these were distributed fairly evenly over the 41-year reign of the four-master.

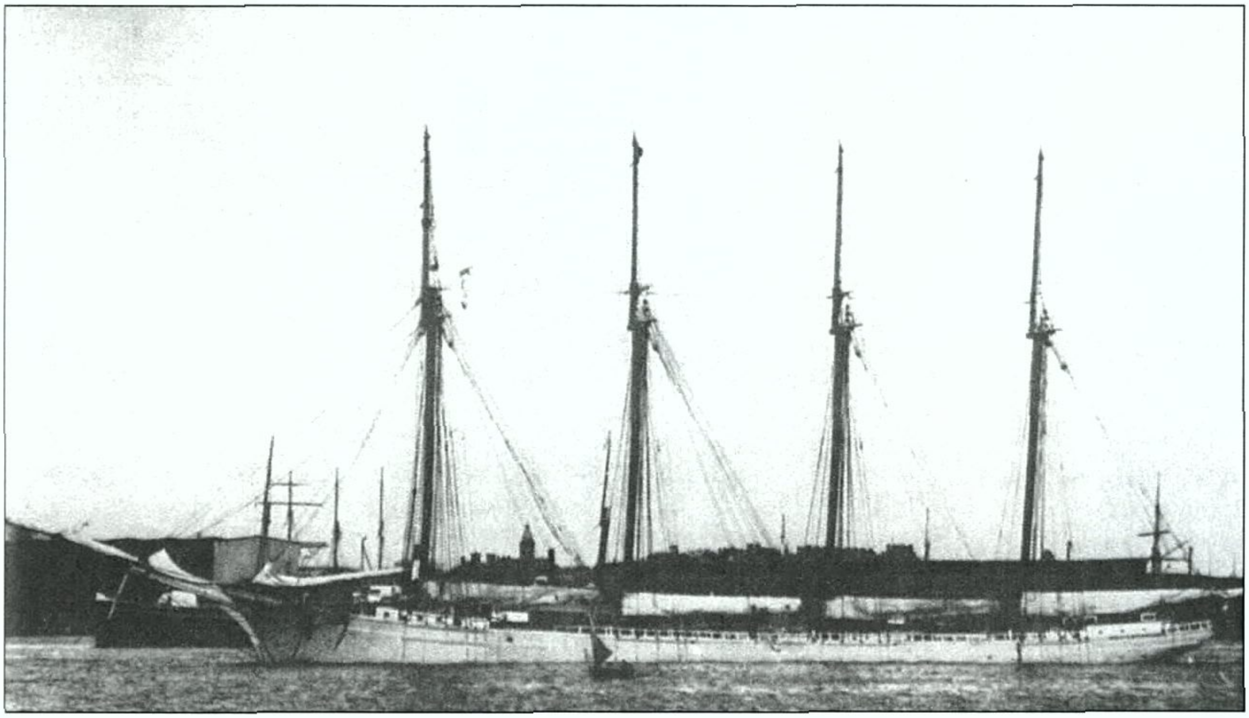


Figure 6-07. The largest four-masted schooner, *Frank A. Palmer* (as presented in Morris 1975).

By the last decade of the nineteenth century, some standardization had occurred with respect to hull form, rigging, and deck arrangement. Most of the four-masters were built with two decks, although some of the larger ones had three. While the addition of extra decks seems to make little sense in the carrying of bulk cargo, which would seem to be better served in an open hull, the realities of wooden hull construction required it for strength. In most cases, the second deck would be left unplanked, giving ready access to the lower deck.

A typical four-masted schooner took between four and six months to build, and the new vessel was usually ready for sea when launched, with a well-appointed main salon (Figure 6-08). Vessels at this point were owned in shares. A single share, 1/64, was considered a sound investment in the latter half of the nineteenth century, often returning a 50 percent dividend in a single year. Managing owners typically owned a number of shares but often not more than 50 percent. The shares of vessels being built for particularly astute fleet managers were the most desirable and fetched a premium price. Some yards built and managed their own vessels, selling shares to raise capital.

Prior to the last several decades of the nineteenth century, coastwise vessels carried all manner of cargo, including general cargoes. Inroads made by the railroads by the last third of the century pretty much restricted the schooners to bulk cargoes, which they could carry more efficiently. Any given vessel was seldom restricted to one particular type of cargo, with coal, lumber, ice (Figure 6-09), phosphate, and fertilizer being the most common (Figure 6-10). Coal cargoes fetched $2.91 per ton in 1885, while lumber in 1890 cost $8.00 per 1,000 feet.

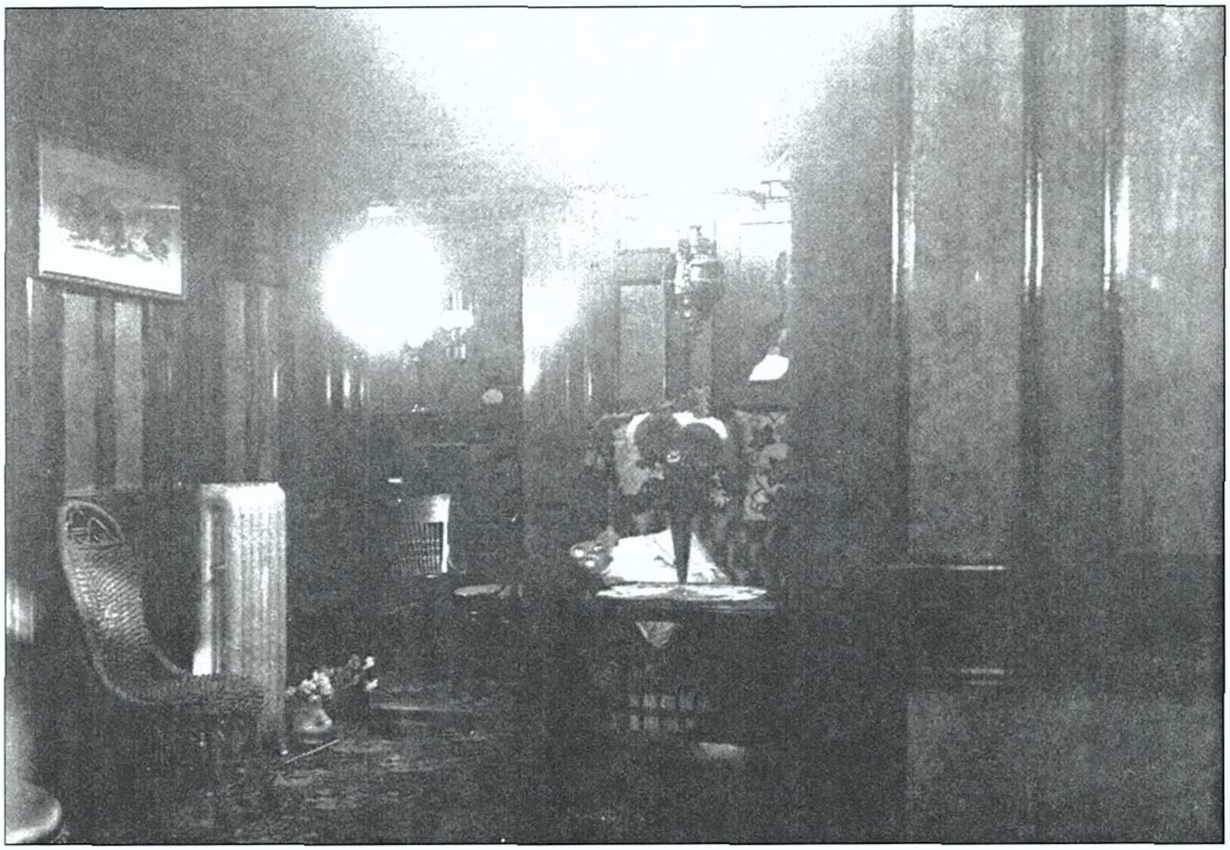


Figure 6-08. Main cabin of five-masted schooner *Marcus L. Uran*, owned by the Coastwise Transportation Company (as presented in Parker 1948).

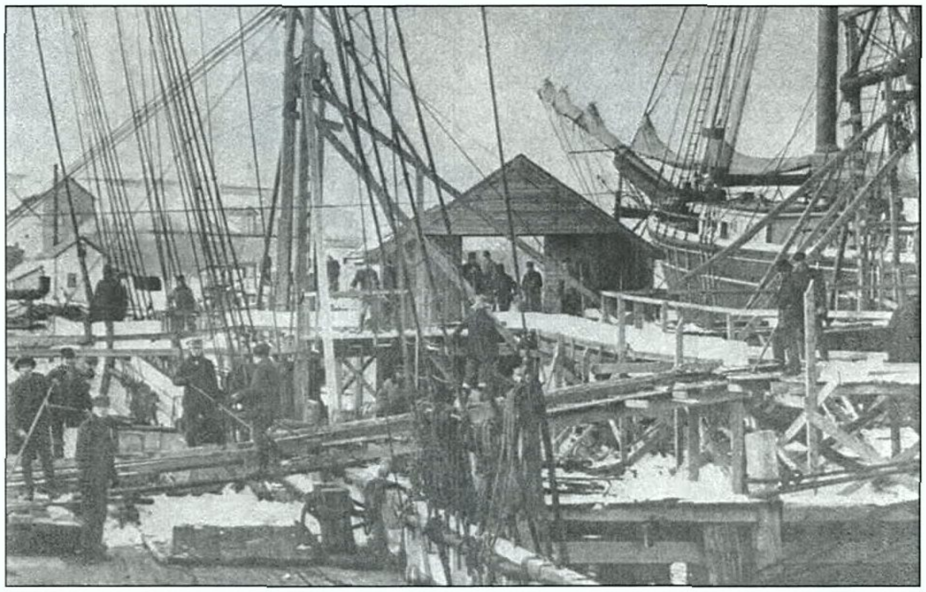


Figure 6-09. Two vessels belonging to Benedict-Mason Marine Company loading ice at the Maine Ice Company in West Boothbay, Maine in 1907 (as presented in Morris 1975).

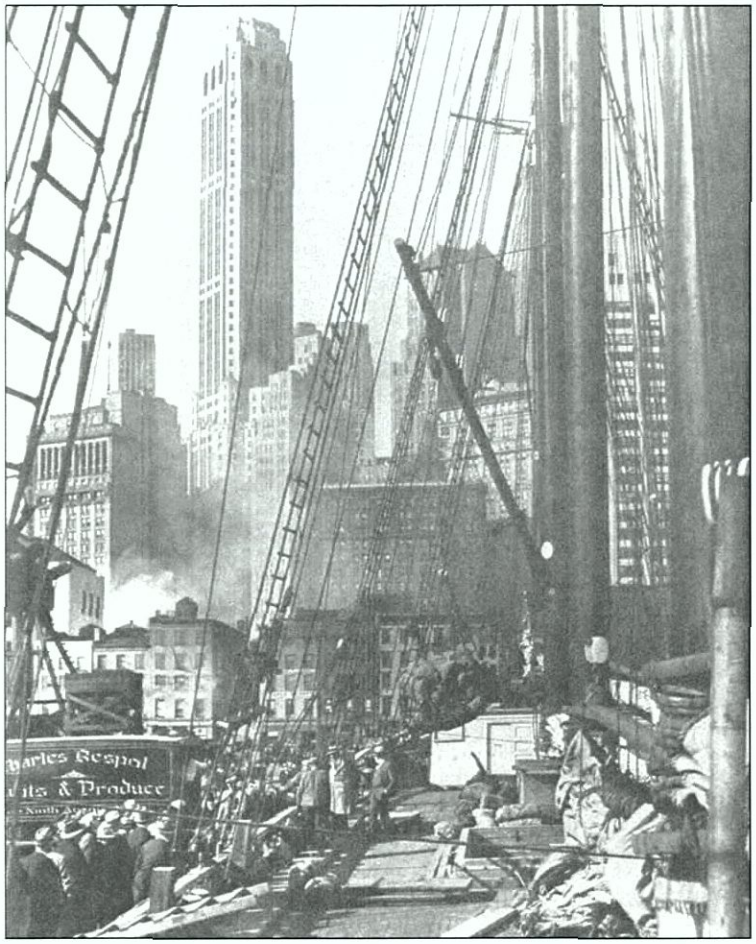


Figure 6-10. *R. R. Govin* unloading a mixed cargo at South Street, New York City, circa 1930 (as presented in Morris 1975).

The first five-masted schooner was built in Toledo, Ohio, in 1881. The *David Dows* was 265 feet in length, shorter than several of the longest four-masters, and 1,418 gross tons. She was used strictly on the lakes and never saw salt-water use. The first five-master built on the east coast was the *Governor Ames* at Waldoboro, Maine in 1888 (Figure 6-11). At 1778 gross tons and 245.6 feet in length, she was also the only five-master to be equipped with a centerboard. The latter was 35 feet in length. Originally intended to be equipped with four masts, it was decided that, although there were several larger vessels that had only four masts, due to her size, a fifth mast would be added. The *Ames* was a well-constructed vessel, and it is thought that her centerboard trunk and a unique hatch coaming arrangement where the longitudinal sides ran continuously fore and aft added considerable strength to her hull. After nearly 20 years of used she showed considerably less hogging than other vessels of similar size. Although she had a long and profitable career, the *Ames* was considered an unsuccessful experiment due to early troubles, including the loss of her masts on her maiden voyage—the re-rigging cost nearly $20,000. Perhaps as a consequence, perhaps not, it would be another 10 years after the *Ames* was launched that another five-masted schooner would be built. The *Nathanial T. Palmer*, built at Bath, Maine, was considerably larger than her predecessor at 295 feet in length and 2,244 net tons. Unlike the *Ames*, she lacked the centerboard, and was more full in the ends and as a consequence had a considerably larger carrying capacity.

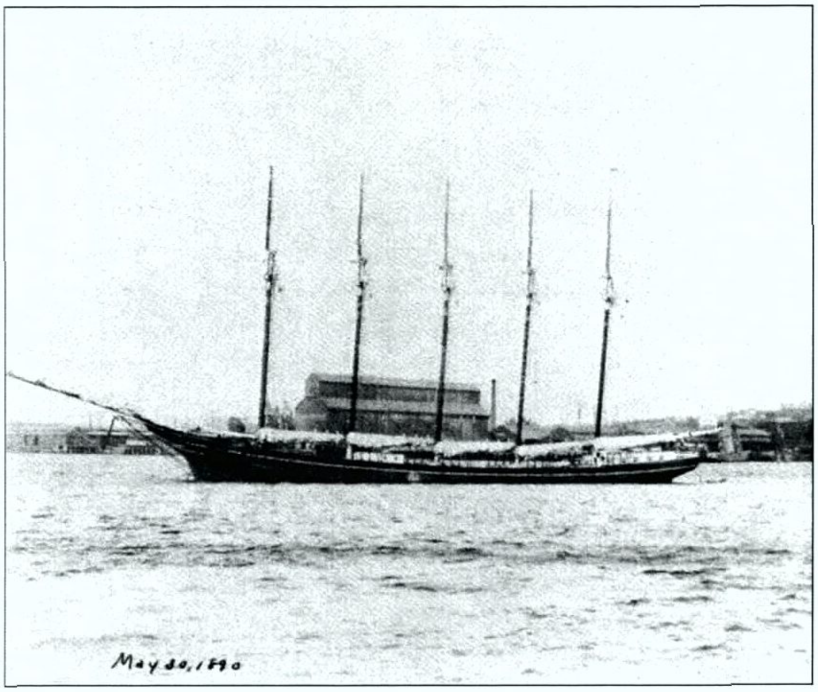


Figure 6-11. Five-masted schooner *Governor Ames*, built in Maine in 1888 (as presented in Albion 1972).

The rapid industrial growth of New England, which drove the construction of larger and larger coasters, continued into the 1890s until 1893, when a worldwide depression, precipitated by the collapse of the Baring Brothers banking empire, spread across the Atlantic. Industrial expansion in the northeast ceased, and more importantly for the coal trade, other factors aligned themselves at the same time to seriously depress the market for bituminous coal. Environmental legislation, passed by Boston lawmakers attempting to curtail the increasing amount of coal smoke in the air, required that at least 75 percent of the smoke emitted be prevented from entering the air. These two factors almost overnight caused a drop in coal shipments to Boston. Shipments of coal received dropped from 1,100,384 tons in 1893 to 958,701 the following year, a drop of 13 percent (Parker 1948:86). With the drop in coal shipments came a corresponding drop in the construction of new vessels, which sent the Maine shipyards into their own economic depression, with production plummeting from 75,000 tons in 1893 to 5,000 in 1897.

Equally remarkable as the drop in industrial output and hence the use of coal, was the rapid rise in use beginning in the last year of the century. At the beginning of the depression, the price of bituminous coal had begun to sink, and by 1895 was cheap enough compared to smokeless anthracite that incentive existed for experimentation with smoke reducing technologies. This coupled with a relaxing of the environmental laws gave the economy the needed impetus. Shipments into Boston increased from 977,762 tons in 1895 to 1,391,949 (Parker 1948:87). The start of the Spanish American War re-launched the Maine shipbuilding economy out of their 8-year depression. In 1898, the first year of the war, 30,000 tons went down the ways, compared to just 5,000 the previous year. The next year, 50,000 tons were completed, with 80 percent coming from yards in Bath.

The six years from 1899 to 1904 saw the greatest production of five-masted schooners in the entire 32 years of their construction, with a total of 37 sliding down the ways. After 1904, only eight were built until 1917. During WWI, an additional 11 were built. It should also be noted that, unlike the three- and four-masted schooners, they did not progressively get bigger throughout their construction history. While they were generally larger than their four-masted brethren, six of the 19 built after 1904, including the *James Pierce* and the *Edna Hoyt* (Figure 6-12), were smaller than the larger four-masters. There was clearly an overlap in the size ranges of these vessels.

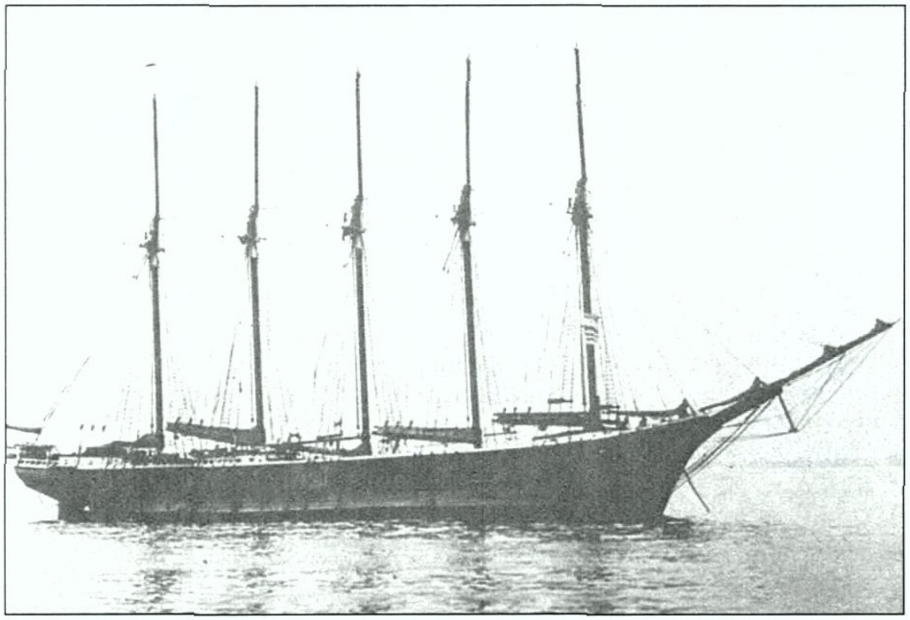


Figure 6-12. Five-masted schooner *Edna Hoyt*, the last five-masted schooner in operation on the east coast (as presented in Morris 1973).

Following these early vessels, five-masters continued to grow in size and tonnage, with the largest being the massive *Jane Palmer*, launched in 1904. At 3,138 gross tons, 2,823 net tons, 308.6 feet in length and 49 feet in the beam, this was a large vessel in absolute terms as well as in comparison to her brethren. The *Palmer* was a successful vessel, with her career stretching over three decades before being abandoned in the Atlantic on December 18, 1920. While she was a successful five-master, she was originally intended to be a six-masted schooner, and would have been the first of her type, but construction was abandoned and another builder finished her later, this time with five masts.

The five-masted schooner represented the maximum size for a wooden sailing vessel. As a result of the competition in the bulk commodities trade, the constant push for larger vessels with greater carrying capacity resulted in the construction of vessels that often could not realize their full potential with respect to carrying capacity and or speed. The larger wooden sailing vessel, lacking any iron component such as cross bracing or framing, has a tendency to hog, or sag at the ends. The length of the hulls of these large vessels, combined with the increased weight of boats and anchors amplified this tendency. Many leaked badly fully loaded under sail. The opinion of many seasoned mariners at the time regarding these large vessels can be summed up by the statement of tug captain Charles A. Drew, "built of hoop poles and caulked with eel grass - limber as a snake."

The great *Jane Palmer* was said to possess this snake-like quality. In heavy weather, the scarphs in her rails would open and close a considerable amount, and her seams below decks had a tendency to do the same. So bad was her leaking that, heavily laden she would have to anchor off Nantucket Shoals to pump out her bilge before attempting to cross. In addition to this looseness of construction, these large vessels would often rest on the bottom at low tide while being loaded and unloaded, thus placing a considerable additional strain on their hulls.

The weakness of these large hulls can be illustrated by the case of the *Samuel J. Goucher*, built in Camden, Maine in 1904. In November of 1911, she became hung up on a ledge of Portsmouth, New Hampshire. It was thought that, although the tide was high, that since the vessel had little to no damage, she could be floated off with relative ease. When the tide dropped, however, the stress on the hull, due to the 4,000 tons of coal in her hold, cause her to break apart.

This instability of the larger hulls was no doubt responsible for the later downsizing of the massive schooners, although they were still large by absolute standards. However, of the 100+ vessels built after 1904, only six of them were less than 230 feet in length. The last five-master, the *Edna M. Hoyt*, was launched in 1920 in Thomaston, Maine, by Dunn and Elliott (Figure 12). At 224 feet in length and 1,512 gross tons, she was smaller than a number of four-masters. Like most other large schooners, she was employed in the coal trade, by Superior Trading and Transportation Company of Boston. When the coastwise coal trade bottomed out in the late 1920s, she was sold and began carrying sheep guano from Venezuela to North America. In 1937, she made a transatlantic voyage to Ireland with a cargo of lumber; on the way back she stopped at Wales for a cargo of coal. While loading, she bottomed out during low tide, not an uncommon occurrence, but one that put a considerable strain on the hull, and she broke several stays. On the return voyage to North America, she hit a gale, which strained her hull further. After battling the storm for 21 days, she was towed into Lisbon, Portugal by the steamer San Amigo, where she was condemned as unseaworthy.

Like any human endeavor, there will always be those who push the envelope. The size of coasting vessels was no exception. In 1899, Captain John G. Crowley, of Taunton, Massachusetts, commissioned the yard of Holly M. Bean in Camden, Maine, to construct the world's first six-masted schooner. The designer, John J. Wardwell, had designed over 150 vessels, of which he personally supervised the construction of 83, and was considered one of the leading designers of schooner hulls. Ready for launching on August 4, 1900, at a total cost of $120,000, she was christened the *George W. Wells*. At the time of her launch she was the biggest sailing vessel in the world, weighing in at 2,970 gross tons and measuring 319.3 feet in length, with a 48.5-foot beam and a 23-foot depth of hold. Her cargo capacity was 5,000 tons of coal. All wood construction, her framing was white oak with pine planking fastened by 1 3/8-inch iron fasteners. Her Oregon pine masts were 177-feet tall, and carried 22 sails totaling 12,000 square yards. She was speedy: Wardwell believed her capable of 12 knots under favorable conditions. Unsubstantiated claims set her speed at times close to 15 knots (Figures 6-13 and 6-14).

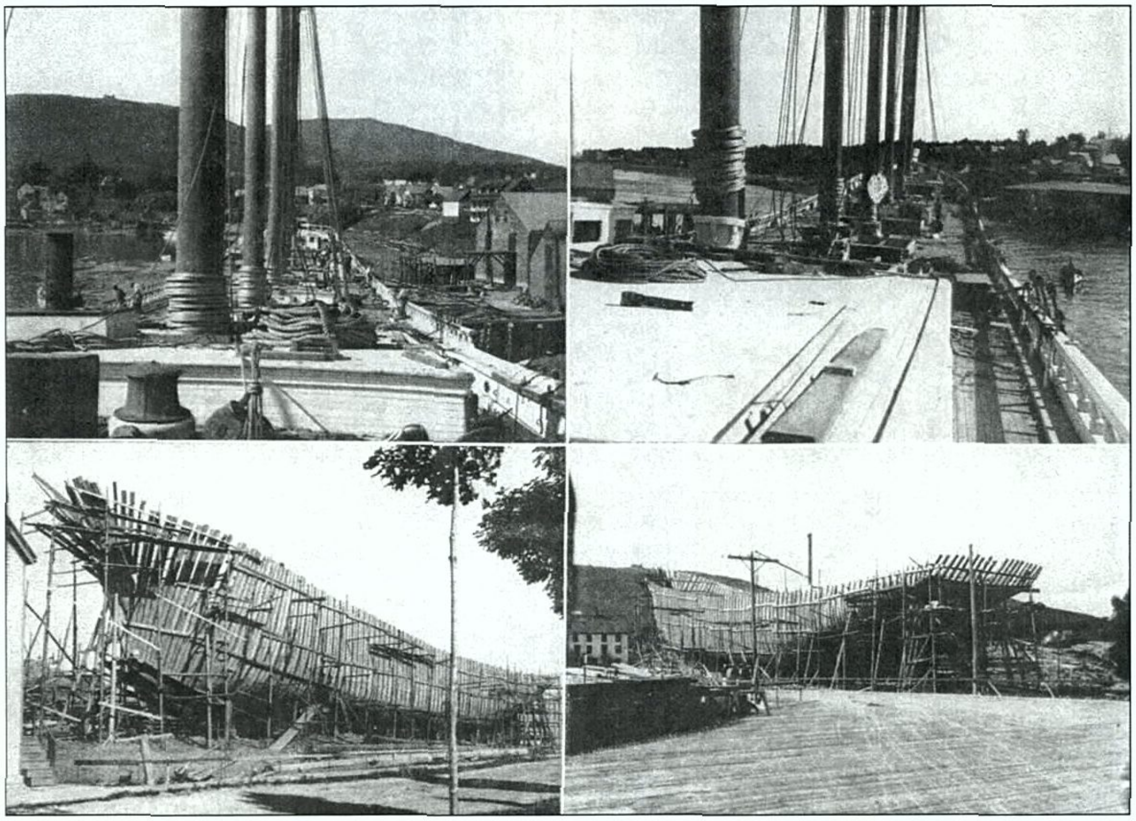


Figure 6-13. Schooner *George W. Wells* (as presented in Parker 1948).

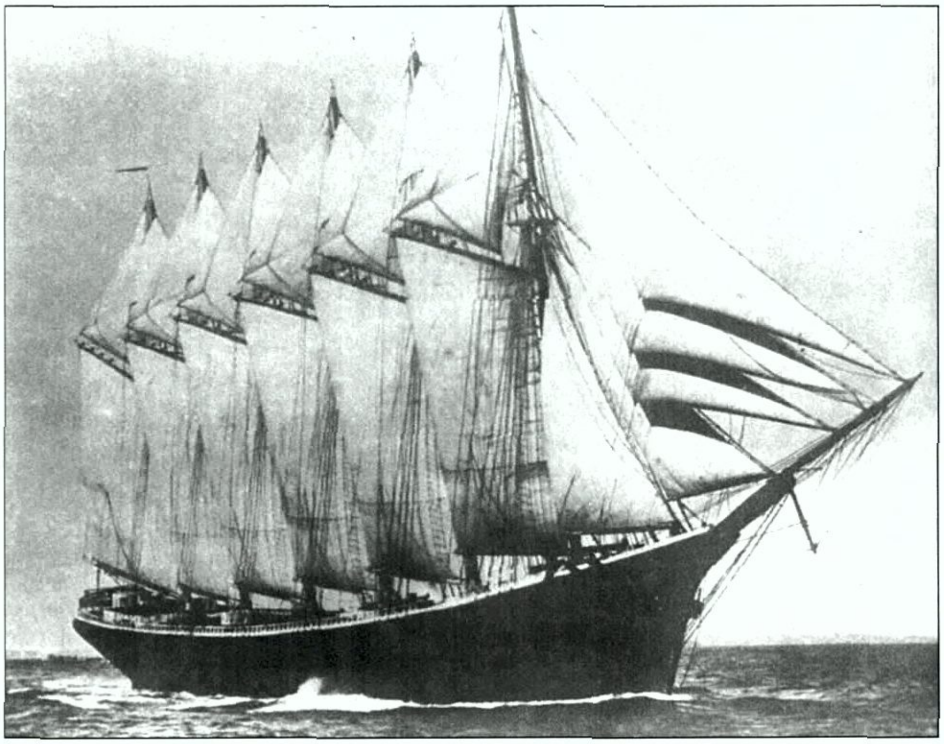


Figure 6-14. Six-masted schooner *George W. Wells*, built in Maine in 1900 (as presented in Gardiner and Greenhill 1993).

The *Wells* had a successful career as a coaster stretching from 1900 to 1913. On September 3, 1913, she became the largest wooden sailing vessel to wreck off North Carolina. After being caught in a storm, she became unmanageable and started taking on water. Drifting with the wind in sinking condition, she struck bottom several hundred yards from the beach in the vicinity of Hatteras Inlet. Sighted by two lifesaving stations, her crew was rescued without loss of life, but the vessel was a total loss.

The second six-masted schooner built was the *Eleanor A. Percy* (Figure 6-15). Larger than the *Wells*, she was launched two months later at the yard of Percy and Small in Bath, Maine. This yard would also launch the largest six-master in terms of tonnage, the *Wyoming*, in 1909. This vessel, the largest wooden hulled ship to carry a cargo, displaced 3,730 gross tons, and 3,036 net tons, was 329.5 feet long, 50.1 feet in the beam, with a 30.4-foot depth of hold. Her largest cargo was 6,004 tons of coal. The vessel was lost off Nantucket in a violent storm in 1924.

A total of 10 six-masted schooners launched between 1902 and 1909, with the largest production being two in 1908. One of these was constructed of steel. Seven of the vessels exceeded 3,000 tons gross displacement, and only two were shorter than 300 feet. The smallest, the *Adieu M. Lawrence*, built by Percy and Small of Bath, was 2,807 gross tons and 292.4 feet in length. Percy and Small would build seven of the 10 large schooners.

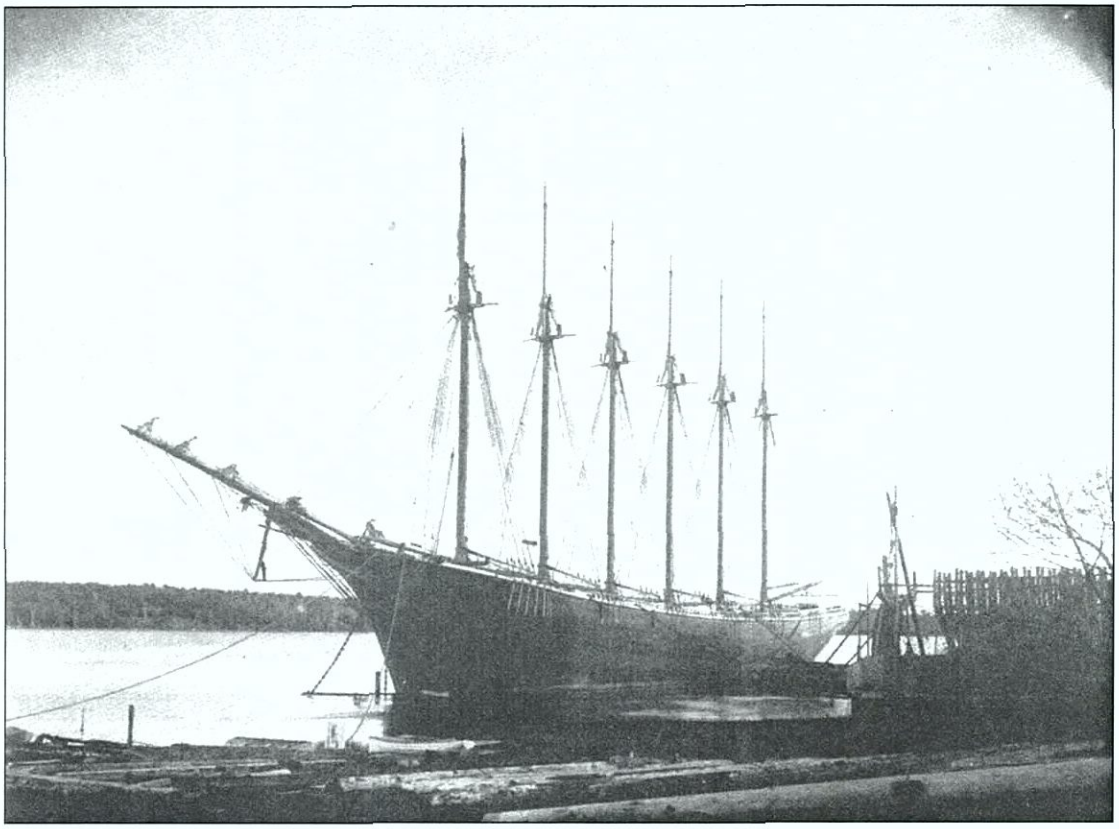


Figure 6-15. Schooner *Eleanor A. Percy*, 3,401 tons, the second six-master built by Percy and Small of Bath (as presented in Parker 1948).

The six-masted schooner in general has a shorter career than any of its smaller predecessors. However, their ability to carry 5,000 to 6,000 tons of coal with a crew of 12 to 14 men plus the captain insured a consistent high return on voyages. However, like the five-masted schooners, the six-masters also suffered from the same problems in terms of hull integrity. Indeed, this may have contributed to the short career of the six-master, with the last one passing from existence in 1925. It also may have contributed to the demise of the *Wyoming*, which broke up off Nantucket in a violent storm (Figure 6-16). Her sinking was occasioned by the storm, but the ultimate cause of her breaking up remains undetermined. In any case, her remains, broken up into many small pieces, were spread over the entire north shore of Nantucket Island.

While the economy of the northeast continued to improve into the early twentieth century, this did not immediately carry over to the shipment of coal. Shortly after the end of the Spanish American War, a major labor strike in the anthracite mines of Pennsylvania caused a reduction in available anthracite coal, normally shipped via railroad. As a result, many consumers made the switch to the less expensive bituminous coal. While this on the outside would appear to be beneficial to the shipping industry, the reality of the situation was that the fleet owners and shipyards over anticipated the demand and produced way too many vessels for the available cargo. By 1904, many of the completed vessels were coming on line, and further depressed the already low shipping rates. Where in the first two years of the twentieth century, the rate was $2.50 per ton; by 1904 this had slid to 65 cents per ton. By 1906, however, things had shaken out in the coastwise industry; older vessels had been retired or sold out of the service, and rates had rebounded. By 1907, the coastwise industry was enjoying its best year ever.

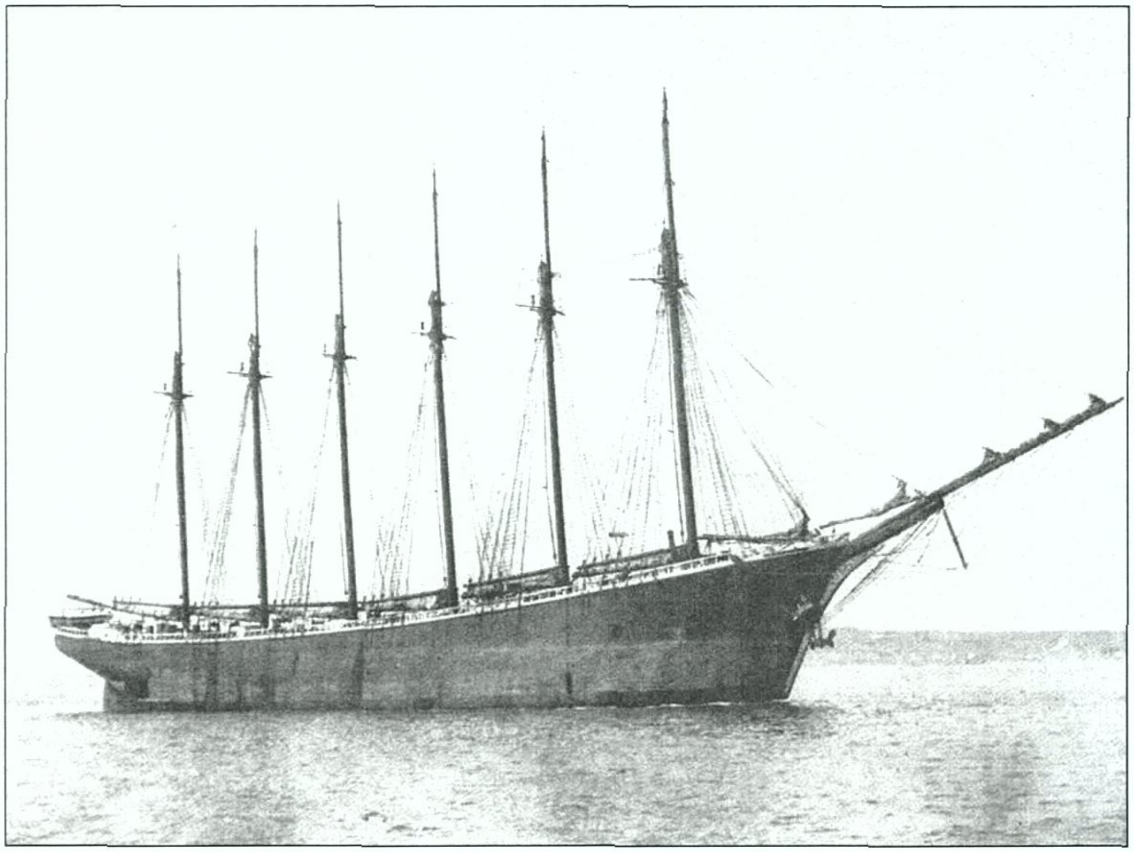


Figure 6-16. Schooner *Wyoming*. The last of the six-masters and the largest, built at Percy and Small in Bath (as presented in Parker 1948).

However, in 1907, steamers began encroaching on the coastwise trade in bituminous coal. According to Parker (1948:92), steamers had been carrying anthracite coal for a number of years. Nevertheless, because anthracite is such an efficient fuel source, and is so dense, the volume required for the same amount of energy is considerably less. Therefore, the smaller and cheaper steamers could carry anthracite for a profit. Between 1869 and 1874, the Reading Railroad Company had built a fleet of 14 iron-screw steam colliers ranging from 417 to 1,283 tons at a total coast of $2,656,510, or $204.75 per registered ton (ibid:93). These 14 small steamers carried the same amount of coal, 450,000 to 500,000 tons annually (Hall 1884:124), as a fleet of 150 to 200 schooners. Evidently the collier fleet was successful, as of 1902 all but one were still in service, although it should be noted that railroad companies are not in the retail coal shipping business. In spite of this, none of the other major railroads built steam colliers, and even Reading after 1874 only built barges. Part of the success, though, can probably be attributed to the fact that Reading also owned its own mines and loading docks, thus creating additional operating efficiency and reducing idle time. By the first decade of the twentieth century, this efficiency had begun to spill over to the much more fragmented bituminous trade as well.

Economic prosperity was again interrupted in 1908 with another depression in the northeast. Production of coal dropped 20 percent in the first eight months of that year. Shipping rates dropped to around 50 cents per ton. Vessels, such as those of the Palmer fleet, routinely had to wait weeks in port to load a cargo. Even so, coal shipments to Boston were at their highest levels ever. Clearly, the existence of steam tugs and schooner barges, which had been increasing in use for a number of years, were beginning to have a lasting effect on the schooner fleets. Beginning in 1907, the first of the modern steam colliers were beginning to be used between Hampton Roads and New England. These vessels could not only carry as much on average, 7,000 tons, as the largest of the large schooners, but their large hatches and open hulls increased loading and unloading efficiency. Indeed, 7,000 tons of coal could be loaded and trimmed into a steamer faster than 5,000 tons could be loaded into a typical large schooner. In addition, a steamer could complete 40-45 round trip voyages per year, as compared to a schooner's eleven. These two factors more than offset the steamer's increased cost per ton, which according to Parker (1948:93) was roughly double that of a sailing vessel.

The main obstacle, it seems, to the wide acceptance of steamers in the carriage of coal was the delay in loading. Steamers, unlike sailing vessels, could not release their much more specialized crewmembers during the sometimes long wait in port for a cargo. This, along with the crew requirement that is double that of a schooner, made this wait very expensive. In 1909, the Virginian Railway opened from Deepwater, West Virginia to Sewall's Point, Virginia. The associated terminals had a capacity of 36,000 tons per day, and greatly eased the sometimes weeks delay in vessel loading. Shortly thereafter, the first sailing company to do so, the Coastwise Transportation Company, contracted with the New York Shipbuilding Company of Camden, New Jersey for the construction of two 8,000-ton steam colliers at a cost of $500,000 each. The shipping firm of Crowell and Thurlow followed suit with its first two steamers in 1912. By 1915 there were 16 steamers in the trade, and few schooners had been built since the *Wyoming* in 1909.

The Thomas W. Lawson

The *Lawson* represents the pinnacle in terms of size of the fore and aft rigged coasting vessels. Built of steel by the Fore River Ship and Engine Company of Quincy, Massachusetts, she was launched in 1902 at a cost of $250,000 (Figure 6-17). Measuring 5,218 gross tons and 4,914 net tons, she was 375 feet long, 50 feet in the beam, and 32.9 feet in depth of hold, with a cargo capacity of 9,000 tons of coal. Considered by Morris (1973:53) to be the first fore-and-aft vessel built of steel in the United States, she was also the first constructed with a double hull. She had up to date machinery for handling sails, cargo, and pumps, including steam powered steering gear and steam heated crew quarters.

Like many of the larger schooners, her sailing qualities left quite a bit to be desired. While her designer claimed she sailed well when loaded, experienced crews found her to be a handful when empty or in light winds. Her high freeboard also made the vessel difficult to handle. In light winds she often had to be "club hauled," a term used to refer to changing tacks through the use of the main anchor, and often refused to come about entirely, forcing her crew to change direction by wearing with the wind and jibing downwind. This combined with her massive draft, nearly 30 feet when fully loaded, along with her reputation for running aground, no doubt contributed to her short career as a sailing coaster. She was converted to an oil tanker in 1906 and spent most of her remaining voyages under tow. Her end came in 1907, when under sail with a cargo of 2,003,063 gallons of oil she ran into a violent winter storm off Newfoundland. After riding out the storm for a number of days, she dropped anchor off Land's End, England. The storm continued to worsen, and both anchor chains parted, sending the *Lawson* onto Hellwether Reef, where she split in two and sank in deep water. Seventeen members of the crew perished, and are interred at St. Ives. The captain and the chief engineer survived.

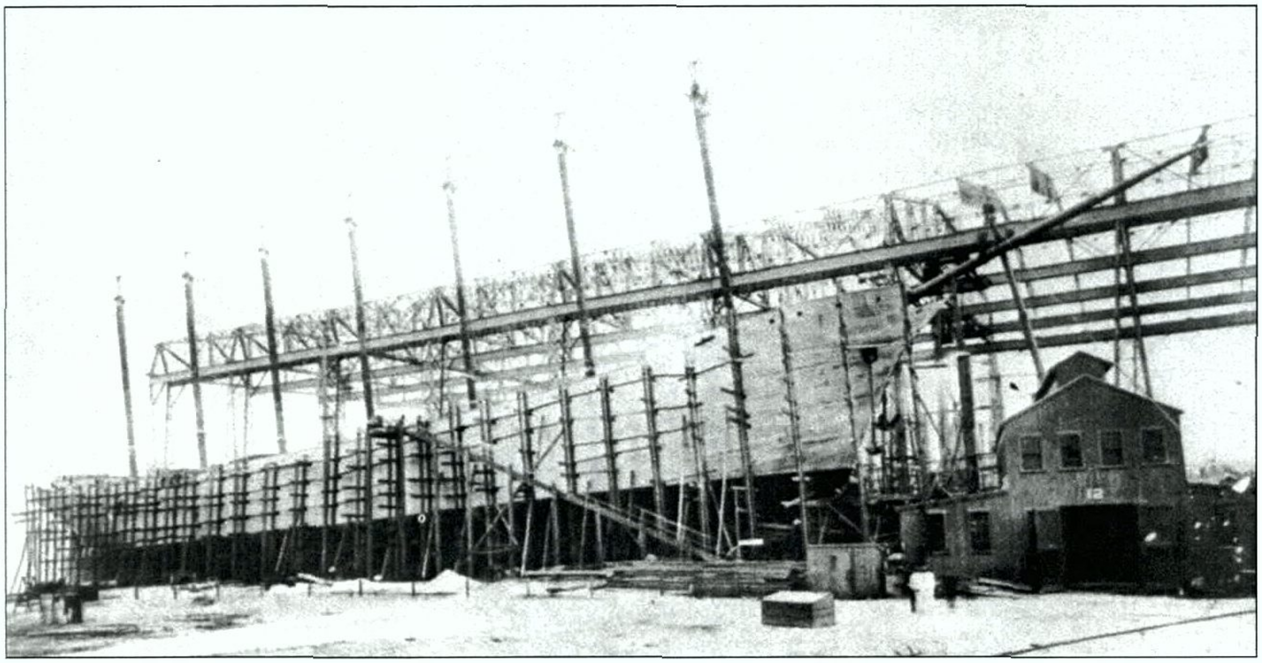


Figure 6-17. Seven-masted schooner *Thomas W. Lawson* on the ways at the Fore River Ship and Engine Company, Quincy, Massachusetts, July 1903 (as presented in Albion 1972).

STEEL VS. WOOD CONSTRUCTION

The shipbuilding tradition in the United States in the nineteenth century strongly favored wood. While European builders were cranking out sailing vessels with iron and steel hulls, the Americans and Canadians continued to build vessels with wooden hulls almost without exception until the end of the sailing era. Most of the exceptions were square-rigged deepwater vessels; there were very few fore-and-aft rigged sailing ships built in the Americas of steel or iron. According to Morris (1973:52), the earliest metal-hulled schooner was the *Josephine*, a three master of 365 gross tons and 129.3 feet in length, launched in 1880 in Philadelphia. The *Red Wing* was a slightly larger three master of 437 tons launched in 1884, while in 1888 a 96-foot schooner called the *Sea Fox* was launched in Wilmington, Delaware. The little sloop *Pioneer*, launched in 1885, can attest to the durability of these iron hulls. Measuring 57 feet in length and 43 gross tons, she was rerigged as a two-masted schooner between 1896 and 1898. Between 1901 and 1905, she was converted to a motorship and remained so until 1968, when she reappeared in the register as a two-masted sailing vessel.

As previously mentioned, there is an upper limit to the size of a wooden vessel. At some point, in order to provide the required longitudinal strength, the scantlings of a wooden vessel must be made so large as to be impractical. One of the largest wooden vessels ever constructed, the *Elizabeth Palmer*, was over 300 feet in length. Her ceiling plank was 13 × 14 inches, and her keelson was built up of 14 × 14-inch timbers. Her hull planking was 6 inches thick. Even with this massive construction, she still suffered from considerable hogging and flexing along her sheer line while underway in heavy seas. While this lack of longitudinal strength was partly due to the large schooner having shallower depth of hold when compared to square-rigged deepwater vessels of similar size, the fact of the matter is a wooden vessel has a practical upper limit in terms of size. Steel technology, which had been used successfully in the construction of deepwater vessels for a number of years, would be an obvious solution to the problem. Indeed, the gigantic *Thomas W. Lawson*, at 375.6 feet long, was constructed entirely of steel (and was, according to Morris [1973: 52] the first purpose built schooner constructed of steel in the United States). Were such a vessel to be constructed of wood, her depth of hold and scantlings would have to be so large as to be completely impractical, else she would no doubt have a very short and unhappy career.

However, of the 450 schooners built on the east coast in the heyday of the coastwise sailing vessel, only seven vessels had steel hulls. There are several reasons for this. Many of those sailing vessels were not of the size where the lack of longitudinal strength was a problem. Even the larger four-masted schooners, on the order of 230 feet in length, did not suffer considerably from it, and measures such as multiple stacked keelsons installed with a rocker or sag of around a foot to compensate for future hogging were employed to offset the problem. Only the largest four-masters and the five- and six-masted schooners had a problem with longitudinal stability, and even so, most of these vessels enjoyed long and profitable careers. Another reason is, although steel enjoyed much better longitudinal strength, steel hulls lacked the stability of wood hulls when empty. Certain measures were taken to offset this tendency, including the use of a double outer hull, which could be filled with water when the vessel was empty in order to increase its stability (Parker 1848:43). The most likely reason for the resistance to steel hulls in coastwise shipping vessels was where the vessels were built. Shipyards in Maine produced the lion's share of coastwise hulls, and the strong shipbuilding tradition in the northeast was one of wood.

THE FINAL YEARS

The launch of the *Lawson*, and several years later the *Wyoming* (1909), represented the last stage of development of the large sailing vessel. It was soon after that barges (a string of which a single tug could operate much more economically than a single schooner under sail), railroads, and in the case of coal, steamers, began to take on the shipment of commodities. While World War I created a temporary revival in the coastwise shipping business, the truth is the industry had been on a continuous downward trajectory since 1909. By the time the WWI demand came into being, many of the experienced wooden shipbuilders were no longer around, and the lack of jobs in the industry had resulted in the next generation turning to something else for their livelihood. When the end came in the early 1920s, it was not only the schooners that suffered, but construction of nearly all wooden merchant vessels, save a few fishing craft, came to a halt. The last five-master was built in 1920, and the final four-master, the *Josiah B. Chase*, slid down the ways in 1921. Arthur Story launched the last three-masted schooner built for the merchant trade in 1929 as the *Adams*, measuring 147.6 feet in length and displacing 370 gross tons. The last sailing coaster built in the U.S. was the small two-masted schooner *Endeavor* at Stonington, Maine in 1938.

While construction of new vessels came to a virtual halt after WWI, existing vessels continued in service when cargoes could be found. When they outlived their usefulness, they were laid up. The era of the sailing coaster lasted until after World War II, although the actual number of schooners to survive the war was quite small.

History of the Shipping Firm of Crowell and Thurlow

The schooner *Paul E. Thurlow* was one of many vessels owned and operated by the shipping firm of Crowell and Thurlow. Organized in 1900, this firm owned and operated upwards of 50 schooners until driven out of business by the Great Depression.

The formation of this company coincided with the rise of the coasting trade. The worldwide depression of the 1880s and 1890s had thinned America's fleet of square-rigged coasting vessels, or "downeasters," as they are often referred. The last of this type built in the U.S. was the *Aryan* in 1893, with many of the others being scrapped or converted to barges. However, during this same time, New England was beginning a massive economic expansion. The expansion required a great amount of fuel, which was supplied through the use of coal. Non-powered sailing vessels were considered the most economical means for transporting the coal from ports south of New England.

Schooners fit the bill nicely because they required smaller crews to operate than the more complex square rigged vessels. Early coasting schooners were two-masted. However, as the demand for coal increased, so did the size of the vessels. In 1879, the steamer *Weybosset* was converted to a four-masted schooner as an experiment, which was successful. The first purposely built four-master was the *William L. White,* built in 1880 by Goss, Sawyer and Packard of Bath. Eight years later, the six-masted schooner *George W. Wells* was built at Camden, Maine. These massive vessels culminated with the nearly 400-foot long seven-masted schooner *Thomas W. Lawson* in 1902. Several well-known fleets were formed at this time, including that of William F. Palmer, consisting of a large number of white five-masted schooners, and that of John G. Crowley, who commissioned the construction of the *Lawson* and the *Wells.*

The shipping firm of Crowell and Thurlow was no exception, and along with coal, the company shipped other bulk cargoes, such as ice and lumber. The firm would ultimately become very successful and would be remembered as one of the largest of its kind and among the last to employ the large sailing vessels. At its height, Crowell and Thurlow would own, control, or otherwise manage 82 vessels.

Enter Peter H. Crowell

The company's roots began in 1837 with the birth of Peter H. Crowell in West Dennis, Massachusetts, as the eldest son of Captain Peter Crowell and his wife Reliance (Figure 6-18). Peter first went to sea at the age of 13 as a cabin boy on his father's coasting vessel *The Empire.* He served with his father for a year, after which he found employment on several other vessels before becoming a first mate at the age of 17. In 1860, at the age of 23, he purchased his first vessel in partnership with a relative. The 46-foot fishing schooner *P & B Crowell* was built to his specifications by C.B. Harrington at Bath, Maine. After fishing on Cape Cod for a year, the *Crowell* was sold, and he bought a share in the two-masted schooner *Frank Herbert,* which began his career in the coasting trade (Figure 6-19).

Captain Crowell's third vessel, the 650-ton *Belle Crowell,* was a 127-foot three-masted centerboard schooner built by Colcord, Berry and Company of Stockton, Maine (Figure 6-20). Most shares of the vessel, which Crowell commanded for two years, were owned by the builders. The vessel was lost in 1876 after striking a ledge off Moosabec, Maine, though apparently not while under the command of Crowell.

In 1872, Captain Crowell's next vessel, the *Hattie G. Dow,* was built by Campbell and Brooks of East Boston. Built of white oak framing and southern pine planking, the vessel was 130-feet long at the keel (137-feet long overall), with a 34-foot beam and 16-foot depth of hold (Yarmouth Register 1872, as presented in Morris 2002). The vessel was owned by Kilham, Loud and

Company, who served as brokers, and by Crowell, with a 6/64 share, along with a number of other people. He retained this interest well into the 1870s, but he also began to enlarge his merchant fleet holdings. In 1873, the three-masted centerboard schooner *Peter H. Crowell* was launched from the Campbell and Brooks yard in East Boston (Figure 6-21). This fast schooner was nearly 100 tons larger than the *Belle Crowell* and was owned primarily by Crowell and his brother-in-law, Captain Van Buren Chase. This vessel would continue in the Crowell fleet until November 1893, when she was lost off Bodie Island, North Carolina, in stormy weather while en route from Charleston to Bremen with a load of coal. In 1874, he added partial ownership of the 655-ton three-master *Henry Lippitt*, built by N.P. Kean in Duxbury, Massachusetts. This vessel, commanded by Otis D. Chase, was the first vessel owned by Crowell that he did not command at some time. While a profitable vessel, the *Lippitt* still had difficulties, running ashore on Smith Point in Chesapeake Bay during 1886 while carrying a cargo of ice from Bangor to Baltimore. The crew, led by Captain Benjamin Howes, remained on the vessel, and with the assistance of the Cook Wrecking Company of Provincetown, she was refloated. She eventually was sunk after a collision with the schooner *Red Wing* in Hampton Roads, Virginia, on October 9, 1894.

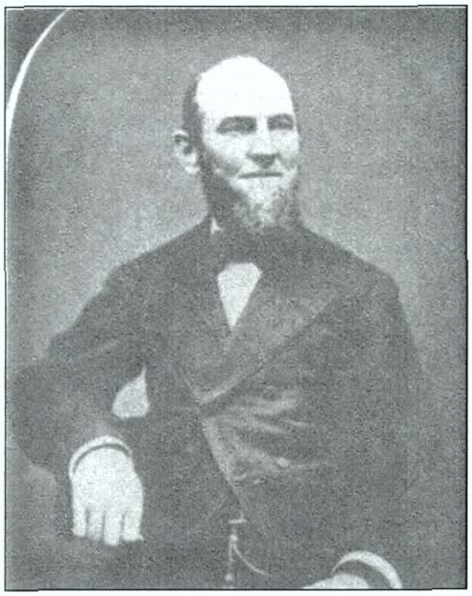


Figure 6-18. Peter H. Crowell, ca. 1887 (as presented in Morris 2002).

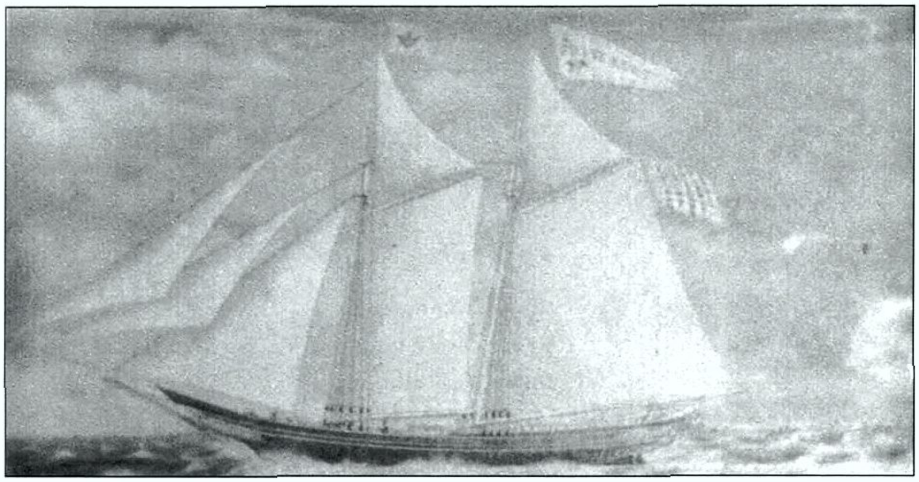


Figure 6-19. Crowell's second vessel, two-masted schooner *Frank Herbert* (as presented in Morris 2002).

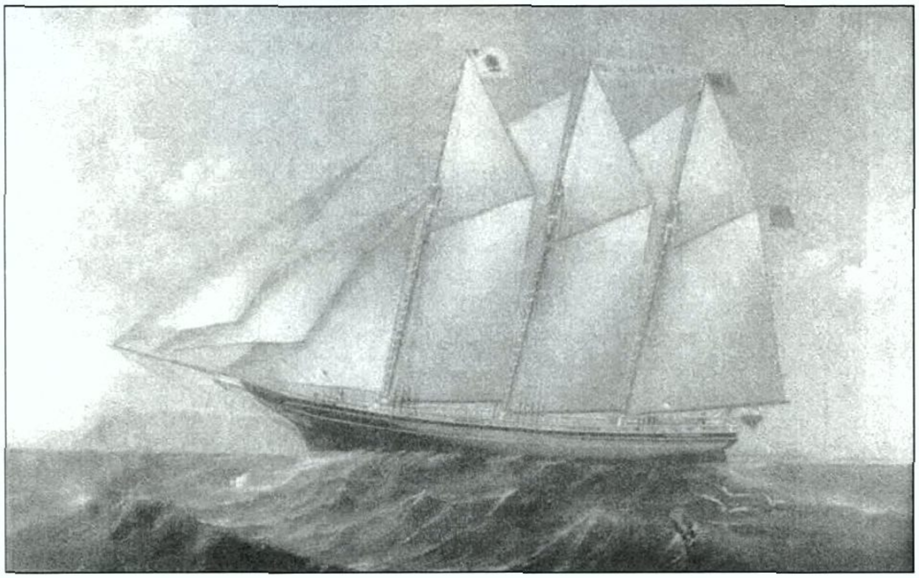


Figure 6-20. Crowell's third vessel, three-masted schooner *Belle Crowell* (as presented in Morris 2002).

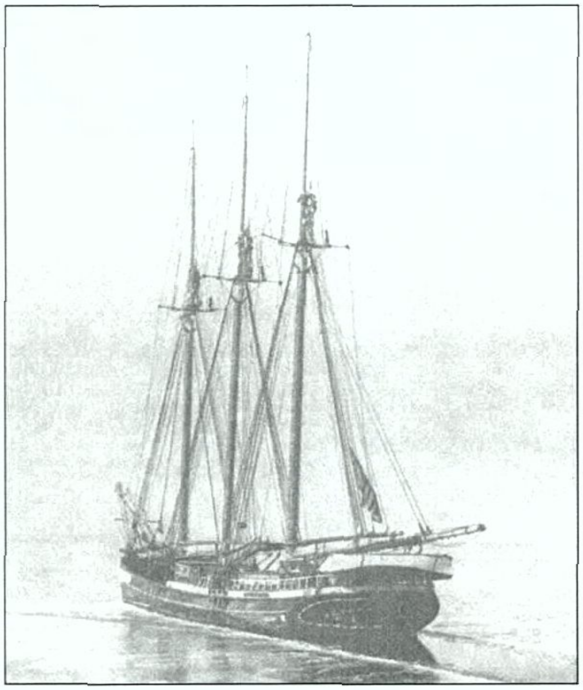


Figure 6-21. Three-masted centerboard schooner *Peter H. Crowell* (as presented in Morris 2002).

In 1880, 1881, and 1882, Crowell sailed as master of the *Jeanie Lippitt* (Figure 6-22). This three-masted schooner, named after the daughter of the Governor of Rhode Island, was built at the yard of John M. Brooks of East Boston. She was owned by Crowell along with a number of other people, including Cyrus Loothrop and Governor Lippitt. Built of white oak from New Hampshire with planking of yellow pine, she was 150-feet long at the keel with a 36-foot beam, and included a steam windlass for hoisting sails. He returned as master of the *Lippitt* in 1884 after two years in command of the *Robert Graham Dunn,* built in 1881 by Goss, Sawyer and Packard of Bath, Maine (Figure 6-23). This was to be his last sailing command, as he retired from the sea in 1887.

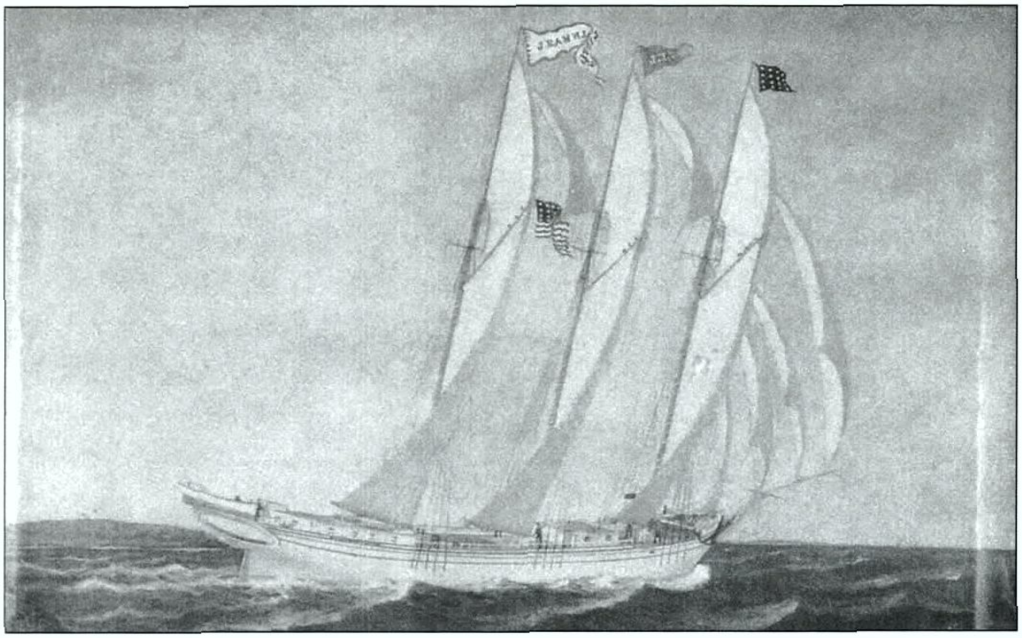


Figure 6-22. Three-masted schooner *Jeanie Lippitt*, of which Crowell was master from 1884 until 1887, when he retired from active seafaring (as presented in Morris 2002).

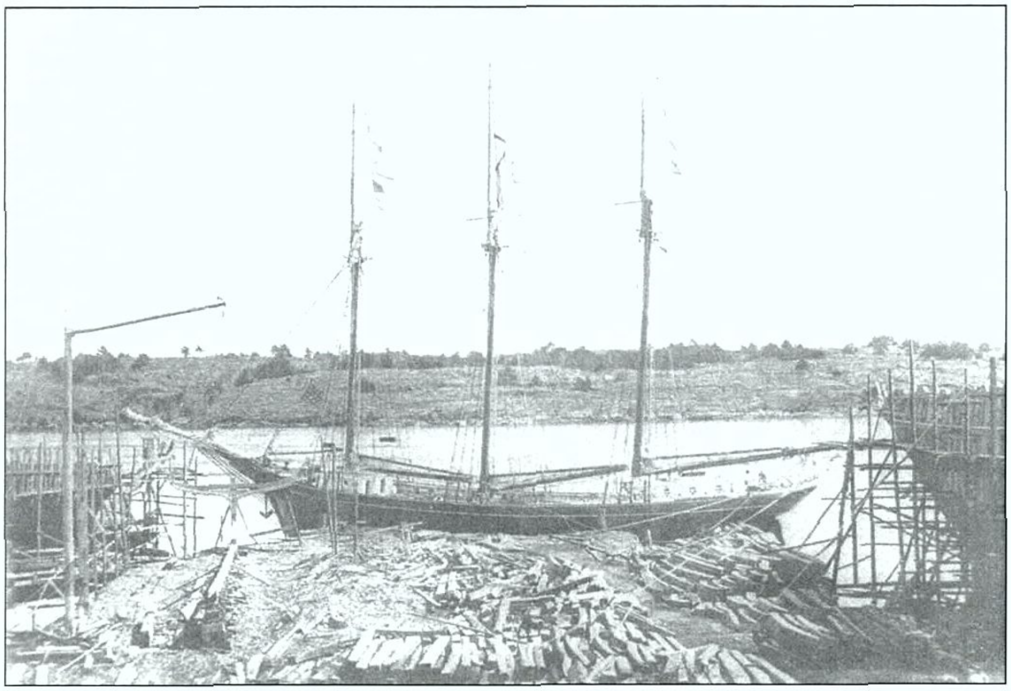


Figure 6-23. Schooner *Robert Graham Dunn*, built in 1881 and Crowell's last command before retiring from the sea in 1887 (as presented in Morris 2002).

It was about this time that he bought shares in his first four-masted schooner. The *W.H. Fredson* was converted to a schooner from the Russian bark *Vesta*. Built in Jacobstad, Russia in 1866, the *Vesta* was an old vessel, but one that appeared to be a bargain to the thrifty New Englander. She was not to be in service long after her conversion, however, as on May 4, 1890, while under the command of Captain D.H. Nickerson, she ran aground in foul weather off Southwest Point on her way from Baltimore with a cargo of coal. Although the vessel was a total loss, the entire crew of eight was rescued by a lifesaving crew from the Block Island Station, and salvors managed to recover part of the cargo.

Although retired from active sea life, Peter Crowell continued to build his merchant fleet. In 1888, he purchased an interest in the *Puritan*. Built by Campbell and Brooks of East Boston as the barkentine *Charles L. Pearson*, the vessel was re-rigged in 1886 as a three-masted schooner. She continued under Crowell's management until December 1886, when she was stranded off Scituate, Massachusetts. She was carrying a load of empty syrup barrels when she ran ashore during heavy winter weather. Much of the cargo plus some rigging elements were salvaged.

In 1889, Crowell acquired an interest in the three-masted schooner *Jacob M. Haskell* (Figure 6-24). A swift sailer, this vessel was often referred to as the *Flying Haskell*—she set the transatlantic record in 1874, the year of her launching, by sailing from Boston to London in 17 days. Her career before Crowell included many transatlantic trips, including 16 to the Mediterranean, as well as trips to South America. In the fall of 1889, she ran into foul weather while carrying lumber from Savannah to New York and was abandoned. She was towed back to Boston after drifting for five months and sold at auction, where she was purchased by Crowell. He had her refitted in Bath, Maine before putting her back into service. While carrying a cargo of coal, the schooner went ashore off Sagua de Grande, Cuba in November 1898, with the cause being blamed on the lack of channel buoys, which had been removed during the Spanish American War and not replaced.

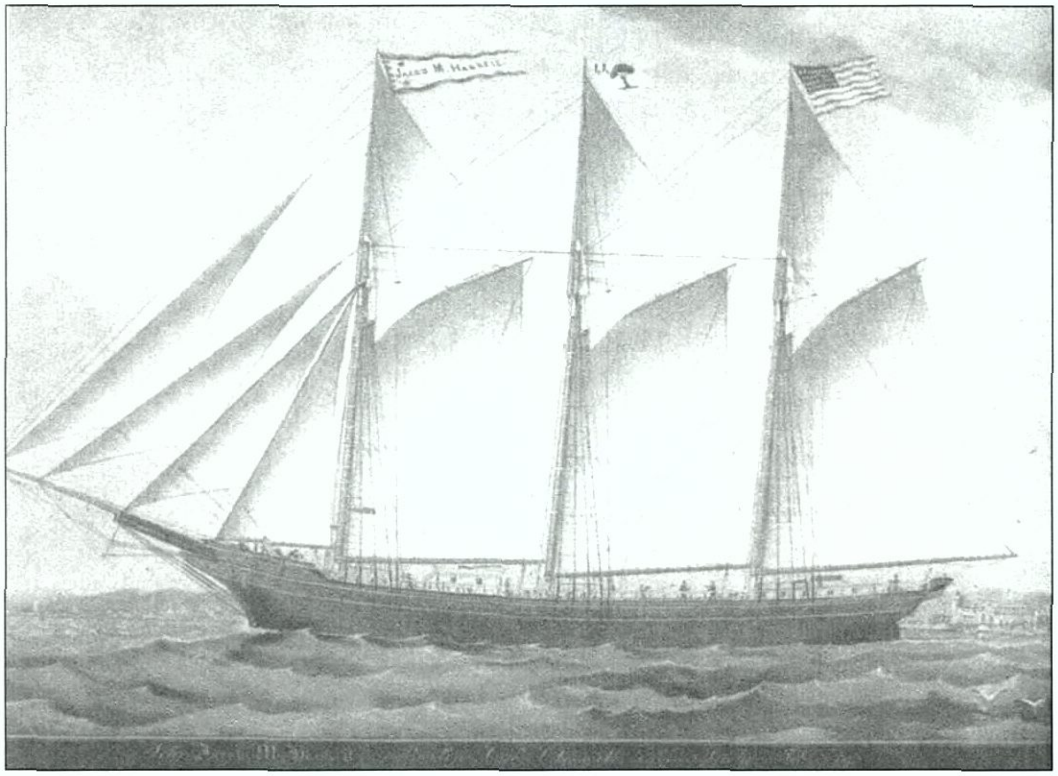


Figure 6-24. Swift three-master *Jacob M. Haskell*, acquired by Crowell in 1889 (as presented in Morris 2002).

Shortly after the loss of the *Haskell*, Peter Crowell acquired ownership of the four-masted schooner *Wesley M. Oler*, his second of that type (Figure 6-25). Built in Bath, with oak framing and yellow pine planking, she was 191 feet in length and 1,091 gross tons. She was capable of spreading 5,500 yards of sail (Yarmouth Register 1891, as presented in Morris 2002).

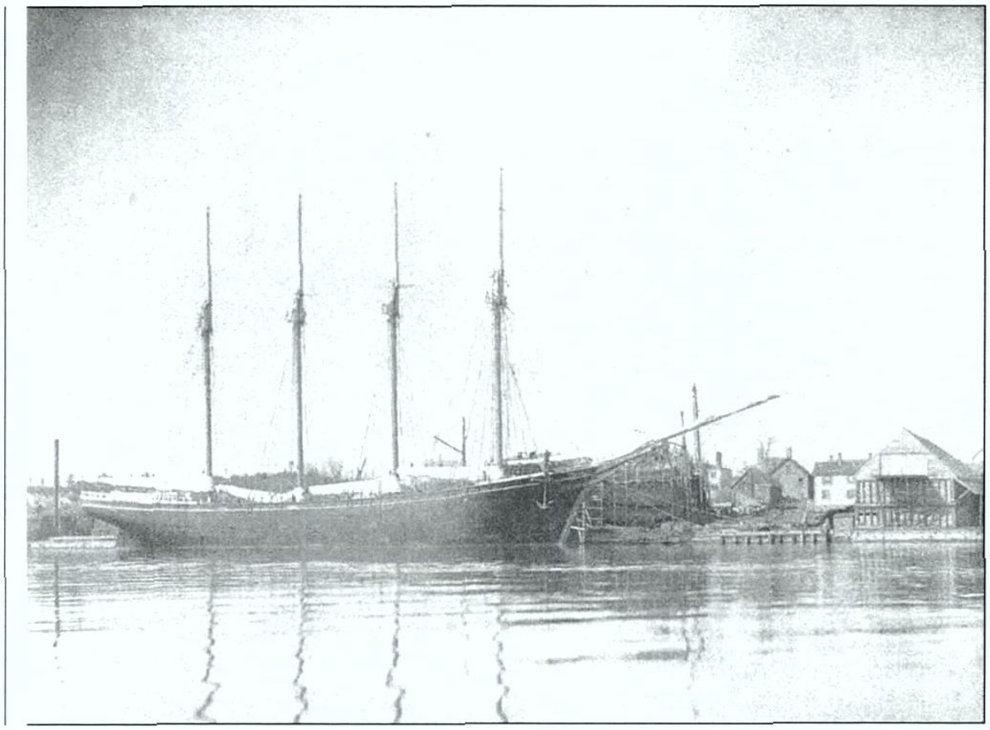


Figure 6-25. :rowell's second four-masted schooner, *Wesley M. Oler*, acquired after the loss of the *Haskell* (as pre: nted in Morris 2002).

LEWIS K. THURLOW

By 1897, (·owell was becoming a successful businessman, and moved his business office from West Denr ; to Boston. It was approximately this same time that his daughter Grace Belle talked him into t; .ing on a young man by the name of Lewis Kalmonde Thurlow as a junior partner (Figure 6-: ›). Mr. Thurlow was born in 1867 in Cutler, Maine. He graduated from Washington Academy i 1887 at the age of 19. It was not long after that he married Ella Louise Pierce. His early caree was spent teaching school, though this did not last terribly long, and he soon found himself en ›loyed in the shipping business by the firm of John S. Emery and Company, which controlled ıe interests of some 40 sailing vessels.

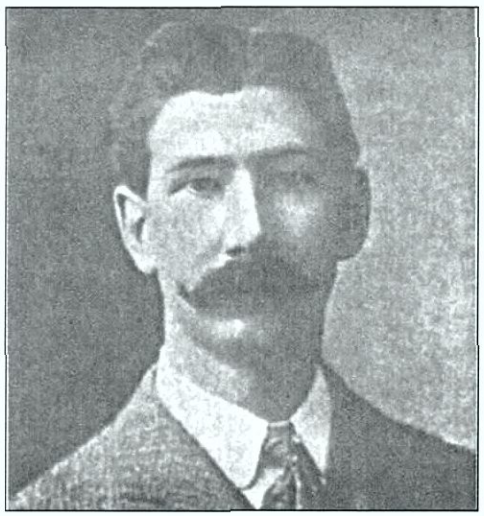


Figure 6-26. .ewis Kalmonde Thurlow, circa 1900 (as presented in Morris 2002).

BEGINNINGS OF THE SHIPPING FIRM OF CROWELL AND THURLOW

The firm of Crowell and Thurlow was organized in 1900. By 1901, the firm was listed in the Record of American and Foreign Shipping as managing owners of eight vessels, including the barkentine *Elmiranda,* three-masted schooners *Jeanie Lippitt*, *Malden* (ex *Frank Vanderherchen)*, *Maplewood*, *Robert Graham Dunn*, and *St. Thomas*, along with four-masted schooners *Wesley M. Oler* and *Star of the Sea.*

Star of the Sea began her career as the *Katie J. Barrett*. On February 16, 1890, while bound for Philadelphia from Boothbay, Maine with a cargo of ice, she ran aground New Nauset Inlet on Cape Cod. The lifesaving crew from Nauset Station rescued all nine of the crew. She was given up as a total loss and abandoned to the elements. However, after seven months of pounding from storms and heavy seas, she was refloated, and in spite of being badly hogged and dismasted, was towed to Boston, refitted, and renamed *Star of the Sea.* Subsequently, she was owned and operated by William F. Green before she was purchased by Crowell and Thurlow in 1901.

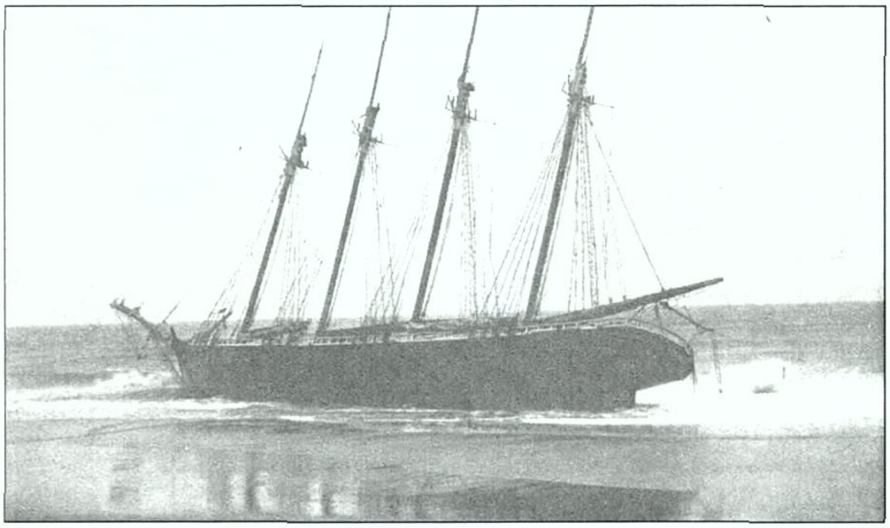


Figure 6-27. Schooner *Katie J. Barrett*, following her stranding on Cape Cod in 1890 (as presented in Morris 2002).

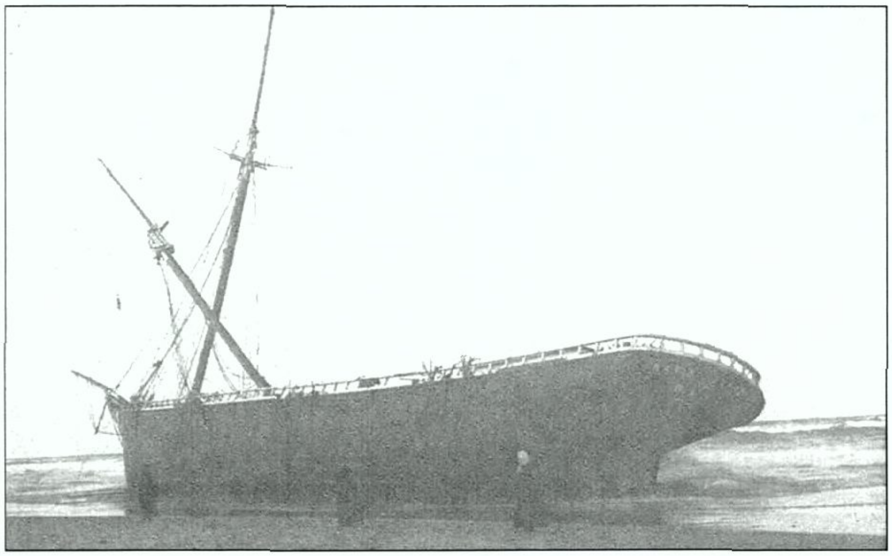


Figure 6-28. *Katie J. Barrett* seven months later, immediately preceding her salvage and repair. She was renamed Star of the Sea and added to the Crowell and Thurlow fleet (as presented in Morris 2002).

The two three-masted schooners would not remain with the company past 1901. The *Maplewood*, built in 1883 by J.M. Brooks of East Boston, was abandoned off Block Island on November 11, 1900, while the *St. Thomas*, built in Phippsburg, Maine, in 1885 by C.V. Minot, was stranded on Mutton Shoals Rip of Nantucket on September 13, 1901. Likewise, the four-master *Wesley M. Oler* was stranded off Cape Hatteras on December 5, 1902.

Expansion Years

The firm began its rapid expansion almost immediately. In 1901, the shipyard of Cobb, Butler and Company would build the first of many vessels for Crowell and Thurlow. The four-master *Jacob M. Haskell*, the second of that name controlled by Peter Crowell, was launched on August 3 (Figure 6-29). The new vessel, larger than her predecessor at 1,778 gross tons, was a fast sailer like the *Flying Haskell,* making numerous runs from the Chesapeake Bay area to New England beginning early in her career (Figure 6-30). In 1902, the firm added several more vessels, including the three-masted *W.H. Oler*, whose name was changed to *Melrose* to avoid confusion with the *Wesley M. Oler*. The four-masted *Samuel W. Hathaway* was launched in Brewer, Maine, in 1902, as well. In 1903, the three-master *Annie L. Henderson,* built in 1880 by H.M. Bean of Camden, Maine, was purchased from the international shipping firm of A.H. Bull and Company, of New York. Crowell and Thurlow also bought the largest three-masted schooner ever built, the *Bradford C. French*. She was launched in 1884 at Kennebunkport, Maine, by David Clark, and initially owned by coal merchant J.B. Phillips of Taunton, Massachusetts. With a gross tonnage of 968, she was 184 feet in length, 37 feet in breadth, and 9 feet in depth of hold. She was lost off South Pass, Mississippi on July 5, 1916, after 24 years of service with Crowell and Thurlow. They again commissioned Cobb, Butler and Company, this time to build the four-masted schooner *Robert H. McCurdy*. This vessel, 178 feet in length, 37 feet in breadth, and with a gross tonnage of 735, was employed by the company until 1918, when she was taken over by the U.S. Navy for use as a U-boat "mystery ship." She eventually was lost at sea on December 19, 1920 under the ownership of the Ramsay Navigation Corporation of New York.

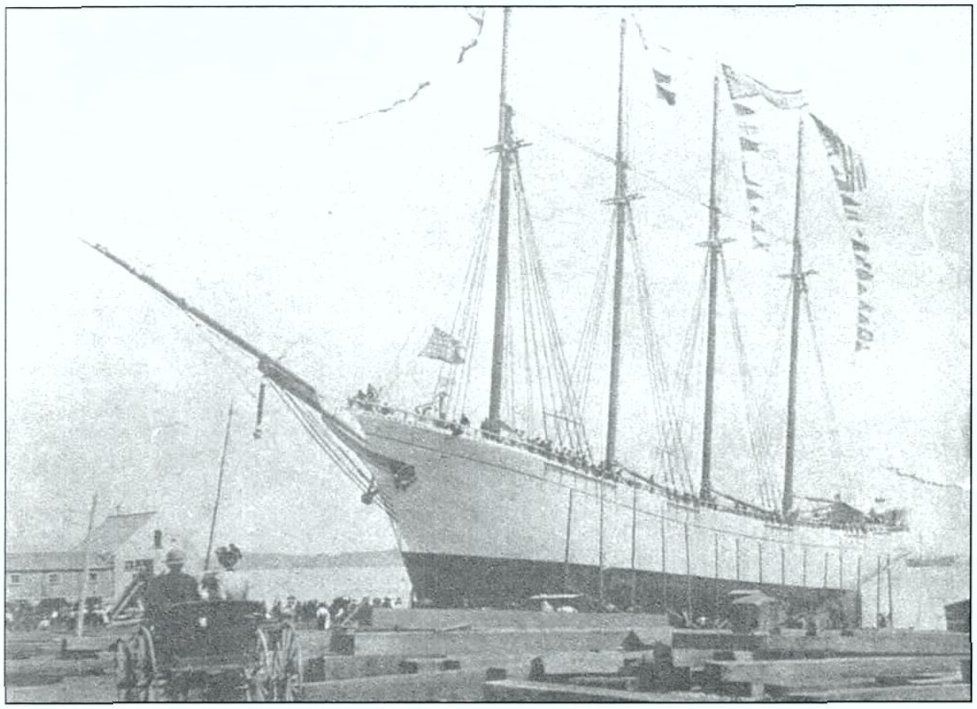


Figure 6-29. The four-masted schooner *Jacob M. Haskell*, built in 1901, was the first vessel built for Crowell and Thurlow by the yard of Cobb, Butler and Company (as presented in Morris 2002).

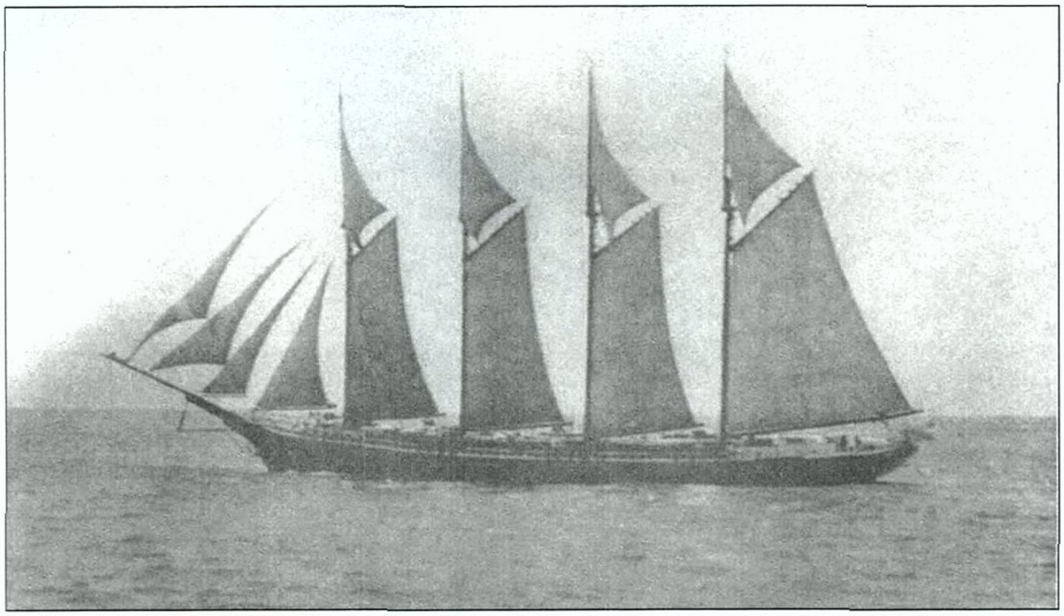


Figure 6-30. ***Jacob M. Haskell*** **under sail with a load of lumber (as presented in Morris 2002).**

The following year, in 1904, the four-master *Edward H. Cole* was added to the company's expanding fleet. Built at the yards of Cobb, Butler and Company, the vessel was named for a partner in the brass manufacturer of Eaton, Cole and Burnham. At 228 feet in length, 43 feet in the beam, and 1,791 gross tons, the *Cole* was a member of the largest class of four-masted schooners. She was sunk by the German submarine *U-151* southeast of Barnegat Light with a crew of 12. The Germans removed the crew and placed explosives on the hull. The year 1904 also saw the construction of the *Governor Powers*, the third largest four-master built at that time, at 1,962 gross tons and 237 feet in length, again at the yard of Cobb and Butler. The vessel became a total loss in 1918 after she was rammed by the steamer *San Jose* near Half Moon Shoal in Nantucket Sound. She was towed—still afloat—to shallow water, but was considered a total loss. 1904 saw the loss of the company's only barkentine, *Elmiranda*, when she was abandoned at sea. The vessel had been acquired by the company in 1900 from J.M. Phillips, who had purchased her from the builder, N.B. Mansfield of Stockton, Maine. Originally rigged as a bark, her rig was converted to a barkentine in 1894.

The four-masted schooner *Auburn* was launched in February 1906, at the yard of Frank S. Bowker of Kennebec, Maine. This was the first four-master built by Bowker, who shared ownership with Peter Crowell with a one-quarter interest. The *Auburn*, although small for a four-master at 633 gross tons and 171 feet in length, proved to be a very fast vessel. Under the command of Captain Thomas J. Ginn, she made several swift trips along the coast, including five days from Jupiter, Florida to New York with a load of lumber. During her first year of service she exceeded 12 knots average speed, and often passed four- and five-masted vessels twice her tonnage and even the occasional steamer (Morris 2002:27). Captain Ginn left command of the *Auburn* in 1908 to supervise the construction of another four-master at Cobb and Butler called the *Lewiston*. *Auburn*'s service with the company came to a tragic end in 1909, when she left Jacksonville, Florida on December 23 with a load of lumber for Philadelphia. It was assumed she was lost in one of a series of storms that hit the east coast in January 1910, but she was never heard from again. Another tragedy befell the company in 1906, when the *Annie L. Henderson* (Figure 6-31) caught fire while unloading a cargo of coal at the dock in Bangor, Maine. The blaze quickly got out of control, and the vessel was towed to the middle of the Penobscot River so the blaze would not spread to the surrounding vessels and structures. She burned to the waterline and sank.

Figure 6-31. ***Annie L. Henderson*** **(as presented in Morris 2002).**

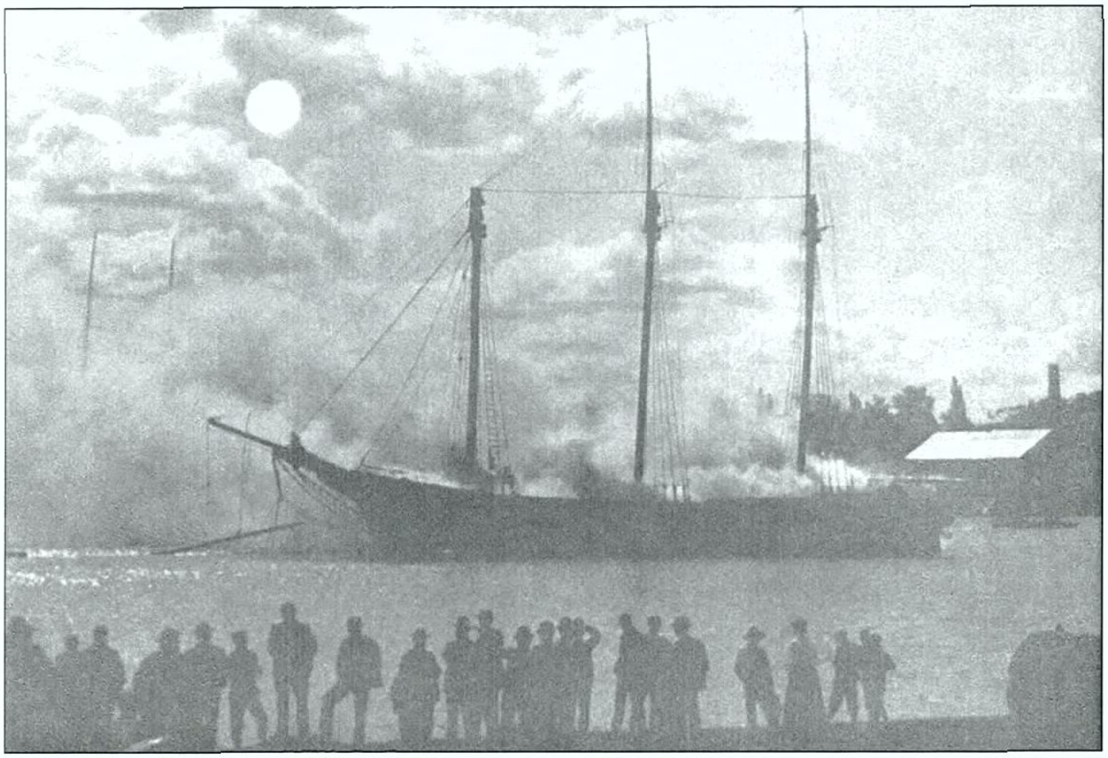


Figure 6-32. ***Annie L. Henderson*** **on fire in Bangor Harbor (as presented in Morris 2002).**

Over the next two years, 1907 and 1908, the company added several new vessels to their fleet, including the three-master *Fred A. Small,* a 142-foot long, 619-ton vessel built in 1886 and originally owned by John Ingler, and captained under Crowell and Thurlow by F.P. Hardy. She was lost on March 12, 1909 after stranding on Nantucket Shoals; the crew of nine was saved. Another three-master, the *H.E. Thompson*, 683 gross tons and 153 feet in length by 32.5 feet in breadth, built by John Shaw of Machias, Maine and acquired from C.H. Thompson in 1907, was lost a year later on April 8, on Anegada Island in the British West Indies. They also acquired their second square-rigged vessel, the 932-gross ton *Onaway,* a 173-foot long bark-rigged sailer built by Loring Chadsey & Company of Yarmouth, Maine, in 1883. Originally owned by Ben Webster of Portland, she was sold to W.S. Jordon Company of Portland in 1903 before being acquired by Crowell and Thurlow. She was eventually sold to Portuguese interests on December 14, 1916.

Crowell and Thurlow also acquired the four-master *Horace A. Stone*, at 1,376 gross tons, 208.5 feet long, and 38.6 feet in breadth, in 1907. Built in 1903 by E. & I.K. Stetson of Brewer, Maine, and owned by said builder until her sale to Crowell and Thurlow, this vessel remained with the company for a considerable amount of time, with ownership transferring to Lewis Thurlow after the death of Peter Crowell. She was eventually sold on February 3, 1930 at a U.S. Marshall's sale at Boothbay Harbor, Maine, to A.W. Hanlon of Boston. The vessel apparently changed hands again that same year, on October 4, at a sum of $2,500 for conversion to a restaurant. The vessel sat idle in East Boston for five years, at which time she deteriorated considerably and sank at her moorings. The hulk was removed and sunk some 10 miles offshore east of Graves Lighthouse on June 3, 1940.

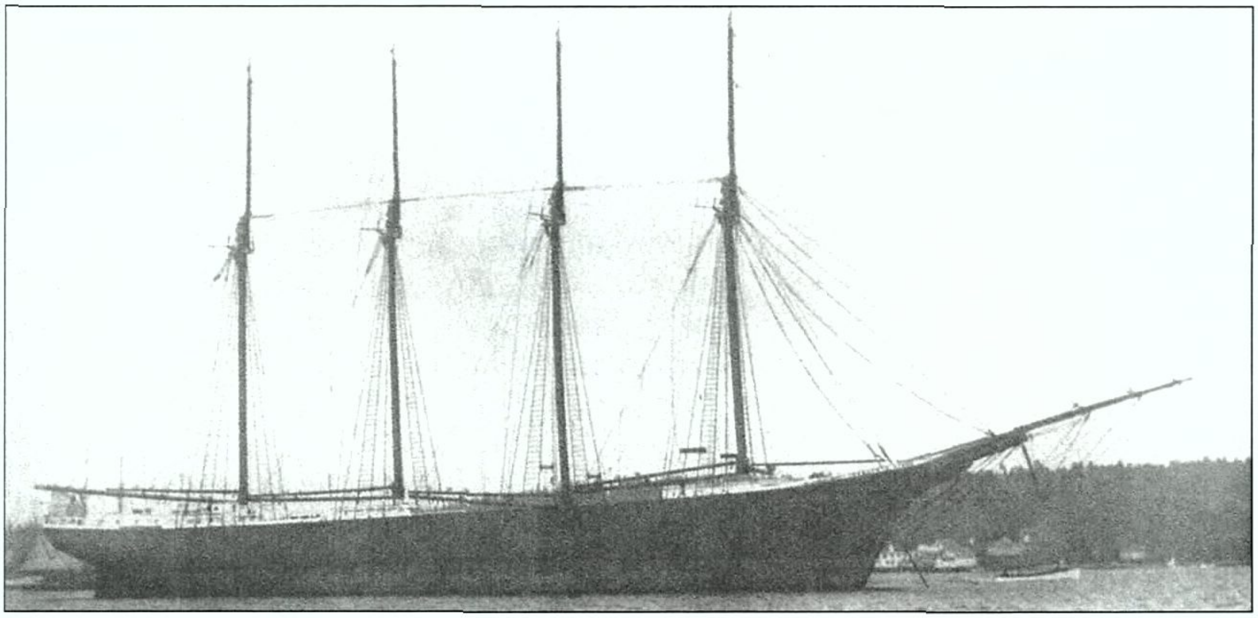


Figure 6-33. *Horace H. Stone*, built by E. & I. K. Stetson of Brewer, Maine, and sold to Crowell and Thurlow in 1907 (as presented in Morris 2002).

In 1908, the company began to see the effects of the declining role of sailing vessels in the coastal trade. Many owners were having difficulty finding cargoes for their fleets, and shipbuilding in Maine was almost at a standstill. Only nine vessels were launched at Bath in 1908 and 1909. In addition, Crowell and Thurlow experienced several tragic losses from their fleet, the worst of which was the *Jeanie Lippitt,* which ran aground at Winter Quarter Shoals, Virginia, with the loss of seven of her eight crewmembers, including Captain E.J. Robinson. This was a particularly violent grounding, as the vessel ran into an intense gale off Cape Charles en route from Jacksonville to New York with a cargo of lumber. After taking on a considerable amount of water, she ran aground on a shoal and quickly went to pieces. The captain and five of her crew were washed overboard and lost, while others died of exposure. The sole survivor, a sailor named Jorgenson, was rescued by the steamship *Ravenscraig* (*New York Times*, December 25, 1908, as presented in Morris 2002).

Also lost that year were the *Melrose,* north of Cape Lookout, North Carolina, on February 14; and the *H.E. Thompson*, in the B.W.I. The *Fred A. Small* also became a total loss on Nantucket Shoals, although the entire crew was rescued.

In spite of this slate of losses, the company continued to add vessels. In 1909, they acquired the three-master *John R. Fell.* This vessel, 131 feet in length with a 34-foot beam and a gross tonnage of 354, was built by William Rogers at Bath, Maine in 1880. She was originally owned and operated by J. Middleton of Philadelphia before being sold to John R. Fell, also of Philadelphia. This vessel, with a crew of six, went missing while returning to Bowdoinham, Maine from Venezuela. That same year, Crowell and Thurlow bought the four-master *Augustus H. Babcock*, a 1,589-ton vessel 216 feet in length and 41 feet wide, built in 1904 at the yard of E. & I.K. Stetson of Brewer, Maine (Figure 6-34). The vessel was operated by the company until January 20, 1919 when the cargo of gasoline she was carrying from New York to the Canary Island, exploded (Figure 6-35). Seven of the crew of 10, including Captain John B. Rawding and Mate Albert T. Black, were lost. A Chinese freighter saved the remaining crewmembers.

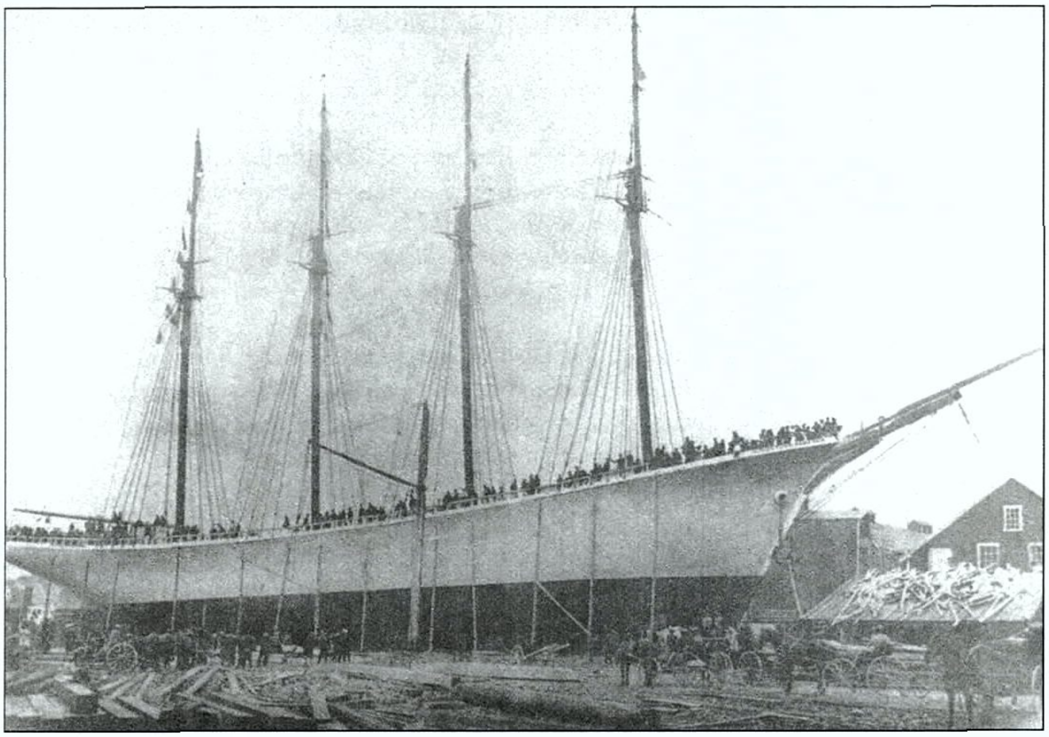


Figure 6-34. ***Augustus H. Babcock*, also built by Stetson, in 1904, was bought by Crowell and Thurlow in 1909 and owned for 10 years (as presented in Morris 2002).**

In 1910, the company acquired the four-master *Horatio G. Foss*, built in 1908 by J.I. Mills of Camden, New Jersey, as well as the *R.W. Hopkins*, a four-master built in 1896 by E.P. Washburn of Thomaston, Maine. The 935-ton vessel was presumed lost with all hands, including Captain Sidney A. Ellis, while on a voyage from Baltimore, Maryland to San Juan, Puerto Rico in the so-called Bermuda Triangle.

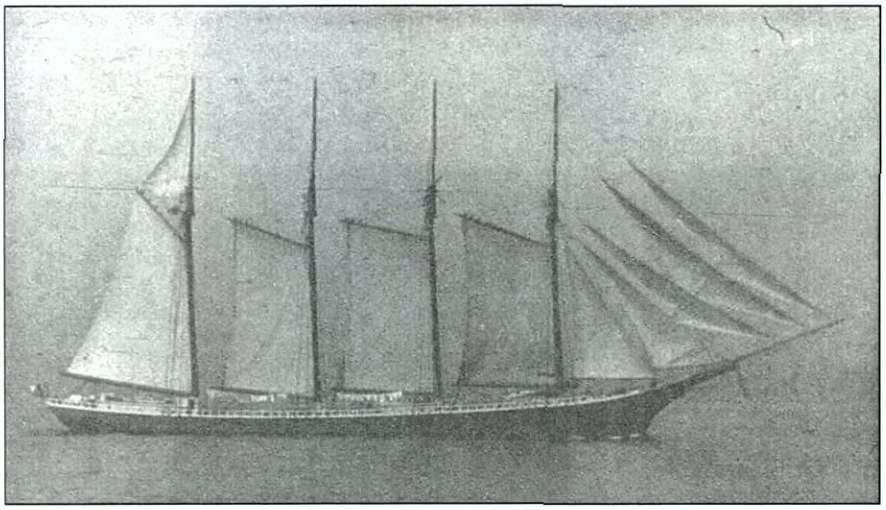


Figure 6-35. ***Augustus H. Babcock*** **under sail shortly before her loss in 1919 (as presented in Morris 2002).**

The downward trend of the industry continued—and accelerated—into 1910. While the six-masted *Wyoming*, the largest wooden cargo vessel ever built, was launched in 1909, no schooners of any size were built in the Maine yards in 1910, with only five total from 1911 through 1915. The decline of the sailing coaster was further enabled by the rise of the coasting steamer; particularly the large oceangoing tugs that towed long strings of schooner barges. Although later regulated and restricted by Congress, these vessels did much to stifle the once-flourishing coastal trade of the sailing vessels.

It was a tribute to Peter Crowell's business acumen that he not only remained in business during this time, but he also managed to expand his fleet by acquiring the Washburn Brothers Company. The deal included four schooners, including the company's first five-master, the *James Pierce*. While built after the general model in use at the time, the builders estimated that by adding a fifth mast, they could increase carrying capacity by 1/8 and speed by 1/5. The 226-foot vessel was built with oak framing over a 15 × 18-inch keel. Five keelsons measuring 15 inches square topped the keel, while three tiers of sister keelsons measuring 14 inches square were placed adjacent to the keelsons. The masts were shaped of pine from Oregon, and each was 104-feet long and 28 inches in diameter. Registered length was 236 feet, with a 43-foot beam and a 20.3-foot depth of hold. Gross tonnage was 1,664.39, with a resulting net tonnage of 1,520.19. This massive and potentially speedy vessel did not remain a Crowell and Thurlow vessel for long, as she collided with the Norwegian steamer SS *Fram* off the Bahamas and was lost.

Three four-masted schooners were acquired in the same deal, including the *Helen Thomas*, a 212-foot vessel with a gross/net tonnage of 1,470.71/1,153.38, built in 1904 for the Washburn Company and lost March 5, 1912, on Cape Charles Shoals, Virginia. The *Mary T. Quinby*, whose name was changed to *Estelle Krieger* shortly after acquisition, was built in 1899. A 1,172-gross ton vessel, she was 184 feet long with a 40.3-foot beam and an 18.8-foot depth of hold. She was sold to Boston Ship Brokerage Company in 1925 before her eventual sale, apparently for salvage, to John L. Richly of Jersey City, New Jersey for $125. The vessel was burned in 1932 while resting in Port Johnson, New Jersey, on Kill Van Kull. She is currently at this location and has been determined to be eligible for placement on the National Register of Historic Places. Also purchased from the Washburn Company was the *Margaret Thomas*, built in 1904.

Advent of Steam

As skilled as they were at finding ways to profitably employ their fleet of sailing vessels, Peter Crowell and Lewis Thurlow did not ignore the profit potential of steam powered vessels. The firm began their association with steam in June of 1911, when Peter Crowell became vice president of the newly formed Cape Cod Steamship Company of Boston. The new firm bought the steamer *Charlotte,* built in 1889 by Neafie & Levy of Philadelphia. Originally owned by the Chesapeake Steamship Company, her name was changed to the *Dorothy Bradford* and used on what turned out to be the highly profitable run from Boston to Provincetown (Figure 6-37). Peter Crowell would eventually become president of the Cape Cod Steamship Company, a position he would hold until shortly before his death in 1923.

Figure 6-36. Board of Directors of the Cape Cod Steamship Company, formed in 1911, posing on the steamer *Dorothy Bradford*, ca. 1920 (as presented in Morris 2002).

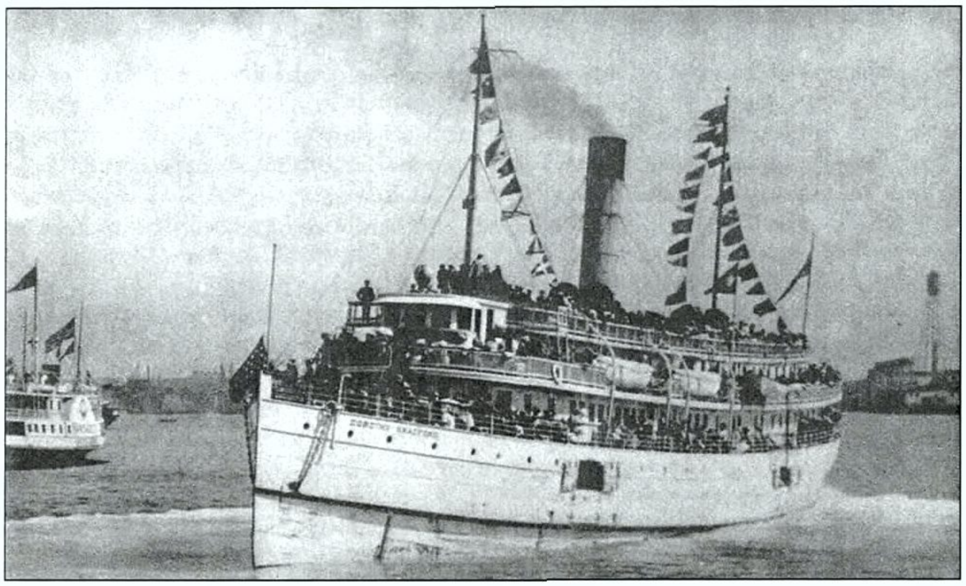


Figure 6-37. The *Dorothy Bradford* (ex *Charlotte*) circa 1912. This excursion steamer proved to be one of the more successful vessels operated by Crowell and Thurlow (as presented in Morris 2002).

Satisfied of the profit potential of the steamship, Crowell and Thurlow formed the Crowell and Thurlow Steamship Company (Figure 6-38). This Maine registered corporation with an initial capitalization of one million dollars commissioned the Newport News Shipbuilding and Drydock Company to construct its first vessel. One December 12, 1912, the *Peter H. Crowell* was launched (Figure 6-39). Although designed as a freighter, the 3,101-gross ton, 313.5-foot long vessel would spend much of her time in the coal trade. A second steamer, the *Lewis K. Thurlow*, was 3,178-gross tons and 313.5-feet long, launched on October 3, 1913 (Figure 6-40).

Figure 6-38. Stock certificate of the newly formed Crowell and Thurlow Steamship Company. Source: www.scripophily.com.

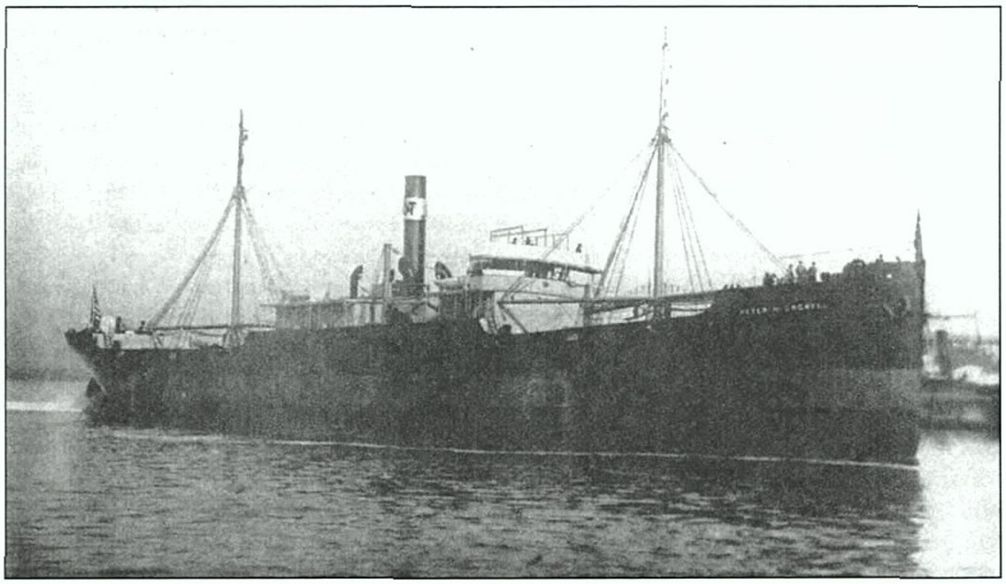


Figure 6-39. Steamer *Peter H. Crowell,* built by Newport News Shipbuilding and Drydock Company, was the first vessel built and owned by the Crowell and Thurlow Steamship Company (as presented in Morris 2002).

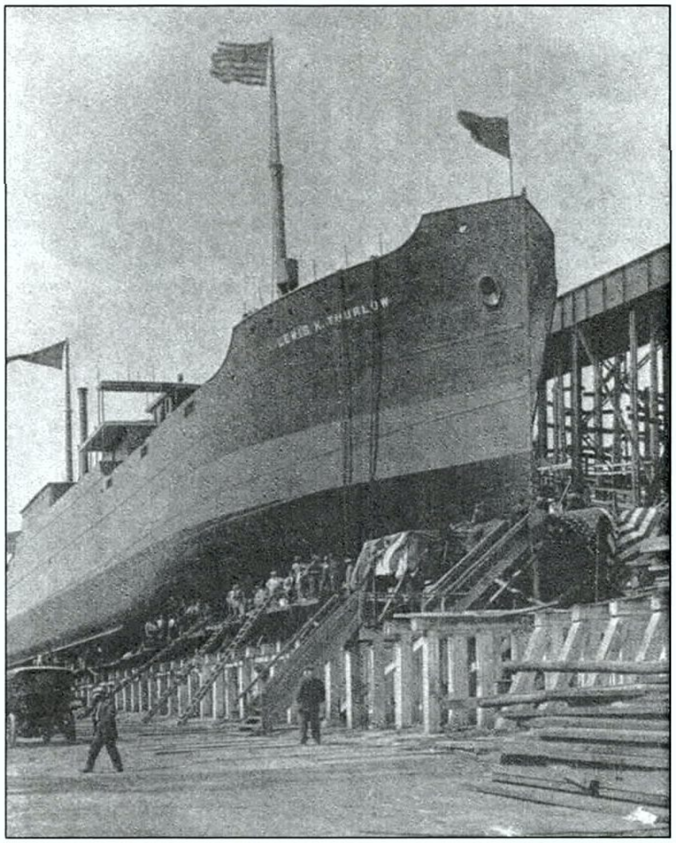


Figure 6-40. Steamer *Lewis K. Thurlow*, built shortly after the *Crowell* (as presented in Morris 2002).

Expansion of the steamer business did not deter the company from also expanding their fleet of schooners. In 1913, they added three four-masted schooners, all built by Cobb and Butler of Rockland, Maine. The *Ellen Little,* built in 1904, was 999 gross tons, 188.2 feet in length, and 39.2 feet in beam. Originally owned by Donnell and McKown of Boston, she was transferred to the New England Maritime Corporation during a Crowell and Thurlow reorganization in the 1930s before being sold to Portuguese interests in 1935. She was broken up in 1937 on Cape Verde Island. The *John D. Colwell* was built in 1906, and the *Stanley M. Seaman* was built in 1908. The latter was a 1,060-ton four-master, 189 feet in length, 39.4 feet in the beam, and had a 20-foot depth of hold. Also initially owned by Donnell and McKown of Boston before being sold to Crowell and Thurlow, she was captained by Herbert L. Rawding and R.C. Rawding until WWI. She was sunk by *U-140* on August 5, 1918 with a crew of eight while under the command of Captain William McAloney.

During the early 1900s, the Crowell and Thurlow Company also began managing the fleets of other companies and single vessels owned by individuals, in addition to their own fleets. In 1913, they began managing the small fleet of the Revere Shipping Company, as well.

In 1914, the Crowell and Thurlow Steamship Company acquired another new steam vessel, the *Edward Peirce,* from the Newport News Shipbuilding Company. This vessel was the first of three nearly identical vessels the company would construct over the next year. At 354-feet long, she was 40 feet longer than the other two C&TSSCo. vessels, and had a 4,387 gross tonnage. She was owned by Crowell and Thurlow until 1924, when she was sold to the Mystic Steamship Company, which operated the vessel from 1924 to 1936 before selling her to the Koppers Coal Company, where she was in operation until 1941. Her last owner was Eastern Gas and Fuel

Associates, which operated her for seven years before scrapping her in 1949—still with the original compound steam engine—after a 35-year career spanning over 1,000 voyages. A second steel-hulled collier, *Stephen R. Jones*, was built in 1915 and was nearly identical to the *Peirce* and the *Noyes*, with a crew of 55. Taken over by the U.S. Navy in WWI, at Philadelphia, on May 3, 1918, she was refitted for naval service and commissioned as a Naval Overseas Transportation Service ship. Loaded with a cargo of Army supplies and ordered to Norfolk, she joined a convoy at Hampton Roads and sailed for France on May 18. She would make a total of five round trips to Europe carrying war supplies. She was returned to Crowell and Thurlow in March 1919. In 1924, she was sold to the Mystic Steamship Company, where she was employed for 12 years. In 1936, she was transferred to Koppers Coal Company for five years, then to Eastern Gas and Fuel Associates. She was lost on June 28, 1942 when she stranded on rocks in the Cape Cod Canal. She was dynamited after blocking the canal. A third steel-hulled vessel, the *Walter D. Noyes*, was constructed in 1915. Identical in size to the two other vessels built by Newport News, this vessel was transferred in ownership along with the two previous vessels. In 1949, she was transferred to the Eastern Transportation Company of Baltimore, where she was cut down to a barge of 4,236 gross tons. She was scrapped after three years of service.

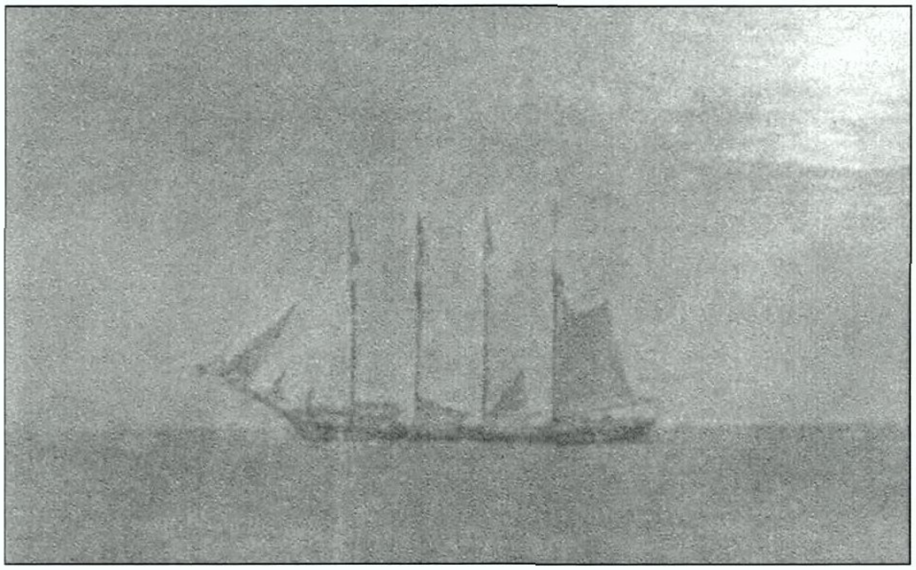


Figure 6-41. Photo of the *Stanley M. Seaman*, taken by a crewmember of the *U-140* shortly before she was sunk (as presented in Morris 2002).

In 1915, the company lost four vessels, including the small four-master *R. W. Hopkins* and the aged *Robert Graham Dun*. Built in 1881, this 595-gross ton three-masted schooner, owned by Crowell and Thurlow since 1901 and built by Goss, Sawyer and Packard of Bath, Maine, foundered in the Atlantic with the loss of one life. The *Lewiston,* a diminutive 814-ton four-master, 190 feet in length, built for the company by Cobb and Butler was stranded on Maranham Island in Brazil on May 15. A fourth vessel, the *John R. Fell,* acquired by the company in 1909, was lost returning from Venezuela.

Sailing Revival: WWI

With U.S. entry into WWI in 1916, supplies of all kinds were needed, and shipping vessels of all types were pressed into service, creating a desperate need for vessels to enter the coasting trade. Seeing it as an opportunity of the first order, Crowell and Thurlow formed the Atlantic Coast Company. Incorporated under the State of Maine, the company was headed by Walter D. Noyes, while day-to-day operations were headed by Lewis K. Thurlow. Almost immediately, the new company acquired the lease of the defunct Washburn Shipyard in Thomaston, Maine. Although some of the machinery had been removed, the location contained nearly all that was required for a working shipyard. With W.G Washburn named as manager and Ira Vinal as master builder, the yard began construction of the *Jessie G. Noyes* (Figure 6-42). This 1,376-ton 225.2-foot long vessel, named for the president of the ACC, was launched on October 6, 1917, and served the company until 1927, when she foundered off the coast of Florida with the loss of three men. The launch of this vessel was just in time to replace the loss of the *Bradford C. French,* caught in a hurricane en route from San Juan to New Orleans with a load of molasses and alcohol. Although she rode out the storm, she had 10 feet of water in her hold and was apparently in a sinking condition; the crew abandoned ship, escaping in the ship's yawl. They managed to sail 250 miles to Panama City, arriving safely five days later.

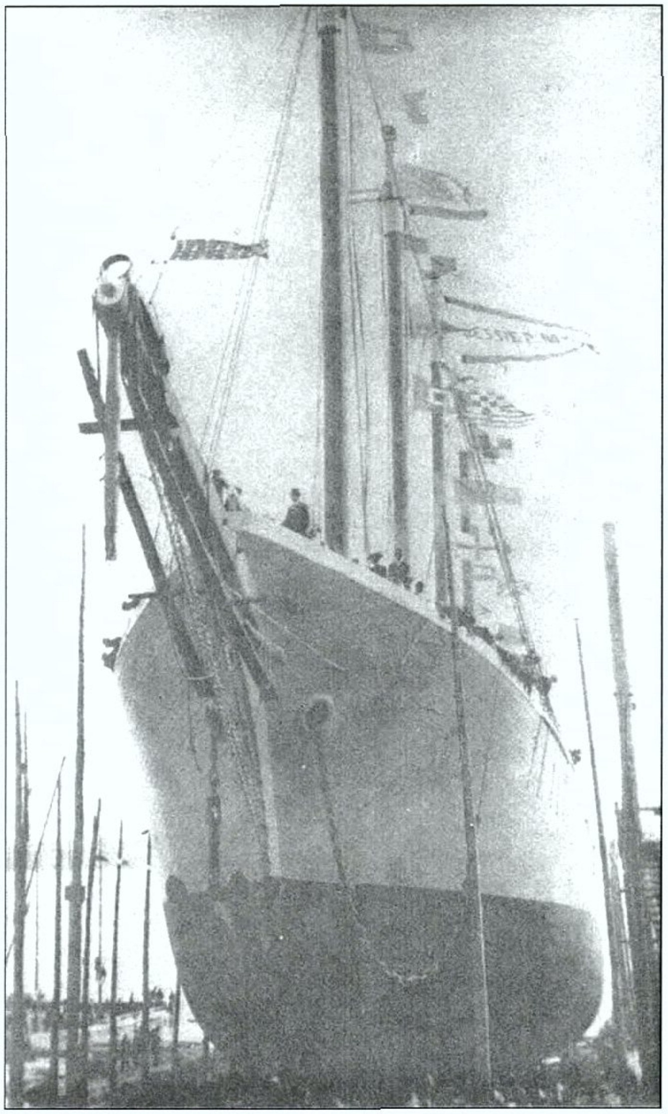


Figure 6-42. Schooner *Jessie G. Noyes* was the first vessel constructed at the newly acquired Thomaston yard in Maine, and the first vessel owned by the newly formed Atlantic Coast Company (as presented in Morris 2002).

That same year, the C&TSSCo. launched the *William A. McKenney* at Newport News. The largest steamer built by the company to date, she was 395 feet in length with a gross tonnage of 6,256. She followed the same ownership as the previous four steamers before being shelled and torpedoed by *U-175* during 1942 in Venezuelan waters off the mouth of the Orinock River. That same year, the bark *Onanway* was sold to Portuguese interests.

Also in 1916, the aging Peter Crowell—then almost 70 years old—resigned as president of the Crowell and Thurlow Steamship Company, although he remained on the board of directors, as well as the Cape Cod Steamship Company. Edward Peirce took his place as president, while Walter Noyes moved up to vice president and Lewis Thurlow served as treasurer. Peter Crowell was also taking a smaller role in the day-to-day operations of Crowell and Thurlow, with the junior partner managing the majority of the company's 21-vessel schooner fleet out of the firm's Broad Street address in Boston (Figure 6-43).

Figure 6-43. Crowell and Thurlow offices on State Street in Boston, ca. 1916 (as presented in Morris 2002).

On September 17, 1916, Congress created the United States Shipping Board. The subordinate Emergency Fleet Corporation (EFC) was given powers enabling it to order construction of new vessels and to requisition existing vessels for use in wartime shipping. This was to effect the operations of Crowell and Thurlow to a large extent, particularly after the EFC began obtaining vessels after the U.S. declared war on Germany in April 1917. By June of that year, all four C&TSSCo. vessels had been acquired by the U.S. Navy, including the newly built *Felix Taussig*, a near twin of the *McKenney*. While under the American flag as the USS *Felix Taussig* she made four voyages to France over two years. She sank the subchaser *SC-209* on August 27, 1918, with her deck gun after mistaking her for a submarine. This vessel was returned to Crowell and Thurlow after the war, and like the other steamers, was transferred to the Mystic Steamship Company in 1924, Koppers Coal Company in 1936, and Eastern Gas and Fuel Associates in 1942, before being sold to Italian interests in 1848. She underwent several name changes, to *Georgie* in 1946, and *Ata* in 1948, after being acquired by Katana S.D.N. Marittima of Catania, Italy. In 1954, she was sold to Japanese interests and scrapped.

With the steamships temporarily out of their control, Crowell and Thurlow were free to increase the size and profitability of their schooner fleet, particularly given the shortage of vessels for coastwise shipping. The years 1917 to 1920 would prove to be the busiest and most profitable in their history. Not only would the company expand their operations at the Thomaston yard by constructing a sail loft, but they would also turn again to the Cobb and Butler yard, now known as the Francis Cobb Company. From 1917 to 1920, Francis Cobb would build 11 schooners for Crowell and Thurlow (Morris 2002:56). The Thomaston yard would produce an additional seven four-masters. On July 6, 1917, the board of directors voted to purchase the property and assets of the Townsend Marine Railway and Construction Company of Boothbay Harbor, Maine, including the unfinished four-masted schooner *Anna Laura McKenney*, for $175,000 in cash and Atlantic Coast Company stock (Figure 6-44). This yard would produce four more schooners for Crowell and Thurlow through 1921, including the *Josiah B. Chase*, considered the last four-masted schooner built in the U.S.

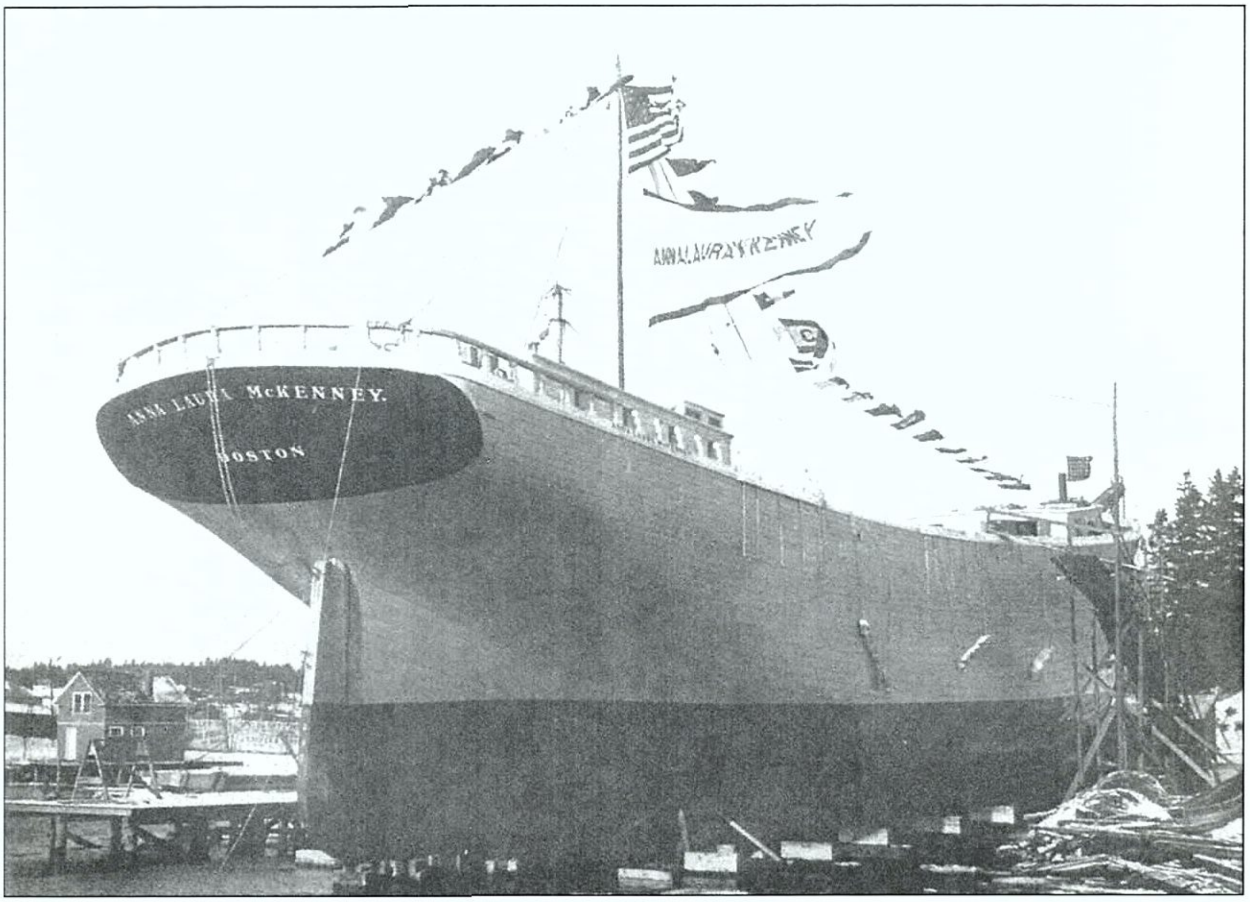


Figure 6-44. Schooner *Anna Laura McKenney*, acquired when Crowell and Thurlow purchased the Townsend Marine Railway and Construction Company in 1917 (as presented in Morris 2002).

At this same time, the newly formed East Coast Ship Company purchased the Boothbay Harbor yard belonging to Irving M. Reed, and constructed four new schooners from 1917 to 1920, including the *Marguerite M. Weymss*, *James E. Newsom*, *Mary G. Maynard* (Figure 6-45), and *Zebedee E. Cliff* (Figure 6-46). While ownership of the vessels was retained by the East Coast Ship Company, their affairs were managed by Crowell and Thurlow. In 1917, a new company was incorporated as the Stockton Yard. Acquiring the assets of the Crooker Yard at Stockton Springs, Maine, the yard began construction of vessels under contract to Crowell and Thurlow. Beginning with the *Helen Swanzy*, the yard, under direction of longtime company captain Herbert L. Rawding, would construct five vessels for the company between 1917 and 1921, including the longest lasting of the Crowell and Thurlow vessels, the *Herbert L. Rawding*.

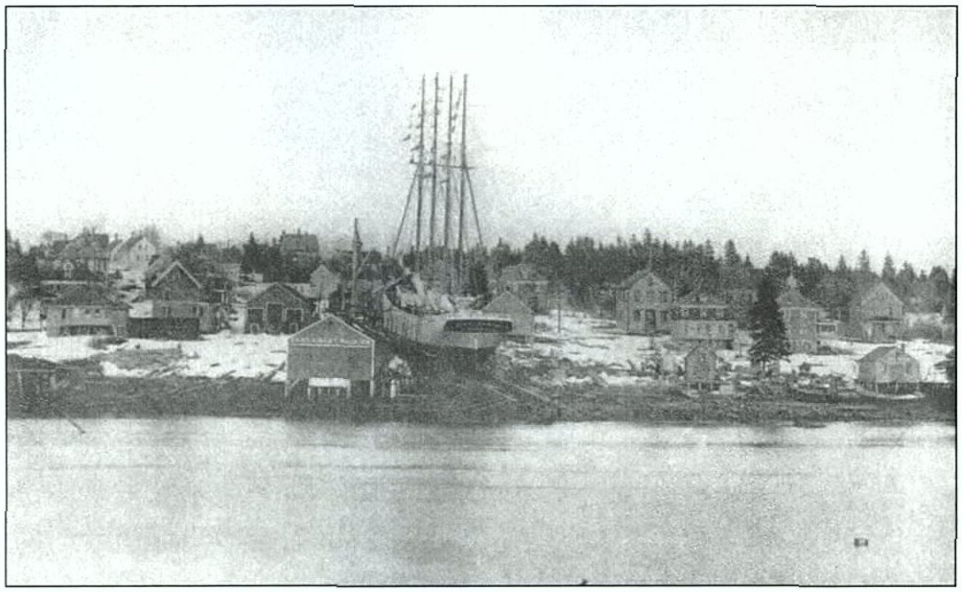


Figure 6-45. Boothbay Harbor shipyard acquired by the East Coast Ship Company in 1917. Note the *Mary G. Maynard* on the ways (as presented in Morris 2002).

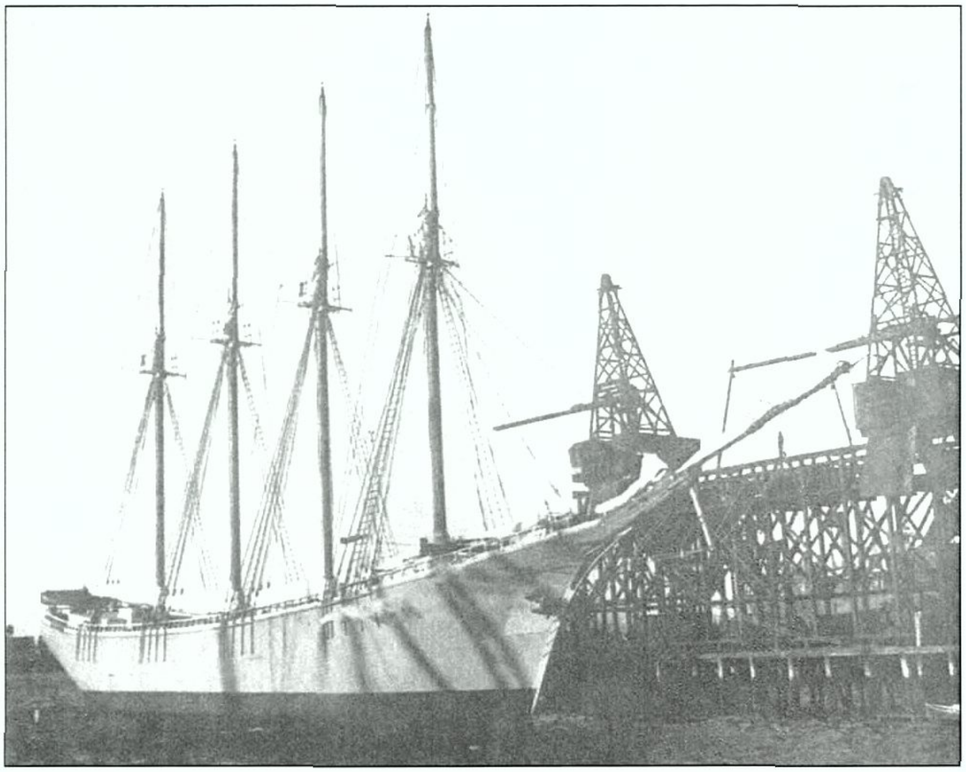


Figure 6-46. Schooner *Zebedee E. Cliff*, also constructed by the Boothbay Harbor yard for the East Coast Ship Company (as presented in Morris 2002).

Construction of new schooners would ramp up further in 1917. A second set of ways was built in January of that year at the Thomaston yard, and construction was begun on a new vessel. In July, the Atlantic Coast Company purchased the still unfinished *Jessie G. Noyes* from the interests whom they had sold it to after they acquired the Thomaston yard. Further expansion of the fleet was accomplished when the *Theoline* was launched (Figure 6-47). This four-master was originally constructed as the *Allen* for Baltimore interests, but was acquired by Thurlow before completion. The original contract price was approximately $50,000, but due to the strong demand for wartime shipping, Thurlow had to pay nearly $85,000 to get it. A small four-master at 594 gross tons and 184 feet in length, she was constructed of hardwood framing (presumably oak) and planking of yellow pine, with a 7-inch thick ceiling. The main keelson was 13 inches square with two additional riders above, and two tiers of sister keelsons of the same dimension. The vessel was fastened using yellow metal fasteners below the waterline and a combination of wood treenails and galvanized fasteners above. The four masts were 90 feet in length, made of Oregon pine with a 24-inch diameter at the deck. At the same time, Cobb and Company was constructing the *Ella Pierce Thurlow*, a sizable four-master of 1,505 gross tons, 221.2 feet in length, 42 feet in the beam, and 22.3 feet in depth of hold, named for the wife of Lewis K. Thurlow (Figures 6-47 through 6-49). A solid vessel, she retained an American Bureau of Shipping rating of A1 for 15 years. She was owned by the Atlantic Coast Company until 1925 when she was transferred to the New England Maritime Company during a reorganization, then, in 1931, sold to William A. Martino of New York for $1,550 at a U.S. Marshall's sale in Portland, Maine. Mr. Martino, who also purchased a number of other Thurlow vessels including the *Paul E. Thurlow*, had the *Ella Pierce Thurlow* cut down to a barge. She was lost off Frying Pan Shoals, North Carolina, on March 23, 1932. The Thomaston yard also completed the 1,376-ton four-master *Jessie G. Noyes*, named for the wife of the Atlantic Coast Company president. One of the vessels that was to survive the company upheaval of the 1920s, she was employed by the ACC until 1927, when on March 3, with a crew of 10, she foundered in the Gulf of Mexico with the loss of three men.

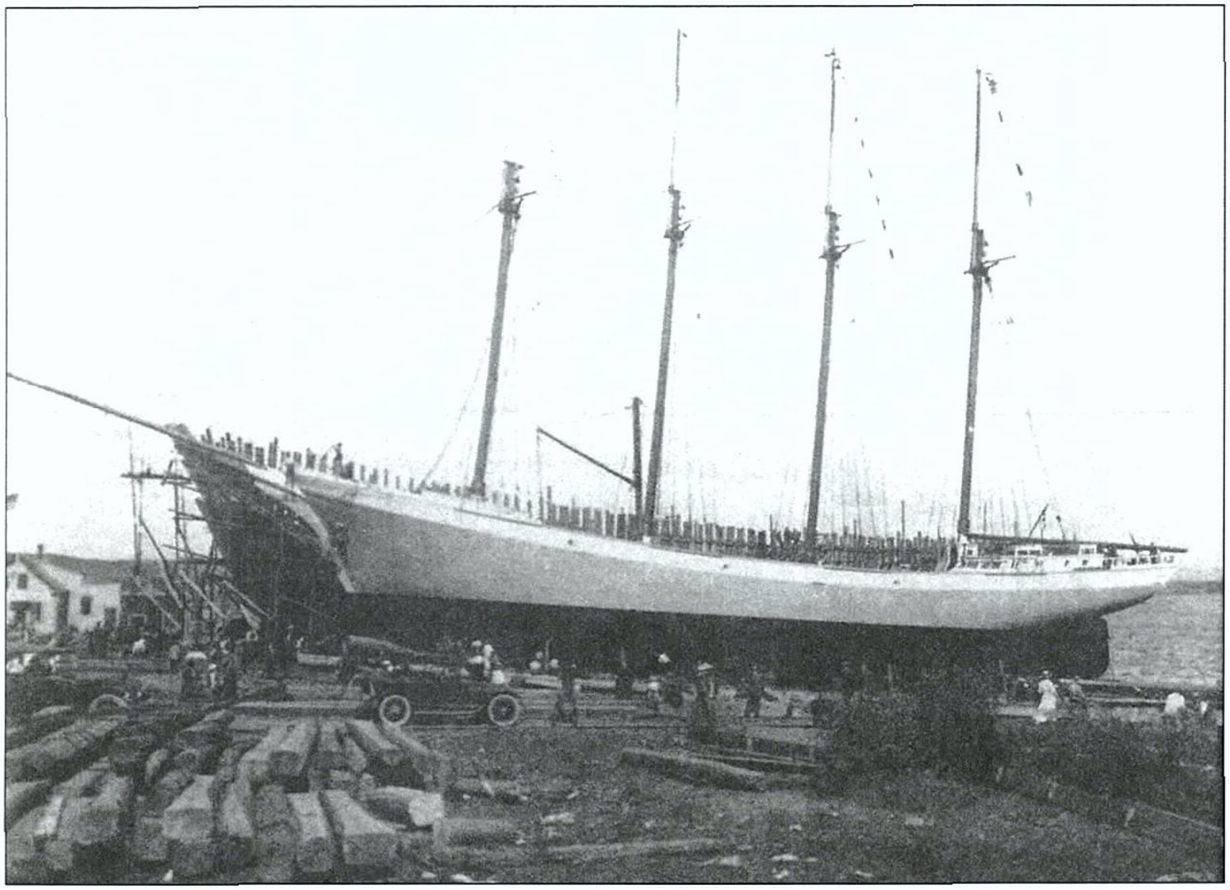


Figure 6-47. Schooner *Theoline*, built at the Thomaston yard in 1917. Note the framing of the *Ella Pierce Thurlow* in the background (as presented in Morris 2002).

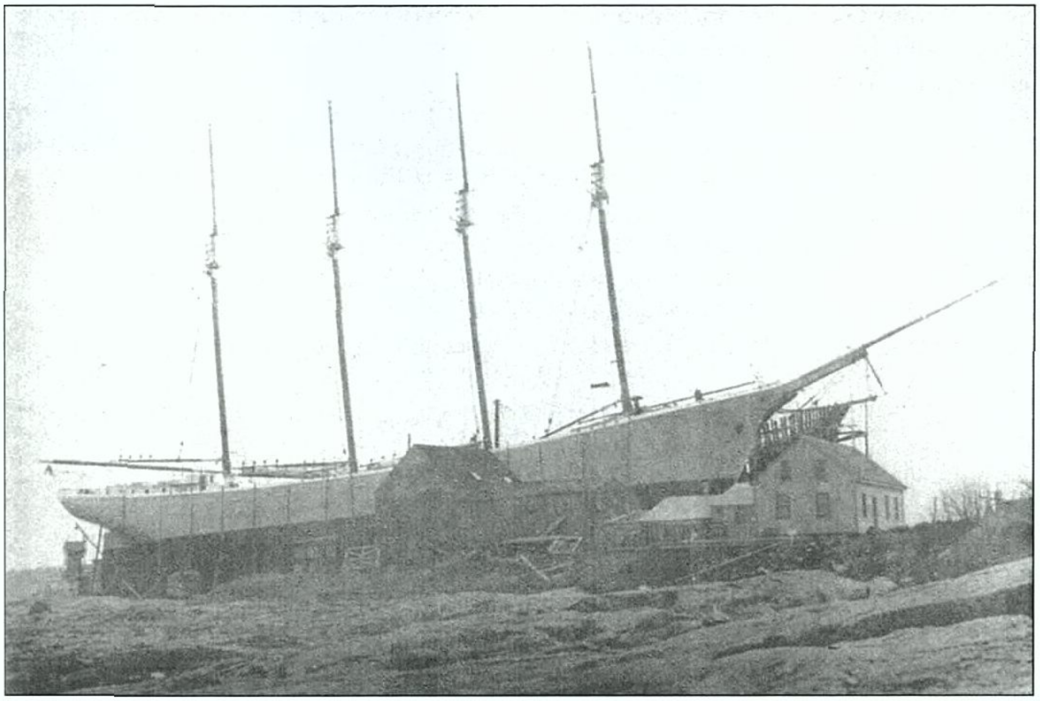


Figure 6-48. ***Ella Pierce Thurlow*, launched by Cobb, Butler and Company in 1917 (as presented in Morris 2002).**

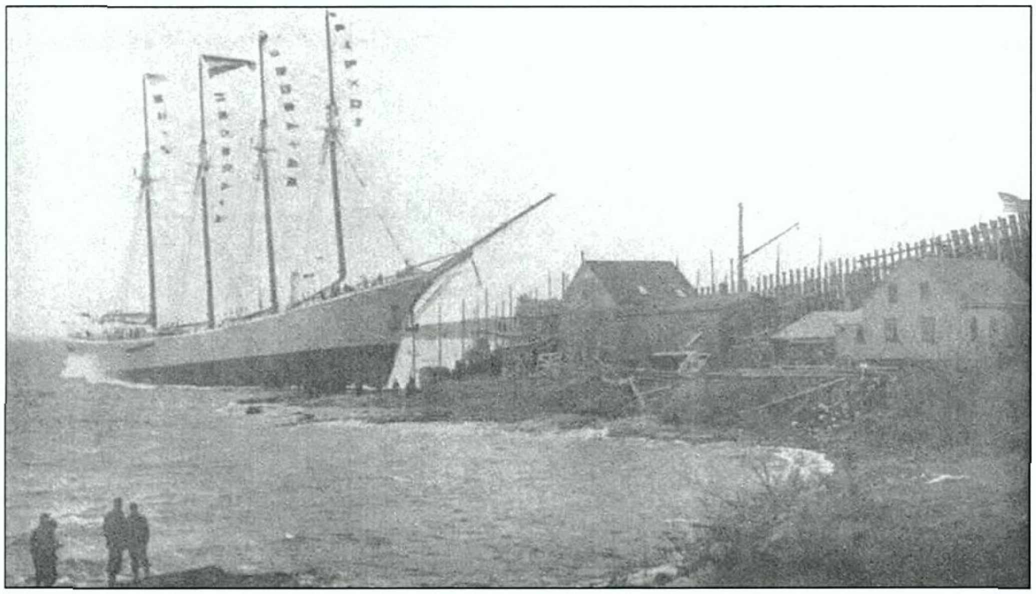


Figure 6-49. ***Ella Pierce Thurlow* at launch in 1917 (as presented in Morris 2002).**

Further construction at the company's Thomaston yard occurred in 1918 with the launch of both the *Augusta G. Hilton* (Figure 6-50) and *Ida S. Dow* (Figure 6-51). The *Hilton*, a 1,562-ton four-master, 223.6 feet in length, was transferred to the New England Maritime Company in 1925 before being sold to Boston interests in 1932, then acquired by Canary Ship Corporation of Fernandina, Florida in 1933. On August 18 that year, she caught fire in the Gulf of Mexico and was abandoned in sinking condition by 46 passengers and crew. They were rescued by the Dutch steamer *Hercules* and taken to San Juan, Puerto Rico. The *Dow*, a similar sized vessel, was mastered by Grover C. Cole from 1920-1923, then by Robert C. Rawding until 1931, before the New England Maritime Company sold the vessel to Bath, Maine, interests. Seriously damaged in a collision with the steamer *Herman Frasch* in 1932, she was abandoned as a hulk in Newport News, Virginia before dropping off the official vessel register in 1940.

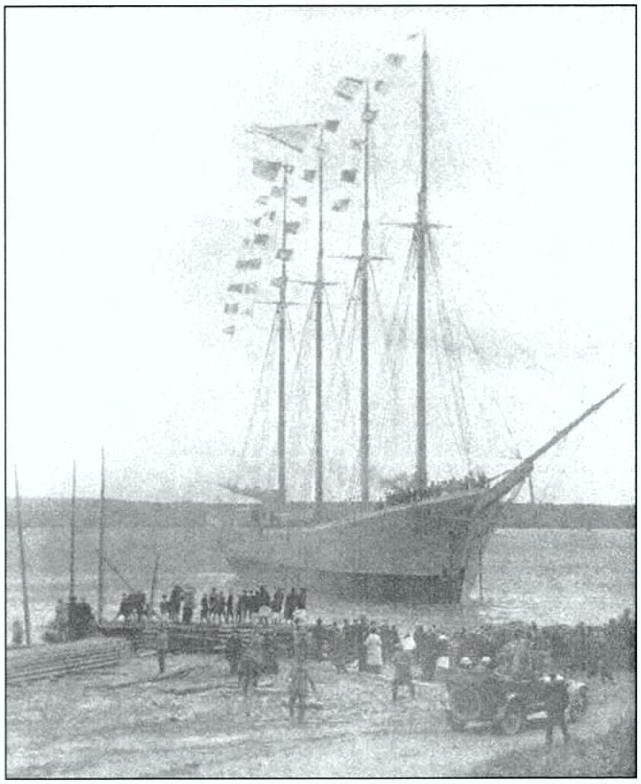


Figure 6-50. ***Augusta G. Hilton*****, launched in 1918 from the Thomaston yard (as presented in Morris 2002).**

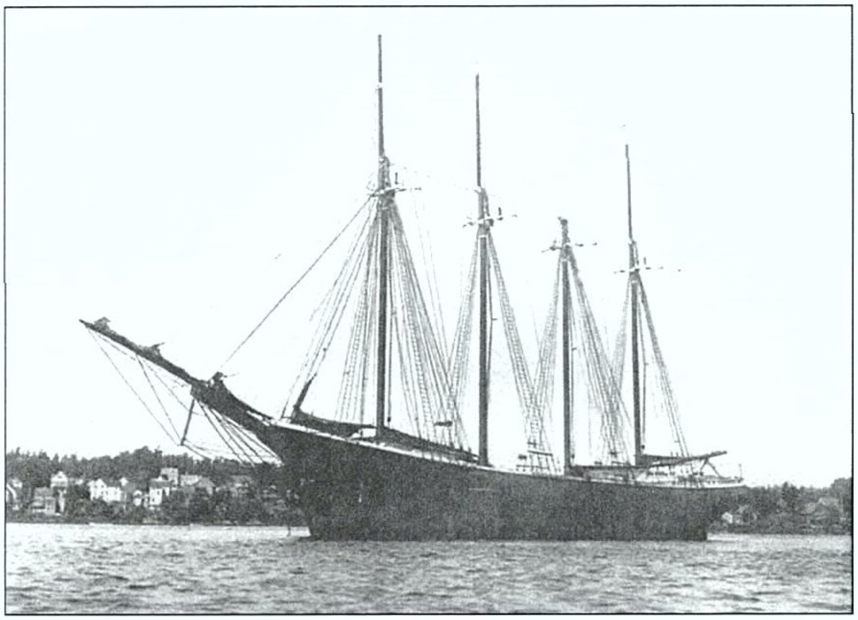


Figure 6-51. ***Ida S. Dow*****, launched immediately after the** ***Hilton*** **at the Thomaston yard (as presented in Morris 2002).**

Four more vessels were launched by the Thomaston yard from 1919-1921, including the *M. Vivian Peirce* and *Wm. H. Harriman* (Figure 6-52) (1919), the *Elizabeth Freeman* (1920), and the *Atlantic Coast* (1921). The *Peirce* was a 1,511-ton vessel owned by ACC until transfer to NEMC in 1925. After the company disbanded in 1931, she was sold at auction to Superior Trading and Transportation Company and renamed *Edward L. Swan*. In 1936 while in drydock, the vessel fell over and was abandoned, and eventually was used as a breakwater in Astoria, New York on Long Island. The *Harriman*, at 1,450 tons, followed a similar fate, sold in 1928 to one R.C. Durant of Los Angeles, California. She was abandoned in 1931—cause unknown—and was eventually scuttled in December 1940 after a collision with the Romanian steamer SS *Prahova*. The *Freeman*, at 1,665 tons and 232 feet in length, burned in Jacksonville on October 22, 1927, while still under company control. The *Atlantic Coast* suffered a similar fate, stranding on the north shore of Cuba on December 31, 1925.

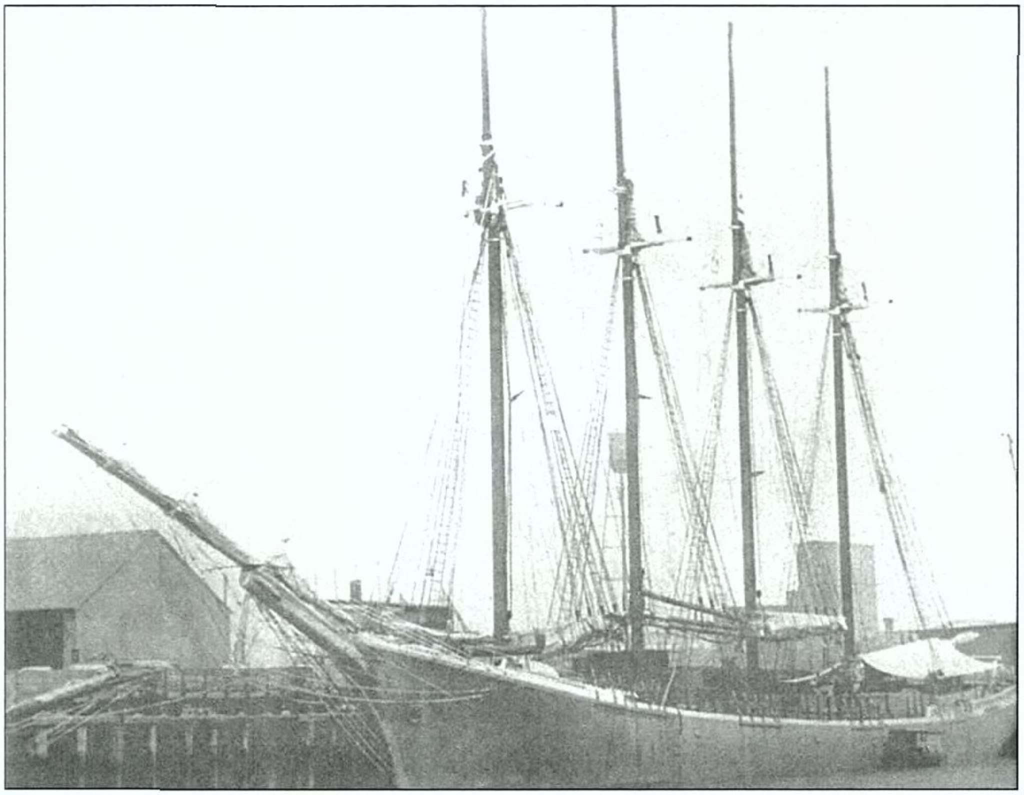


Figure 6-52. *William H. Harriman*, launched in 1919 at the Thomaston yard. She was named for the man who supervised her construction (as presented in Morris 2002).

A longtime Crowell and Thurlow employee, William H. Harriman had commanded numerous vessels for the company, beginning in 1902 with the *Wesley M. Oler*. At this time, he began supervising the construction of vessels for the company, including vessels built at Thomaston and Francis Cobb. The Francis Cobb Shipbuilding Company was started by Francis Cobb in 1865 and renamed Cobb Butler Company in 1889. Run by Cobb and his son-in-law, A.W. Butler, and specializing in wooden vessels, they constructed vessels for their own use as well as for outside interests. Peter Crowell was apparently a satisfied customer, as they built 11 vessels for him beginning in 1901 with the *Jacob M. Haskell* and ending in 1920 with the *Josephine A. McQuesten*. Three additional schooners built for Donnell and McKown eventually ended up under the ownership of C & T as well. In 1918, Cobb, Butler and Company launched the *Paul E. Thurlow,* named for the son of Lewis K. Thurlow. While this vessel will be discussed in greater detail below, she was owned and operated by Crowell and Thurlow until transfer to NEMC in

1925, then sold to William A. Martino of New York at a U.S. Marshall's auction in 1931. She was cut down and used as a coal barge until 1944, when she was abandoned in her current location on Staten Island. Captain Harriman also supervised Cobb's construction of the *Lucia P. Dow* (Figure 6-53), launched in Rockland on August 29, 1919. Small compared to other C & T schooners built in the same time period, at 998 gross tons and 189 feet in length, this vessel, carrying a crew of nine, was owned by the company until she was purchased in 1931 by British interests. On her first voyage under the new owners she became stranded off the coast of Nova Scotia. She was eventually refloated and used as a coal hulk. Her final disposition is unknown.

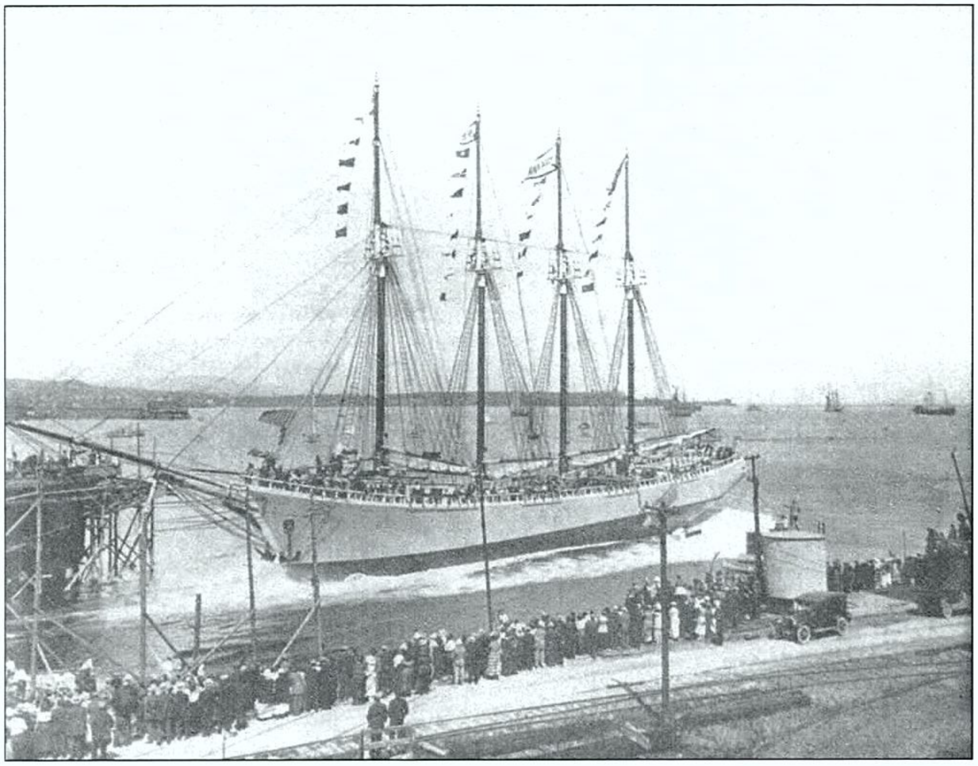


Figure 6-53. Schooner *Lucia P. Dow*, one of many vessels built for Crowell and Thurlow by Cobb, Butler and Company (as presented in Morris 2002).

While Thurlow controlled yards along with Cobb and Company, who constructed the majority of vessels for the company, other smaller yards also were employed in vessel construction. In 1918 and 1919, the yard belonging to Robert L. Bean of Camden, Maine built three four-masted schooners for the company. These included the *Edna M. McKnight* in 1918 and *Charles A. Dean* (Figures 6-54 and 6-55) as well as *Helen Barnet Gring* (Figures 6-56 and 6-57) in 1919, at a cost of $200,000 each. The *McKnight* was 1,326 gross tons, 209.4 feet in length, 41.2 feet in beam, and 20.3 feet in depth of hold, with a crew of 12. This vessel, listed as "lost" in the Merchant Vessels of the U.S., was apparently salvaged or recovered and towed to Bermuda, where she was sold to one A.L. Kent. Towed to Boston, then to Boothbay Harbor, Maine, she was abandoned in Mill Cove, where she remained as of 2002 (Morris 2002:59). The *Dean* had a somewhat colorful history, as far as coastwise cargo vessels go. Transferred to the Crowell and Thurlow subsidiary of the Boston Maritime Corporation, the schooner was lost on Frying Pan Shoals, off Cape Fear, North Carolina, while en route from Savannah to Baltimore. The captain reported that a mutiny had taken place, and he was holding the mutineers at bay with a revolver. The crew, with the exception of Captain W.H. Davis, was eventually removed by the Coast Guard. The ship was abandoned on December 29, 1926, 18 days after striking the shoals, and considered a total loss.

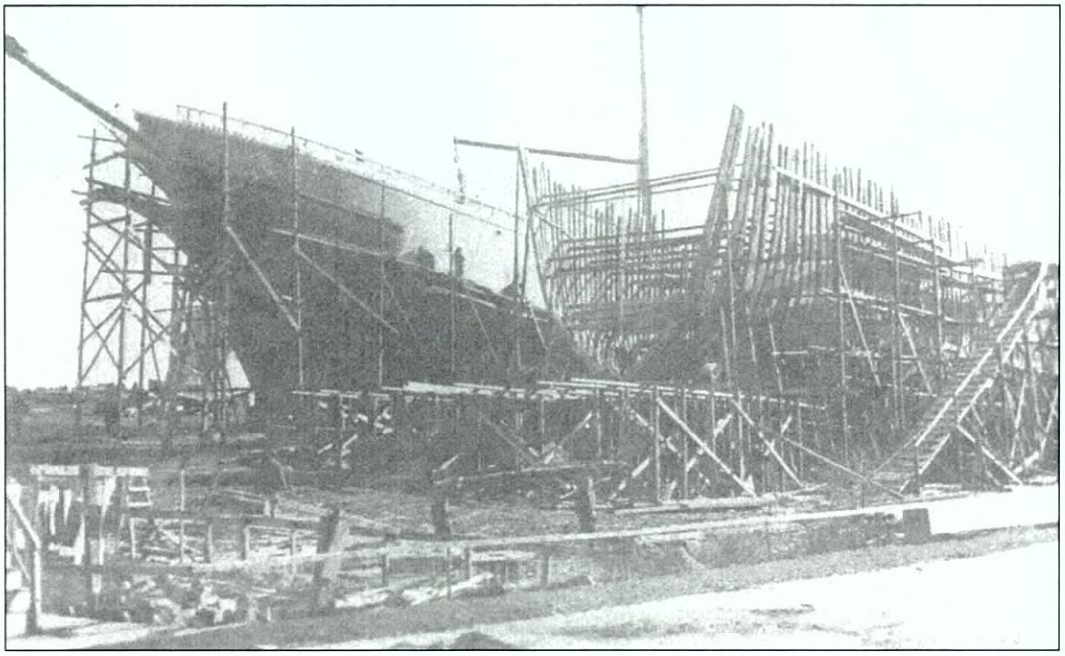


Figure 6-54. ***Charles A. Dean*****, left, one of three vessels constructed by Robert L. Bean of Camden, Maine for Crowell and Thurlow. The *****Helen Barnet Gring***** is on the right (as presented in Morris 2002).**

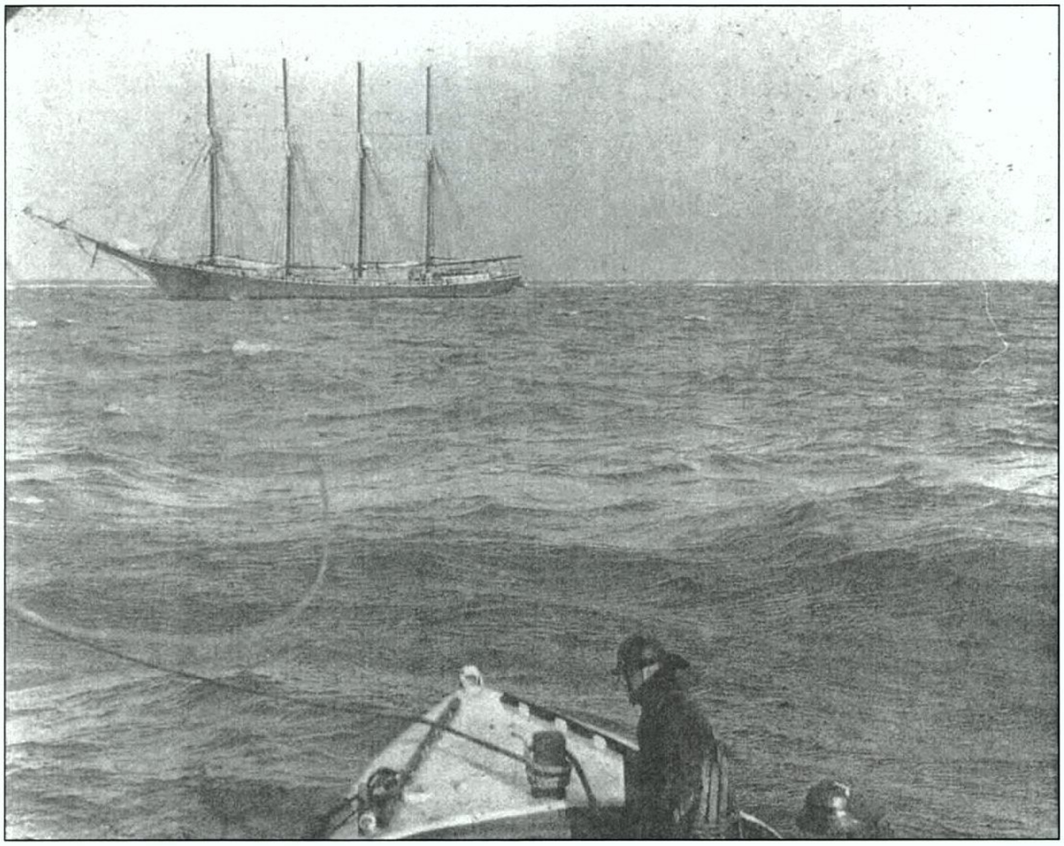


Figure 6-55. ***Charles A. Dean*** **aground on Frying Pan Shoals, December 11, 1926. She was a total loss (as presented in Morris 2002).**

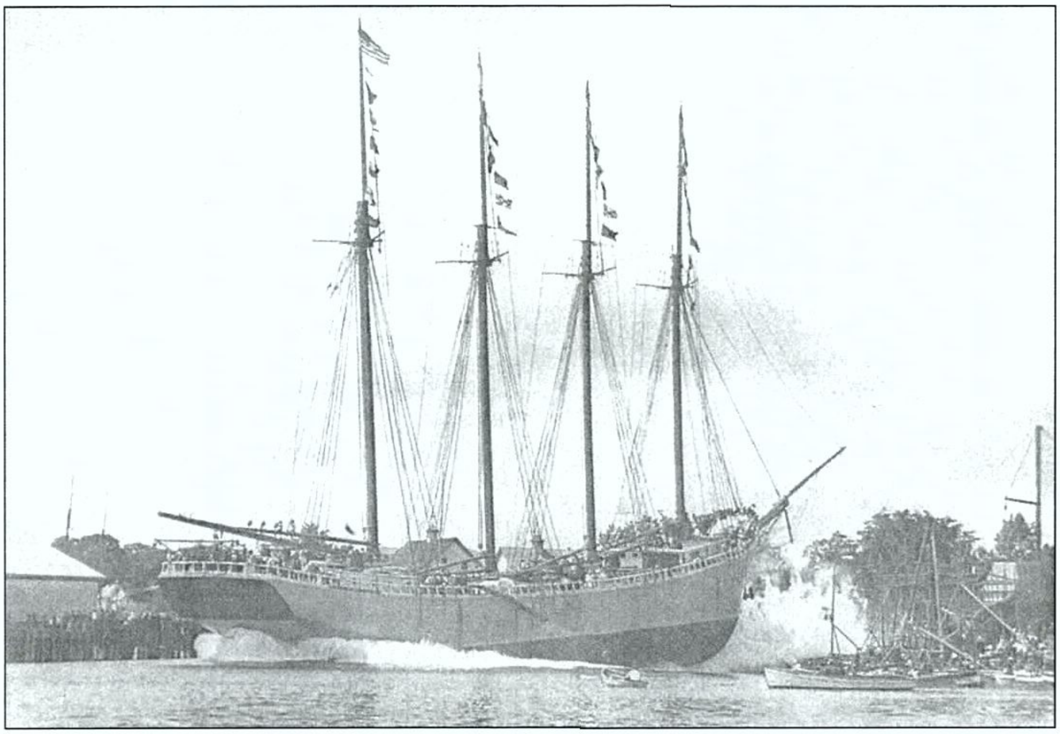


Figure 6-56. ***Helen Barnet Gring*****, one of three vessels constructed by Robert L. Bean of Camden, Maine between 1918 and 1919 (as presented in Morris 2002).**

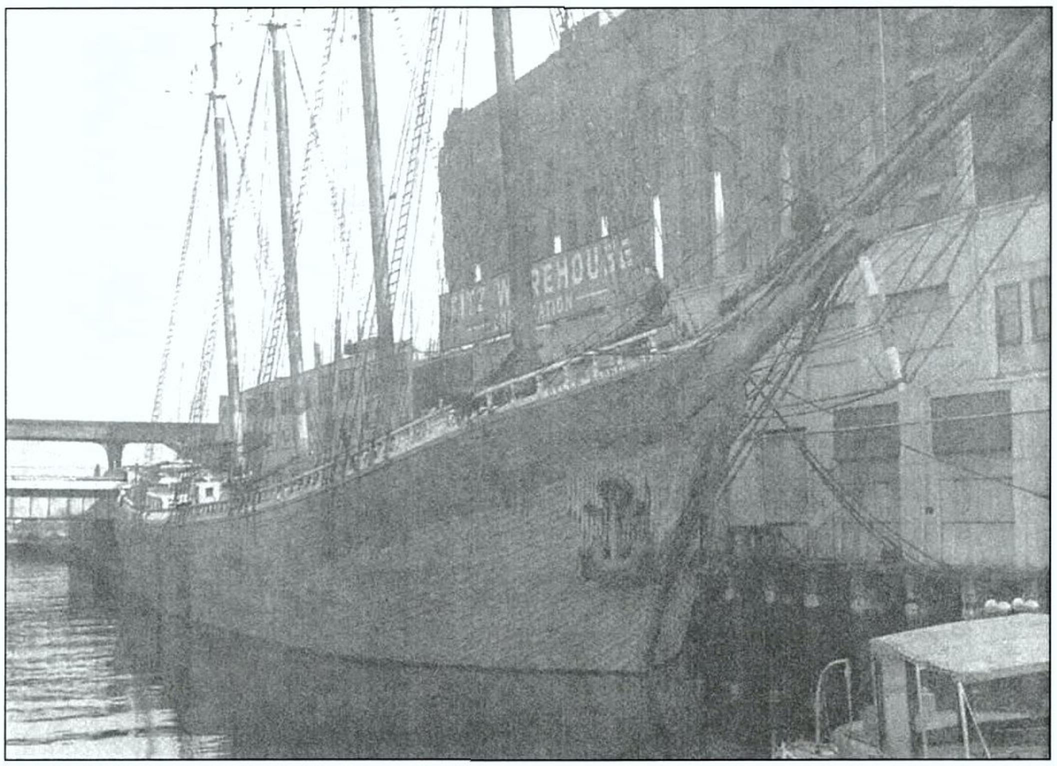


Figure 6-57. ***Helen Barnet Gring*** **in Boston late in her career, ca. 1938 (as presented in Morris 2002).**

The firm of Frye, Flynn Shipbuilding Company of Harrington, Maine constructed four schooners for C & T from 1918 to 1920, including the *Sally Persis Noyes* for the ACC in 1918 (Figure 6-58), the *Doris Hamlin* and the *Velma L. Hamlin* in 1919, and the *Mabel A. Frye* (Figure 6-59) in 1920.

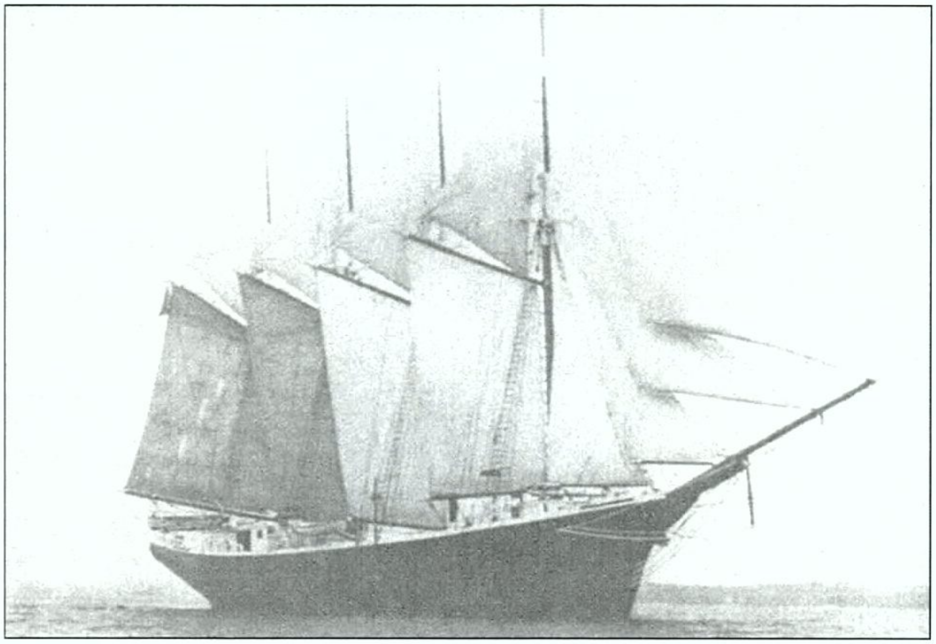


Figure 6-58. ***Sally Persis Noyes*****, one of four vessels built for C & T by Frye, Flynn Shipbuilding Company of Harrington, Maine, between 1918-1920 (as presented in Morris 2002).**

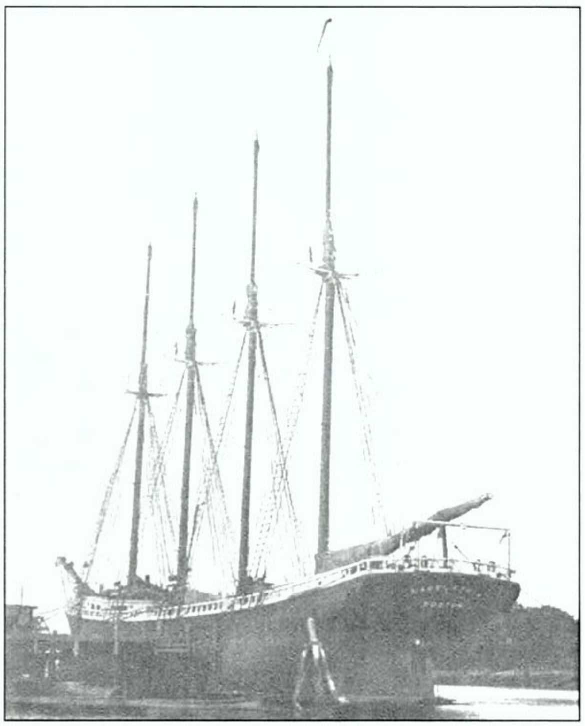


Figure 6-59. ***Mabel A. Frye*****, the last of four vessels built for C & T by Frye and Flynn, in 1920 (as presented in Morris 2002).**

By the end of 1917, things were going well financially for the company. Net earnings for the ACC were $76,971.09. Freight rates skyrocketed the following year and enabled savvy ship owners to return the cost of vessel construction within one year. The board of directors of both the ACC and the C&TSSCo. scrambled to find more vessels. Yards all over Maine would build vessels in 1918 and 1919 that would be owned or controlled by Crowell and Thurlow. These included the last three-masted schooner purchased by the company, the *Priscilla Alden,* as well as the only tug, the *Clara H. Doane*. This vessel was constructed of wood, and although the exact configuration of the propulsion is not known, given its size it is likely it was powered by a single-cylinder upright steam engine producing somewhere between 200 and 400 HP. At 96 feet in length, she was owned and operated by C&TSSCo. before being transferred to the Doane Towboat Company in 1925, then to Doane Commercial Towing in 1929. She was transferred to Koppers Coal Company in 1936, which changed her name to *Orion* before selling her to Eastern Gas and Fuel Associates in 1942. She was off the register in 1949, and her fate remains unknown.

The war in Europe had reached its height by 1918. Unfortunately, even for coastwise shippers like Crowell and Thurlow, the war extended to the east coast as German U-boats crossed the Atlantic to attack American shipping. Beginning with the sinking of the four-masted schooner *Lyman M. Law* on February 12, 1917, there were a total of 32 coastwise schooners sunk by U-boat action. This number included three C & T vessels; two of which were sunk by *U-151* on a cruise beginning April 18, 1918, when it left Germany under the command of Korvettenkapitan von Nostitz un Janckendorf. It ended with the sinking of seven merchant vessels. In one single day, June 2, 1918, *U-151* destroyed 14,517 tons of American shipping and sent 448 people adrift. After prowling off Virginia and taking three vessels in June, *U-151* headed north. Off the coast of New Jersey, she ran into the *Jacob M. Haskell* of the Crowell and Thurlow line, en route from Norfolk to Portland, Maine with a cargo of coal, on June 5. Officers from *U-151* boarded the vessel and ordered the crew off the ship. Allowed to take a small amount of provisions, the crew cast off in the ship's boat, and the Germans sunk the vessel with a combination of explosives and shellfire. The crew was adrift for 19 hours before being picked up by the steamer *Grecian,* of the Merchants and Miners Line. Shortly before 4:00 am the next morning, the crew of *U-151* spotted another C & T vessel, the *Edward H. Cole,* also bound for Portland from Norfolk with a load of coal. The Germans gave the crew of the *Cole* 10 minutes to gather personal effects and supplies then evacuate in the ship's boat. The German crew placed explosives on the outside of the *Cole's* hull at the waterline, and the ship was sunk in 16 minutes. After rowing for several hours, the crew was spotted by the U.S. Navy collier *Bristol.* Although against standing regulations, the *Bristol* stopped to collect the drifting sailors.

WWI ended on November 11, 1918. Within a few months, the U.S. Shipping Board EFC returned the vessels they had commandeered for wartime service. Demand for vessels was still high, there were still profits to be made in the shipping business, and the rapid pace of ship construction continued unabated. The Atlantic Coast Company completed and launched four four-masters in 1919, and Francis Cobb completed two, with the Mathews Brothers yard of Belfast, Maine, launching one. Comparatively, only one vessel was lost, the *Augustus H. Babcock*, which exploded and burned en route to the Canary Islands from New York with a cargo of gasoline. The wreck resulted in the death of Captain John Rawding—one of six brothers, all sea captains—and the first mate, Albert T. Black. Construction also continued on vessels for the steamship company. A contract was signed with Bath Iron Works in September 1919 for the steam collier *A.L. Kent,* with a fixed price of $1.625 million. After 13 months of construction, she was launched. This vessel, 394 feet in length and 5,849 gross tons, was the largest yet built for the Crowell and Thurlow Steamship Company, and also the largest ever built at the Bath Iron Works.

As the decade came to a close, Peter Crowell had less of an influence on company affairs than he had in the past. While he remained as company president, affairs were controlled by the Board of

Directors of both the Atlantic Coast Company and the Crowell and Thurlow Steamship Company, both of which were made up of many of the same members. In the heady days of 1917-1920, it appeared as though the prosperity would never end. The management of the steamship company began a practice that would cause them trouble in future years. In 1917, they voted to advance $100,000 to the Atlantic Coast Company to finance ship construction. This loan was secured through the issue of company stock. Again in 1918 they did the same. In November 1919, the board of the steamship company voted to loan the ACC $300,000, again to finance vessel construction. Although the ACC was maintaining a good cash flow from operations, this was a heavy debt load, and the continuing practice of issuing of additional company stock to cover the debt further diluted the value of existing shares.

In 1920, Lewis K. Thurlow was running day-to-day operations and continued the ambitious construction program. Eight four-masted schooners were launched from Maine shipyards, along with one five-masted schooner, the *Mary H. Diebold* (Figure 6-60*)*, from the Newcastle Shipbuilding Company. The year 1920 also saw what would ultimately be the last large four-master built for the company by the Francis Cobb yard, the *Josephine A. McQuesten* (Figure 6-61*)*. Built at a cost of $212,000 with 1,607 gross tons, the *McQuesten* was 230 feet long with a 41.9-foot beam. She was owned by Thurlow-controlled interests until 1935, when she was sold to Estonian interests and renamed *Viktor*. While en route to her new owners, she was lost off the Faroe Islands in 1936.

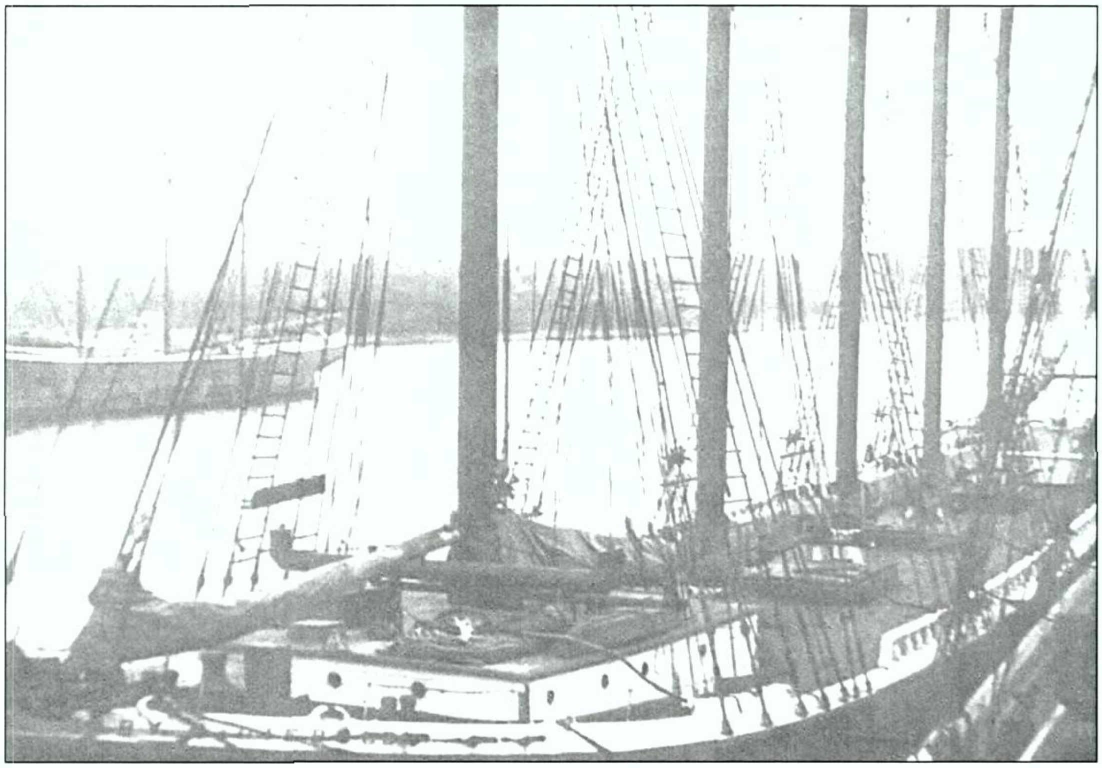


Figure 6-60. *Mary H. Diebold*, built in 1920 by the Newcastle Shipbuilding Company, one of eight vessels built in Maine shipyards that year (as presented in Morris 2002).

Also at this time, the steamship company ordered another large steam collier, the *Thomas P. Beal*. Nearly as large as the *Kent,* the *Beal* was built at a fixed cost of $1.6 million. Slightly larger than the *Kent,* she was rated 6,216 gross tons and 394 feet in length. Her ownership followed the other vessels controlled by the steamship company. Her fate is unknown, although it appears she was off the registers by 1949.

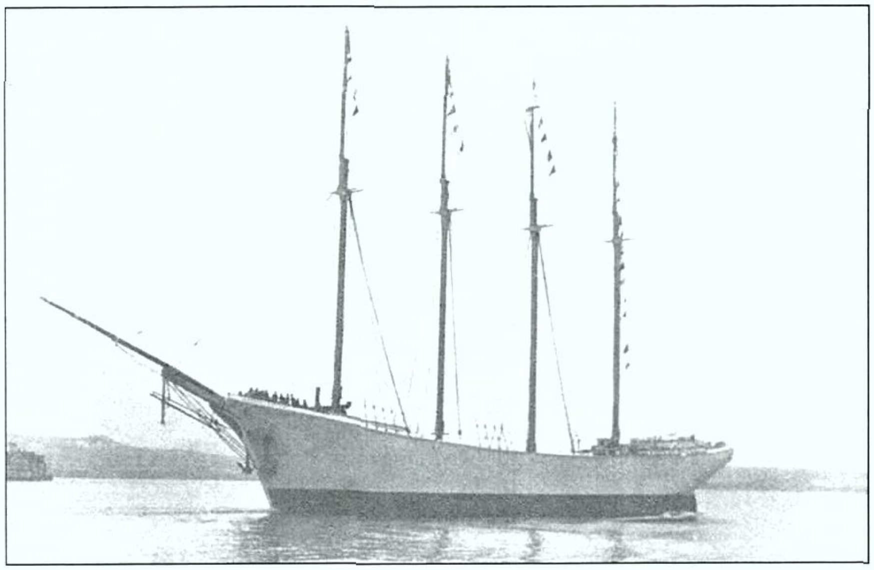


Figure 6-61. The *Josephine A McQuesten*, built by Cobb, Butler and Company in 1920, would be the last large four-masted schooner built for Crowell and Thurlow (as presented in Morris 2002).

The Final Years

When the end came, it came quickly. In the fall of 1920, the ambitious construction pace, along with the return of vessels commandeered during the war, created a severe surplus of vessels. Shipping rates dropped dramatically in a slump that turned out not to be temporary. While the Atlantic Coast Company finished vessels already on the ways, including the *Atlantic Coast* and the *Josiah P. Chase,* both around 230 feet in length and 1,600 gross tons, construction of new vessels came to what would turn out to be a permanent end. Throughout 1921 and into 1922, the company experienced increasingly difficult economic conditions. At the end of 1921, the Crowell and Thurlow companies controlled a total of 54 vessels. It became increasingly difficult for management to find good crews and good cargoes for this many vessels; the company was increasingly forced to take any available cargo to fill its hulls. Even with the help of capital from the steamship company and additional loans, the ACC continued to lose money.

In March of 1923, the major creditors of the Atlantic Coast Company, including the steamship company, took control of company affairs. Hoping shipping conditions would improve, they continued to operate the company at a loss until 1924, at which point all attempts to keep the company viable were abandoned and the company's assets were liquidated. Many of the vessels were sold to a new venture of the Crowell and Thurlow Company, the New England Maritime Company, for pennies on the dollar. However, shortly after, in March of 1924, mortally wounded by the financial drain of trying to keep the ACC afloat, the Crowell and Thurlow Steamship Company entered receivership. That same month, the receiver, Paul J. Bertelsen, filed a lawsuit for one million dollars against company board members and shareholders, alleging gross mismanagement. This case was eventually dismissed in favor of the defendants by the Supreme Judicial Court of the Commonwealth of Massachusetts.

The assets of the Crowell and Thurlow Steamship Company were taken over by the newly formed Mystic Steamship Company, including all vessels owned by the company except the *Tampico*, which was acquired by the F.D. Gleason Coal Company of Detroit in 1925.

A New Beginning

Even though the Crowell and Thurlow Steamship Company and the Atlantic Coast Company were both gone, the company continued operations under the New England Maritime Company, the Boston Maritime Corporation, and Crowell and Thurlow into the mid-1920s. About that time, cheap land, coupled with the newly emerging middle class who had access to automobiles and easy credit, fueled a huge land boom in Florida that was to change the face of the state. This enormous boom, with its accompanying demand for building materials, brought many idle schooners out of retirement. It was not uncommon to see a dozen or so schooners unloading their cargoes in Miami, with more waiting (Morris 2002:102) (Figure 6-62). Crowell and Thurlow made numerous changes to their fleet, including acquiring the *Mary L. Baxter,* which had been built for the C.G. Deering Company. This 1,036-ton, 188.4-foot long four-master, renamed *John C. Hilderbrand* by C & T, sailed for the company until 1928, when she foundered en route from Norfolk to Eastport, Maine, with a load of coal. The crew of nine was picked up by the fishing vessel *Pojola* and taken to New York. In 1924, the company lost the *Margaret Thomas* to stranding, the *Samuel W. Hathaway* off Cape Hatteras, and the *Alcaeus Hooper,* which was lost off Cape Henry en route from Hampton Roads to Calais, Maine, with a load of coal. In November of that year, the four-master *Marguerite M. Weymss* collided with the SS *City of Montgomery* and was declared a total loss. The company also sold its last three-masted schooner, the *Priscilla Alden.* This little 404-ton vessel was converted to an auxiliary yacht by her new owners and renamed *Rocinante.* She was eventually sold to Russian interests in 1929, who used her as a mother vessel for their fishing fleet.

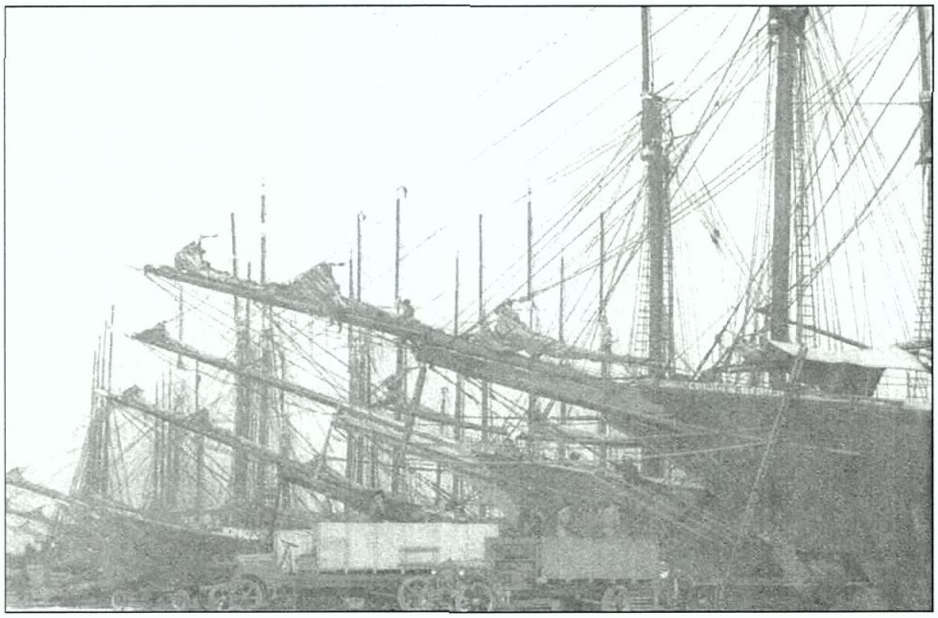


Figure 6-62. Miami waterfront ca. early 1920s, showing vessels unloading cargo (as presented in Morris 2002).

The Florida boom continued into 1925 (Figure 6-63). C & T lost two vessels that year, including the *James W. Howard.* This vessel was built in 1920 at the behest of the Atlantic Coast Company, and attracted much attention at her launching due to her being outfitted with new technology, including steam heat, electric lights, and hot and cold running water. Even the crew quarters, in the forecastle, were considered fairly well-appointed for the times (Morris 2002:103). On December 14, 1925, she was rammed and sunk by the Italian steamer *Livenza* off Cape Lookout, North Carolina. Also during this year, the company sold the aging *Estelle Krieger* to the Boston Ship Brokerage out of Boston.

The period 1925-1926 was of highest demand for building supplies in Florida. At this time, the company added five-master *Courtney C. Houck* as well as four-masters *Harry G. Deering* and *Maude L. Morey.* The five-master was built in 1913 by G.G. Deering Company of Bath.

Originally owned by the builder, the 1,627-ton, 218.9-foot long vessel was sold to Bernstein and Jacobson of Portland in 1937 for $225. Not much is known of her career under this owner, and in 1940 she was abandoned in Boothbay Harbor. In 1945, she was burned to celebrate the end of WWII. Her remains are still there, next to those of the *Edna M. McKnight*. The *Deering* was also acquired from the G.G. Deering Company. In 1929, she was laid up in Boothbay Harbor, apparently while still under C & T ownership. Converted to a barge in 1939, she performed in this capacity until she was stranded and wrecked at Pastillo, Cuba on August 7, 1941. The *Morey* was acquired from the same company. The 1,364-ton, 207.1-foot long vessel was owned by Crowell and Thurlow until 1930, when ownership transferred to Crowell and Crowell and laid up in Boothbay Harbor with several C & T schooners. She was eventually sold in 1939 to Bernstein and Jacobson for $320, in the same sale in which they acquired the *Houck*. She was acquired by the government in 1942 and used as part of a breakwater in Casco, Maine, alongside the *Zebedee E. Cliff* (Figure 6-65).

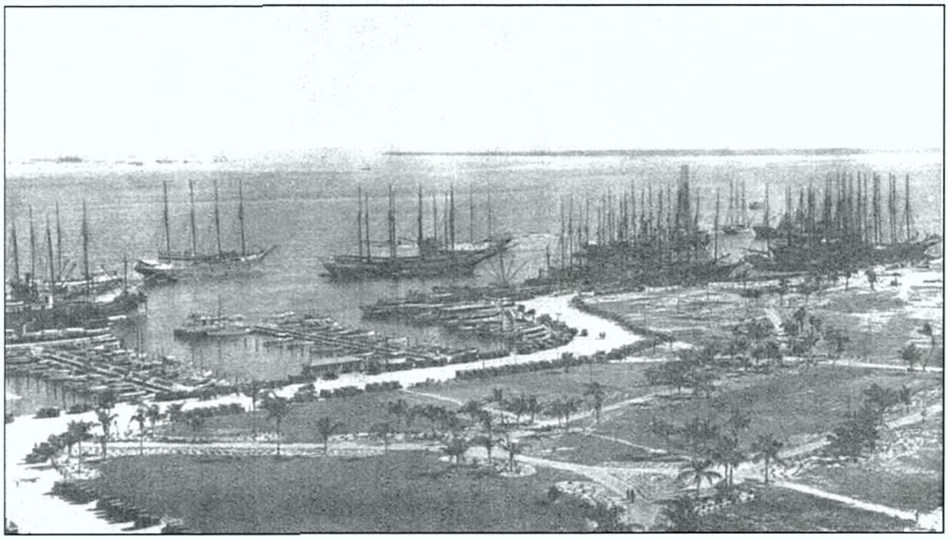


Figure 6-63. Bay Front Park in Miami, ca. 1925 (as presented in Morris 2002).

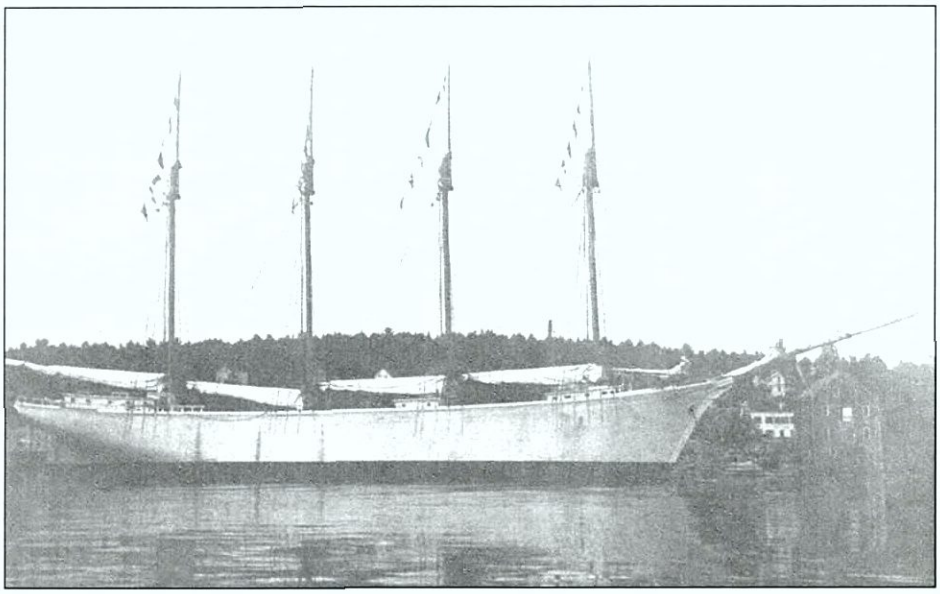


Figure 6-64. *Maude L. Morey* shortly after her sale to Crowell and Thurlow (as presented in Morris 2002).

The height of the Florida construction boom, 1927, was a bad year for C & T in terms of vessel losses. Beginning March 3 with the *Jessie G. Noyes,* the company lost five of its sailing vessels.

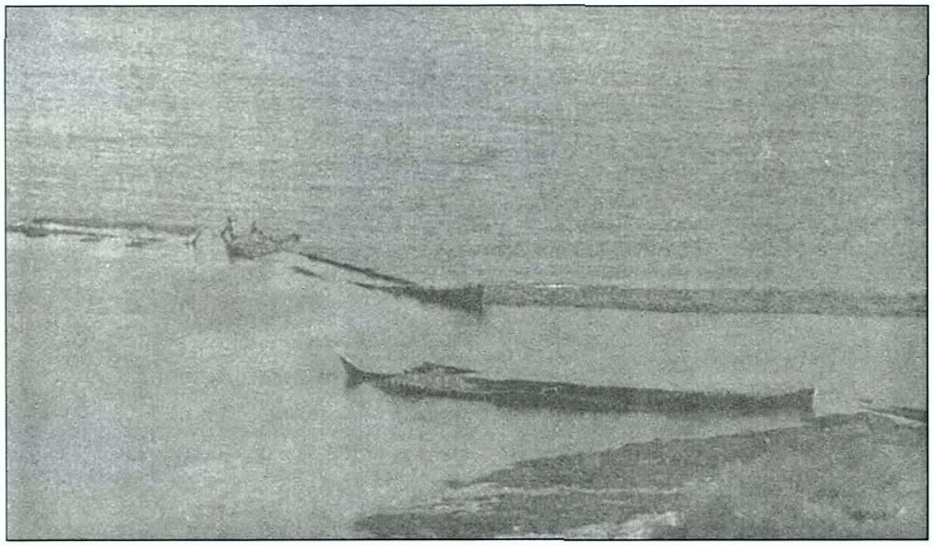


Figure 6-65. ***Zebedee E. Cliff*** **and** ***Maude L. Morey*****, abandoned as part of a breakwater at Casco, Maine, in 1942 (as presented in Morris 2002).**

Although the construction boom in Florida briefly revived the coastwise sailing industry, the truth is it had been in decline ever since the end of WWI, and the brief period of work in the 1920s never brought the industry back to its heyday. The Florida boom was essentially over by the end of 1927, and even though the number of schooners operated by C & T had been declining all through the 1920s, there was not enough cargo available even to fill the smaller fleet. Many schooners, including those of C & T, were idled. In 1928, the company paired its fleet further, selling three of its schooners, including the *Wm. H. Harriman* and *Theoline*. The *John C. Hildebrand* was lost the same year, along with the *Gladys Taylor,* which was bound for Thomaston from Walton, NS, with a load of gypsum when she ran aground on Malcom's Ledge, near Rockland. Many of the other schooners were laid up in and around the Boston area.

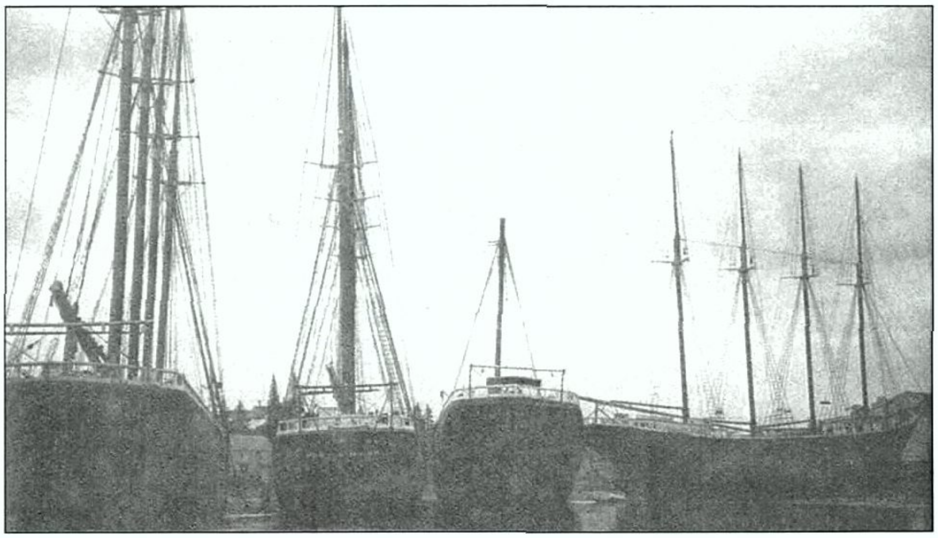


Figure 6-66. Four Crowell and Thurlow vessels laid up in Boothbay Harbor in 1927. Left to right: ***Ellen Little*****,** ***Augusta W. Snow*****, a dismasted** ***Edna M. McKnight*****, and the** ***Freeman*** **(as presented in Morris 2002).**

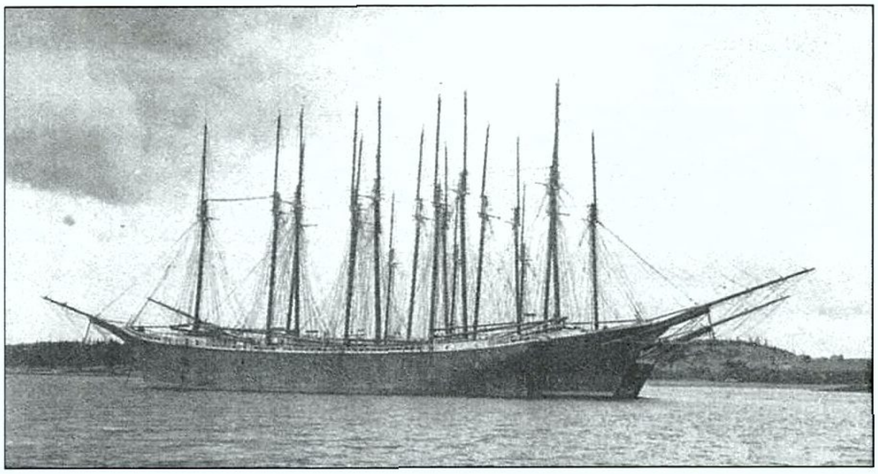


Figure 6-67. ***Zebedee E. Cliff* and the *Josephine A. McQuesten*, in Eastport, Maine, illustrate the typical fate of many Crowell and Thurlow vessels in the late 1920s to early 1930s (as presented in Morris 2002).**

The shipping empire of Peter Crowell and the rest of the coastwise sailing industry were dealt a final blow by the stock market crash in October 1929. Shipping along the eastern seaboard had all but come to a complete halt. Vessels up and down the east coast of the U.S. were placed in areas that would become the gravesites for many unwanted and outdated sailing vessels. Places like Port Johnson, New Jersey, the areas around modern day Liberty Park, the waterfronts of Hoboken and Jersey City, and the western shore of Shooter's Island were lined with dozens of unused and unusable vessels. Most of the vessels slowly rotted and sank into the mud. Many of the Crowell and Thurlow vessels ended up in East Boston and Boothbay Harbor, Maine.

The management of Crowell and Thurlow were trying to figure out what to do with their rapidly dying shipping business. In 1930, a new organization, Crowell and Crowell, was formed and took over ownership of the *Morey*. The *Morey* had previously been involved in a collision with the steamer SS *Westport*, while southbound from Rockland to Norfolk, presumably to pick up a load of coal. She came under C & C ownership while laid up in Boothbay Harbor for repairs (Figure 6-68). These repairs were never done. Although C & C retained ownership, the vessel remained at the dock, eventually being sold to Bernstein and Jacobson of Portland, Maine for $320 in 1939. After 1939, the organization of Crowell and Crowell ceased to exist.

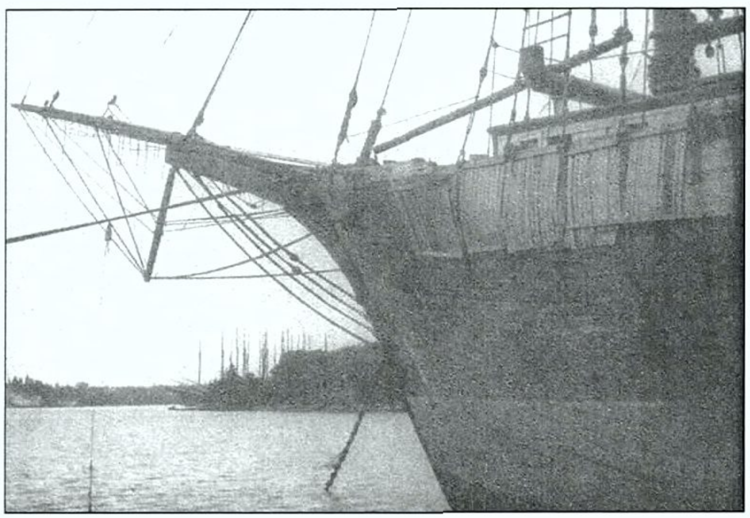


Figure 6-68. ***Maude L. Morey* showing temporary repairs made after her collision with SS *Westport*.**

The fleet of Crowell and Thurlow continued to shrink through attrition into the 1930s. On February 3, 1930, the *Horace A. Stone* was sold to Boston interests, who in turn sold her later in the spring to other Boston interests for conversion into a floating dance hall and restaurant. Almost two years later, the conversion had not been undertaken, and on December 3, 1932, she caught fire at the dock in East Boston. The blaze killed the caretaker as well as set the *Jennie Flood Kreger*, moored alongside, ablaze. While the blaze was extinguished, the vessel continued to languish at the dock before sinking in 1935. On June 3, 1940, her remains were raised, removed from the harbor, and sunk offshore. Also in 1930, the company sold the *Velma L. Hamlin*. This little 1,091-ton four-master, built in 1919 by Frye, Flynn Company of Harrington, Maine, was sold to one E. Malcom Stannard of New Haven, who kept her for two years before selling her to the Atlantic Trading Company of Newport News. In 1935, she was again sold, this time to a Captain William F. Plummer, who apparently took her to Fort de France, in Martinique. She was sold there by court order to French interests, before being abandoned on the island shortly afterward. The *Doris Hamlin*, nearly identical in specifications to the *Velma L. Hamlin* and constructed by the same yard, was sold by order of the federal court to W.B. Vane of Baltimore for $1,500. In 1940, under the ownership of Penn Lehigh Coal Company, which purchased her in 1939, she set sail for the Canary Islands from Norfolk with a load of coal and a crew of eight, and was never seen again. The *Mary G. Maynard* was the fourth schooner to go in 1930. Built at Boothbay Harbor in 1920 by the East Coast Ship Company, this small 735-ton four-master was purchased from the builder in 1923 and operated by the C & T subsidiary Boston Maritime Company. On July 14, she sank at sea.

The next year, eight Crowell and Thurlow schooners were sold, all of which were owned by the New England Maritime Company. These included the *Augusta G. Hilton*, *Bradford E. Jones*, *Ella Pierce Thurlow*, *Ida S. Dow*, *Lucia P. Dow*, *M. Vivian Peirce*, *Paul E. Thurlow*, and the *Sally Persis Noyes*. The *Mary Bradford Peirce* was also sold, to the Beacon Navigation Corporation of New York. Later the same year, she was in ballast on a voyage from Eastport Maine to Campbellton, Nova Scotia to pick up a cargo of wood lathe destined for New York City. On July 16, while in heavy fog, she ran on the rocks off Cape Smokey. The crew safely reached the shore, but the vessel was a total loss.

Several of the vessels sold in 1931 were done so at a U.S. Marshall's sale, presumably to settle claims on outstanding liens on the vessels. Both the *Paul E. Thurlow* and the *Ella Pierce Thurlow* were purchased by William M. Martino of New York. Both were cut down to barges for the hauling of bulk cargo. The *Dow* ownership was acquired by her then current captain, William F. Plummer. The following year, while on a trip from Newport News to Bermuda with a load of coal, she was rammed by the SS *Herman Frasch*. While the collision did not sink the *Dow*, she was severely damaged. She was towed stern first, in leaking condition, back to Hampton Roads. She apparently was never repaired and her registration was dropped in 1940, and she became a hulk in Newport News.

The *Sally Persis Noyes*, also sold at the same sale, was purchased by the Durham Navigation Company of New York, before being resold shortly after to Joseph S. Hulings. She was sold again in 1932, to Robert Royall of East Boothbay, Maine, who completely refurbished the old schooner, with plans for turning her into a school ship, and renamed her *Constellation*. While the school idea did not come to fruition, she was transferred to Washington D.C. under the command of long-time Crowell and Thurlow skipper Alvin Loesch. There she was put on display and used as a spa and restaurant. Although achieving some success in this role, she was converted in 1935 to a salvage vessel equipped with a diving bell. Employed on a treasure hunt organized by Lt. Harry E. Riesberg, she went to the Silver Banks on a hunt for a sunken Spanish galleon. The expedition was cancelled when Riesberg fell and was injured. Changing hands again in 1936, she was further employed as a salvage vessel, preparing for an expedition in search of the sunken passenger liner *Merida*. The *Merida* had been sunk in 1911 in a collision with the SS *Admiral Farragut*, 55 miles east of Cape Charles, Virginia. She was rumored to have been loaded with a large quantity of gold and silver. Leaving from Jersey City on August 20, 1936, the *Constellation* reached the supposed site of the sinking within a week. Before much work was done, a gale blew up, and the *Constellation* was damaged and parted her anchor chain. She returned to New Jersey and the expedition was cancelled. She was laid up there.

World War II, like the previous war, created a demand for vessels to carry cargo overseas. One of the few wooden schooners to last this long, the *Constellation*, was purchased by the Intercontinental Steamship Company in 1943 and readied for a voyage to La Guaoira, Venezuela, carrying general cargo. Not long out, she was discovered to be leaking badly. Captain Howard Neaves headed for Bermuda for repairs. Heading into the harbor under light winds, she ran aground on North Reefs, becoming a total loss.

1932 saw further reductions in the fleet of C & T. The *Jennie Flood Kreger*, a big five-master, was laid up in Perth Amboy, New Jersey, for several years before being moved to the Meridian Street Bridge in East Boston. There, she was tied up with several other mothballed Crowell and Thurlow schooners including *Horace A. Stone*, *Ellen Little*, and *Augusta W. Snow* (Figure 6-69). On December 3, 1932, she caught fire. Although this fire was put out, she again caught fire in December of 1933 resulting in $5,000 worth of damage. By March of 1935, much of her upper structure and decks had been removed for firewood. She was removed and sunk offshore in 1940 by the Coast Guard after the death of a 12-year-old boy who had been playing in her rotted hulk (Figure 6-70). The public outcry that resulted from this incident was responsible for a lot of cleanup of old hulks in the East Boston area, including the *Stone* and the *Snow,* which were both sunk in deep water off Boston. In 2005, an archaeological survey tentatively identified the resting place of the *Augusta W. Snow* in Massachusetts Bay (Figure 6-71). The *Ellen Little*, however, was saved this fate, and sold to Portuguese interests. At the time she was owned by J.V. Riley, who had purchased her from C & T. She was eventually broken up in the Cape de Verde Islands in 1937.

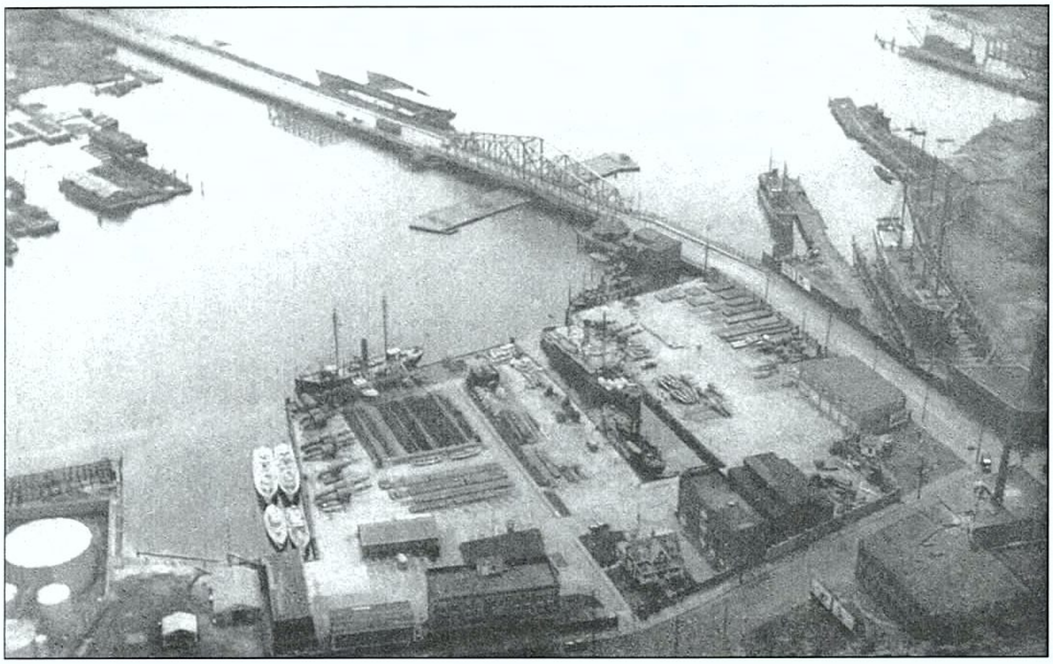


Figure 6-69. East Boston's Meridian Street Bridge in the early 1940s, showing a number of abandoned Crowell and Thurlow vessels, including the *Horace A. Stone* in the upper left, the *Jennie Flood Kreger* in the upper center against the bridge, and the *Augusta W. Snow* outside the *Kreger*. The *Helen Barnet Gring* is undergoing repairs on the marine railway at right (as presented in Morris 2002).

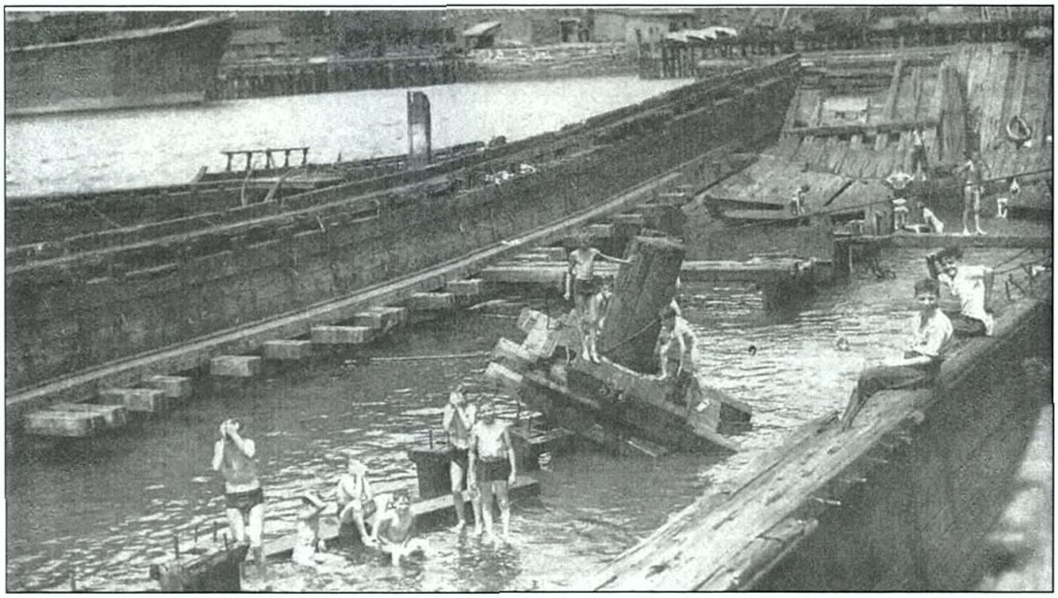


Figure 6-70. The sunken hulk of the *Jennie Flood Kreger* was a popular site for Boston youth in the 1940s (as presented in Morris 2002).

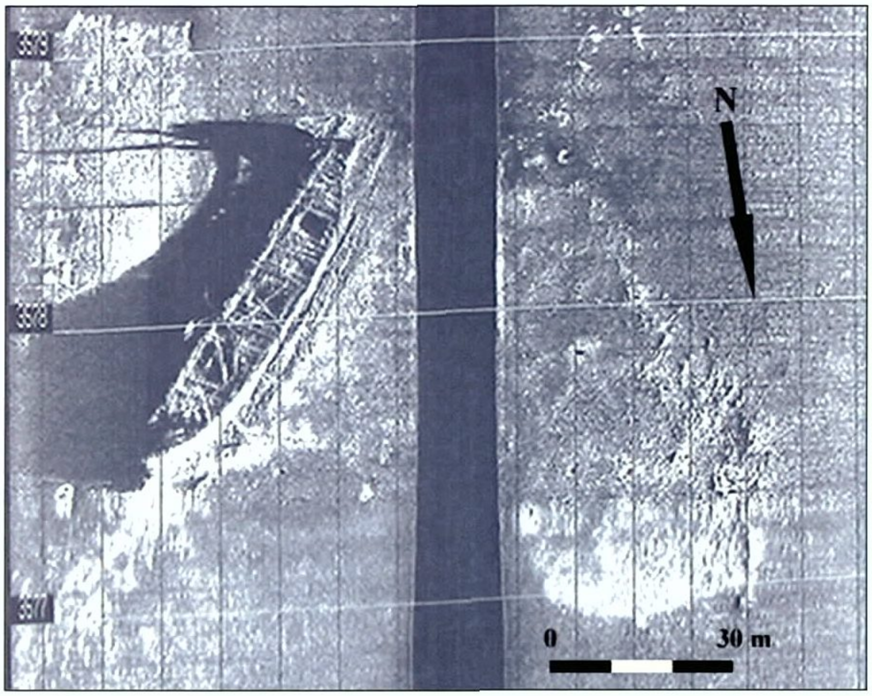


Figure 6-71. Sidescan image from Massachusetts Bay of a wooden four-masted schooner, tentatively identified as Crowell and Thurlow schooner *Augusta W. Snow*.

By 1933, the New England Maritime Company ceased to be listed in Lloyd's Register of Shipping, indicating at the very least that they no longer owned any vessels. The remaining 13 Crowell and Thurlow vessels were divided in ownership between the Boston Maritime Corporation, Crowell and Thurlow, and Lewis K. Thurlow. A good number of these schooners were already unable to put to sea due to their deteriorated condition. 1934 saw the laying up in Boothbay Harbor of the last active Crowell and Thurlow schooner, the *Zebedee E. Cliff*. The

Josiah B. Chase was sold that year to Estonian interests for the Baltic trade and renamed *Mikhel,* (Figure 6-72). On January 23, 1944, she sank en route to Germany during severe weather.

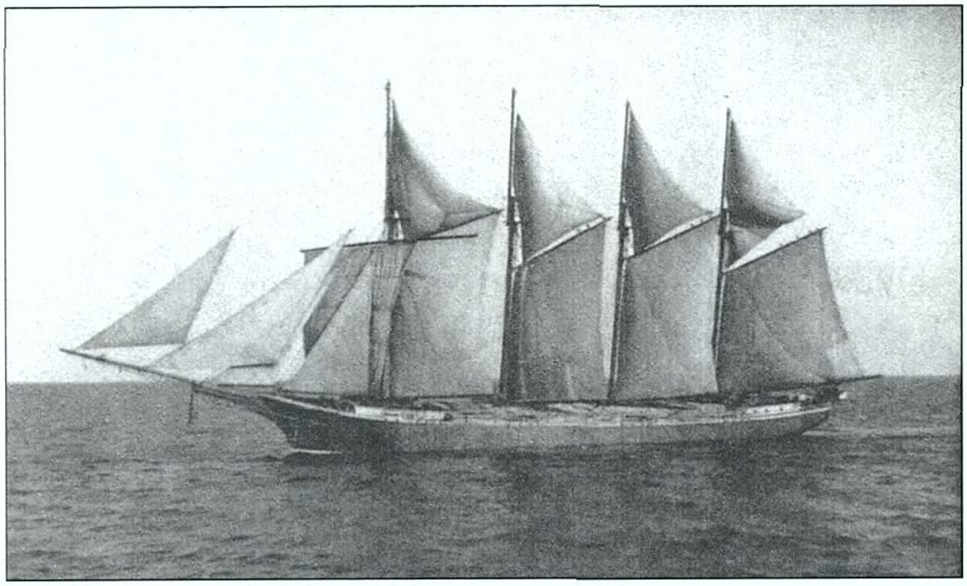


Figure 6-72. Estonian vessel *Mikhel* (ex *Josiah P. Chase*) under sail in the Baltic Sea ca. 1940 (as presented in Morris 2002).

The following years of the 1930s saw the disposal of the remaining fleet, by now mostly deteriorating hulks. The *Josephine A. McQuesten* was sold to Estonian interests, but she was wrecked in the Faroe Islands before she could reach her destination. The *Mabel A. Frye,* which had been in Boothbay Harbor for a number of years, was sold to Captain Alexander Rodway of Newfoundland, who intended to run her in the coal trade. In April of that same year, while on a voyage from Sydney, Nova Scotia to Bay Roberts, Newfoundland, after battling bad weather for five days, the *Frye* had lost most of her sails, masts, and rigging before her seams started leaking. The crew took to the pumps, but they were soon clogged with coal dust from the hold, and they abandoned ship after flagging down the steamer *American Merchant*. The *Herbert L. Rawding* was sold for approximately $3,000 to the Kiraco Transportation Company of New York. After considerable repair, she was sailed from Portland, Maine in June 1937. Also that year, the *Helen Barnet Gring* was sold to Bernstein and Jacobson of Portland, who had also purchased and partially stripped the *Harry G. Deering*. The *Gring* was taken to Port Greville, Nova Scotia for major repairs. On October 15, 1937, she departed for England with a cargo of lumber. Eventually, she was laid up again, this time in Chelsea, Massachusetts, in September 1938, but not before being used along with the *Deering* in a salvage operation in the Cape Cod Canal. The tug *Plymouth* had been rammed and sunk at the east end of the canal, and the two schooners were to be used as pontoons to refloat the vessel. The effort failed and the tug was destroyed with dynamite to clear the channel. In June 1940, the *Gring* was purchased by the Clipper Marine Shipping Corporation of Portland, and Captain Arthur Scott replaced Captain Plummer as master. While en route from Las Piedras, Venezuela, to Jacksonville with a load of goat manure, she ran onto the reef at Cayo Verde, Cuba, on October 22, 1940, and was a total loss.

The ultimate end for the sailing operations of Crowell and Thurlow came about quietly during 1939. That year, the company is listed as owning three schooners, the *Courtney C. Houck*, the *Freeman*, and the *Zebedee E. Cliff*. The *Freeman* was sold to Nova Scotia interests and used as a coal hulk in Halifax. She was eventually scuttled off Halifax in 1947. The *Cliff* was used, along with the *Maude L. Morey,* by the U.S. government as part of a breakwater at Long Island, Casco Bay, Maine.

The last Crowell and Thurlow vessel, the five-masted *Courtney C. Houck*, has a more interesting fate. Purchased by the company in 1926, she had been used as the setting for a silent film entitled "Cappy Ricks" in 1921. This was but a brief respite from her career of hauling coal, which she did until laid up at Boothbay Harbor in the 1930s. She remained there, sitting on the bottom with a hold full of water, until 1937 when she was purchased by Bernstein and Jacobson for $255. She was stripped of all usable parts, and by the start of WWII she was a dismasted hulk. Her remains were burned at the end of the war. The next year, all organizations associated with Crowell and Thurlow disappear from the register as managing owners.

The *Herbert L. Rawding* was the longest lived of all of the Crowell and Thurlow vessels. Purchased from C & T in 1937 by a Dr. Baruch, she was resold in 1937 to Robert Rockson, her then current captain (Figure 6-73). He in turn sold her to Captain Harold G. Foss, and the vessel then passed through a succession of owners, until she was purchased by Freeman Wareham in 1945, and at that time she was transferred to Canadian registration. In 1946, she had two diesel engines installed, and her topmasts, jib boom, and spanker were removed. She sailed for Cadiz, Spain, in 1947, where she loaded a cargo of salt. On the return trip, her seams opened up due to vibration from the engines and the crew was forced to abandon ship. The vessel sank stern-first approximately 500 miles off Cape St. Vincent after her crew had evacuated to the Liberty ship *Robert W. Hart*.

While the demise of the Crowell and Thurlow sailing interests was a drawn out, painful affair, the end of the company's steamship interests was surprisingly quick. The Crowell and Thurlow Steamship Company went bankrupt in 1924, ending the Crowell and Thurlow foray into steam vessels. The exception was the excursion steamer *Dorothy Bradford*, which, along with the *Steel Pier*, was owned and operated by the Cape Cod Steamship Company, which was taken over by Crowell and Thurlow in the 1920s and operated as its own entity until the *Bradford* was scrapped in 1948. The assets of C&TSSCo. were taken over by the newly formed Mystic Steamship Company in that same year.

In 1931, the company was still operating all nine vessels acquired from Crowell and Thurlow. By 1936, all vessels—save one, the *Lewis K. Thurlow*—had been taken over by the Koppers Coal Company. The *Thurlow* was sold to the Eastern Transportation Company in 1937, cut down to a barge, and renamed *Ajax*. She was eventually broken up in 1951. Koppers overhauled the *Peter H. Crowell* in 1933, and she was used for six years before she was broken up for scrap in 1939. The *Felix Taussig* remained with Koppers until 1942, when she was sold to Eastern Gas and Fuel Associates. Four years later she was again sold, this time to Panamanian interests and renamed *Georgie*. In April 1947, she ran aground in the English Channel en route to Denmark. While salvers were able to free her, she was severely damaged. After undergoing repairs in Newport News, she was sold in 1948 to Italian interests and renamed *Ata*. After six years of service in Italy, she was scrapped. Like the *Taussig*, the *Edward Peirce* was transferred to Mystic. While with this company she was involved in a collision with the SS *Muldelta* in Boston Harbor, a collision that sunk the *Muldelta*. She was repaired and eventually sold to the Koppers Coal Company along with several other vessels. She was employed in coastal work until her scrappage in 1949, with more than 1,000 voyages in her log. The *Walter D. Noyes* had a similar fate. After going to Koppers and then to Eastern in 1941, she was sold in 1949 to the Eastern Transportation Company of Baltimore. Cut down to a barge at that time, she was scrapped in 1951. The *Stephen R. Jones* also was sold to Koppers, then to Eastern. On June 28, 1942, she struck rocks in the Cape Cod Canal and sank broadside in the canal. The U.S. Navy cleared the wreckage using 17.5 tons of dynamite.

Lewis K. Thurlow passed away before WWII, at the age of 74. Paul Thurlow, his son, took control of what remained of the company, including the Cape Cod Steamship Company. With only one vessel, the SS *Steel Pier*, the company continued to operate until she was broken up in Baltimore in 1948, and the shipping empire of Crowell and Thurlow ceased to exist.

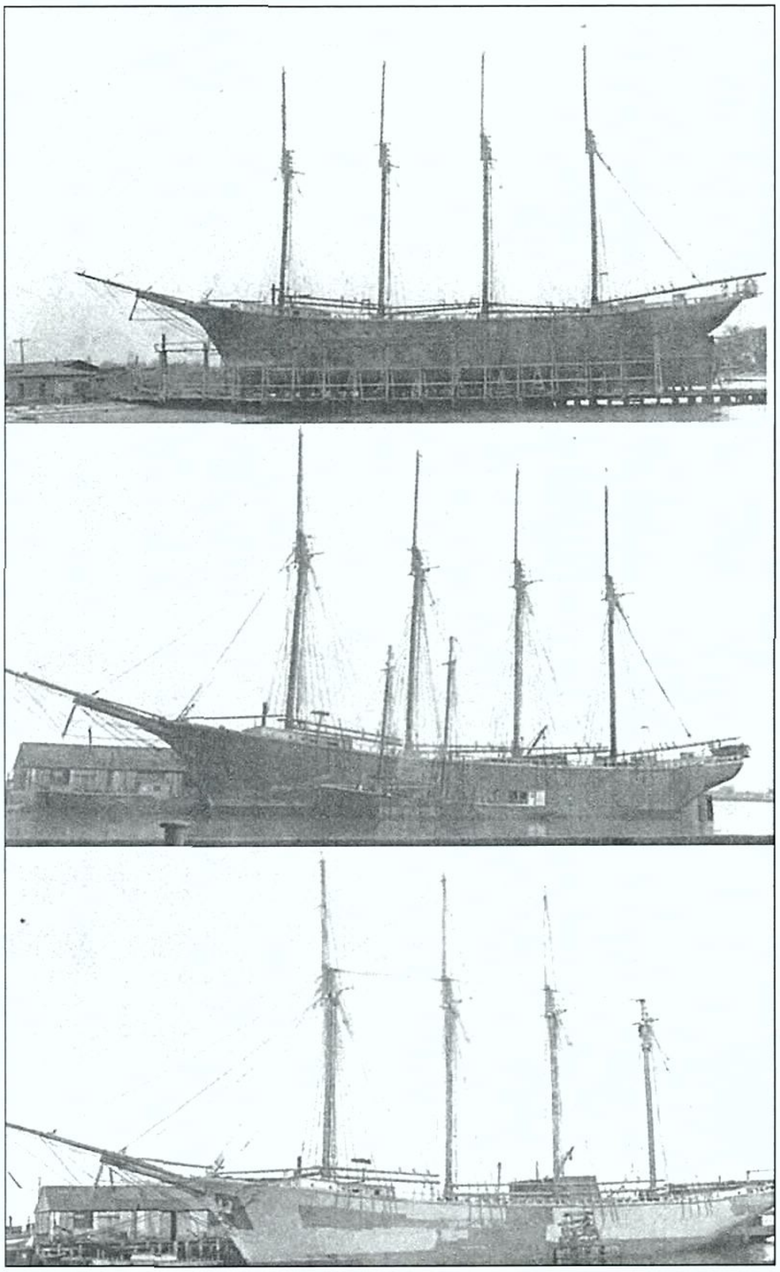


Figure 6-73. ***Herbert L. Rawding*** **undergoing repairs in 1937 in South Portland, Maine. The vessel would work until 1947, when she sank off Cape St. Vincent (as presented in Morris 2002).**

HISTORY OF THE SCHOONER PAUL E. THURLOW

The four-masted schooner *Paul E. Thurlow* was built and launched by the Francis Cobb Shipbuilding Company (Figure 6-74). Located in Rockland, Maine, Francis Cobb, later to be renamed the Cobb, Butler Company, constructed almost 20 sailing vessels for the shipping firm of Crowell and Thurlow, most during World War I. Named for the son of operating partner Lewis K. Thurlow, the vessel was owned and operated by the Atlantic Coast Company, a subsidiary of Crowell and Thurlow, until 1924. At that time, she was transferred to the New England Maritime Company, another Crowell and Thurlow subsidiary, during a company reorganization that occurred in the mid-1920s. Before being sold in 1931, she carried bulk cargo for the company, including coal and lumber (Figure 6-75).

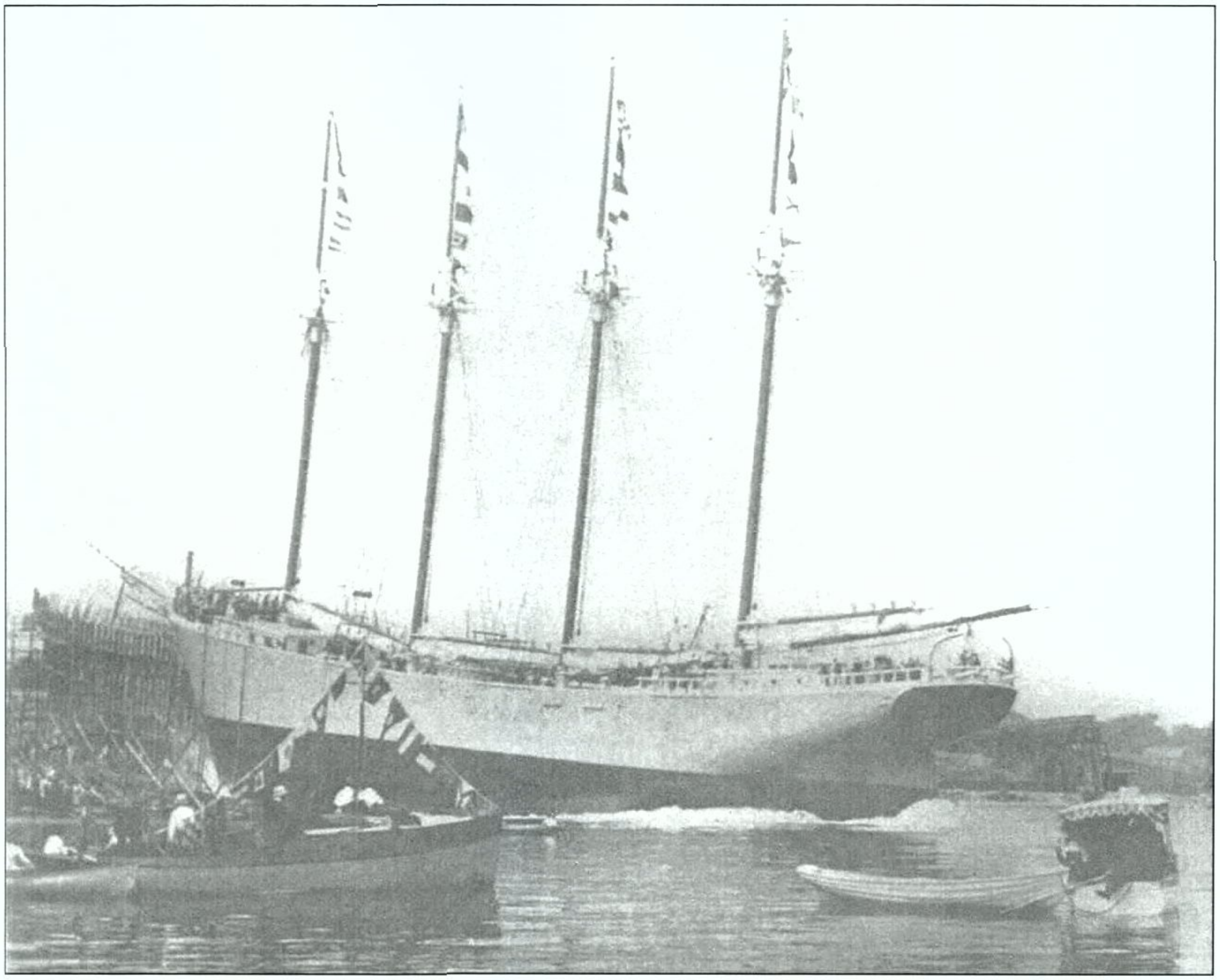


Figure 6-74. ***Paul E. Thurlow*** **is launched at the yard of Francis Cobb Shipbuilding Company of Rockland, Maine, on August 29, 1918 (photo courtesy of Mystic Seaport Collections and Research Department).**

The *Paul E. Thurlow* was a four-masted schooner of 1,590 gross tons and 1,453 net tons. At 230 feet in length, 41.8 feet in breadth, and 23.3 feet in depth of hold, she was among the larger four-masted schooners built in the waning days of the coastwise sailing industry. Although plans specific to the *Thurlow* were not located during the historical records search, it may very well be that no specific plans exist. Many vessels built in the same yard during the same time period as the *Thurlow* may have used the same sail and hull plans. Figure 6-76 is a sail plan from the Cobb, Butler and Company shipyard, with notations indicating it was used for the *Josephine A. McQuesten*, *Josiah B. Chase*, *Atlantic Coast*, and *Elizabeth Freeman*, all vessels of similar size built at the same yard and during the same time period as the *Thurlow*. They are also nearly identical in size to the *Thurlow*. While this may or may not have been the exact plan used in the rigging of the *Thurlow*, it most certainly would have been similar.

In January 1931, the vessel was sold by order of the federal court in Portland, Maine. The purchaser, William M. Martino of New York, also purchased the *Ella Pierce Thurlow*, paying $1,650. Both vessels were cut down and used as schooner barges to haul bulk cargo. The *Paul E. Thurlow* received three masts and a new pilot's cabin on the afterdeck (Figure 6-78). She was used to haul coal until October 1944, when she was abandoned on Staten Island just west of the Bayonne Bridge.

Figure 6-75. ***Paul E. Thurlow*** **sometime in the 1920s, loading coal (photo courtesy of Mariner's Museum).**

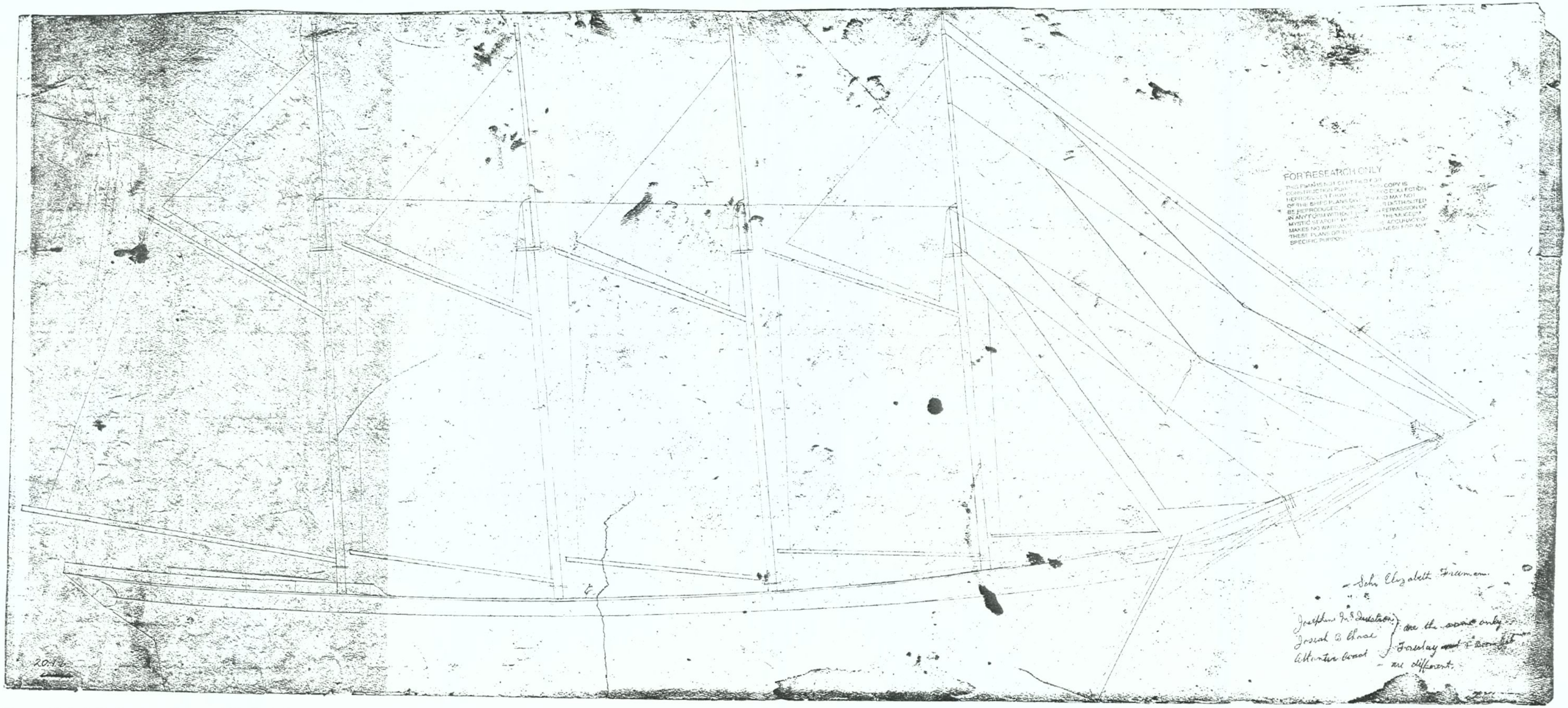


Figure 6-76. Sail plan for schooner *Elizabeth Freeman*. The same plan applies to the *Josephine A. McQuesten*, *Josiah B. Chase*, and *Atlantic Coast*, although the forestay was different for the latter three (courtesy of Mystic Seaport Daniel S. Gregory Ship Plans Library).

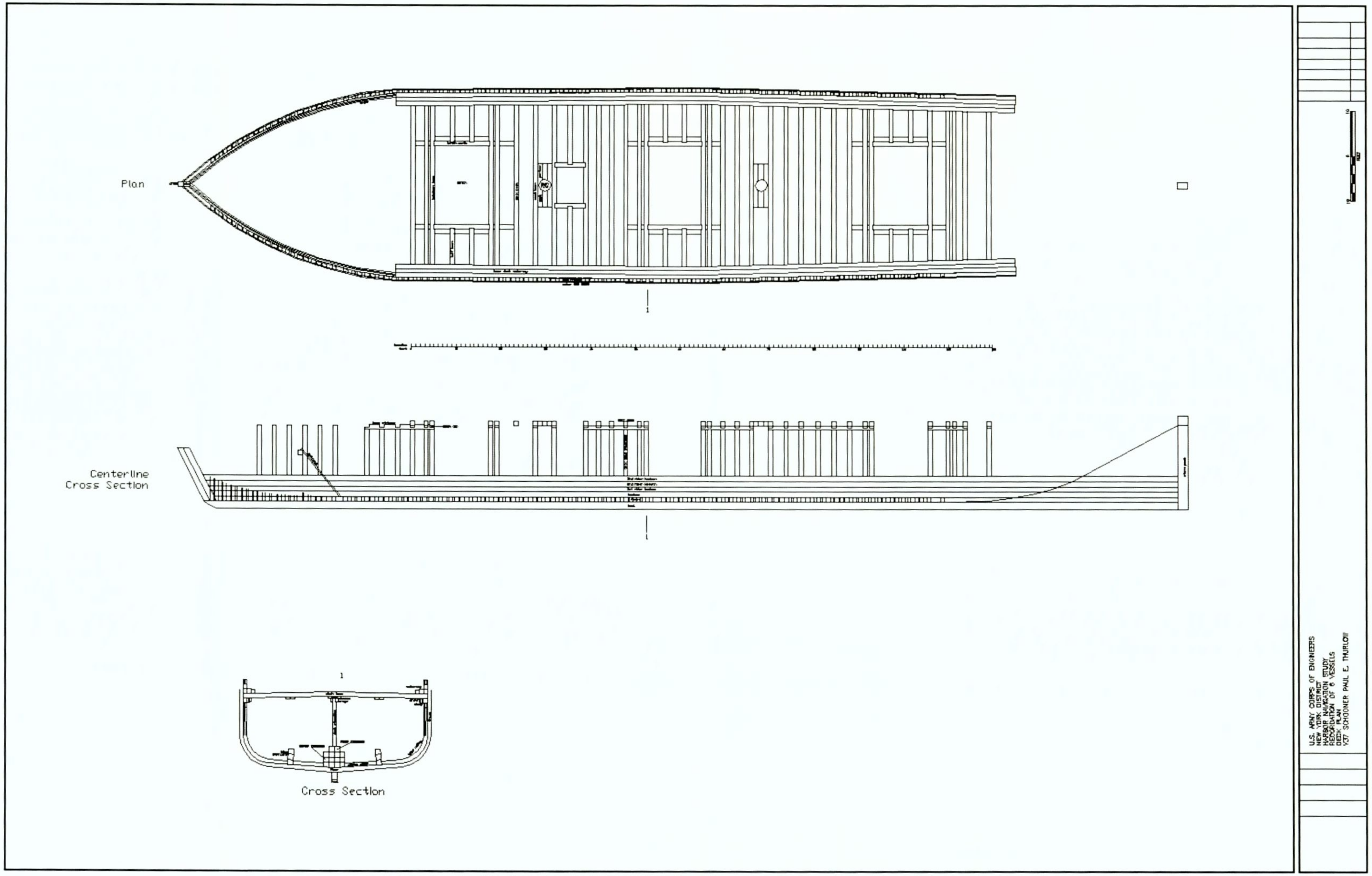


Figure 6-77. Plan, longitudinal cross section, and athwartships cross section of *Paul E. Thurlow* remains.

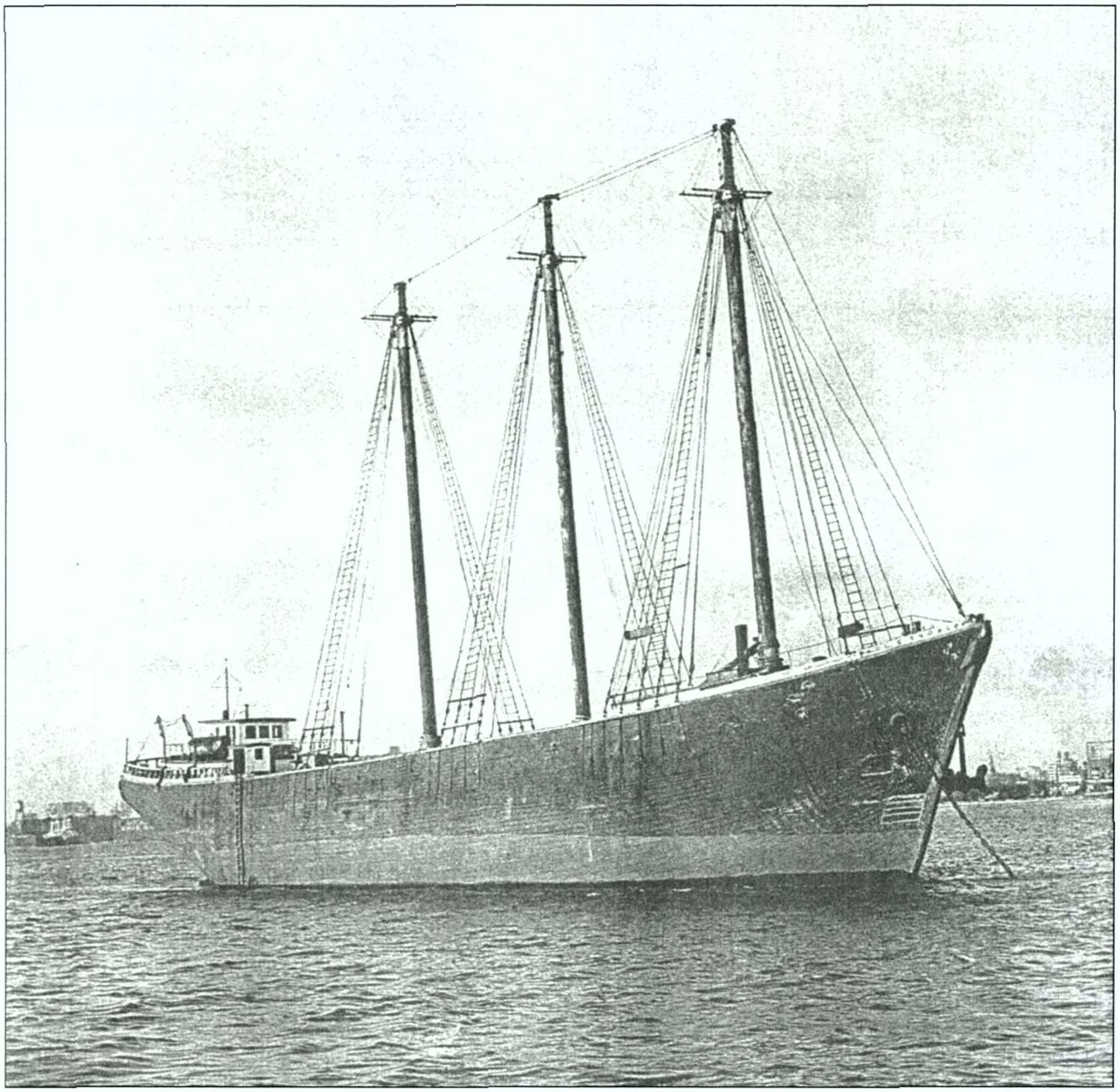


Figure 6-78. ***Paul E. Thurlow*** **shown ca. 1935 as a schooner barge (photo courtesy of Mariner's Museum).**

PREVIOUS INVESTIGATIONS

Raber and Associates (1995) inventoried over 500 derelict vessels in Kill Van Kull and Arthur Kill, including V37. They recommended each vessel be assessed as to its National Register eligibility and that field investigation be undertaken to collect basic measurements, photographs, and registration numbers, as well as basic historic background research (Raber et al. 1995:159).

In 1995, Panamerican Consultants, Inc., in its Phase II assessment of wrecks in the Arthur Kill, assessed V37 as historically significant and representative of the last days of large scale commercial sailing ships, and recommended complete documentation of the above water structure, and a plan view of the hull outline, framing pattern, deck stanchions and holds (James 1999:379).

REMAINS OF VESSEL V37: PAUL E. THURLOW

GENERAL DESCRIPTION

The vessel lies in the position in which it was abandoned in the 1940s. It is located on the north shore of Staten Island, west of the Bayonne Bridge and east of Shooter's Island. It sits with the bow facing south, toward the shore (Figure 6-79).

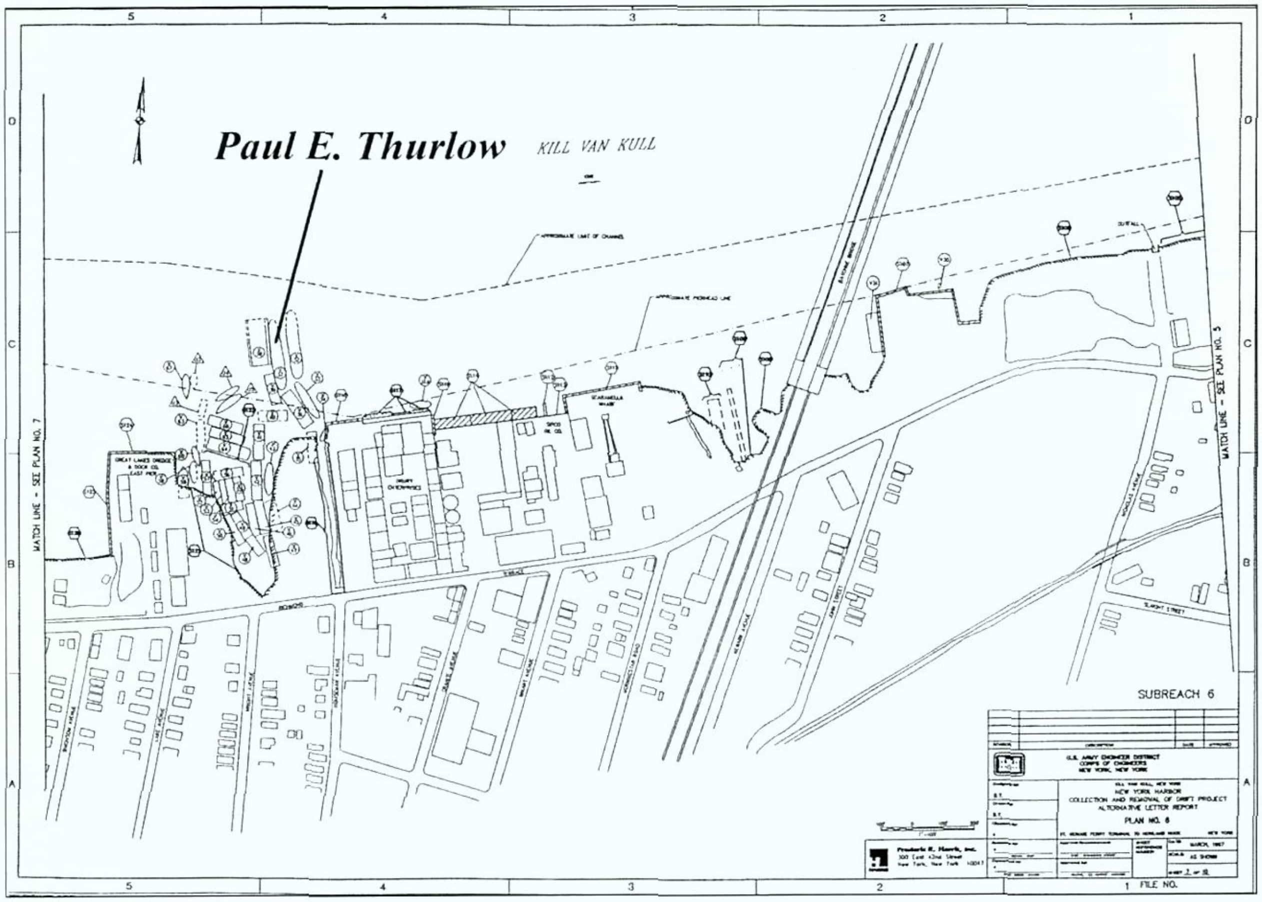


Figure 6-79. Location of *Paul E. Thurlow*.

The hull of the *Thurlow* remains fairly well intact to the second, or cargo, deck (Figures 6-77 and 6-80). The presence of portions of the stem and sternpost indicate the hull is extant along most of its length as well. The planking of the cargo deck is no longer present. The absence of any significant deteriorated deck timbers suggests two things: that the wood may have been removed for salvage rather than allowed to deteriorate in place, or there never was any. The presence of fasteners and fastener holes in the deck beams suggests the former. The hull above the cargo deck, along with the upper deck and masts, is no longer present and it is unknown whether it was salvaged or allowed to deteriorate. The fact that the *Thurlow* was abandoned rather than wrecked, along with evidence of other salvage, would suggest at least some salvage of upper hull timbers has occurred. The tops of the existing hull timbers exhibit significant deterioration so if any salvage has occurred it has been some time since.

The bow and stern areas exhibit more deterioration than the central two-thirds of the ship, with exposure of the lower hull indicated in both areas. Since the vessel sits at a slight angle to the stern, the bow was exposed at low tide, allowing limited access to the area below the cargo deck for recordation. Lower hull was generally inaccessible being below the low tide line and under a 4-6 foot covering of harbor mud. However, enough records exist of other schooners built during the same time period, that a certain amount of interpolation can be achieved by reference to other designs. The stern area between the last extant deck beam is deteriorated to a point considerably below the cargo deck level. Diver investigations indicate the area to be covered by a large collection of debris and mud with the exception of the rudder and sternpost.

Deck features present include three cargo hatches and the remains of a personnel hatch immediately aft of the mizzenmast hole. Two of the four mast holes, the main and the mizzen, are present. The foremast hole is missing along with the supporting deck beams; the jigger mast supporting timbers are not extant, even though the deck beams are present. Deck support stanchions are evident along the intact portion of the lower deck and toward the bow.

Figure 6-80. General view to the north.

KEEL

This timber is hidden and inaccessible along with the rest of the lower hull. However, the dimensions of a keel are generally reflective of the size of the vessel. For instance, the 226-foot *James Pierce*, a C & T vessel built in 1901 by the Washburn Brothers of Thomaston, Maine, had a keel measuring 18 inches molded and 15 inches sided. By contrast, Estep (1918) discusses what he refers to as a modern American wooden ship of the conventional type. Specifically, he refers to a vessel with a single deck, 275 feet in length, with a keel measuring 18 × 20 inches. Alternately, he also discusses a 290-foot five-masted auxiliary schooner with a keel measuring 20 × 24 inches. Desmond (1919), another vintage wooden ship building how-to book, discusses a four-masted schooner designed by Cox and Stevens. With a length of 200 feet, this vessel has a keel of 14 × 20 inches. Specifications of various vessels indicate the lengths of timbers scarphed to form the keel be no less than 45 feet in length; plans for the 200-foot *Herbert L. Rawding* specify timbers of 42.8 feet. Based on this information, it is likely the dimensions of the *Thurlow* keel are somewhere in the neighborhood of 18 × 14 inches. Individual timbers of 45 or so feet in length would make up the 200+-foot length of the keel. Joints were likely either a plain scarph fastened with galvanized iron fasteners or a keyed scarph.

KEELSONS

As with the dimensions and numbers of keelsons, they appear to vary in dimensions with the size of the vessel. The description of the *James Pierce*, as related in Morris 2002, indicated a keelson with dimensions of 15 × 15 inches, and a total of four rider keelsons of the same dimensions. Cross section measurements taken from the cargo deck of the *Thurlow* to the ceiling planks showed a drop in depth of 4 feet, 9 inches at the centerline of the vessel. Assuming a ceiling plank thickness of 12 inches in the hold and a 15 × 15-inch keelson dimension would indicate a total of four rider keelsons sitting stop the main keelson of the *Thurlow*, making a total of 72 inches of material in the vertical dimension. This measurement is similar to other vessels of this size class. However, one interesting note that differentiated the *Paul Thurlow* from other vessels of this type is suggested by the depth of hold measurements take during the project. Cross section measurements taken at several different points along the hull suggest a double width stack of four keelsons along the centerline. This is reflected in the vessel drawings accompanying this report, but due to the depth of overburden in the hull and various safety issues, this was not confirmed via direct inspection (see Figure 6-77).

SISTER KEELSONS

Descriptions provided in Morris (2002) of the *James Pierce* indicate a sister keelson dimension of 14 × 14 inches, stacked in single part and starboard tiers three timbers high. Depth of hold measurements taken on the *Thurlow* seem to indicate single port and starboard tiers two-high of sisters measuring 12 × 12 inches. This seems somewhat undersized, both in terms of number and dimension, for a vessel this size, although the cross section presented by Desmond (1919:55) of a 200-foot auxiliary schooner illustrates sister keelsons two-high of 12 × 14-inch dimension.

CEILING

No data was gathered regarding the dimensions of the floor or bilge ceiling planking. However, as with other parts of the vessel, a close approximation can be obtained through analogy to similar sized vessels built during the same time period. Ceiling planking is slightly more problematic, as sources consulted do not indicate the same correlation between the size of the vessel and the size of the planking, although ceiling planking seems to be thinner if the vessel is braced with iron strapping between the frames. However, some commonalities are evident, including the use of thicker planking around the turn of the bilge (the bilge ceiling) to aid in increasing longitudinal strength. The 200-foot four-masted schooner detailed by Desmond (1919:55) indicates ceiling planking with a thickness of 7 inches. Likewise, Estep details a 290-foot auxiliary schooner with ceilings of 10-inch thick material. By contrast, the midship section of a 4,000-ton steamer with iron bracing has ceiling planks with only 8-inch thickness. Morris (2002:30) details an account of the construction of the *James Pierce,* which describes the ceiling as 12 × 14 inches in the lower hold. Given the size of the vessel and its lack of composite construction, it is likely the floor ceiling on the *Thurlow* is around 10-12 inches in thickness. At the turn of the bilge (bilge ceiling), this generally increases by 2-4 inches around the turn until the frames are vertical. The mold ceiling planks are typically thinner, but the thicker planks may be used to further stiffen the vessel longitudinally. Observations on the *Thurlow* indicate the mold ceiling consists of three layers of 3.5-inch planking at a point just below the cargo deck (Figure 6-81). This would suggest a bilge ceiling thickness of 14 inches.

Figure 6-81. Bow looking aft (north) showing composite mold and bilge ceiling.

Figure 6-82. Starboard side looking starboard (east) showing extant mold ceiling. Note composite shelf just below deck beams.

FRAMES

As with the other bottom structure, the floors were inaccessible to the recording teams. Insight can again be gained by referring to previous examples. Frame sets measured at the cargo deck level on the *Thurlow* were 9 inches. The floors would have been thicker, probably on the order of 12-15 inches. This does seem to have been a relatively lightly built vessel, given its size and the use by the builders of composite timbers rather than solid, and it is probable the thickness of the floors is toward the smaller end of that range. Sided dimension of the floors would be the same the entire length of each timber, and is a consistent 12 inches, making each frame set 24 inches in a sided direction. Space between frames is 12 inches amidships.

OUTER HULL

The outer hull is highly deteriorated and much of the plank above the low tide line is missing. However, enough remains to form a clear picture of the character of the outer hull. Planks measure 9 inches molded and 4 inches sided and are fastened to the frames with galvanized iron rose head spikes in an alternating pattern.

CARGO DECK

Since the vessel is extant only to the cargo (or second) deck, recordation was fairly straightforward. The deck has no planking. While it is possible, due to the *Thurlow* being a bulk cargo carrying vessel, that no planking was installed in order to facilitate the loading and unloading of cargo such as coal or lumber, the presence of fasteners and several extant deck planks indicate that decking was in fact installed on the cargo deck. It more than likely was removed, as the vessel shows evidence of significant salvage. Deck planks, interpolated from the few remaining on the deck and the fastener pattern, measure 3 inches molded and 7 inches sided, and are made of high quality yellow pine. Fasteners are rose head iron spikes 6 inches in length in an alternating pattern (Figure 6-83).

Figure 6-83. Single remaining deck plank just starboard of forward hatch. Note rose head spikes and fastener pattern.

Deck support beams remain over the central two-thirds of the vessel, approximately 130 feet. The hull has deteriorated past this deck toward the bow and stern, including the timbers supporting the deck beams (Figures 6-84 through 6-86). Deck beams measure between 12 and 13 inches sided and molded, although they are heavily weathered, and are placed on 52-inch centers.

Figure 6-84. Cargo deck. View to the north. Note sternpost, left center.

Figure 6-85. Cargo deck. View to the north.

Figure 6-86. Cargo deck midships. View to the west.

The deck is suspended through the use of a clamp and shelf, rather than hanging knees. While slightly weaker structurally, the use of this arrangement is advantageous for two reasons. One, given the deforestation of the east coast by the early twentieth century, a sufficient number of compass timbers would have been difficult and much more expensive to procure than previously. Additionally, the increased production levels in the late 1910s would have further pinched the supply. Second, dispensing with the necessity of shaping individual knees and instead using a continuous longitudinal timber to support the deck would reduce the overall labor requirements of vessel construction, enabling a yard to produce the vessel more quickly and at reduced cost.

The clamp consists of a 12 × 14-inch timber fastened directly to the frames via galvanized iron drift bolts. Although this timber ends where the remains of the deck end toward either end, it would have been continuous from stem to stern, fastening to the stem at the bow and ending at the transom in the stern. The shelf is a composite timber, consisting of three 14 × 3.5-inch beams, fastened to each other and to the inboard edge of the clamp with drift pins that pass through the clamp but not into the frames (see Figure 6-82). The tops of both the clamp and the shelf were notched 3 inches to receive the deck beams. The clamp timber rests directly on the topmost ceiling plank. The space above the clamp and between the deck beams is filled with 12 × 12 chocks (Figure 6-87).

Deck beams measured 12 inches square, with a slight crown. They extend to the outboard edge of the clamp, flush with the inboard side of the frames. The clamp timber is notched 4 inches to receive the deck beams, which are fastened to the clamps with galvanized drift bolts (see Figure 6-87). The deck beams are spaced on 52-inch intervals, with a space of 40 inches.

Figure 6-87. Starboard midships showing cargo deck beams in relation to clamp and frames. View to the south.

Spaced at various intervals along the centerline of the cargo deck are three cargo hatches. Measuring 12 feet wide by 16 feet in the fore-and-aft direction, the hatch openings were framed by the same 12 × 12-inch timbers used for the deck beams (Figure 6-88), with a couple of exceptions. The CAD drawings in Appendix E and Figure 6-77 show the hatch framing. Carlings, forming the longitudinal part of the hatch framing, are composite beams measuring 13 × 12.5-inches, and span four deck beams. Two half beams are notched into the outboard edge of the carlings to a depth of 3 inches, while the carlings are notched into the hatchway beams—the deck beams forming the fore and aft edges of the hatch opening—to a depth of 2.5 inches (Figure 6-89). The hatchway beams consist of a double set of deck beams with a five-inch space between them, filled periodically with chocks. A second carling placed just outboard of the main carling and notched to a depth of 7 inches to receive the deck beams is fastened to the underside of each deck beam. Both the fore and the aft end of each of these sub-carlings is notched with a lap joint to a depth of 7 inches and the lap extends under the beams out to the edge of the second of the pair of hatchway beams at each end of the hatch opening. Fastened to the underside of the main carling is a single plank measuring 5.5 inches by 12.5 inches. This corresponds with the 5.5 inches that the rider carling extends below the bottom of the deck beams, making the two flush. This beam extends fore and aft beyond the double hatchway beams to the next deck beam (Figures 6-90 and 6-91). A generic illustration of hatch framing is included in Figure 6-92.

Figure 6-88. Cargo deck showing cargo hatches. View to the west.

Figure 6-89. Detail of hatch carlings.

Figure 6-90. Detail of hatch beams. View to the northwest.

Figure 6-91. Detail of foreword cargo hatch with separated carling. Note notching of partial deck beams into carling and over rider carling. View to the northwest.

Also evident on the cargo deck framing are three of the four mast holes. According to various sources, including Desmond (1919:45), the framing of a mast hole generally consists of several distinct elements as illustrated in Figure 6-92, including chocks, which form the frame of the hole and are made up of individual timbers called mast partners, and mast carlings, which are fore-and-aft timbers that serve to tie the chocks to the deck beams immediately fore and aft of the mast hole structure (referred to as mast beams). The *Thurlow* differs from the illustration in Desmond in that the chock assembly consists of three 12-inch square partners fastened to each other and to the deck beams via iron drift bolts. There are no apparent carlings between the mast beams. It should be noted that the illustration in Desmond refers to the main deck structure, and the mast holes observed on the *Thurlow* are on the cargo deck. The chocks measure 7 feet long thwartships, and are presumably centered on the centerline of the vessel. The hole itself is 2 feet, 7 inches in diameter.

No lodging knees were noted in the construction of hatch or mast hole framing.

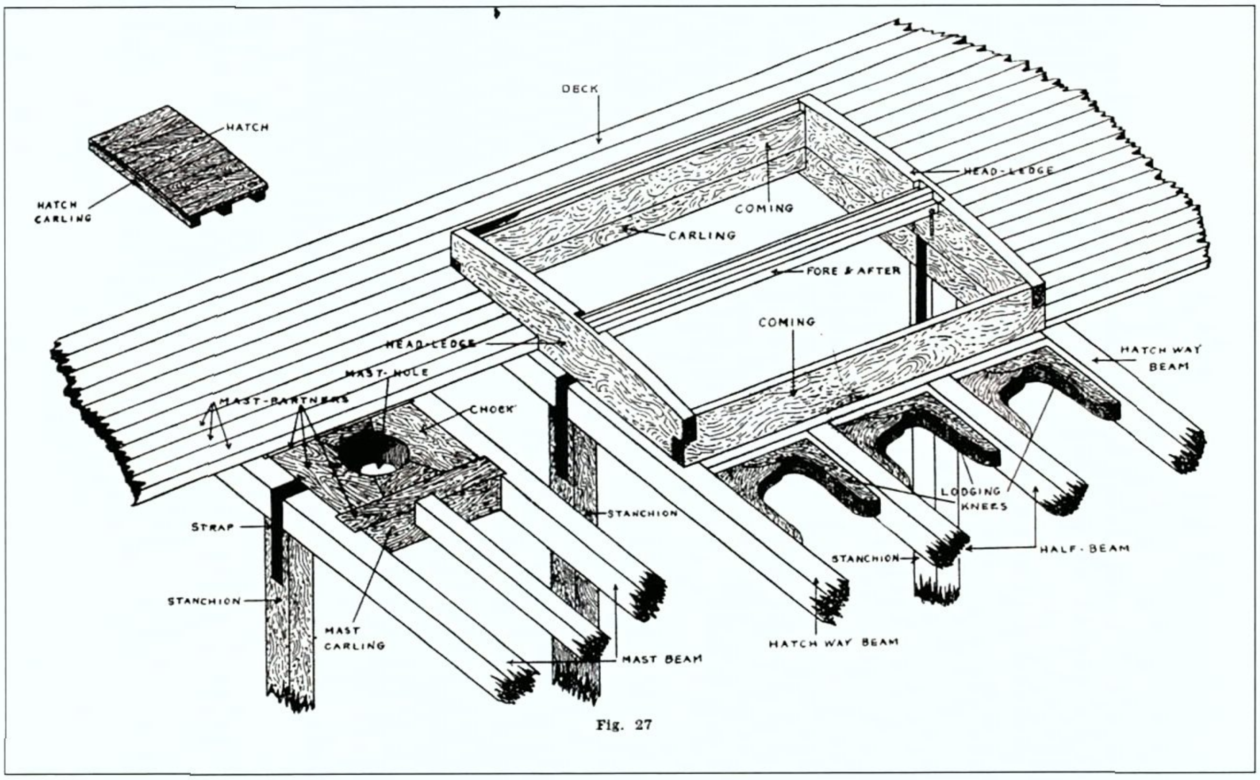


Figure 6-92. Illustration of common method of framing deck mast hole of typical wooden sailing vessels in the early twentieth century. Note use of lodging knees, which are absent in the *Thurlow* (as presented in Desmond 1918).

Waterway

The cargo deck waterway consists of three 12-inch square timbers running the length of the vessel (Figure 6-94). Placed side by side, they are fastened to the deck beams with galvanized iron drift bolts, as well as to each other via the same type of fastener, in an alternating pattern. Drift pins are 24 inches in length, and waterway timbers are fastened in rolling pairs, which gives maximum strength without using longer fasteners. Waterway timbers are notched 2 inches over the deck beams (Figure 6-95). Waterway timbers are joined longitudinally with a plain scarph joint (Figure 6-98) measuring 48 inches in length. The joint is not fastened other than via the regular waterway timber fastening pattern.

Figure 6-93. Detail of mainmast hole. View to the west.

Figure 6-94. Port side view aft (north) showing three-timber waterway of cargo deck. Note pattern of fasteners.

Figure 6-95. Port side view looking port (east) showing deck beam, waterway, and clamp.

Figure 6-96. Port side looking forward (south) showing scarph joint.

Cargo Deck Support

The cargo deck is supported down the length of the vessel along the centerline by a series of stanchions. Each deck beam is supported along the centerline by a corresponding stanchion measuring approximately 12 inches square. Deck beams are fastened to the stanchions via galvanized drift pins. The stanchions are stabilized fore and aft by the addition of stringers to either side of the stanchions just below the deck beams (Figure 6-97). The timber, 12 inches molded and 4 inches sided, is notched 4 inches to fit the underside of the deck beam, providing additional fore and aft stability for the deck beams. An additional timber, referred to as a cap, is placed between the deck beam and the stanchion (Figure 6-98). Also seen in Figure 6-98 is the absence of a reinforcing strap, commonly used on early-twentieth-century wooden vessels to reinforce the stanchion to deck beam connection along the fore and aft edges of deck openings (as seen in Figure 6-92).

The stanchions supporting the upper (or main) deck have been removed with no trace remaining. It is not immediately apparent what method was used to fasten the lower ends of the stanchions to the top of the cargo deck, or to the underside of the main deck. However, by examining analogs of the time period as well as the remains of the *Thurlow*, it is possible to gain some insight as to the construction method. It is highly likely that the same method used to fasten the stanchions to the cargo deck was used on the underside of the main deck. The top of the cargo deck is not quite as straightforward, although a few things are apparent, given the lack of fastening evidence on the tops of the cargo beams. The least likely scenario is there were no stanchions between the main and cargo decks. Given that this would likely weaken the vessel significantly, especially one that is used to carry deck cargoes, this possibility can safely be ruled out. There are no notches in the deck beams, indicating the stanchions were likely fastened directly to the beam or to another cap, such as seen in Figure 6-99. The presence of a number of larger drift pins protruding from the deck beams, seen in Figure 6-98, along the centerline of the vessel would suggest this to be the case.

Figure 6-97. View starboard forward (southwest) showing centerline stanchion and portion of stringers.

Figure 6-98. Stanchion detail on aft edge of forward cargo hatch. Note presence of stringers, cut just forward of the stanchion, the caps, and the absence of an iron reinforcing strap.

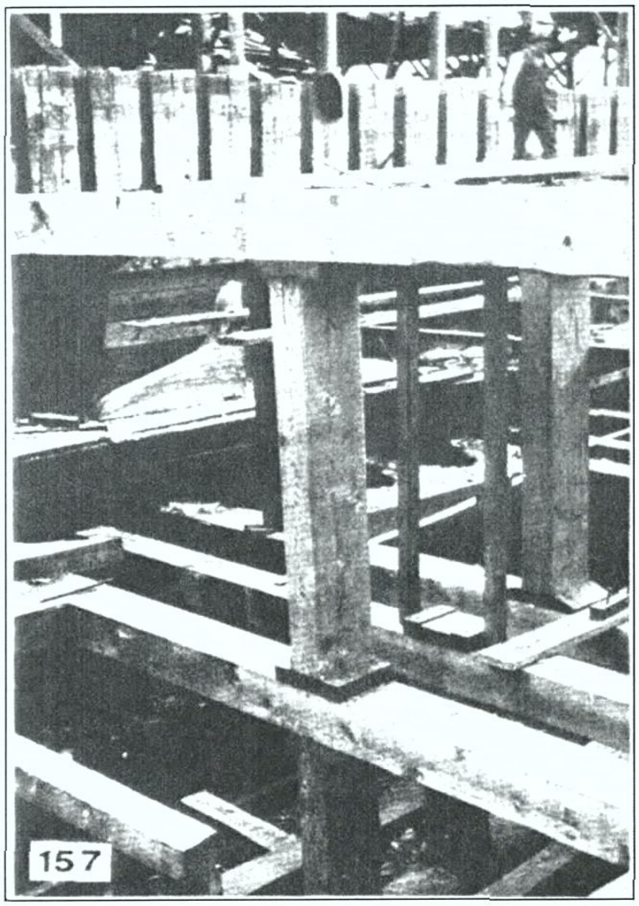


Figure 6-99. Typical wooden cargo vessel deck stanchion construction (as presented in Estep 1918:74).

Examination of the stanchion footings in the keelson was not possible due to safety reasons. However, given the similarity to other published examples of early-twentieth-century vessels, some speculation as to the form can be made with a reasonable amount of accuracy. Figures 6-100 and 6-101 show illustrations from Estep (1918:Figures 154 and 156). While neither one appears exact in relation to the bottom of the lower deck, one can see a couple of schemes to stabilize the bottom of the stanchions, from the notching of the rider keelsons to receive the end of the stanchion to holding them in place with angle iron. Given the general dearth of supplemental iron in the construction of the vessel, it seems unlikely that iron brackets would be used for this purpose. More than likely the rider keelsons were notched to receive the end of each stanchion although without corroborating evidence in the form of direct observation or analogous vessel plans or information, this remains speculative. One detail that can be gleaned from the examples from Estep is the fastening of the bottom of the main deck stanchions against the cargo deck. Particularly evident in Figure 6-99, but also in Figure 6-100, one can see that the base of the main deck stanchions appear to be resting directly on a foot that is fastened to the deck beam. Given the lack of evidence of fasteners and timbers along the vessel centerline where the stanchions would have been attached to the cargo deck, it is likely the form was some arrangement involving a minimum of fasteners and timber.

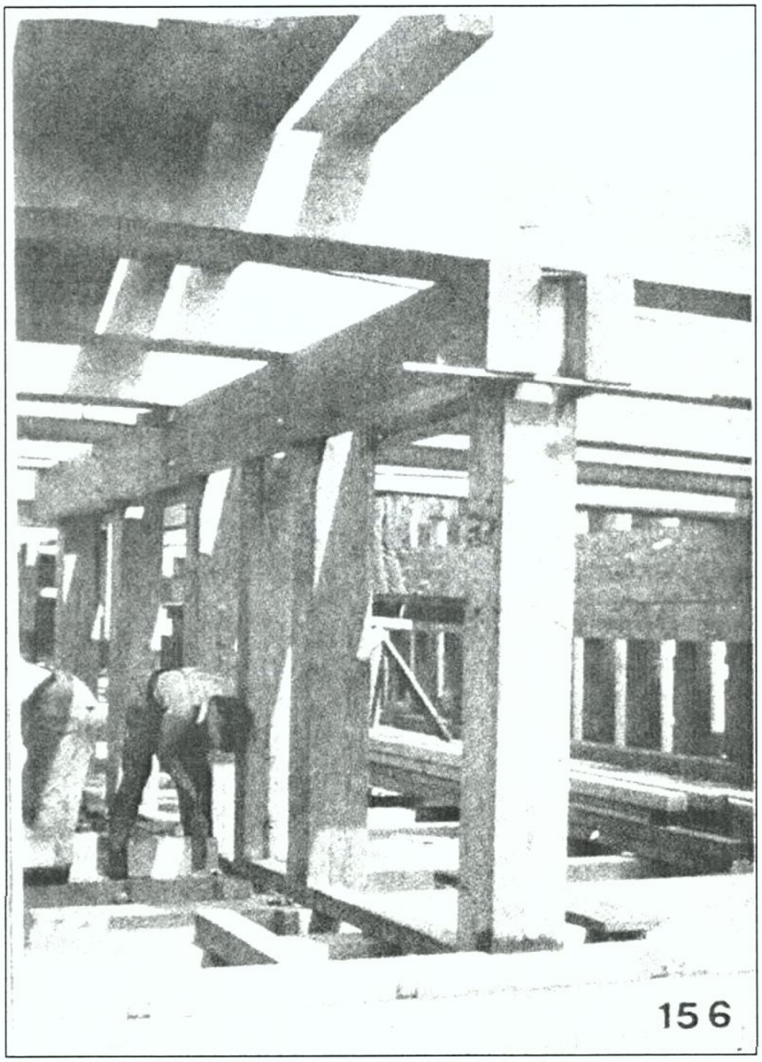


Figure 6-100. Typical wooden cargo vessel deck stanchion construction (as presented in Estep 1918:74).

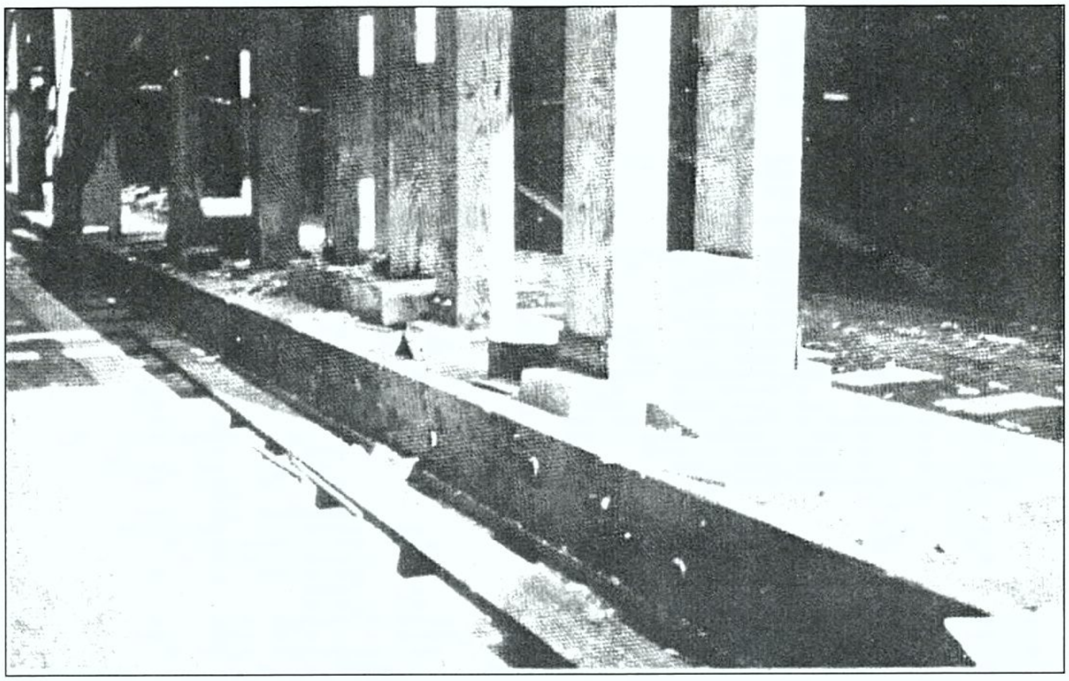


Figure 6-101. Typical wooden cargo vessel deck stanchion construction (as presented in Estep 1918:73).

Bow

The bow section is heavily deteriorated, and only visible at low tide (Figure 6-102). Given the angle of the outer hull planking as it meets the stem, it is apparent that it is very near the original waterline. Indications of the remains of the forward lumber hatch (Figure 6-102b) indicate the hull has deteriorated to a point slightly above the hatch; however. Other valuable construction details were evident.

Figure 6-102. Heavily deteriorated bow section. View to the south (forward).

Figure 6-102b. Starboard bow, indicating remains of forward lumber hatch.

STEM

The stem, heavily deteriorated but still present, consists of a stem or gripe (fore edge) and apron (aft edge) timber, both measuring 12 × 14 and fastened together with 1-inch galvanized drift bolts (Figure 6-103). The apron is fitted with a rabbet to receive the ceiling planks. There is no remaining evidence of a stem band or cutwater, including fasteners or fastener holes.

Figure 6-103. Deteriorated end of stem. View to the west.

Very little else of the extreme bow appears to be present. The knighthead is missing from both port and starboard, as are the hawse and filling timbers. However, a gap of approximately 2 feet on the starboard side and 3 feet on the port side indicate where these timbers were located, if not their dimensions. Also noted were two diagonal riders (Figure 6-103b). These timbers, in this case consisting of a laminate of three timbers of dimension similar to the clamp, serve to unify and join the hill sections together, stiffening the hull and reducing hogging. Fastened to the ceiling and frames with galvanized drifts, these timbers are likely chocked to the keelson and cut with a bird's mouth into either the overhead deck beam or the clamp and shelf.

Figure 6-103b. Starboard diagonal rider.

Stern

The stern section of the *Paul E. Thurlow* is deteriorated as well, with just the lower hull remaining. Diver investigations in the stern area indicate the area is covered by a large amount of unrelated debris and mud, with frames and outer hull planking exposed. Major stern structural components like the keel, dead wood, and skeg are either missing or inaccessible. There are no remains of the counter timber, transom, filling chocks, or filling transoms. The sternpost, measuring 14 × 24, consists of two timbers that are edge fastened with iron drift bolts. The sternpost is highly eroded, particularly in the tidal zone (Figure 6-104). However, below the low waterline it is well preserved (Figure 6-104b), and several sets of gudgeons and pintles are still in place. The rudder, highly deteriorated, is in position aft of the sternpost, but has been dismounted from the gudgeons (Figure 6-104c).

Figure 6-104. Sternpost. View to the northwest.

Figure 6-104b. Stem timber.

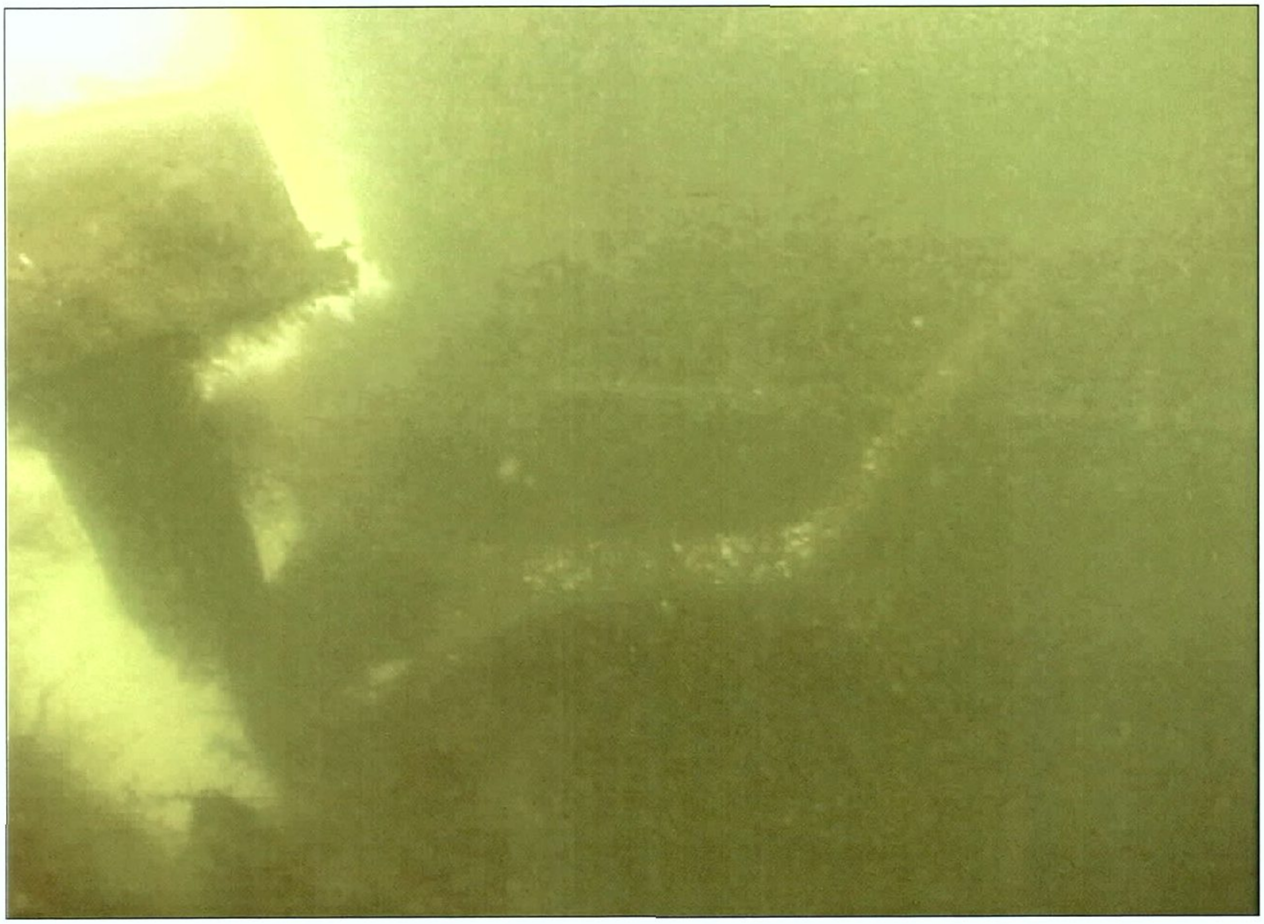


Figure 6-104c. Dismounted gudgeon.

Outer Hull

The outer hull of *Paul E. Thurlow* is pretty straightforward as far as wooden ships are concerned, consisting of frames and outer hull planking. Excepting the bow and stern, which will be discussed separately, the highly eroded frame sets consist of a pair of futtocks, each measuring 9 inches molded and 6 inches sided, making the frame room between 12 and 14 inches sided, depending on the gap between the futtocks. As is apparent from Figure 6-105, space varies considerably between frame sets, but was generally discovered to be between 2 and 8 inches.

The bow is heavily framed in comparison to amidships. The first six futtocks aft of the stem (not including a gap between the stem and the first extant frame–clearly there are several futtocks missing) are all equally spaced and appear to be cant frames (Figures 6-106 and 6-107). Aft of this six-futtock grouping, the frames are spaced with the same variation as the amidships frames. The stern framing is heavily deteriorated and the frames have eroded to a point below the mud line beginning at frame 52. There is no reason to believe, however, that the framing in this area differed considerably from conventions of its time period.

It should be noted that no iron reinforcing straps were noted during the inspection of the vessel. This late in the history of wooden vessel construction, it was not uncommon for some kind of steel or iron to be used as reinforcement. Such use often took the form of iron strapping placed in an "X" pattern between the frames and the outer hull or between the frames and the ceiling; this reinforcement would provide additional longitudinal stability in longer vessels. At 230 feet in length, one would expect the *Thurlow* to contain some kind of reinforcement, but there was none observed. The most likely explanation is the availability of steel and iron during World War I. As mentioned previously in this report, coasting vessels like the *Thurlow* were built of wood for a number of reasons, with the biggest probably being that most of the large iron and steel vessel building capacity was used to build vessels for the overseas war effort. One possible explanation for the lack of steel reinforcement is that such material was hard to come by, as most was being used for steel- and iron-hulled vessels.

Figure 6-105. Port side, amidships, showing arrangement of futtocks and frames. View to the southwest.

Figure 6-106. Port side, forward, framing (colors exaggerated to enhance definition). View to the southwest.

Figure 6-107. Port side forward, cant frame detail.

7. VESSEL V33: MENHADEN FISHING TRAWLER *FISH HAWK*

HISTORY OF MENHADEN FISHING

Menhaden, probably at one time North America's most plentiful fish, has a long history of use. Prior to European settlement of North America, Native Americans used menhaden as a fertilizer, burying one fish under each hill of corn. It was not long after the arrival of European settlers that they also recognized the value of the fish as a fertilizer. The fish were caught by the thousands, and whole fish were applied directly to the fields. This practice continued well into the nineteenth century until the discovery that menhaden had other uses, including oil and food for livestock, in addition to fertilizer.

Commercial menhaden fishing began in the nineteenth century as a cheaper, less hazardous alternative to whaling in the days before the discovery of oil at Titusville, Pennsylvania in the 1870s. Although not as refined as sperm whale oil, the oil from the menhaden could be acquired with considerably less capital and time invested. The first production of menhaden oil in the country was probably accomplished in Rhode Island in 1811, when Christopher Barker and John Tallman set up a pair of iron pots on the shore of the Sakonnet River. The fish were boiled in the pots and the oil skimmed off the top. The oil was sent to New York for sale and apparently did well enough that in 1814 the pair added two more pots. After the operation was destroyed by storms in 1815, they resumed the operation in 1818. In 1824, Barker improved his operation with the addition of a portable boiler christened the Bit Barker Fish Oil Factory. This roughly six-foot-square box could handle 60 pounds of menhaden at a time, and consisted of a furnace with copper piping through the water tank. He saved the water and fish parts, called scrap, for use on his fields.

The infant commercial menhaden fishery initially supplied its fish through numerous means, including the use of weirs, seine nets worked from shore (Figure 7-01), gill nets worked from small boats, or by collecting fish that were driven ashore by larger predators. In 1845, what would turn out to be the industry's single most important technological advance, the purse seine, was introduced (Figures 7-02 and 7-03). The purse seine led to the development, in the 1870s, of vessels specifically designed with the use of these large nets in mind.

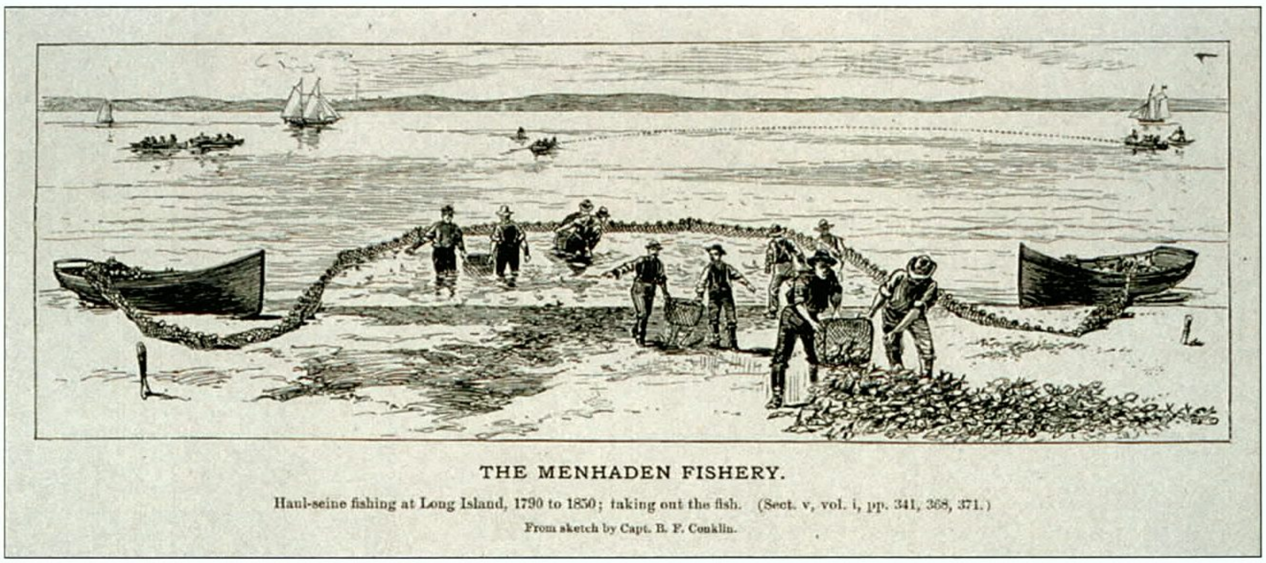
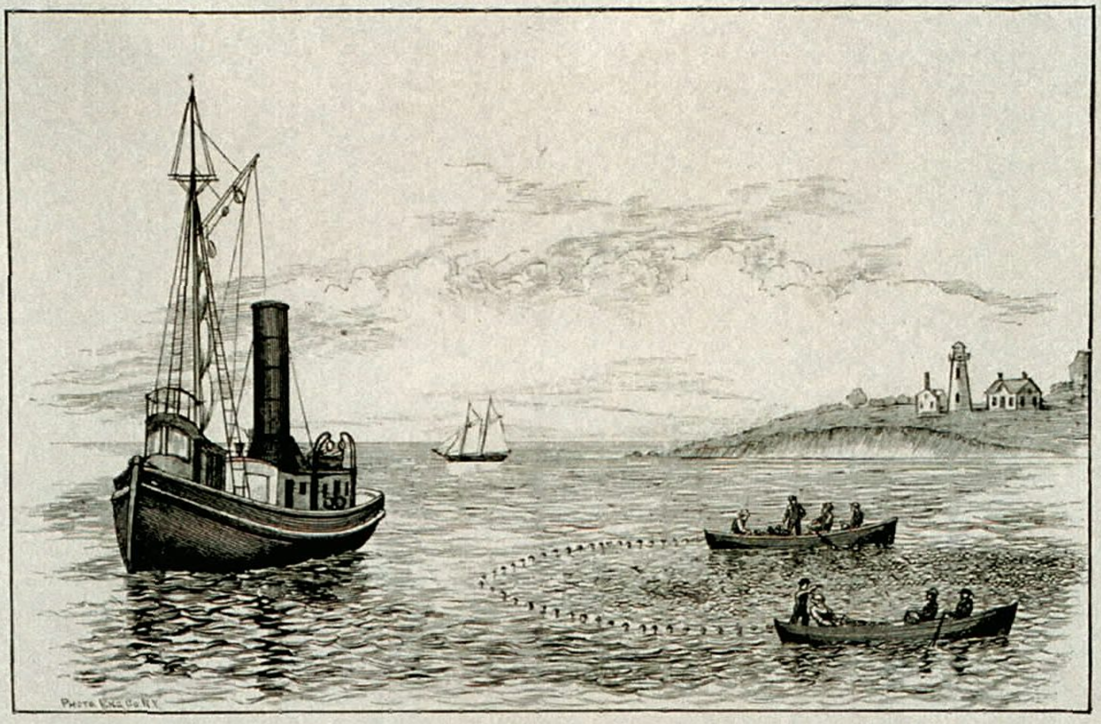


Figure 7-01. Haul-seine fishing from shore by hand in New England, 1790-1850 (as presented in Goode 1887).



THE MENHADEN FISHERY.

Steamer's crew surrounding menhaden with a purse-seine. (Sect. v, vol. i, pp. 337–339.)

From sketch by Capt. B. F. Conklin.

Figure 7-02. Nineteenth-century drawing of seine boats surrounding a school of menhaden with a purse seine (as presented in Goode 1887).

Figure 7-03. Transferring the catch from the purse seine to the ship's hold (as presented in Goode 1887).

In 1841, John Tallman built the first factory using steam to render the fish. Using wooden tanks, the factory had a capacity of 60 barrels and was equipped with a flue boiler. The following year Tallman and George Lambert built a factory at the mouth of the Merrimac River in Massachusetts, while another factory was built the same year in Greenhill by local concerns. Another Greenhill concern, Charles Tuthill, is credited with being the first to use a mechanical press to extract oil from the fish.

By the 1850s, further improvements to menhaden processing were made. William D. Hall received a patent in the 1850s for his steaming process, as well as his process for drying scrap, thus increasing its longevity. Additionally, the weighting method of extracting oil gave way to a much more efficient method involving a screw and lever press. The increasing production led to a change in the method of catching the fish. Using gill nets from skiffs or seining from shore gave way to the use of small boats to handle the purse seine nets along with larger sloops and schooners to carry the larger numbers of fish to the processing plants (Figure 7-04).

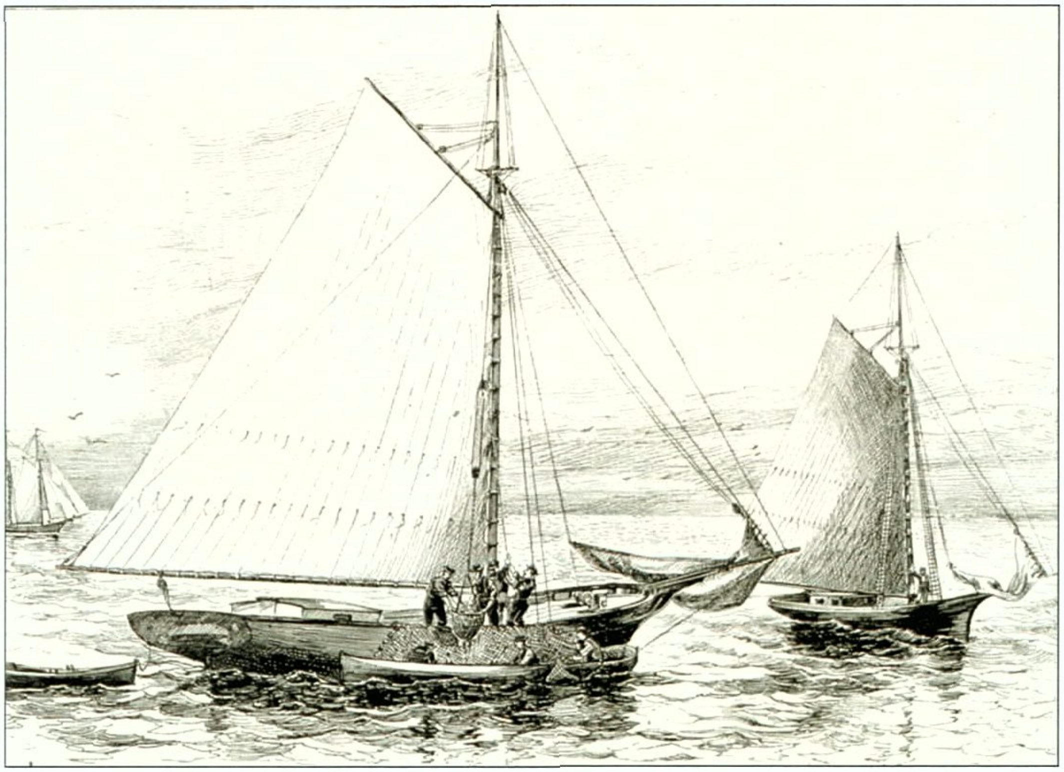


Figure 7-04. Unloading the catch from a seine boat into a sloop for transport to the processing plant (as presented in Goode 1887).

One increasing issue with the production of menhaden oil was what to do with the remaining fishmeal, or "scrap." Early on, the remnants were simply dumped overboard, but it was soon discovered that this had an adverse effect on other fish species. It was found that productivity of agricultural fields could be increased by adding the scrap to the fields. Since the scrap tended to decompose quickly, the early menhaden processors simply gave away large amounts to local farmers. As demand increased, processing plants soon began selling the scrap, and by 1864 it was selling for \$6/ton. It was not long before the scrap became as valuable as the oil.

In the 1870s, the first floating rendering plants appeared. These vessels, the earliest examples of which were built on the hulls of old vessels and towed from point to point, saved both time and money by shortening the distance the fishing boats had to travel to reach the processing plant.

Floating plants also reduced the effects of the offensive odor of menhaden processing by moving it offshore. Although they were never widespread, the introduction of steamers to the industry in the late 1870s gradually caused the decline of this type of vessel.

The period of 1865 to 1874 was one of considerable growth and innovation in the industry, with more than 20 factories being built in New England. By 1874, factories on Long Island, and increasingly in other parts of New England like Maine and Massachusetts, were producing large amounts of oil, with 75,000 gallons produced in 1874. Table 7-01 lists vessels and men employed in the industry before 1873. By 1877, there were menhaden factories spread over much of the east coast. According to George Goode's 1887 survey of the menhaden industry, there were four factories in New Jersey, four in Chesapeake Bay, and none in North Carolina. By the late 1870s, the center of the industry on the east coast had shifted to Virginia, where 15 fisheries had opened during the 1870s. In 1869, there were four vessels engaged in the trade, with a total production of 300 tons of fertilizer and 200 barrels of oil. By 1878, there were 78 vessels employing 286 men, with 201 men on shore, producing 10,832 tons of guano and 234,168 gallons of oil from over 118 million fish (Goode 1880).

Table 7-01. Vessels and men employed in the menhaden industry by state (source: Commissioner of Fish and Fisheries, 1877).

State (s)	Vessels	Vessel size (tons)	Men
Maine	351	15-100	1811
Massachusetts	42	20-70	415
Rhode Island	0	-	100
Connecticut	98	20-	708
New York	106	-	858
NJ, DE, MD	10		40
VA, NC	-	-	-
South	-	-	-

In Charleston, South Carolina, he listed a company that did not process raw fish, but instead processed scrap into fertilizer. The Pacific Guano Company refined the processing of scrap, eventually producing fertilizer in which menhaden was just one ingredient. In the 1860s the company bought Howland's Island, located in the South Pacific, which is known for its large deposits of bird droppings. The company shipped large amounts of the guano to Boston for drying, after which it was bagged for sale. The company experimented with mixing processed scrap with the guano to replace ammonia lost during the drying process. This proved successful, and the company continued the process, acquiring the scrap from other fish processing companies. After the company exhausted the deposits at Howland's Island, they began using mineral phosphates, first from the Caribbean, then from South Carolina after the Civil War.

It was during the 1880s that menhaden fishing became big business, and the era between the late nineteenth century and the First World War gave rise to a number of companies that would dominate the industry for the next half century, expanding the industry down the east coast and into the Gulf of Mexico.

North Carolina

The menhaden fishery in North Carolina got its start in the years after the Civil War, first with small operations, and then a string of larger but unsuccessful operations lasting one or two seasons. Chief in the slow start were several factors, including the summer heat, which speeded up the already fast deterioration of caught menhaden that in turn limited the range of the menhaden vessels to around 25 miles (Frye 1978:82). In addition, the shallowness of the many inlets of North Carolina limited the carrying capacity of the fishing vessels. Goode predicted in

1887 that these factors would prevent the establishment of a strong menhaden fishery in the state. In 1887, however, a nascent fishery with seven small factories had been established in Beaufort, which that year caught 15,000,000 pounds of fish. By 1900, a second center had been established at Southport, and by 1902 the catch had risen to 18,000,000 pounds. By 1908 the catch had risen to 57,00,000 pounds, and by 1918, was routinely approaching 180,000,000 pounds.

Gulf of Mexico

The advent of menhaden fishery in the Gulf of Mexico is recent, relatively speaking, but by the 1970s was accounting for 3/4 of all the menhaden landed in the U.S. Early landings were recorded in west Florida in the late nineteenth century and Alabama in the early twentieth, but neither amounted to much more than 1,000 pounds of fish. According to Frye, early reports are fragmentary, as the industry was essentially nonexistent when Goode published his landmark study on the menhaden fishery in 1887 (Frye 1978:92). One plant operated in Texas from around 1900 until 1923, and several in the Apalachicola area of Florida from around 1918 (Frye 1978:93). In addition, small factories appeared around the Sabine Pass area in 1900.

Large-scale menhaden fisheries were established in the 1930s when Wallace M. Quinn built a plant and docks in Pascagoula, Mississippi, then soon after in Apalachicola. By the 1940s he was operating three plants, with the third built at Empire, Louisiana, in 1949. In 1945, the Smith Company opened a plant at Moss Point, then another a few miles away at Cameron. Other companies soon followed, including Humphreys and the Reedville Oil and Guano Company of Virginia. Expansion in the Gulf continued at a regular pace into the 1970s, when 11 factories fronting between 66 and 85 boats and 1,122-1,445 men (Frye 1978:97) were processing more than one billion pounds of fish per year.

The Menhaden Trawler at War

The War Department acquired many privately held vessels after the U.S. entered WWI, and the vessels of the menhaden industry were no exception. The navy certainly needed vessels, but given their size and engine compliment, menhaden trawlers—such as the *Walter Adams* (Figure 7-05)—were not suitable for intense combat duty. It seemed to take time for the navy to establish the usefulness of the menhaden trawler. On July 28, 1917, the War Department issued General Order 314, which designated privately held vessels as Scout Patrol (SP) craft. In addition, many were converted into minesweepers, since their wooden hulls were ideal for the task.

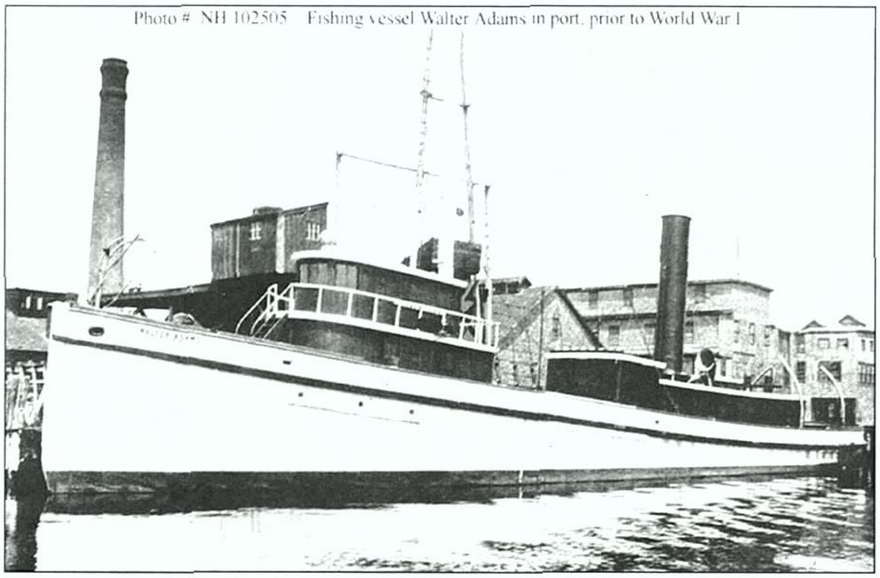


Figure 7-05. ***Walter Adams*** **in port prior to World War I (photo courtesy of Naval Historical Center).**

Figure 7-06. USS *Walter Adams* (SP-400) at the Charleston Navy Yard, September 11, 1918 (photo courtesy of Naval Historical Center).

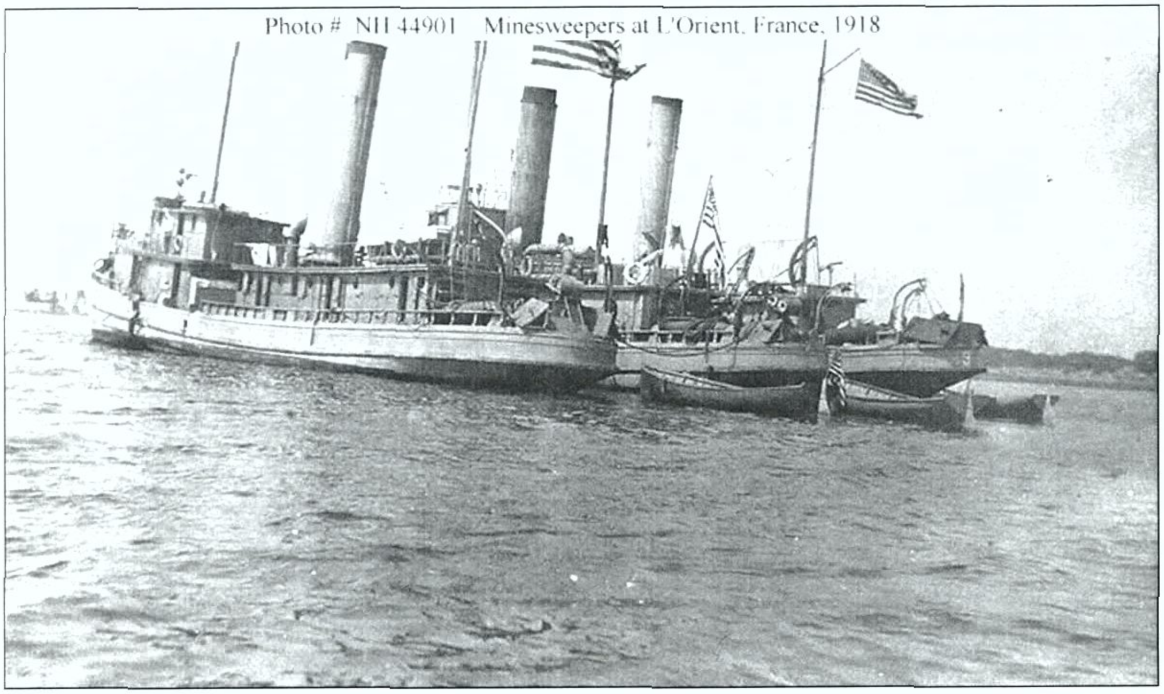


Figure 7-07. Minesweepers off L'Orient, France in 1918 (photo courtesy of Naval Historical Center).

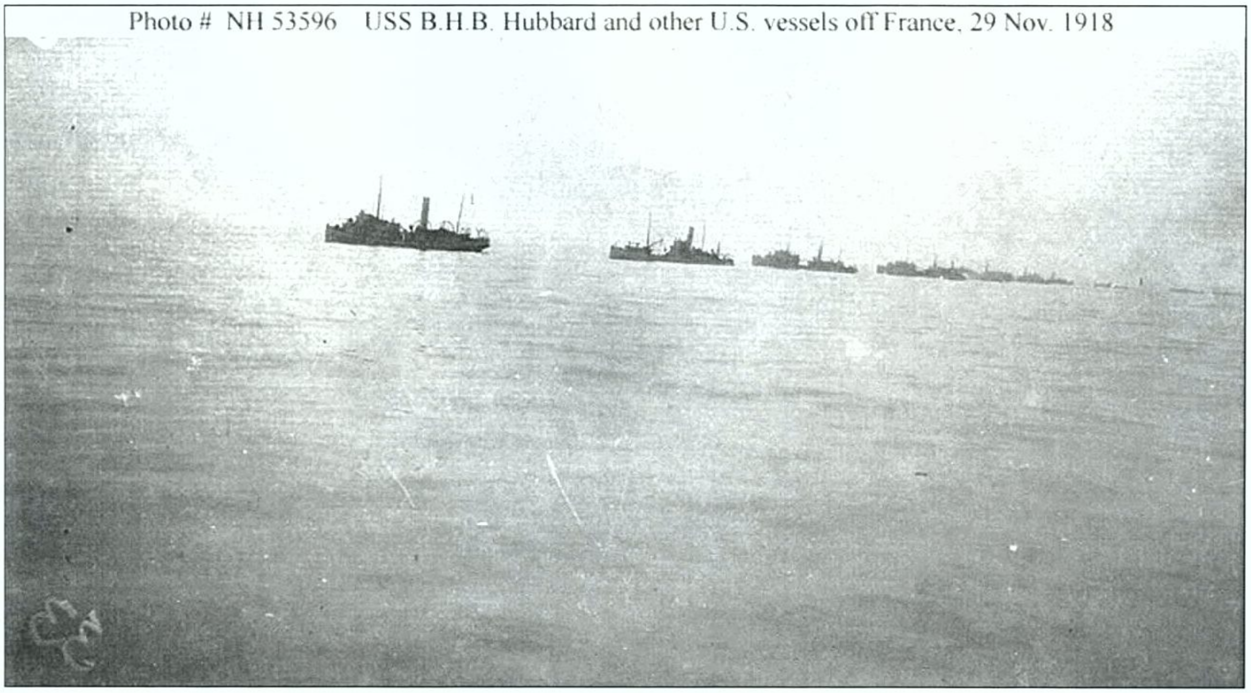


Figure 7-08. USS *B.H.B. Hubbard* and other vessels off L'Orient, France in 1918 (photo courtesy of Naval Historical Center).

Several examples can best illustrate the usage of the menhaden trawler during the conflict. The *Winfield S. Cahill*, built in 1912 by M.M. Davis of Solomons, Maryland, was acquired by the navy from the Eubank Tankard Company of Kilmarnock, Virginia, on June 12, 1917. Commissioned on August 10 the same year as USS *Cahill*, she sailed for France as part of the Squadron 4 Patrol Force Atlantic Fleet. Although earmarked by the navy for "distant service," the design of the menhaden trawler—with its low freeboard, slow speed, and top-heavy character—immediately proved inadequate for the open ocean. In addition, the installation of guns, armor, and deckhouses raised the center of gravity to a point where the vessels became unstable in high seas. After a rough trip across the Atlantic, the squadron was relegated to minesweeping and light patrol duties close to port. At the end of the conflict, the vessel was decommissioned and sold to Italian interests in order to avoid taking her back across the Atlantic.

The *W.T. James*, built in 1912 at Wilmington, Delaware by Harlan and Hollingsworth, was acquired in the spring of 1917 from the Taft Fish Company of Tappahannock, Virginia. Commissioned into the Fifth Naval District on August 10, 1917 as *SP-429* (USS *James*), the vessel departed Hampton Roads as part of a convoy headed to L'Orient, France. Employed in a variety of uses, the *James* covered coastal convoys (Figure 7-09), undertook night antisubmarine patrols, assisted vessels in distress, and performed minesweeping duties. The *James* remained in France through the winter of 1918-1919, departing for home on April 27. She soon encountered increasing northwesterly winds and choppy seas. An escort commander ordered the group to return to Brest, but the *James* began taking on water through her weakened wooden seams. Although taken in tow by the *Penobscot* (*SP-982*), the line parted after 20 minutes and the *James* was abandoned; the vessel sank soon after.

After the War, many menhaden vessels were returned to their owners or sold to foreign interests.

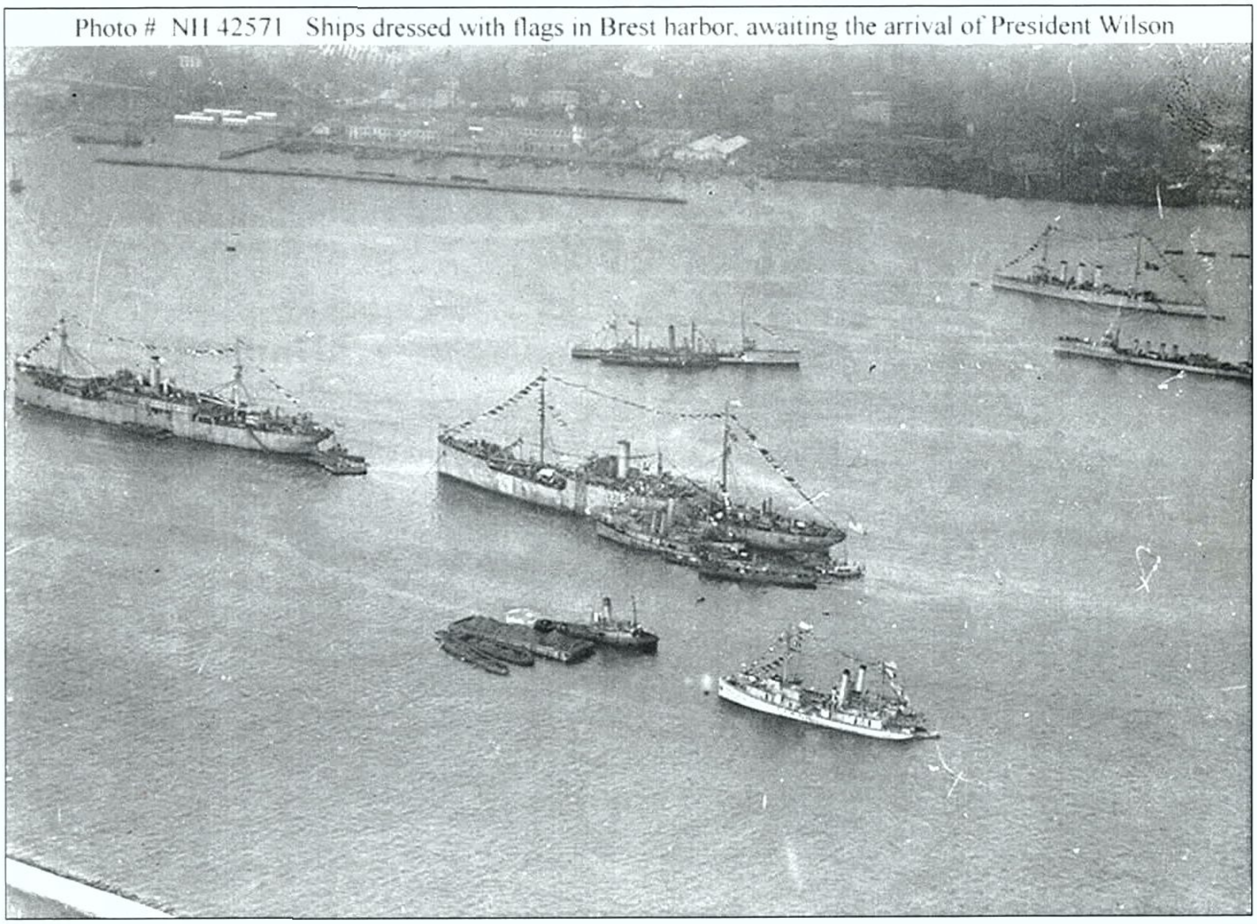


Figure 7-09. Menhaden vessels in Brest Harbor, France (photo courtesy of Naval Historical Center).

Between the Wars and the Great Depression

In the 1920s, a number of factors, including World War I, the Great Depression, and a cyclical reduction in menhaden population lasting from approximately 1915 to 1920, put considerable pressure on the industry as a whole, and companies specifically. This led to a number of companies exiting the business, although the menhaden industry seemed to be driven more by the supply of fish rather than the economy. Some companies, J. Howard Smith included, along with Reedville Oil and Guano Company (Haynie) and Consolidated Fisheries (Edwards) of Lewes, managed to expand by buying the factories and vessels of failed companies.

The Menhaden Trawler at War, Part II

As in World War I, the U.S. government took over numerous menhaden vessels for the war effort. With vessels lost at the rate of 1.35 per day (uboatarchive.net), the Commander of the Eastern Sea Frontier sent a message to his sub-commanders stating, "Vessels in your district that can be purchased and are capable of carrying depth charges and guns and are fit for sea patrol report at once."

A following message nine days later that inquired about menhaden fishing boats resulted in information indicating the slow speed of the menhaden boats (less than 8 knots) would severely limit their usefulness. Generally, menhaden vessels were not used in the same manner as they were used in WWI, but they were restricted to short range patrols in the U.S. and the Caribbean. They were used mostly by the Coast Guard as EM (Emergency Manning) YWP class vessels.

POST-WORLD WAR II

In the years following WWII, technical innovations were introduced that further streamlined the harvesting process. The use of spotter aircraft coupled with radio communication gradually eliminated the land based or crow's nest spotter and enabled the vessels to locate schools of menhaden much more quickly. In addition, hydraulically powered net hoists greatly reduced crew needs of the vessels by reducing the number of people needed to pull the net to the surface with the catch. Along with net hoists, fish pumps made the process of transferring the fish from the seine to the hold much more efficient. The reduction in manpower and the automation of the process also led to the use of larger vessels and changed the historically familiar form of the menhaden fishing vessel.

During the period from 1940 to the mid-1950s, the menhaden catch increased steadily, along with the number of boats and factories employed. During the 1960s, however, the industry began a decades long decline from its high water mark of 659,100 metric tons caught in 1959 (Vaughan et al. 2002:6) to 167,000 metric tons in 2000. According to Vaughan et al. (2002:4), the number of vessels involved in the trade declined steadily from 150 in 1955, to 12 in 2002. A slight increase in tonnage caught in the late 1970s and early 1980s was not matched by an increase in the number of vessels and can likely be explained by increased efficiency in the harvesting process.

Also associated with this time period were a significant number of plant closings, with the number of plants declining from 23 in 1955 to two in 2002, with 16 of 26 plants closing during the 1960s. An additional 14 plants closed in the 1980s and early 1990s. Only five plants opened or reopened during this time. By the end of the 1990s, only one major processor remained.

VESSELS EMPLOYED IN THE INDUSTRY

Three types of vessels were used in the capture of menhaden. Prior to the early 1870s, sailing vessels dominated the industry, with the majority being of sloop or schooner rig (Figure 7-10). These ranged in size from 5-10-ton open boats to larger schooners of 80-90 tons. In addition, smaller "carry away" boats (or lighters) were sometimes used to transfer the catch from the sailing vessel to the processing plant.

THE MENHADEN FISHERY.

Haul-seine fishing at Long Island, 1790 to 1850; taking out the fish. (Sect. v, vol. i, pp. 341, 368, 371.)

From sketch by Capt. B. F. Conklin.

Figure 7-10. Sloops engaged in menhaden fishing (as presented in Goode 1887).

By the late 1870s, the use of steamers was increasing dramatically, although the majority of vessels were still wind powered. Goode (1887:334-5) describes the 1880 fleet as consisting of 82 steamers and 374 sailing vessels with a combined tonnage of 12,905.71. The advantages of steam over sail were the same as in other industries: lack of dependence on wind and ease of maneuverability. In 1880, the average steamer was 90 feet long, 70 tons burden, and cost $16,000; the largest steamers were 150 feet long, cost $30,000, and employed crews of 27-30 men. They were generally constructed of hard pine with white oak framing, although locally available materials often determined what was used.

Also by this time, the steamers had taken the characteristic form recognizable as a menhaden steamer, one it would retain until the modern vessels of the second half of the twentieth century: a double decked pilothouse forward, a hoisting mast with spotter's platform immediately aft, and an aft cabin housing the engine room. The seine boats were carried on davits alongside the aft cabin. The hatch leading to the cargo hold was placed amidships between the two cabins (Figure 7-11), and opened to a watertight tank in which the fish were stowed. It was not until after WWII, when aircraft began to replace the spotters on the cabin roof or on the mast, that the form gradually began to change.

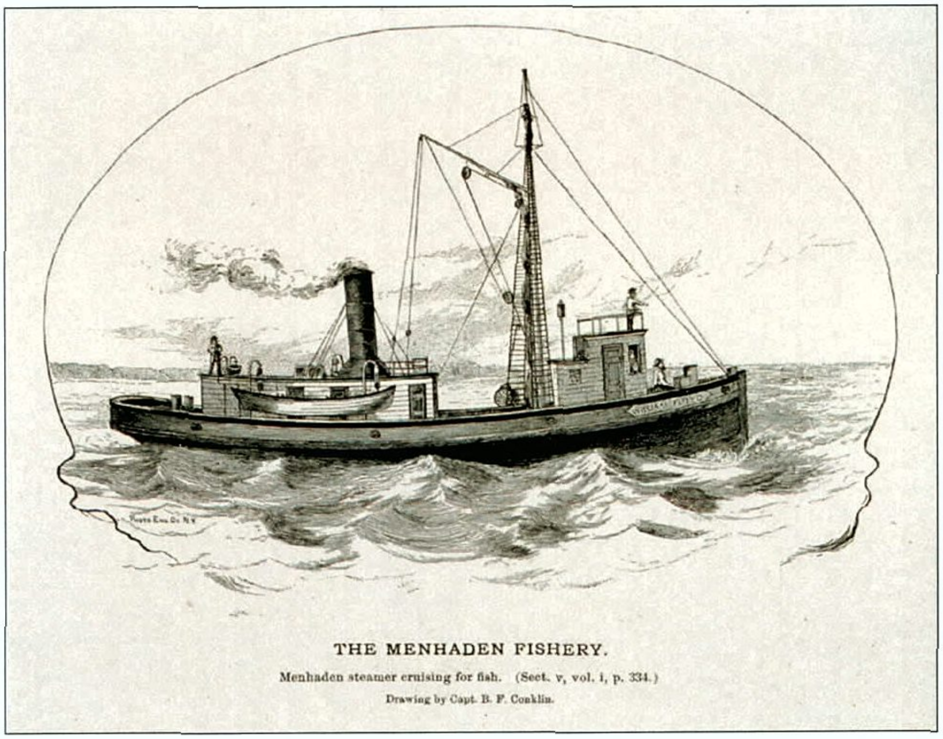


Figure 7-11. Typical menhaden steamer of the late nineteenth and early twentieth centuries (as presented in Goode 1887).

Smaller boats, called seine boats, were used to handle the nets. These 20- to 30-foot vessels ranged in form from square-stern lapstrake vessels similar to a yawl or dingy, to double ended vessels resembling a whaleboat. Like the steamers, the seine boat had evolved into a specialized vessel by the late nineteenth century, with characteristics reflective of its use. These include stability, as handling of seine nets requires much moving about the boat; speed, so as to encircle the fish school as quickly as possible; and, for those seine boats used by sailing craft, ease of towing. The seine boats used with sailing vessels tended to be double ended, 30-35 feet in length, with oak frames and a smooth planked hull (Figures 7-12 and 7-13). Steamers, which carried their seine boats on davits near the stern, used either double enders or yawls, 22-26 feet in length. These vessels were handled by a crew of 8-10 men with engines gradually replacing oars as a means of propulsion in the early twentieth century.

Figure 7-12. Seine boats with menhaden steamer (as presented in Goode 1887).

Figure 7-13. Seine boat setting a net (as presented in Goode 1887).

J. Howard Smith and Company

The Early Years: 1900-1929

In the 1880s, two men from Long Island, Malaga Smith and Gilbert Potter, set up a menhaden factory on Fire Island. The factory—one of four in the area—did well, working off the large schools of menhaden driven ashore by larger predator fish. Malaga Smith's two sons, Gilbert P. Smith and Julian Howard Smith, showed promise and ambition, and in 1900, Gilbert Potter gave his half interest in the plant to then 19-year-old Gilbert. Their father died while both were young, and the sons took over the operation, which generated enough money for the family to live comfortably and to provide Julian Howard with a law school education.

In 1911, the brothers expanded their operation to the shores of Raritan Bay, buying the menhaden plant owned by Griffin and Vail at Port Monmouth, New Jersey, for $11,000 (Figure

7-14). The new venture was named the Monmouth Oil and Guano Company. The menhaden industry had been associated with Port Monmouth for many years. George Brown Goode reported in 1878 on several plants in the vicinity, including the American Club Fish Company, which canned menhaden for human consumption, as well as two other plants of Cort and Company and Stanley and Company. Nearby in Keansburg, Charles Preston of Greenport, Long Island, built a factory in 1878 for the production of fertilizer from menhaden, horseshoe crabs, and other trash fish caught by local pound-net fishermen. By the time the Smiths arrived, there were two plants remaining, with Eastman's being the other. The enterprise was given the name of the younger brother, and became the J. Howard Smith Company, Incorporated.

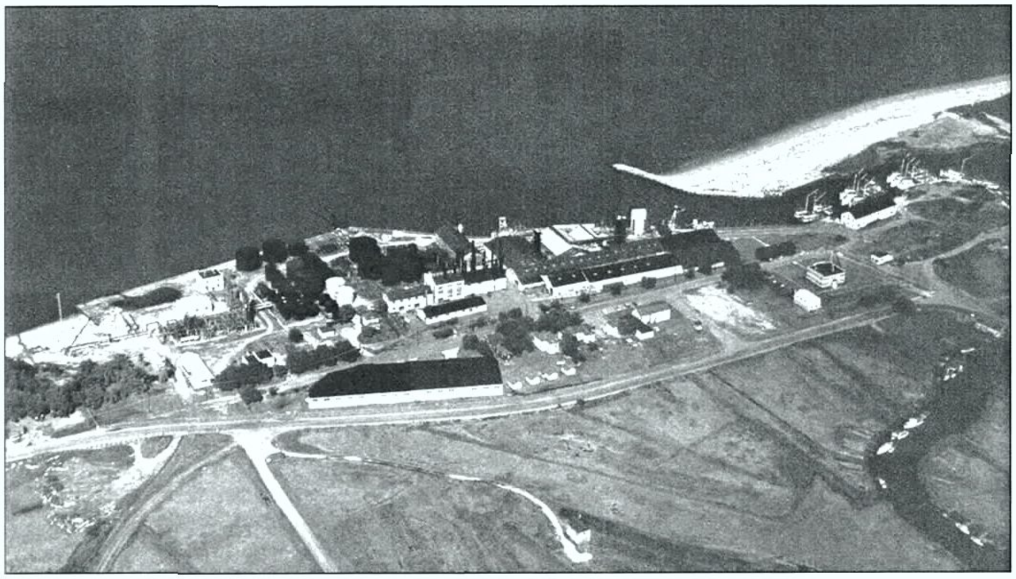


Figure 7-14. Port Monmouth, New Jersey plant, shown in the mid-1950s. This plant would be the homeport of the Smith Company for nearly the entire 60+ years of its existence (photo courtesy of Bob Cubbage).

Initially, the Smiths relied entirely on the production of local pound fisherman and seiners, buying all they could supply. The first 20 years of the operation were touch and go, as the local population of menhaden varied widely, resulting in boom years followed by several lean years. 1911 was such a boom year, described by Robb Leon Greer as the probably the largest catch ever (1915). Four new factories were built in 1911 and eight more in 1912; however, in 1913 the catch was almost nonexistent, and many new operations failed while existing ones reduced their capacity. In the years 1913-1917, along with a number of years in the 1920s, the catch of menhaden was greatly reduced. Nonetheless, the Smith Company continued to grow, and in the late teens acquired two small steam fishing boats, their first. By the late 1920s, they had acquired more steamers, including the *Ocean View* and the *Sterling*, while still buying all the fish the locals could supply.

1930s

The Great Depression bestowed hardship on many industries, and the menhaden fisheries were no exception. It was at this point, however, that J. Howard Smith, Inc. entered a decade of steady growth during which the company would expand from Long Island to Florida. Expansion included both the building of new plants and the acquisition of existing companies. One such company was the Edwards Company of Reedville, Virginia, from which they acquired not only plants in Reedville (Figure 7-15), and Lewes, Delaware, but numerous vessels as well. The Edwards purchase enabled Smith and Company to increase their catch considerably. Nearly half the boats providing fish to the Amagansett plant were Edwards' boats, including the *Elizabeth Edwards*, *Ocean View*, *Sterling*, *Willard*, *Stephen W. McKeever*, and *Henry J. McKeever*. They also purchased the Frank Morse plant near Amagansett in 1930, which put their vessels in range of the rich Maine fishing grounds, desirable because the menhaden found there had a higher oil content than those farther south. The catch in Long Island Sound and areas farther north was so good that by 1941, the Smith Company was getting 75 percent of its catch from these areas.

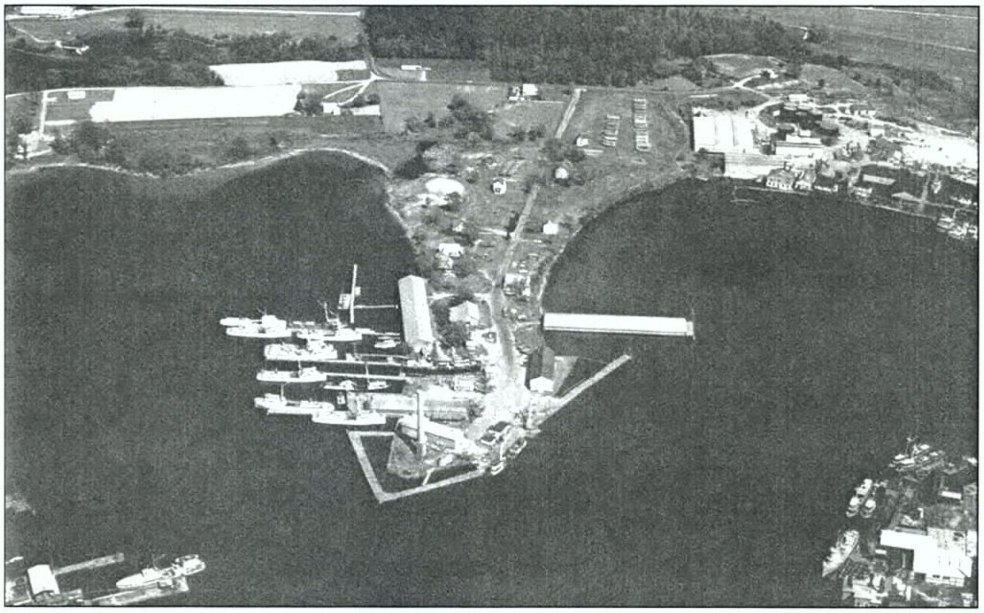


Figure 7-15. The Reedville Smith plant, shown in the mid-1950s (photo courtesy of Bob Cubbage).

The 1930s saw a large amount of organic growth within the company, as well. Several of the Smith brothers purchased or built factories along the east coast from Long Island to Florida. In 1931, Harvey Smith built a plant at Beaufort, North Carolina (Figure 7-16), while Otis Smith bought the factory at Fernandina, Florida. Howard Smith purchased a plant owned by the Atlantic City Garbage Company, who had purchased the plant in 1920 from the Newport Fertilizer Company when that company did not survive the menhaden recession of the mid-1910s. This venture was incorporated as the Fisheries Products Company, operated by Smith's second son Otis until 1965. This plant, with six new steel boats constructed after WWII including *Beach Haven, Barnegat, Sea Girt, Brigantine, Texas,* and *Moriches*, brought in an average catch of 160 million fish per year.

In 1938, Gilbert P. Smith purchased the Atlantic Fisheries plant at Lewes for the Fisheries Products Company, again putting them in direct competition with the Hayes Company of Consolidated Fisheries as well as the Menhaden Company, owned by Thomas Howard Jett, uncle of the Hayes brothers. However, the fish population was large enough to keep all three companies in business, and by 1953, the port of Lewes became the largest fishing port in the country, with 360 of the 390 million pounds of fish brought in consisting of menhaden.

It was during this time they began fishing with company owned vessels in addition to buying fish from local watermen. In 1932, the Smiths acquired the oil screw vessel *Lancaster,* built in the boom year of 1918 in Weems, Virginia, the first of 22 vessels the company would buy or build during the 1930s. The following year, they bought the aging *George P. Squires*, a 137-foot long, 218-ton screw steamer built in Baltimore in 1900. The year 1934 saw the addition of four vessels to the Smith fleet, including the small steamer *Ocean View,* built in Noank, Connecticut, in 1884; and the oil screw vessels *Stephen W. McKeever Jr.*, from the Seaboard Oil and Guano Company of Reedville, Virginia, *Parkins*, and *Annie Wilcox*. The following year, the company added the abandoned but sound *Luce Brothers,* named for a New England firm that operated a plant in

Lewes, Delaware. The vessel was recovered from Cockrell's Creek and rebuilt, with the original steam plant replaced with a 300-horsepower Atlas diesel engine. That same year, Smith purchased the 105-foot converted steamer *John Twohy Brusster*. The following year, in 1936, four vessels were purchased for the expanding fleet, including steamers *Elias F. Wilcox* and *Sterling*, and oil screw boats *Edward J. McKeever* and *John L. Lawrence*, the latter a converted screw steamer.

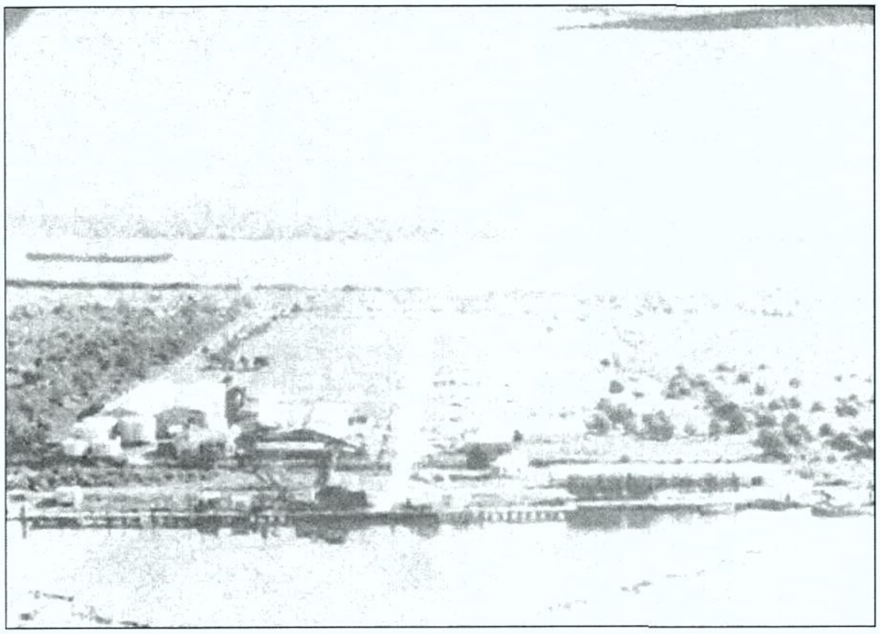


Figure 7-16. Smith Company processing plant in Beaufort, North Carolina ca. 1950 (as presented in Frye 1978).

By 1936, the Fernandina operation had hired its own boat builder, J.H. Whitehurst, who would build six vessels for Smith in the 1930s beginning with the 100-foot long, 149-ton oil screw vessel *J. H. Whitehurst*. Three more vessels were built the following year, including the identical *Charlie Mason* and *Mary Ellen,* and the *Benjamin L. Bishop,* all oil screw vessels. Also acquired was the screw steamer *Rowland H. Wilcox* along with the tiny oil screw boat *Doswell S. Edwards*. The last two years of the 1930s saw the building of the oil screw vessels *Promised Land*, *West Beaufort*, and *Port Monmouth*, the latter two of which were identical.

1950s

In 1954, J. Howard Smith, Inc. acquired the Hayes Company of Consolidated Fisheries, along with its aging fleet of steamers, for $3.5 million, and renamed the company Seacoast Products. Howard and company again tapped the operational talents of son Otis Smith in the modernization of the Consolidated plant. He replaced worn and outdated machinery and added the best Consolidated boats to the Smith fleet.

The following year, 1955, the Smiths acquired numerous additional plants, including the Taft Fish Company, on the banks of the Rappahannock River, six miles from Chesapeake Bay. This operation, founded by Dr. D.B.H. Hubbard and W.T. James in 1912, had lukewarm success until 1927, when it closed. It remained idle until 1933, when it was bought by the Colonna Brothers of Norfolk and reopened. The Smith brothers continued the plant's operation until after WWII, when it closed for good. Other acquisitions include the Bellows and Squires plant at Ocran, three additional Reedville plants, the Menhaden Products Company, and the Morris Fisher Company. All were closed down.

Expansion continued in the 1950s as the company began operations in the Gulf states of Alabama, Mississippi, Louisiana, and Texas. These included a processing plant in Port Arthur, Texas as well as one in Pascagoula, Mississippi. It was during this time that the J. Howard Smith Company became the largest menhaden company in the country. Otis, Harvey, and Gilbert Smith continued to manage the affairs of the company, with the corporate holdings split among a number of different companies, including:

- J. Howard Smith, Inc.
- Smith Meal Company
- Fish Products Company
- The Fish Meal Company
- Gulf Menhaden Company
- Texas Menhaden Company
- Atlantic Navigation Company
- Menhaden Products Company
- Smith Research and Development Company
- Marine Products Company
- Atlantic Processing Company

By this time, harvesting and processing of menhaden had become a streamlined manufacturing process, although it still closely resembled the turn of the century industry. Although the harvesting process was little changed (Figures 7-17 through 7-19), the processing aspect had become big business, with large-scale operations for grinding and bagging the fishmeal (Figures 7-20 through 7-22).

Figure 7-17. Modern seine boat being lowered from the stern of a menhaden trawler (courtesy of NOAA).

Figure 7-18. Menhaden trawler with full hold (photo courtesy of NOAA).

Figure 7-19. Menhaden trawler with full hold (photo courtesy of NOAA).

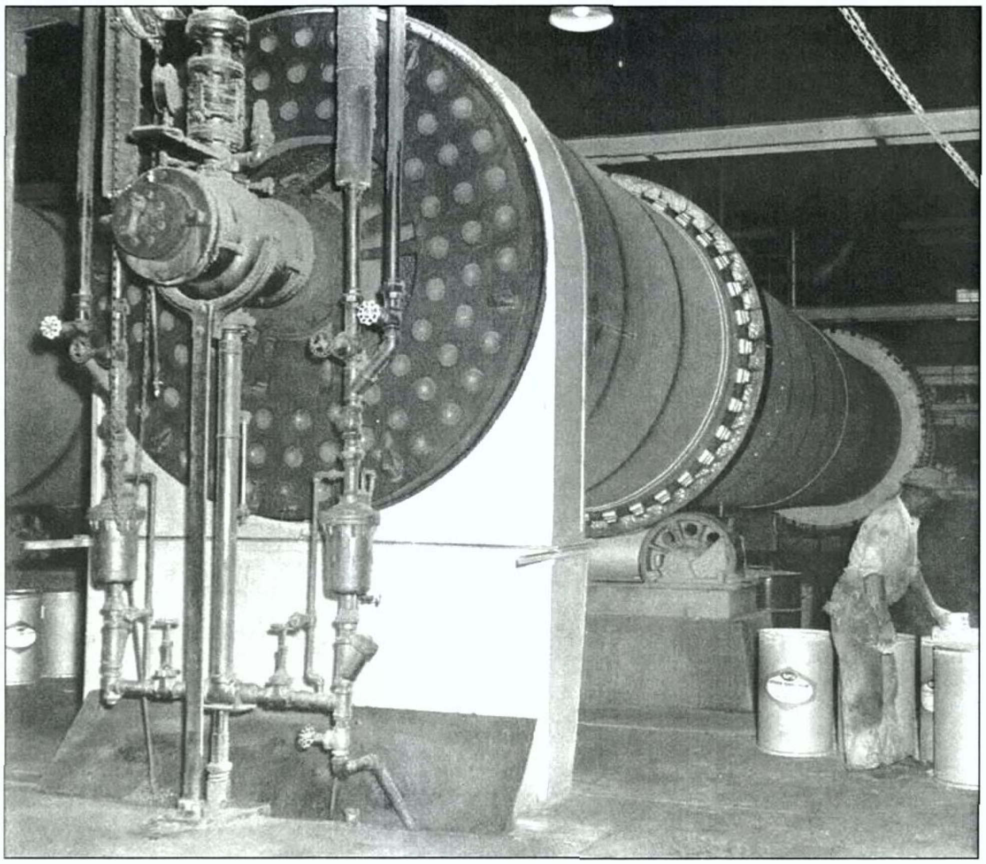


Figure 7-20. Scrap drier at Smith Company's Monmouth plant, circa 1958 (photo courtesy of Bob Cubbage).

Figure 7-21. Dried scrap at the Port Monmouth plant, circa 1958 (photo courtesy of Bob Cubbage).

Figure 7-22. Dried scrap bagging operation (photo courtesy of State Historical Society, Wisconsin).

During the 1950s, J. Howard Smith Company leaders had a discussion regarding the material used to construct the vessels (Cubbage, personal communication). Prior to the 1950s, vessels had been made exclusively of wood. However, the decision was made to introduce steel, and they began building steel-hulled vessels in addition to those of wood (Figure 7-23) (Cubbage, personal communication). While they continued to build wooden-hulled vessels into the mid-1950s, these were eventually phased out in favor of the much more durable and considerably stronger steel vessels. The Smith Company steel vessels were designed by naval architect Jack Gilbert of John Gilbert and Associates, using *Little Joe* as the standard (Figures 7-24 through 7-26). This vessel was 134 feet in length and 250 gross tons, built in 1922. Vessel construction would continue until 1960, with most of the modern vessels stationed in the Gulf operations.

Figure 7-23. Steel-hulled vessels *Romer Shoal* and *Louisiana*, built in 1955 and 1956 respectively, shown in 1958 (photo courtesy of Bob Cubbage).

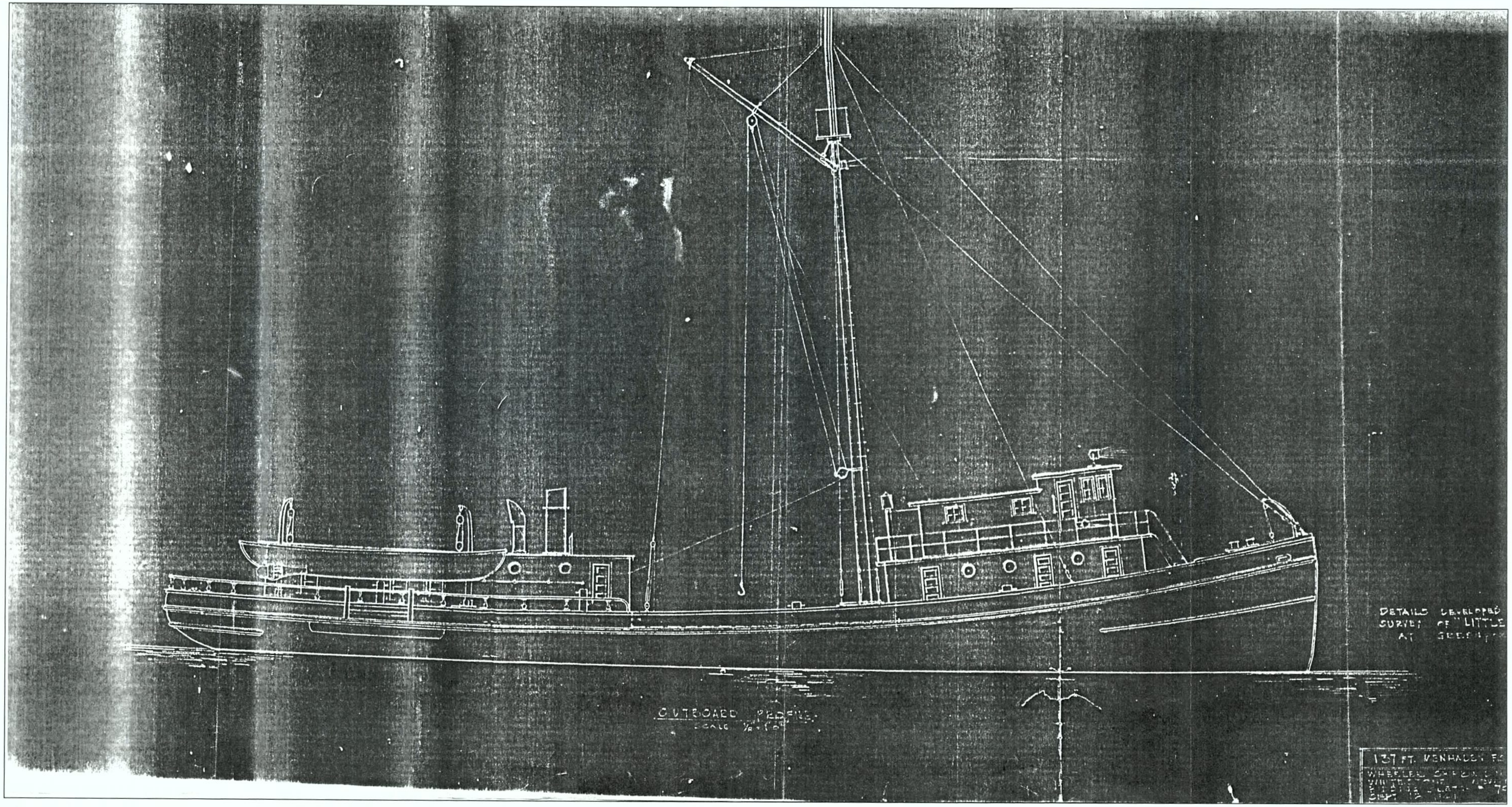


Figure 7-24. Profile of *Little Joe* (courtesy of Steve Rogers).

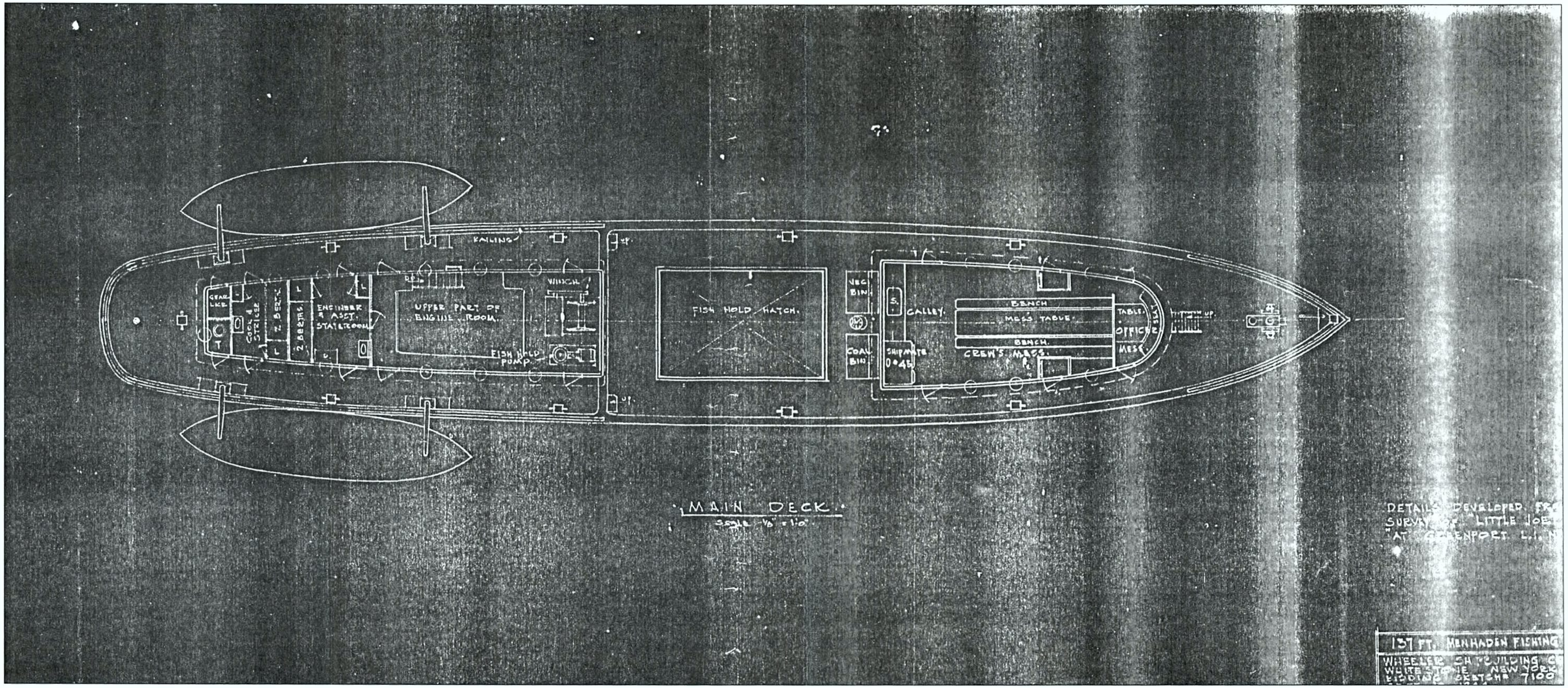


Figure 7-25. Main deck plan of *Little Joe* (courtesy of Steve Rogers).

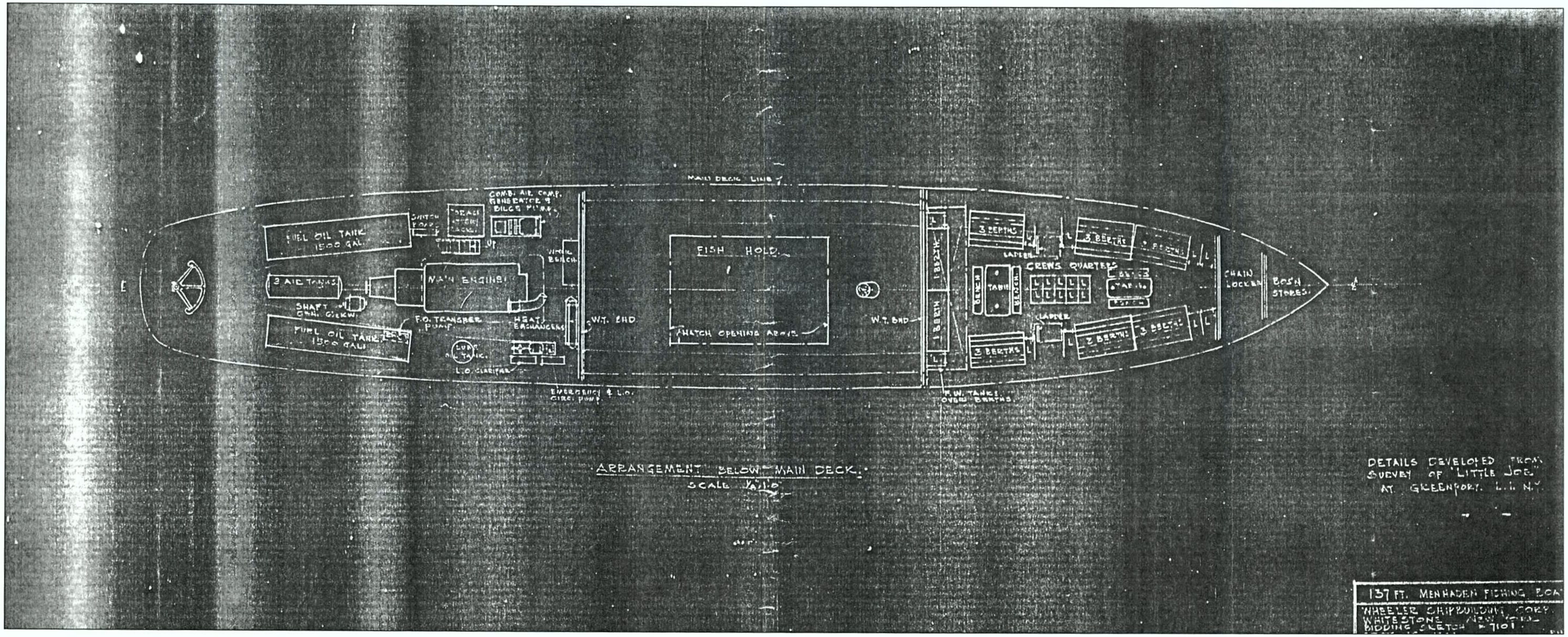


Figure 7-26. Lower deck plan of *Little Joe* (courtesy of Steve Rogers).

The company ran the new and aging wooden vessels alongside the steel vessels. There was a definite demographic distinction between the crews of the various vessels. The older wooden vessels, generally less modern and less comfortable, were painted white and referred to as the "White Fleet." The White Fleet had black crews. The modern steel vessels, painted black with tan superstructures, had white crews and were referred to as the "Black Fleet" (Rogers, personal communication 2004).

The 1960s saw the beginning of a gradual decline in the menhaden industry. Several factors contributed to the decline, not the least of which was overfishing. However, the largest factor was a lessoning demand for menhaden oil; petroleum based products were quickly taking over, and the demand for the processed scrap was not enough to sustain the industry. By the late 1970s, most of the companies involved in menhaden fishing had either gone out of business or been acquired by larger corporations. Sadly, the J. Howard Smith Company was not one of the survivors. The company was sold in the early 1970s and ceased operations in 1979.

HISTORY OF THE FISH HAWK

The *Fish Hawk* (Figures 7-27 and 7-28) was constructed in 1949 by the Atlantic Navigation Company, a J. Howard Smith Company subsidiary, at the Beaufort, North Carolina plant, operated by the Smith subsidiary of the Fish Meal Company. The *Fish Hawk* was one of many vessels owned and operated by the Smith Company throughout its existence (Appendix H). Fifteen vessels were built at this location between 1944 and 1950, with the *Fish Hawk* and her nearly identical sister *Princess Bay* (Figure 7-29) being the two largest. The *Fish Hawk* was 134.2 feet in length, 23.7 feet in beam, 11.8 feet in depth of hold, 283.61 gross tons, and 229 net tons. The capacity under the tonnage deck was 236.41 tons, and the capacity of enclosures on the upper deck listed at 47.20 tons. The second listing breaks down into the break at 12.64 tons, the deckhouse at 32.74 tons, and excess hatchways at 1.82 tons. Areas omitted from the tonnage measurements included various companionways (0.99 tons), the galley (6.86 tons), the wheelhouse (3.59 tons), light and air spaces (21.28 tons), and other machinery spaces (6.51 tons). Engine room tonnage is listed at 30.90 tons. Her official registration number is listed in the Annual List of American Merchant Vessels as 257819. This number is stamped on the forward hatch coaming of the vessel investigated in 2004, thus confirming her identity as the *Fish Hawk* (Figure 7-30). She was powered by a single screw Atlas diesel 550-horsepower six-cylinder engine built by the Atlas Imperial Manufacturing Company of Oakland, California in 1945.

Figure 7-27. ***Fish Hawk*** **bow, circa 1958 (photo courtesy of Bob Cubbage).**

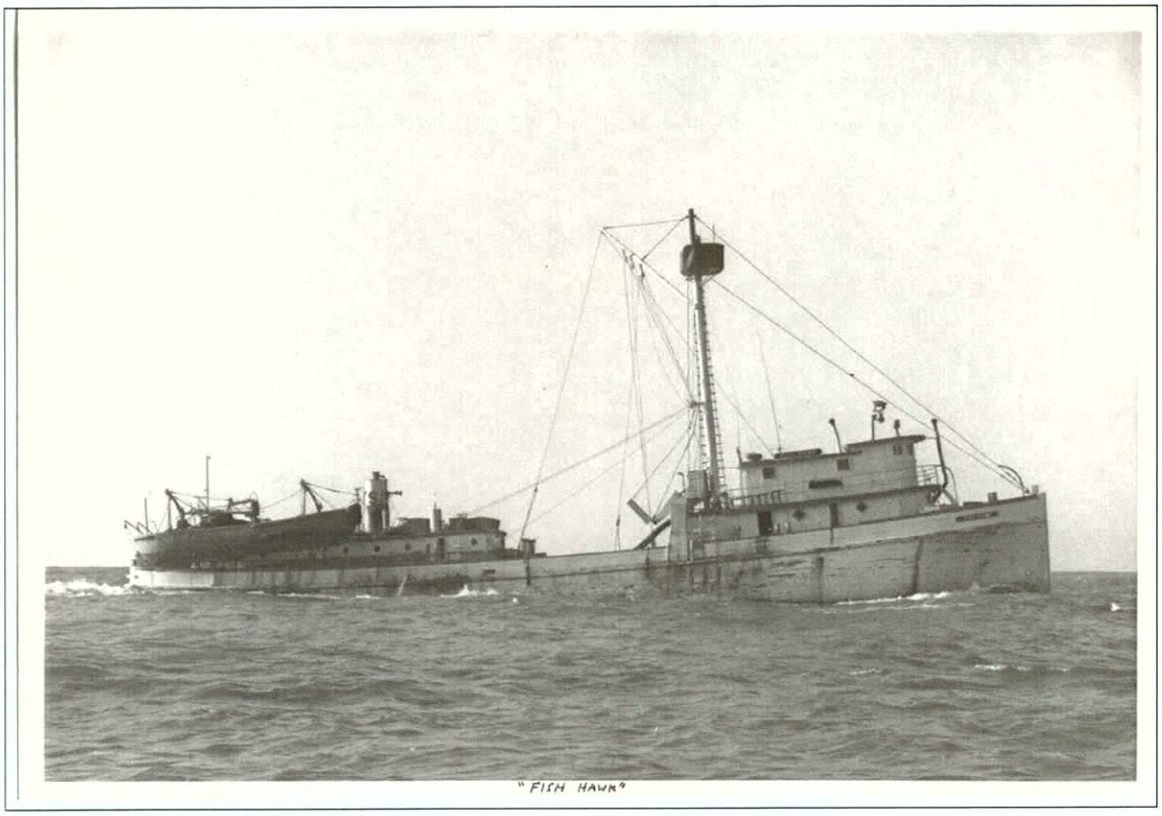


Figure 7-28. *Fish Hawk* underway (photo courtesy of Steve Rogers).

Figure 7-29. *Princess Bay* (photo courtesy of Steve Rogers).

Figure 7-30. Forward hatch coaming, showing vessel registration number.

Ownership

According to Department of Transportation documents (Appendix I), application was made for an official number from the United States Customs Service on May 11, 1949. Application was made to the Collector of Customs in Beaufort, North Carolina, and signed by H.W. Smith in the capacity of sole owner of the *Fish Hawk*. Her first permanent enrollment certificate, No. 13-D, was issued on May 20 the same year. H.W. Smith of the Fish Meal Company was listed as the owner and master. Shortly after, on May 27, 1949, an endorsement was added to the certificate, changing the master to Fred W. Haynie.

The enrollment was surrendered on June 13, 1949, and a new enrollment issued for a change of ownership and homeport. A new certificate, No. 558, lists the owner as J. Howard Smith, Incorporated, of Port Monmouth, New Jersey, and the new homeport as New York, New York.

Enrollment was again surrendered on May 21, 1951 under a change of registered owner. A new enrollment certificate issued on that day lists the new owner as Atlantic Navigation Company. This enrollment remained in effect until April 17, 1957, when ownership passed to Fish Hawk, Incorporated, and the enrollment was surrendered. A new enrollment was issued on the same date. This enrollment was surrendered and renewed on May 20, 1964, when the spaces on the attached form for annual endorsement and renewal were filled.

The enrollment was surrendered again on April 8, 1970, when ownership changed from Fish Hawk, Inc. to Atlantic Navigation Company, under permanent certificate No. 152. Ownership changed again on May 6, 1974 to the Smith Meal Company, and the Permanent Enrollment No. 152 was surrendered and Permanent Enrollment No. 129 was issued.

Ownership permanently passed from the J. Howard Smith Company on November 20, 1975, when the vessel was purchased by the Eastern Tanker Corporation of New York. A Permanent Enrollment certificate (No. 72) was issued, listing John P. Alban as the master. On February 27, 1976, Permanent Enrollment No. 72 was surrendered at New York, indicating a change of ownership, and no new enrollment was issued, indicating the vessel was no longer in use.

A number of captains were in charge of *Fish Hawk* during her nearly 25-year career, including Wiley Lewis, Len Lowry, Fred W. Haynie of Reedville, Virginia, Jackie Simpson (b. 1906, d. 1989), and Jimmie Lupton. Table 7-02 lists the captains, dates of service, and homeport.

Table 7-02. *Fish Hawk* captains. Source: National Archives.

Captain	Dates	Homeport
H. W. Smith	5/20 – 5/271949	Beaufort, NC
Fred W. Haynie	5/27/1949 – 5/13/1950	Beaufort, NC
Henry Nagle	5/13/1950 – 11/10/1950	Reedville, VA
Len O. Lowry	11/10/50 – 11/30/52 5/13/53 – 11/9/53 5/22/54 – 11/5/54	
James Lupton	11/3/52 – 5/13/53 11/9/53 – 5/22/54	
R. S. Welles	11/5/54 – 5/20/57	
Wiley H. Lewis	5/20/57 – 2/16/61 5/22/61 – 6/6/69	
Warner Haynie	2/16/61 – 5/22/61	
Jackie A. Simpson	6/6/69 – 11/6/70	
E. B. Haynie	11/6/70 – 11/12/70	
William G. Lewis	11/12/70 – 11/20/70	
Mathews Gaskins	11/20/70 - unknown	

As mentioned previously, a number of vessels were built at the Beaufort facility between 1944 and 1950. Known vessels are listed in Table 7-03. They were built primarily by a man named Elmo Wade (Figure 7-31), who was employed by the Smith Company at Beaufort specifically as a boat builder. Figures 7-32 and 7-33 illustrate the *Mermentau*, a vessel slightly larger than *Fish Hawk* but bearing many of the same features, including a decorative carving at the top of the stem as well as the characteristic quarterdeck railing spindles. There were a number of other vessels built to the same form during that time, but it cannot be said for certain that they were built by Elmo Wade. However, they are very similar in form to the *Fish Hawk* and bear mentioning.

In 1995, Panamerican Consultants, Inc., in its Phase II assessment of wrecks in the Arthur Kill, assessed V36 as historically significant and recommended photo documentation of main structural elements and recording of basic dimensions.

Table 7-03. Smith Company vessels built at Beaufort, 1944-1950.

Official No.	Type	Name	GT	NT	L	W	D	Year	Where built	Crew	HP	Company	Home Port
245903	oil screw	*Belford*	149	48	113.9	21.1	7.4	1944	Beaufort, NC	20	540	Harvey W. Smith	Beaufort, NC
245904	oil screw	*Fire Island*	153	51	113.9	21.1	7.4	1944	Beaufort, NC	20	540	Harvey W. Smith	Beaufort, NC
248128	oil screw	*Shoal Harbor*	193	98	120.5	20.5	9.2	1945	Beaufort, NC	20	265	Harvey W. Smith	Beaufort, NC

Official No.	Type	Name	GT	NT	L	W	D	Year	Where built	Crew	HP	Company	Home Port
257540	oil screw	*Mermentau*	199	135	121.7	20.6	9.8	1945	Beaufort, NC	21	400	Gulf Menhaden	Beaufort, NC
252204	oil screw	*Escatawpa*	137	93	95.7	22.9	7	1946	Beaufort, NC	20	320	Harvey W. Smith	Beaufort, NC
252206	oil screw	*Mississippi*	138	93	95.7	22.9	7	1946	Beaufort, NC	20	320	Harvey W. Smith	Beaufort, NC
249835	oil screw	*Sandy Hook*	188	153	125.6	20.5	9.1	1946	Beaufort, NC		400	Fish Meal	Biloxi
2532	oil screw	*Ocean Springs*	149	101	105.9	22.7	7.1	1947	Beaufort, NC	20	500	Harvey W. Smith	Beaufort, NC
84	oil screw	*Singing River*	106	108	106.8	23.3	6.8	1947	Beaufort, NC	20	500	Harvey W. Smith	Beaufort, NC
252652	oil screw	*Singing River*	106	108	106.8	23.3	6.8	1947	Beaufort, NC	20	500	Fish Meal	Biloxi
253791	oil screw	*Chandeleur*	160	109	105.4	23.3	7.2	1947	Beaufort, NC		512	Fish Meal	Biloxi
255736	oil screw	*Rockaway*	187	152	121.8	20.5	9.1	1948	Beaufort, NC	20	550	Atlantic Navigation	NY NY
255027	oil screw	*Pascagoula*	165	112	105.9	23.2	6.9	1948	Beaufort, NC		375	Fish Meal	Biloxi
259594	oil screw	*Princess Bay*	281	227	134.22	23.7	11	1950	Beaufort, NC	23	550	Atlantic Navigation	NY NY
257819	oil screw	*Fish Hawk*	283	229	134.2	23.7	11.8	1949	Beaufort, NC	23	550	Atlantic Navigation	NY NY

Figure 7-31. Photo of Elmo Wade, circa late 1950s (photo courtesy of Nancy W. Lewis Collection).

Figure 7-32. ***Mermentau*** **midships view, circa 1958 (photo courtesy of Bob Cubbage).**

Figure 7-33. ***Mermentau*** **bow, circa 1958 (photo courtesy of Bob Cubbage).**

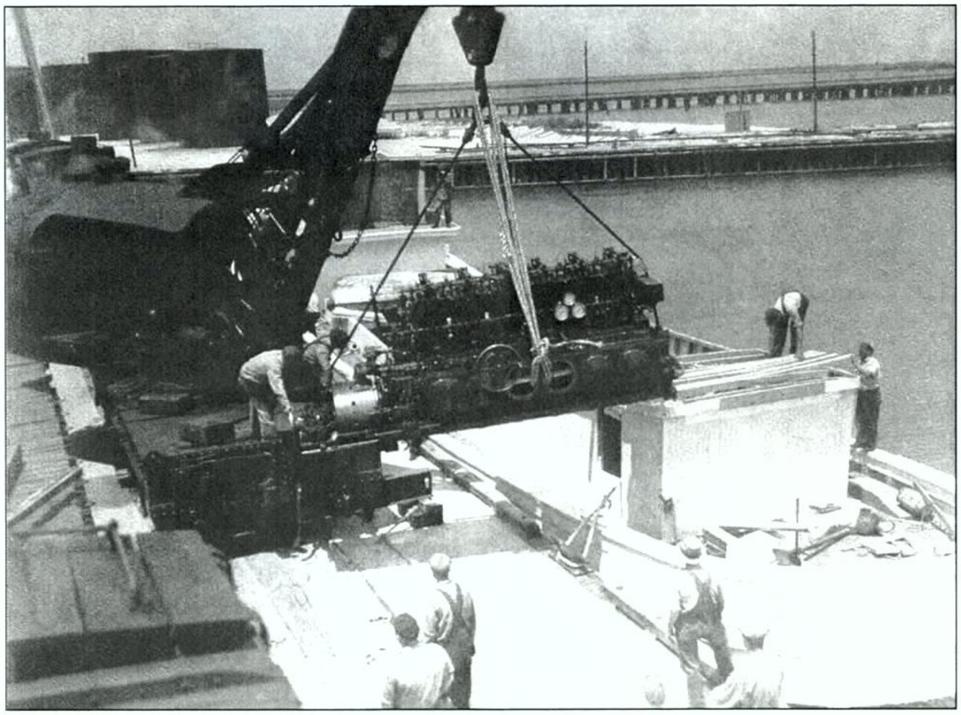


Figure 7-34. Vessel *Ocean Spring* having her engine installed, circa 1958 (photo courtesy of Bob Cubbage).

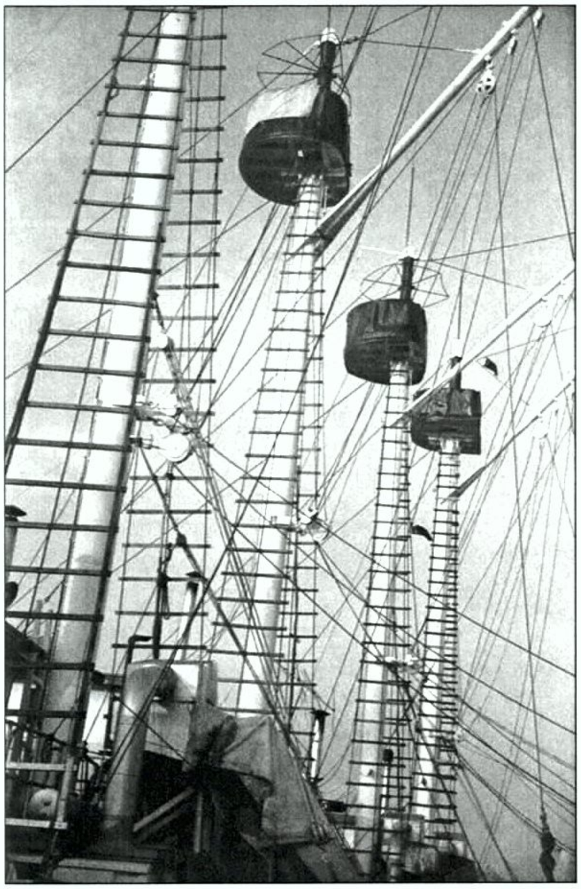


Figure 7-35. Masts of vessels moored at Port Monmouth, circa 1958 (photo courtesy of Bob Cubbage).

Figure 7-36. ***Elmo*** **bow, circa 1958 (photo courtesy of Bob Cubbage).**

Previous Investigations

Raber and Associates (1995) inventoried over 500 derelict vessels in Kill Van Kull and Arthur Kill, including V33. They recommended each vessel be assessed as to its National Register eligibility and that field investigation be undertaken to collect basic measurements, photographs, and registration numbers, as well as basic historic background research (Raber et al. 1995:159).

In 1995, Panamerican Consultants, Inc., in its Phase II assessment of wrecks in the Arthur Kill, assessed V33 as historically significant and representative of the last days of commercial fishing using wooden-hulled steamers, and recommended complete documentation (James 1999:341).

Description of Fish Hawk *Remains*

General Description

The vessel known as *Fish Hawk* is located on the north shore of Staten Island at the confluence of Kill Van Kull, Arthur Kill, and Newark Bay. She lies west of the Bayonne Bridge and east of Shooters Island with her bow to the south. Although apparently heavily salvaged, the *Fish Hawk* is generally fairly well intact to the main deck. The vessel measures 134 feet overall, and was constructed with a maximum beam of 23.7 feet. Depth of hold was 11.8 feet at its maximum. The vessel has a rounded stern, while the bow was sharp with a vertical stem. Remains of deck features include a forward pilothouse, a midships cargo hatch, and an aft deckhouse, along with several davit bases and a number of king posts and ventilation stacks. Figures 7-37 and 7-38 show deck plans and cross sections of the vessel. Figures 7-39, 7-40, and 7-41 show a general overview of the vessel.

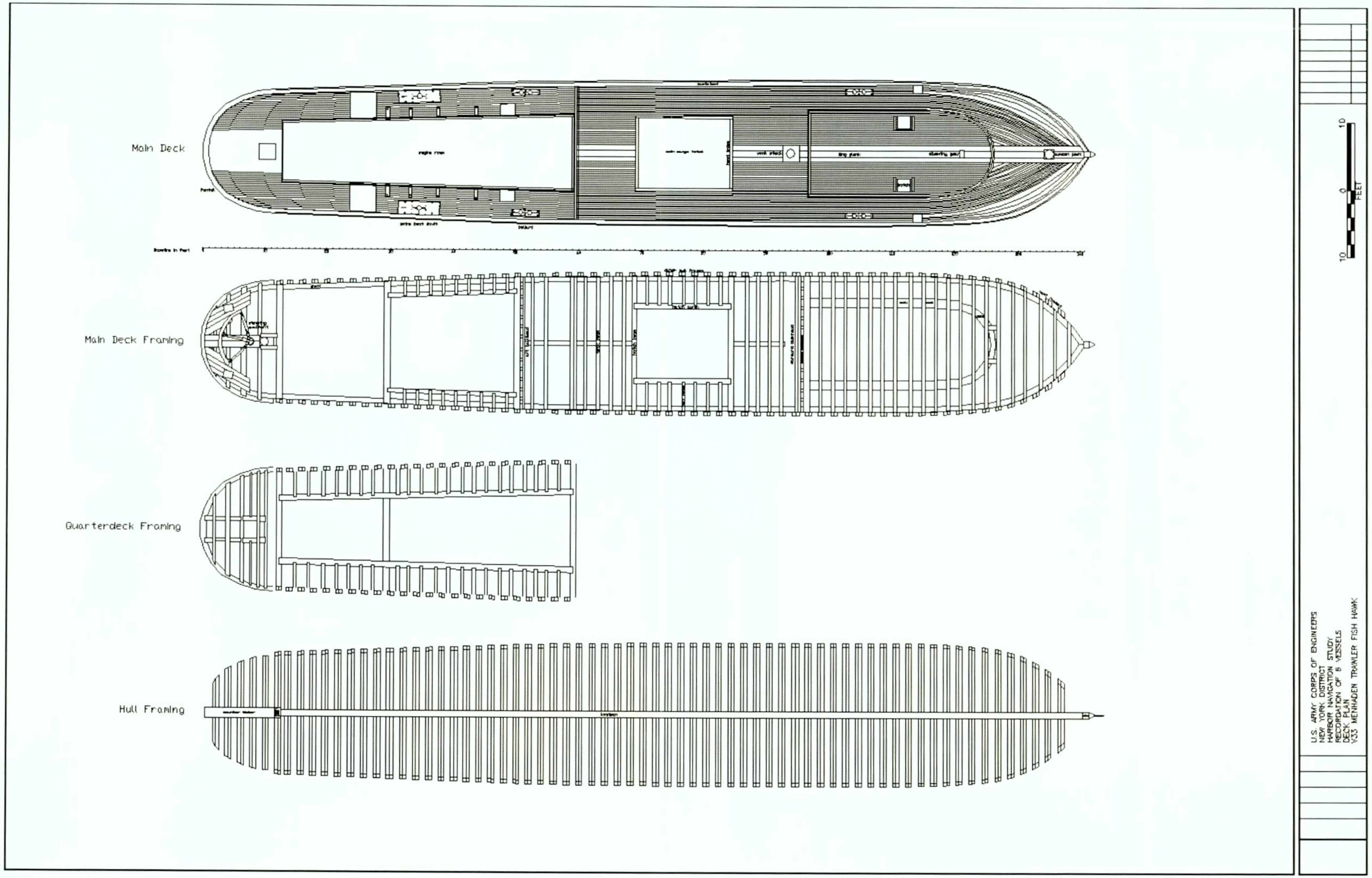


Figure 7-37. Deck plan of the *Fish Hawk*.

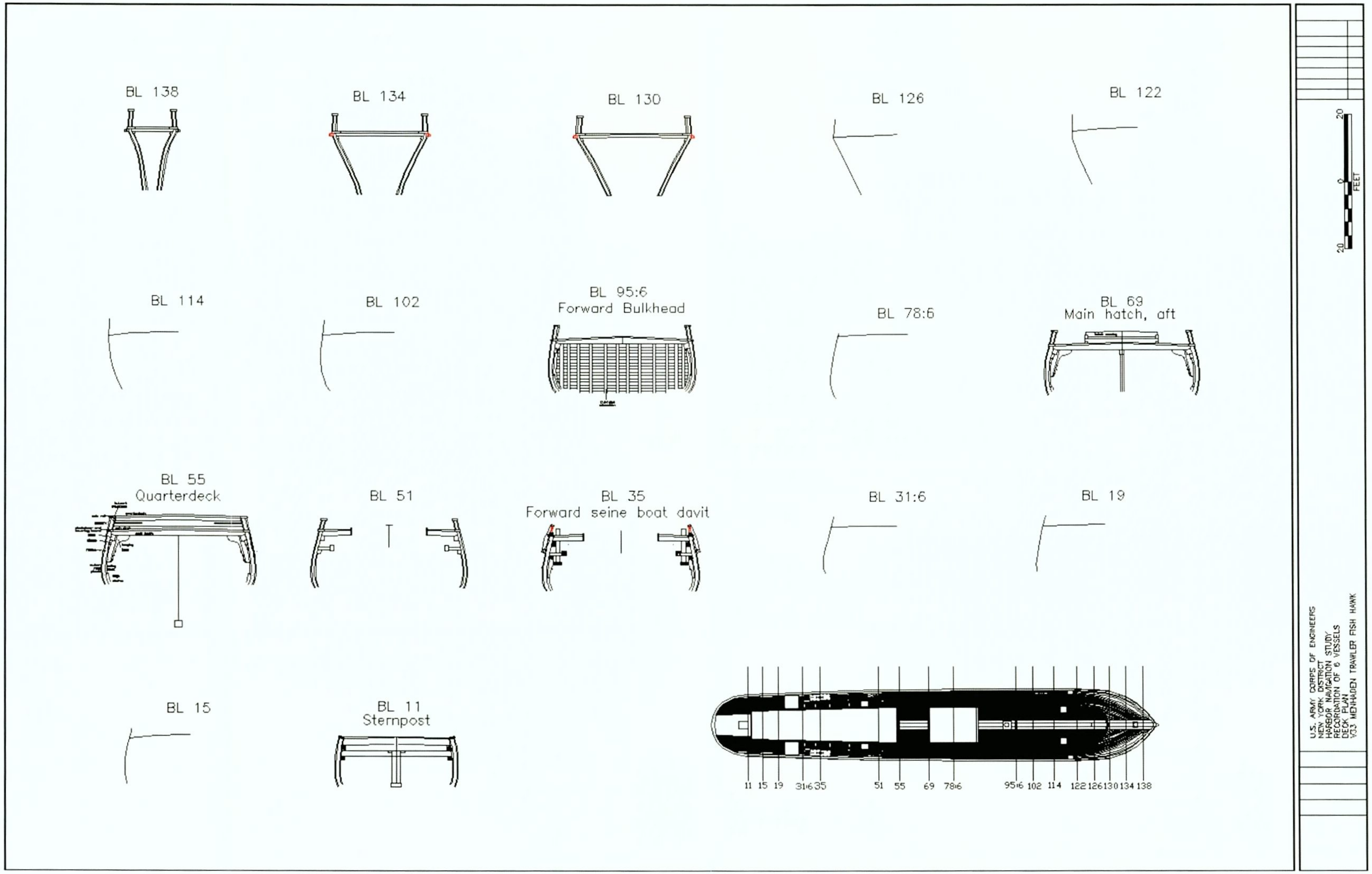


Figure 7-38. Cross sections of the *Fish Hawk*.

Figure 7-39. General view of *Fish Hawk* from port side, looking west.

Figure 7-40. General view of *Fish Hawk* from stern, looking south.

Figure 7-41. General view of *Fish Hawk* from the forward port quarter, looking aft (north).

KEEL AND KEELSON

Although the lower hull remained intact, it was inaccessible due to safety constraints; therefore, no data was collected regarding this area.

BOW ASSEMBLY

The bow of the *Fish Hawk* was formed around a stem and apron. The stem consists of three timbers joined via a plain scarph joint (Figures 7-42 through 7-44). The base of the stem was attached to the keel, although by what joint is not known. The aft edge of the stem was fayed to the apron, which was cut to form the rabbet. The apron is topped by a rough carving that characterized the Wade-built trawlers owned by the Smith Company (Figure 7-45). The stem is fastened to the apron by a number of 1-inch carriage bolts (see Figure 7-45). The stem was tapered forward from a width of 11 inches to 3.25 inches, with a molded dimension of 11.75 inches. The stem band was attached to the forward edge of the stem (see Figure 7-42) and was formed from an iron half round.

Figure 7-42. *Fish Hawk* stem assembly from starboard side, looking east. Note plain scarph on stem timber, just below rub rail.

Figure 7-43. ***Fish Hawk*** **stem assembly from forward, looking north.**

Figure 7-44. Close-up of stem showing scarph joint. Also note stem band. View to the east (port).

Figure 7-45. ***Fish Hawk*** **stem assembly from foredeck, looking forward and south.**

Stern Assembly

The sternpost was fitted to the aft end of the keel, although the joint type is unknown. The sternpost was vertical with dimensions of 12 inches molded and 18 inches sided. The counter timber, which extends aft from the sternpost to form the rake of the stern, is attached to the sternpost and extends upward at an angle of 19 degrees from the horizontal and is 18 inches sided. The stern deadwood, 18 inches sided, extends forward from the sternpost. The counter timber is fastened to the sternpost via angled iron plates that are bolted to each timber. Located 27 inches below the counter timber on the sternpost is the propeller shaft hole, which is 6 inches in diameter and extends forward through the deadwood. The shaft has been removed along with the propeller, but the shaft bezel remains attached to the sternpost (Figure 7-45b). Located 3 feet, 10 inches aft of the sternpost is the rudderpost. The rudder has been removed and all that remains is a hollow tube 3.5 inches in diameter. The counter timber extends another 8 feet, 3 inches aft to the stern chine, for a total distance of 12 feet, 1 inch from the sternpost. The stern of the vessel is vertical from the stern chine. The bottom, extending outward from the counter timber, is planked with timbers measuring 6-8 inches sided and 2.5 inches molded.

Figure 7-45b. Shaft bezel.

FANTAIL ASSEMBLY

The stern was formed by a graceful fantail assembly, the curve of which has a radius of roughly 9 feet (see Figures 7-38 and 7-46). The curve extends in a vertical direction from the stern chine to a height above the chine of 8 feet to the waterway (Figure 7-47). The stern hull planking is characterized by short curved planks that appear to have been added when the vessel was built rather than during a later repair. This is an unusual method of construction for a wood vessel of this size, and several reasons may explain its use. The builder may have been conserving timber, reserving longer planks for use in other areas of the vessel; or, the builder lacked the capacity to steam bend longer timbers and instead cut shorter timbers to the stern curve or used compass timbers (timbers cut to follow the natural curve of the grain) in the construction; or, the timbers were added during a later repair. It was determined from examination of the wreck that the builder used a combination of these techniques. For the absolute stern of the vessel, the builder used straight timbers that were cut to shape rather than steam bent or compass timbers (Figure 7-48). Longer hull planks, bent to the curve of the hull, were used forward of the stern, where the hull did not present as extreme of a curve.

The stern was also characterized by the addition of four rub rails (Figure 7-47). These rub rails were cut and fitted using the same method as the aforementioned stern hull planking. Each of the four rub rails measured 7 to 8 inches in a molded direction and 9 inches in a sided direction. The outboard edge of each rub rail was chamfered for 1/3 of its depth and height, and capped with a 3-inch wide half round steel band. Vertical spacing of the rub rails was a consistent 18 inches, with the top rail being 14 inches below the waterway. The base of the lowest rub rail is flush with the stern chine, although it is below the waterline and is not visible in the photos.

Figure 7-46. ***Fish Hawk*** **fantail assembly from port side, looking west.**

Figure 7-47. Close-up of fantail assembly. Note short timbers and rub rails. View from starboard looking east.

Figure 7-48. Stern detail showing timbers used to construct stern. Photo taken looking aft (north).

FRAMING PATTERN

Although the bilge ceiling planks were not removed as part of the investigation, a good indication of the framing pattern was had through the examination of areas where framing was exposed, such as on the submerged and eroded port side of the vessel (Figure 7-49). The framing pattern employed in the construction of the *Fish Hawk* consisted of a combination of floors, futtocks, and top timbers that formed the curve of the hull. Individual futtocks measured 6 inches sided and between 6 and 7 inches molded. Frame sets consisted of doubled futtocks for a combined sided dimension of 12 inches, with the futtocks being fastened with iron drift bolts (Figure 7-50). Room and space were 12 inches and 11-18 inches (Figures 7-49 through 7-51). The floor timber extended an equal distance on either side of the keel, and was fastened to the keel and keelson by iron drift bolts. It is not known if filling frames were used on the *Fish Hawk* but it is doubtful given the relatively small size of the vessel.

The bow framing consisted of five sets of canted frames (Figures 7-52 through 7-54). The cant frames maintain the same dimensions as the full frames, and room and space is similar. However, they are cut so that the molded dimension is perpendicular to the keel, giving the cant frames a diamond or parallelogram shaped cross section. They do not appear to be spaced close together as is normally seen on sizeable wooden vessels, but are instead spaced similarly to the main frames.

Figure 7-49. Starboard side view, looking northeast, of midship section showing exposed framing at the turn of the bilge.

Figure 7-50. Close-up of exposed framing in Figure 7-49. Starboard side, looking east.

Figure 7-51. Close-up of exposed framing in Figure 7-49. Starboard side, looking east.

Figure 7-52. View of port bow showing exposed canted frames, looking west.

Figure 7-53. Close-up of canted frames. Port bow, looking west.

Figure 7-54. Close-up of the fifth canted frame.

Outer Hull Planking

Outer hull planking, as seen in Figures 7-49 and 7-42, varied in dimensions according to location. On the long run of the sides of the vessel, the planking was consistent and predictable. Data was gathered from the turn of the bilge to the gunwale, and three basic sizes were observed. Around the turn of the bilge, planks measured 3.5 inches molded and 6 inches sided with individual plank lengths generally around 24 feet. At a point 3 feet below the main rub rail (see Figure 7-49), the planking dimensions changed to 10 inches sided with the same molded and length dimensions. The rub rail itself consisted of two pieces of a 2.5-inch sided dimension for a total of 5 inches, and fastened to a 3 1/5-inch by 12-inch outer hull plank (Figure 7-55), with individual timbers joined by a basic scarph (Figure 7-56). Parallelogram in cross section, the rub rail is 5 7/8 sided on the outboard edge and 8 inches inboard, and extends from the port side of the stem all the way around the vessel, to the starboard side of the stem (Figure 7-57). Directly above the rub rail covering the hull frame tops is the covering board, which measures 11.5 inches by 2.75 inches. Above the rub rail were three more hull planks covering the main deck bulwarks, each measuring 8 inches by 2 inches. The bulwarks are supported by bulwark stanchions measuring 5.5 inches square. These were fastened to the forward edge of each frame set, extending down to the level of the clamp and shelf. The bulwark cap measured 11.5 inches by 2.75 inches. The hull planking is fastened using yellow metal spikes, 5 inches in length, below the waterline and galvanized above. This matches with historically documented information regarding fasteners.

Hull planking changed slightly in character and in dimensions at the bow. While the bulwark planking remained the same dimension as previously stated, the curvature of the bow below the rub rail necessitated a change in plank width toward the stem. Also, the plank thickness changed from a single plank of 3.5 inches to double planking with individual planks 1.75 inches. In light of the stern construction, noting the lack of steam bent timbers; this double planking was likely done to improve the flexibility of the timber as it approached the stem. Beginning at a point 71 inches (5 feet, 11 inches) aft from the stem, the bilge planks taper from 6 inches to 5.5 inches in width, while the hull planks between the bilge and the rub rail taper from 10 inches to between 7.5 and 8 inches where they meet the stem (see Figures 7-42 and 7-55, Appendix E).

Figure 7-55. Starboard side of bow, showing main rub rail construction. View to the southeast.

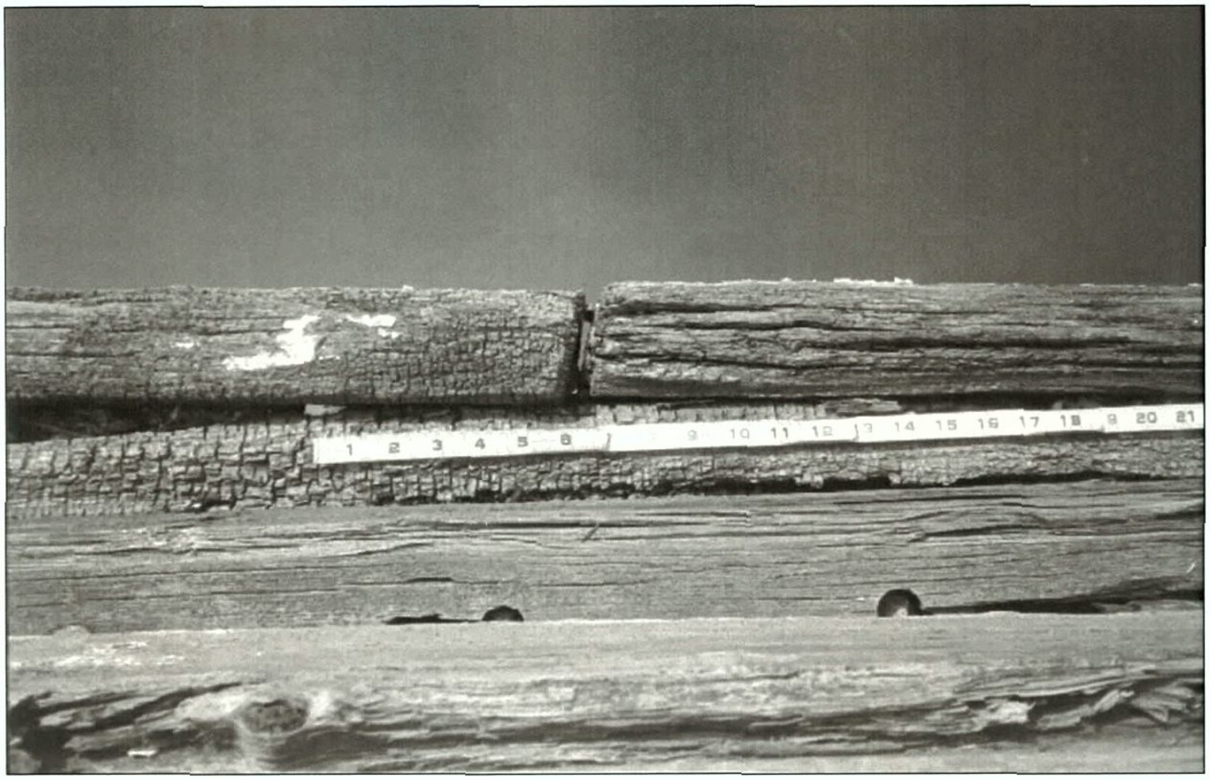


Figure 7-56. Scarph joint on rub rail, starboard side.

Figure 7-57. Main rub rail where it meets the starboard side of the stem. Note iron half-round caps.

Figure 7-58. Main rub rail at bow from top.

Deck

The deck of the *Fish Hawk* consists of two main parts. The main deck stretches about 3/5 of the vessel (a total of 80 feet), while the quarterdeck makes up the aft 60 feet of the vessel. The deck layout follows the classic form of a menhaden trawler, with the main cabin/pilothouse situated forward and the main cargo hatch between the pilothouse and the quarterdeck. The aft cabin, housing the engine room, takes up most of the quarterdeck. Various pieces of deck hardware are evident, including bollards, seine boat davits, a king post, several stacks, and the remains of the main hoisting mast (see deck plan, Figure 7-40, and Appendix E).

The deck is supported by deck beams generally measuring 6 inches square on two-foot centers (Figure 7-59). This measurement varies slightly over the vessel, with certain load-bearing timbers having a larger scantling. Beams on either end of the main cargo hatch, under the forward edge of the quarterdeck (also the forward edge of the aft cabin), and under the center and aft edge of the aft cabin (to support the davits for the net-handling boats in addition to long salvaged machinery such as the crane hoist), under the after edge of the pilothouse (which is also the location of the forward cargo bulkhead, and the beam supports the bulkhead), measure 6 inches in the vertical dimension by 12 inches in the horizontal. The main deck beams of the stern structure, which mainly support the steering gear, vary in size from 5 inches molded by 6 inches sided to 10 inches molded by 6 inches sided (Figure 7-60).

Figure 7-59. Exposed main deck beams along port side of main cargo hatch, looking east.

Figure 7-60. Photo of main deck level beams of the stern, looking aft. Note pivot of steering gear.

The deck beams are fastened to the tops of the hull frames at main deck level via iron drift bolts. The frames also end at this point. The deck beams extend unbroken from port to starboard except where they meet the through deck features of the main cargo hatch and the aft cabin/engine room. The main deck hatch is supported by two larger deck beams (discussed above) at the ends of the hatch opening, and two longitudinal beams of the same dimension as the end beams. The deck beams end at these longitudinal beams and are notched in with a halving joint and fastened with iron drift bolts. Likewise, the longitudinal supports are fastened to the deck beams at either end of the hatch opening also in the same fashion. The main deck beams essentially end at the quarterdeck, with a couple of exceptions. The beam present at the main deck level that provides support for the forward edge of the quarterdeck is a compound beam consisting of two 6-inch square beams fastened together. The next beam aft is either missing or was never installed.

Aft of the after bulkhead, on each side of the vessel, there exists what appears to be a reinforcing arrangement consisting of a longitudinal 8-inch square beam stretching from the aft bulkhead support beam, where it is fastened using a halving joint and iron drifts, to another large main deck level transverse beam at baseline 30 (Figure 7-61, Appendix E). Notched into this beam with the same halving joint previously mentioned are short 6-inch square beams of the same dimension and on the same plane as the deck beams (Figure 7-62). This construction appears to have been installed to provide strength and support to the quarterdeck structure and the davits for the seine boats, as the davit hardware extends through and past this structure (Figure 7-63).

Figure 7-61. Longitudinal stringer in engine room compartment, looking forward (south).

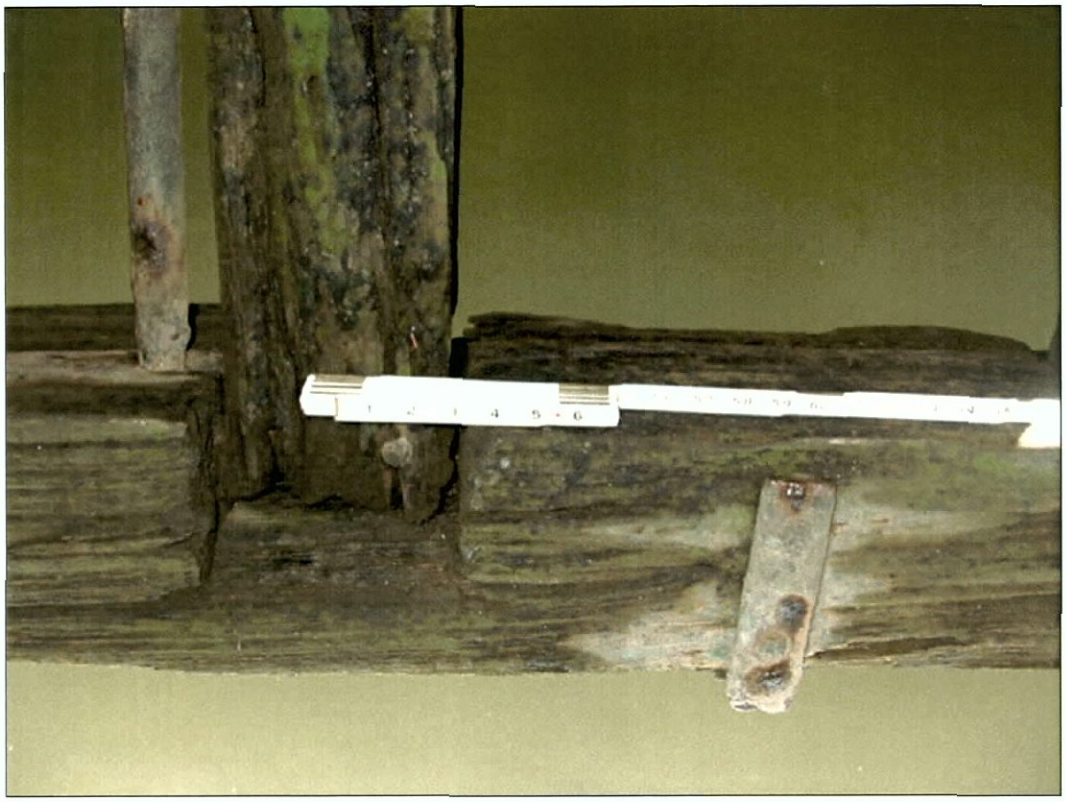


Figure 7-62. Close-up of halving joint used in construction shown in Figure 7-61.

Figure 7-63. Photo of seine boat davit anchor structure, located below the quarterdeck.

The main deck beams are supported by a clamp and shelf arrangement, with hanging knees used only in areas needing added support (Figure 7-64). The shelf is a 10-inch square timber fastened directly to the frames via iron drift bolts. The clamp, measuring 9 inches molded and 5 inches sided is fastened to the frames directly below the shelf. Both timbers run from the stem to the beginning of the fantail at the stern, with individual timbers connected by butt joints. The outboard ends of the deck beams rest directly on the shelf, with the underside of each beam chamfered to match the angle of the shelf (present because of the tumblehome). Hanging knees were used in areas needing extra support, including each end and the center of the main cargo hatch, and the quarterdeck. The knees were constructed of two separate timbers, including a compass timber used for the knee and a backing timber that is notched to fit around the clamp and shelf, and fastened to each other and to the frame with iron drift bolts. Each knee measures 52 inches in height and extends 36 inches from the hull frames. A diagram of a hanging knee can be seen in cross section in Figure 7-38 and Appendix E.

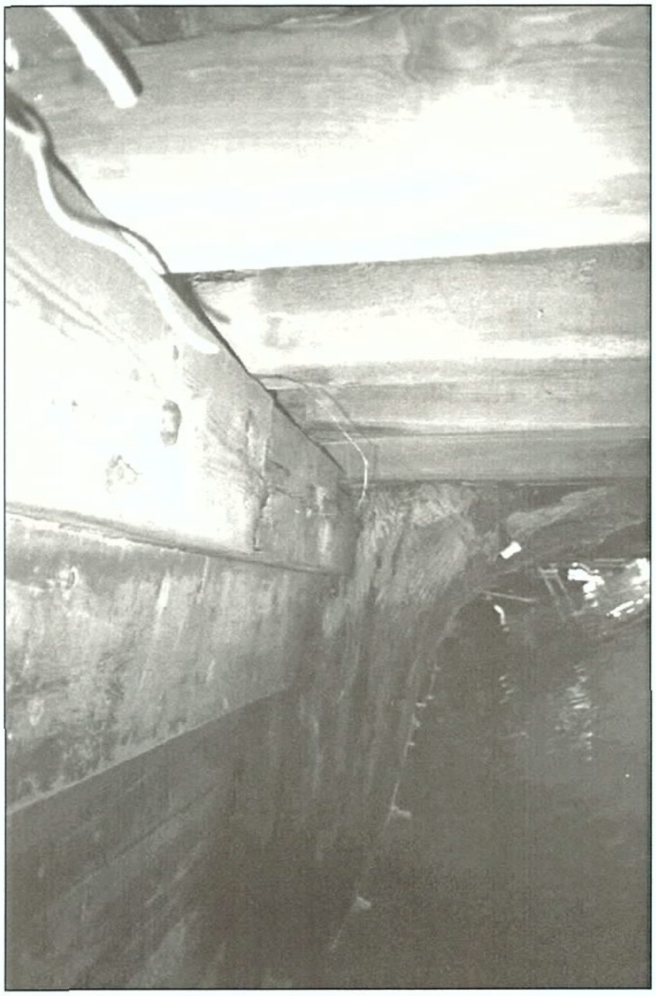


Figure 7-64. Detail of deck beams resting on the clam and shelf along with a hanging knee. Looking aft (north).

In addition to the previously mentioned hatch framing, there is additional blocking and framing added to the main deck beams to support the pilothouse. These consist of chocking inserted between the beams that mirror the outline of the pilothouse. The base of the pilothouse is fastened directly to this chocking (see Figure 7-37).

Below Decks

The below deck space of the *Fish Hawk* is divided into three basic sections. The main section is the cargo hold. This hold would have been built to contain the 300,000+ menhaden fish caught on a typical run. Stretching from 60 to 106 on the baseline, this hold is backed by two bulkheads of similar construction (Figure 7-65, cross section BL-55 in Figure 7-38 and Appendix E). At deck level, the bulkhead is supported by a 12-inch square main deck beam. Vertical stanchions, spaced roughly 19 inches apart and stretching from the top of the deck beam flush with the deck planking to the ceiling plank at the bottom of the hold, serve to hold the bulkhead facing. This facing is formed from planking measuring 3.5 inches sided and 10 inches molded. They are fastened to the stanchions via 5-inch galvanized iron spikes. The facing and stanchions are on the inward side of the deck beam so that they face aft on the forward bulkhead and forward on the aft bulkhead (Figures 7-65 and 7-68).

Forward of the forward bulkhead is the crew quarters. Access is gained through two small hatches in the pilothouse, one port and one starboard (see Figure 7-70). Aside from some faded tan paint, there is not much remaining in terms of furnishings and interior bulkheads (Figure 7-67).

Aft of the main cargo hold is the engine room. Remains of the propulsion system can still be seen, including a 6-cylinder Atlas diesel engine and a pair of fuel tanks (Figures 7-68 and 7-69).

Figure 7-65. Detail of aft bulkhead showing stanchions and facing planks, starboard side, looking south (forward).

Figure 7-66. Detail of top of aft bulkhead showing support beams and stanchion tops, looking port (east).

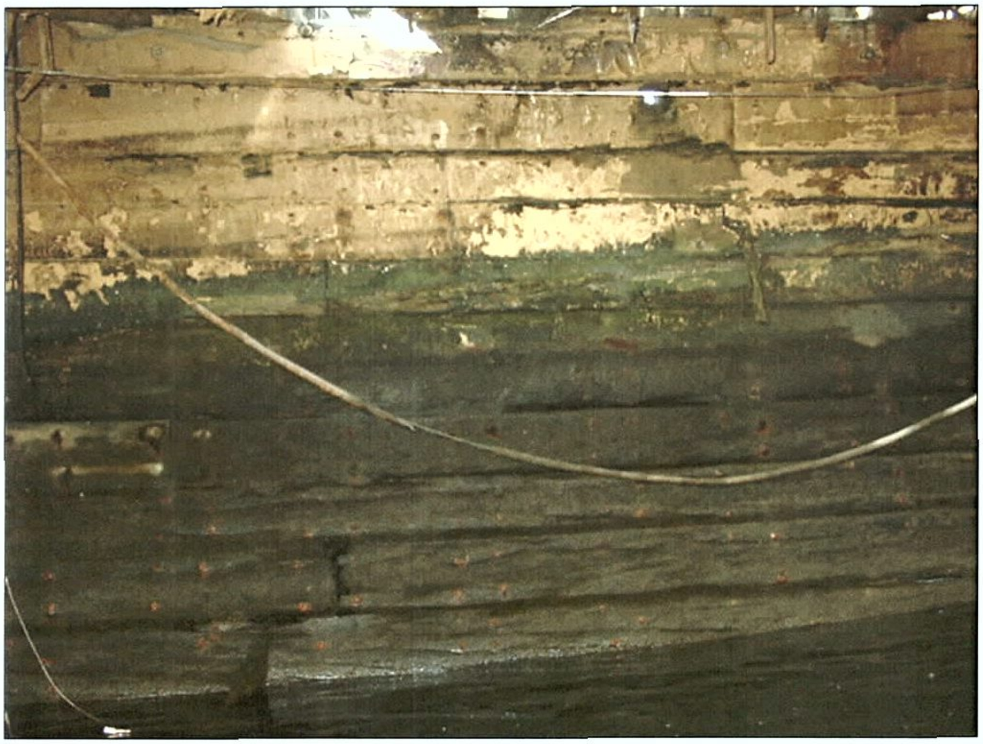


Figure 6-67. Close-up of ceiling planking in crew compartment, looking starboard (west). Note tan paint.

Figure 7-68. Single 6-cylinder diesel engine in engine room. Note aft bulkhead on left. Looking starboard (west).

Figure 7-69. Remnants of starboard fuel tank, looking west.

Further deck support is provided by a pair of central longitudinal timbers (carlings) supported by stanchions. These timbers, measuring 10 inches square, run between the bulkheads above the cargo hold and are broken by the main cargo hatch, with one timber running forward and one running aft. Oddly enough, they stop short of the bulkheads (see Figure 7-66). The supporting stanchions measure 10 inches square and are fastened to the carlings via iron brackets and drift bolts. The attachment method to the keelson is unknown.

Deck Planking

The main deck was planked with yellow pine of 3-inch thickness. A king plank of 12-inch width runs down the centerline of from the stem to the quarterdeck (Figure 7-70). Two rider planks of 10 inch width straddle the king plank. Outboard of the three central planks are the main deck planks. In general, these are 3.5 inches in width, although they vary in places where they have been cut to fit, most notably along the main cargo hatch coaming (Figures 7-71 and 7-72). Forward of the crew quarters access hatches, the deck planking curves inward, yacht style, although they do not exactly match the curve of the outer hull (Figure 7-70). The four outer planks in this area of the deck are of varying width to make up for the difference in curvature between the smaller deck planks and the covering board (Figure 7-73).

The planking of the quarterdeck follows the straight sides of the vessel and angles inward slightly toward the centerline. Unlike the foredeck, the aft quarterdeck planking does not curve to meet the king plank but rather continues straight to the stern (Figure 7-74). Deck planks were fastened to the underlying beams with 5-inch iron spikes (Figure 7-75). The fasteners were countersunk, and the holes plugged (Figure 7-75).

Figure 7-70. Forward third of *Fish Hawk*, including pilothouse, looking south. Note king plank and sisters along centerline.

Figure 7-71. View aft (north), showing deck planking.

Figure 7-72. Close-up of deck planking along forward edge of cargo hatch coaming. Note king planks at right and slight varying in size of planking.

Figure 7-73. Main deck forward, showing yacht style deck plank. Note larger timbers of changing dimension adjacent to waterway.

Figure 7-74. View looking starboard (west) showing quarterdeck planking.

Figure 7-75. Photo of fastener pattern on main deck and quarterdeck planking.

Quarterdeck

Following the classic form of a menhaden trawler, the *Fish Hawk* has a quarterdeck (Figures 7-37, 7-76, and 7-77). Beginning at about BL 55 and extending to the stern, the quarterdeck housed the engine room and provided support for the seine boat davits. Hull framing for the quarterdeck utilized the same frames as the rest of the hull and extended up to the level of the quarterdeck.

Figure 7-76. *Fish Hawk* quarterdeck. View to the west.

Figure 7-77. View of quarterdeck from fantail, looking south (forward).

The covering board on the quarterdeck was a continuation of the rail from the main deck (Figure 7-78). Rather than a bulwark, the quarterdeck utilizes a decorative rail consisting of stiles or spindles along with a cap (Figures 7-79 and 7-80). The rail is supported through the use of stanchions attached to the outside of the hull and extending from the rub rail to the cap (Figure 7-81).

Figure 7-78. Detail of Figure 7-77 showing extension of main deck bulwark cap into the quarterdeck as the covering board. View to the southwest.

Figure 7-79. Starboard side of vessel showing rail with decorative stiles. View to the southwest.

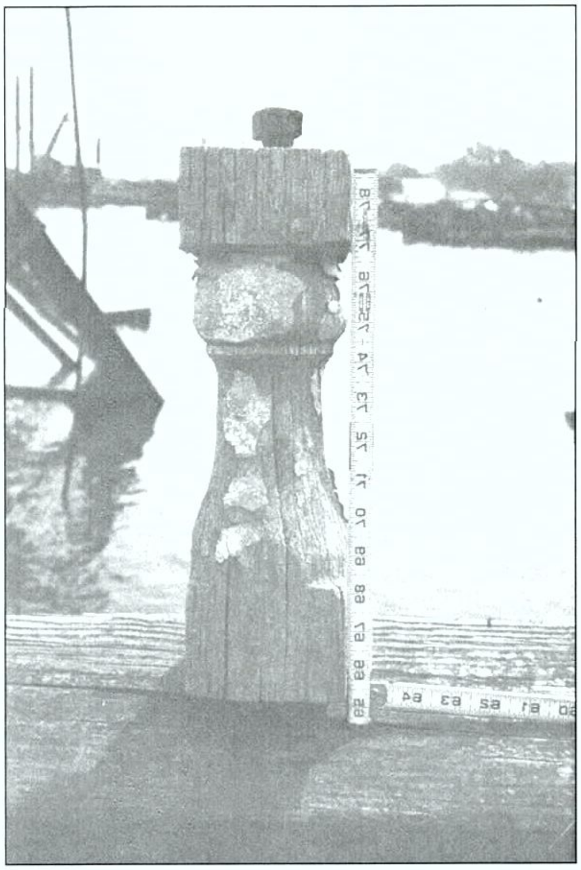


Figure 7-80. Close-up of decorative spindle or stile in quarterdeck rail. View to the west (starboard).

Figure 7-81. Port side of vessel showing quarterdeck rail stanchions. View to the north (aft).

Deck Fittings

There were a number of deck fittings present on the *Fish Hawk* that are indicative of its use as a fishing vessel. On the foredeck between the pilothouse and the stem is a king post (Figure 7-82). This post, measuring 12 inches in diameter and 3 feet in height, extends to the keelson and was likely used as a towing bitt or as an anchor for lines.

Figure 7-82. View from port looking starboard (west). Note king post and steering gear.

Immediately aft of the king post, within the outline of the pilothouse, is part of the remains of the steering assembly. This assembly consisted mainly of cables and pulleys used to transfer the turning motion of the wheel to the rudder. The extant part shown in Figure 7-83 is a pulley housing used to transfer the cable motion 90 degrees to port and starboard. Perpendicular to this pulley housing, at the outboard edge of the pilothouse, would have been another pulley housing to transfer the motion parallel with the vessel centerline. The cable was run in tubes along the deck to the quarterdeck (Figures 7-84 and 7-85). From there it ran below the quarterdeck in the engine room to the steering gear. It is not known if any power assist was used.

The vessel has the remains of four bollards or large cleats (see Figure 7-84 and Figures 7-86 and 7-87). These iron fittings were 3 feet in height and placed forward adjacent to the pilothouse and on the quarterdeck. Their placement seems odd (Figure 7-37), and it is likely there were other tying points aft, perhaps at the stern.

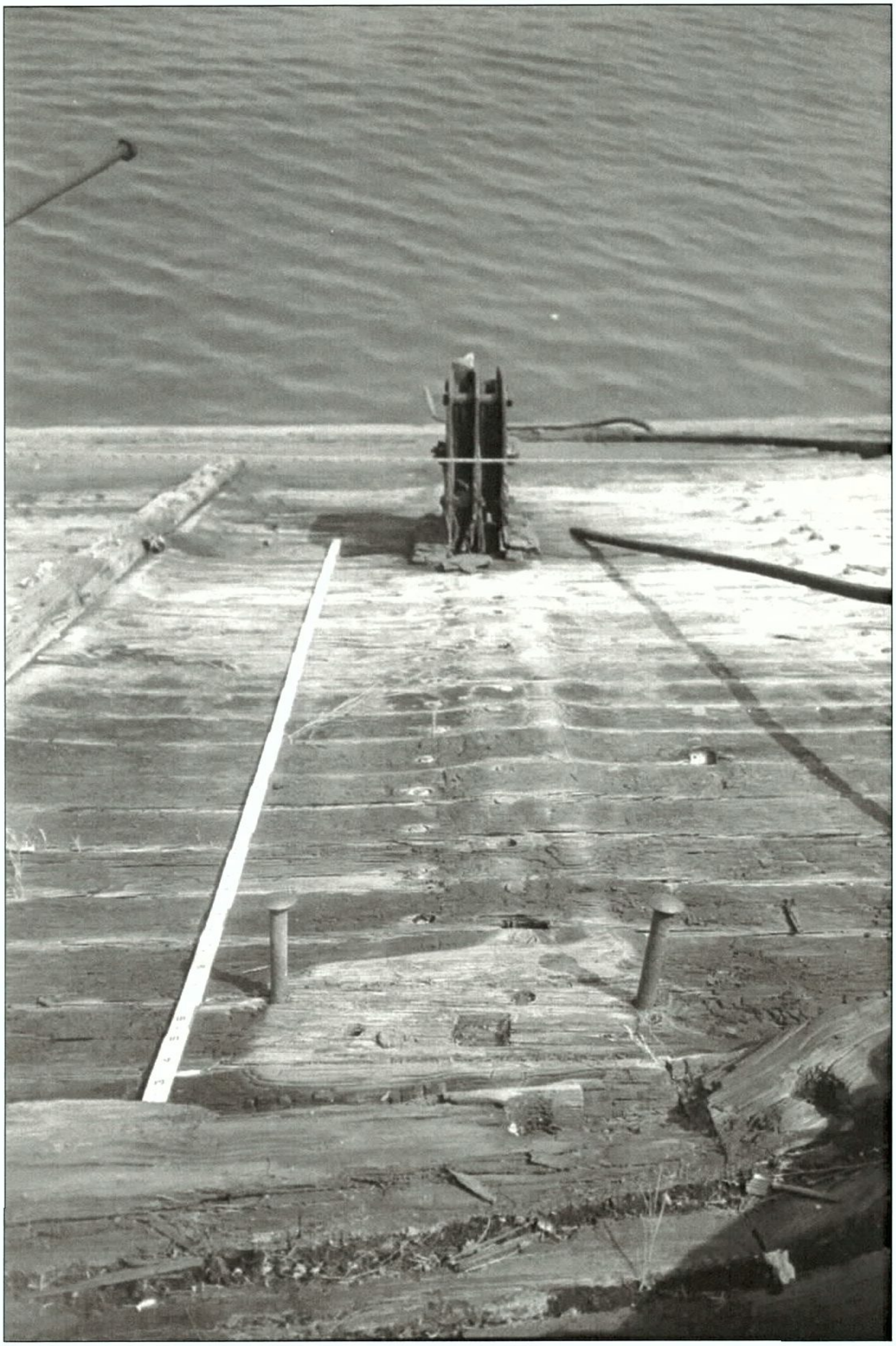


Figure 7-83. Forward section of pilothouse showing remains of steering gear. View to the east (starboard). Note mounting pad for pulley in foreground.

Figure 7-84. ***Mermentau*** **port side. Note small pipe on deck just outboard of main cargo hatch, containing steering cable (photo courtesy of Bob Cubbage).**

Figure 7-85. Aft pilothouse bulkhead remains showing steering cable passages. View to the north (aft).

Figure 7-86. View of starboard bulwarks and bollard, looking southwest.

Immediately aft of the pilothouse are the remains of the hoisting mast. Made of tubular steel measuring 10 inches in diameter, this mast served as the main support for the crane used to operate the dipping net that was used to transfer the menhaden from the seine nets to the cargo hold. It has been cut several feet above the deck but remnants are still visible (Figure 7-87), including stays through the stem and chain plates (Figures 7-88, 7-89, and 7-90). Although it was not investigated, it is a certainty that the mast extended to the keelson.

Figure 7-87. Main deck of *Fish Hawk*, looking aft (north). Note main mast right center and bollard on left.

Figure 7-88. Detail of starboard chain plates.

Figure 7-89. Chain plate detail, starboard side. View to the southeast.

Figure 7-90. Chain plate detail starboard side. View to the east.

On the aft end of the main hatch is an access ladder, made of iron (Figure 7-91).

Figure 7-91. Cargo hold access ladder on aft end of hatch coaming. View to the north.

Aft of the main cargo hatch are what appear to be the remnants of a vent stack or standpipe for the cargo hold (Figure 7-92). While this is not a certain assessment of its function, it is unlikely that it had a load bearing function, as it merely attached to the deck planks with carriage bolts. From the position of the stack, it is apparent there was a second matching stack on the port side; the hole in the deck can still be seen. Historical photos (Figure 7-93) show a similar pipe on a menhaden vessel.

Figure 7-92. ***Fish Hawk*** **from port side looking forward (south). Note remaining vent stack and main mast.**

Figure 7-93. Historical photo of a menhaden vessel, showing standpipe in similar location to ***Fish Hawk*** **(photo courtesy of NOAA).**

Several pieces of deck hardware are evident on the quarterdeck. Aside from the aforementioned bollards, there are remains of a pair of davits on each side for the seine boats, along with a number of small iron plates of unknown function and a 12-inch diameter tubular structure above the steering quadrant (Figures 7-94 through 7-99).

Historical photos of the *Fish Hawk* and similarly sized vessels indicate the presence of a pair of davits on each side of the quarterdeck. The remains of these davits are easily seen (Figures 7-94, 7-95, and 7-96). A supporting structure for the davit is shown in Figure 7-95 that extends below the deck into the engine compartment. While the below deck area under the aft davit could not be accessed, it is assumed a similar structure exists there, as well. The davits are clearly seen in historical photos of the *Fish Hawk* (Figure 7-97) and sister vessels (Figure 7-98).

Other fittings of unknown function can be seen on the quarterdeck, including a number of iron plates. The purpose of these plates is unknown, and historical photos shed no insight; however, they likely represent the remains of various pieces of equipment, such as pumps or compressors.

The final quarterdeck fitting is a single stack immediately aft of the aft cabin. Its function is unknown; it is not exhaust for the engine, as that exited through the roof of the aft cabin directly above the engine room. It is likely a ventilation stack, as it does not extend past the deck and is fastened directly to it via a number of carriage bolts (Figure 7-99).

Figure 7-94. Aft davit, starboard side, looking northwest.

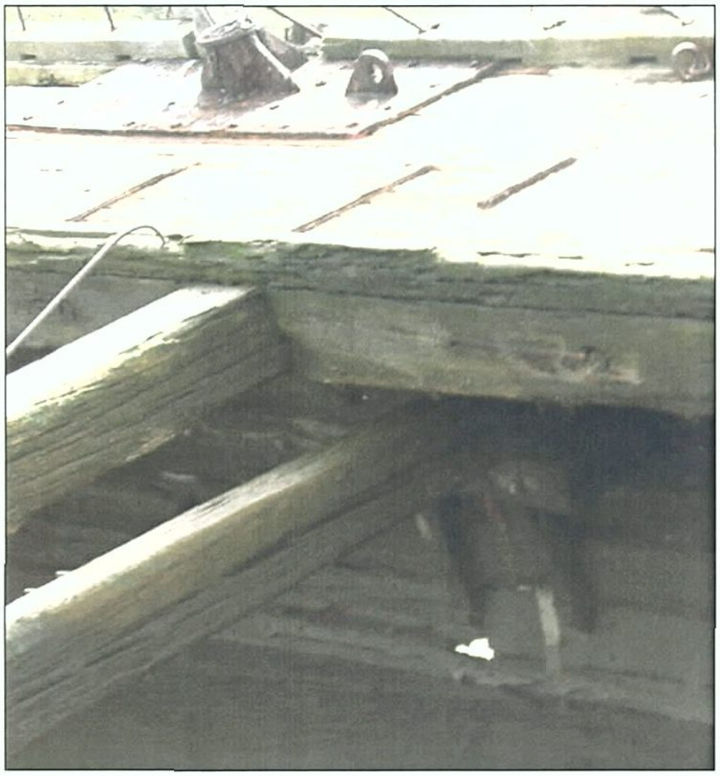


Figure 7-95. Forward davit, starboard side, looking west. Note supporting structure below deck.

Figure 7-96. Starboard quarterdeck, looking west. Note from left to right: bollard, forward davit, large plate, aft davit, and aft stack. Also note small steel deck plates adjacent to aft deckhouse.

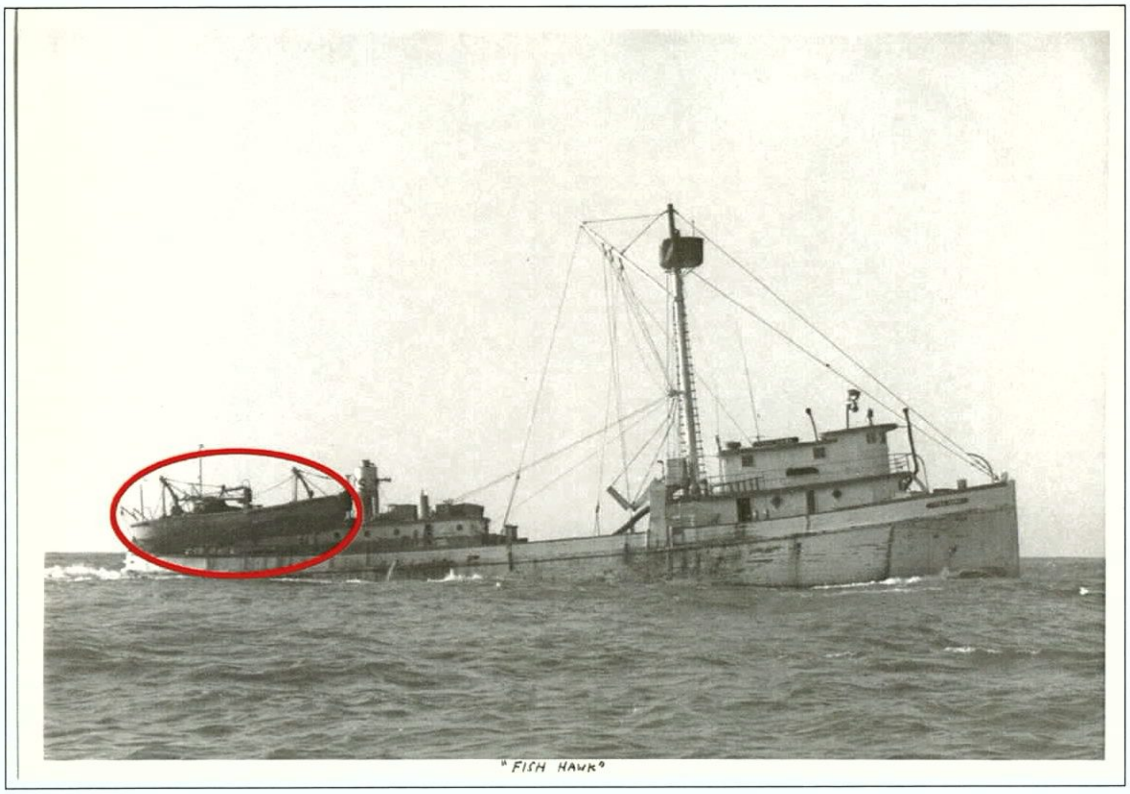


Figure 7-97. Historical photo of *Fish Hawk*, showing location of aft davits.

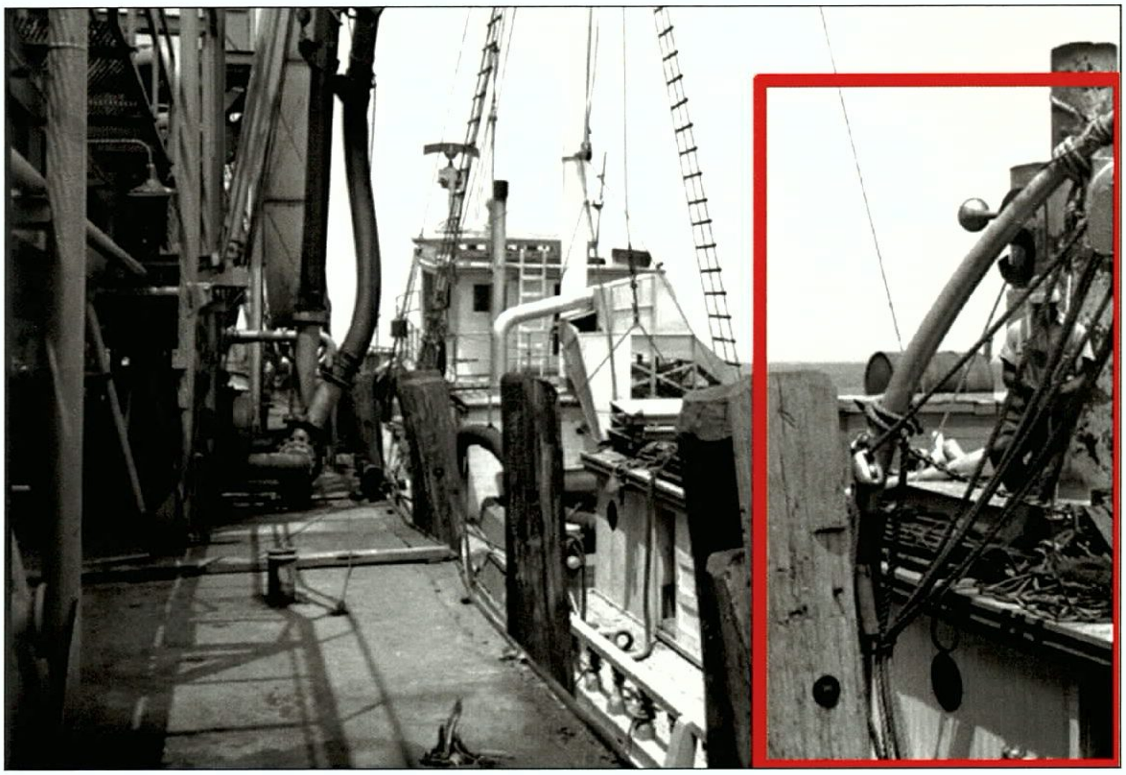


Figure 7-98. Port side of *Mermentau*, showing forward davit.

Figure 7-99. Aft ventilation stack.

JOINERY

What remains of the joinery indicates that a considerable amount of care and workmanship was taken in the construction of the *Fish Hawk*. This is one of the most interesting parts of the vessel. Three main areas warrant consideration, including the pilothouse, the main hatch, and the aft cabin.

Pilothouse

The remains of the pilothouse consist of just the base. This base is constructed of several pieces of timber, and the timber used in the curved forward end is consistent with the type of timber used in the stern fantail. The curve is constructed of short timbers cut from straight stock, rather than steam bent. They are fastened to the underlying deck beams with iron drift bolts (Figure 7-100). The aft corners of the pilothouse also feature interesting joinery. The longitudinal timber forming the side of the cabin is notched with what appears to be an angled dovetail joint to receive the athwartships base timber (Figure 7-101).

Main Hatch

The main cargo hatch extends to approximately 20 inches above the main deck of the vessel. The coaming is built up of three timbers. While the individual timbers are fastened with butt joints to their respective perpendicular timbers at the corners, all the timbers built up create the appearance of a finger joint (Figure 7-102). The joints are fastened with vertical drift bolts, passing through the coaming as well as the deck beams. The fastener holes are finished with wood plugs.

Aft Cabin

Like the forward cabin, all that remains of the aft cabin is the base. Even so, some interesting woodwork remains. The forward corners are fastened using the same angled dovetail, and in this instance, the tenon on the athwartships forward end of the cabin is exposed. This arrangement of perpendicular timbers rests on a pair of slightly wider timbers that are fastened directly to the deck beams. These two timbers appear to be fastened to each other using a standard butt joint.

Figure 7-100. Forward end of pilothouse base. Note cut timbers.

Figure 7-101. Aft end of pilothouse. View to the north.

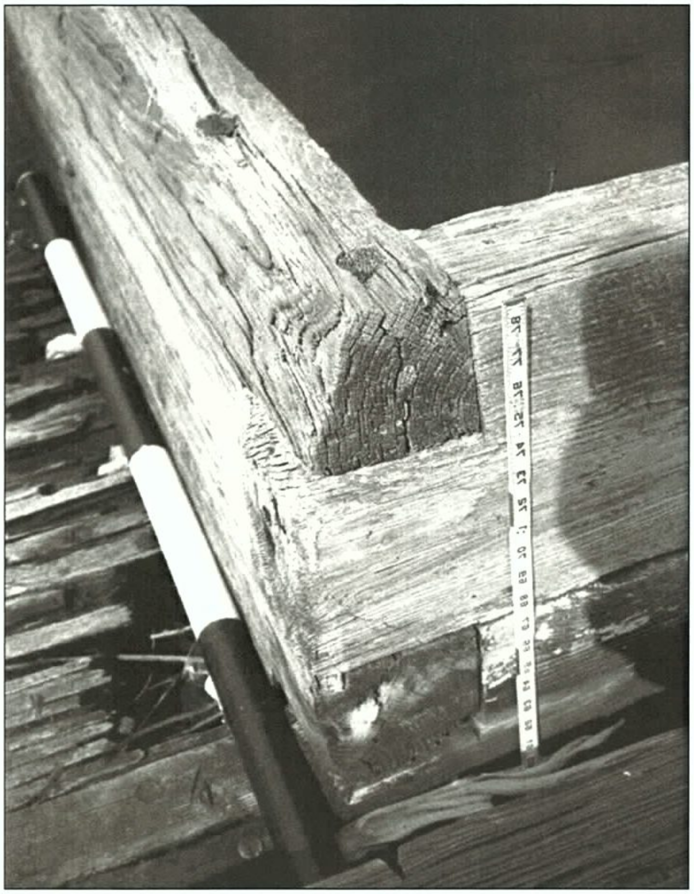


Figure 7-102. Starboard aft corner of the cargo hatch, looking port (east). Note joint.

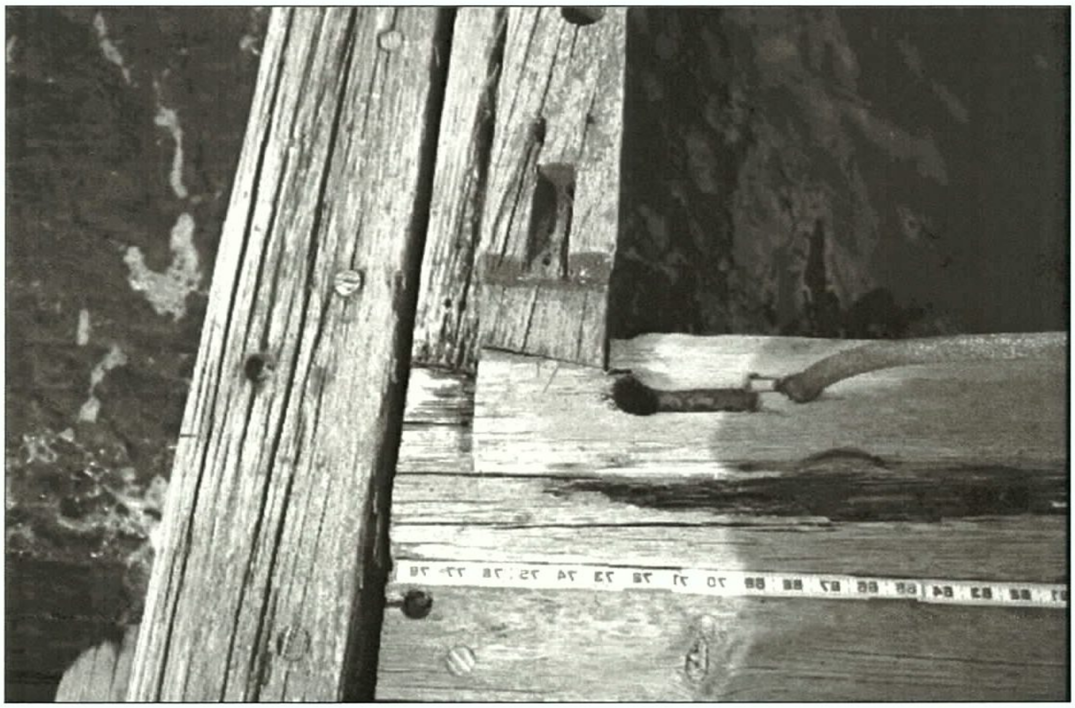


Figure 7-103. Detail of starboard forward corner of aft cabin, looking east.

Miscellaneous Joinery

There were several other places on the vessel with joinery that suggested a higher level of craftsmanship. On the starboard side rail adjacent to the main cargo hatch is a scarph joint used to join two pieces of rail. This is the only joint of this type observed on the vessel, however the rail is considerably deteriorated on the starboard side and missing or submerged on the port side. This scarph joint is uncommon for this type of vessel and in this location on a vessel (Figure 7-104), and is more often associated with English or European built vessels.

Figure 7-104. Scarph joint used to join sections of the starboard rail.

Steering Apparatus

The *Fish Hawk* used a quadrant type steering apparatus. This is a basic setup, with the aforementioned steering cables extending aft from the pilothouse to the stern, consisting of a quadrant and two pulley blocks, one on each side of the vessel (Figure 7-105). The quadrant is attached to the rudder at its pivot point and provides the multiplication of force necessary to turn the rudder (see Figure 7-37, and Appendix E) and the pulley blocks change the direction of the steering cables.

Figure 7-105. Starboard steering pulley, looking southwest.

8. VESSEL SS16B: COMPOSITE-HULLED VESSEL

Brief History of Shooters Island

The earliest history of Shooters Island is vague. It was apparently known to the Dutch, who gave it the name "Shuter's Island" because, according to Leng and Davis (1930:120), the early Dutch settlers shot geese there. In 1680 it was granted to James Graham, a Scotsman who arrived in New Amsterdam shortly after its capture by the British. The documented history of the island extends more or less from the mid-nineteenth century to the present. David Butler, whose house is shown on the 1853 Butler and the 1959 Walling maps (Kardas and Larabee 1985:14), is the first reported owner during this time period. Mr. Decker established a small shipyard on the island in the 1850s before listing it for sale. The advertisement described the property as containing "between 10 and 11 acres of land" with 6 acres being usable. Improvements to the island are listed as a drydock, a two-story brick house, and a joiner's shop (Anonymous 1863).

The island was sold in the 1860s and became the location of the Shooters Island Petroleum Refining and Storage Company. The company constructed numerous buildings, including a refinery, a storage house, and a cooper's shop, although it would seem the shipyard facilities were retained. The company was acquired in 1867 by Woodruff and Houston of New York City. The U.S. Coast and Geodetic Survey chart of 1886 shows the locations of the refinery buildings (Kardas and Larabee 1985:21).

The island was taken over around the turn of the twentieth century by Townsend and Downey, who opened a shipyard. The yard constructed yachts and other small craft, including the *Meteor*, built for Kaiser Wilhelm II of Germany, as well as the record-holding schooner *Atlantic*, between 1900 and 1904 (U.S. Department of Commerce 1936; Kardas and Larabee 1985). While production of vessels at the Townsend and Downey yard seems to have tapered off, nonetheless by 1910 the facilities had been greatly expanded compared to 1886 (Kardas and Larabee 1985:22).

At some point after 1904, the island and associated shipyards were taken over by or reorganized as the Standard Shipbuilding Company. When the U.S. entered WWI, a major period of activity on Shooters Island followed. The Standard Shipbuilding Company, from 1917 to 1921, built 26 steel cargo ships, including one in 1917, nine in 1918, nine in 1919, six in 1920, and one in 1921. Twenty-three of these vessels were cargo ships of at least 4,400 tons. The last ship built on Shooters Island was the New York City fireboat *John Purroy Mitchel*, of 334 gross tons. All industrial activity on Shooters Island ceased after 1921.

Shooters Island East Ship Graveyard

In the latter half of the twentieth century, Shooters Island became a place where vessels were abandoned. Two ship graveyards, one on the west side in the tidal flat and the other on the east side near the shipyard piers, developed in the years after the shipyard closed. Various studies have been completed regarding the development of these graveyards as well as the vessels within, including Kardas and Larabee (1985), Brouwer (1981), Rockman and Rothschild (1979), Brouwer (1983), and Raber et al. (1995). These studies have been summarized in previous reports (Lydecker and James 2002, 2004), but will be touched on again in this section.

The process began not long after the abandonment of the shipyard facilities. The east side of the island, with its piers, served as a long-term storage facility for numerous vessels. As shown in a 1930 aerial photograph presented in Kardas and Larabee (1985), 22 deck scows with cranes, 4 covered barges, 6 hopper barges, a small ferry, the vertical beam sidewheeler *Minerva* (ex *Jane Moseley*), several large cargo vessels, and a number of smaller vessels are moored at the former shipyard facilities (Figures 8-01 through 8-03). At this time, only one vessel appears on the western side of the island, a small hull roughly the same size and deck layout as SS16b. Oddly enough, this hull disappears from this area about the same time as SS16b appears on the eastern side of the island.

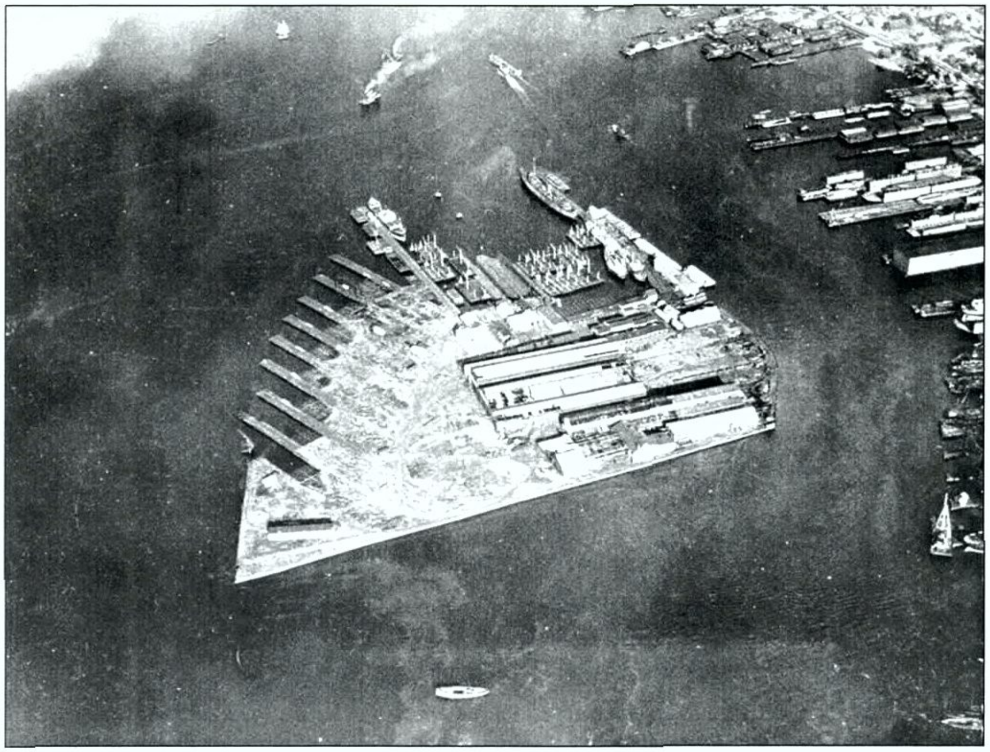


Figure 8-01. 1930 oblique aerial photograph of Shooters Island (as presented in Kardas and Larabee 1985).

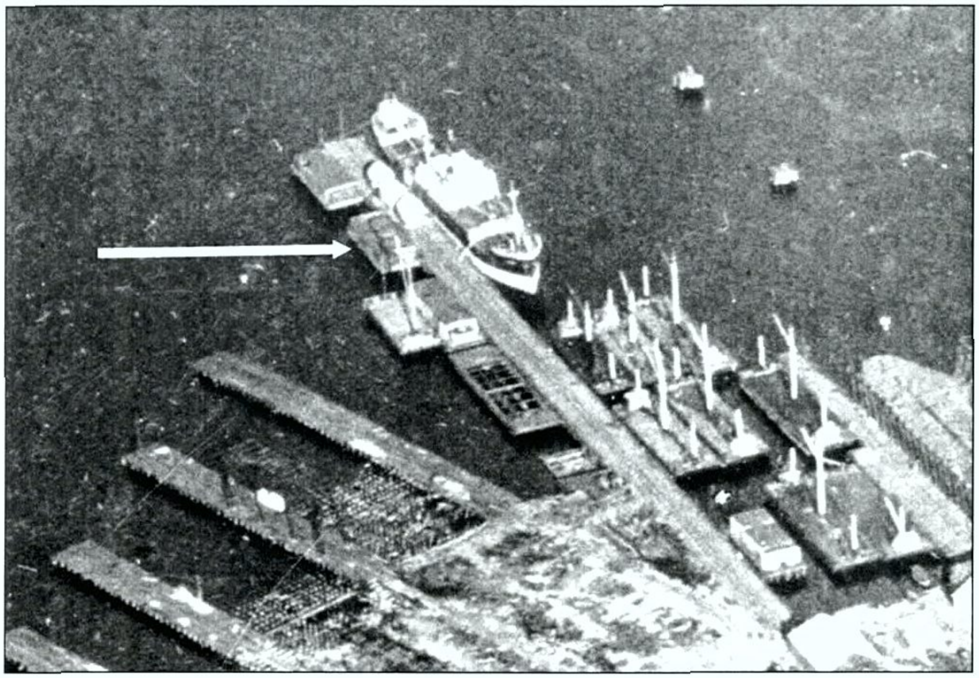


Figure 8-02. Figure 8-01 detail showing absence of SS16b in present location (as marked by arrow).

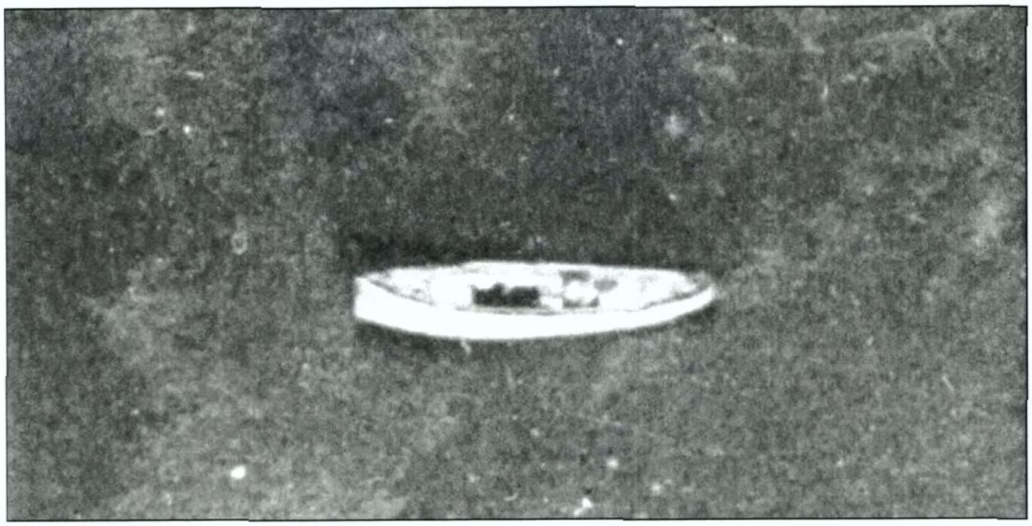


Figure 8-03. Figure 8-01 detail showing lone vessel with approximate dimensions of SS16b on western end of island.

In a 1940 aerial photo, the positions of numerous vessels has changed, but the *Minerva* appears to have settled to the bottom, as has the package freighter documented by Kardas and Larabee (1985), and several other vessels are deteriorating by the piers (Figure 8-04). A number of other vessels, including the two tugs adjacent to SS16b, a number of covered barges, and a large balanced drydock, found their way to the site sometime after 1950. By 1969, the vessels currently present at the site were in place. Some time after, the drydock and several barges were removed. After the mid-1970s, the vessels and structures deteriorated to their present conditions.

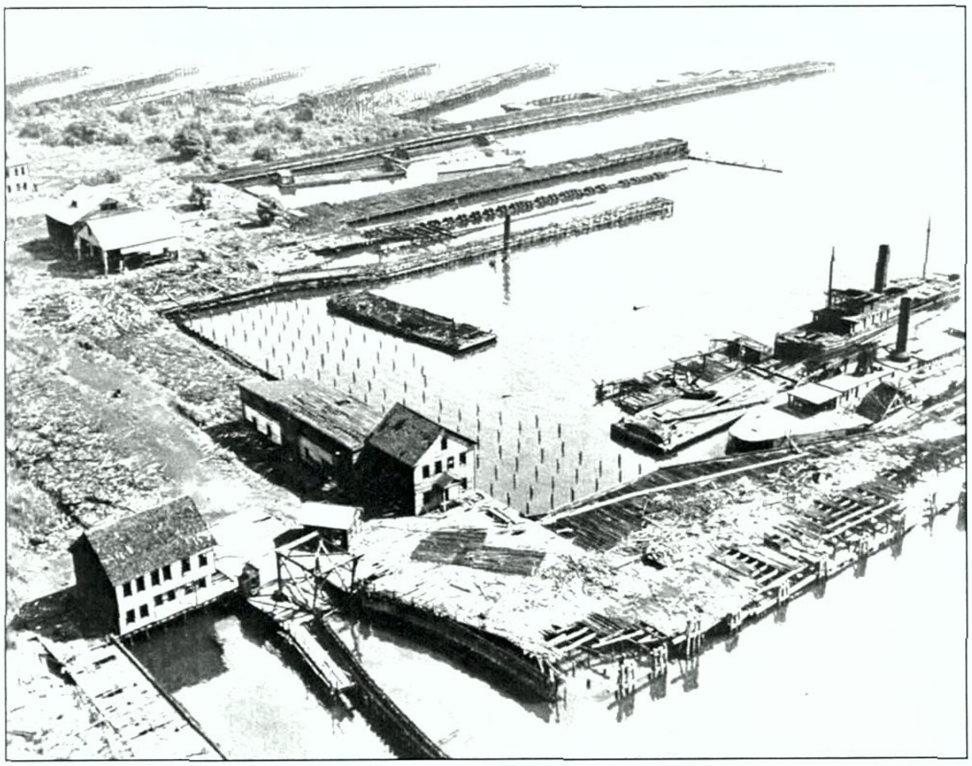


Figure 8-04. 1940 oblique aerial photo of Shooters Island showing vessel SS16b stripped of superstructure (as presented in Kardas and Larabee 1985).

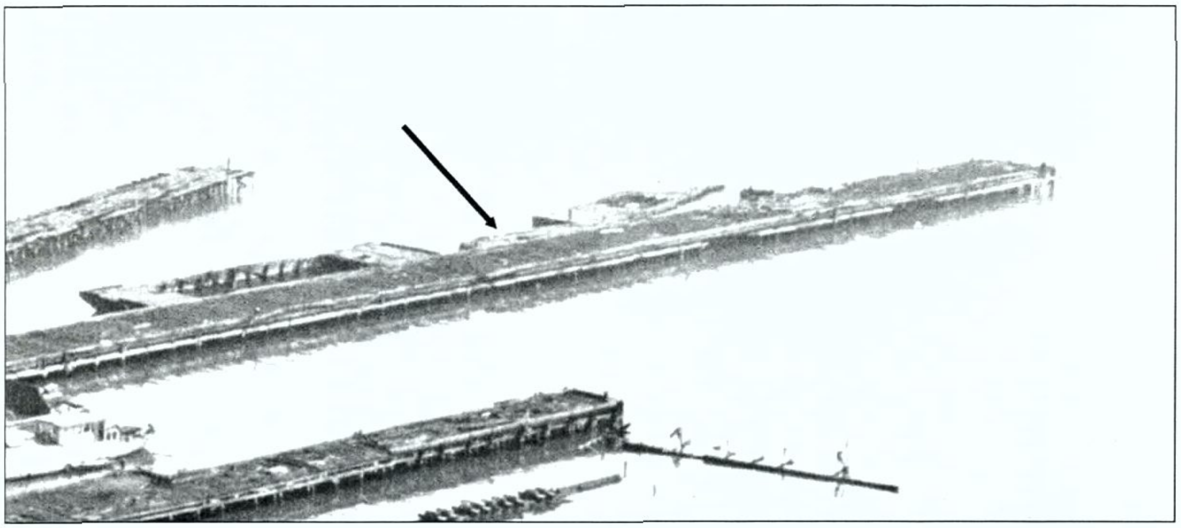


Figure 8-05. 1940 oblique aerial photo detail showing SS16b.

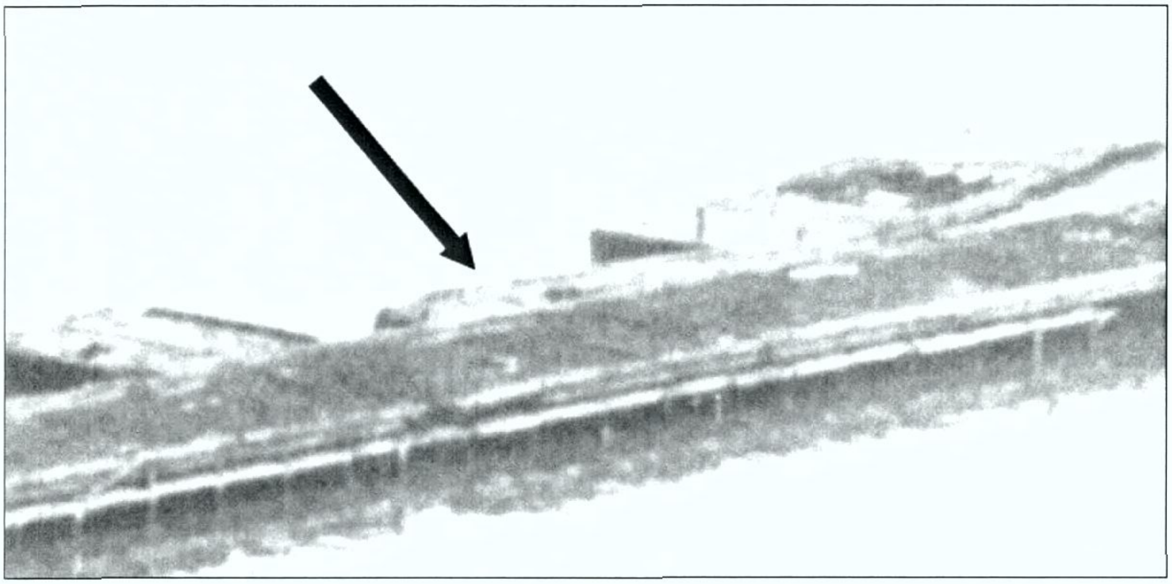


Figure 8-06. 1940 oblique aerial photo detail showing SS16b.

HISTORY OF SS16B

Vessel SS16b was not located during any of the previous archaeological surveys, including Kardas and Larabee, Raber and Associates, Brouwer, or Panamerican, prior to 2002. It was located by Panamerican in 2002 (Lydecker and James 2002) as part of a sidescan target (see Figure 8-17). It was initially not recommended for further investigation, but after review the recommendation was changed. Vessel SS16b remains unidentified, but research has identified some information.

The vessel is physically associated with the remains of the Standard Shipbuilding Company as part of the vessel graveyard on the eastern end of the island and appears to have been tied up to one of the facility's piers. However, aerial photo analysis indicates the vessel arrived at its current location after the close of the shipyard—sometime between 1930 and 1940—and so is not likely to be associated with the operation.

Examination of aerial photos from 1930, 1940, 1951, 1960, 1969, 1974, 1984, and 1994 (Figures 8-01, 8-04, 8-07, 8-08, 8-09, 8-10, 8-12, 8-13, and 8-16) indicate the vessel was in its current location by 1940 and partially submerged by 1960.

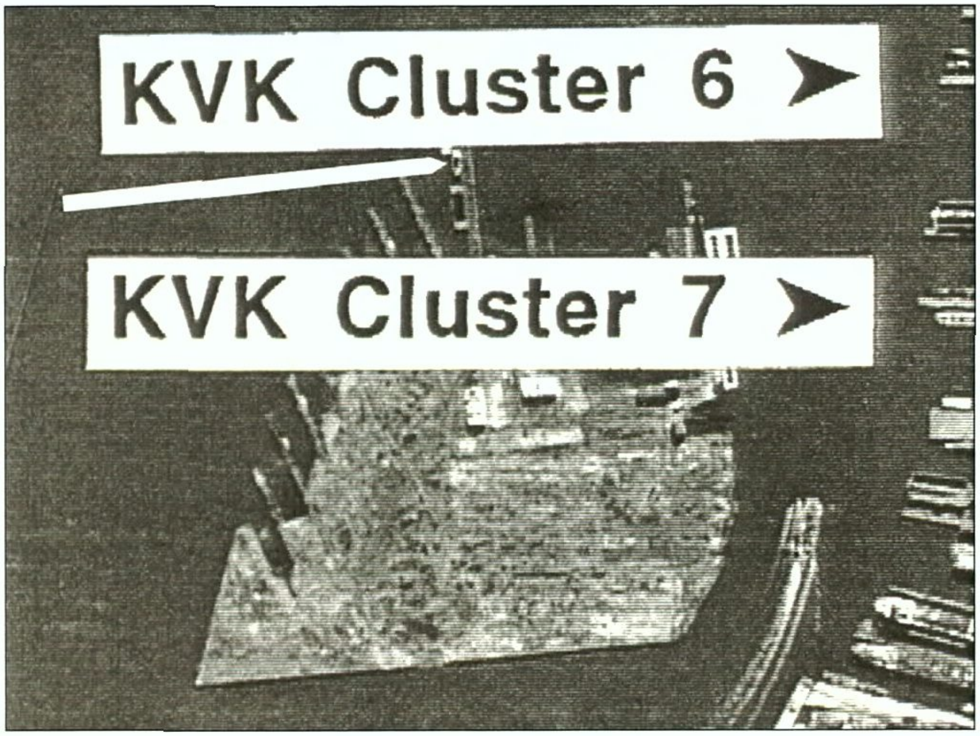


Figure 8-07. 1940 vertical aerial photo showing Shooters Island and SS16b in current location (source: James 1999).

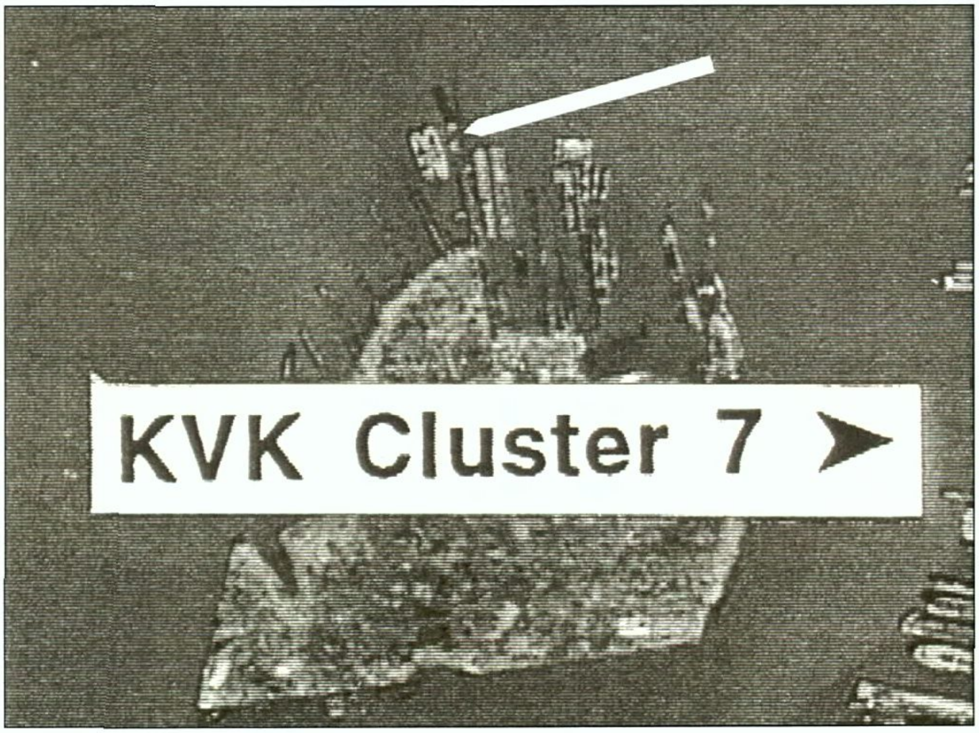


Figure 8-08. 1951 vertical aerial photograph showing SS16b in its current location (source: James 1999).

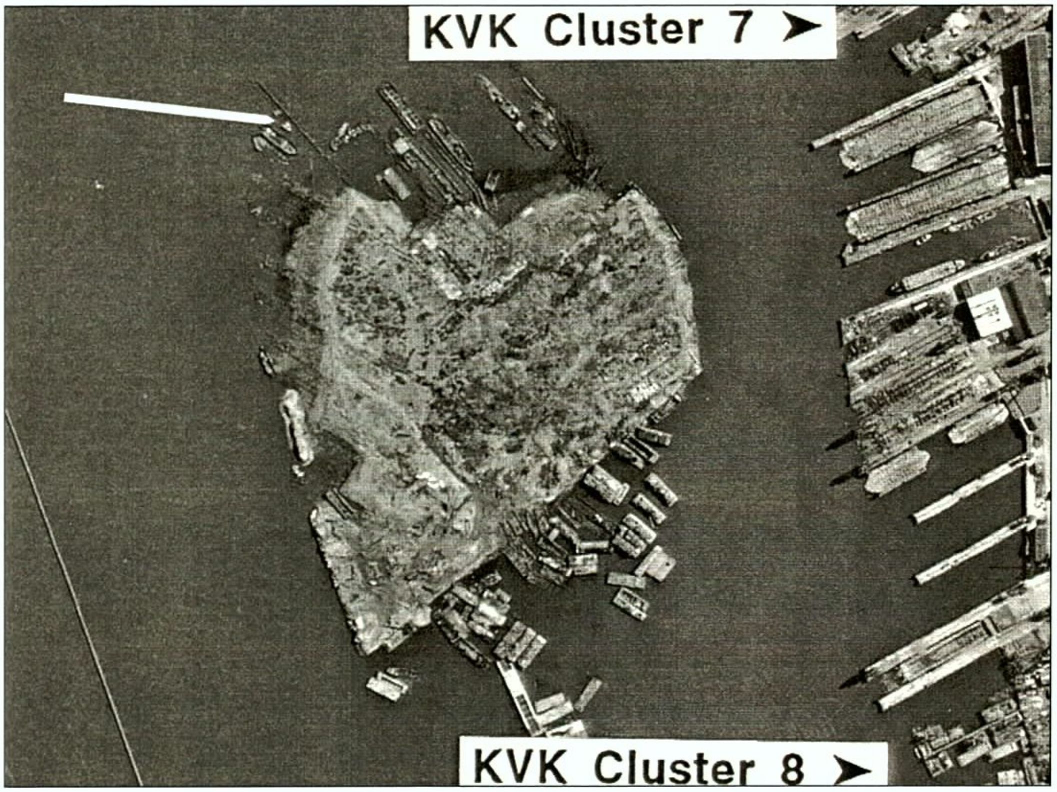


Figure 8-09. 1960 vertical aerial photo showing SS16b in its current location with decks awash (source: James 1999).

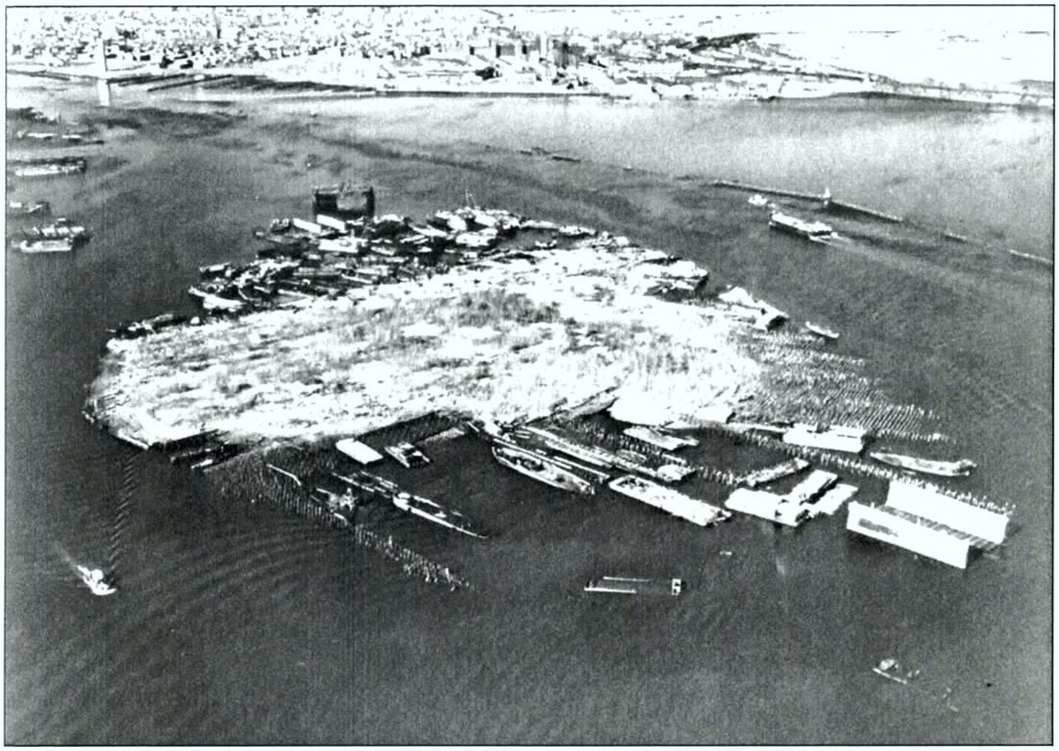


Figure 8-10. 1969 oblique aerial photo showing Shooters Island in 1969. Bow of SS16b visible above drydock (as presented in Kardas and Larabee 1985).

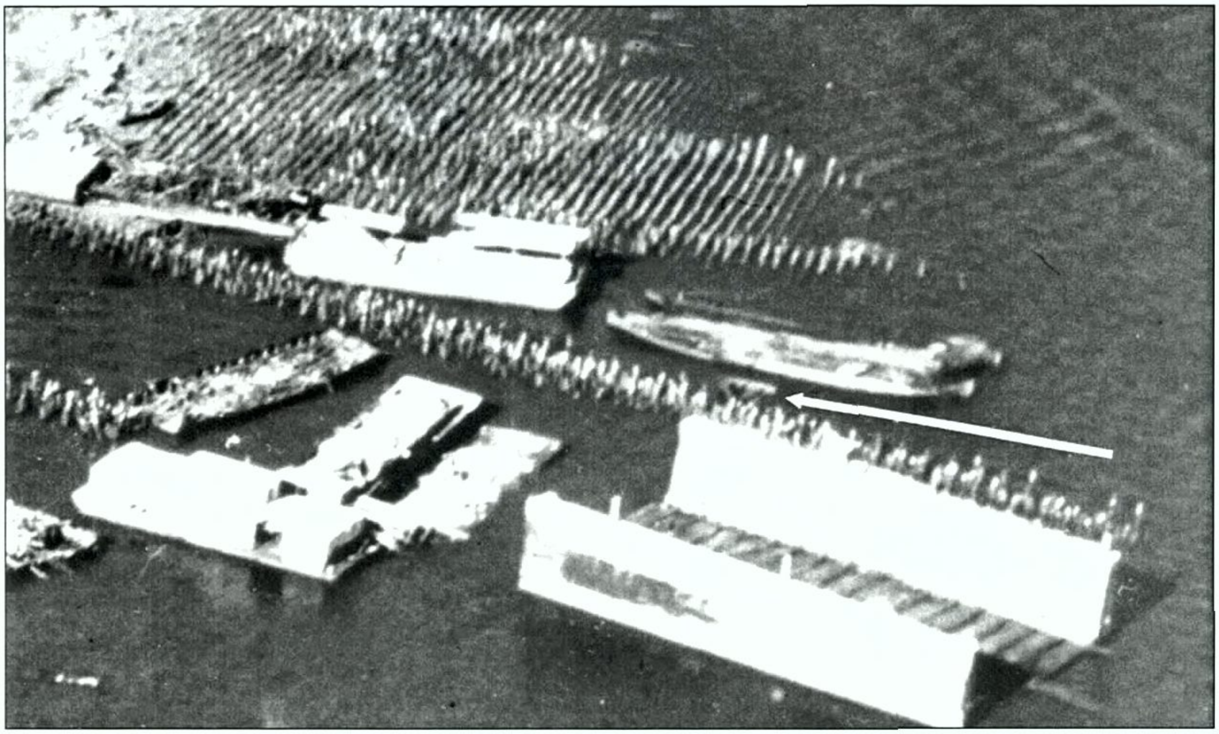


Figure 8-11. 1969 oblique aerial photo detail showing Shooters Island. Note bow of vessel is visible.

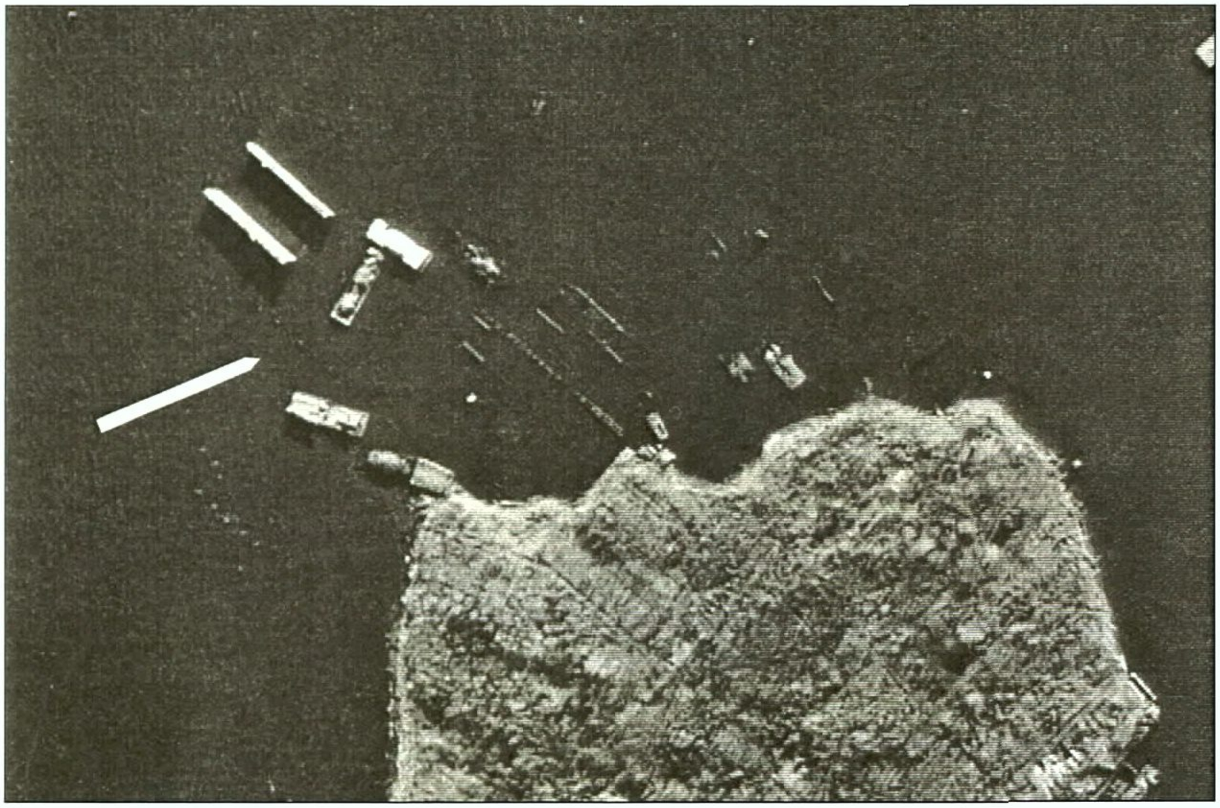


Figure 8-12. 1974 vertical aerial photo showing Shooters Island. Note SS16b no longer visible (source: James 1999).

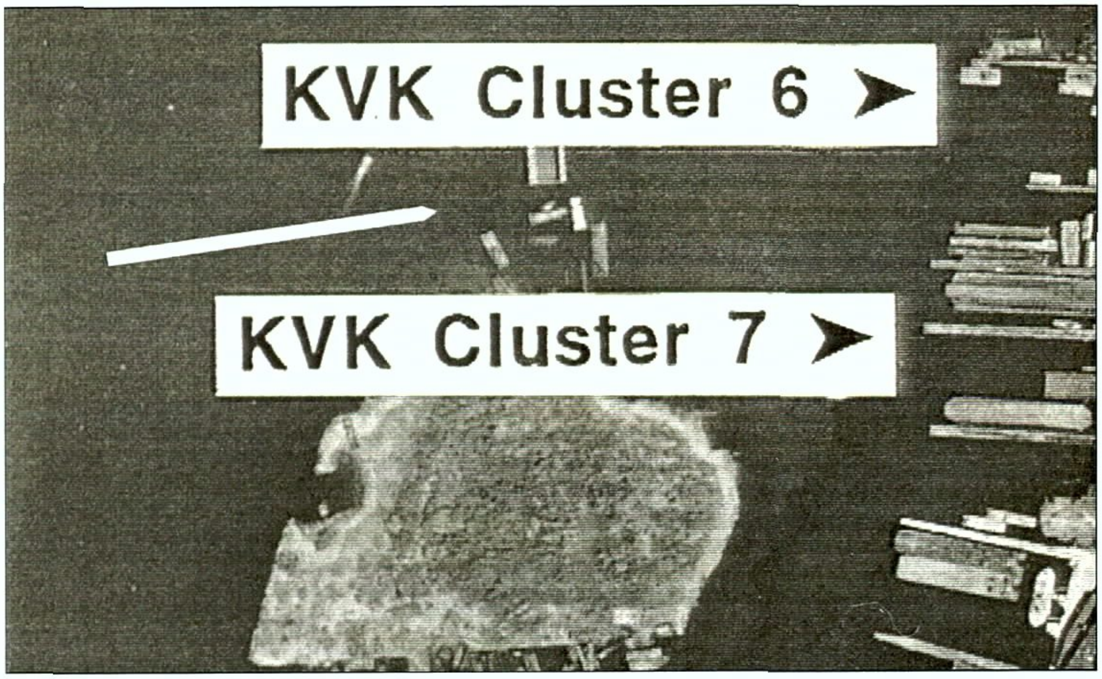


Figure 8-13. 1984 vertical aerial photo showing Shooters Island. Note SS16b no longer visible (source: James 1999).

Figure 8-14. 1985 oblique aerial photo showing Shooters Island graveyards (as presented in Kardas and Larabee 1985).

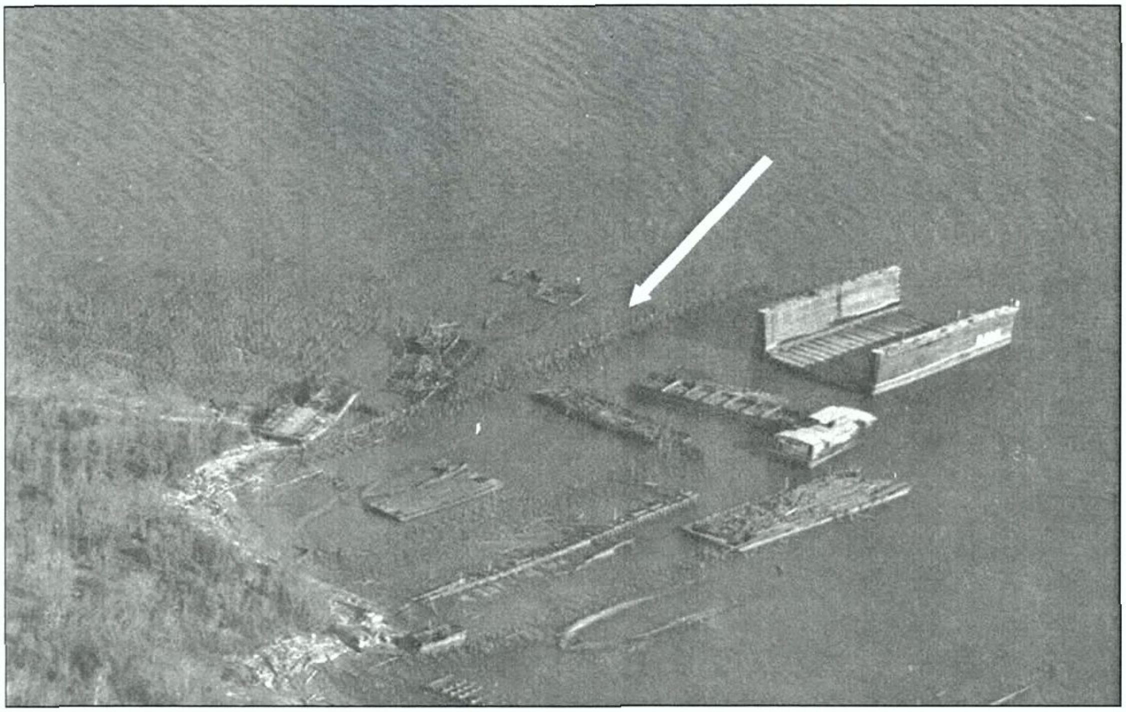


Figure 8-15. 1985 oblique aerial photo detail showing location of SS16b, which is completely submerged and no longer visible.

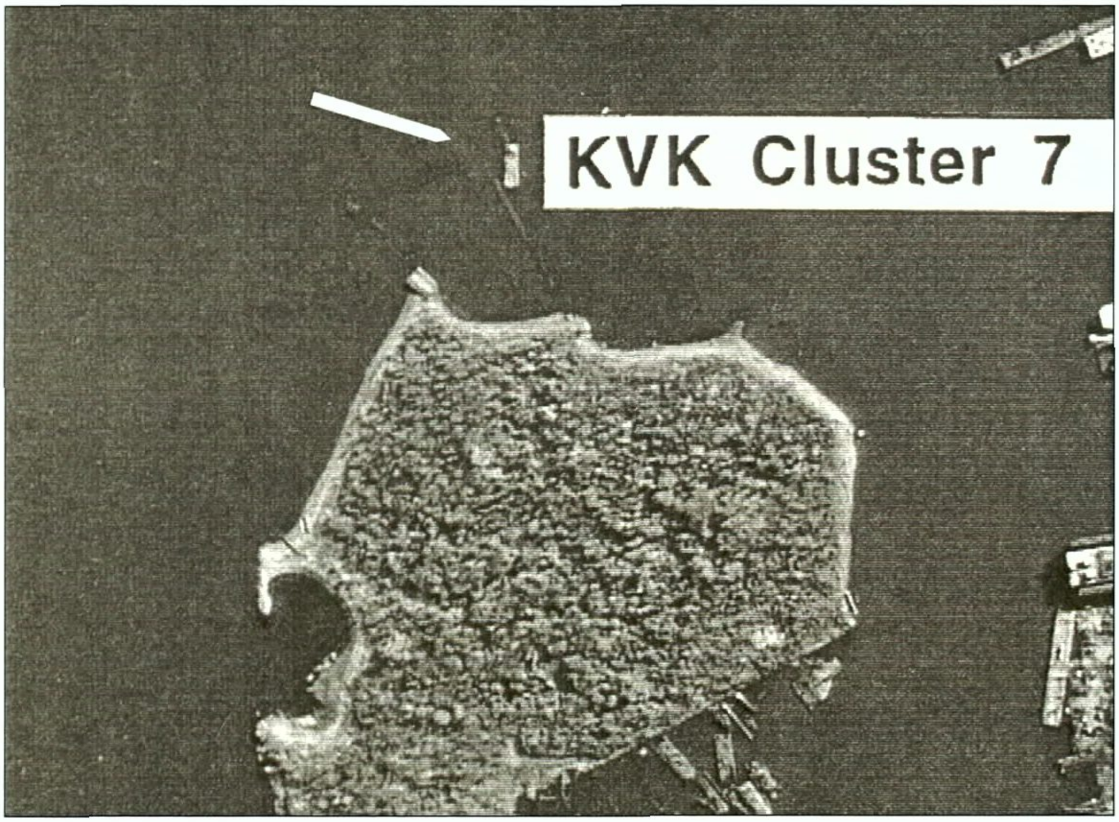


Figure 8-16. 1994 vertical aerial photo of Shooters Island. The two adjacent tugs are barely visible, but SS16b is completely submerged (source: James 1999).

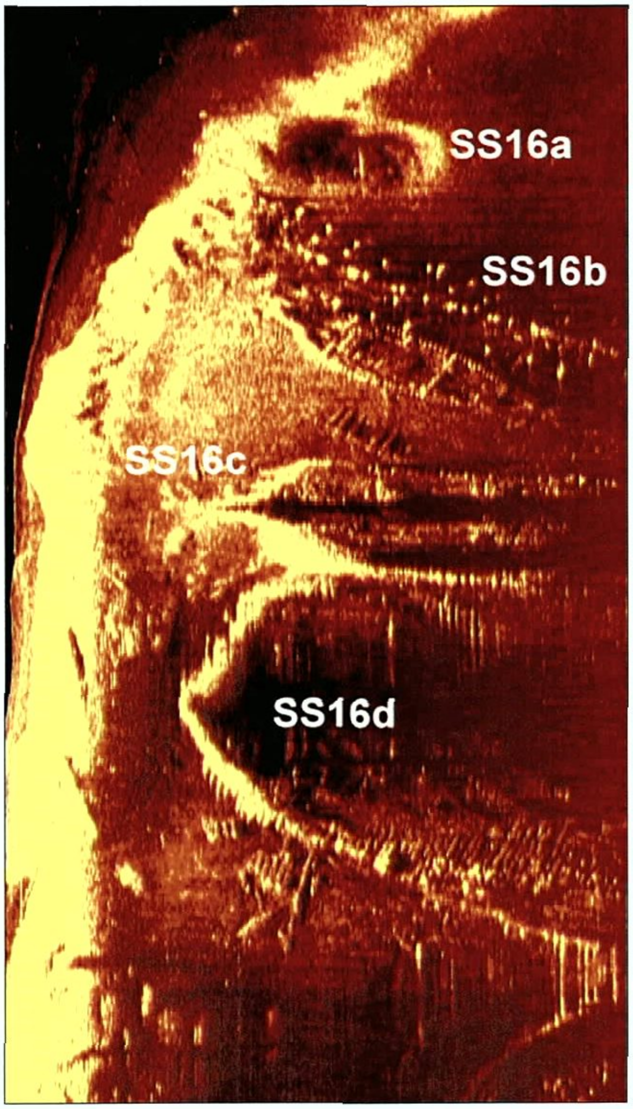


Figure 8-17. 2002 sidescan sonar image of Target SS16 showing locations of three confirmed vessels (SS16a is not a vessel). Note location of SS16b adjacent to pier remains (as presented in Lydecker 2003).

DESCRIPTION OF VESSEL REMAINS

The study examined the vessel in its entirety, evaluating both construction methods and general condition. A plan view of SS16b can be found in Figure 8-18. Specific attention was paid initially to the existing machinery and the condition of the hull and framing. The vessel has deteriorated considerably, and very little framing exists above the turn of the bilge. What little framing remains exposed is considerably concreted, and has deteriorated to the point where it is easily broken by hand (Figure 8-19). The same is true for the outer hull planking; what is exposed above the bottom is heavily damaged by marine borers (Figure 8-20). There is no exposed portion of the framing with hull planks attached that is intact enough to warrant recovery. It is possible that portions of the vessel that remain buried are in better condition. The vessel's machinery was also examined. Very little remains of what was probably a steam power plant, reduced basically to a portion of the drive shaft and the propeller. The propeller was examined and determined to have four blades. The condition of the propeller was also assessed, and it was found to be in less than desirable condition, with 8 to 12 inches of two exposed blades broken off (Figure 8-21).

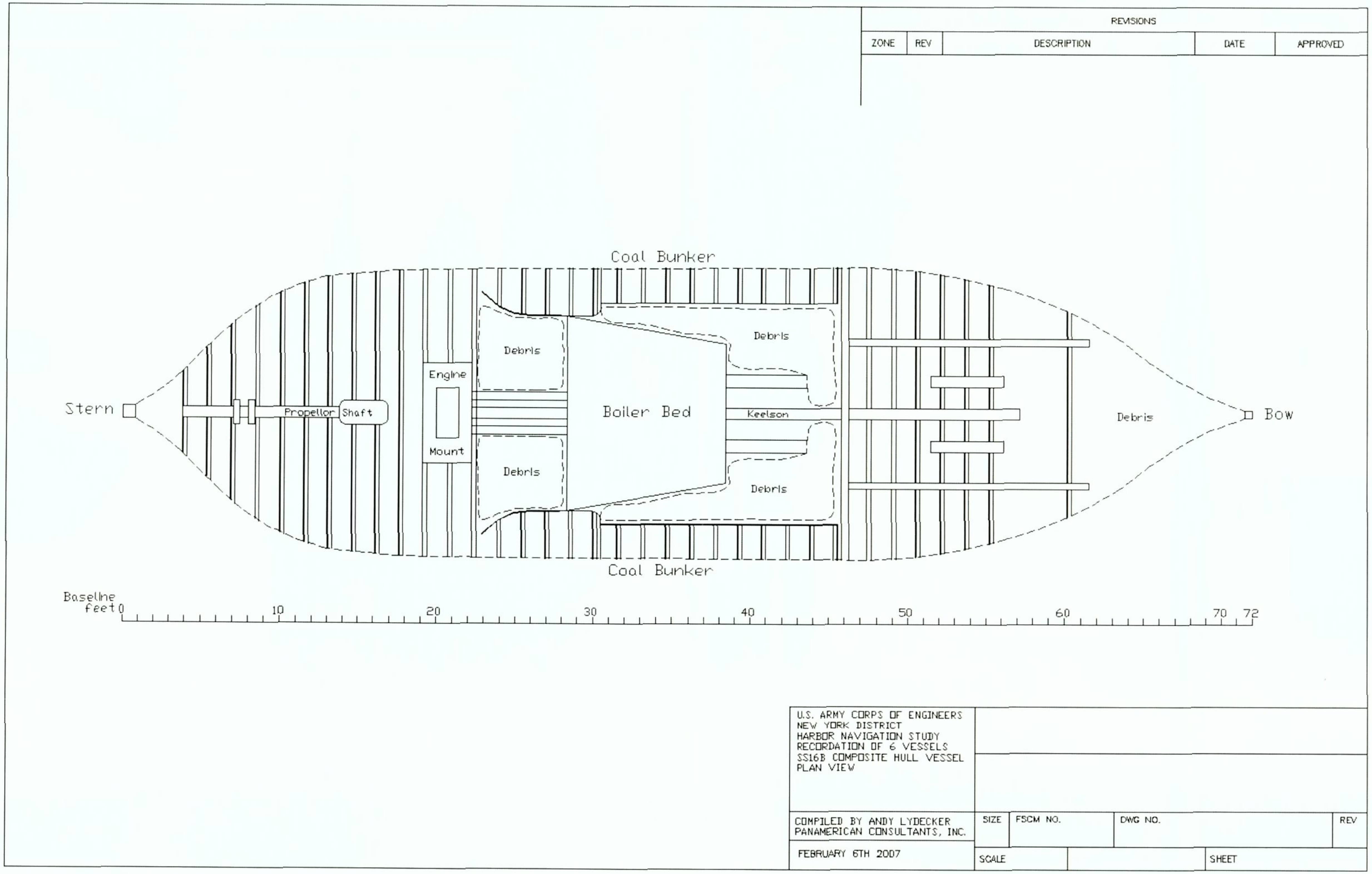


Figure 8-18. Plan view of SS16b.

Figure 8-19. Video frame of deteriorated iron framing of SS16b.

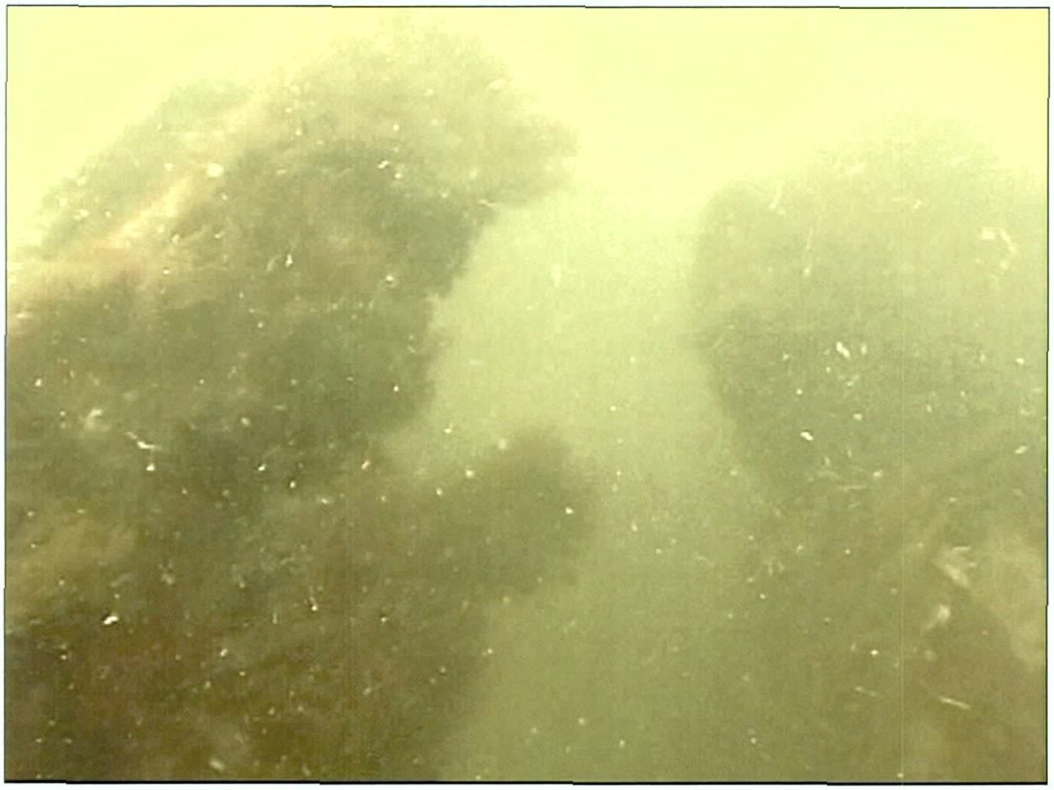


Figure 8-20. Video frame showing deteriorated hull planking.

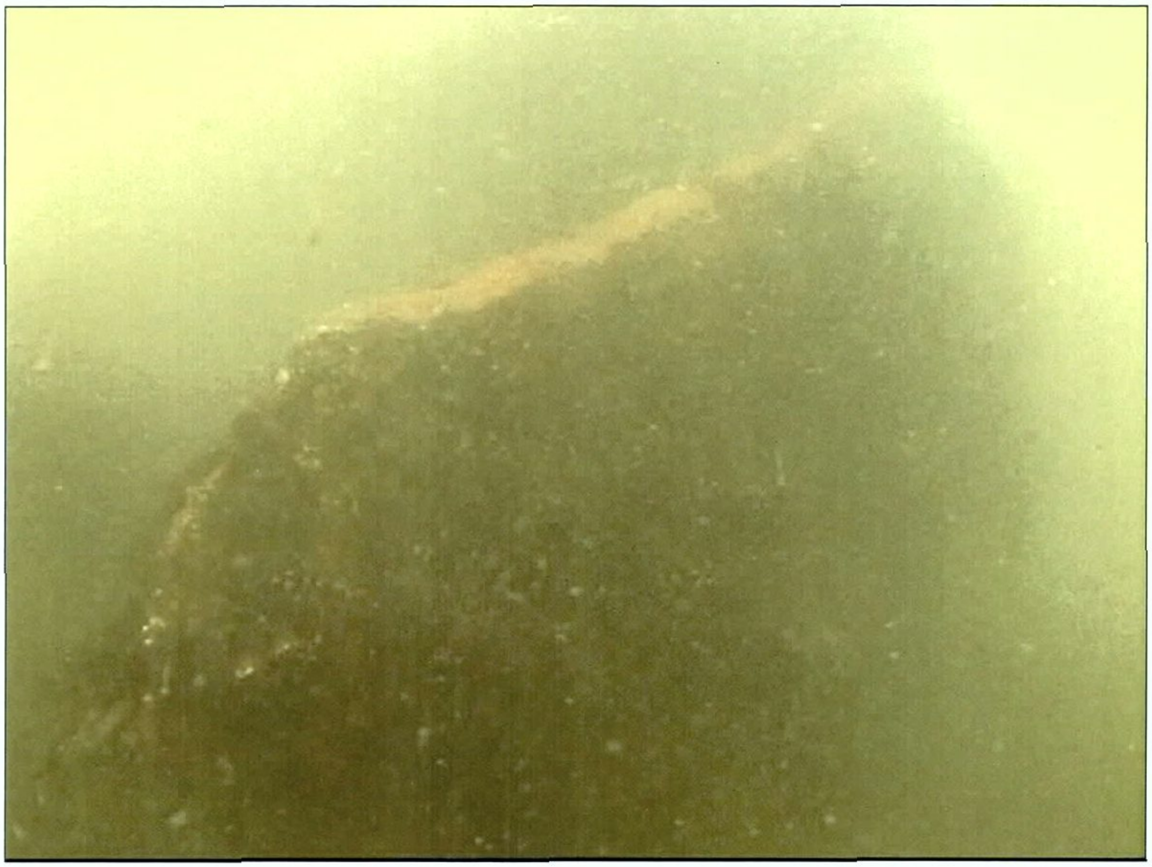


Figure 8-21. Video frame showing broken end of propeller.

Once the vessel's condition was determined, a baseline was laid, with BL 0:0 (Baseline 0' 0") at the stern and the bow at BL 71:6 (Baseline 71' 6"). A site plan was created, showing the locations of key remaining vessel features (Appendix E). Several interesting features were noted, including the aforementioned drive shaft and propeller, along with the mounting base for the engine, the fire resistant base for the boiler, several athwartships bulkheads, and several fuel and/or water bunkers. Also noted were additional details on the composite construction. It was determined that the keelson and ceiling planks were of wood, and the hull was double planked, making the actual frames the only apparent portion of the hull constructed of iron. The deck support beams were also likely constructed of iron, although those are now gone.

Among the remaining vessel components were the drive shaft and propeller. Beginning at the stern and extending to 16:2 on the baseline, the shaft is 8 inches in diameter and appears to be cut at the forward end. Several shaft bearings and pieces of support structure are extant at BL 6:0 and 7:0, while at BL 14:6 is a heavily concreted object that is probably the thrust block.

Beginning at BL 18:11 and ending at BL 22:0 is what appears to be the bedplate for a steam engine. While nothing else remains of the engine, which was likely salvaged, the base consists of a rectangular iron box measuring 6 feet, 4 inches wide; 3 feet, 1 inch long; and 1 foot tall, with sides measuring 6 inches thick (Figure 8-22). Midships and in line with the drive shaft are two round bottom grooves of a similar inner diameter to the drive shaft. These likely represent the bearing seats of the engine's crankshaft. Given the size and shape of the bedplate, it is likely that the engine was a single cylinder upright marine of the type discussed by Hawkins (1904:400). Such an engine was used in small pleasure craft and harbor tugs due to its greater economy and smaller floor space.

Several items lead to the conclusion regarding the size and type of the engine. The size of the bedplate, with its inner chamber being roughly a foot wide, contains room for a crank with only one journal. In addition, the boiler is large in size compared to the engine, but according to Hawkins, single cylinder upright marine engines of the type used in this boat require more steam than a compound engine of similar horsepower (Hawkins 1904:400). Hawkins states, "These engines require very little floor space in the boat, but on account of their greater steam consumption, need a larger boiler than compound engines" (Hawkins 1904:400).

Figure 8-22. Video frame of starboard side of engine bedplate.

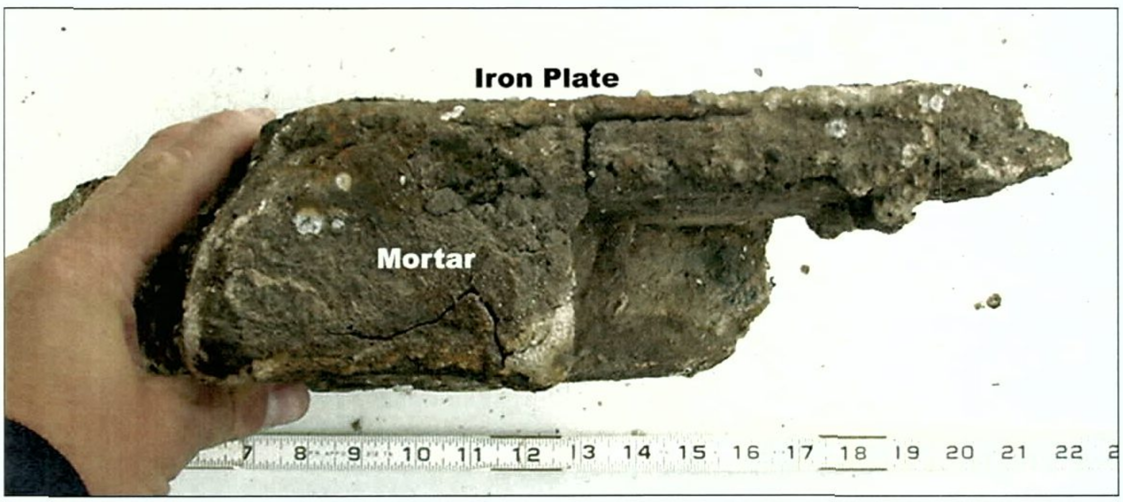


Figure 8-23. Section of boiler base showing top iron plate and mortar or concrete composition. Void on right side of section contained a brick.

The case for the engine being a single cylinder vertical engine is further strengthened:

> "In small pleasure boats and small harbor tugs, which have to stop and start at short intervals, there is not much advantage to using a compound engine, as many times live steam has to be admitted to the low pressure cylinder in starting, which decreases their economy, and the single engine...would be most desirable, their first cost being much lower than the compound, and they are of extreme simplicity" (Hawkins 1904:400).

The use of such engines in harbor tugs and other small harbor craft is well documented. The nineteenth-century wooden-hulled tugboat documented at Hutchinson Island in Savannah, Georgia in 1992 is an example (Watts 1992). Examination of the site plan of this 77-foot long vessel (Figure 8-24) shows a very similar layout to SS16b, including the size and placement of the boiler base, steam engine, thrust block, and shaft bearings. In addition, description of the remaining steam engine (Figure 8-25) indicated a striking similarity to that of SS16b. An important difference was noted in the placement of the condenser and air pump cylinder and lever, which were mounted on the port side of the Hutchinson Island vessel. While the condenser and air pump cylinder are absent from SS16b, the remains of what appear to be the pivot for the air pump and other control levers are present on the forward side of the bedplate. The difference between the two vessels can easily be accounted for by a difference in steam engine design.

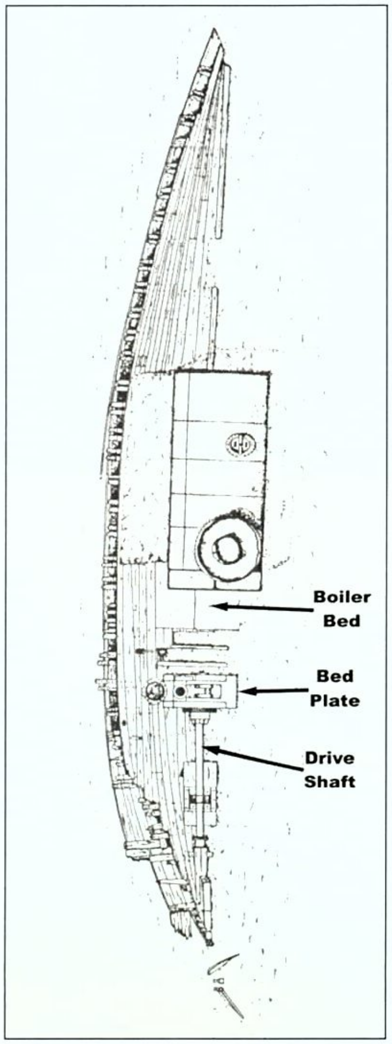


Figure 8-24. Site plan of Hutchinson Island tug wreck (as presented in Watts 1992).

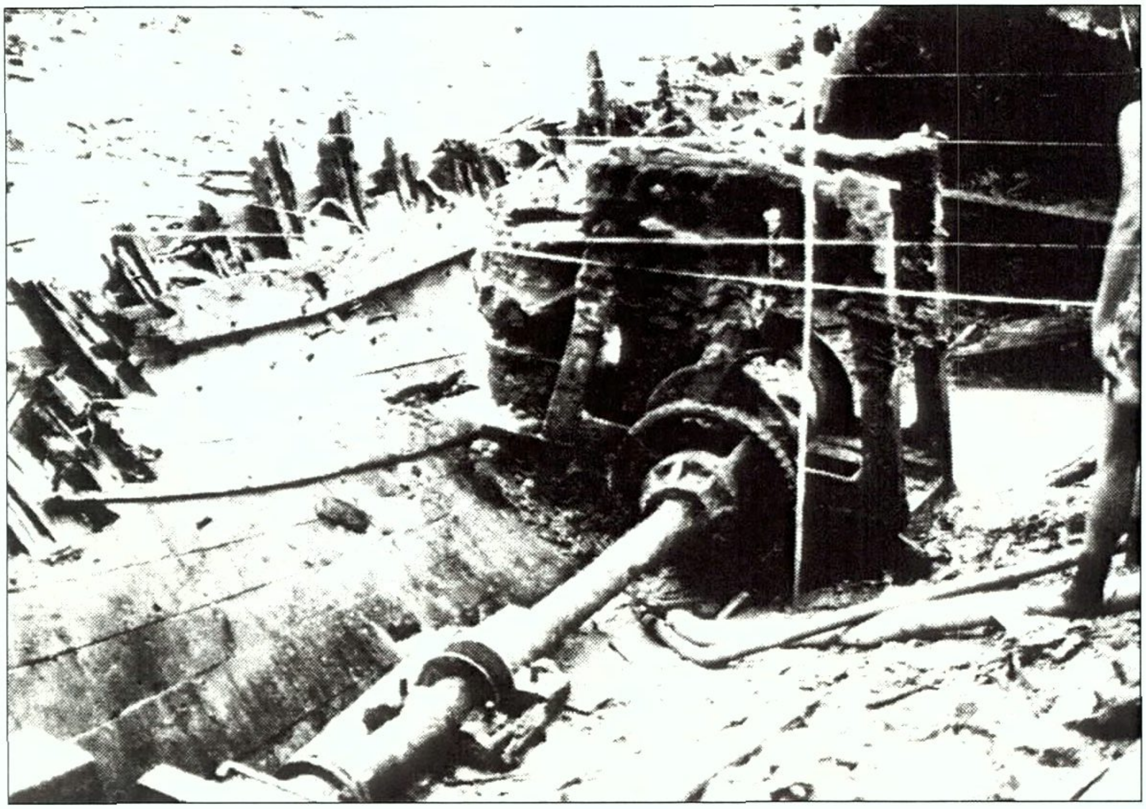


Figure 8-25. Boiler and bedplate on Hutchinson Island tug wreck (as presented in Watts 1992).

Forward of the engine bedplate and stretching between BL 28:0 and 38:0 is the base that supported the boiler. It consists of a large flat iron plate mounted atop a composite brick and concrete structure, the whole of which is supported by a wooden frame.

Immediately outboard of the boiler base on each side of the vessel is what appears to be a series of fuel or water bunkers. Heavily deteriorated, they stretch from BL 22:0 to BL 45:3 and are approximately 2 feet wide at ceiling plank level. The inner bulkhead is vertical, and the outer bulkhead is formed by the outer hull. The entire bunker area was apparently divided into three sections, as the remains of two inner bulkheads were noted at BL 36:0 and BL 30:0. The aft compartment of the bunker appears to be a separate entity, as it is wider and the inner bulkhead has a different shape than the forward bunker. The forward bunker corresponds in location to the side coal bunkers illustrated in Paasch (1890:Plate 44) (Figure 8-26). Its location also makes sense from a functional standpoint, as coal would have been added to the forward end of the boiler. The aft bunker—different in construction and location—is likely a tank, holding water for the boiler, although no plumbing or other evidence exists to indicate such.

Forward of the boiler base, between BL 28:0 and BL 45:6, is an area of partially exposed keelson and ceiling. The keelson measures 0:8 sided while the molded dimension is unknown, but likely the same. The ceiling planks are 0:5 to 0:6 sided and probably 0:3 molded, although this was not directly confirmed. Ceiling planks are exposed approximately 3:0 to either side of the keelson, where they become covered with gravel and debris.

The remains of two athwartships bulkheads were recorded at BL 46:0 and BL 62:6. Both bulkheads have similar construction of wood timber fastened to the iron framing (Figure 8-27). Remains of both extend only 8-12 inches up from the floors.

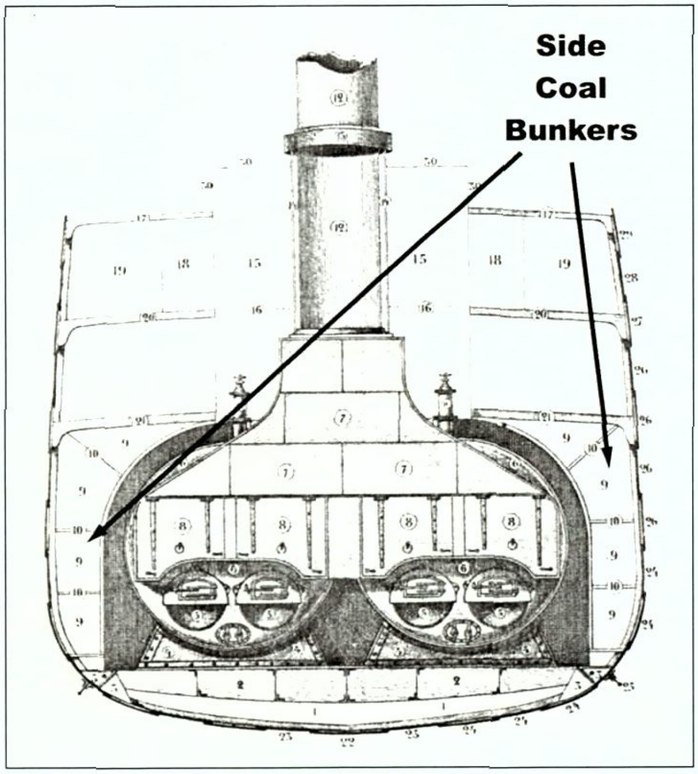


Figure 8-26. Illustration showing side coal bunkers on typical steamship (after Paasch 1890:Plate 44).

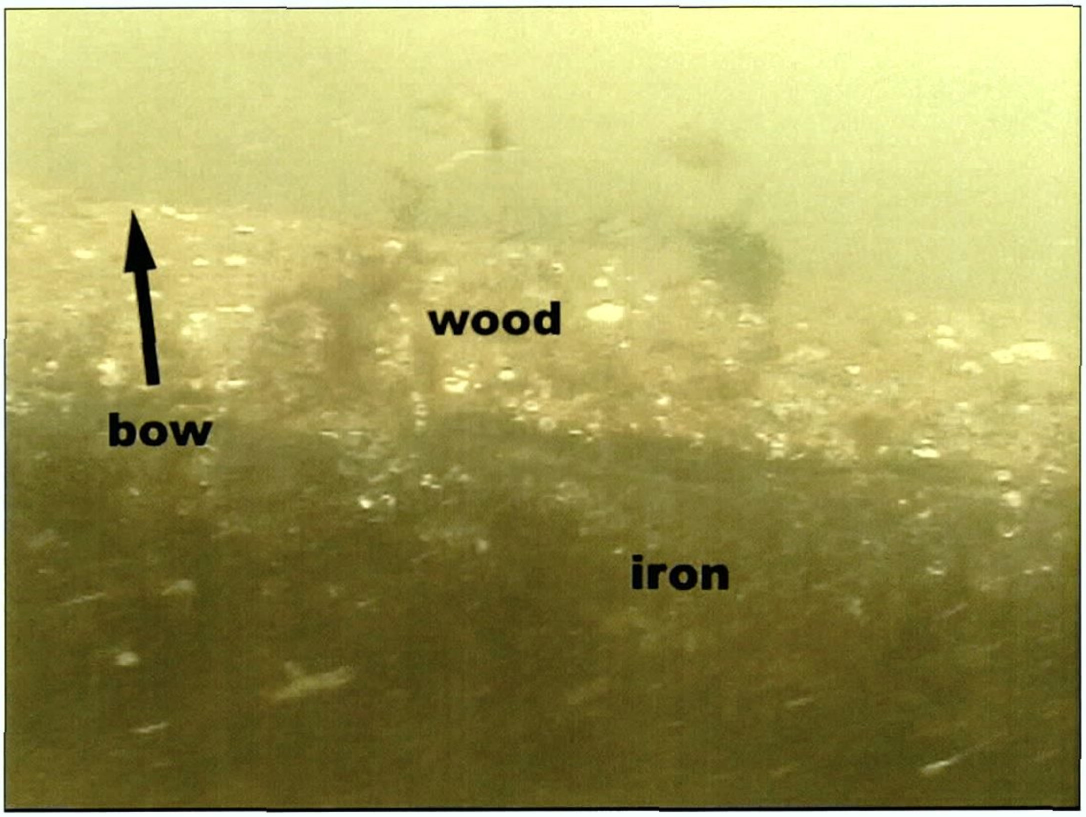


Figure 8-27. Video frame showing construction of athwartships bulkheads.

The stem consists of a wooden timber of 8-inch sided and 8-inch molded dimensions, and extends to approximately three feet off the bottom.

As previously mentioned, outer hull planking is highly deteriorated, with very little being both in good shape and attached to the framing. Much of the intact hull planking is at the bow and stern of the vessel and has parted from the vessel frames, and is either lying on the bottom next to the vessel or is attached on one or two frames only. Enough is extant for some basic observations to be taken, including scantlings. The hull appears to be truly double planked as opposed to initially single planked with sacrificial planking or repairs added later. Although highly eroded, scantlings appear to be 8 inches sided and 3 inches molded, while the outer planking is 8 inches sided and 2.5 inches molded.

Interesting details of the framing construction were noted. Initially thought to consist of I-beams, the frames were discovered to consist of a combination of sheet and angle iron fastened with rivets. Such construction is illustrated by Paasch (1890:Plate 38, Plate 29) (Figure 8-28), with the only difference being the use of a wooden keelson in place of the iron keelsons shown in the illustration. In addition to the framing shown in Paasch Plate 38, framing exposed at the stern of SS16b revealed side girders like those shown in Paasch Plate 29 (Figure 8-29). Both the side girders and the frames followed the Z-bar pattern (see Figure 8-29). Two-inch rivets were used to fasten the framing components. One important difference between the Paasch illustrations and SS16b is the existence of an additional longitudinal stringer placed across the frames directly above the side girder. This stringer was of composite wood and concrete construction, consisting of two 8-inch molded and 6-inch sided timbers with two inches of concrete sandwiched between. This stringer ran from BL 3:8 to BL 15:0 where it disappeared under debris. A similar stringer was noted on the starboard side.

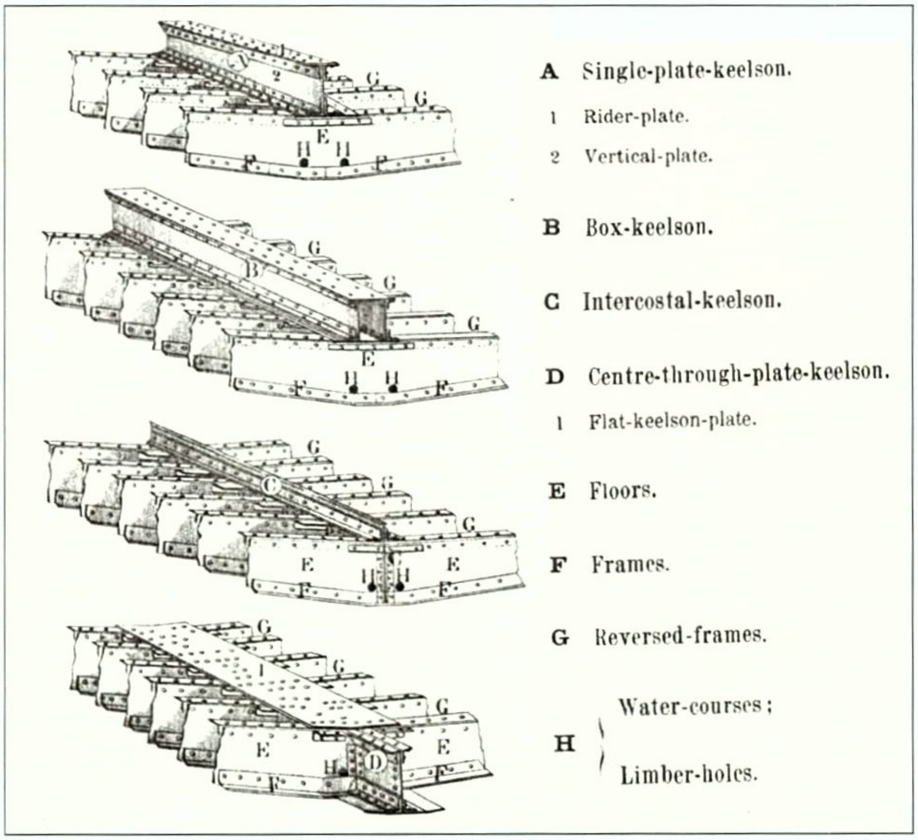


Figure 8-28. Illustration showing frame construction present in SS16b (after Paasch 1890:Plate 38).

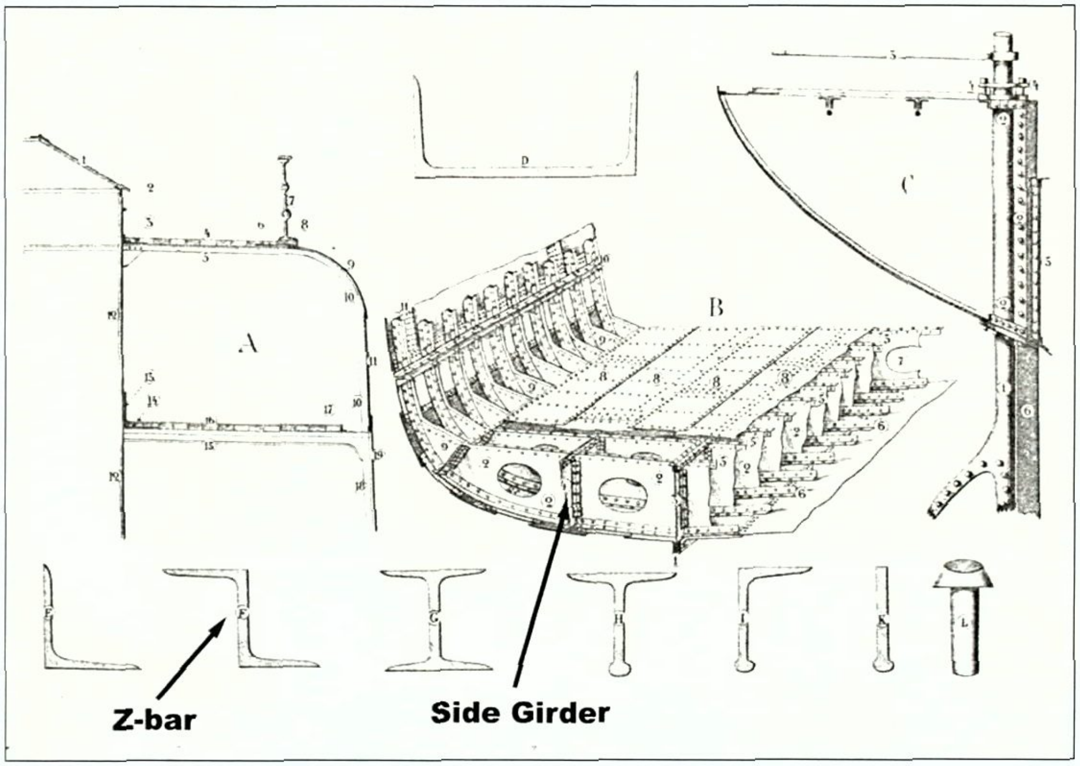


Figure 8-29. Illustration showing side girder framing and Z-bar like that found on SS16b (after Paasch 1890:Plate 29).

Evidence of repairs to the fabric of the vessel in the form of a number of lead patches was also noted. These patches averaged 2 feet by 6-12 inches and were fastened to the inner side of the outer hull planking with fasteners of undetermined material. Many of the fasteners were missing or had been removed.

Associated Artifacts

Three bricks were recovered from the wreck. Two are of the tongue-and-groove type and have LEMB-A-PAT'D pressed into the top (Figure 8-30), while the third is a standard 9-inch firebrick with MONARCH pressed into the top (see Figure 8-30). It is possible that neither brick type is associated with SS16b, as the only place on the wreck that would have firebrick is the boiler base, which is primarily constructed of iron and mortar (Figure 8-31). At least one other vessel nearby has a brick boiler base, although additional diving will be required to confirm that the bricks on either vessel are identical to these. No company has yet been associated with the first bricks, but according to Gurcke (1987:266), a Monarch brick was manufactured by the North American Refractories Company from 1930 to 1935. This date further suggests that the bricks are intrusive, as the late date seems to post-date this type of vessel, given that it appears to have been abandoned shortly after 1930.

Several other items indicative of the industrial/marine use of the vessel were recovered, photographed, and returned to the vessel. While interesting, and certainly indicative of what would be found on a vessel of this type, none had any temporally specific characteristics that would enable a better idea of the vessels time period. Figure 8-32 is a brass drain cover. No distinguishing markings or part numbers were noted that could be used to identify a manufacturer. Figure 8-33 shows two common brass plumbing fittings, and Figure 8-34 is a small section of brass sheet, possibly hull sheathing although none was noted attached to the existing hull planks.

Figure 8-30. Tongue-and-groove brick (top) and Monarch firebrick (bottom) recovered from SS16b.

Figure 8-31. Section of concrete boiler bed.

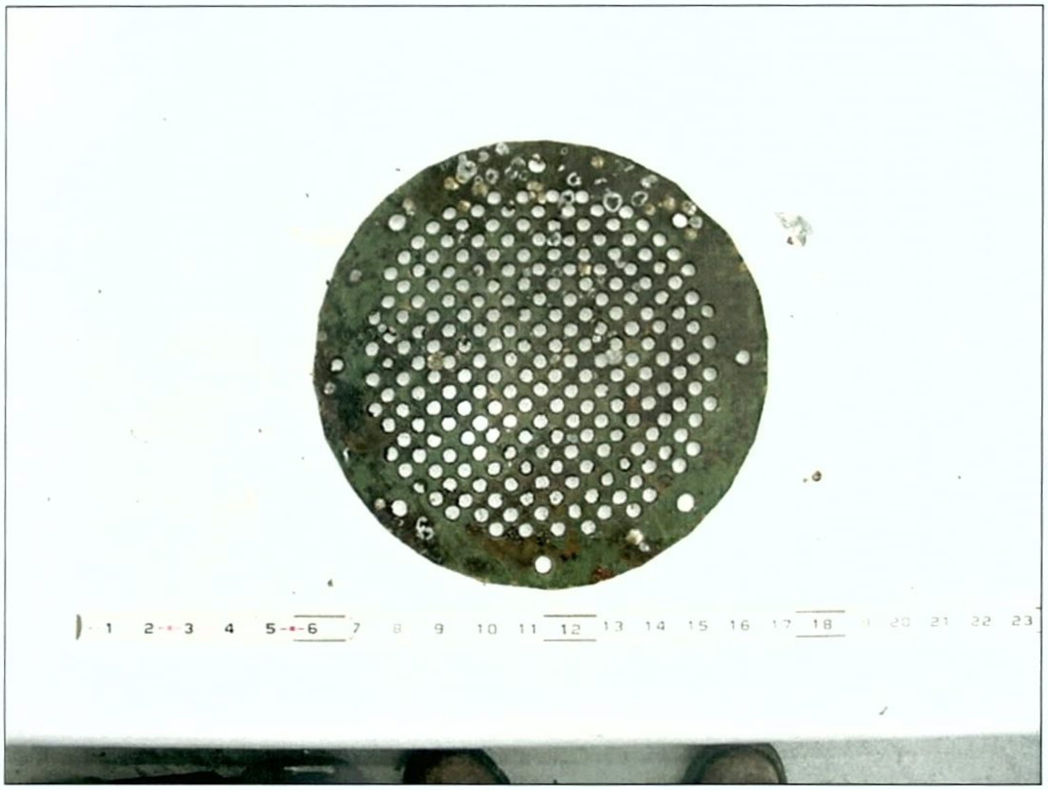


Figure 8-32. Brass drain cover.

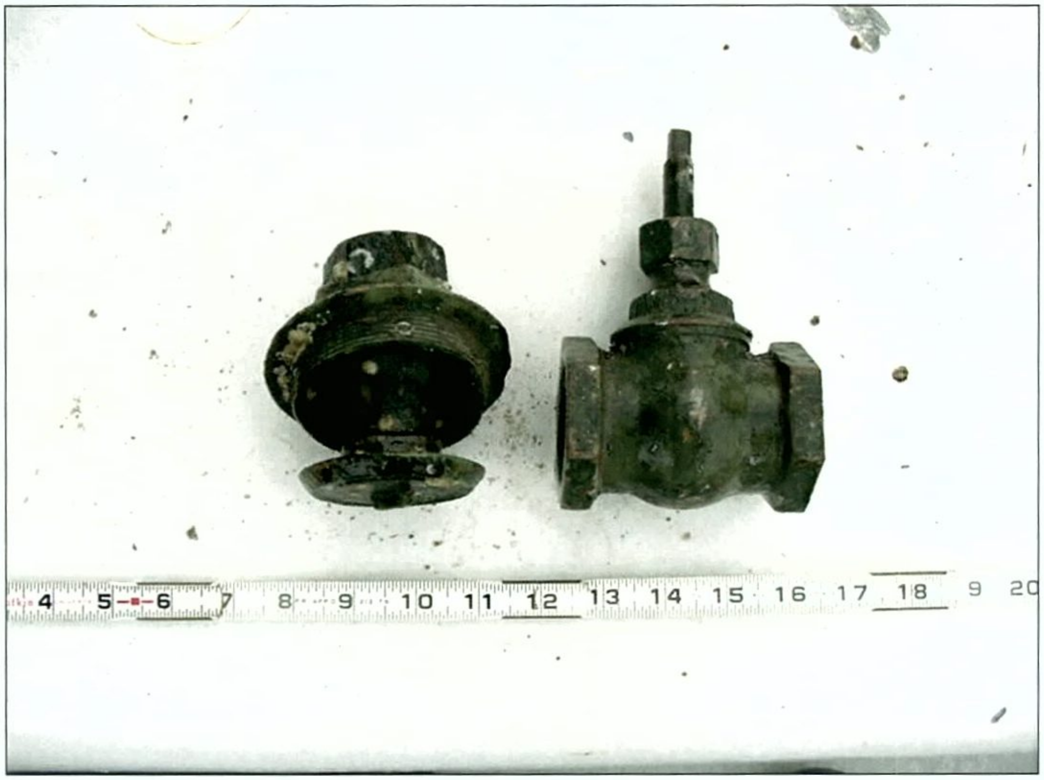


Figure 8-33. Brass check valve (left) and gate valve (right).

Figure 8-34. Small piece of brass sheet.

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