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HISTORIC STRUCTURE REPORT
Historical Data Section

NAUSET BEACH LIGHTHOUSES
CAPE COD NATIONAL SEASHORE
MASSACHUSETTS

By
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STATEMENT OF SIGNIFICANCE

The significance of the "three sisters" lighthouses resides in their historical association with their specific locality. Although inactive, they are probably the only extant triple set of lights in the nation. Multiple lights in separate structures at one location, such as the three lights at Holme's Hole in New England, were phased out and dismantled beginning in the late 1850s.

Since these lighthouses were included in a thematic group of Massachusetts lights to be nominated to the National Register of Historic Places in 1981 and are slated for future restoration, they are subject to the requirements of the "Regulations for the Protection of the Historic and Cultural Environment" (36 CFR Part 800).

General Background of the Lighthouse Establishment

By an act of August 7, 1789, the United States government accepted cession of the title to coastal lighthouses from the several states and agreed to maintain them. The states ceded their lights between 1789 and 1797, with Massachusetts turning its eight lights over to the national government in 1790. Lighthouse administration was placed within the Treasury Department where the secretary had direct oversight until May 8, 1792, when control was vested with the newly-created commissioner of revenue. On April 6, 1802, the office of the commissioner of revenue was abolished and the secretary of the treasury again resumed direct management. Eleven years later the office of the commissioner of revenue was re-established with supervision of the lighthouses as one of the duties. An act of December 23, 1817, however, eliminated the office of commissioner of revenue for a second time as of January 1, 1820. On the latter date, control of the Lighthouse Establishment came under the province of the fifth auditor of the treasury.¹

Stephen Pleasonton, the fifth auditor, controlled the lights for 32 years until the Lighthouse Board was created on October 9, 1852. Pleasonton, an accountant by training, had little knowledge of lights or their operation. His main concern was keeping costs below governmental appropriations so that he could return money to the treasury each fiscal year. Early in his administration, Pleasonton came to rely upon Winslow Lewis, a former Massachusetts sea captain, who advised him on the needs of the Lighthouse Establishment.²

1. Arnold B. Johnson, The Modern Light-House Service, (Washington, D.C.: Government Printing Office, 1890), pp. 13-4; George Weiss, The Lighthouse Service: Its History, Activities and Organization, (Baltimore: The Johns Hopkins Press, 1926), pp. 2-4.

2. Johnson, The Modern Light-House Service, pp. 14-6; Francis Ross Holland, Jr., America's Lighthouses: Their Illustrated History Since 1716, (Brattleboro, Vermont: The Stephen Green Press, 1972), pp. 16, 18.

In 1810, Winslow Lewis developed a version of the Argand lamp and parabolic reflector for use in lighthouses. When his near parabolic device proved successful after testing in the Boston light, Lewis offered to sell the patent to the United States government and refit each of the existing 49 lighthouses with his contrivance. Congress accepted the offer in 1812. Thus, Lewis's lamp became the accepted illuminant until conversion to the Fresnel lens system in the 1850s. It was through this affiliation that Stephen Pleasonton came to know Winslow Lewis.³

Pleasanton executed the orders of Congress to construct lights and fixed their location, if necessary. Actually, the collector of customs nearest the light was designated local superintendent. He was the individual who approved the exact site for a lighthouse and hired a construction overseer to ensure that the contractor built the structure according to specifications. During most of Pleasanton's tenure, the Lighthouse Establishment did not employ architects or engineers to design lights. Instead, according to Lewis's nephew, Pleasanton had Lewis provide the description and specifications for lights. In addition, Lewis often received the contract to build a lighthouse by underbidding others. As a result, to make money, he often hurriedly constructed the lights without regard to the specification that he had authorized.⁴

In the first 60 years of the national government's control of lighthouses, the location and construction of lights usually evolved from local requests made to Congress. These requests grew in number with each passing year. The money approved for lighthouse construction became so large that, in the March 3, 1837, appropriation, Congress called for a board of naval commissioners to examine the

3. Holland, America's Lighthouses, pp. 14-16. Argand, a Frenchman, invented the Argand lamp and parabolic reflector in 1781.

4. Johnson, The Modern Light-House Service, p. 14; "Report of I.W.P. Lewis, Civil Engineer, Made By Order of Hon. W. Forward, Secretary of the Treasury on the Condition of the Light-Houses, Beacons, Buoys, and Navigation, upon the Coasts of Maine, New Hampshire, and Massachusetts, in 1842," HR Doc. No. 183, February 24, 1843, 27th Con., 3rd Sess., p. 18, hereafter cited as "Report of I.W.P. Lewis."

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proposed sites and determine the necessity for a light at each one.

The First Nauset Beach Lights

Among those new lighthouses for which Congress made an appropriation in the March 3, 1847 act, \$10,000 was awarded for three designated lights at Nauset Beach on Cape Cod. The request for these lights evolved from a study made by the Boston Marine Society. In February 1833 this organization voted to establish a three-member committee that would examine and report on the need for an additional light on Cape Cod. The committee evidently did not actively pursue its investigation, for in early 1836 the society received a letter from 21 Eastham area residents who asked for support to establish a light at Nauset Beach. Upon receipt of the letter, the committee examined the site and reported favorably in March 1836. As a result, the Boston Marine Society petitioned Congress to appropriate \$10,000 to light that beach. It recommended that three lighthouses be placed there to prevent confusion with other lights (the existing Highland light and the two lighthouses at Chatham). In addition, the society suggested that the beacons be about 15 feet high.⁶

The rationale for lighting Nauset Beach was not one of providing top-of-the-line lighthouses. Ocean-going vessels, that did not come close to shore at Nauset Beach, could observe the Highland and Chatham lights and thus chart a course beyond the Nauset shoals. Only those coastal and fishing vessels that hugged the shore encountered problems. The curving cape shoreline prevented craft from viewing either the Highland or Chatham lights when in the vicinity of Nauset Beach. Thus, without a guiding light, coastal vessels were subject to grounding on the

5. Johnson, The Modern Light-House Service, p. 15.

6. William A. Baker, A History of the Boston Marine Society, 1742-1967, (Boston: Boston Marine Society, 1968), p. 134. The Boston Marine Society's membership was restricted to individuals who then commanded ships or those who had in the past.

Nauset bars. As a result, the need for a light(s) at Nauset served only an intermediate purpose--signaling ships of the local danger until they could view the Highland or Chatham lights.⁷

As stated previously, Congress approved the funds for the Nauset lights contingent upon an inspection of the site by a naval officer. The appropriation act read, "for three small light-houses on Nanset [sic] beach, Cape Cod, fifteen feet high, ten thousand dollars." Captain John Percival of the navy inspected the site and approved it as a necessary location for lights. He drove stakes into the ground on a line parallel with the coast at the points he selected for each lighthouse. David Henshaw, the Boston customs collector who acted as the area superintendent of lights, purchased approximately 5 acres of land at the Nauset site from Benjamin H. A. Collins of Eastham on September 14, 1837.⁸

In the early 19th century, the lighthouses of Massachusetts were constructed of either rubble stone, brick, or wood. Walls were usually 3 feet thick at the base, tapering to 2 feet at the top. The structures ranged up to 50 feet in height. A dome was placed inside the top which contained a square opening near the spring line to give entrance to the lantern. A flat, slab-stone roof, 4 inches thick, was placed over the dome and projected over the tower walls from 6 to 12 inches. Lanterns were attached to the towers by imbedding the lower ends of their iron angle posts into the walls some 3 to 4 feet.⁹

7. Winslow Lewis to Stephen Pleasonton, Fifth Auditor of the Treasury Department, April 6, 1842, Box 7, Light-House Superintendent, Boston 1826-44, Records of the United States Coast Guard, Record Group 26, National Archives, Washington, D. C.

8. "An Act Making Appropriations for Building Light-Houses, Light-boats, Beacon-lights, Buoys, and Dolphins for the Year 1837," United States Statutes At Large, 5, (Boston: Charles C. Little and James Brown, 1850), p. 182; "Affidavit of David Bryant, Carpenter, and Superintendent of Construction at the Nauset Light-Houses, Erected in 1838," Report of I.W.P. Lewis, p. 29; David Henshaw to Stephen Pleasonton, September 19, 1837, Box 5, Light-House Superintendent, Boston, 1834-48, Records of the United States Coast Guard, Record Group 26, National Archives, Washington, D. C.

9. Report of I.W.P. Lewis, pp. 25-26.

Winslow Lewis, as low bidder, signed the contract on May 26, 1838, to build the three Nauset lights, a keeper's dwelling, an outhouse, and well for \$6,549. The contract specifications, which had probably been written by Lewis, called for three, round brick towers each 15 feet high from the ground to the top of the walls. They appeared to be patterned after the common type found in Massachusetts. Each was to have a base diameter of 16 feet, tapering to a top diameter of 9 feet. The thickness of the base walls was to be 3 feet, while graduating to 20 inches at the top. An arch was placed at the interior top with a 4 inch thick soapstone roof or deck projecting 18 inches beyond the wall. Granite stairs were to lead from the ground to a platform 6 feet from the top. At that point, an iron ladder led to the lantern's entrance. Each tower was to have two windows composed of twelve, 8- by -10-inch lights, and one, 6- by 3-foot door. Iron octagon lanterns were to top the towers. Their 1-1/2-inch square posts were to be imbedded 4 feet into the walls. In addition, the contract called for a 34- by 20-foot one-story brick house with a 16- by 14-foot kitchen addition, a 4- by 5-foot wood outhouse, and a well.¹⁰

Lewis's construction crew of four masons, two carpenters, three laborers, and a cook arrived in June. They proceeded to relocate the middle and south lights back from the staked sites to lower ground. The reason for such action was to place the three lights at the same elevation and thus save building materials, otherwise the northernmost light would have had to be twice the height to make it level with the other two. During construction, which took only 38 consecutive days, the workmen often ignored the building specifications. Some points of the contract, however, were so loosely worded that it was left to the contractor to interpret them in an honest manner. David Bryant, the construction supervisor, felt that the work had been so poorly accomplished that

10. Ibid., pp. 31-33.

he refused to sign the completion certificate presented by Winslow Lewis which stated that the terms of the contract had been honorably fulfilled. Instead, he referred Lewis to George Bancroft, the superintendent in Boston. He also notified Bancroft of his action. Bancroft, however, told Bryant to sign the completion certificate. When he hesitated to place his signature on a questionable document, Bancroft informed him that Stephen Pleasonton had accepted Lewis's word that the construction had been properly finished. As a result, Bryant signed the certificate.¹¹

Stephen Pleasonton's ignorance of appropriate construction methods and the trust he had placed in Winslow Lewis over the years did not benefit the Lighthouse Establishment. The two men's relationship, however, was mutually advantageous. For his part, Lewis received many contracts to construct lighthouses and, although he bid low, he made money by cutting corners. At the same time, Pleasonton's parsimonious, accountant nature was satisfied, for as in the case of the Nauset lights, he could return \$3,451 of the appropriated construction money to the treasury and thereby appear to be carefully handling the public money.

Pleasonton, however, was not without his share of critics about the manner in which he operated the Lighthouse Establishment. Sometimes these fault-finders would succeed in presenting their case to Congress. One of the first occasions occurred in 1838. In that year Pleasonton's opponets succeeded in getting a congressional bill which called for the creation of six Atlantic coast and two Great Lakes lighthouse districts with naval officers detailed to inspect the lights in each and to report on their condition. Massachusetts became part of the second district and Lieutenant Edward Carpenter was assigned as the inspector. He promptly traveled to each facility. When he arrived at Nauset Beach several months after the completed construction, he found that the lights had yet to be lit for lack of a fuel delivery.

11. Report of I.W.P. Lewis, pp. 29-30.

Carpenter recognized that Nauset Beach needed to be illuminated because the sand bars had caused the destruction of many vessels, but he could not understand why three lights had been built when one would suffice. He concluded, "I cannot believe that the Government will consent to consume 900 gallons of oil, when 300 or 360 will answer every purpose. Accordingly, I shall recommend the conversion of these lights into a single revolving red light." While at the site, Carpenter noted that Winslow Lewis had installed ten lamps in each lantern.¹²

Although Pleasonton weathered the findings of the naval officers' inspection reports which indicated poor management, his critics continued to complain about the lighthouse system. As a result, in May 1842, the secretary of the treasury appointed Isaiah W.P. Lewis, a civil engineer of unquestioned repute, to inspect the lights of Maine, New Hampshire, and Massachusetts and to report on their condition and management. Lewis, the nephew of Winslow Lewis, produced a document that did not flatter the Lighthouse Establishment or his uncle. He focused on the Nauset Beach lights as a typical example of fraud practiced by contractors. The three Nauset Beach lighthouses, he wrote, were constructed on sand without foundations. The contractor used inferior lime in the mortar. Bricks were laid at random with no regard to forming a bond. There were 24 courses of stretchers for every course of headers. The lower windows in each of the towers had been boarded up because blowing gravel, during storms, kept breaking the glass. Lewis recommended that there be only one lighthouse at Nauset with a revolving light flashing every 1-1/2 minutes.¹³

12. Johnson, The Modern Light-House Service, p. 16; report of Lieutenant Edward W. Carpenter, U.S.N., New York, November 1, 1838, Box 2, Clipping File, Edgartown, Massachusetts 2nd District - Barnegat, New Jersey, 3rd District, Records of the United States Coast Guard, Record Group 26, National Archives, Washington, D. C. The near parabolic reflectors in each of Lewis' ten lamps measured thirteen and a half inches.

13. Johnson, The Modern Light-House Service, p. 18; report of I.W.P. Lewis, pp. 17, 28-29, 179.

Isaiah Lewis's report caused a stir with Stephen Pleasonton and his uncle. Pleasonton complained that the account had unfairly and grossly misrepresented him. Winslow Lewis denounced his nephew as an incompetent who was wholly incapable of judging proper lighthouse construction methods.¹⁴

The secretary of the treasury agreed with I.W.P. Lewis and recommended to Congress that an engineer be appointed who would devote full time to the regulation of details of the lighthouse system. Congress adjourned without taking any action on the matter.¹⁵

It was not just the poorly constructed lighthouses that received criticism but also the lighting system. The lamp, which Winslow Lewis invented and for which he had become the sole supplier to the Lighthouse Establishment, had been eclipsed in value with the introduction of the Fresnel lens in France in the 1820s. His influence with Stephen Pleasonton, however, kept his lamp in use as the principal source of lighting until the 1850s. The lamps proved to be flimsily constructed, for the reflectors could be easily bent, thereby reducing their effectiveness. In addition, the silver plating on the reflectors was easily removed with the abrasive cleaning material supplied to the keepers. When complaints about the lamps surfaced by 1838, Congress ordered Pleasonton to import two Fresnel lenses for experimental purposes, but the fifth auditor stubbornly defended the Lewis lamp. Among others, I.W.P. Lewis condemned his uncle's lamps in his 1843 inspection report. Finally, the critics became so numerous that in March 1851, Congress authorized Pleasonton to begin the importation of Fresnel lenses in a move to convert the illuminating equipment of America's lighthouses.¹⁶

14. Johnson, The Modern Light-House Service, p. 18; Holland, America's Lighthouses, p. 33.

15. Johnson, The Modern Light-House Service, p. 19.

16. Johnson, The Modern Light-House Service, p. 20; Holland, America's Lighthouses, p. 18; report of I.W.P. Lewis, pp. 51-54.

The same 1851 act authorized and required the treasury secretary to assemble a board of inquiry to investigate every aspect of the Lighthouse Establishment. After an exhaustive study, the board, as had I.W.P. Lewis before it, found every phase of the Lighthouse Establishment to be faulty. The investigative board recommended that the administration of lighthouses be removed from the fifth auditor and that the responsibility be placed under a 9-member lighthouse board whose membership would be mostly army engineers and naval personnel. It proposed the creation of 12 districts, each with its own inspector who had an engineering background. The board asked that lighthouses be classified, after the French model, into six orders with orders one through three designated as coastal lights and four through six commissioned as harbor lights. Finally, they advised the replacement of the Lewis lamps and reflectors with the Fresnel lenticular system. Congress acted on the recommendations and approved the necessary legislation on August 31, 1852, to establish a Lighthouse Board.¹⁷

The Lighthouse Board, established under the secretary of the treasury, was organized on October 9, 1852. One of its first acts was to begin the process by which each lighthouse would receive the Fresnel lens system. Along with the nation's other lights, the ones at Nauset Beach came under the board's watchful eye. An index to no longer extant letterbooks indicates that in September 1853 there was some question as to the need for three lights at Nauset. Since that number of lighthouses remained at the site, the board obviously decided to retain them.¹⁸

17. Johnson, The Modern Light-House Service, pp. 20-21; Holland, America's Lighthouses, pp. 33-35. First order Fresnel lenses were the largest with a height of about 12 feet while the smaller ones - fourth, fifth, and sixth - were no more than 3 feet tall. The larger size allowed a bigger lamp to be installed and thus a greater brightness occurred.

18. Index to Light-House Board Letterbooks, Records of the United States Coast Guard, Record Group 26, National Archives, Washington, D. C.

Because they were deemed to have a lesser significance, the Nauset lights were given a lower priority for conversion to the Fresnel lens system. The letter-book index indicates that there was evidently some problem in placing the new lenses in the old lanterns when they arrived for installation. At any rate, the old lanterns were replaced in October 1858, and sixth order Fresnel lenses were placed in them. That lens was the smallest of its type. Valve lamps were used in conjunction with the lenses.¹⁹ Figure 1 shows the "three sisters" masonry towers with the 1858 lanterns. The exterior ladders were added to the towers in 1889. Also visible in the photograph are the masonry house and the barn.

Several changes occurred to the lights in the post-1858 period. In 1869 the valve lamps were replaced with Franklin lamps. The sixth order Fresnel lens was replaced by one of the fourth order in 1873. By the early 1880s, Haines lamps with 1-5/8-inch burners were in use.²⁰ All of these lamps had concentric wicks. The difference came from the method used to deliver fuel to the wicks.

The Wooden "Three Sisters"

The Lighthouse Board annual report for 1892 stated, "three wooden movable towers were erected by hired labor, 30 feet to the westward of the old towers. This was done because of the washing away of the bank." Despite the jerry-built construction methods, the old masonry towers served for 54 years. Rather than deteriorating to disuse, they were claimed by the sea. The lanterns from the brick towers were moved to the new lights on April 25, 1892.²¹

19. Ibid.

20. Annual Report of the Light-House Board to the Secretary of the Treasury for the Fiscal Year, 1869 (Washington, D.C.: Government Printing Office, 1869), p. 16; Annual Report of the Light-House Board of the United States, 1873 (Washington, D.C.: Government Printing Office, 1873), p. 18; Annual Report of the Light-House Board to the Secretary of the Treasury for the Fiscal Year Ending June 30, 1882 (Washington, D.C.: Government Printing Office, 1882), p. 17; Index to Light-House Board Letterbooks.

21. Annual Report of the Light-House Board to the Secretary of the Treasury for the Fiscal Year Ended June 30, 1892 (Washington, D.C.: Government Printing Office, 1892), p. 55.

Figure 1

The Original Masonry "Three Sisters"
Courtesy of the National Archives, Washington, D. C.

In the background one can see the 1838 brick house and the 1875 wood frame dwelling. The use of the term "three sisters" was never an official name for the lighthouse. According to Edward Rowe Snow in his book, Famous New England Lighthouses, they were named the "three sisters of Nauset" soon after their construction, but he does not indicate whether the local population or mariners gave them that designation.



The circular, wooden towers were taller than the ones they replaced. Raising the lights could perhaps have stemmed from the findings of the 1851 investigation which concluded that many lighthouses were too short to serve effectively. At any rate, the new lights were 22 feet to the top of the tower, with an additional 7 feet to the lantern's ventilation (Figure 2).

The foundations were formed from posts that had been driven 4 feet into the ground. In 1910 each tower was described as having a base diameter of 14 feet, with 10-1/2 inch thick walls. At the top, the diameter diminished to 11 feet 2 inches with 8 inch thick walls. Architectural investigation, however, has shown the walls to be 6 inches thick. A wooden deck with a corbelled cornice extended beyond the tower walls. White-painted shingles covered the tower exteriors while the inside walls were lath and plaster. Each tower had one window and one door. The double sash window contained 6 over 6 glazing in each sash. In addition the sashes measured 28 inches wide and 26 inches high. Inside the towers, a wooden stairway led to a single landing that covered half of each structure's diameter. A metal ladder from the landing to a trap door gave entrance to the lantern.²²

The old nine-sided lanterns from the brick lighthouses topped the towers. Wooden parapets comprised the lower portion of the lanterns while the remainder, except for the copper roof and ventilation balls, was cast iron. Each lantern contained nine plates of glass that measured 3 feet high and 28 inches wide. The parapet, below the glass, had ventilators and a wooden door which led to the iron balustraded deck.²³

22. "Description of Light-House Towers, Buildings, and Premises at Nauset Beach, Massachusetts, Light-Station, January 11, 1910," pp. 2-3, First District Coast Guard Files, Boston, Massachusetts.

23. Ibid., pp. 3-4.

Figure 2

The 1892 Wooden "Three Sisters"
Courtesy of Cape Cod National Seashore

The storm doors attached to the entrances in 1895 are visible on two of the lighthouses.



The fourth order Fresnel lenses, placed in the brick lighthouse lanterns in 1873, were transferred with the lanterns to the wooden towers. Both the north and center tower lenses were manufactured in France by Barbier and Fenester, while the one in the south tower, also imported from that country, was made by Henry Lepute. At some time during this period, improved Funck Heap lamps with one wick and burner were installed in the lenses.²⁴

Only one change was made to the Nauset lights between 1892 and 1911. In 1895 a storm porch was placed at the door of each tower.²⁵

By 1911, continuing erosion brought the Nauset Beach cliff to within 8 yards of the north tower and 18 yards of the one farthest south. As a result, it was decided to move the central light back from the cliff and use only the one lighthouse into which a flashing light would be placed. Although technology had advanced to the point that a new, single flashing light could produce 20 times the brilliance as compared to that of the three lights combined, illuminating power was not the only reason to reduce the lighthouse number to one. Three lights could be mistaken for one or two if a vessel sailed by them at certain angles. In addition, the double and triple light systems in separate structures were being phased out for economic reasons.²⁶

The central tower of the "three sisters" was moved near the 1875 wood frame keeper's quarters and attached to it by a short covered walkway. It rested on

24. Ibid., pp. 4-5.

25. Annual Report of the Light-House Board to the Secretary of the Treasury for the Fiscal Year Ended June 30, 1895 (Washington, D.C.: Government Printing Office, 1895), p. 54.

26. Inspector H. C. Poundstone, Second District, to the Commissioner of Lighthouses, Washington, D.C., May 31, 1911, Correspondence of the Bureau of Lighthouses 1911-39, File 1342-E, Box 953, Records of the United States Coast Guard, Record Group 26, National Archives, Washington, D.C.; Commissioner of Lighthouses to the American Association of Masters, Mates, and Pilots, Piscataqua Harbor No. 83, January 24, 1912, Correspondence of the Bureau of Lighthouses 1911-39, File 1342-E, Box 953, Records of the United States Coast Guard, Record Group 26, National Archives, Washington, D.C.

a solid brick foundation (Figure 3). A small hole was cut near the center of the deck to allow the installation of part of the revolving apparatus in the interior below the lantern. A fourth order Fresnel lens with a ball bearing flashing apparatus was installed. It included the Funck Heap oil-wick lamp. Soon, however, an incandescent oil-vapor lamp was installed. To retain a touch of the past, the light produced a triple flash every 10 seconds when it went into operation on June 1, 1911.²⁷

Within days after the single light began to function, the second district inspector reported that the tower was so poorly constructed that, despite its low height, even moderate winds caused it to vibrate. The shaking interfered with the flashing apparatus. The inspector asked permission to install four galvanized guy wires as a means of stabilizing the tower. The guy wires are visible in Figure 3.²⁸

Inspector H. C. Poundstone recommended that the two unused towers be torn down, saving the lanterns and using the rest for the keeper's firewood. Before demolition approval was received, H. N. Cummings of North Eastham appeared in

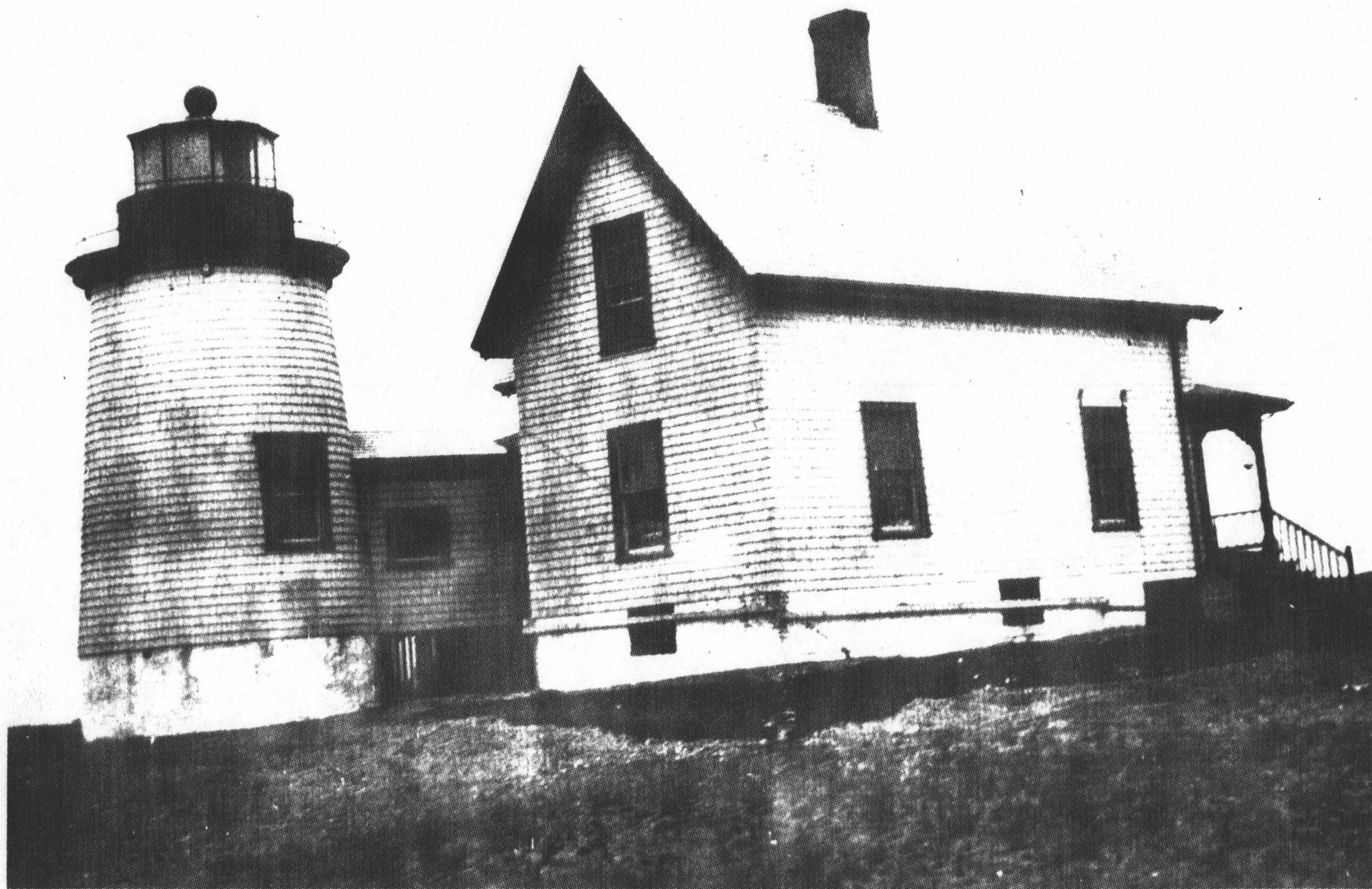
27. Annual Report of the Commissioner of Lighthouses to the Secretary of Commerce and Labor for the Fiscal Year Ended June 30, 1911 (Washington, D.C.: Government Printing Office, 1911), p. 40; Inspector H. C. Poundstone, Second District to the Commissioner of Lighthouses, Washington, D. C., June 12, 1911, Correspondence of the Bureau of Lighthouses 1911-39, Files 1342-E, Box 953, Records of the United States Coast Guard, Record Group 26, National Archives, Washington, D. C.; Commissioner of Lighthouses to the American Association of Masters, Mates, and Pilots, Piscataqua Harbor No. 83, January 24, 1912; Annual Report of the Commissioner of Lighthouses to the Secretary of Commerce and Labor for the Fiscal Year Ended June 30, 1912 (Washington, D. C.: Government Printing Office, 1913), pp. 43, 47; Inspector, Second District to the Commissioner of Lighthouses, Washington, D. C., September 30, 1912, Correspondence of the Bureau of Lighthouses 1911-39, File 1342-E, Box 953, Records of the United States Coast Guard, Record Group 26, National Archives, Washington, D.C.

28. Inspector H. C. Poundstone, Second District to the Commissioner of Lighthouses, Washington, D.C., June 12, 1911.

Figure 3

The Wooden Central Tower Attached to the 1875 Wood Frame Keeper's Dwelling
Courtesy of the National Archives, Washington, D. C.

This May 1915 photograph shows the original tower window which was identical to the ones in the other two lights. Guy wires placed on the tower in 1911 to stabilize it are also visible as well as the connection to the 1875 wood frame keeper's dwelling.



Poundstone's office and asked to buy the two towers. As a result, he contacted the commissioner of lighthouses and requested permission to sell them--minus the lanterns--by sealed bid. A month later, E. L. Hoyt of Chicopee Falls, Massachusetts, wrote to the commissioner about purchasing the towers. He was told that they would be sold at public auction.²⁹

Seven years later in 1918, the two lighthouses were sold. Helen M. Cummings, whose husband had previously inquired about the towers, bought the structures at a three-bid auction. She paid \$3.50 for both buildings and had to remove them from the property within 10 days. They were removed within the allotted time and placed on a site near the French Cable Hut where they remained for two years. During that period, the Cummingses used one tower for a kitchen and living room on the ground level, and they used the landing as a bedroom. The other tower contained two bedrooms. In 1920 the two structures were moved to their present location where they were butted into a 26- by 28-foot living room. A morning room and kitchen were also added.³⁰

In addition to attaching the two towers to a central structure, the Cummingses made some changes to the buildings. A second ground-floor window was placed in each and another window added at the second-floor landing level of both structures. The landing in each tower was enlarged from covering half the space to that of about three-quarters of the area. In conjunction with that alteration, the wooden stairs leading to each landing were removed and relocated to another position. A nearly flat roof covered with tar paper replaced the old deck covering.

29. Inspector H. C. Poundstone, Second District to the Commissioner of Lighthouses, Washington, D. C., May 31, 1911; Inspector H. C. Poundstone, Second District to the Commissioner of Lighthouses, Washington, D. C., June 26, 1911, Correspondence of the Bureau of Lighthouses 1911-39, File 1342-E, Box 953, Records of the United States Coast Guard, Record Group 26, National Archives, Washington, D. C.; Commissioner of Lighthouses, Washington, D. C. to E. L. Hoyt, July 26, 1911, Correspondence of the Bureau of Lighthouses 1911-39, File 1342-E, Box 953, Records of the United States Coast Guard, Record Group 26, National Archives, Washington, D. C.

30. John A. Cummings written account of the sale of two of the Three Sisters to his parents, March 23, 1969, Cape Cod National Seashore park files.

In December 1965 the National Park Service obtained the two towers from the Cummingses' son, John. Since that time, in 1980, the additions have been removed, leaving the two structures freestanding.

The third of the "three sisters" remained in service until 1923. At that time the disused cast-iron north tower at Chatham was moved to Nauset Beach and replaced the wooden third sister (Figure 4). In 1923, when the Chatham tower was moved to Nauset Beach, the 1875 keeper's dwelling was moved to a new location (Figure 4). A concrete foundation was laid for the cast-iron tower. In that same year, Albert Hall purchased the wooden tower with lantern and moved it to its present location.³¹ He built a single-story addition to the tower and named it the "Beacon." Hall's modifications were similar to those made by the Cummingses. Windows were added at the ground-floor and landing levels. The landing area was enlarged, but the wooden stairs remained in their original position.

Albert Hall's son, Harold, sold the structure to the National Park Service. In the summer of 1983 the one-story addition was removed, leaving the tower freestanding, and on September 13, 1983, it was moved to a site adjacent to the other towers.

Ancillary Structures

As shown on the 1840s map, only two other buildings were constructed in 1838 when the lighthouses were erected. These structures included a brick, one-story keeper's dwelling and a privy. The house measured 34 feet by 20 feet, with a 16- by 14-foot kitchen attached to the rear. The main portion contained two rooms with a central stair leading to the attic. A 4- by 5-foot privy was north of the house.³²

31. History of "Jack O' Lantern"--Hall Cottages, a telephone conversation between Doris Doane (a Cape Cod National Seashore employee) and Harold T. Hall, November 21, 1975, Cape Cod National Seashore files.

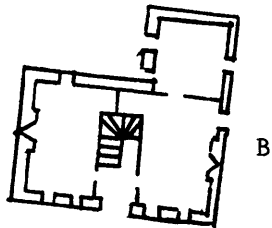
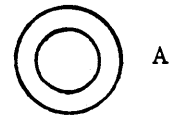
32. Ground Plan Map of Nauset Beach Structures, no date, United States Coast Guard Academy Library, New London, Connecticut; report of I.W.P. Lewis, p. 34.

Figure 4

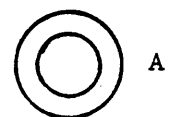
Installation of the Cast-Iron, Unused Chatham Tower in 1923
Courtesy of the National Archives, Washington, D. C.

In addition to the cast-iron tower, the 1875 wood frame keeper's dwelling can be seen on its new location over a new cellar.





Map 1
EARLY MAP (CA 1840s?) OF
NAUSET BEACH LIGHTHOUSES
A LIGHTHOUSES
B BRICK KEEPER'S DWELLING
C OUTHUSE



At an unknown date (perhaps the 1850s), a board and batten barn was constructed on a site west of the north tower. Its location was recorded on the 1885 and 1922 maps. The first mention of the barn was in the 1868 annual report when it was reported to have been repaired. A 9- by 15-foot addition was attached to the rear of the barn in the following year.³³

The 1869 annual report indicated that a 9-1/4- by 18-1/2-foot shed was built at the Nauset Beach light site. It could have been the hen house that appeared on the 1885 map near the barn.³⁴

In 1873, Nauset Beach received an assistant keeper because of the additional work required by the changes in lenses from sixth order to fourth order. The assistant keeper lived in the same dwelling as the keeper, an arrangement that did not prove satisfactory. As a result in 1875, a new wood frame, two-story keeper's dwelling was constructed. The assistant keeper was assigned the 1838 brick structure for his house. The new quarters were located about 95 feet west of the middle tower and just north of the old dwelling.³⁵

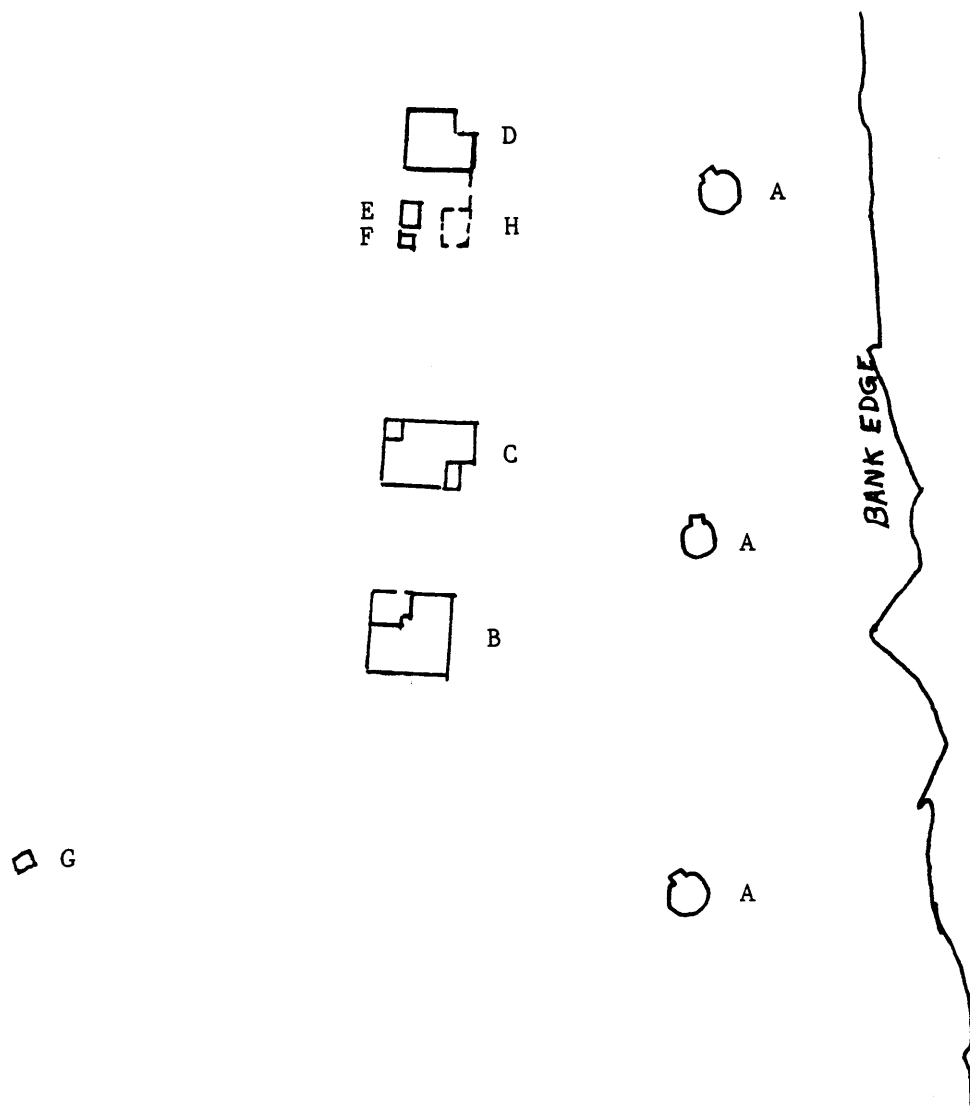
A brick oil house, 11 by 9-1/3 feet, was built in 1892 at the same time as the wooden towers. As shown on the 1922 map, it was located approximately 90 feet west of the barn.³⁶

33. Annual Report of the Light-House Board to the Secretary of the Treasury, for the Year 1868 (Washington, D. C.: Government Printing Office, 1868), p. 16; Annual Report of the Light-House Board, 1869, p. 16.

34. Annual Report of the Light-House Board, 1869, p. 16.

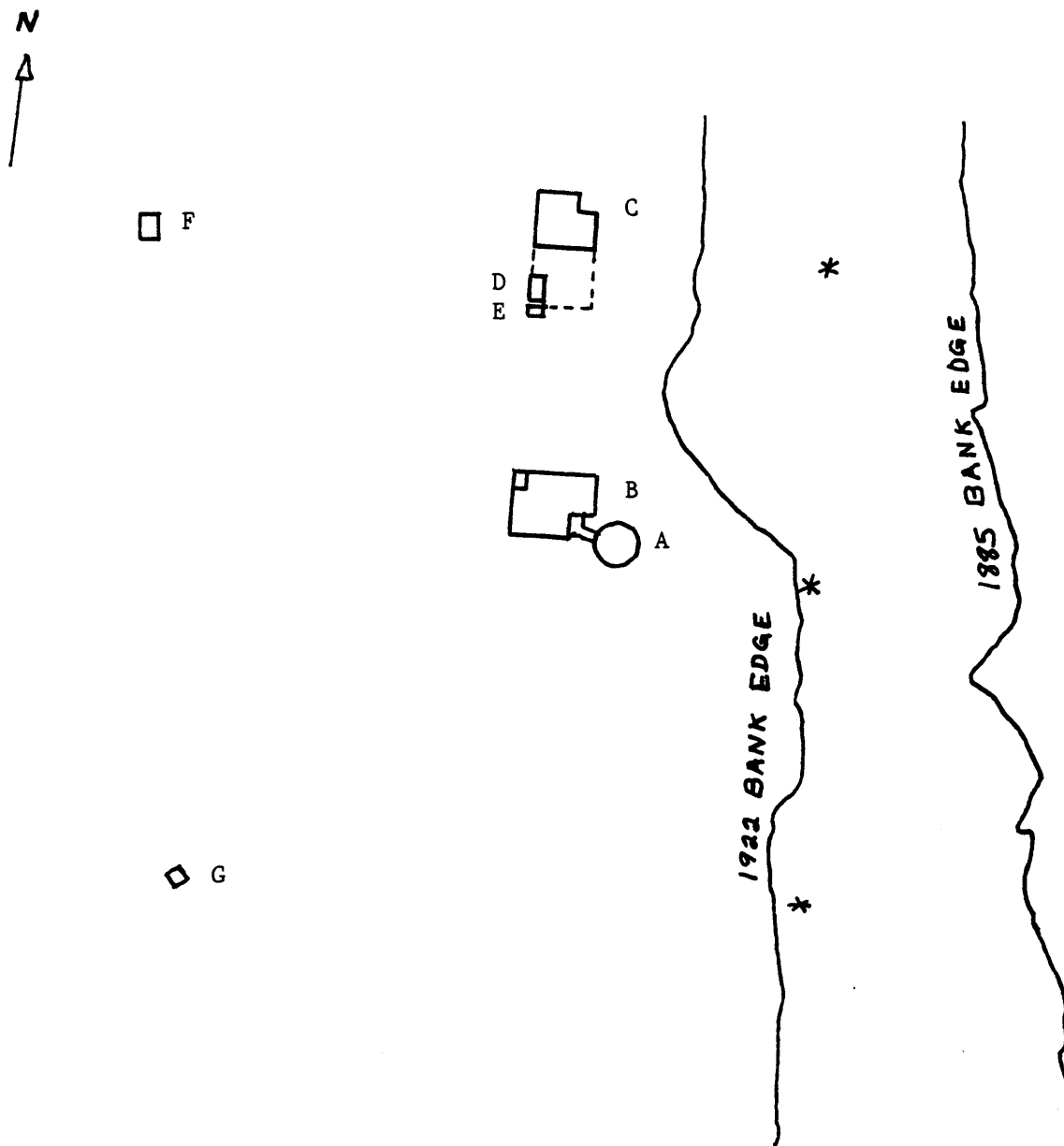
35. Annual Report of the Light-House Board of the United States to the Secretary of the Treasury for the Fiscal Year Ending June 30, 1874 (Washington, D. C.: Government Printing Office, 1874), p. 21; Annual Report of the Light-House Board to the Secretary of the Treasury for the Fiscal Year Ending June 30, 1876 (Washington D. C.: Government Printing Office, 1877), p. 16.

36. Annual Report of the Light-House Board, 1892, p. 55.



Map 2
NAUSET BEACH LIGHTHOUSES 1885

- | | | | |
|---|-------------------|---|-----------|
| A | LIGHTHOUSES | E | HEN HOUSE |
| B | OLD DWELLING 1838 | F | PRIVY |
| C | NEW DWELLING 1875 | G | WELL |
| D | BARN | H | PEN |



Map 3
 NAUSET BEACH LIGHTHOUSE 1922
 (SHOWS POSITION OF 1911 SINGLE WOODEN TOWER)

- | | | | |
|---|------------------------|---|-----------------------------|
| A | LIGHTHOUSE | E | PRIVY |
| B | 1875 KEEPER'S DWELLING | F | OIL HOUSE |
| C | BARN | G | WELL |
| D | HEN HOUSE | * | 1885 LOCATION OF THE TOWERS |

At an unknown date, a white signal mast that was 65 feet high was erected on the site. A 1910 description of the Nauset Beach lights placed it 83 feet southeast of the middle tower.

The final structure to be built at the site was a 9- by 18-foot garage. Built between 1922 and 1927, it was located 200 feet southwest of the cast-iron tower. It evidently signaled that the Lighthouse Service recognized the advent of the automobile age.³⁷

After 1883, when an assistant keeper's services were no longer required at Nauset Beach, the old brick dwelling remained vacant for a time. Soon, however, it was used to store firewood and paint. After a recommendation, the house was demolished in late 1912.³⁸

In 1923, at the time the unused cast-iron tower was moved from Chatham to Nauset, the 1875 wood frame keeper's quarters was moved back from the bluff's edge and installed over a new cellar.³⁹ It is currently on that site.

At some unknown date between 1922 and 1927, the barn, hen house, and privy were removed. At least the 1927 description of Nauset Beach light did not mention the existence of those buildings.

Supplies and Supply Methods

Prior to the advent of Stephen Pleasonton's administration in 1820, light-houses were supplied by a number of local contractors. These individuals not only made repairs but furnished oil, wicks, chimneys, and cleaning stores. From the period 1812 to the early 1850s, Winslow Lewis was the sole source of lamps and reflectors. After Pleasonton, as fifth auditor of the treasury, gained over-

37. Nauset Beach Light Description, June 9, 1927, Description of Light Stations 1876-1938, Box 5, Records of the United States Coast Guard, Record Group 26, National Archives, Washington, D. C.

38. Inspector Goddard to the Commissioner of Lighthouses, October 4, 1912, Correspondence of the Bureau of Lighthouse 1911-39, File 1342-A, Records of the United States Coast Guard, Record Group 26, National Archives, Washington, D. C.

39. Annual Report of the Commissioner of Lighthouses to the Secretary of Commerce for the Fiscal Year Ended June 30, 1923 (Washington, D. C.: Government Printing Office, 1923), p. 48.

sight of the Lighthouse Establishment, he instituted a system by which one contractor supplied the needs for all lights and repaired them as well. The contractor was to visit each light station annually and report on its condition and the conduct of the keeper. As a check on the contractor, each keeper was to make a yearly report on the supplies he received.⁴⁰

In 1840 the Lighthouse Establishment acquired its first tender. It was a sailing vessel that was transferred from the United States Revenue Cutter Service. The ship received limited use, however, since a contractor continued to service most lights. A supply vessel visited each light on an annual basis. The delivery of supplies began in April in Georgia. From there, the vessel worked its way north finishing in Maine in September. In October the ship would return to Florida and work its way to Louisiana. Supplies often arrived at Nauset in late July or early August. The first extant record of delivery to Nauset Beach occurred on July 31, 1850. The keeper, Joshua Crosby, received 100 tube glass, five gross of wicks, 47 yards of cloth, two buff skins, two boxes of tripoli, two boxes of soap, three pairs of scissors, two burners complete, one fountain, one hand lamp, and one file.⁴¹

Before 1860 all of the lighthouses were supplied with sperm oil from New Bedford, Massachusetts. As increasing industrialization occurred with its dependence on sperm oil, the price soared. During the 1841-42 period, sperm oil sold for \$.55 per gallon. By 1850-51 it had reached \$1.17, and in 1855 it cost \$2.25. The Lighthouse Service began to search for an alternative fuel. In the

40. Johnson, The Modern Light-House Service, p. 15.

41. Letter from the Secretary of the Treasury transmitting the Report of the General Superintendent of the Lighthouse Establishment, December 19, 1850, p. 63, Records of the United States Coast Guard, Record Group 26, National Archives, Washington, D. C.

late 1850s colza or rapeseed oil seemed to answer the need, but inadequate supplies forced the Lighthouse Board to search for another substitute. Experimentation showed that lard oil was the solution to the problem.⁴²

With the introduction of lard oil, the Lighthouse Board established its own distribution system. The old customs station at Tompkinsville on Staten Island, New York, was converted to an oil supply center. Although slowed in its procurement of vessels by the Civil War, the board acquired two schooners (the Pharos and the Guthrie) for use in making East Coast deliveries. These two ships carried lard oil in large casks. When one of the schooners arrived at a light station, it would lower a small boat filled with small barrels along side. The oil would be pumped into the small casks and rowed ashore. On a number of occasions the small boats overturned in heavy surf, dumping their contents into the sea.⁴³

By the 1870s the Lighthouse Board had converted its Staten Island center into a warehouse nucleus for all supplies. In 1876 it replaced the two East Coast schooners with one vessel--the Fern. At this time the Lighthouse Service began to name its vessels after plants and flowers.

In 1878, when conversion to kerosene began with fourth, fifth, and sixth order lights, the Fern had a carrying capacity of 30,000 gallons of that fuel. It was carried and delivered in small cases. The Fern usually arrived at Nauset Beach in early August to deliver that light station's supplies.⁴⁴

42. "Light-House Construction and Illumination," Putnam's Magazine, 8 (August 1856), p. 208; Holland, America's Lighthouses, p. 23.

43. Kirk Munroe, "From Light to Light: A Cruise of the Armeria Supply Ship," Scribner's Magazine, 20 (October 1896), pp. 460-61.

44. Munroe, "From Light to Light," p. 461.

In 1891 the Fern was replaced by the Armeria (botanical name for Sweet William). It had a carrying capacity of 100,000 gallons of fuel that was loaded and delivered in 5-gallon tins, each in a wooden case. (See appendix A for illustrations and a description of the Armeria's sister ship, the Azalia. Such information was not available for the Armeria.) Brick oil houses were constructed at this time at each light station to accommodate a 13-month oil supply in 5-gallon tins.⁴⁵

The Armeria brought supplies to Nauset Beach a little later each year than the Fern, coming in late August to early September. In addition to oil, it carried such items as paint, lubricating oil, cans of tallow, brooms, mats, shovels, hoes, rakes, lamps, boxes of chimneys, window glass, soap, and tin chests (known as supply boxes) that held linen, stationery, brushes, cleaning material, and other minor articles. The keeper exchanged each empty 5-gallon kerosene container for a full one and had to save his worn brooms, mops, tools, and other equipment each year to exchange for new items. All worn equipment was taken back to the supply ship and eventually dumped at sea. (In 1896 the Armeria supplied over 300 lights in New England alone.)⁴⁶

In the latter part of the 19th century a secondary depot for supplies to the second district was established at Wood's Hole on Cape Cod. Articles kept on inventory were buoys and appendages, fuel, lubricating oil, anchors, light-vessel chains, paint, and miscellaneous items. About the same time a lens and lamp repair shop was located in Boston to serve the Second Lighthouse Service District. Both of the above operations ceased about 1912.

45. Ibid., pp. 461, 466.

46. Ibid., pp. 464-65, 467. Drawings of lighthouse equipment and tools will be furnished independent of the report to Cape Cod National Seashore.

Lighthouse Keepers

Prior to 1852 the Lighthouse Establishment operated on a very loose arrangement with its keepers. Many received their positions through political appointment. Most were untrained in the operation of the illuminating equipment and received only minimal instructions. In fact there were no written instructions outlining the keeper's duties. When I.W.P. Lewis inspected the Maine, New Hampshire, and Massachusetts light stations in 1842, he noted the poor performance of many keepers. The best individuals, he found, were old sailors who were more aware of the necessity of good coastal illumination. Many keepers were lazy and neglected to trim the lamp wicks between 11 and 12 o'clock at night, thus causing the lights to dim and lose their effectiveness. Some lit their lamps, but gave so little attention that if a light were to extinguish during the night, it would not be relighted. Lewis felt that the average yearly salary of \$350 was too low and, therefore, discouraged qualified men from seeking such positions. Another regulation that he disapproved was the right of keepers to be pilots. He found that some of these men, to augment their income, would leave their wife and children in charge of the lighthouse while they acted as a pilot.⁴⁷

With the establishment of the Lighthouse Board in 1852, the situation began to improve. The board instituted a requirement that keepers had to be at least 18 years of age and be able to read. It considered a keeper's job as a full-time position. Almost immediately, the board developed a set of written instructions defining the keeper's duties and the proper operation of a lighthouse. Although updated on a regular basis, the first such set of instructions can be found in pages 112-75 of the Annual Report of the secretary of the treasury, dated December 18, 1852. The instructions which were issued closest to the historical

47. Report of I.W.P. Lewis, p. 57.

period in which the "three sisters" will be interpreted, are found in the United States Bureau of Lighthouse Regulations for the United States Lighthouse Service, Washington, D. C.

Instruction manuals covered a multitude of subjects. The first duty of a keeper was to light the lamps precisely at sunset. Lights were to be kept free of smoke, with the flame at its greatest attainable height during the entire night. A flame was to be periodically measured during the night. Lights were to be extinguished at sunrise whereupon the keeper was charged with making them ready for the next evening by 10 o'clock in the morning. Other instructions included directions for cleaning and placing the lamp chimneys, cleaning the lamps, trimming the wicks, preserving and economically using the oil, filling the lamps, keeping the lanterns free of ice and snow, and using the various tools.⁴⁸

Despite the almost constant complaints of low pay, keepers' salaries did rise somewhat. By 1852 the Nauset Beach keeper received \$425 per year. Just before the Civil War, average yearly wages rose to \$600 and remained there until the early 19th century. In 1910 the "three sisters" keeper was paid \$679 but received no heating fuel allowance for his dwelling.

Starting in June 1911, when the three lights were reduced to one, his remuneration was adjusted down to \$517 plus a \$50 heating fuel allowance.⁴⁹

For about a 10-year period between 1873 and 1883, an assistant keeper was stationed at Nauset Beach because the lights were upgraded from sixth order Fresnel lenses to ones of the fourth order. The usual salary of an assistant keeper was half that of the keeper. As a result, the subordinate at the "three sisters" received \$300 per year.

48. Charles Nordhoff, "The Light-Houses of the United States," Harpers New Monthly Magazine 48 (March 1874), p. 470.

49. Letter from the Secretary of the Treasury Transmitting Estimates of Appropriations required for the Service of the Fiscal Year Ending June 30, 1854, House of Representatives, Ex. Doc. No. 2, 32nd Cong., 2nd Sess., December 10, 1852, p. 97.

Communication and Technology

The lighthouses at Nauset Beach served as one link in the entire lighthouse system by which mariners were warned of potential dangers along the coast, in harbors, and on lakes and rivers. There was no communication among the various keepers. Instead, correspondence was kept, at first, with the local collector of customs who acted as a superintendent of lights. After 1852, with the establishment of a Lighthouse Board, a series of districts were created. Within these administrative units authority became more diffuse. The collector of customs retained the duty of appointment of keepers and financial matters, while an inspector saw to the building, maintenance, and supply of lights. Within a short time, however, the collector of customs' duties were given to the inspectors who headed each district. They received the title of general superintendent for their district.⁵⁰

Technologically, the Nauset Beach lighthouses advanced as new innovations appeared in lighting and were adopted by the Lighthouse Service. The first method of lighting was the lamp and near parabolic reflector invented by Winslow Lewis. With the conversion to sixth order Fresnel lenses in 1858, a valve lamp was used for illumination. Franklin lamps were installed in fiscal year 1869. They were retained when the lenses were changed to fourth order in 1873. During the 1880s and part of the 1890s, Haines lamps were used. By the late 1890s, Funck Heap lamps provided the light. Shortly after the three towers were reduced to one in 1911, an incandescent oil vapor lamp served as the illuminant. It operated on the same principle as the present-day Coleman lantern and was the last oil-fired lamp used by the Lighthouse Service. In the 1920s the Nauset Beach light was converted to electricity with a bulb that produced an intensity of 30,000 English candle power from the lens. Within recent years the Coast Guard has installed an airplane beacon-type lamp.⁵¹

50. Holland, America's Lighthouses, p. 36.

51. Annual Report of the Lighthouse Board, 1869, p. 16; Annual Report of the Commissioner of Lighthouses, 1912, p. 47; Nauset Beach Light Description, June 9, 1927.

APPENDIX

The Armeria's sister ship the Azalia

THE AZALEA.

GENERAL DESCRIPTION.

There will be one right-handed cast-iron screw-propeller, of about 8 feet diameter and suitable pitch, driven by an inverted-cylinder surface-condensing two-cylinder fore-and-aft compound engine, the cylinders to be 19 inches and 36 inches in diameter, with a stroke of 28 inches.

BOILER.

There is to be one cylindrical boiler, 11 feet 9 inches diameter outside of the smallest course of shell, and 11 feet 4 inches long from outside to outside of ends.

There are to be two Fox's patent corrugated furnaces, 40 inches in diameter; inside corrugations to extend from the front end to the back tube-head and secured thereto by means of a single seam of rivets of diameter and pitch to suit the thickness of the plates.

The back-connection will be 29½ inches long at the bottom and 26 inches at the top, increased in a direction parallel with the length of the boiler, and the side sheets are to be carried eccentric to the shell, so that the distance between the shell and said side-sheet will be about 5½ inches in the clear at the bottom, increase upward to a distance, in the clear, of about 7½ inches, increased diametrically at the height of the top row of the tubes. The crown-sheet is to be horizontal and stayed by means of wrought-iron girders, properly spaced, and formed at the ends to have bearings on the front, back, and crown plates, and have a clear space of not less than 1½ inches between the crown-sheet and the bottom of the girders.

The shell of the boiler will be made in two lengths of shell, longitudinally, the smaller course toward the front, or firing end, and suitable thickness to meet the requirements of the United States steam-boiler inspection for a working pressure of 110 pounds per gauge. The circumferential seam will be a double lap-riveted seam, and the longitudinal seams are to be properly spaced to clear all fittings, and are to be riveted and strapped to suit the requirements of the United States steam-boiler inspection for a working pressure as stated above. The end plates shall be made in not more than two plates in each end plate, the seam joining the plates to be horizontal, and situated at a proper height above the tops of the tubes; seams to be double-riveted zigzag, with the calking edge upon the outside. There are to be one hundred and sixty-six 3½ inches outside diameter American lap-welded charcoal-iron boiler-tubes; the distance between the tube-sheets, from inside to inside, to be about 8 feet, spaced not less than 4½ inches horizontally and vertically; a vertical space of about 7½ inches, in the clear, to be left between the tubes in the center of the boiler. Stay-tubes to be put in in a sufficient number, and to the satisfaction of the representative of the Light-House Board. The stay-tubes are to be proportioned at the ends for cutting suitable threads; the back-end thread to be minus and the front-end thread plus, so that the tube will pass freely through the front head. Each stay-tube to be fitted with a flat-cheek hexagonal nut, the other tubes to be expanded and beaded in the very best manner. Tubes, etc., to be arranged according to working drawing furnished by the Light-House Board.

The scantlings of the boiler to be as follows: Shell-plate, $\frac{1}{2}$ inch in thickness; front and rear tube-head, $\frac{1}{2}$ inch; back-head of back-connection, $\frac{1}{2}$ inch; side sheets of back-connection, $\frac{1}{8}$ inch; crown-sheet of back-connection, $\frac{1}{8}$ inch; upper part of end plates, $\frac{1}{8}$ inch; furnace, $\frac{1}{2}$ inch. The back-connection will be stayed to the shell in a substantial manner, and in accordance with the rules of the Board of Supervising Inspectors governing the construction of marine boilers to be used in salt-water. The strain on the stays shall not exceed 5,000 pounds per square inch of section at the bottom of the thread. The front and back ends will be provided with stays extending from outside to outside of shell, with hexagonal-nut washers outside, and nuts and castings inside to stiffen the end plates properly. A pair of 3 by 3 by $\frac{1}{4}$ inches angle-iron are to be securely riveted to the inside of the end plates, one on each side of the stay, and about $\frac{1}{2}$ of an inch farther apart than the diameter of the stay. The angle-irons are to extend horizontally across the ends a sufficient distance beyond the outside stays to insure good work. The stays are to be spaced far enough apart to admit a man to pass between them to inspect the boiler. These stays are to be proportioned to stand not more than 6,000 pounds per square inch of section at the root of the thread.

BOILER-FITTINGS.

An independent stop and safety-valve will be fitted to the boiler; the safety-valve is to be on the shell of the boiler at the up-take end, and an exhaust-pipe of copper, with a properly designed end of ornamental pattern, and branch-pipe to lead steam up and out, properly attached in a substantial manner, and carried to such height as may be directed. The safety-valve is to be of such spring safety-valve pattern as is suitable for marine purposes, and of such size as is required by law. The stop-valves are to be of an approved form, and will be attached to the end of the boiler nearest the engine; they are to be furnished complete with hand-wheels, stuffing-box, and bonnet. A 5-inch diameter wrought-iron pipe will extend from this valve inward along the top of the boiler, one end being made so as to prevent steam from entering, and the other end screwed into the valve-body. The pipe will be properly fastened to the inside of the boiler, about 3 inches from the upper side; two rows of $\frac{1}{2}$ -inch diameter holes shall be drilled through the top side of said pipe, so that the sum of the area of said holes shall be 50 per cent. in excess of the area of the pipe; 11 by 15 inch elliptical man-holes and 5 by 7 inch elliptical hand-holes are to be cut through the boiler, in such position and number as may be directed, and these openings are to be properly re-enforced and fitted complete, with good hinges between the plates and boiler to insure tight joints and strength. The plates, bolts, and bridge-bars are to be of the best quality of material and workmanship.

The furnaces are to be fitted complete with bridge-walls, grate-bars, bearing-bars, front castings, firing and ash-pit doors, in a substantial and complete manner; the bridge-walls to be furnished with soapstone shapes to suit the diameter of furnace. The boiler is to be furnished complete with bottom and surface blow-valves and pipe, feed-pipe and valves, foam-pipe, glass and cock gauges, 6-inch dial-gauges, and all fittings necessary to place them in complete working order, such as sea-connections, firing-tools, and all necessary fittings. The boilers are to be securely strapped to the cradles and chocked in a substantial and neat manner, to prevent any movement endwise or athwartship on the cradles. The smoke-box will be constructed as shown on the drawing, and will be built double up to within 4 inches of the top of sheet-iron casing fitted to deck; the passages are not to be reduced in area to less than one-fifth of the grate area at any point. The front of the smoke-box will slope outward, and will be framed so that the openings for doors will admit of the tubes being removed without deranging any of the structure.

These doors are to be hinged at the top edge and swing vertically, and are to be finished complete, with hinges, clamps, eye-bolts, baffle-plates, and lifting-chains, with pulley-leaders and lines leading to some accessible and convenient point. The

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lows: Shell-plate, $\frac{1}{2}$ inch in thickness; end of back-connection, $\frac{1}{4}$ inch; side sheets of back-connection, $\frac{1}{8}$ inch; upper part of back-connection will be stayed to the shell with the rules of the Board of Supervisors of marine boilers to be used in salt-water. 100 pounds per square inch of section at each end will be provided with stays with hexagonal-nut washers outside, and lates properly. A pair of 3 by 3 by $\frac{1}{4}$ to the inside of the end plates, one on each farther apart than the diameter of the nutally across the ends a sufficient distance apart. The stays are to be spaced far enough apart to inspect the boiler. These stays are to be 100 pounds per square inch of section at the

FITTINGS.

It will be fitted to the boiler; the safety-valve at the smoke end, and an exhaust-pipe of copper, of standard pattern, and branch-pipe to lead steam in a proper manner, and carried to such height as to be of such spring safety-valve pattern and of such size as is required by law. The stop-valve will be attached to the end of the boiler and complete with hand-wheels, stuffing-box, and light-iron pipe will extend from this valve being made so as to prevent steam from entering the valve-body. The pipe will be properly sized in inches from the upper side; two rows of rivets on the top side of said pipe, so that the rivets are in excess of the area of the pipe; 1-inch elliptical hand-holes are to be cut in number as may be directed, and these openings complete, with good hinges between them and strength. The plates, bolts, and rivets of material and workmanship. The bridge-walls, grate-bars, bearing-bars, in substantial and complete manner; the shapes to suit the diameter of furnace. Bottom and surface blow-valves and pipe, cock gauges, 6-inch dial-gauges, and all working order, such as sea-connections, boilers are to be securely strapped to the boiler in a proper manner, to prevent any movement. The smoke-box will be constructed as shown within 4 inches of the top of sheet-iron. The area will be reduced in area to less than one-fifth of the area of the smoke-box will slope outward, and will admit of the tubes being removed

large and swing vertically, and are to be secured by bolts, baffle-plates, and lifting-chains, accessible and convenient point. The

material of smoke-box and funnel is to be of sufficient strength for first-class work, and must be finished complete, in place, with bearings for properly supporting the weight, stays, stay-band, umbrellas, drip and shield plates, and all fittings necessary to complete the work, to meet the requirements of the United States Inspector of steam-vessels. All valves to be of the best material and workmanship, properly attached and fitted in place. The engine and boiler rooms are to be fitted complete with wrought-iron platforms, ladders, and floor-plates, as shown on the drawings, or as may be directed during construction, to render every part of engine and boilers accessible and convenient.

When the boiler has been properly tested, etc., asbestos and felt, or other approved covering, shall be put on by the contractor, to the satisfaction of the representatives of the Light-House Board.

MATERIAL.

All the material of the boilers is to be Siemens-Martin mild-steel, excepting the tubes, with a tensile strength of not under 60,000 pounds nor more than 65,000 pounds per square inch of original cross-section, and an elongation of 23 per cent. in 8 inches. Rivets are to be of the very best quality of steel, of 50,000 to 55,000 pounds tensile strength per square inch, and an elongation of 30 per cent. in 8 inches.

TRIAL-TRIP.

In addition to the necessary trials of the machinery at the dock, a trial-trip is also to be made, of about twelve hours' duration, or as may be directed by the Light-House Board, at the expense of the contractor, and the engine must develop the required 400 indicated horse-power when the engine is making 107 revolutions per minute, with a coal-consumption as hereinbefore specified, and a cut-off in the high-pressure cylinder of one-half the stroke, links in full-gearing and steam, per gauge, at 100 pounds pressure per square inch.

All bearings, journals, crank-pins, and other parts of the engine to show no tendency to heat or grip, but to run smoothly, the engine to pass its centers without shock or noise. The machinery must work on this trial-trip to the entire satisfaction of the representative of the Light-House Board, and if any defects should develop on the trial, subsequent trials, at the expense of the contractor, as described above, will be made until every part of the machinery has been proven to be in accordance with the requirements of these specifications, to the satisfaction of the Light-House Board.

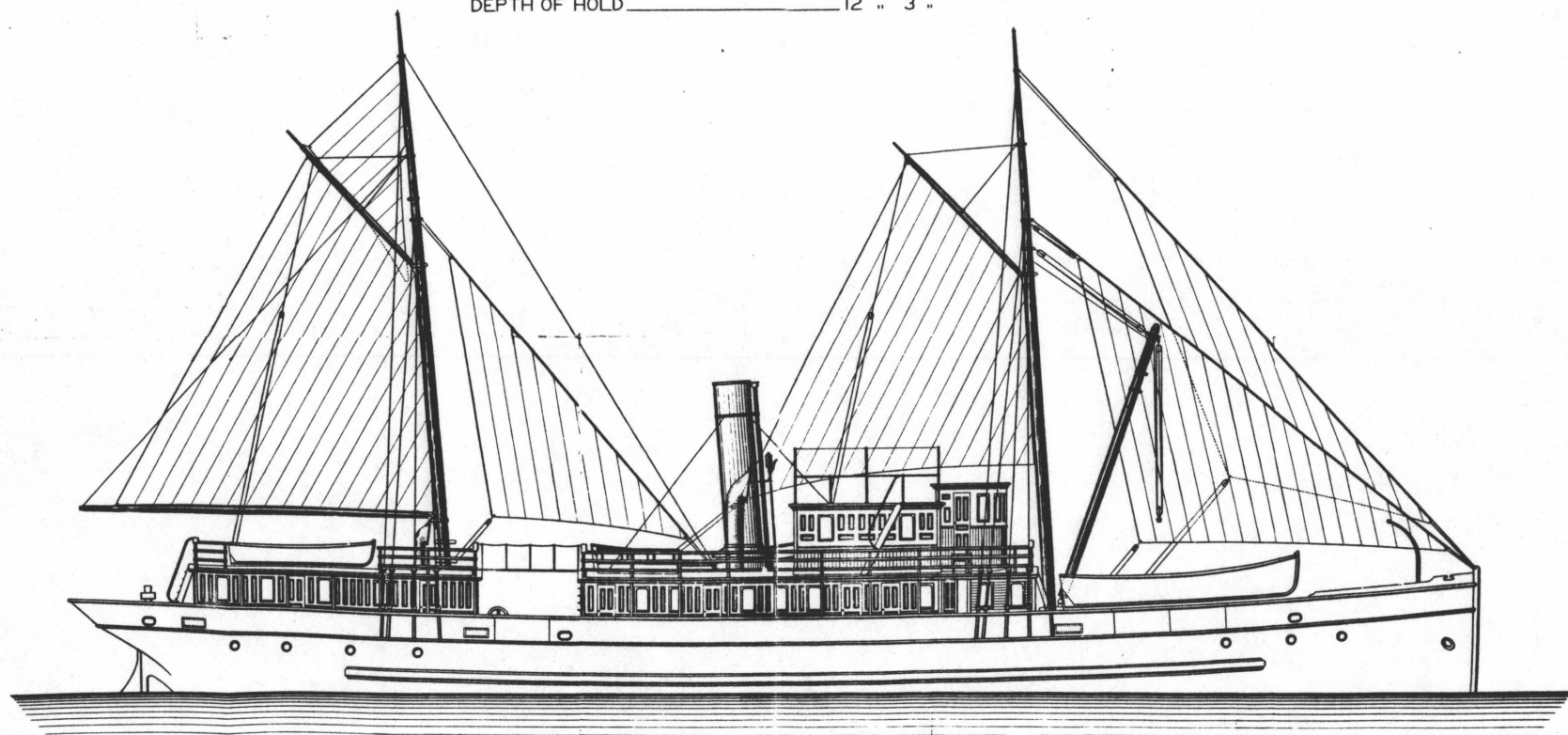
The contract for the *Azalea* requires the delivery of this vessel at the light-house depot Tompkinsville, Staten Island, New York, on or before seven calendar months from the date of the approval of the contract by the Secretary of the Treasury. This contract was approved on February 28, 1890, so her delivery may be expected on or about September 28, 1890.

U. S. LIGHT-HOUSE TENDER "AZALIA."

LENGTH BETWEEN PERPENDICULARS 145 Ft. 0 In.

BREADTH MOULDED _____ 25 " 0 "

DEPTH OF HOLD _____ 12 " 3 "



Office of the Light-House Board, December, 1889.

James C. Coffin
Commander U. S. N.
Naval Secretary.

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Office of the Light House Board December 1850

BIBLIOGRAPHY

The major portion of lighthouse records dealing with the Nauset Beach lights between 1852 and 1921 were burned in the Commerce Department fire of 1921. As a result, Record Group 26, Records of the United States Coast Guard in the National Archives has a restricted number of documents. The Cartographic and Architectural Division of that archives had no drawings on the Nauset Beach lights. Several pictures were obtained from the Still Photo Division. Few records on those lights were found in the United States Coast Guard Academy Library at New London, Connecticut. The library contained several maps of the property showing building locations and elevation and floor plan drawings of the 1875 wood frame keeper's dwelling. The First District Coast Guard office in Boston had a document giving a good description of the lights in 1910. Cape Cod National Seashore files yielded some material, including several maps and photographs. Those depositories investigated, which yielded no primary documents on the Nauset Beach lights, included the Massachusetts Historical Society, Bostonian Society, Boston Public Library, Massachusetts Historical Commission, Massachusetts State Archives, and the Library of Congress.

Many secondary sources gave only general descriptions of the Nauset Beach lights, such as Edward R. Snow's, Famous New England Lighthouses and Malcolm F. Willoughby's, Lighthouses of New England. These works proved of little value and were not used for source material. Only those books cited below were used and they contained mostly background information on the Lighthouse Service.

Primary Sources

Unpublished documents

National Archives, Washington, D. C.

Clipping File. Records of the United States Coast Guard. Record Group 26. This file has some information on the Nauset Beach lights between 1860 and 1900 in a folder marked "Nauset Beach Lights." Included are appropriate sections from the Lighthouse Board Annual Reports.

Correspondence of the Bureau of Lighthouses, 1911-39. Records of the United States Coast Guard. Record Group 26. This series of documents contains only a small amount of material on the Nauset Beach lights.

Description of Light Stations 1876-1938. Records of the United States Coast Guard. Record Group 26. This entry contained a 1927 description of the Nauset Beach lights.

Index to Lighthouse Board Letterbooks (Nauset Beach lights). Records of the United States Coast Guard. Record Group 26. All that remains from the Commerce Department fire of 1921 are the index to these letterbooks. The one or two index sentences describing each letter's contents provide some information, but do not give a full account of each letter's subject matter.

Letter from the Secretary of the Treasury transmitting the Report of the General Superintendent of the Lighthouse Establishment, December 19, 1850. Records of the United States Coast Guard. Record Group 26. The report contains a list of supplies delivered to Nauset Beach in 1850.

Lighthouse Superintendent, Boston 1826-44 (correspondence). Records of the United States Coast Guard. Record Group 26. This group of documents has a small amount of material pertaining to the early Nauset Beach lights.

United States Coast Guard Academy, New London, Connecticut

Group Plan Map of Nauset Beach structures. No date.

First District Coast Guard, Boston, Massachusetts

Description of Lighthouse Towers, Buildings, and Premises at Nauset Beach, Massachusetts, Light-Station. January 11, 1910. The document gives a fairly good description of the three lights as to their dimensions including doors and windows.

Cape Cod National Seashore

History of "Jack O'Lantern" -- Hall Cottages. A telephone conversation between Doris Doane (a Cape Cod National Seashore employee) and Harold Hall. November 21, 1975. Hall tells of this parents' purchase of the third of the three sisters in 1923.

John A. Cummings's written account of the sale of two of the "three sisters" to his parents. March 23, 1969. Cummings gave an account of when his parents bought the lights, the cost, and what they did with them.

Published Government Documents

Annual Report of the Light-House Board to the Secretary of the Treasury for the Year 1868. Washington, D. C.: Government Printing Office, 1868.

Annual Report of the Light-House Board to the Secretary of the Treasury for the Fiscal Year 1869. Washington, D. C.: Government Printing Office, 1869.

Annual Report of the Light-House Board of the United States, 1873. Washington, D. C.: Government Printing Office, 1873.

Annual Report of the Light-House Board of the United States to the Secretary of the Treasury for the Fiscal Year Ending June 30, 1874. Washington, D. C.: Government Printing Office, 1874.

Annual Report of the Light-House Board to the Secretary of the Treasury for the Fiscal Year Ending June 30, 1876. Washington, D. C.: Government Printing Office, 1877.

Annual Report of the Light-House Board to the Secretary of the Treasury for the Fiscal Year Ending June 30, 1882. Washington, D. C.: Government Printing Office, 1882.

Annual Report of the Light-House Board to the Secretary of the Treasury for the Fiscal Year Ending June 30, 1892. Washington, D. C.: Government Printing Office, 1892.

Annual Report of the Light-House Board to the Secretary of the Treasury for the Fiscal Year Ending June 30, 1895. Washington, D. C.: Government Printing Office, 1895.

Annual Report of the Commissioner of Lighthouses to the Secretary of Commerce and Labor for the Fiscal Year Ending June 30, 1911. Washington, D. C.: Government Printing Office, 1911.

Annual Report of the Commissioner of Lighthouses to the Secretary of Commerce and Labor for the Fiscal Year Ending June 30, 1912. Washington, D. C.: Government Printing Office, 1913.

Annual Report of the Commissioner of Lighthouses to the Secretary of Commerce for the Fiscal Year Ending June 30, 1923. Washington, D. C.: Government Printing Office, 1923. Although the run of annual lighthouse reports were reviewed from 1852 to 1925, only the above reports contained a small amount of information on the Nauset Beach lights.

House of Representatives. "Report of I. W. P. Lewis, Civil Engineer, made by Order of Hon. W. Forward, Secretary of the Treasury on the Condition of Light-Houses, Beacons, Buoys, and Navigation, upon the Coasts of Maine, New Hampshire, and Massachusetts, in 1842." Doc. No. 183. February 24, 1843. 27th Cong., 3rd Sess. Lewis's report is very revealing about the condition of the Light-House Establishment under Fifth Auditor Stephen Pleasonton. He singles out the Nauset Beach lights as a horrible example of the conduct of Pleasonton's administration.

House of Representatives. Letter from the Secretary of the Treasury transmitting estimates of appropriations required for the Service of the Fiscal Year Ending June 30, 1854. Ex. Doc. No. 2, 32nd Cong., 2nd Sess. This document contains a list of keepers' salaries for the period.

United States Statutes At Large. 5. Boston: Charles C. Little and James Brown, 1850.

Secondary Works

Books

Baker, William A. A History of the Boston Marine Society, 1742-1967. Boston: Boston Marine Society, 1968. Baker was commissioned by the Boston Marine Society to compile its history. Although the book is dull and redundant, it does cover the history of that organization quite well and mentions how the Nauset Beach lights came into existence.

Holland, Francis Ross, Jr. America's Lighthouses: Their Illustrated History Since 1716. Brattleboro, Vermont: The Stephen Greene Press, 1972. Holland's work has been accepted as the standard account of the lighthouse service. Factually, it is a good balanced work. His opinions, however, indicate that he lacks a general knowledge of American history.

Johnson, Arnold B. The Modern Light-House Service. Washington, D. C.: Government Printing Office, 1890. Johnson was a Light-House Service employee who was asked to produce a study of his organization. Except for not presenting the controversy over Stephen Pleasonton's administration of the Lighthouse Establishment, Johnson wrote one of the best accounts of the service up to 1889 and can still be considered an excellent book on the early history of lighthouses.

Weiss, George. The Lighthouse Service: Its History, Activities and Organization. Baltimore: The Johns Hopkins Press, 1926. Weiss's work is very similar to that of Arnold Johnson. He, of course, continued the story beyond the 1889 date of Johnson's book.

Articles

"Light-House Construction and Illumination." Putnam's Magazine. 8 (August 1856) 198-213. The article gives a general history and description of lighthouse construction and lighting through the ages.

Munroe, Kirk. "From Light to Light: A Cruise of the Armeria Supply Ship." Scribner's Magazine. 20 (October 1896) 460-75. An interesting account of the methods used to supply lighthouses.

Nordhoff, Charles. "The Light-Houses of the United States." Harper's New Monthly Magazine. 48 (March 1874) 465-77. The article discusses the development of the American Lighthouse Service.