Society for Industrial Archeology · New England Chapters

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Editorial

The Second Annual Conference on New England Industrial Archeology was a big success (Old Sturbridge Village, Feb. 4), and the Northern New England Chapter has already held its Spring Meeting (Brandon, VT, April 22). Now as this Newsletter goes to press, the Northern New England Chapter is about to conduct a recording project at the site of a state-owned ironworks in Forestdale (Brandon), Vermont. It's all-too-rare that either chapter sponsors field work that all members can take part in, yet there are many threatened industrial sites in New England that will receive scant attention before they are destroyed. If you have a site in your local area that you believe deserves recording, you may want to contact the appropriate Chapter President and see if a group activity can be organized to help document it with drawings and photos!

David Starbuck
Rensselaer Polytechnic Institute

Photographer Wayne Fleming balances on an abutment for this shot of Hastings Bridge in Sterling, MA, during an HRC recording project. (Historic Resource Consultants photo)

President's Report, NNEC

It is with deep sadness that we must note the sudden death of John Stone in March. He was seventy-nine. John, along with his wife Jean, was an owner of Yankee Typesetters of Concord, NH, one of the last Linotype shops in Northern New England. His shop was the subject of an article by Jerry Wolfe in the Spring 1987 Newsletter after a February tour that year by the NNEC. John and his shop were the subject of a local TV documentary which was aired, ironically, the same week as his passing. John's enthusiasm for hot type and the Linotype machine which produced it was a major factor in the company's success in this era of computers and desk-top publishing. He would convince anyone who would listen that the Linotype was a truly marvelous machine. He will be missed. Customer demand for Yankee Typesetters' product remains strong, and for now the company will continue to be operated by its very able employees.

Congratulations to Peter Stott and Larry Gross of the SNEC for their efforts resulting in the excellent Second Annual Conference on New England Industrial Archeology held at Sturbridge Village in February. There was a capacity crowd, and the program was an example that the NNEC will find hard to match when it's our turn again to be hosts next February.

The last of New Hampshire's early 20th-century riveted-plate gasholders has been razed. A victim of improved delivery systems for natural gas, increasing maintenance costs, and a public attitude which branded it as an "eyesore", the ca. 1921 gasholder in Concord has been torn down. Originally constructed to meet demands for increasing volumes of coal gas which could not be met by the smaller capacity of the much-publicized historic 1888 gasholder, the 1921 gasholder was constructed with four telescoping sections, 100 feet in diameter. The telescoping holder floated in one and one-half million gallons of water and was guided up and down along 10 vertical 120-foot rails. The gasholder was carefully designed, and constructed chiefly by hand to solve the problem of operating an economical production plant, yet meeting extreme fluctuations in demand as the use of gas for home heating and industrial processes increased after World War I. In 1953 coal gas was replaced by piped-in natural gas in Concord. Today, natural gas is delivered under high pressure from a pipeline which serves much of the eastern U.S. Gas volume is regulated to changing local demand by a device the size of a hardhat, and the 1921 gasholder capacity would have been only enough to provide a single hour of gas on a cold winter morning this year.

IA people will agree with Bill Miscoe, the engineer contracted to tear down the gasholder, who nonetheless appreciated the structure's unique and rare craftsmanship. He said, "It's a part of our mechanical history. When we turn on the gas tap we have no idea how it got there. It got there step by step and (the 1921 gasholder) was one of the steps. It was the last artifact from a time when every city made its own gas for illumination, cooking and heat. We will miss it a little bit."

Another item of bad news for preservationists and industrial archeologists is that the landmark Notre Dame arch bridge in Manchester, New Hampshire, is being demolished. The majestic bridge with its 130-foot-high arch spanning 444 feet across the Merrimack River will be replaced by an I-beamed, multiple-pier, reinforced concrete highway bridge. The Notre Dame bridge, which belongs to the city of Manchester, was considered by many to be an important part of the city's and state's heritage. It was built by the American Bridge Company in 1937 after a flood had destroyed a previous bridge.

A plan presented by a local committee of business and political leaders to move the bridge and maintain it as a unique public park was not successful because the committee was not able to raise sufficient funds. A last minute attempt to have the state purchase the bridge from the city for one dollar also failed.

In my opinion the action by the city of Manchester to demolish the bridge is senseless and uncaring. The decision appears to be biased by an attitude on the part of Manchester's political leaders which considers "modernize" to mean total replacement. It suggests the kind of mindset that existed in this country during the 50s and 60s when many historically-important and architecturally-significant structures were lost to the "modernizing progress" of the wrecker's ball. The fifty-year-old bridge's safety had not been seriously questioned by any of the engineers who inspected it. Although Manchester officials said that maintenance costs were too high, I cannot believe that maintenance and repair of the bridge could possibly be as expensive as tearing it down and building a new one. The city of Manchester is reacting to a short-term budget crisis and the politics of greed. The State of New Hampshire engineers seem to have a dislike for arch bridges and a preference for bridges supported from below with many piers and massive I-beams. A graceful, beautifully designed, and intelligently engineered structure, the Notre Dame bridge has been lost.

Dennis Howe
Concord, NH

President's Report, SNEC

The Southern New England Chapter held its 1988 fall meeting Saturday, November 5th, in East Cambridge at the former Boston Woven Hose and Rubber Company complex. Following the morning meeting, which approved the first bylaw revision since the founding of the chapter over a decade ago, the group was given a tour of the historic complex courtesy of the developers, The Athenaeum Group, and their architects, O.K.S. Architects. The afternoon included tours of the 1645 residence-*cum*-machine shop of Dr. Edward Seldin, and of the diesel-electric tugboats *Venus* and *Luna*.

The Chapter's bylaws were the principal subject of the annual business meeting. At the fall meeting the year previous, a Bylaws Committee had been formed to make recommendations in the way in which the Chapter conducted its business. Named to the subcommittee were Larry Gross, Paul McGinley, and Chapter officers Rick Greenwood and Peter Stott. Among the changes recommended by the subcommittee were an expansion of the role of program coordinator as "vice president," and provision of the appointment of a "nominating committee" to present a slate of officers for consideration at the Chapter's annual fall meeting. The pro-

The c1937 Notre Dame arch bridge, Manchester, NH, is being demolished and will be replaced with a multiple-pier, I-beamed highway bridge. This photo, taken before demolition began, shows the newly-constructed piers of the replacement bridge, and illustrates the different engineering designs of the original and the replacement. The arch bridge required no structural supports from below which would be exposed to the river's flow. (Closs Planners photo)

posed bylaws were adopted.

The meeting concluded with the annual election of officers. Unanimously nominated and voted into office were Peter Stott, President; Jeff Howry, Program Coordinator; Maureen Cavanaugh, Treasurer; and Anne Tait, Secretary. President Rick Greenwood will head the three-person committee to propose next year's slate of SNEC officers.

The tour of the Boston Woven Hose & Rubber Company opened with an historical overview of the company by Charles Sullivan, Executive Director of the Cambridge Historical Commission and long-time SIA and SNEC member. Charles Mulhern of O.K.S. Architects Group, architects of the present renovation, described the several components of the complex and the progress of the project. He followed his presentation with a tour of the buildings, several of which are noted for their early use of reinforced concrete.

At the conclusion of the tour, many chapter members walked to the nearby residence of Dr. Edward Seldin, described as "worthy of the Robert M. Vogel Award for interior decorating." Dr. Seldin's collection of shop tools, building finishes, and industrial curiosities have been combined to create an extraordinary *tour de force* of industrial design.

The day concluded with a tour of the tugboats *Venus* and *Luna*. Constructed in 1930, the tugs represented the state-of-the-art in diesel-electric propulsion at the time of their construction, and for many years they were the pride of the Boston tugboat fleet. Today, berthed in the Charles River Basin adjacent to the Science Museum, the *Luna* is being slowly restored under the auspices of the Terra/Mare Research and Education Society. Capt. Fran Gage, director of this restoration, provided the group with a colorful tour of the *Luna's* sister tug, the Venus, berthed beside her.

Much of the organization of the day's activities was the work of Michael B. Folsom, for whose hard work the Chapter is much indebted. Special thanks should also be given to Chris Mulhern of the O.K.S. Architects Group, Charles Sullivan, Dr. Edward Seldin and Capt. Fran Gage.

Anne Tait
Brookline, MA
[for Peter Stott]

MEETINGS AND ANNOUNCEMENTS

Upcoming Events

May 26-29, 1989

Recording project by the Northern New England Chapter, SIA, at the Forestdale Ironworks, Brandon, Vermont.

June 1-4, 1989

Annual Meeting of the Society for Industrial Archeology, to be held in Quebec City, Quebec.

June 17, 1989

Spring Meeting of the Southern New England Chapter of the Society for Industrial Archeology. We will explore the waterpower canals of downtown Holyoke, Massachusetts. For further information contact Jeff Howry at (617) 367-3933 (daytime office) or (617) 861-8524 (home).

October 13-15, 1989

Annual Meeting of the Society for the History of Technology in Sacramento, California.

October 12-15, 1989

Annual Fall Tour of the Society for Industrial Archeology in Butte, Montana.

New England Electric Railway Historical Society, Inc.

The New England Electric Railway Historical Society, Inc. is a not-for-profit educational organization founded in 1939 and incorporated in the State of Maine in 1941. The Society owns and operates the Seashore Trolley Museum, located in Kennebunkport, Maine. It is the world's oldest museum dedicated to acquiring, preserving, and operating mass transit vehicles, and related artifacts, and is the largest museum of public transportation vehicles in North America. The museum's professional standards and its commitment to the preservation of its collections has resulted in its being accredited by the American Association of Museums.

The original focus of the Museum was on the preservation of streetcars, but the collection has been gradually expanded to include a highly varied collection of all types of mass transit vehicles, including horse-drawn omnibuses, horsecars, streetcars, motor buses, trolley coaches, and rapid-transit subway and elevated streetcars. Also included are several uniquely related vehicles such as overhead wire repair trucks, battery-powered electric trucks, and heavy-duty transit wreckers.

The Museum was established in Maine since land requirements were extensive, and a large tract of land with an adjacent, but abandoned, electric railway right-of-way was available. This unique arrangement was ideally suited for constructing a museum and a demonstration railway. The Museum currently owns several hundred acres of contiguous property in the towns of Arundel and Kennebunkport and the City of Biddeford. Except for a small mortgage on one parcel, the land is unencumbered. The Museum's facilities currently include several carhouses, a fully equipped restoration and repair shop, a large visitor reception center, and several other smaller supporting buildings, as well as an electric railway line that museum volunteers constructed along the right-of-way.

The Museum's first vehicle exhibits came from New England, but starting in 1951 it broadened its scope and sought out representative vehicles from throughout the United States and Canada and, indeed, from around the world. Today, the vehicle exhibits number over 160. Examples of North American cities represented include: Allentown, Baltimore, Boston, Brooklyn, Cedar Rapids, Chicago, Cleveland, Dallas, Dayton, Denver, Halifax, Johnstown, Los Angeles, Milwaukee, Minneapolis/St. Paul, Montreal, New Haven, New Orleans, New York, Philadelphia, Pittsburgh, Providence, Quebec City, Rochester, San Francisco, Seattle, Vancouver, Washington, Wheeling, and Wilmington. Among our foreign exhibits are vehicles from Berlin, Glasgow, Hamburg, London, Nagasaki, Rome, Sydney and Vienna.

Most of the vehicle collection is housed in large carbarn storage buildings, two of which are arranged as exhibit halls for the display of restored exhibits. The restoration shop, which accommodates about a dozen vehicles undergoing maintenance and restoration at one time, is also accessible to the visiting public.

Many of the vehicles in the collection have suffered from extensive deterioration after many years of public service, and in many cases, neglect during their later years of operation. As a result, the museum has set priorities for equipping and operating the shop. Authentic trades, techniques, machines, and materials are used to restore and conserve the vehicles. Long-term exposure to salt corrosion and general deterioration due to the weather frequently necessitates the extensive rehabilitation of the vehicle structure and body panels during conservation of a vehicle. Most areas of mechanical and body rehabilitation are handled by the Museum's staff, comprising both volunteer and full-time personnel. Traction motor rehabilitation is handled by outside firms or Museum staff, depending on need.

One of the primary attractions at the Museum is the demonstration railway, an operating electric railway line on which the visiting public may ride in authentically restored vehicles. The railway is maintained to high standards.

While the primary focus of the Museum has been to collect and stabilize the vehicle collection and construct the demonstration railway, other areas of activity have included the development of a library and archives containing drawings, books, photographs, specifications, technical literature and other data relating to the mass transit industry. A small building currently houses these collections, but expanded and improved facilities are required.

The New England Electric Railway Historical Society, Inc. is a membership organization, with over 1,200 members worldwide. Membership is open to any person, and dues are nominal. The Society is governed by a Board of Trustees who are elected by the membership. They meet on a monthly basis, and an Annual Meeting is held in May of each year. An Annual Report, including audited financial statements, is issued each year.

The Corporate Officers include: James D. Schantz, Chairman; C. Murry Cott, Vice Chairman; Henry B. Brainerd, President; Arthur G. Duncan, Executive Vice President; Jeffrey N. Sisson, Treasurer and Comptroller; Cecilia B. Clapp, Secretary and Assistant Treasurer; Wayne T. Adams, General Counsel and Clerk of Corporation; Henry Dickinson, Jr., Membership Secretary; and Frederick J. Perry, General Manager.

Operating and Administrative Officers are numerous, but include: Dwight B. Minnich, Museum Director; Janet E. Krippendorf, Vice President of Marketing; Donald G. Curry, Superintendent of Car Restoration and Maintenance; Roger G. Tobin, Safety Officer; Peter Folger, Museum Store Manager; and Dorothy B. Warner, Bookkeeper and Office Manager.

The Museum's address and telephone number are:

New England Railway Historical Society, Inc.
Seashore Trolley Museum
P.O. Drawer A, Log Cabin Road
Kennebunkport, ME 04046-1690
Telephone: (207) 967-2712

The Society is recognized as a non-profit organization under Section 501(c) (3) of the Internal Revenue Code. All contributions to the Society are tax-deductible.

Lowell Conference On Industrial History

October 26-28, 1989
Lowell Hilton, Lowell, Masschusetts

After Hours: Life Outside of the Workplace

The Tenth Annual Conference on Industrial History, "After Hours: Life Outside of the Work Place," will be held Thursday through Saturday, October 26-28, 1989, at the Lowell Hilton, Lowell, MA. The conference will address the theme of leisure time in industrial society and time away from the work place. Presentations and group discussions will involve recent scholarship and research, media, oral history, museum interpretation, local history, and artifact analysis. Workshops and sessions will also highlight educational issues, especially the teaching of the history of leisure time as a topic in elementary and secondary social study classes. A film and video series will be shown in the evenings. Saturday's sessions will focus on quilts and quilting as leisure time activities.

Selections from the papers and presentations at each annual conference are considered for publication in a series of anthologies which are published by the conference through the Museum of American Textile History and the American Association for State and Local History.

The Lowell Conference is sponsored by the Tsongas Industrial History Center, Lowell National History Park, Museum of American Textile History, University of Lowell, Lowell Historic Preservation Commission, Whistler House Museum of Art, and New England Quilt Museum. For information and registration, write or call:

Dr. Edward Jay Pershey
Lowell Conference on Industrial History
Tsongas Industrial History Center
Boott Mill, Foot of John Street
Lowell, MA 01852
(508) 459-2237

OBITUARY

Rev. Arthur W. Shaw, Jr. 1931—1989

Dr. Arthur W. Shaw, founder of the Pioneer Valley Museum of Industry and Greenfield Community College instructor, died February 14th, following an automobile accident not far from his home in Orange, Massachusetts.

A graduate of Boston University where he received degrees in journalism and divinity, Dr. Shaw had served churches in Byfield, Baldwinville, and Greenfield before becoming minister of the Community Church of North Orange and Tully in 1970.

Dr. Shaw was associated with Greenfield Community College since its founding in 1962, where in addition to English, logic, and philosophy, he taught a course in the Industrial History of the Connecticut Valley as part of the College's Pioneer Valley Studies program.

In 1970 he founded the Pioneer Valley Museum of Industry, an outgrowth of the Pioneer Valley Studies program. Dr. Shaw intended that the Museum should become a center for study of the Valley, economic and industrial history for students at all levels. Using representative machines, products to study the course of the Industrial Revolution in the Pioneer Valley, he hoped to give more meaning to the Industrial Revolution in America.

The Museum's location, in the Franklin County industrial town of Orange, gave Dr. Shaw a ready opportunity to collect the products of former Orange manufacturers, like the New Home Sewing Machine Company, once the town's largest employer. But the Museum collected from throughout the Valley, including Greenfield, Florence, Springfield, and Northampton. To this writer, Dr. Shaw gave a tour of the town and of the Museum's collection, which at that time featured a display of Nonotuck silk and New Home Sewing Machines. He was an enthusiastic and knowledgeable speaker, and his affection for his subject was obvious. A member of the Southern New England Chapter since 1987 and a loyal visitor at Chapter events, Dr. Shaw will be missed.

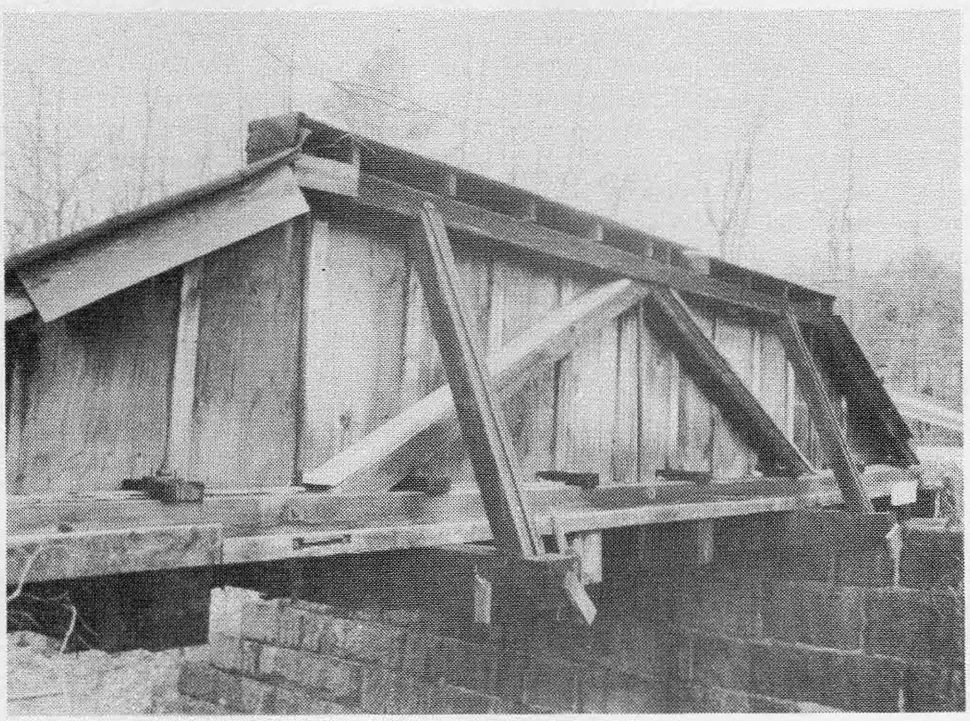
Peter Stott
Newton, MA

CURRENT RESEARCH IN NEW ENGLAND

Current Research Conducted by Historic Resource Consultants, Hartford, Connecticut

Work on the *Rhode Island Bridge Survey* is drawing to a close after two years. The survey phase occupied the first year, identifying 47 bridges that warrant special preservation consideration. Patrick Malone and Donald Jackson assisted with the survey and evaluation work. The identified bridges include a rare 1875 truss, an 1882 wrought-iron Warren truss and several 19th-century stone arches. Most of the notable spans represent the range of reinforced-concrete: an unusual through-arch in Wickford, 1925; two monumental open-spandrel structures, Ashton Viaduct, 1934-1945, and Stillwater Viaduct, 1932; two 1913 arches made from Daniel Luten's patented designs; and six examples of an uncommon hybrid between the filled and open spandrel techniques, the distinctive "modified spandrel" or "slanted spandrel" designed by state engineers in the early 1920s. During the second year we worked with Department of Transportation planners and engineers to develop both a comprehensive preservation management plan and detailed, site-specific recommendations for the most critical bridges. Our *Connecticut Bridge Survey* is scheduled to begin in May.

Other bridge work included recording projects of a swing bridge in the Bronx, NY, and a timber and wrought-iron truss in Sterling, MA, built in 1892 by the Boston & Maine Railroad (see photos). The latter, first recognized for its engineering significance by Steve Roper, is an anachronism best understood as a consequence of the B&M's irresponsible acquisitions in the 1880s. Burdened by high-interest debt from buying feeder and competing lines (the junk bonds of the 1880s and 1890s), the B&M had no money to upgrade its lines or rolling stock. Driven by penury to build with wood instead of metal, the B&M's chief engineer presented his designs to his technical colleagues in a tone of regret, and suggested that their interest (like ours) might be as much historical as practical: *The building of wooden bridges is a live business on the Boston and Maine Railroad, although the impression seems to be prevalent in many quarters that such construction is obsolete... . This paper is offered to describe the present practice in wooden bridge construction on the [B&M] railroad, and if not considered as in line with present approved practice elsewhere, may at least have some interest as a history of one branch of the bridge-building art.* [J.P. Snow, "Wooden Bridge Construction on the Boston and Maine Railroad," *Journal of the Association of Engineering Societies*, 15, 1 (July 1895):31-43, quotation on 31.]



The 1892 Hastings Bridge over the B&M Railroad resembles very closely the "modified Howe pony truss" that Squire Whipple designed in the 1860s for the New York State canals. The B&M bridge has more complex chiseled joints where timbers meet, and the outrigger sway bracing was not found on Whipple's design. Also, the B&M engineers placed floor beams at 2.5-foot intervals rather than confining them to the panel points. (HRC photo)

In 1988 we also completed the first stage of interpretive planning for Mt. Elliott Park in Detroit, a combined gallery and open-air setting devoted to the history of Detroit's industrial waterfront. Closer to home, the much-delayed exhibition on manufacturing for the State of Connecticut's history museum, "To Shape a State," seems to have emerged from a long period of dormancy since we wrote the script for it back in 1985. New museum director Dean Nelson has dusted off the plans and begun collecting industrial artifacts including (if floor loadings allow) an 1853 Parmalee & Mix lathe. Also, in October, the Mark Twain Memorial will open an exhibition commemorating the 100th anniversary of *A Connecticut Yankee in King Arthur's Court*, including our unit on Twain's views of technology and labor in 1880s Hartford.

We will be conducting more IA canoe tours in 1989 on the Naugatuck River, on May 14 and October 22; and on the Blackstone River on May 20, June 17, September 30, and October 21.

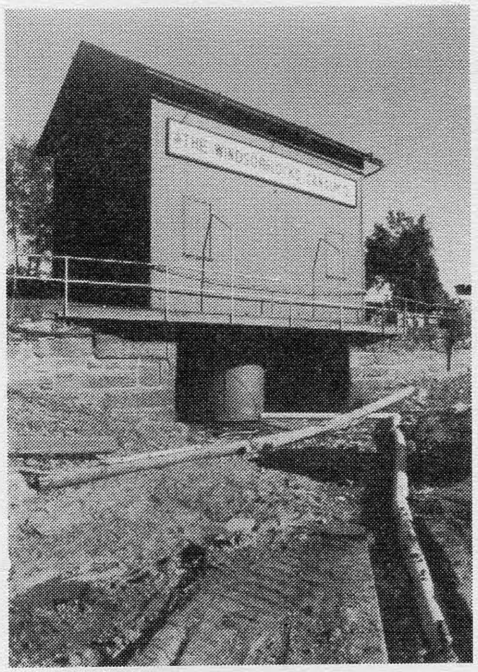
Bruce Clouette
Matthew Roth
Hartford, CT

CURRENT RESEARCH CONNECTICUT

Enfield Canal in Windsor Locks, CT

Recent archeological projects completed by Raber Associates include recovery and analysis of cross-sectional data from the Enfield Canal in Windsor Locks, CT (built 1827-1829). Undertaken in conjunction with a crossing of the canal by an electric transmission line, the study used several sampling techniques to gather detailed subsurface information at a substantially intact canal section. Analysis of recovered samples, and interpretation of local soils and surficial geologic data, indicated that the canal at this point was built in a flood plain with a high artificial embankment. Although the canal is regarded as having a clay liner by former maintenance workers, project data indicated that canal prism surfaces generally consisted of original alluvial soils, which were adequate to seal the canal prism against water losses; little if any applied liner appeared in the samples. These findings are consistent with the wheelbarrow-and-shovel technology employed on many contemporary canals, and with statements of some early 19th century canal engineers about the use, wherever possible, of soils within a canal right-of-way to construct prisms.

Mike Raber
South Glastonbury, CT



October 1988 view to southeast of the "Suckerhouse" on the Enfield Canal, located just above the flight of three locks at the lower end of the canal in Windsor Locks, CT. The Suckerhouse is the intake for the principal water level control structure on the canal, draining water east into the Connecticut River as required. The structure includes a 9-foot-diameter drain, and a motor-powered, pulley-operated 7.8 foot-high riveted iron cylinder which opens and closes the drain. The two-story frame housing for the motor and pulley lift probably dates originally to c1855-1869, when the Connecticut River Company installed the drain structure with a hand-operated pulley. Connecticut Light & Power Company, which bought the canal in the 1920s, motorized the intake structure in 1936.

Nike Missile Site Photodocumentation: Middletown and East Windsor, CT

Two Nike missile launcher batteries located in East Windsor and Middletown, Connecticut, were scheduled for demolition in the summer of 1988. The Army Corps of Engineers and Fort Devens recognized that Nike sites represent an important historical event in the military history of the Cold War years of the 1950s and 1960s. The two Nike launcher batteries were located on US Army Reserve facilities. Due to their deteriorated condition, they posed a safety hazard and were slated for demolition. Both launcher batteries were flooded, and the site in East Windsor contained unspecified debris. Therefore, in the public interest, preservation in place was not possible.

Because of previous contacts with the Connecticut SHPO, the Corps and Fort Devens became aware of the SHPO's concern at the destruction of Nike sites in Connecticut. Many of these sites are now privately owned by individuals who are modifying these areas for practical use. Since the Nike missile program was terminated in the 1970s, most of those sites have not been maintained and are in a poor state of repair. Based on information received from the Corps, the SHPO determined that the Middletown and East Windsor Nike launcher sites appeared to be eligible for The National Register of Historic Places; therefore the proposed demolition would have an effect on the historical and engineering integrity of the two sites. In order to ameliorate this event, Fort Devens engaged the New England Division of the Corps to prepare a report on the physical condition of the sites prior to their demolition. The report, "Nike Launcher Sites, Middletown and East Windsor, Connecticut: A Photodocumentation of Two Nike Sites Slated for Demolition," was prepared by the Corps at the request of the Fort Devens Environmental Office. Below is a brief description of the Nike missile program as prepared for this report.

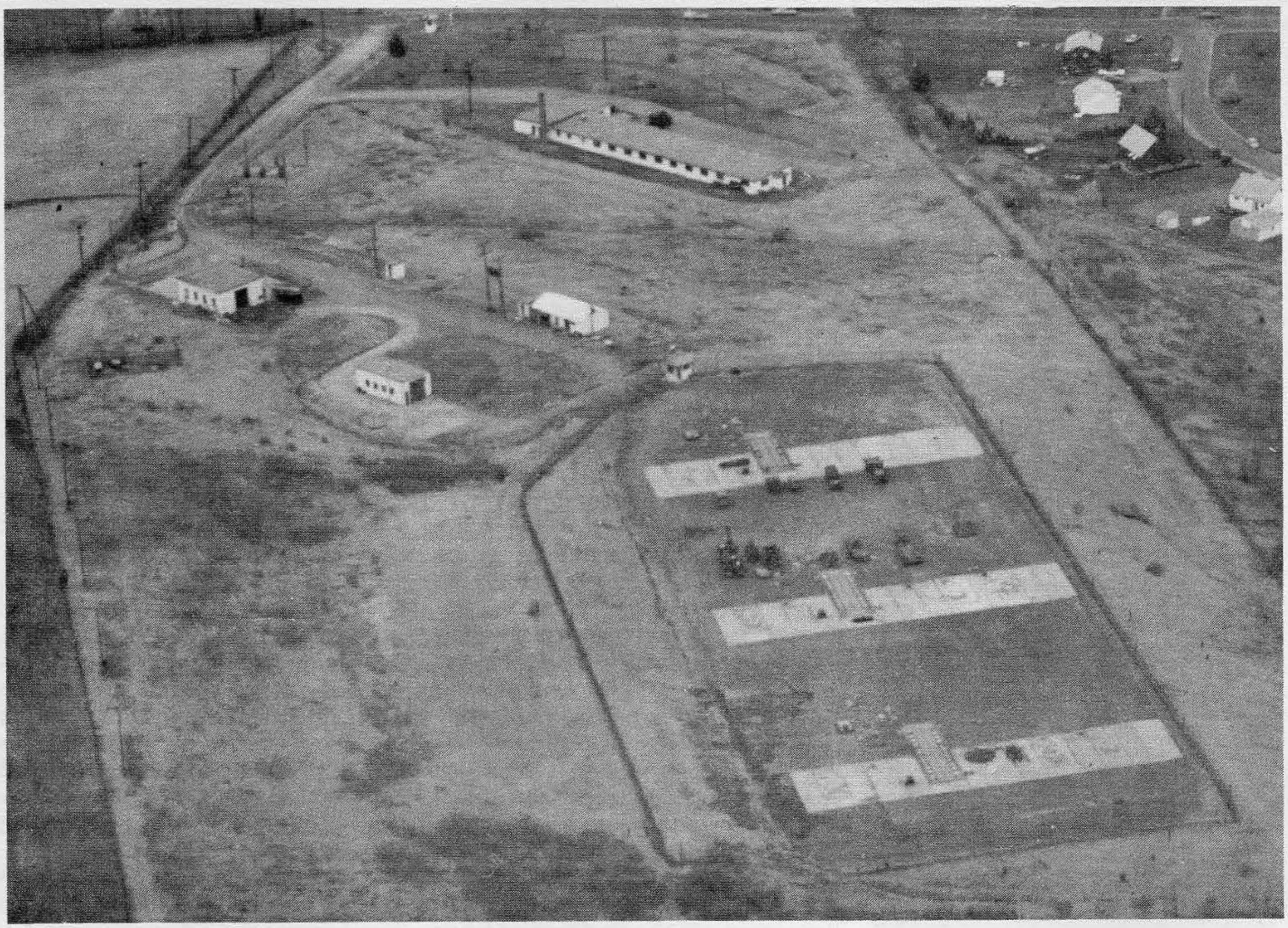
The Nike Missile System

The Middletown and East Windsor Nike launcher sites are components of the 1950s defensive system. This system was developed in response to heightened tensions and a perceived threat to national security during the Cold War years.

In the period following World War II, the Army's missile program encountered public disinterest, and severe financial problems. These plagued the program until 1950. With the onset of the Korean War, however, the military readiness of the US became a prime concern. The Secretary of Defense created the position of director of guided missiles to expand the program (Hatheway, et al. 1987:10). In 1953 the first prototype Nike battery was tested at the White Sands Proving Ground in New Mexico. By 1954 the first combat-ready Nike unit was in operation (Hatheway, et al. 1987:11).

The Army Corps of Engineers (New England Division) constructed 35 Nike-Ajax batteries that encircled the cities of Limestone, ME, Boston, MA, Providence, RI, Hartford, CT and Bridgeport, CT (Parkman 1978:151). The Middletown and the East Windsor Nike sites were part of the Hartford defense system. Both facilities were constructed in 1958 (Carol Borja, Fort Devens Real Property Office, personal communication 1988).

Each Nike site consisted of two areas: the control area and the launcher site. The control area consisted of a mess hall, administration building, barracks, a control van or building, all of cinder block construction, and three 20-foot radar towers (Stark 1986:37). This area was located on 6 to 8 acres of land and was manned by eight officers and 101 enlisted men. The launcher area was situated 1 to 4 miles away on about 42 acres of land. Fifteen acres contained the launcher site with the underground storage magazines, launchers, missile assembly buildings, and



Aerial photo of Middletown, CT, Nike Launcher Site taken January 26, 1973. The dog kennels and the structure opposite the garage are no longer present.

fallout shelter. The remainder of the property was enclosed as a surrounding safety zone (Parkman 1978:151).

The Nike-Ajax missile was a finned cylinder, 12 inches in diameter by 20 feet long, which was fired by a booster rocket. It could travel at supersonic speed and had a range of 25 miles (Hatheway, et al. 1987:15). Each battery had 12 launchers, divided into 3 magazines with four launchers each. Nine missiles could be fired at one time, and each battery had a storage capacity of 30 missiles (Stark 1986:35).

Each Nike battery could operate independently with its own acquisition and tracking radar, but battery capabilities were usually coordinated through a fire direction system known as "Missile Master." The Missile Master site for the Northeast (controlling Middletown and East Windsor) was located at Fort Heath in Winthrop, MA (Parkman 1978: 151-152).

By 1958 the Nike-Ajax was being replaced by the Nike-Hercules missile (Stark 1986:58). The Nike-Hercules was a larger missile with an improved guidance system and three times the range, which could carry a nuclear warhead. The Corps of Engineers, New England Division, converted 10 Nike-Ajax sites to accommodate the Nike-Hercules (Parkman 1978:153). It is unknown which of the sites in the New England area were enlarged for the new Hercules missiles. However, according to the facility manager, Mr. Mark Yatsco, the Middletown Nike battery was a Hercules launcher site.

The Nike system became obsolete in the mid-1960s after development of the intercontinental ballistic missile. The Nike system program at Middletown, Connecticut, was terminated in 1968, and by the same year the East Windsor site was no longer in use (Carol Borja, Fort Devens Real Property Office, personal communication 1988). In 1968 a national program was initiated to deactivate the remaining Nike sites, and most were deactivated by 1974 (Hatheway, et al. 1987:51).

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Kathleen A. Atwood
Waltham, MA

ARTICLE

Bunker Hill Quarry: The Loss of Another Archeological Treasure?

Bunker Hill Quarry, arguably the most historically significant quarry in Quincy, Massachusetts, is threatened by development. Plans have been filed for a 92-unit condominium, which, after considerable blasting, will replace the historic quarry.

The Bumker Hill Quarry represents the embodiment of 19th century American innovation and work ethic, and therefore deserves considerable national significance and prominence. The level of this historic property's significance is related to, or otherwise associated with, a number of "firsts" in industrial technology, and some of the country's greatest engineers and architects.

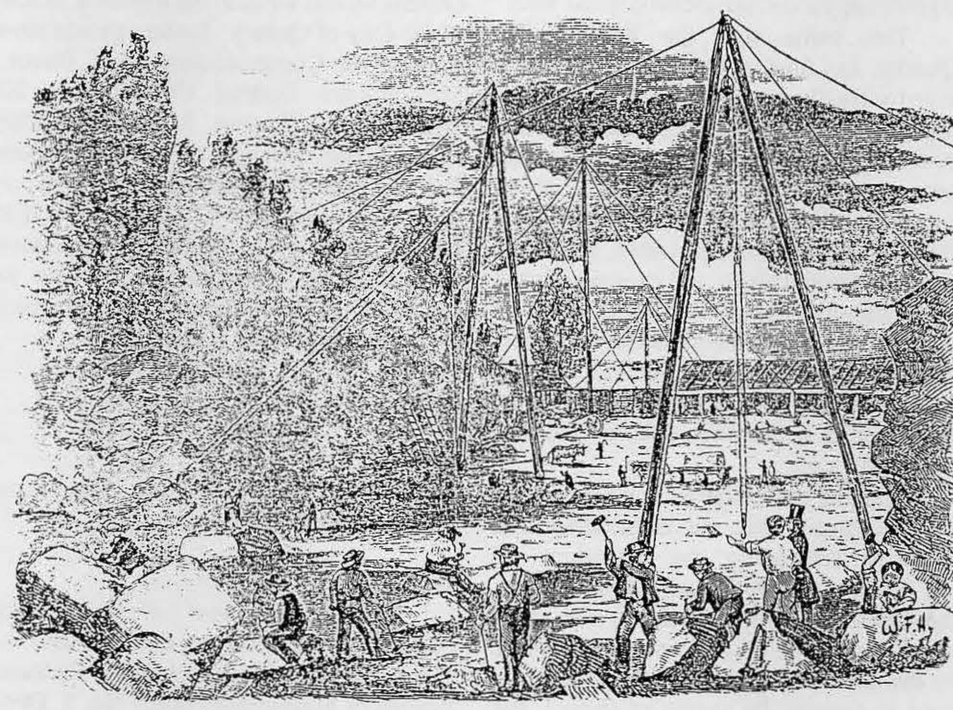
Although Laommi Baldwin, the nation's foremost civil engineer at the time, and builder of the Middlesex Canal, is credited with the obelisk design of the Bunker Hill Monument, it was Solomon Willard, in his capacity as chief architect and field supervisor, who was actually responsible for the structure's near perfect construction.

At the time of its conception in 1843 the Bunker Hill Monument was one of the world's architectural masterpieces, if not wonders. Although there were several structures which were taller, the construction of a slender, essentially hollow cylinder in the shape of an obelisk which stood 221 feet tall, was an unprecedented engineering feat in its day. The fact that even now over 140 years after its completion it stands only an inch or two off true plumb attests to the ingenuity and skill of its 19th-century builders.

As noted above, it is with Solomon Willard that much of this credit belongs, as he oversaw every aspect and phase of the construction. Charged with the construction of the monument, Willard first roamed the environs of Boston in 1825 looking for granite that would be worthy material for the monument that was to commemorate the Battle of Bunker Hill. In the rugged hills of West Quincy he found a granite unlike any known at the time; its fine granular quality and rich grayish hue was exactly what Willard had in mind for the obelisk. With the discovery of this granite source, Quincy's granite quarry industry began.

Willard has been described as a farmboy, carver and artisan. An accomplished carpenter, he apprenticed to Peter Banner, architect of the Park Street Church, where he undoubtedly first became familiar with the qualities of granite from Quincy. Willard also carved figureheads and went on to design a hot-air furnace for use in the White House and in the Nation's Capitol.

His plans were finalized and construction activities commenced. Willard moved out to the quarry where he supervised the opening of the Bunker Hill Quarry and took charge of the quarrymen there. Willard must have felt that his presence on site was needed to ensure the quality and precision of the dressed stone. Today, to run your hand over the smooth finish of the monument's surface, you have to be impressed and conclude that Willard's constant supervision paid off handsomely.



View of the granite quarries at Quincy, Massachusetts. (Gleason's Pictoral, January 21, 1852.)

Willard's enthusiasm, resourcefulness and penchant for detail was boundless, but he faced two related problems seemingly as insurmountable as the structure he was trying to build: both dealt with the movement and transportation of the granite. Willard had to resolve how to get the larger-than-normal granite blocks out of the quarry; then how to move them to the Charlestown construction site; and lastly, how to get these large blocks in place, particularly at the dizzying height of 221 feet above the ground.

Willard proved to be a shrewd judge of men as he enlisted the assistance of two other notable engineers/inventors to help him solve his engineering problems. For the projects, Gridley Bryant, a mason by trade, and a principal in the development of the Middlesex Canal, invented a funny-looking (at least by today's standards) wheeled contraption that traveled on a set course of rails. In 1826, with eight-ton blocks appearing to be slung under its frame, the Granite Railway began to trundle its load from the bottom of a long wooden chute which extended from the heights of the quarry, to the Neponset River, and on to Charlestown. This was the precursor of the modern railroad. By 1835, 111 miles of track went out to Lowell, Worcester and Providence. The age of the railroad had begun.

In 1824, several years before construction of the monument began, Almoran Holmes, a local seaman, received the first American patent for a hoisting apparatus. Willard gave Holmes the first contract for hoisting the dressed granite blocks from the ground to the rising heights of the monument. By adapting an age-old maritime technique used for loading and off-loading cargo from the hold of a ship, Almoran Holmes revolutionized the construction industry. Previously, building heights and the size of stone blocks were largely dictated by the strength of oxen in conjunction with various combinations of block and tackle. Further adapting this new apparatus for use at the quarry site itself, where it was used to extract and move blocks of granite to staging, and hewing and dressing work areas, and then to the Granite Railway, also revolutionized the quarrying industry.

These technological innovations also heralded the dawn of a new look for the City of Boston. Monolithic blocks of granite became the standard for public buildings. Much of downtown Boston and the great mercantile warehouses along the wharves were transformed into granite showplaces. Even military engineers appreciated the quality of Quincy granite, and Fort Independence at Castle Island, and Fort Warren on Georges Island, integral parts of Boston's 19th-century harbor defense system, were largely constructed of this material.

Thus the Bunker Hill Quarry (through such historical personages as Solomon Willard, Gridley Bryant and Almoran Holmes) is related to the fluorescence of the modern granite industry, as well as that of the City of Quincy, to changes in architecture, and the origins of the modern railroad and construction derrick. Seldom can a single operation lay claim to such associations and distinctions. Seldom has there been a single historic site where so many important innovations coalesced — seemingly feeding on one another — which were to have such an effect on the entire fabric of society. Surely, the Bunker Hill Quarry represents one of the region's most significant industrial archeological sites.

This same site, the Bunker Hill Quarry, has until now miraculously survived virtually intact. Among the surviving archeological features, besides the deep scars in the bedrock where the granite has been removed, are the level terraces which served as platforms for the descendants of the Holmes Hoisting Apparatus, a maze of raised roads and trails, and enormous groat piles. Fan-like deposits of chipping debris and detritus betray the locations of former stone-cutting areas where Willard's skilled stone masons and artisans dressed the granite with a precision seldom matched before or since.

Amateur archeologist Dick Muzzerole, who is responsible for excavating and partially rebuilding the Terminus of the Granite Railroad, which lies below the eastern edge of the quarry, also identified a number of features which relate to the former wooden chute which was used to convey, by means of sliding, the granite from the heights of the quarry down to the railway. Near the top of the chute are associated derrick platforms.

In, over, and around the ledges and through the many depressions that make up the quarry, long rows of drill holes are easily visible. Of particular interest are partially dressed curved stone blocks which were meant for the newel, or inner cone, of the Bunker Hill Monument.

Below the southwestern rim of the quarry, the faint hint of several stone building foundations suggests the existence of office/staging area.

All of these features and more have survived the ravages of time. The archeological remains of the Bunker Hill Quarry document nearly every step and phase of the 19th-century quarrying and stone working industries. It is a veritable laboratory for the student of technology and industrial innovation.

The Bunker Hill Quarry, however, may not survive another year, as it is threatened by the construction of condominiums; and six new private homes, built in the woods leading to the condominiums, will further destroy an old hauling and access road into the quarry.

Archeological colleagues, students of technology, historians, and interested citizens should write to the Planning Board of the City of Quincy. Letters should also be sent to Commissioner Ilyas Bhatti, Metropolitan District Commission, 20 Somerset St., Boston, MA 02108. The MDC already manages the nearby Granite Railway Quarry and should be urged to acquire this property. The Bunker Hill Quarry should be preserved for future generations to enjoy and to be able to marvel at the craftsmanship and ingenuity of our 19th-century ancestors.

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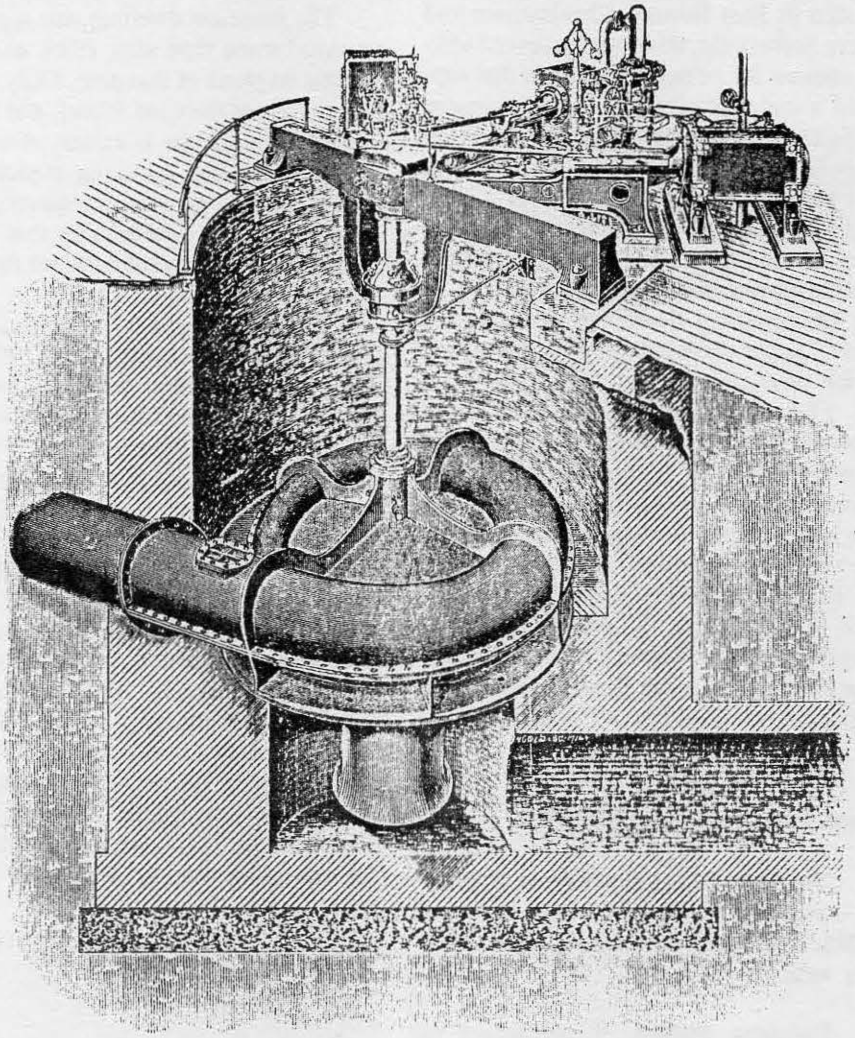
[Note: This article is only a preliminary discussion of the Bunker Hill Quarry, and much archival research and field work is needed to document fully the site's features and historic significance.]

Thomas F. Mahlstedt
Chief Archeologist
Metropolitan District Commission

ARTICLE

Evaluation of the Engineering Features at the Deer Island Sewerage Works — 1894-1909, Boston, Suffolk County, Massachusetts



CENTRIFUGAL PUMP.
"BOSTON TYPE."

Centrifugal pump, "Boston Type." Source: E.P. Allis Catalogue, c1898.

Preface

An historic survey report prepared by Boston Affiliates in October of 1985 considered the general historic significance of various facilities located on Deer Island, among them the pumping station located on the southwest side of the island. The purpose of this report is to evaluate the historic significance of the engineering features of the sewerage works constructed on Deer Island, and to make recommendations concerning the appropriate treatment of the historic resources.

Overview of the Metropolitan Sewerage System

Background of the Regional Sewerage System

The general plan of a Boston-area system was proposed by a commission convened in 1875, whose members were E.S. Chesborough, Moses Lane and Dr. Charles F. Folsom. The "Chesborough Commission" (named after its most eminent member, a civil engineer involved in the design of the Boston water system in previous decades) produced recommendations which initially resulted in the design of the Boston Main Drainage. The Boston system commenced construction in 1877 with an end point on Moon Island and was designed with the intent of releasing accumulated sewage at periods of receding tide.

The Metropolitan District Sewerage Commission

The Board of Metropolitan Sewerage Commissioners was organized in 1889 by an act of the Massachusetts Legislature for the purpose of directing the design and construction of a metropolitan sewerage system to serve towns to the west and north of Boston. The Metropolitan System comprised two separate systems. The Charles River system connected portions of western Boston, Brookline, Newton, Waltham and Watertown to the Boston Main Drainage. The North Metropolitan system linked 14 communities north and west of Boston proper, from Winthrop and East Boston to Winchester and Woburn. Pumping facilities related to the North Metropolitan Sewerage System were located in East Boston, Charlestown and North Somerville, all of which served low-lift stations for principal branches that supplied a main gravity line that terminated at the Deer Island Sewerage Works. At the Deer Island facility, sewerage was pumped continuously into the harbor via a submerged conduit whose outlet was near the Deer Island Light. The North Metropolitan system represented approximately 85% of the Metropolitan Sewerage system's capacity, based upon total population served at the time of its design.

The Commissioners appointed Howard A. Carson as Chief Engineer in October, 1889, in charge of directing the survey and design construction of the entire Metropolitan Sewerage System during the years that followed. By 1895 William M. Brown, Jr. had succeeded Mr. Carson, who left to assume the position of Chief Engineer for the Boston Transit Commission at a time when the street railways were being consolidated into a single company.

Deer Island Sewerage Works

The Deer Island facilities were initially completed during the years 1894 and 1895. The facilities included the following structures:

Pumping Station — containing an engine room, boiler room with economizer and a 125' high stack, coal house and screening house,

Coal Wharf — connecting to the coal house section of the pumping station by a coal-run more than 400 feet in length,

Trestle with intake and discharge pipe — for seawater to serve as cooling water for the low pressure piston of each steam engine,

Residence — containing four units and located about 150 feet south of the pumping station,

Masonry outlet conduit connection to a submerged wooden conduit terminating at Deer Island Light.

The tenement dwelling was apparently removed some time after 1939, as it is indicated on plans of that date. Only the pilings remain of the Coal Wharf, and no portion of the coal run is extant. A coal car remains near the pumping station, suggesting that coal was transferred by a system of small shuttle cars that moved over narrow-gauge rails between the wharf and coal house.

An overall layout of the facilities is illustrated in the accompanying 1908 plan. The pumping station buildings were designed by Boston architect Arthur F. Grey; the general contractors were Gooch & Pray, also of Boston; the contractor for the pumping plant was the Edward P. Allis Company of Milwaukee, Wisconsin.

A building south of the residence, and identified as the "farmhouse" in the previous Boston Affiliates report, was constructed approximately 1,000 feet south of the pumping station. The structure is a two-story, double-wing building that may have served as a residence as well as had administration functions. Its design suggests it was constructed during the same period as the two construction phases of the pumping station discussed in this article.

Pumping Station

The building segments comprising the pumping station were constructed with a granite foundation, brick walls and hipped slate roofs with terra-cotta coping along roof ridges and gables. Interior floors were brick pavers or terra-cotta tiles in the engine rooms and concrete in the remaining areas of the pumping station. The different segments could be considered as having three functional components — screening room, coal house and boiler room, and engine room. The original engine room (100' x 31.5') and boiler room (65' x 35') were completed in 1894, followed by the latter part of 1895.

The operation of the pumping station involved first passing the incoming sewerage from the gravity sewer conduit through a screening apparatus to remove large debris and insoluble organic matter. After screening, the sewerage passed to the centrifugal pumps where it was lifted an average of 12 feet to the discharge channel and out into the harbor through a specially constructed wood-stave conduit submerged for a length of 1,925 feet from the end of Deer Island to a point opposite Deer Island Light.

Left: two-story screen house (1895) and right: south elevation of coal house (1895). (J. Howry photo)

Screen Machinery

The screening apparatus comprised two separate but similar pieces of equipment that contain a series of vertical screens of steel bars suspended above the incoming sewer conduit by a chain-driven hoisting system powered by small steam engines. The two-story structure on the northwest corner of the present pumping station was the original Screen House completed in 1895. With the expansion of the station in 1909, an additional screening apparatus was added behind the original building as part of the coal house addition.

Pumps and Steam Engines

The original configuration in the engine room of the pumping station allowed for three centrifugal pumps with impellers 8.25 feet in diameter, each driven by a horizontal, triple-expansion steam engine of the Reynolds-Corliss type. The engine and pump combination was a specially manufactured design of the Edward P. Allis Company, Milwaukee, WI, intended to pump high volumes of sewerage with a relatively low lift. At the Deer Island facility each of the pumps was rated at 45 million gallons a day with an average lift of 12 feet. Records for the period of 1898-1899 indicate that during the times of high rainfall, daily pumping exceeded 86 million gallons (Eleventh Annual Report, p.21). The original Reynolds-Corliss engines incorporated three cylinders with diameters of 13.5", 24" and 34" set at 60 degree angles in order to provide uniform rotation to the pump crank shaft. The design allowed steam to pass from the first cylinder to the second, and finally on to the third. As the steam passed to successively larger cylinders, it expanded, thereby providing additional energy at each step before being removed from the engine.

The two initial engines and pumps installed in the plant were operational by 1896, and in regular service by 1897. In May, 1900, a third engine and pump, identical to the the two original engines and pumps, was placed in service. The profile plan of the pump and engine in the accompanying figure is taken from the E.P. Allis Company catalog, c1898, and illustrates the arrangement of the two components in a pump pit, as is found at the Deer Island facility. During that same year, an additional pump pit was excavated at the south end of the original engine room in order to allow for the addition of a fourth engine and pump. Dimensions published for the fourth pump excavation indicate that the pit is at least two feet larger than that of the earlier pumps. During the period of 1909-1910 a two-story brick addition was completed at the southeast end of the engine room and a 100 million gallon-a-day pump was installed by the Allis-Chalmers Company with an engine of the same triple expansion type but of larger dimensions than those previously installed (note: documentation for the later building additions is less detailed than that of the initial construction; specific dimensions were not published in the reports describing the pumping station expansion). Additions were also made to the screening machinery, boilers and coal house (see below).

The installation of diesel engines in the 1950s resulted in the removal of the three original steam engines. However, the original centrifugal pumps likely remain in the pump pits. Only the block of a single diesel engine remains at the middle of the three original pumps. The fourth steam engine and pump, the original Reynolds-Corliss equipment installed in 1909 by the Allis-Chalmers Company, remains over the centrifugal pump in the southeast addition to the engine room.

Left: south elevation of original engine house (1895) and right: two story addition (1909). (J. Howry photo)

Boilers and Economizer

The boiler house has three pairs of boilers, two pairs of which were installed when the facility was initially constructed in 1895. All are of the horizontal return-tubular type and are attached to a Green fuel economizer. The initial two pairs of boilers were supplied by Edward Kendall & Sons, of Cambridge, Massachusetts. The economizer was provided by the Fuel Economizer Company of Matteawan, New York. (An economizer is a heat recovery device that allows for the capture of waste heat in the boiler flue that is used to preheat water entering the boilers for the production of steam.) The original boilers installed in 1895 were supplemented by a larger pair of boilers that were added in the expansion of 1909.

Coal House

The original coal house was designed with large-dimension wooden timber framing that supported and reinforced concrete walls. As part of expanding the facility's capacity in 1909, a rear addition was made to the coal house that exceeded the storage capacity of the original coal house. The addition also provided for the construction of a second screen room adjacent to the original screen house.

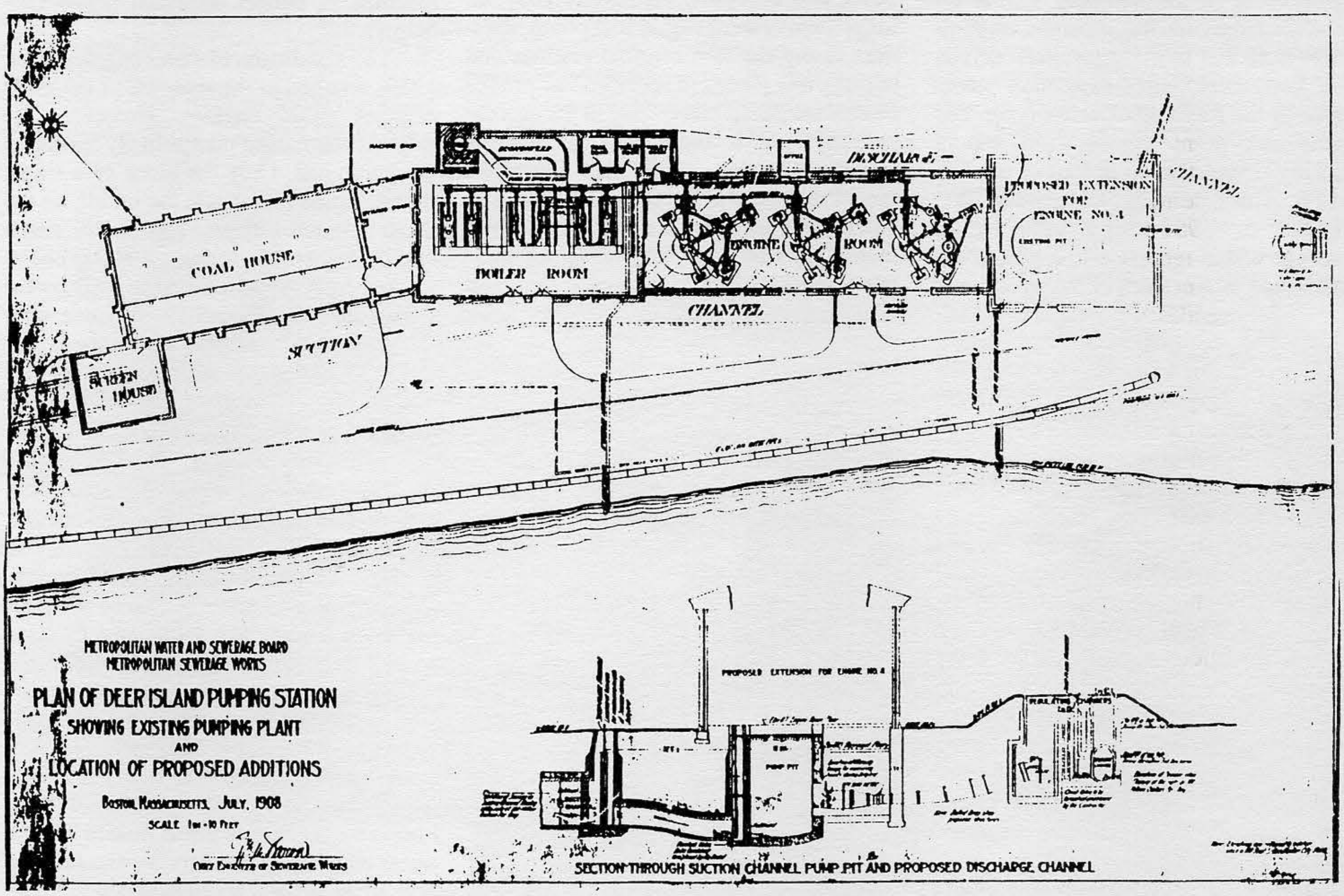
Related Features

There are three engineering structures apart from the pumping station buildings which are important components of the Deer Island Sewerage Works: the outflow conduit, the coal wharf and the seawater intake and discharge pipe.

The original coal wharf with trestle constructed for the pumping station extended 407 feet southwesterly from a point in front of the screen house. At the screen house the trestle curved toward the building, making a 90-degree turn into the side of the coal house. Limited available evidence suggests that small coal cars running along narrow gauge rails on the trestle transported coal from barges or other supply vessels to the coal house.

The outlet conduit south of the pumping station was constructed by the cofferdam method until reaching deep water where the conduit was extended by specially constructed sections of wooden pipe of reinforced oak hoops lined with Portland cement. The pipe sections were 52 feet long, 6 feet 3 inches in diameter, and weighed up to 210,000 pounds. After their construction on land, each section was towed out to its proper location. A specially constructed floating cradle was designed which lowered the sections into a dredged trench after each section was partially flooded. Sections were then connected under water by divers. The total length of the outlet conduit was 1,925 feet, extending from a point approximately 60 feet inside the high water line to a point opposite the Deer Island Light.

A pair of sea water intake and discharge pipes of cast iron enclosed and supported by a wooden trestle were constructed perpendicular to the boiler house. The trestle extended several hundred feet



Plan of Deer Island Pumping Station showing existing pumping plant and location of proposed additions. July, 1908. Scale of this reproduction is undetermined.

from the shore, and included a sea water well at approximately the mid-point of its overall length.

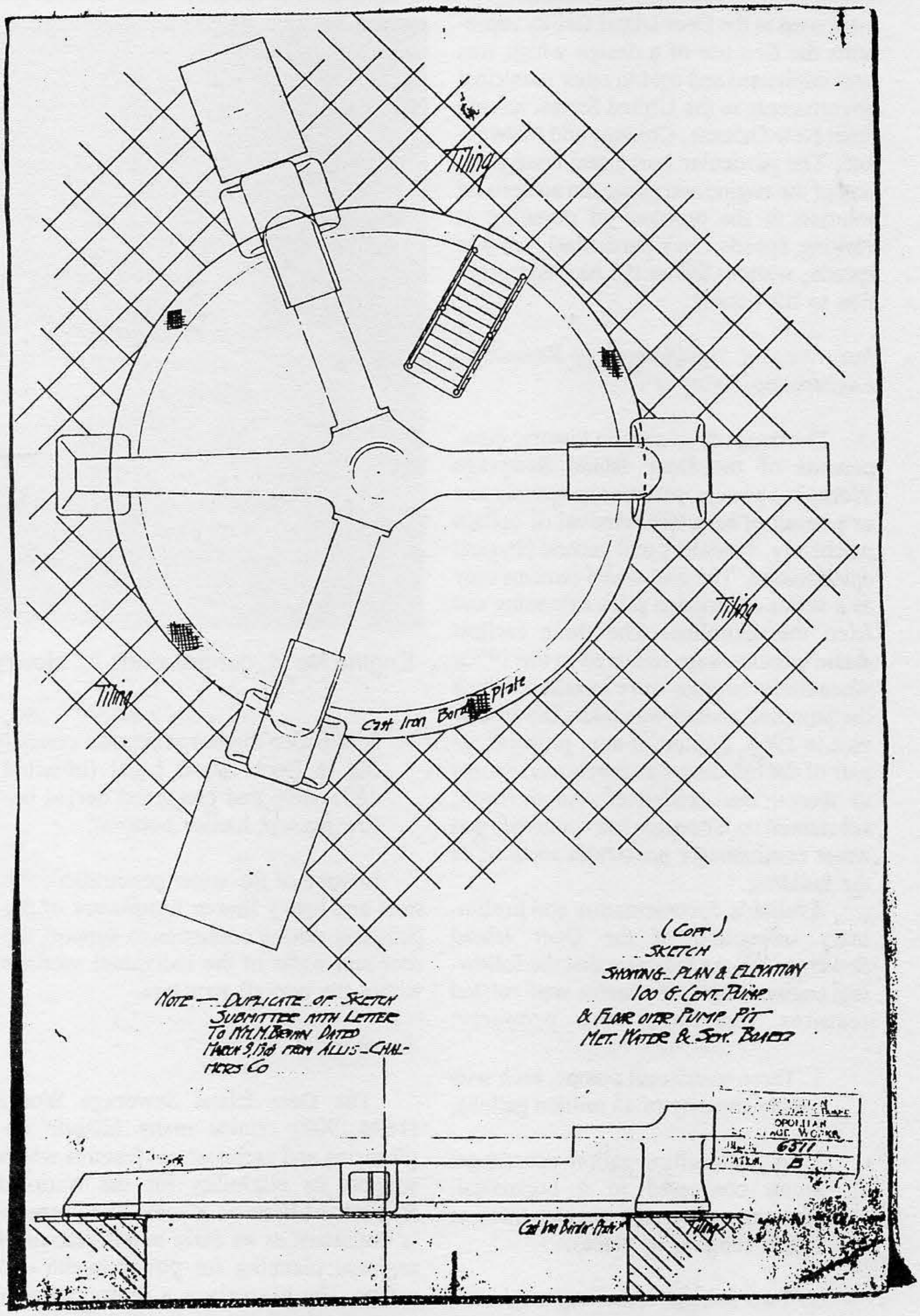
Significance and Integrity of the Engineering Features and Related Features of the Deer Island Sewerage Works

General Significance

The Metropolitan Sewerage District was a concept developed in part by E.S. Chesborough, a distinguished American civil engineer of the nineteenth century and an important contributor to the design of the Boston metropolitan water supply system. The Metropolitan Sewerage System is among the engineer's later contributions to the Boston area.

The Boston area, at the invitation of the State Board of Health, became the first urban area in the United States to develop an extensive system of intercepting sewers connecting adjacent municipalities in order to manage collectively sewerage disposal and also to provide an interconnected water supply (Stott 1984). The Deer Island Sewerage Works represents one of the few remaining late nineteenth and early twentieth century facilities of its kind which preserves both historically important engineering features and distinctive architecture. The property is most significant for its engineering features which demonstrate a system of handling large quantities of sewage as part of managing a major urban public health issue. The specialized machinery present represents a combination of components that demonstrate technology important to the urban development of many American cities, and particularly so because of the wider use of the technology first used in the Boston system and applied to other urban sewerage systems.

The pumps and engines were developed and installed by the Edward P. Allis Company, a nationally-recognized machinery manufacturer during the nineteenth century. The company's chief engineer and designer of equipment, Edwin Reynolds, was among the most distinguished mechanical engineers of large steam machinery prior to the introduction of the steam turbine. The particular equip-



Plan and elevation of Engine No. 4. March 1909. Scale of this reproduction is undetermined.

ment used at the Deer Island facility represents the first use of a design which was later duplicated and sold to other municipal governments in the United States, among them New Orleans, Chicago and Milwaukee. The particular horizontal configuration of the engine and pump are an unusual solution to the problem of pumping at varying speeds, and particularly slower speeds, without losing the necessary suction to lift liquids.

Integrity and Significance of Remaining Engineering Features

The integrity of certain historic components of the Deer Island Sewerage Works has been jeopardized or entirely lost as a result of selective removal of certain machinery, vandalism and general physical deterioration. The coal wharf remains only as a series of wooden piles extending out from the shoreline. The three earliest steam engines were removed in the 1950s when diesel engines were installed. When the pumping station was taken out of service in 1968, limited, if any, physical repair of the building was performed except to discourage vandalism. As a result, substantial roof damage has occurred, and water continuously penetrates sections of the building.

Available documentation and preliminary inspection of the Deer Island Sewerage Works indicates that the following engineering components and related features remain at the property:

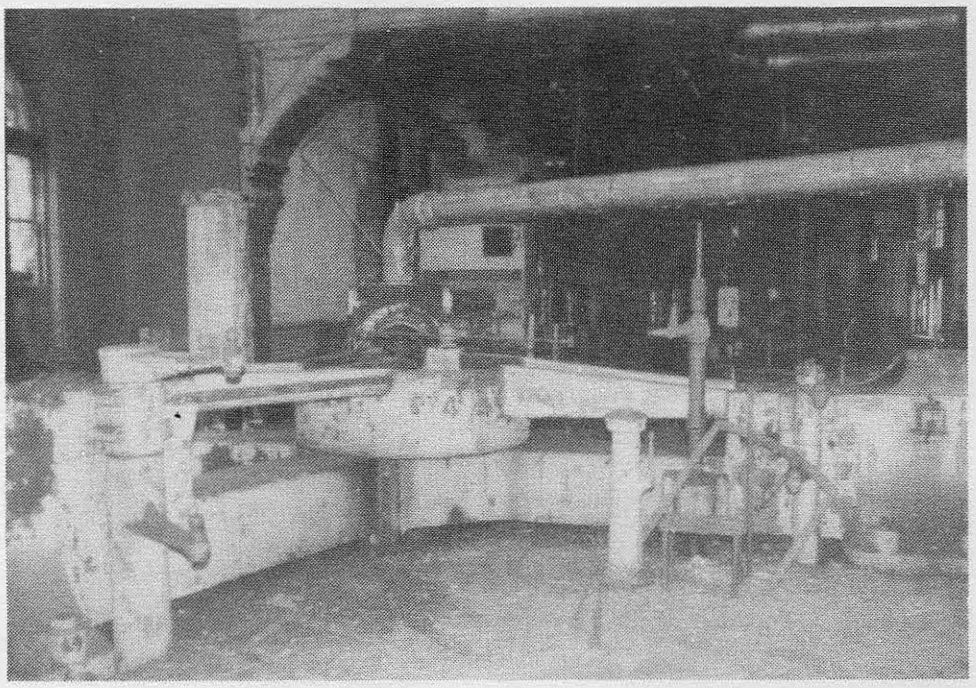
1. Three centrifugal pumps, each with a daily capacity of 45 million gallons,

2. A 100-million-gallon centrifugal pump connected to a horizontal, triple-expansion steam engine (most of which remains in place),

3. Two sewage screening machines, with many gears and small steam engines used to operate the lifting apparatus removed,

4. Boilers, economizer and 125-foot stack,

5. Sea water intake and discharge trestle with pipe,



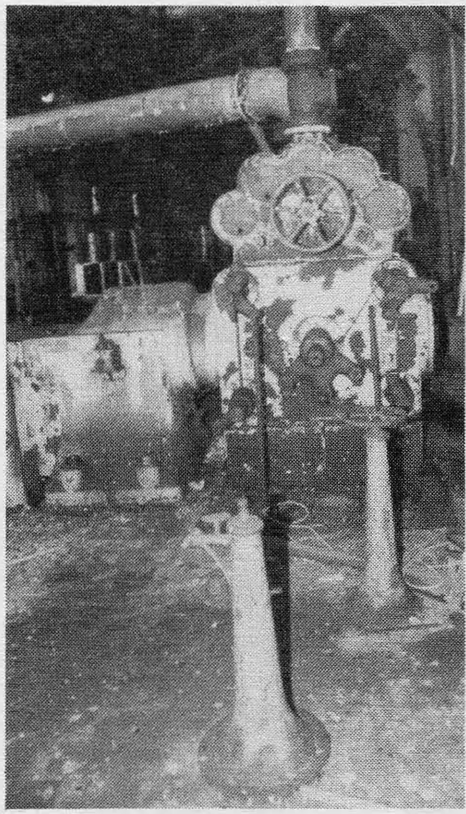
Engine No. 4, central shaft. (J. Howry photo)

6. Wooden discharge conduit extending to Deer Island Light (installed 1895-1896 and presumed buried below present harbor bottom).

In spite of the water penetration, the steel and heavy timber framework of the pumping station continues to support the roof and walls of the individual sections within the overall structure.

Summary

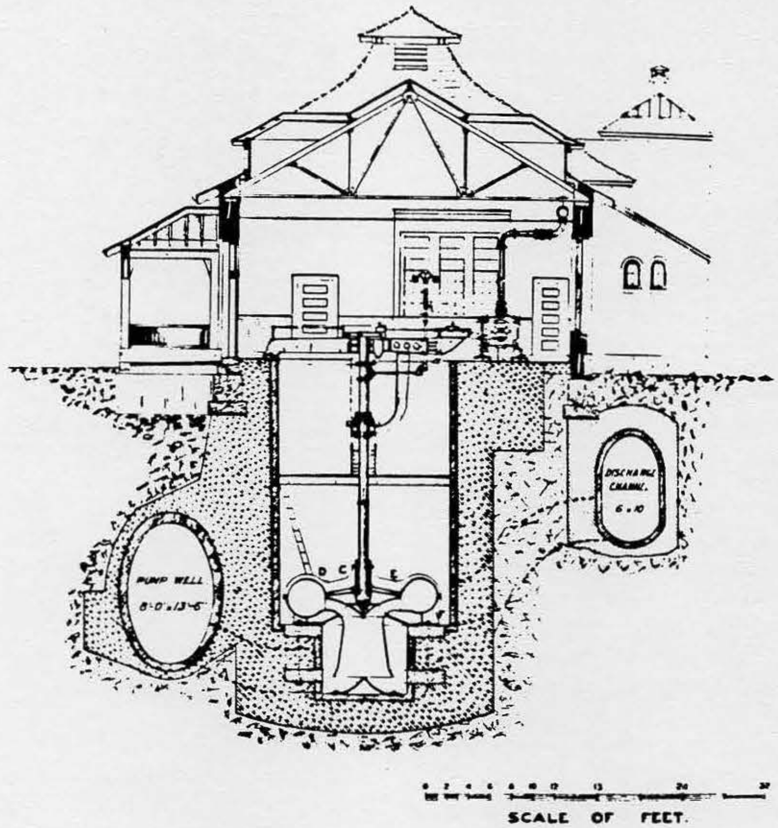
The Deer Island Sewerage Works (1894-1909) retains many historic engineering and architectural features which support its eligibility for the National Register of Historic Places. The property is important as an early manifestation of regional planning for public health and safety. The property is a central component of a larger system which was conceived and designed by individuals of national and regional importance. The property retains components of exceptional value to the history of mechanical engineering and, particularly, the application of steam technology to hydraulic engineering. The existing 100 million gallon-a-day centrifugal pump is possibly



Engine No. 4. High pressure piston and pump valve controls (foreground). (J. Howry photo) the largest of its type ever manufactured and is the only remaining example of its size in the U.S. (the two similar engines and pumps at the East Boston Pumping Station are rated at 45 million gallons a day).

Recommendations

The historic significance of the Deer Island Sewerage Works (1894-1909) in large measure is a result of its possessing many of the related components that are integral to a historic site of its type. The design of the pumping station principally reflects the functional needs of the equipment intended to serve a special use, namely, for pumping sewerage. The special qualities of the historic pumping station and related facilities warrant their preservation in place as the preferred method of treating the resource. If the components of the sewerage works and its principal building cannot be preserved in place, relocation of its principal engineering components should be undertaken. The special examples of technology represented by the pumping engine, centrifugal pumps, screening machinery and associated technology represent historically significant examples worthy of preservation and restoration.



Section through pump, Deer Island Station. Source: Annual Report for 1897, Metropolitan Sewer Commission.

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