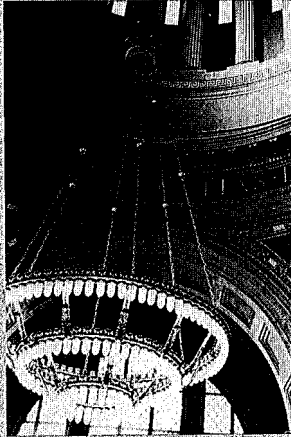
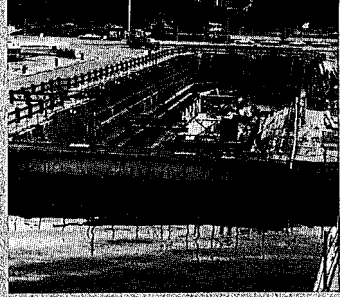


BOSTON SOCIETY OF CIVIL ENGINEERS SECTION

# *Civil Engineering Landmarks of New England*

AMERICAN SOCIETY OF CIVIL ENGINEERS



*Farmington River Bridge  
Windsor, Conn.*

*Dry Dock Number One,  
Charlestown, Mass.*

*State House Dome,  
Providence, R.I.*



*Some of the outstanding early civil engineering landmarks in New England are described in the following pages. These projects were selected by members of the New England Council ASCE. Following the descriptions is a list of Transportation Firsts which reflect the primary role played by the Boston region in the nation's transportation growth.*

**SEWALL'S BRIDGE** over the York River in York, Maine. Built in 1761 by Major Samuel Sewall, it was America's first pile trestle structure designed for general highway traffic. It was rebuilt in 1932 on the original design.

**MIDDLESEX CANAL** between Boston and Lowell, Massachusetts. This was the pioneer project that ushered in the canal era of American transportation in the early 1800s. With locks, stream crossings, reservoirs and varied conditions to deal with, Loammi Baldwin here established engineering practices that became standard for many other canals that followed.

**THE ALLENDALE MILLS** are located on the Woonasquacket River in North Providence, Rhode Island. The original mill building is a four story stone rubble structure built in 1822 by Zachariah Allen. The dam raceways are dry stone masonry. The building is one of the earliest applications of heavy timber set in mortar to increase fire resistance. Here was pioneered the use of power looms for manufacturing broadcloth, and the use of a rolling process to produce a gloss finish.

**GRANITE RAILWAY** in Quincy, Massachusetts. This was the country's first railway to be incorporated and operated as a transportation business, in this case, to move Quincy granite from quarry to waterfront. Built in 1826, the operating flexibility required for a common carrier resulted in innovations that are still part of railroad practice. Gridley Bryant was the engineer.

**CUMBERLAND AND OXFORD CANAL** in Maine, from Portland to Sebago Lake. The canal was about 20 miles long and had a rise of 265 feet, 27 locks, and a crossing over a small stream on a wooden aqueduct 100 feet long. It operated from 1830 to 1870. The designer was Holmes Hutchinson, engineer also for the Erie Canal.

**PENOBSCOT BOOM** on the Penobscot River in Maine. For about 100 years this vast complex of booms and crib-work piers along the river played a key role in the prosperity of the area's lumbering industry. In 1835 the boom received and rafted over 82 million board feet of river-floated logs.

**CANTON RAILROAD VIADUCT** in Canton, Massachusetts. Completed in 1834, the viaduct is still used by main line trains (Boston-Providence-New York). It is one of the earliest surviving multi-arch stone railroad bridges in the country, and is 615 feet in length. The engineers were Whistler and McNeill.

**DRY DOCK NO. 1, BOSTON NAVAL SHIPYARD** in the Charlestown section of Boston, Massachusetts. Completed in 1834 along with Dry Dock No. 1 at Norfolk, Virginia, they were the pioneer dry docks in this country and had a great influence on our naval history. Loammi Baldwin Jr. was the engineer. The Charlestown dock is now part of the Boston National Historical Park.

**TUNNEL at Lisbon, Connecticut.** America's first true railroad tunnel, it was built in 1835-1837 by James Laurie as Chief Engineer for construction of the Norwich and Worcester Railroad. It carried the railroad line through a hill of solid rock.

*BABB'S BRIDGE, Gorham and Windham, Maine. Built in 1840 at a cost of \$318, it is the oldest covered bridge in Maine. A queenpost truss structure, it still carries highway traffic.*

*MASSACHUSETTS BASE LINE from Hatfield to South Deerfield, Massachusetts. This was the base line for a geodetic survey of Massachusetts authorized in 1830 and completed in 1841. It was the first such survey in any state. The base line measurement was accomplished by Simeon Borden using surveying equipment of his invention.*

*LEWISTON MILLS CANAL in Lewiston, Maine. The canal system, 1.9 miles long, includes an upper and a lower canal and three cross canals. The design was so advanced that the canal is still being used in much the same way as it was when completed in 1850. The engineer was B. F. Perham.*

*MINOT'S LEDGE LIGHTHOUSE off Cohasset, Massachusetts. Built in 1855 to 1860 on a wave-swept ledge, it has withstood the severest of weather and sea conditions for 118 years. For design and construction it ranks as one of the world's foremost lighthouses and has greatly influenced the design of those that followed.*

*HOOSAC TUNNEL in North Adams, Massachusetts. Built between 1855 and 1876, the  $4\frac{3}{4}$  mile long railroad tunnel presented unusual construction obstacles requiring the pioneering use of a number of tunnel construction practices that have continued as standard. Canadian as well as American engineers were involved in this project.*

*WIRE BRIDGE, New Portland, Maine. A wire cable suspension bridge with a span of 187 feet 6 inches, it opened in 1866. The 3-inch diameter cables were imported from England. It is believed to be the oldest suspension bridge of its type that is still in service.*

*LAWRENCE EXPERIMENT STATION in Lawrence, Massachusetts. Starting in 1886, research conducted at this station had led to pioneering developments in water and sewage treatment with resulting contributions to public health.*

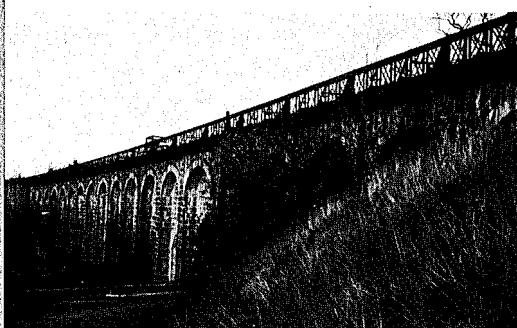
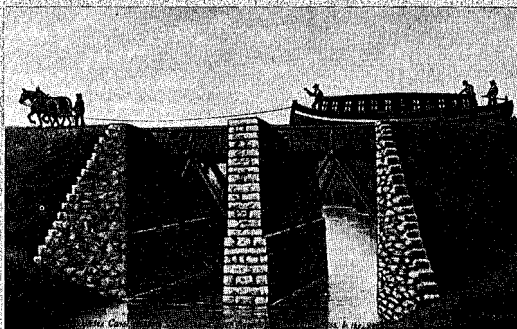
*WINDSOR, VERMONT - CORNISH, NEW HAMPSHIRE. Built in 1866 across the Connecticut River, this is the longest existing covered bridge in the U.S.; 2 spans, 460 ft., town lattice truss. This is the fourth bridge on the site. The first was built in 1796 (probably uncovered) and was destroyed by a flood in 1824. The present bridge was built by James Tasker and Bela Fletcher.*

*FARMINGTON RIVER BRIDGE at Windsor, Connecticut. As Chief Engineer of the New Haven, Hartford and Springfield Railroad, James Laurie replaced many of the line's early wooden bridges. This handsome stone bridge was built in 1867 and is still in use.*

*MOUNT WASHINGTON COG RAILWAY, in the White Mountain National Forest, New Hampshire. Rising 6,288 feet above sea level, the first trip on the world's first cog railway reached the summit of Mount Washington on July 3, 1869. The railway, still in service, has an average gradient of 25 percent, the steepest portion being the 37.4 percent at Jacob's Ladder. The railway founder was a civil-mechanical engineer, Sylvester Marsh.*



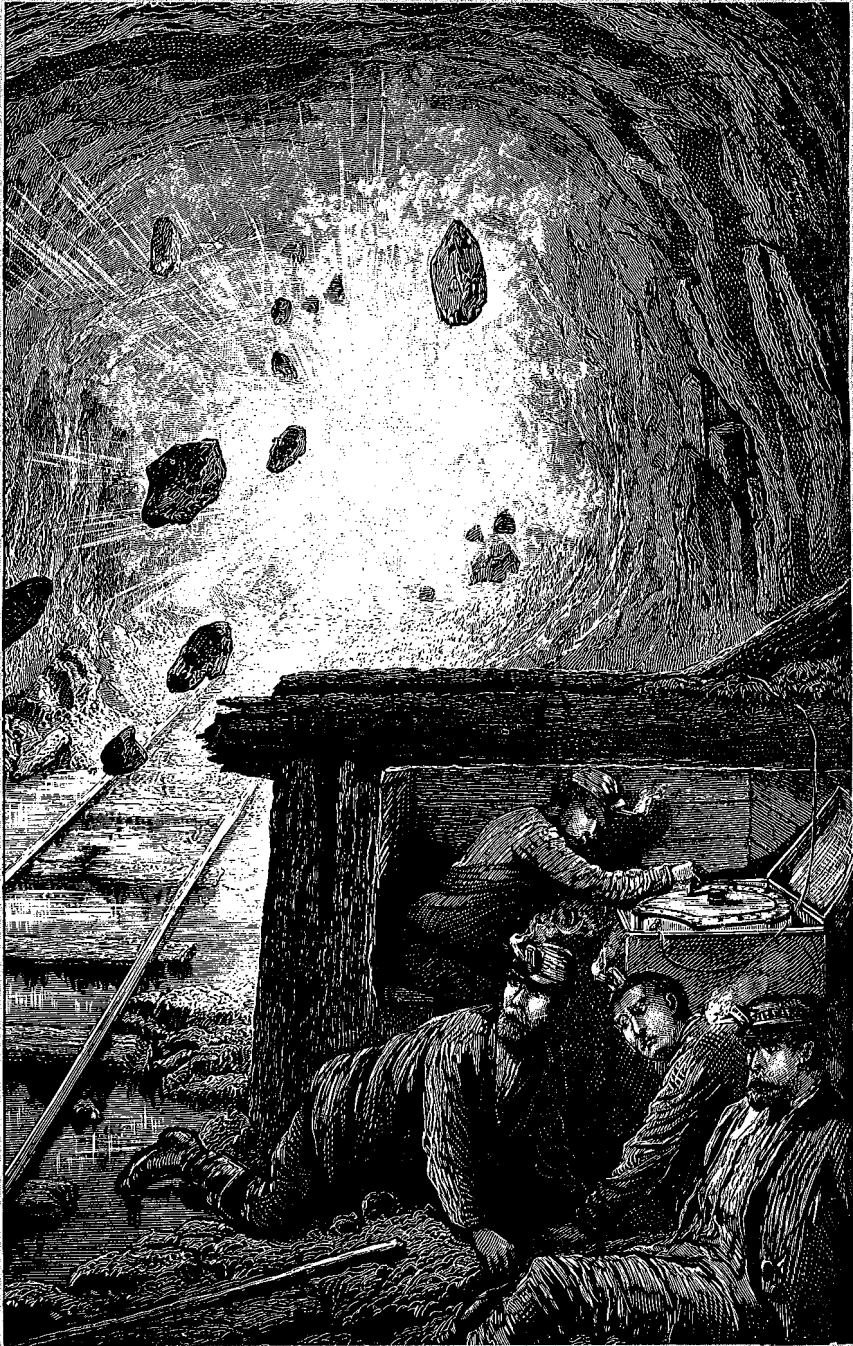
*Gridley Bryant, father of the country's first railway.*



*Middlesex Canal, between Boston and Lowell, Mass.  
Canton Railroad Viaduct, Canton, Mass.*



*Mount Washington Cog Railway, New Hampshire*



*Hoosac Tunnel, North Adams, Mass.*

**SANDY RIVER AND RANGELEY LAKES RAILROAD** in Maine, built in 1870. Connecting with the standard gauge railroad system at Farmington, the 24-inch gauge line served a vast wooded area. Extending over 100 miles, it was America's longest line with that gauge. Thomas Appleton was the engineer.

**SMELT HILL HYDROELECTRIC STATION**, Falmouth, Maine. The dam was built in 1890, and the station and the transmission line to Cumberland were completed in 1896. There were four 225-kw, 1100-volt ac generators. The transmission line is believed to have been the first high voltage line in New England. The station operated until 1947.

**BOSTON SUBWAY** in Tremont Street, Boston, Massachusetts. This was the first subway in North America; it opened for service in 1897. A key element in a complex transportation system, its success spurred the development of other urban subways in this country.

**RHODE ISLAND STATE HOUSE DOME** in Providence. The self-supporting marble dome rises 235 feet above the foundation. It is exceeded in size only by the dome of St. Peter's Basilica in Rome. The capitol building was constructed between 1895 and 1904; McKim, Mead & White were the architects.

**HARVARD STADIUM** in the Brighton section of Boston. This was the first massive structure to be constructed of reinforced concrete. Built in 1903, it is today the country's oldest football stadium. Many concrete construction engineering practices were pioneered here and are reflected in many stadiums that followed.



*AZISCOHOS DAM in Lincoln Plantation, Oxford County, Maine. This control dam on the Androscoggin River system was completed in 1911. It is one of the earliest dams with horizontal reinforced concrete arches between piers. Sawyer and Moulton were the engineers.*

*BAILEY'S ISLAND BRIDGE between Bailey's Island and Orr's Island in Harpswell, Maine. Except for the navigation channel span, the bridge is constructed of dry split stone laid in open crib fashion to provide for flow of tidewater. It is believed to be the only bridge of this type in the world adapted to highway traffic. It was built in 1926 to 1928 to the design of L. N. Edwards.*

*THE QUONSET HUT. The first Quonset hut was fabricated at Davisville, Rhode Island, in 1941. The semi-cylindrical galvanized steel structure was conceived, engineered and the first units shipped, all within eleven weeks, by the Civil Engineering Corps, U.S. Navy. The basic unit was forty feet by one hundred feet. Eventually 160,000 units were built, 32,000 of them at Davisville. The Quonset hut provided the military with an inexpensive, compact and lightweight structure which was adapted to a wide variety of uses during and after World War II.*

*WOLFEBORO WASTEWATER IRRIGATION PROJECT in New Hampshire consists of a sixty-five million gallon storage reservoir and a spray system on approximately one hundred acres of forested land, divided into five separate sections. The new project is a major step in the reduction of wastewater discharge to Lake Winnepesaukee. With the addition of this project, the Town of Wolfeboro will achieve a zero discharge of municipal waste to Lake Winnepesaukee.*

## SIGNIFICANT HISTORICAL DATES • BOSTON REGIONAL TRANSPORTATION

### *Automobile Transportation*

- 1673 - *First Boston to New York routes established by overland mail riders (Boston Post Road, now Route 1 South);*  
*First Boston to Worcester Turnpike, (now Route 9);*
- 1786 - *First large bridge in Boston opened - Charles River Bridge: (City Sq., Charlestown to Keany Sq., Boston);*
- 1802 - *Newburyport Turnpike established (now Route 1 North);*
- 1803 - *Neponset Bridge completed;*
- 1805 - *Cambridge-Concord Turnpike established (now Route 2 & 2a);*
- 1806 - *Canal Bridge and Causeway completed (Leverett Street to Lechmere Point);*
- 1891 - *Harvard Bridge opened;*
- 1892 - *Arborway, from Jamaica Pond to Franklin Park, completed;*
- 1907 - *Longfellow Bridge opened;*
- 1910 - *Charles River Dam and roadway completed;*
- 1913 - *First concrete road in Massachusetts constructed (North Andover);*
- 1915 - *Larz Anderson Bridge replaces North Harvard Bridge;*
- 1934 - *Summer Tunnel opened;*
- 1934 - *World's first ramp-type garage opened (India and Franklin Streets);*
- 1950 - *Mystic River Bridge opened;*
- 1954 - *First segment of the Fitzgerald Expressway opened (Mystic Bridge to Haymarket Sq.);*
- 1955 - *Route I-95 (north) completed (Route 1 to New Hampshire line);*
- 1957 - *Massachusetts Turnpike opened (New York to Weston, Mass.);*
- 1959 - *Southeast Expressway and Central Artery completed;*
- 1961 - *Boston Common Parking Garage opened;*
- 1962 - *Callahan Tunnel opened;*
- 1964 - *Route I-93 completed;*
- 1965 - *Massachusetts Turnpike Extension opened (Weston to South Station);*
- 1965 - *Route I-95 (south) completed (Route 128 to Rhode Island line).*

### *Public Transportation - Land*

- 1767 - *Stage coach line established between Boston and Providence;*
- 1825 - *First omnibus line started between Boston and Roxbury;*
- 1826 - *First railroad in the United States opened (Quincy Granite Railway; Bunker Hill Quarry to Neponset River);*
- 1834 - *First steam train operated in Massachusetts;*
- 1836 - *Boston and Maine R.R. completed first line between Andover and Wilmington;*
- 1856 - *First horsecar line opened;*  
*(Cambridge Railroad; Harvard Sq. to Bowdoin Sq.);*
- 1889 - *First electric streetcar line (Park Sq. to Brookline and Brighton);*
- 1894 - *North Station opened;*

## SIGNIFICANT HISTORICAL DATES • BOSTON REGIONAL TRANSPORTATION

- 1897 - *First subway in the United States opened (Public Garden to Park St. Station, using electric streetcars);*
- 1899 - *South Station opened;*
- 1900 - *Last horsecar line discontinued (Marlborough St. to Copley Square);*
- 1901 - *World's largest electric railway terminal opened (Sullivan Square Station);*
- 1901 - *World's first subway-elevated line with multiple-unit trains opened (Sullivan Sq. Station to Dudley Station);*
- 1904 - *World's first subaqueous concrete tunnel opened (Maverick Sq. to Court Street, using electric streetcars);*
- 1912 - *Cambridge Subway opened (Harvard Square to Park St. Station);*
- 1912 - *East Cambridge viaduct opened from Lechmere Square to North Station;*
- 1914 - *Boylston Street Subway opened, Tremont Street to Kenmore Station;*
- 1922 - *First regular transit bus service (Union Sq. to the North Beacon St. Bridge);*
- 1924 - *East Boston Tunnel line converted from streetcar to rapid transit car operation;*
- 1929 - *Mattapan to Ashmont high-speed trolley line opened;*
- 1936 - *First trolley-bus line (Harvard Sq. to Lechmere Sq.);*
- 1937 - *First P. C. C. streetcar in regular operation (Arborway to Charles River Loop);*
- 1942 - *Elevated Structure on Atlantic Avenue removed;*
- 1954 - *East Boston rapid transit extension completed to Wonderland, Revere;*
- 1959 - *Highland Branch opened to Riverside;*
- 1967 - *Arlington Station (Green Line) modernized and opened to traffic;*
- 1967 - *Express bus Watertown-Newton-Boston via Massachusetts Turnpike inaugurated*

### *Public Transportation - Air and Water*

- 1631 - *First ferry established in the United States (Winnisimmet Ferry; Chelsea to North End);*
- 1716 - *Boston Light - First lighthouse in America;*
- 1803 - *Middlesex Canal opened;*
- 1912 - *Commonwealth Pier opened;*
- 1923 - *Boston Airport opened;*
- 1926 - *First New York - Boston airmail service started;*
- 1940 - *Boston, Revere Beach and Lynn R.R. ferry ceased operation (East Boston to Atlantic Ave.);*
- 1946 - *Logan Airport created from Boston Airport;*
- 1952 - *Boston's last ferry service ended (South Ferry, East Boston to Atlantic Ave.);*
- 1963 - *Commuter Boat established (Massachusetts Bay Lines; Pemberton to Rowe's Wharf);*
- 1967 - *Completion of International Terminal, North Terminal and Tower Restaurant, and a three level parking garage at Logan International Airport.*

*Minot's Ledge Lighthouse,  
off Cohasset, Mass.  
Sandy River & Rangeley Lakes  
Railroad, Maine  
Tunnel at Quinebaug River,  
Lisbon, Conn.*

