Society for Industrial Archeology · New England Chapters

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NNEC Chapter Fall Meeting and Tour Bath, Maine

Saturday, November 21, 1998

The Northern New England Chapter of the Society for Industrial Archeology will hold its annual meeting at the Conley Building of the Bath Iron Works, Centre Street, Bath, Maine. After the meeting, which begins at 9:30 am, participants will tour the Stinson Sardine Cannery if enough herring have been caught to pack that day. If no, there will be the opportunity to see the Texas Yard, a shipyard where the present Carleton Bridge over the Kennebec River was built, and there will be a presentation about the construction and of the new bridge in progress alongside the Carleton Bridge.

After lunch (on your own) there will be a walking tour of the Bath works. Please be sure to wear good walking shoes. The tour will take several hours. Following the tour, those who are interested will be able to see the (outside of) the Great Bowdoin rag paper Mill in Brunswick-Topsham on the Androscoggin River. The mill has been purchased by a developer and the main building will be renovated. Other associated buildings will be torn down, and so this may be the last chance to see the buildings *in situ*. There are several bridges of interest, including a portion of a truss bridge built by Zenas King, which was prefabricated at the King Bridge Company factory in Cleveland, Ohio, and shipped east via rail. Other bridges include a wire walking bridge and a two-level rail/auto bridge.

The Maine Maritime Museum is located in Bath, and is open daily, should anyone wish to visit it on either Saturday or Sunday (207/443-1316).

Hotels in the area include Super 8 Motel in Brunswick (207/725-8883 or 800/800-8000), Best Western (207/725-5251), Comfort Inn (207/729-1129), and EconoLodge (207/729-1316).

Please note: The Bath Iron Works asks that a list of participants in the tour be provided to them before hand. If you plan to do the tour, please call Kate Donahue at her office (603/535-2424) use the voice mail) or e-mail kated@oz.plymouth.edu by Wednesday, November 18.

Conference on New England IA to be held at Slater Mill Pawtucket, RI

February 6, 1999

The Southern New England Chapter SIA and the Slater Mill National Historic Site in Pawtucket, Rhode Island, will host the 12th Annual Conference on New England Industrial Archeology on Saturday, February 6. By changing the host chapter's usual Lowell venue to Pawtucket, we hope to draw more SIA members from Connecticut and Rhode Island, and to attract new members to the organization. Conference highlights will include tours of the 1793 Slater and 1811 Wilkinson

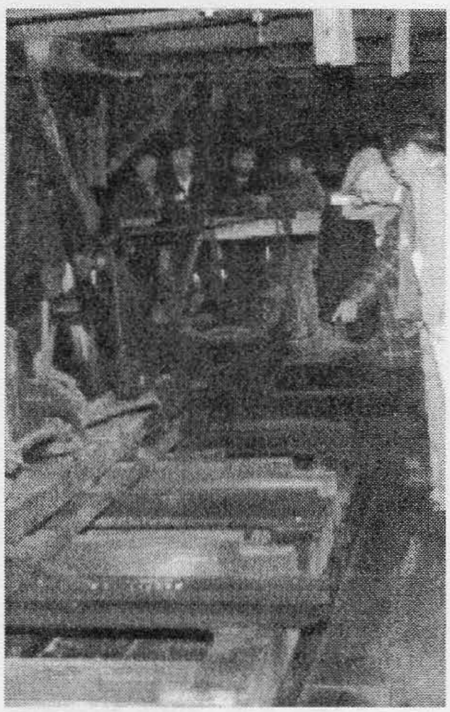
Mills, including a working water wheel, textile machinery, and belt-driven machine shop. Call For Papers: Papers on New England industrial history and archeology subjects are preferred. The conference committee particularly encourages proposals from new members, and those who have not presented before or in recent years. Proposals from non-members and from the New England academic community are also encouraged. If you would like to present a paper at this conference, please submit a full title, half-page abstract, and short biography by Friday, January 1, to Matthew A. Kierstead, 22 Rosewood Street #3F, Pawtucket, Rhode Island 02860. Additional information will be mailed to Northern and Southern New England chapter members this winter.

President's Report, NNEC

The Northern New England Chapter is involved in several fall events. The first, held on Saturday, October 24, 1998, was a tour of Robert Whitmore's Palermo Mine in rumney, New Hampshire. The mine which produced mica and was a source of beryllium during World War II, was active until fairly recently. Robert Whitmore, of Weare, NH, conducted the tour and discussed the varieties of minerals extracted there besides the mica and beryllium. Numerous mining artifacts and features remain.

Planning for the fall meeting of the Northern New england Chapter is under way. We will tour the Bath Iron Works and Stinson Sardine Cannery in Bath, Maine, as well as tours of many places of interest to industrial archeologists, including the now-empty Pejepscot (Topsham/Brunswick) pulp paper mill, a truss bridge, and the maine Maritime Museum (which may be something people can do on their own). The date will be Saturday, November 21, 1998. Details are not yet firmed up as this goes to press, but please give me a call (Kate Donahue, Plymouth State College, 603-535-2424) is you would like more information.

Colin Cabot demonstrates the use of the unique wooden screw crane used to lift and position the runner stone in his grist mill during the NNEC spring tour. Dennis Howe photo.



NNEC members inspect the long carriage of the water-powered sawmill at Colin and Paula Cabot's farm during the spring tour. Dennis Howe photo.

The spring meeting and tours of the water-powered mill sites at Canterbury Shaker Village and the standing grist and saw mills of the Cabot farm (formally Sanborn Farm) were well attended. Thank you all.

Katherine C. Donahue
Windsor, VT

President's Report, SNEC

The significance of IA as a part of the heritage of southern New England continues to make the news. In Boston, debate continues in the newspapers on almost a daily basis on the fate of the the 1907 Northern Avenue pivot lift swing bridge over Fort Point Channel. Some promoters of development in the so-called Seaport district of South Boston around the new federal courthouse would like to see this engineering landmark disappear, and have pushed for the demolition of this span, which now serves as the best pedestrian access to the area. A friends group, *Save the Old Northern Avenue Bridge*, continues to advocate for redevelopment plans that would allow preservation of this structure. Historic Massachusetts, Inc. (HMI), the statewide non-profit historic preservation organization, recently named the bridge on its Ten Most Endangered properties list. In fact HMI's Ten Most Endangered List includes three other IA landmarks: the long neglected Chestnut Hill Waterworks complex in Boston, the 1890 Danforth Street Bridge in Framingham, and the Washburn and Moen Wireworks in the Quinsigamond Village neighborhood of Worcester.

Meanwhile, the Connecticut Trust for Historic Preservation has highlighted the state's Industrial Sites among Connecticut's Most Important Threatened Places. While noting that the potential for losses is widespread, the Trust particularly noted imminently endangered properties such as the massive Baltic Mill in Sprague, threatened by a possible site-clearing development scheme, the Winchester Repeating Arms Factory complex in New Haven, much of which slated for demolition under a new revitalization plan proposed by Governor Rowland, the Cos Cob Power Plant, owned and long neglected by the Town of Greenwich, and a host of vacant mills, including Pomemah Mills in Taftville, Gilbert and Bennett in Georgetown, and Lawton Mills in Plainfield.

While not noted by the Trust, another collection of IA properties with a questionable future is the historic Connecticut Light and Power infrastructure, scheduled for auction as part of the new deregulated power industry environment. Facilities on the block next year may include the state's first hydroelectric plant, the 1904 Bull's Bridge plant, and the first pump storage power plant in the country, the 1929 Rocky River plant, both of which are located in New Milford.

Broader public awareness and concern about the region's industrial and engineering heritage is heartening, and we like to think that research and advocacy by SIA and its members continues to play a key role.

Michael Steinitz
Somerville, Massachusetts

A Participant's Report on the SIA National Fall Tour in Connecticut Valley

Bob Stewart and a large cast of Connecticut Valley friends of IA hosted a stellar program for a contingent of about 140 for the national SIA Fall Tour, September 30 through October 4th. From the Wednesday pre-program walkabout on the Windsor Locks Canal to the Sunday guided tour of the Farmington Canal, participants experienced the variety of IA present in the Hartford-Springfield region, where long traditions of hydropower, metal fabrication and diversified manufacturing persist today. From the depths of the early 18th century copper mine at Newgate to the advanced metal forging and finishing at Smith & Wesson today, the tours covered nearly 300 years of IA in southern New England. Transportation canals aside, hydraulics were well covered in Holyoke, Massachusetts, perhaps the ultimate water-power city, where we visited one of two remaining paper production plants, Parsons Paper Company; toured the industrial landscape of the power canal system; and visited the mid-20th century Hadley Falls Station of the Holyoke Water Power Company (established 1859).

Military contracting, from small arms to aerospace, has long been a mainstay of the regional economy. The group was treated to an all-morning tour of Smith & Wesson handgun production and specialty metallurgical services divisions (followed later by target practice by some), and the arms production theme followed through with visits to the Springfield Armory Museum and the Museum of Connecticut History in Hartford, which includes an important Colt arms collection. At the Connecticut Museum, director Dean Nelson described the challenges of preserving rapidly disappearing IA artifacts in a de-industrializing region, where the museum's collections development program needs to keep up with plant closures and equipment auctions. A case study, which hopefully will turn into a success story, is the nearby Hartford Clamp

Hartford Clamp Company flyer.

Company in East Hartford, where the fourth generation of the founding family continues to manufacture high-end wood and metal working bar clamps in a 1920s shop of two dozen overhead belt-driven metal working machines, a museum quality integrated operation that could easily disappear forever with relocation and modernization of the business.

Remarkable also are the ongoing family-run operations of the Noble and Cooley Drum Company in Granville, Massachusetts , which has been producing drums since 1854. The company's metal toy drums are featured in major national retailers' catalogs and stores, and since 1980 the company has also been producing fine-crafted, professional, solid maple shell drums coveted by many leading concert and recording artists. Our tour of the company's historic factory complex included some dramatic demonstrations of traditional laminating and printing machinery and processes.

Springfield was a center of the American automotive industry before Detroit, and we were able to follow at least part of this story in the collections of the Indian Motorcycle Museum. The transportation theme was continued in our visit to the rolling stock and repair and restoration shops of the Connecticut Trolley Museum in East Windsor.

Although I missed these tours, those interested in plastics were treated to the automated toy brick molding facilities of Lego Systems, and the New England textile industry was represented by the integrated woolen mill of the Warren Corporation in Stafford Springs. Some participants may even have been surprised to learn that tobacco continues to be a significant industry in this region, as the valley's shade- grown wrapper leaf had come back into demand with the current boom in fine quality cigars.

Regional cuisine was well represented, perhaps most notably in the varied forms of kielbasa that appeared, and in the hearty New England dinner banquet set amidst the sizable civilian and military aircraft collection of the New England Air Museum. Kudos and thanks to Bob Sewart and his small army of supporters, and to all the companies and organizations that opened their doors to the Fall Tour! SNEC was pleased to have been able to sponsor the opening night reception at the Enfield Historical Society. It's beyond the capacity of this brief summary to do justice to all the tours, presentations and contributors to this southern New England IA extravaganza.

Michael Steinitz
Somerville, MA

National IA Symposium to be held in Lowell

November 12-14, 1998

The Society for Industrial Archeology will hold "Whither Industrial Archeology?," a "state-of-the-discipline" symposium in Lowell, November 12-14. This national organization conference invites participants to engage in and discuss broad issues about industrial archeology as an important discipline within and outside of the academy. Parochial issues and concerns (such as history and preservation of specific sites) will not be discussed, rather this conference will focus on the major concerns facing industrial archeologists. A copy of the conference schedule and registration form appears elsewhere in this issue. For additional information, contact Gray Fitzsimons, Lowell National Historical Park, 67 Kirk Street, Lowell, MA 01852.

SNEC Fall Iron Tour Bridgewater, MA

Saturday, October 31, 1998

SIA-SNEC members and guests enjoyed a fall tour in the heart of the historic southeastern Massachusetts iron district. The program began at the Henry Perkins Company, 180 Broad St. (Route 18), Bridgewater, Massachusetts, a family-run foundry established in 1848, which claims to be the second oldest foundry in the state; the tour included one building constructed in 1865. The company employees about 35, and some were working during our tour. Although they do not pour hot metal on Saturday, we toured the facility and its varied equipment, and saw some molders at work. As a jobbing foundry, Perkins produces a wide variety of cast iron products including compressor housings, gear blanks, turbine housings, and custom auto parts.

After the morning tour at Perkins there was a break for lunch and BUSINESS MEETING at a nearby restaurant.

After lunch the group reconvened at the historic Bridgewater Ironworks complex for a tour led by local experts, followed by some preliminary documentation of this important but threatened historic site. The planned Bridgewater "Iron Works Park" is the site of what was once one of New England's largest ironworks. Ironworking started on this site ca. 1707 and continued here until 1988. Over those many years the operation was variously known as the Lazell Perkins Co., Stanley Tool, and the Bridgewater Foundry. A large variety of products were made here including artillery shells, armor plating for the U.S.S. Monitor, rolled steel tube, steel plate, and various types of castings. By 1875 the works covered about 75 acres and was said to be the largest iron concern in New England. In 1996 the town of Bridgewater accepted the gift of the property and its extant structures and varied ruins. The town plans to use some of the property for a park and some for a new municipal works yard. Unfortunately, these plans call for the demolition of a major foundry building which although abandoned still contains a cupola furnace, blower, numerous patterns, and other ironworking items. We toured this site with locals who knew it when it was in operation. There are two extant buildings on site (both threatened), an extant forebay with turbines visible, and numerous partially standing ruins. There are also many mysterious remnants on site. After the site tour, some SIAers assisted with preliminary site documentation. This is a very important complex which merits documentation before critical elements are lost. While there is local interest for the planned park, there is as yet little local funding. Your assistance is needed to help preserve this site! We hope this tour is the kick off to a documentation project which hopefully will continue with additional visits from SNEC members.

Michael Steinitz
Somerville, Massachusetts

Providence Area Report: Industrial Sites Bite the Dust

Several significant industrial resources in the Providence area have been demolished in recent months. These massive buildings and structures were true landmarks, and were the character-defining elements of their neighborhoods. Some of these landmarks were associated with the storage and distribution of food and fuel, and were therefore civic as well as industrial landmarks. The loss of these types of prominent, longstanding feature of the urban environment are losses of important reminders of how our cities functioned and were organized.

The twin Pawtucket steel gasholder frames, which long dominated the skyline where Interstate 95 crosses the Seekonk River in Pawtucket, were cut down this Summer. The gasholders, built in 1908 (1 million cu ft) and 1924 (3 million cu ft), were part of a coal gasification plant that operated from the 1880s to the 1950s, and were considered an eyesore. Not as widely recognized as older brick gasholders, of which there are actually more in New England, the steel-framed gasholder has only just begun to creep into the consciousness of IAers, and was incorporated in the artwork for the 1998 Indianapolis SIA National Conference.

The 1894 Providence Cold Storage Warehouse, a massive brick building with Gothic detailing that dominated the Providence skyline immediately west of downtown, was also razed this Summer. This building, designed by Providence Union Station architects Stone, Carpenter, & Willson, housed more than 1 million sq ft of cold storage space. Its construction provided the impetus for the establishment of the surrounding Provisions Warehouse District, listed on the National Register of Historic Places, that is to be demolished to make way for parking and structures associated with the new Providence Place downtown mall. The tenant community of meat and produce companies are moving to scattered locations, or simply shutting down.

The sprawling 1890 Gorham Manufacturing Company complex in Providence was also demolished this Summer, despite efforts to market the buildings for adaptive reuse. Gorham, founded in 1818, was a large decorative metals company which manufactured silverware, placeware, and art metal castings, and was an important contributor to Providence's industrial economy. The 32-acre complex, designed by noted New England mill architect Frank Perry Sheldon, included 35 buildings totalling over 460,000 sq ft, and included one of the largest non-ferrous metal foundries in the world. The carriage house, which includes a carriage elevator, was the only building saved.

The extensive 1889-1911 Narragansett Brewery in Cranston, Rhode Island, New England's largest brewery complex, is slated for demolition in 1999. The India Point and Sakonnet River railroad bridges, two of four remaining swing bridges in Rhode Island, will soon fall to the cutting torch. One wonders if demolition of the Atlantic Coal and Oil Company anthracite coal elevators, the "leaning towers of Olneyville," will not be far off.

There are some encouraging industrial preservation happenings taking place in Providence. The Rhode Island Historical Society has purchased the old Narragansett Electric Company's South Street Power Station for the site of an ambitious Rhode Island history museum, Heritage Harbor. This museum will interpret Rhode Island history from the Industrial Revolution to the present, and proposed plans include exhibits on the textile, jewelry, and other industries, and installation of the Providence-built Corliss steam engine that powered the 1876 Philadelphia Centennial Exposition. Immediately adjacent is the Point Street Bridge, one of the four remaining Rhode Island swing spans, which is undergoing restoration. Further south is Collier Park, where examples of the former marine coal-handling equipment have been preserved as industrial sculptures on a waterfront promenade. The long-abandoned 1848 Phoenix Iron Foundry in Providence, an unusual three-story, granite foundry building, is finally undergoing restoration for commercial use.

Matthew A. Kierstead
Pawtucket, RI

Recent Exploratory Excavation of U.S. Pottery Company Site, Bennington, VT

Much was found during the August 17-21, 1998, exploratory excavation of the U.S. Pottery Company site (VT-BE-263), now the location of Bennington Elementary School. Volunteers, under the leadership of archeologists Victor Rolando and David Starbuck, dug ten pits to the south of the school. It is estimated that over 20,000 ceramic objects were found, at least as many sherds and bits of kiln furniture as were excavated during the May 26-30, 1997 dig (on the southwest corner of the schoolyard).

The U.S. Pottery Company (1847-1858) was not only the earliest and largest 19th-century pottery in New England, but was also the first American company to produce figures in parian. While much is known about the potter – it was the subject of some of the earliest monographs on American ceramics – less is known about the firm's production, and particularly its parian porcelain production.

Finds include thousands of fragments of bisque yellowware, parian porcelain, Rockingham, flint enamel, gate ware, glazed yellow and white wares, and kiln furniture. Fragments of the following known parian pitchers were found: tulip & sunflower, charter oak, pond lily, wild rose, palm tree, Paul & Virginia, cascade and the design Richard Carter Blanchard illustrates on page 81, the bottom right-hand corner, in his *Bennington Pottery and Porcelain.*

While formal analysis of artifacts has not yet begun – this will happen after all the objects found have been washed and sorted – the following are "significant" finds:

- fragments of a parian pitcher decorated in relief with small lily-of-the-valley flowers and small clusters of grapes (a design not previously identified with Bennington),
- a fragment of a parian figure of a dog,
- several parian cane heads, with and without mustaches (as illustrated in Barrett, p. 327),
- fragments of a parian curtain tie-back, similar to the one illustrated in Barrett, p. 137,
- several parian sherds of the Paul & Virginia pitcher (we know the pottery made this form because several marked examples exist, but fragments of these pitchers were not found during the May 16-30, 1997, and April 20-22, 1998 digs),
- several fragments of known Bennington parian designs in yellowware,
- several fragments of known Bennington parian pitcher designs in yellowware,
- bisque yellowware faces and fragments of various Toby forms,
- bisque yellowware head of a cow creamer,
- and more yellowware fragments which appear to bear relief decoration not yet associated with the pottery.

Fragments of parian vases and trinket boxes were not found at the site, but this is not conclusive evidence that the U.S. Pottery Company did not manufacture these items. Many fragments of other known pottery forms have not been unearthed during the total twelve days of exploratory digging (1997 and 1998) at the pottery site. Furthermore, the exploratory excavations have concentrated in the area to the south of the pottery.

Digging under the pavement that surrounds the school itself could yield fragments of other forms and decoration. Other locations in Bennington – where the pottery either dumped materials, or soil from the site was move during the erection of the schools on the site in the 1870s and 1950s – could also reveal significant sherds.

Over thirty volunteers assisted with the excavation and washing, sorting, and cataloging of finds. Much more work remains to process and ultimately to know and understand the significance of these objects.

Catherine Zusy
Somerville, MA

Jenkins Brothers Manufacturing Company Plant in Bridgeport

Jenkins Brothers Manufacturing Company began in 1860 when Nathaniel Jenkins, a Boston jeweler, became frustrated with a leaky faucet. In an attempt to fix the faucet, Jenkins created a valve that was to become the standard valve in use around the world. Valves themselves were not a new invention; in the construction of the first steam engine, 500 BC, Hero of Alexandria used the butterfly valve, gate valve, and check valve. During the Roman Empire, valves were used in the construction of aqueducts. When Rome fell, so did the use of valves.

The valve appeared again in 1613, when valves were used in the construction of the second steam engine. By 1854, rubber was being used in the construction of valves in England. Vulcanized rubber was used in these valves to produce a tight joint. However, this type of vulcanization would not hold through hot water and steam, so the English valve was prone to leakage. Although other valves were constructed that produced variations on this, none solved the problem.

Nathaniel Jenkins developed a rubber composition impervious to the action of water, air, steam and gas under heavy pressures. In 1864, only four years after Jenkins' creation, the Jenkins Brothers Manufacturing Company was formed and began contracting with other manufacturers to produce Jenkins Valves. Although Jenkins Brothers did not open their own manufacturing plant until the 1920's, Jenkins Valves were produced by a subcontractor on Water Street in Bridgeport, Connecticut. Jenkins Manufacturing Company purchased this property for their own main manufacturing plant in 1920, and Jenkins Valves continued to be manufactured at this site until 1988. This historic manufacturing plant was recorded prior to demolition to Connecticut Historical Commission standards by Historical Perspectives, Inc., of Westport, Connecticut.

A Springfield, Massachusetts native, Edwin Goodwin Burnham moved to Bridgeport in 1860; in 1864 he began producing brass goods for steam, water and gas at a small shop near the New York, New Haven & Hartford Railroad station. Soon after, he moved his manufacturing shop to a site on Water Street, along Bridgeport harbor. Burnham began manufacturing valves for Jenkins Brothers at this site in 1870. In 1875, Burnham merged with a New York City company called Eaton and Cole, and expanded their operations. Eaton, Cole & Burnham continued to manufacture Jenkins Valves.

The Crane Company of Chicago purchased the Eaton, Cole and Burnham plant in 1904. They retained the name Eaton, Cole and Burnham, and continued to manufacture Jenkins Valves. In 1920, Jenkins Bros. began to manufac-

Always marked with the "Diamond"
Jenkins Valves
SINCE 1864

ture their own valves for the first time since the inception of the business. They purchased the Main Street property from Crane Co. and began production at that site. In 1924, a newer plant was added to the complex, where the iron body and steel body valves were made.

The Bridgeport manufacturing plant continued to grow; in 1931, the rubber division of manufacturing was moved to the West End of Bridgeport from its former site in Elizabeth, New Jersey. During the war, the United States Navy constructed a new factory at the Jenkins Valves plant to produce damage control mechanisms for combat ships. Referred to as the "Navy" building, this structure housed the big boring machines to produce large diameter valves.

By this time, Jenkins valves were made rather differently than they had been when Nathaniel Jenkins created his valve in 1864. An interviewed manager from the early 1940's related the following valves production process: "A valve is made of many parts. These come from the foundry division. The first operation in the foundry is core-making. The core is the inside of the casting and is important in the making of good castings. The sand used must also be of good quality, as well as the chemical compound used in mixing the sand. Most cores are made by machines; a few are made by hand, Mr. Lee pointed out. . . . With the castings prepared, rigidly tested metal combining alloys of tin, lead, copper and zinc are melted in the modern furnaces at 2,500 to 3,000 degrees Fahrenheit to insure a good grade of metal. Jenkins makes valves of varying alloys, according to Mr. Lee, who stressed the fact that all of them should be termed 'bronze' to indicate their strength. . . . Castings go to the cleaning room from the foundry. Here they are cleaned, the burrs are ground of and they are generally prepared for the machine division, the next destination. In this department, the valve castings are milled and readied for inspection. All parts—except on special orders—are machined automatically. Inspection is rigid. After the assembling of the valve, it is tested under actual conditions that it will meet in actual usage. The valves then move on to the shipping department where the painstaking Jenkins routine again subjects them to a critical inspection. They are cleaned with benzine before being shipped." (*Bridgeport Times-Star,* May 10, 1940.)

The rubber disc created by Nathaniel Jenkins was modified depending on the size and type of valve it was used for. Discs differed with those used for steam, air, hot water or cold water; rubber discs were replaced by stainless steel and nickel alloy discs when used for pressures heavier than 200 pounds per square inch. In size, valves ranged from the simple ones used for bicycles to ones the size of a small car. By the early 1950s as many as 800 employees worked on the site, both men and women.

In the late 1970's and the early 1980's, the company continued to boom, employing as many as seven hundred employees. The 1980's, however, were not a good time for manufacturing businesses in Connecticut. High taxes, the cost of energy, militant unions and environmental regulations contributed to the flight of manufacturing firms from the Northeast. In 1987, Jenkins Bros. announced that the Jenkins Bros. plant at 510 Main Street would be closed down by early 1988 and Jenkins Bros. valves would be produced by the factory in Montreal, Canada, or by outside companies who would sell the products under the Jenkins trademark. Warehousing operations were moved to Allentown, Pennsylvania and Columbia, South Carolina. (It seems unlikely that Jenkins Bros. still exists; no listing was found for them in New York, Charleston, Allentown, or toll-free directory assistance.)

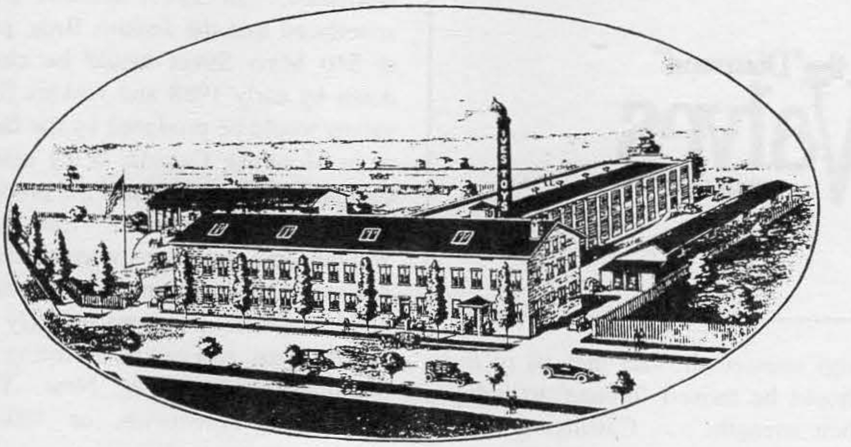
The property changed hands several times before the City of Bridgeport acquired it. The vacant Main Street plant was demolished in the spring of 1997. The City of Bridgeport has tentative plans to construct a sports and entertainment complex on the site.

Cece Saunders and Emily Jones
Westport, CT

"Ives Toys Make Happy Boys": Bridgeport's Ives Manufacturing Company recorded to HAER standards

Ives Toy Manufacturing Company in Bridgeport, Connecticut (CT-170) was recently recorded to HAER standards by Historical Perspectives, Inc., of Westport, Connecticut. Ives Manufacturing Company, the first U.S. manufacturer of "O" gauge toy trains, was a mainstay of Bridgeport industry until the company was purchased by Lionel in 1928.

Edward Ives founded what was to become The Ives Manufacturing Company in 1868 and moved it to 1047 Broad Street in Bridgeport in 1870. A disastrous fire struck the Ives & Williams Company factory on December 22, 1900, destroying the building and all the patterns, parts and tools for manufacturing the cast-iron toys. In 1901 The Ives Manufacturing Company, in rented space, began producing the first "O" gauge trains in the



Ives Toy Manufacturing Company.

United States to run on fabricated sectional track. The trains were powered by clockwork machinery inside the toy. The term "gauge" refers to the distance between the tracks on which a train runs. In "O" gauge, this distance is 1 inch, the size that children of the fifties most commonly remember. During 1901 and 1902, the die stamping production of trains, cars and track was subcontracted out to another manufacturer.

The fire provided an opportunity for Edward Ives and his son Harry to rethink their line. Ives purchased a large lot, with room for expansion, on Holland Avenue, and the present building was erected in 1907. The main section was completed in 1907, and had wood posts, beams, trusses and floors. It was the first factory in the U.S. built for the sole purpose of making toy trains. The new Ives factory was of typical early twentieth century mill construction except for its exterior cladding, which was made of cast concrete blocks molded to look like rough-dressed ashlar masonry. A separate ancillary building was for japanning. In 1917 a two-story, flat-roofed addition to the main building was completed; it had reinforced concrete floors to support the heavy machinery that was used in this area.

Edward Ives was a pioneer in the manufacturing of mechanical toys but his son Harry perfected the electric toy train that became synonymous with the company slogan "Ives Toys Make Happy Boys." In addition to the "O" gauge trains, Ives added a #1 gauge to his line in 1904 and continued to produce it until 1920. It was then discontinued and, in a major policy change, replaced with a larger gauge, which was very similar to Lionel's trademarked "Standard Gauge". Ives called it "Wide Gauge", with a measurement of 2 inches.

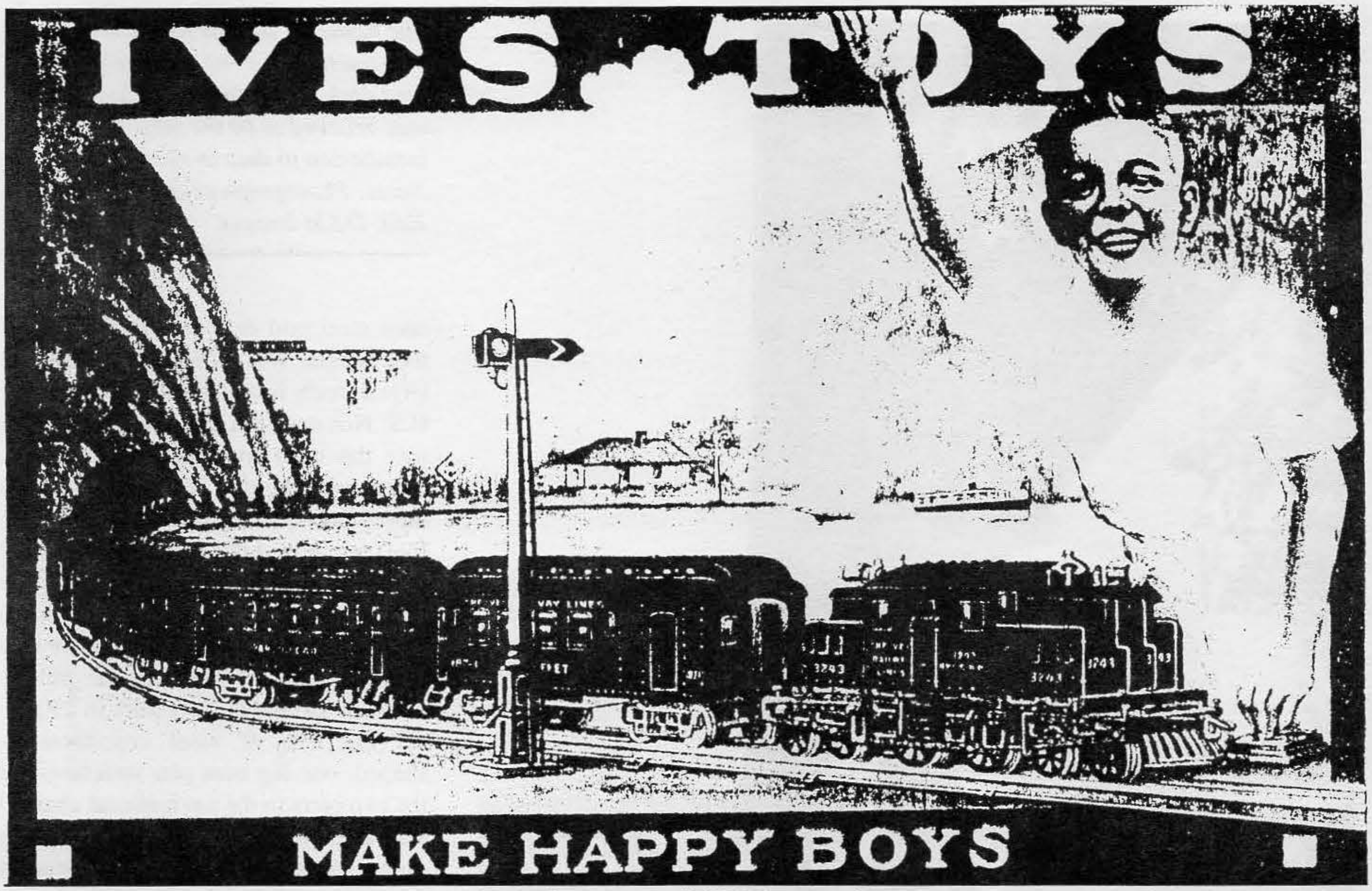
Ives chose to manufacture sectional tracks, even though they were more costly to make, since they were easier for children to assemble and did not kink and twist like strip or ribbon track. Unlike some of his competitors' trains, Ives products continued to run by clockwork as they had before the introduction of tracks. Competition was fierce, and in 1910, the same year that the German company Bing opened a New York office, Ives trains were finally electrified. At first the fields and armatures for the electric motors were wound on a machine improvised out of an old sewing machine with a treadle. Then this machine was electrified, and soon there were many winding machines. After the introduction of the first electric train in 1910, Ives became the largest producer of toy trains in this country and maintained that position until 1919.

Ives also manufactured an ambitious line of accessories. In the early 1900's the company created a lift bridge that dropped automatically when a train approached. In 1909 Ives made a turntable for "O" gauge trains that could either be operated manually or powered by clockwork; the toys were still not electrified. Among the most popular, even famous, accessories were the various Ives stations with glass domes, now much sought by collectors. One was constructed so the train could run underneath. In 1930, the year before Ives was completely taken over by Lionel, the factory produced the "Treasure Chest," filled with a multitude of accessories. No train was included, but there was everything else to set up a complete railroad: transformer, tracks, stations, signals and a variety of houses and sheds. The 1915 catalogue even advertised a "Controlophone," which stopped and started the train by a voice command.

Harry Ives introduced a new line of clockwork toy boats. The boat line never enjoyed the popularity of the trains and was an economic drain on the company. The company also made a line of construction sets, but this too never sold well.

Ives trains were realistic looking, with accurate details reproduced from real trains actually in use. This was a result of the use of cast-iron frames and the soldering of tinned steel to form bodies. The method was expensive, however, and the amount Ives could charge for his products was limited by the competition.

Ives' popular, realistic-looking trains were the result of several manufacturing processes. Ives' lithography, for example, was considered exceptional. The stamping press was an important asset to Ives. It enabled the factory to mass produce a variety of parts economically. A strip of sheet metal was fed into a press, where it could be either cut or shaped. The press was a heavy, strong and rigid machine with a very heavy fly wheel transmitting power via belts or gears to the drive shaft. Legend claims that during the Christmas rush of 1917, the steam engine that drove the early stamping presses broke down, and



From front cover of 1923 Ives catalog.

Ives rented elephants from Barnum's Circus (whose winter quarters were in Bridgeport) to power the punch presses.

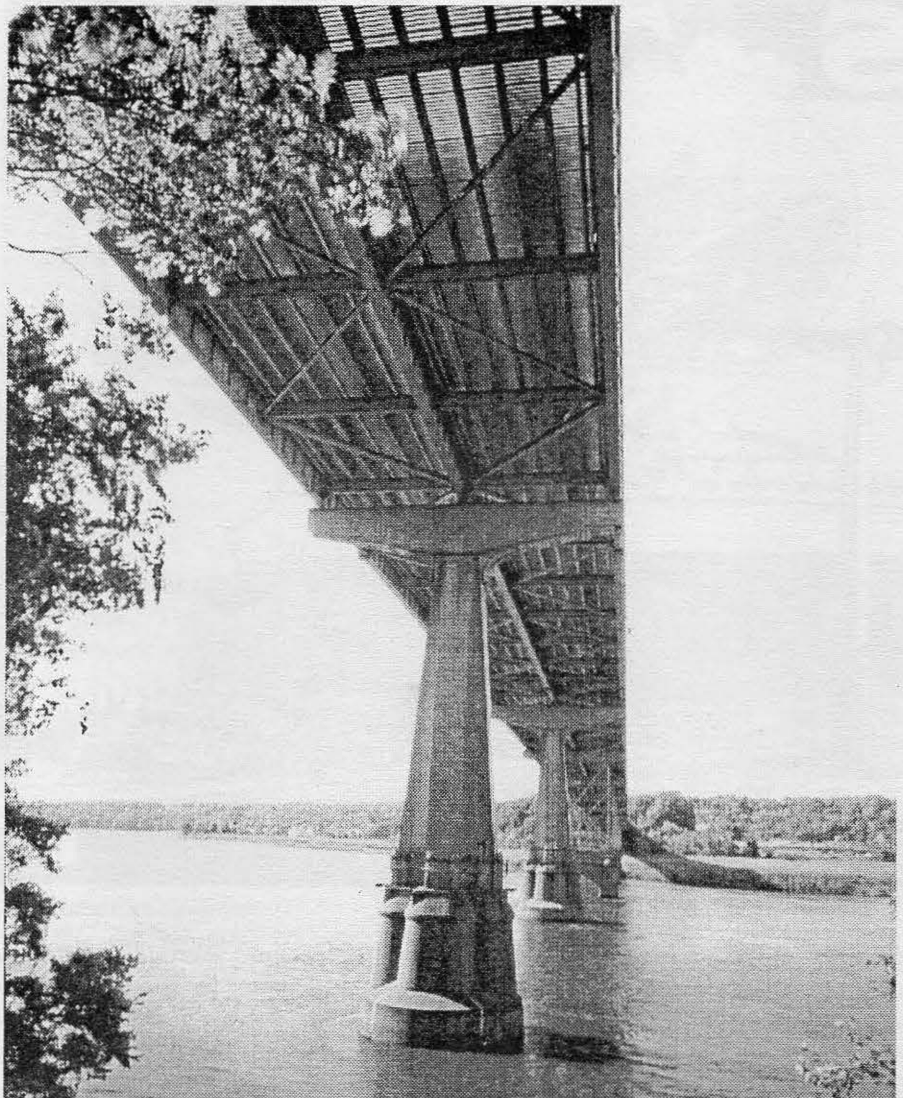
Metal spinning, a way of shaping metal, was also done in the shop. It required a solidly built metal spinning lathe, since considerable strain was placed on it. The lathe operated at fairly high speed, and a sheet metal disc was revolved in the lathe against a hard wooden chuck which determined the shape of the part being made. A variety of spinning tools, with handles the size of baseball bats that are held between the arm and the body, were pressed against the metal to shape it against the chuck. These tools performed such functions as trimming, smoothing, grooving, or beading the metal disc. The part was then polished and buffed.

Despite their high-quality toys, Ives Manufacturing Company began to experience financial difficulties in the late 1920's. There were probably several factors contributing to the firm's financial difficulties. Competition was certainly a principal one. Harry Ives insisted on making a high quality product, but his pricing had to be within range of the other toys on the market. Thus his costs were higher than other lines but his selling price remained low. His profit margin declined and it is possible that he actually lost money on some products. He was also faced with aggressive advertising by the competition. For instance, Lionel regularly featured broken down wrecks of Ives' trains in its catalog. Harry Ives was also generous to a fault. Repairs to the Ives trains were done in the factory and were almost always free. A catalogue was included with every set, no matter how small.

On July 7, 1928, the Ives Manufacturing Corporation filed for bankruptcy. Christmas orders worth $245,000 had already been received, so Charles R. Johnson, Ives President and General Manager, asked the court for a rapid settlement so that production could continue under a new owner. The factory and all its assets, including patents and equipment, was sold to Lionel.

Ives trains continued in production until 1930 under the joint aegis of American Flyer, Hafner and Lionel. The Ives family was no longer involved, but some managers remained. Working with American Flyer and Lionel managers, they created a line "that represented the apex of appealing yet sophisticated toy trains". According to a display at the Toy Train Museum in Strasburg, PA, these trains made between 1928 and 1930 ("The Ives Transition Period") are rare and much valued by collectors. Lionel moved production out of the factory building in 1930.

Cece Saunders and Emily Jones
Westport, CT



The Route 15 Bridge. At the time of construction in 1940, the open steel grid deck for the full 1,824-foot length was believed to be the largest such installation to date in the United States. Photograph courtesy of Duncan Hall, D&M Images.

The Route 15 Bridge Over the Housatonic River, Connecticut

Introduction

The Connecticut Department of Transportation (ConnDOT) plans to remove and replace the Route 15 Bridge over the Housatonic River to increase traffic capacity and reduce long term maintenance costs associated with the existing aging structure. The bridge, named the Igor Sikorsky Memorial Bridge after the aviation industrialist Igor Sikorsky, spans the river between Stratford, in Fairfield County, and Milford, in New Haven County. The decision to replace the bridge was based on ConnDOT studies that demonstrated it was not possible to modify the existing bridge to accommodate the wider, solid deck needed for current and future traffic volumes.

The Sikorsky Bridge is an essential link between the two parkways comprising the southern portion of Route 15 in Connecticut - the Merritt Parkway and the Wilbur Cross Parkway. The bridge is not part of the Merritt Parkway but the beginning of the Wilbur Cross Parkway. The structure is individually eligible for listing on the National Register of Historic Places (National Register) due to several significant engineering features, including the open steel grid deck and the one-leg bent pier structures used at the navigational channel.

At the time of construction, the open steel grid deck for the full 1,824-foot length was believed to be the largest such installation to date in the U.S. Not only did the open grid eliminate the need for snow removal, but, more importantly, its lighter weight (approximately 20 pounds per square foot) minimized the dead load, resulting in appreciable savings in construction cost. At that time, steel grid deck was a relatively new product, having been first used for a major bridge on the Marine Parkway Bridge in New York in 1937.

The use of steel cruciform T-shaped, one-leg bent pier structures for the two piers in the navigational channel was an innovative way to ensure adequate navigational clearances beneath the bridge, while minimizing the length of the main span. As an added benefit, the design of the relatively shallow, longitudinal through girders and steel pier bents, combined with the steel grid deck, produced a slim, attractive structure.

The Connecticut State Historic Preservation Office (SHPO) has determined that the replacement of the bridge will constitute an adverse effect on a significant historic property. To mitigate the adverse effect, pursuant to the National Historic Preservation Act of 1966, Historic American Engineering Record (HAER) documentation was undertaken, as agreed upon in a 1996 Memorandum of Agreement among the Federal Highway Administration, SHPO, the Advisory Council on Historic Preservation, and ConnDOT. Documentation of the bridge (HAER # CT-177) has been completed by Fitzgerald & Halliday, Inc., consulting planners, and Parsons Brinckerhoff Quade & Douglas, Inc., consulting engineers, in association with Steven M. Bedford, architectural historian, with photographs by Duncan Hall, D&M Images.

Historical Context of the Bridge

Opened to traffic on September 2, 1940, the Sikorsky Bridge is the connecting link between the Merritt Parkway, which extends westward to the New York State line, and the Wilbur Cross Parkway, which runs northeast towards Hartford, Connecticut. Construction of the bridge took approximately two years. At the time of the opening, the Merritt Parkway had been completed but only 10 miles of the Wilbur Cross Parkway was finished.

The Merritt Parkway, dubbed "the Gateway to New England," was named after U.S. Representative Schuyler Merritt of Connecticut. In 1991 the Merritt Parkway was placed on the National Register and in 1993 the Parkway was designated by ConnDOT as a State Scenic Road.

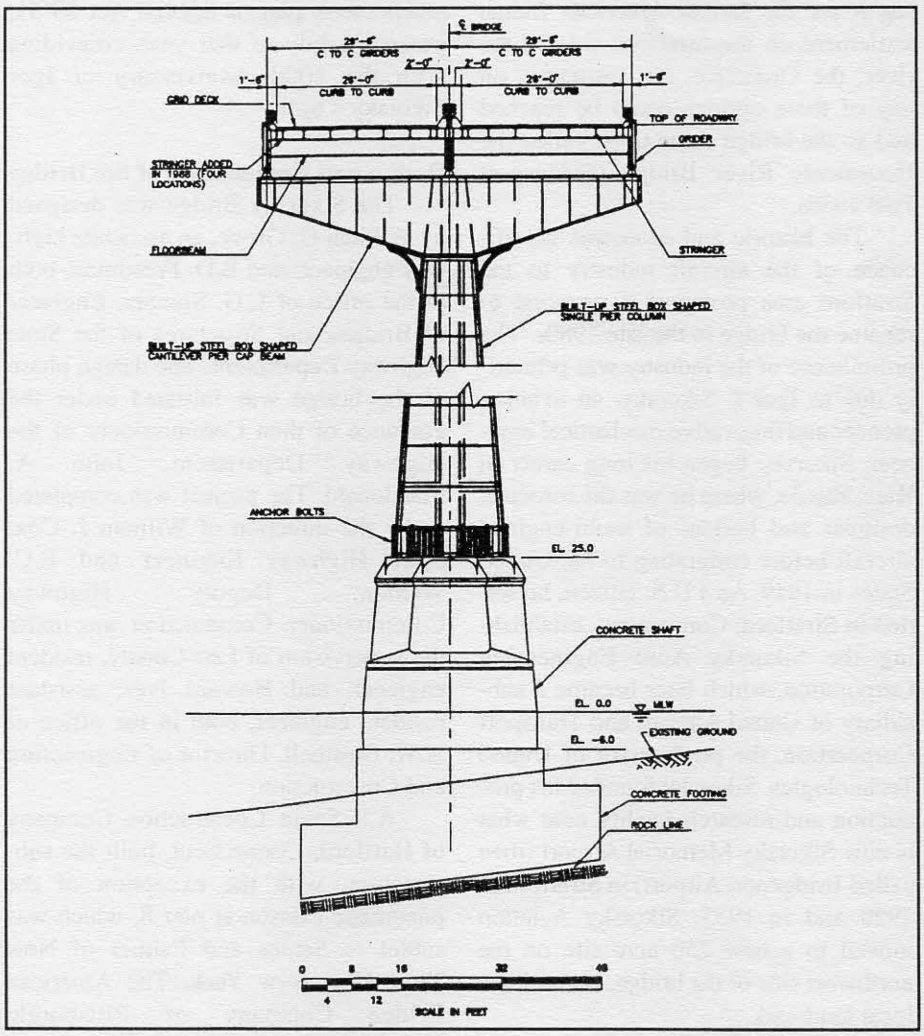
The Merritt Parkway owes much of its beauty to its landscape architecture and ornate bridges. Completion of the bridge was to provide the last essential link for motorists between the two metropolitan areas of New York City and Hartford. Traffic on the bridge, like the rest of the parkway system (State Route I5), has been limited to non-commercial passenger and "combination" vehicles weighing less than 3402 kg (7,500 pounds).

The initial cost estimate for the bridge was $1.5 million. For reasons of economy, efforts were made to reduce the cost of the bridge through the use of an open steel grid for the roadway deck, which was lighter in weight and less costly than the usual concrete roadway. Use of the steel grid deck also had the effect of lowering the overall structural costs due to its lower weight, while speeding up the construction process. The final cost of the bridge was approximately $1 million, including a contract price of $410,000 for the substructure and $520,000 for the superstructure (Grove 1940). The bridge was financed with the aid of a 45 percent federal Public Works Administration grant.

In its 57 year history, the original design elements of the bridge have not been significantly altered. However, the bridge deck has been renovated and altered four times in attempts to provide a satisfactory driving surface. After the bridge was opened, it was found that drivers often experienced difficulty steering their cars, especially in wet weather. A bituminous wearing surface supported by metal lath was installed on top of the open grid in 1947 in an attempt to correct this condition. This surfacing did not prove to be satisfactory and in 1957 it was removed and replaced with a new bituminous overlay applied over steel plates that were welded to the grid.

By 1964, the bituminous overlay was deteriorating badly due to serious corrosion of the steel plates and more effective methods of correcting the problem were being sought. In 1964-1965, the bituminous overlay and steel plates were removed and 5/16 inch diameter by 3/8 inch long studs were welded to the exposed steel grid in a pattern comprising about 12 studs per square foot. In 1987, a new open steel grid deck with studs was installed on the bridge. At this time, the structure was also rehabilitated, strengthened, and painted.

The bridge was originally named



Typical section of a tower pier. The use of cruciform T-shaped, one-leg bent pier for the two piers in the navigational channel was an inovative way to insure adeguate navigational clearances beneath the bridge, while minimizing the length of the main span. Drawing courtesy of Parsons Brinkerhoff Quade & Douglas, Inc.

the Housatonic River Bridge, but not without controversy. Several names historically attached to the area were promoted by various factions. Proposals for a bridge name included the following: naming it for the revolutionary war hero, Major General David Wooster; naming it for a naval hero of the War of 1812, Commodore Isaac Hull; naming it for Moses Wheeler, who ran the first ferry across the Housatonic, about three miles south near the location of the Washington Bridge; naming it for the governor who first supported and promoted the construction of the parkway system in Fairfield County, Governor Raymond E. Baldwin; and, finally, naming it for the former American Indian settlement on the Stratford side of the river, the Oronoque. No consensus on any of these options could be reached and so the bridge came to be called the Housatonic River Bridge (Bridgeport Post 1939).

The historic and economic significance of the aircraft industry to the Stratford area prompted a proposal to rename the bridge in the late 1980s. The prominence of the industry was primarily due to Igor I. Sikorsky, an aviation pioneer and innovative mechanical engineer. Sikorsky began his long career in Kiev, Russia, where he was the foremost designer and builder of multi-engined aircraft before emigrating to the United States in 1919. As a U.S. citizen, he settled in Stratford, Connecticut, establishing the Sikorsky Auto Engineering Corporation, which later became a subsidiary of United Aircraft and Transport Corporation, the predecessor of United Technologies. Sikorsky founded his production and research facility near what is now Sikorsky Memorial Airport (then called Bridgeport Airport) in Stratford in 1929 and in 1955, Sikorsky Aviation moved to a new 250 acre site on the northwest side of the bridge, becoming a local landmark.

Sikorsky's most famous contribution to the aviation industry came on September 14, 1939, in Stratford, Connecticut, when he made history with the first flight of a production-ready helicopter, called the VS-300. Within two years, the VS-300 had broken all world helicopter records and the company received its first government contract for the newer, refined XR4, marking the birth of America's helicopter industry. He also designed and built the famed Flying Clippers, which were very large, twin-engined, all-metal aircraft that pioneered transoceanic air transportation and proved a forerunner of the modern airliner (Stratford Chamber of Commerce 1989).

In 1989, State Senator George Gunther proposed an amendment to a bill before the state legislature to rename the bridge for Igor Sikorsky. The amendment, part of Special Act 89-51, passed in July of that year, coinciding with the 100th anniversary of Igor Sikorsky's birth.

Design and Engineering of the Bridge

The Sikorsky Bridge was designed by William G. Grove, an associate highway engineer, and B.D. Freedman, both in the office of L.G. Sumner, Engineer of Bridges and Structures of the State Highway Department. The design phase of the bridge was initiated under the guidance of then Commissioner of the Highway Department, John A. Macdonald. The project was completed under the direction of William J. Cox, State Highway Engineer and E.C. Weldon, Deputy Highway Commissioner. Construction was under the supervision of Leo Conaty, resident engineer, and Howard Ives, assistant resident engineer, both in the office of A.W. Bushnell, Director of Engineering and Construction.

A.I. Savin Construction Company of Hartford, Connecticut, built the substructure, with the exception of the pneumatic caisson at pier 8, which was sublet to Senior and Palmer of New York City, New York. The American Bridge Company of Pittsburgh, Pennsylvania, an arm of the Carnegie Steel empire, fabricated and erected the superstructure.

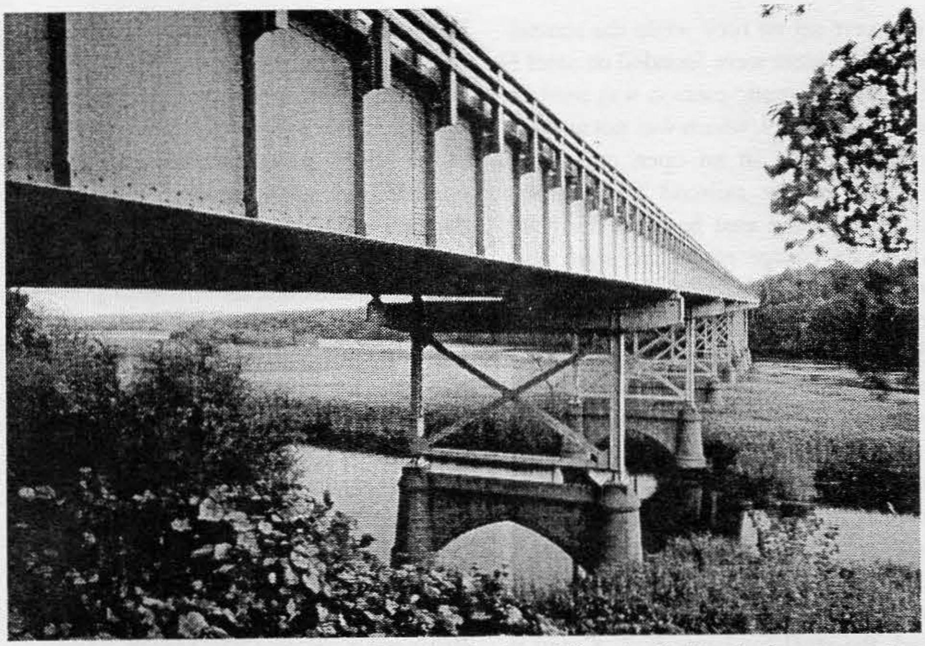
Bridge Description

The Route 15 Bridge over the Housatonic River is a 12 span, 1,824 foot long steel, riveted plate, through-girder bridge with a 26 foot wide, steel open-grid deck roadway in each direction. It has a 4-foot wide center island, 1.5 foot inside shoulders, and no outside shoulders. Sloping upward from west to east, the bridge provides a navigational clearance of 85 feet above mean high water at its eastern end. The Waterbury line of the Metro-North Railroad runs beneath the bridge at its eastern side. This was formerly the New York, New Haven, and Hartford railroad line. The major structural elements of the bridge consist of three longitudinal girders supported by an abutment at each end and 11 steel piers resting on reinforced concrete footings.

Abutments and Piers

The eastern and western abutments are roughly U-shaped (in plan and section) reinforced concrete structures. The eastern abutment is founded directly on rock, while the western abutment rests on a pile foundation. They are slightly decorated with triple vertical grooving on the north and south wing walls. The top of the wing walls align with the longitudinal girders on the bridge superstructure. The abutments are connected to the superstructure via pinned bearings.

The 11 bridge piers are numbered in the same direction. The piers in the navigation channel (piers 8 and 9) are founded on bedrock via concrete footings. Piers 10 and 11 are founded on rock on either side of the railroad right of way. The remaining piers are founded on steel H-piles driven into glacial till. There are two reinforced concrete pile caps at each of these piers, with a reinforced concrete beam between the footings.. At water level, they are shaped in the form of gothic arches, while the tops of the tie beams rise to form conical, mushroom-shaped forms at the base of the steel piers. These forms serve as bases for the steel pier bents. This conical shape is repeated at piers 8 and 9, which are single shafts.



Opened to traffic on September 2, 1940, the Igor Sikorsky Bridge is the connecting link between the Merritt Parkway and the Wilber Cross Parkway. Photograph courtesy of Duncan Hall, D&M Images.

The steel piers, with the exception of piers 5, 8, and 9, are pinned at the base to accommodate thermal movement of the steel superstructure. Pier 5, a steel bent, and piers 8 and 9, steel towers, are fixed by large anchor bolts at their bases to resist the longitudinal movement of the superstructure. The tower piers (8 and 9) consist of two cantilever arms of equal length supported atop a single column, cellular steel leg constructed in a hollow cruciform shape. The overturning force at the base of each of these towers is resisted by anchor bolts embedded up to 50 feet into the concrete pier footings.

One-leg bents were used at piers 8 and 9 because of their location adjacent to the river navigation channel. The channel is 150 feet wide to allow boats to pass under the bridge. In order to achieve proper clearance, the portion of the bridge over the channel needed a 177 foot rise above the water along its centerline (note that the average clearance of the bridge over mean high water is 90 feet). If conventional two-leg bents with a rectangular pier had been used, the clear span across the navigation channel would have needed to be 250 feet. Since steel girder panels were used for the deck support, the 250-foot length would have required increasing the size of the longitudinal girders. With the one-leg bents angled 58 degrees to match the skew of the navigation channel, the pier structures used less open water space and the navigation channel span could be reduced to 224 feet in length.

Piers 1 through 7, 10 and 11 are a common design. Each bent is approximately 40 feet wide and consists of pairs of built-up steel box-shaped columns topped by a built-up steel box-shaped cap beam with tapered ends. Horizontal and diagonal bracing is provided by built-up beams connected by riveted gusset plates at the tops and bottoms of the columns. The columns are built up rolled steel channel sections with the interior face made up of riveted lattice work. The same method of construction is used for the bracing elements. The cap beam has vertical stiffeners at the columns and its lower element is open-webbed.

Superstructure

As with the steel piers, all of the superstructure is riveted steel construction. Starting at the western end of the bridge, the superstructure is divided into four sections. The first section, from spans 1 to 3, consists of a three-span continuous unit, with each span being 128 feet long. The second section (spans 4 through 7) is a four-span continuous unit, with 160-foot long spans. Spans 8 through 10 comprise a three-span cantilever unit, consisting of a main span of 224 feet, flanked by 160-foot-long anchor spans. The 224-foot long span rises above the navigation channel and is made up of two cantilever arms with a 160-foot long suspended span. The final section (spans 11 and 12) is a two-span structurally continuous unit, with each span having a length of 128 feet. Span 11 carries the superstructure over the railroad, with a vertical clearance of 40 feet.

The superstructure consists primarily of three longitudinal, built-up plate girders, spaced at 29 feet, 6 inches on centers. The center girder is 100 inches deep and the fascia girders are 91 inches deep. All the girders have evenly spaced vertical stiffeners. The top flanges of the girders extend above the roadway and make up the fascia curbs and median island. W-beam rails guard rails have been added to these beams at the roadway level. All the longitudinal plate girders are supported on fixed bearings atop the piers and abutments. The ends of the continuous span units are joined by a pin and hangar assembly at piers 3, 7, and 10, as are the ends of the suspended span between piers 8 and 9.

The girders support two 26-foot wide roadways consisting of 5-inch open steel grid deck set on 21-inch deep rolled stringers spaced at 4 feet 4 inches on centers. The stringers are supported on 33-inch deep rolled floorbeams spaced at 32 feet on centers along the bridge. The floorbeams are framed into the longitudinal girders by means of riveted angle plates and knee bracing. Lateral bracing for the superstructure consists of rolled steel I-sections, connecting the bottom webs of the floorbeams and longitudinal girders by means of gusset plates. The pier cap beams are laterally tied to the fascia girders of the superstructure with cross bracing.

Open-Grid Steel Deck Design

The bridge designers decided to use the open steel grid deck primarily because it was less costly than a reinforced concrete slab design and was much lighter. The steel grid weighs 20 pounds per square foot (psf) as compared with 54 psf for a concrete filled steel deck or 100 psf for an eight-inch reinforced concrete slab deck. The Highway Department had used open grating floors on three smaller bridges between 1937 and 1939. They felt that those bridges had performed well and they had received few complaints from drivers, except from drivers of the occasional horse-drawn vehicle. Another anticipated advantage of the open grid steel deck was that snow would not accumulate and, in theory, ice would melt off quickly as vehicles crossed the grid and their tires created friction. Therefore, the expense of snow removal could be saved and the surface of the bridge should have remained safer for vehicle travel.

As the bridge was being completed, an unexpected problem arose. Smoke from the New York, New Haven and Hartford trains, which passed beneath the bridge on the Milford shore (currently the Metro North line), presented an unexpected problem. The smoke penetrated the open grid deck, potentially obscuring drivers' vision, and over the long run, could be detrimental to the structural steel. In response, William G. Grove, the bridge's primary designer, incorporated a smoke barrier into the design of the eastern end of the bridge, although this was subsequently removed.

Bridge Construction Technology

Foundation work was simple and without notable incident (Grove 1940). The east abutment and piers eight and nine were set on rock while the remainder of the piers were founded on steel H piles. A pneumatic caisson was used for pier 8, but pier 9, which was not as deep, was put down in an open cofferdam. Because of the railroad tracks under span 11 on the east bank of the river, American Bridge elected to start work on this end of the bridge where steel could be brought in on a siding. Spans 11 and 12 were thus built using a locomotive crane in combination with a tractor crane. With these two spans in place, a starting platform was available for a deck traveler which rode on the center and north line of girders. As the deck traveler moved westward, it was assisted on the river spans by a derrick boat. While most of the steel came in by railroad, the steel for bents 6, 7, 8, and 9, and the girders for spans 7, 8, 9, and 10 were delivered by barge.

Erection of the river spans was the most difficult part of the project (Grove 1940). After spans 8, 9, and 10 were erected, operations shifted to the west end of the navigation channel where a derrick boat, unaided, raised bent 7 and the three girders of span 8. These bridge elements, including the 32-foot long cantilever arms into the channel span, were 192 feet in length. The girders came to the job in two sections and were the heaviest pieces erected, although the longest single girder on the bridge is 160 feet long. The two girder sections were connected on the barge and lifted as one piece weighing 76 tons. The derrick boat set bent 6 and that operation completed its use. The deck traveler, standing on the cantilever of the span 7 girders that extended out into span 6, was able to place the bent at pier 5. The remainder of the steel to the west was erected using the deck traveler with the same cantilever construction procedure.

The Current Scenario

Traffic volumes on the Route 15 Bridge have increased many-fold since its construction, and presently exceed capacity during peak periods, creating considerable rush hour congestion. In addition, the on and off ramps located at both ends of the bridge necessitate merging and lane shifting at the already-constricted ends of the bridge. In previous years, the toll booths at the east end of the bridge, part of the original bridge construction, served to slow traffic and dampen volumes. Since the toll booths were removed in 1988, traffic congestion has intensified, as operating speeds and traffic volumes have increased. These travel conditions, combined with the physical condition of the aging bridge structure, have produced the impetus for the removal and subsequent replacement of the historic Igor Sikorsky Memorial Bridge across the Housatonic River.

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Linda Perelli Wright and
Rachel Fertik
with Carol Gould,
Steven M. Bedford
and Michael Abrahams

Announcement

The Director of the Pasold Research Fund in England, that publishes *Textile History* (in which Richard Candee's article on home knitting machines just appeared) is compiling an international directory of textile historians which will, in due course, be available on-line. This will include scholars working in such fields as economics and business history, costume and clothing, fashion, fabrics and textile related archives but also technology, machinery, and mill architecture. That makes it fair game for many SIA members. Those who wish to be listed should provide:

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