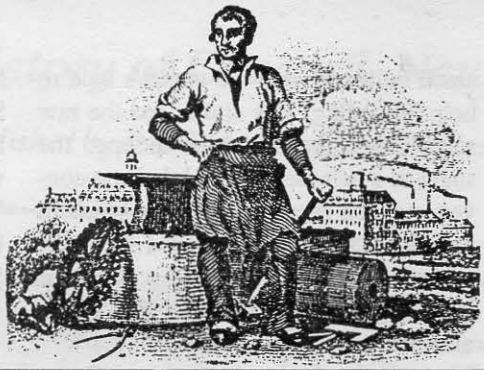


Society for Industrial Archeology · New England Chapters

VOLUME 15 NUMBER 1 1995

CONTENTS

CONTRIBUTORS
Robert Coyle, Robert Gordon, Cece Kirkorian, Woodard Openo, Vic Rolando, Michael Steinitz, Tom Vaughan

NORTHERN CHAPTER OFFICERS
Woodard Openo, President
Richard Borges, 1st Vice President
Kate Donahue, 2nd Vice President
Walter Ryan, Treasurer
Krista Butterfield, Secretary

SOUTHERN CHAPTER OFFICERS
Michael Steinitz, President
Matt Kierstead, Program chair
Tom Vaughan, Jr., Secretary
Jack Yerkes, Treasurer

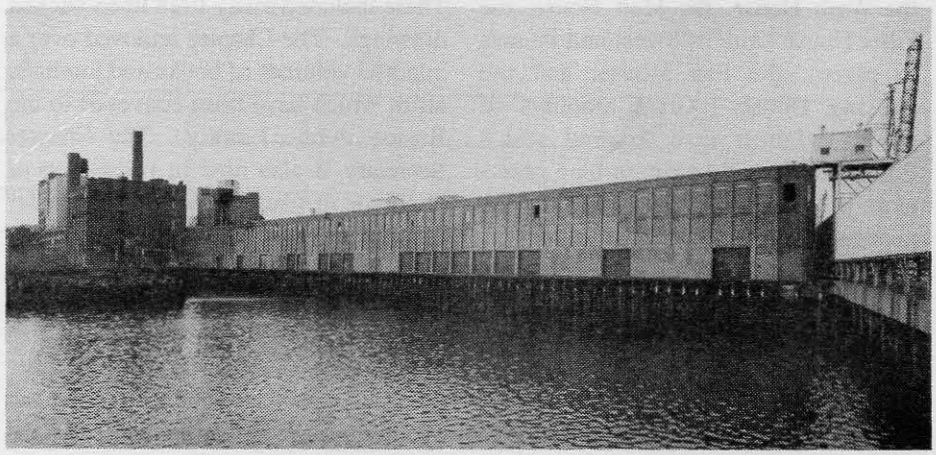
EDITOR
David Starbuck
PO Box 147
Fort Edward, NY 12828

President's Report, SNEC

SNEC Undertakes Emergency Recording and Documentation of the Revere Sugar Refinery, Charlestown, Massachusetts

In late November the SNEC learned of the impending demolition of the historic 1918 Revere Sugar Refinery Complex in Charlestown, Massachusetts closed since 1986, and since then owned by the Massachusett Port Authority (Massport). Revere Sugar is a significant IA site, and though it has never been recorded in the state historic properties inventory, it was studied while it was still in operation by Peter Stott — who also interviewed a plant manager — for his IA survey of greater Boston in preparation for the 1984 SIA national conference. We were able to get Peter's files, as well as some preliminary documentation prepared by the Public Archeology Laboratory in 1988. Through the efforts of Maura Fitzpatrick of the Boston Landmarks Commission, the Chapter was granted permission to get on the site for one day to do both exterior and limited interior recordation. On very short notice and under a questionable weather forecast, we were nonetheless able to assemble a dozen chapter members and spent a December Saturday on the site, taking 35 mm slides, color prints, and black & white prints, a dozen large format exterior shots, and interior video.

Revere Sugar had existed under various names in Boston and East Cambridge since the 1860s. It was bought by United Fruit in 1914, and relocated to this new plant on a seven-acre Charlestown site with deep water



Southeast side of the Revere Sugar Works, Charlestown, MA, December 1994. From left to right: Pan/Filter/Packing/Power House complex, Melt House, Raw Sugar Storage Warehouse, and Ship Unloading Crane and Dock.

facilities on the Mystic River in 1918. United Fruit was particularly interested in building refinery capacity in the U.S. for the products of its Cuban sugar plantations. This plant was built with a two million pound daily refining capacity. The scale of operations and the sheer volume of material that moved through here is a big part of what is so striking about this complex. At its peak, it employed 500.

The architect was New York-based William Higginson, and the designing engineer was Renier P. Defries. The plant apparently duplicated one built for the Atlantic Sugar Company in St. John's New Brunswick, from where many the early employees on this site came. Ships unloaded directly into a 650-foot-long brick Raw Sugar Shed, with a 20,000 ton capacity, allowing the plant to stockpile a 20 day supply of raw sugar at peak operation. The plant introduced important innovations in the handling of bulk sugar in the 1930s, replacing 100 pound bags with loose cargo, and introducing travelling cranes for unloading. From the shed, the sugar was moved horizontally, vertically, and diagonally through a series of buildings, each with a processing stage.

Chapter members who were at the SIA meetings in Toronto and toured the Redpath Refinery have an idea of the modern process, which is still very legible in the Revere Sugar complex. Major surviving processing buildings include the Wash House, the Melt House, the Filter House (with its Sweetland Presses in place), the Pan House, and the Packing House. Great amounts of power and heat were required, and a Power House with steam turbine generators provided both electricity and the necessary hot water used in refining. A 1930s Office Building, also contained quality control testing laboratories.

Major modernizations were undertaken here in the 1960s, very visibly at the waterfront end of the complex, where a new, more efficient, 460 foot dock was added with two Colby gantry cranes with 8-ton grab bucket unloaders. The cranes were also set up to drop a small bulldozer into the vessel's hold to help unloading. The cranes fed the raw sugar into hoppers, which dropped the sugar to a belt feeder which led a to conveyor at the rear of the dock, which in turn fed a system of enclosed conveyor bridges which were added around the Raw Sugar Shed. This unloading set up allowed the plant to unload 5 to 7 million pounds of sugar in an 8 hour shift.

The plant continued to operate, albeit with increasingly marginal profitability, until May of 1986, when it was finally put out of business - along with many other American refineries by the opening of a number of government subsidized corn fructose plants in Iowa. Next to Revere Sugar is the 1960 American Sugar Refinery (later Amstar Domino), which relocated here from South Boston, and which is also out of operation. Together these were the last two sugar refineries operating in New England.

During the course of the site work we found the service manuals for the Colby Cranes in the Weigh House. At the end of the day as it was getting dark, we also found in the Office Building, open to the elements through broken windows, scores of journals, proceedings of symposia, and scientific books on aspects of the refining process. We also discovered, with our flashlights at this point, the plan vault, with easily a thousand plans and drawings of all aspects of the plant, and from all periods of operation. These included many 1918 linen-backed drawings. The Chapter removed over a hundred volumes of books and journals, all of which have been conveyed to the Boston Public Library. The Chapter Secretary is also now in possession of hundreds of plans, which await transfer to an appropriate archival home.

Our goal was to assemble enough materials in a format that might be submitted to the Historic American Engineering Survey or to the State Archives or both. I hope the chapter can follow through to achieve this. Special thanks go to Maura Fitzpatrick and the chapter members who participated: Dave Engman, Howard Gorin, Stanley Moss, Rick Greenwood, Pat Malone, Susan Hollister, Paul McGinley (and the firm of McGinley Hart and Associates which provided refreshments). Also Virginia Adams of Public Archeology Lab for sharing their documentation. Special note should be made of the efforts of our two new officers. Tom Vaughan did the video recording, and Matt Kierstead spent the day working his large format camera.

Michael Steinitz

President's Report, NNEC

The Northern New England Chapter of the Society for Industrial Archeology held a recording session at the Franconia, NH, iron furnace on September 9-11, 1994, under the supervision of "Iron Man" Vic Rolando. About ten people participated in the recording of this unusual octagonal granite furnace.

The Chapter held its fall tour on October 15 at Mt. Washington, NH. Blessed with a sunny, clear fall day, about twenty-five members heard about the Cog Railway, toured the car shop where machinery is built and repaired, and (the non-acrophobic) took the Railway to the top of Mt. Washington. The Mountain, incidentally, had received 10" of snow the week before. The Cog Railway was started in 1887 and currently operates seven steam locomotives which push cars up the mountain with the help of a denticulated track (carrying the cog wheel of the locomotive) between the rails. Needless to say, the reason for the cog arrangement is that the railroad could be built far steeper than would otherwise have been possible. It is a marvel of the Industrial Revolution — living archeology.

This was the year for the Southern New England Chapter to host the annual winter conference, which took place at Charlestown Navy Yard in Boston, Massachusetts. The meeting was snowed out on February 4 (the first time

in eight years this has happened, I believe) and rescheduled to March 11, 1995. Ably organized by Michael Steinitz and Co., the interesting morning papers were followed in the afternoon by tours of the *U.S.S Constitution* (oldest commissioned warship in the world, authorized in 1797) and the World War II destroyer *U.S.S. Cassin Young* (which survived a kamikaze direct hit near the end of the war). Also included in the tour was the building where parts and rigging for the *Constitution* are fabricated. The ship is undergoing a major overhaul and restoration, and we were privileged to get a very complete, hardhat tour. The granite buildings and drydocks of the Navy Yard (now exhibited by the National Park Service) are significant examples of American nineteenth century architecture and engineering.

For our spring NNEC tour, we are planning to visit the water-powered Scheyd-Yeaton-Kayes up and down sawmill in Washington, NH on Saturday, May 6. The mill is a replica, constructed by NNEC member Harold Yeaton and his associates using timbers and boards salvaged from several old buildings which had been demolished. The mill stands on the property which contains the ruins of the town's first mill which had been built in the 1770s. In addition to the up-and-down saw, the mill also contains many vintage woodworking machines, including several from the Abbot-Downing factory.

On Memorial Day weekend Vic Rolando will return to Franconia with a few volunteers to finalize the recording which was begun last fall.

Woodard D. Openo
Somersworth, NH

Bryant Electric Company Bridgeport, CT

The Bryant Electric Company complex, immediately north of US Interstate 95 in Bridgeport, Connecticut's west end neighborhood, is being documented to HAER standards prior to demolition The recordation, written and photographed by Historical Perspectives' (HPI) team of Marty Cobbs, Steven Bedford, Betsy Kearns, Cece Saunders Kirkorian, and Robert Stewart, embraces the three separate but contiguous parcels that Bryant held when manufacturing ceased in 1988.

The Bryant electric Company was founded in 1880 for the manufacture of quality electric wiring devices at a time when electric service to the home was in its infancy. A rented loft served as the first workshop for Waldo Calvin Bryant's company and the first product of note was an "Electric Switch or Cut-Out" patented by Bryant. Moving to its present location in 1889, the company eventually built a plant, and over the years expanded to cover an entire city block and sections of neighboring blocks. The complex, surveyed by Matthew Roth in 1984, is dominated by a 4-story brick building with corner entry set off by a stepped, cast-stone surround. The brick pier walls, with round-corner piers, feature round-arched windows on the 4th floor, segmental-arched on the 3rd floor, and rectangular with stone lintel on the 1st and 2nd. Stone stringcourses mark floor levels and a corbel table appears along the cornice.

In 1901 Bryant was purchased by Westinghouse Electric and manufacturing Company but was operated as a wholly-owned subsidiary. In 1928 Bryant acquired Hemco Electric, a company that specialized in manufacturing plural plugs and Bakelite molded components. Using the Bakelite technology, Bryant developed a line of thermoset plastic, non-breakable dinnerware. Ultimately they entered the load center and circuit breaker market. By the 1960s one of Bryant's major product lines, manufactured on the State Street site in Bridgeport, was electric baseboard heaters.

In addition to the HAER document to be filed with the park service, HPI is

View southwest of Bryant electric company (Bryant Wiring Device Division, Westinghouse Electric Corporation), 1421 State Street, Bridgeport, Connecticut. The section which includes the elevator machinery house on the left side of the photograph was erected in 1901. The portion to the right of the elevator is building 23, added in 1920. These buildings housed management and engineering offices on the fourth floor. The lower floors accommodated manufacturing departments which primarily produced small electrical components for switches and fluorescent lighting fixtures.

assisting the City of Bridgeport in identifying significant Bryant Electric architectural and industrial elements for salvage and possible reuse or display. There is very little manufacturing and processing equipment remaining on site. Identified industrial elements include:

Three turn-of-the-century motor-generator sets which converted 700 volts D.C. to an unknown alternating current voltage.

A large lever-action platform scale in operable condition. A number of original balance weights accompany the scale.

A large ingersoll-Rand air compressor c. 1960.

Two package boilers c. 1960.

Cece Kirkorian
Westport, CT

Second Try at Annual Conference a Success!

The worst weather day of the past winter season caused the postponement of the Conference on New England Industrial Archeology from February 4th to March 11th. A group of about eighty Northern and Southern New England Chapter members and friends gathered for a fine late-winter morning of papers, videos and poster displays, and an afternoon of tours at the Charlestown Navy Yard. The morning started off during registration with a video on the Tugboat *Luna*. The paper sessions began with a report by Michael Steinitz on the SNEC's recent emergency recording of the Revere Sugar Refinery in Charlestown, Massachusetts. Kerrylynn Boire of the Public Archaeology Lab then reviewed recent investigations and excavations at the site of the ca. 1880 Whitman, Massachusetts, Roundhouse, where PAL uncovered information on the turntable pit, roundhouse foundation, and other site components. Rodney Freeman of the Heritage Studies Program at Plymouth State College followed with an enthusiastic presentation of his study of the Draper-Maynard Sporting Goods Company of Plymouth, New Hampshire, whose baseball gloves, including the "Lucky Dog" brand, and baseballs dominated the major league markets. The presentation included a discussion of the history of the organization of manufacturing from home to factory production, the importance of quality control, and various marketing efforts.

During the break that followed, attendees viewed video footage of the interior of the Revere Sugar Refinery, and also examined poster presentations on the SNEC recording of Revere Sugar, work at Richmond Furnace (including an iron pig) and the Tugboat *Luna*. The second paper session began with Matthew Kierstead presentation of his recent research on the Davis Pyrite Mine in Rowe, Massachusetts. The Eastern Appalachians were an important source for the extraction of iron pyrites for the production of sulfuric acid, although the corrosive effects of wet ore presented a particular challenge. Between 1882 and 1912, the deep shafts of the Davis Sulphur Ore Company operations supported a small village, including many Cornish miners, in this remote area. A second presentation relating to extractive industries in the region by William Edwards, Sandy Noyes, and Karl Danneil brought attendees up to date on the past several years of recording and documentation efforts at Richmond Furnace by the Richmond Historical Commission, with some help from SIA New England Chapters members. The presentation reviewed the status of research, site surveying and stabilization, measured drawings, and large format photography at the furnace site, the Klondike Mine, and in the Furnace Village area. Philip Whitney brought the morning to a rousing conclusion with his enjoyable and informative lecture on the history of rope making, including early New England production, which culminated with a demonstration on a reproduction rope making machine.

During the lunch break a video of the SNEC's recent tour through the Byfield Snuff Mill was shown. After lunch, attendees were treated to below-deck tours of the ongoing restoration work on the *U.S.S. Constitution,* and of the rope loft and woodworking shop of the Maintenance and Repair Shop, where the staff of the Naval Historical Center is undertaking the restoration work. The afternoon ended with informal tours of the World War II-era destroyer, the *U.S.S. Cassin Young.*

Many thanks to our hosts the National Park Service, the U.S. Navy, and the Naval Historical Center, and to all those who contributed papers and presentations for making the annual conference a success.

Tom Vaughan,
Secretary, SNEC

Luna Preservation Society Secures Ownership of Tugboat

At the eleventh hour and under threat of legal action by the Boston Landmarks Commission, the Metropolitan District Commission has finally transferred control of the National Historic Landmark Tugboat *Luna* to the Luna Preservation Society. The MDC recently destroyed the Luna's sister vessel the *Venus*, turning her into landfill. A similar fate seemed certain for the *Luna*, but on March 27th the *Luna* cleared dry-dock in East Boston, remained moored for twenty-four hours, and was then towed to the Charlestown Navy Yard, where she remains docked and afloat at this writing. This most recent development is finally a positive turn in a five-year struggle over the Luna after she was abandoned and left to sink by her former owners and became by default the responsibility of the MDC. Soon after securing custody of the *Luna*, LPS was awarded a $20,000 matching Preservation Projects Grant by the Massachusetts Historical Commission. As it now initiates its

efforts to restore the *Luna,* the Society needs volunteers, new members and contributions. At this writing a special need is for able-bodied volunteers for the twenty-four hour watch necessary to monitor the pumping system that is keeping the *Luna* afloat. Those leading the LPS effort include Patrick Otton of the Naval Historical Center, who led the tours of the Constitution rope loft at the Winter Conference at the Navy Yard, and SNEC Secretary Tom Vaughan. Anyone interested in helping out in any capacity should contact: Patrick Otton 617 244-2761 (home); Douglas Randall 617 720-2678 (home); Tom Vaughan 617 468-0681 (page) 617 389-1023 (home) 617 355-6280 (work). Thomas Vaughan, Luna Preservation Society, 176 Linden Street, Everett, MA 02149-2808.

Spring RecordingScheduled at Richmond Furnace in June

The Richmond Historical Commission will once again host a weekend of recording at the Richmond Furnace site in Richmond Furnace on the weekend of June 10th. Northern and Southern New England Chapter members and friends are welcome to attend! Details will be forthcoming in a mailing, but anyone interested in attending should contact Matt Kierstead, SNEC Program Chair, at 617 237 5952, or Bill Edwards, Richmond Historical Commission, at 413 698-3458 for details.

Diner IA!

American Diner: Then and Now, at the Museum of Our National Heritage, Rte 2A and Mass. Ave., Lexington, MA; *Sandwich, Pies & Coffee: Origins of the Diner in New England*, at the Rhode Island Historical Society, 100 Benevolent St., Providence. The diner has long been an integral part of the New England urban industrial scene. While long maligned, the diner in recent years has achieved international recognition as an American pop-culture icon, as evidenced for example — by the trans-Atlantic relocation of several diners — to create the trendy Fat Boy's chain in London. The diner had its origins in the late 19th century lunch car manufacturing companies of Providence and Worcester; along with barbed wire, it might be seen as one of the great contributions to the American landscape made by the industrial Blackstone River Valley. Two current museum exhibits tell the story of this fascinating aspect of southern New England IA history. The more ambitious Lexington show includes several interior installations and a multi-media array of videos, 3-D viewing apparatus, and even a working juke box. Visitors here at lunch time can also grab a meal in the parking lot at Hickey's Diner, a mobile Worcester Lunch Car that for decades served night owls at the Taunton Common. In Providence the unsuspecting visitor to the Federal-period Aldrich House on College Hill steps through a stately portal into a blue-collar world of corned-beef hash and a cuppa joe. While the Providence show is more modest in scale, both exhibits display an impressive array of archival photographs, documents, blue-prints, artifacts, architectural elements, memorabilia and ephemera that evoke the diner era and celebrate the entrepreneurs, inventors and craftsmen who made New England a major center of diner manufacturing in the country. Both these shows move far beyond nostalgia to present decades worth of serious IA research, collecting, oral history, and hands-on preservation and restoration by our colleagues in the field of commercial archeology. Both are well worth a special trip.

Michael Steinitz

Call for Help

The Pioneer Valley Industrial Museum and the North Quabbin Museum of Natural History need your help. Both museums are housed in the 1893 Memorial Hall Building in Orange, MA. This historic old building is in need of major repairs and, as you know, money is hard to come by these days. The east (and possibly the south) wall needs repairs due to water damage. Memorial Hall is owned by the Town of Orange and there is a move by some town leaders to tear it down. This may mean the end of the two museums housed there.

It would be a help to us if members of the SIA would write to Town of Orange officials in support of saving the historic building and the museums.

The Pioneer Museum of Industry was started by Arthur Shaw. It has a number of artifacts from the Pioneer Valley that I am sure SIA members would find interesting. It is suggested that the Chapter members see the museum in conjunction with a field trip to some of the local industrial sites: Starrett Tools — they have a small museum also, the many buildings of the old New Home Sewing Machine Company, The Harvard University School of Forestry Museum in Petersham, the old Minute Tapioca Plant or one of several other places along the Miller's River. The Orange Historical Society, near our museums, has and original Grout automobile, and the old Grout Factory is close by. There is also an interesting old blacksmith shop that would be worth a visit.

The North Quabbin Museum of Natural History, of which I am Director, has exhibits of birds, mammals, skeletons, plus rock and mineral specimens, many from local mine and quarry sites. (One local site was used for ore for the Saugus Ironworks.)

Robert B. Coyle
1978 Chestnut Hill Ave.
Athol, MA 01331

Article

Ironworks on Mount Riga

American artisans working at bloomery and finery forges in the early republic made important advances in metallurgical technique. They reduced fuel consumption rates in wrought-iron making below those attained by Europeans, and they successfully responded to the demand created by the newly-established manufacturers of precision-made metal goods for supplies of iron with more uniform and reliable properties than any previously made. Documents reveal little about the techniques that these artisans developed because they worked before professional metallurgists began writing books and journal articles. Industrial archeologists can help fill this gap in the historical record when they can find sites that retain evidence of past ironmaking techniques. The remains of stone furnace stacks often mark the sites of ironworks that had blast furnaces. Archeologists have recorded some of these sites, and have carried out excavations at a few. Study of the forge branch of ironmaking has proved more difficult.

Because forges required more power than blast furnaces, their proprietors generally built on the flood plains of substantial streams. Consequently, few forge sites survive undisturbed. Often, another industry would immediately take over the water privilege of an abandoned forge. Floods swept away the remains of many of the forges at sites that were not re-used for other purposes. We are fortunate to have in northwestern Connecticut the site of a blast furnace and finery forge complex important in American history that has remained largely undisturbed by man or major flood since the 1850s (Fig. 1).

Connecticut's earliest surviving blast furnace is at the outlet of South Pond on Mount Riga (Fig. 2). The remains of the associated finery forge, where artisans converted pig iron from the furnace to bar iron, are located a

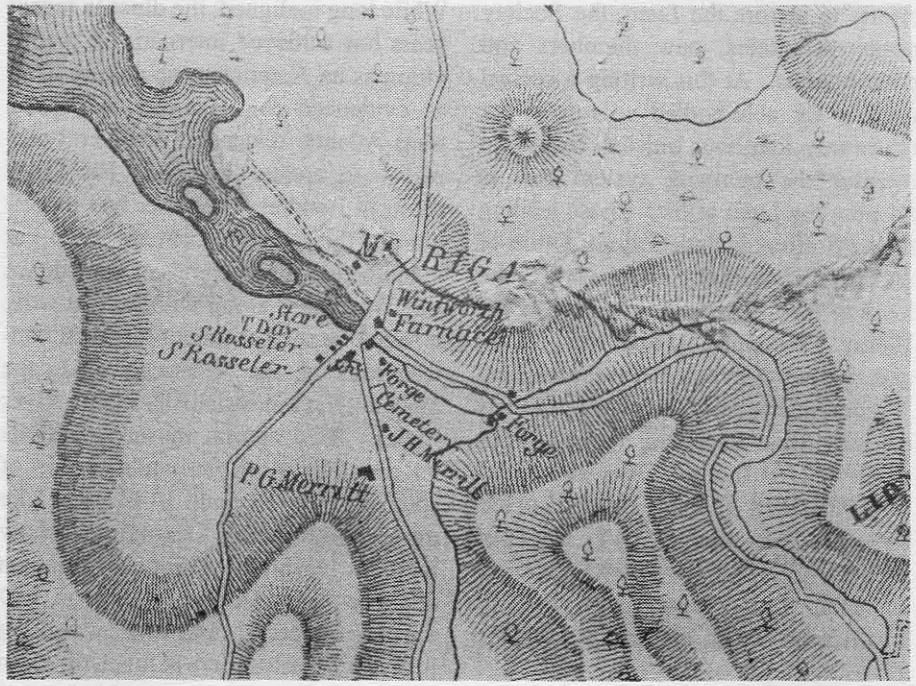


Fig. 1. *This section of Clark's 1859 map of Litchfield County shows the location of the Mount Riga ironworks, even though both forge and furnace had been abandoned for several years when the map was made. However, the mapmaker incorrectly placed the blast furnace on the north side of the river. It is actually at the upstream site marked "forge." The principal finery was at the lower forge located where the road crossed the river.*

Fig. 2. *The casting arch of the Mount Riga furnace still retains part of the furnace crucible. The single blowing arch is in the right side of the furnace, and the stone walls that supported the charging bridge are to the left. Both arches are now partially filled with soil that obscures the lower part of the furnace structure.*

Fig. 3. *This dam formed the forge pond on Mount Riga. The builders used large stones to support the downstream face of their earth-fill dam. The spillway would have been where the dam is now breached. The notch to the left accommodated a flume that carried water to drive one or more of the forge hammers. (Photograph by William Sacco.)*

short distance down the Wachocastinook River (Fig. 3). The forge is of particular interest because it was here that Holley & Coffing and their successor, the Salisbury Iron Co., made the gun iron used by the Springfield and Harpers Ferry armories, iron considered the finest available from any source in the early republic.

When Richard S. Allen compiled the historical data available on the Mount Riga works, he found that Seth King and John Kelsey started building the furnace about 1806 near the site of Abner Woodin's 1781 bloomery forge. At this time members of the Holley family had already established themselves as leading ironmasters in the district. Luther Holley (born in Sharon, Connecticut, in 1751) had purchased the Lakeville blast furnace (built at the outlet of Wonoskopomuc Lake in 1762 by Ethan Allen, John Hazeltine, and Samuel and Elisha Forbes) and an interest in the great iron mine known as Old Hill (or Ore Hill) about 1798; his son John Milton Holley (b. 1777) joined him in the enterprise.

By the time Luther retired in 1810, and John together with John Churchill Coffing had formed the partnership of Holley & Coffing to operate the Lakeville furnace; they purchased the partially completed Mount Riga works in 1808 and finished the furnace in 1810. Joseph Pettee was a partner in the operation of the furnace and the ironmaster through 1838. John Holley's son Alexander Hamilton Holley (b. 1804) became clerk for Holley & Coffing in 1819. One of his tasks was to buy fuel for the Mount Riga furnace and forge. (It was A. H. Holley's son Alexander Lyman Holley [b. 1832] who introduced the Bessemer process in the United States. A. H. Holley razed the Lakeville furnace about 1843, and built a pocket knife factory on its site. The factory survives in gentrified form today, Fig. 4.) In 1827 Holley & Coffing consolidated ownership of the Mount Riga-forge and blast furnace with several other properties by forming the Salisbury Iron Co. After 1838, other proprietors ran the Mount Riga furnace until 1856.

Several houses, cellar holes, and a cemetery remain from the ironworkers' community on Mount Riga. Going up to the furnace site is a good way to appreciate how important a superior water-

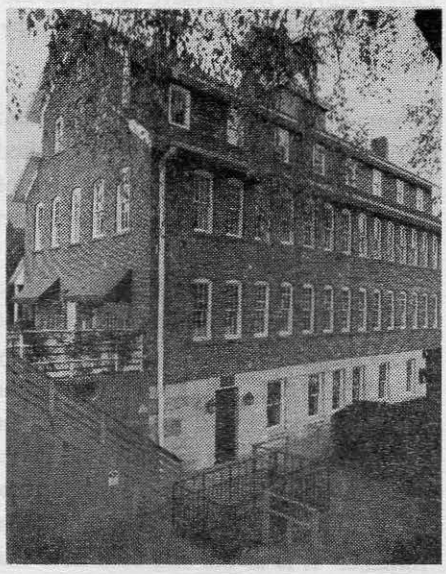


Fig. 4. *Alexander Hamilton Holley razed the Lakeville furnace about 1843 and built this pocket knife factory on its site. It is now occupied by non-industrial tenants. The owners preserved the turbine that at one time powered the knife-making machinery; it can be viewed through the opening in the wooden platform at the side of the building. When a youth, A. L. Holley wrote a detailed account of the knife-making technique used here. (Photograph by William Sacco.)*

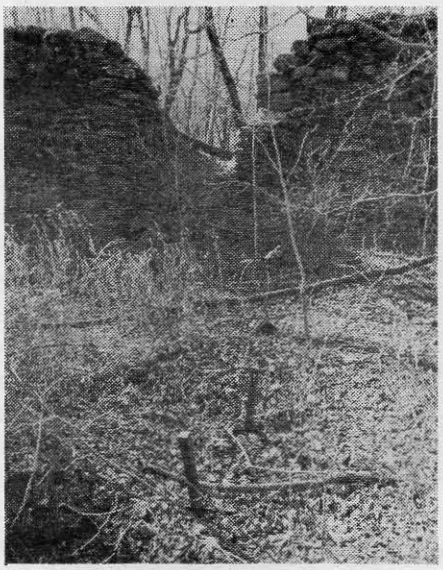


Fig. 5. *These hold-down bolts for a helve hammer are located just below the notch in the forge dam shown in Fig. 3. Forge hearths would have occupied the adjacent level ground. (Photograph by William Sacco.)*

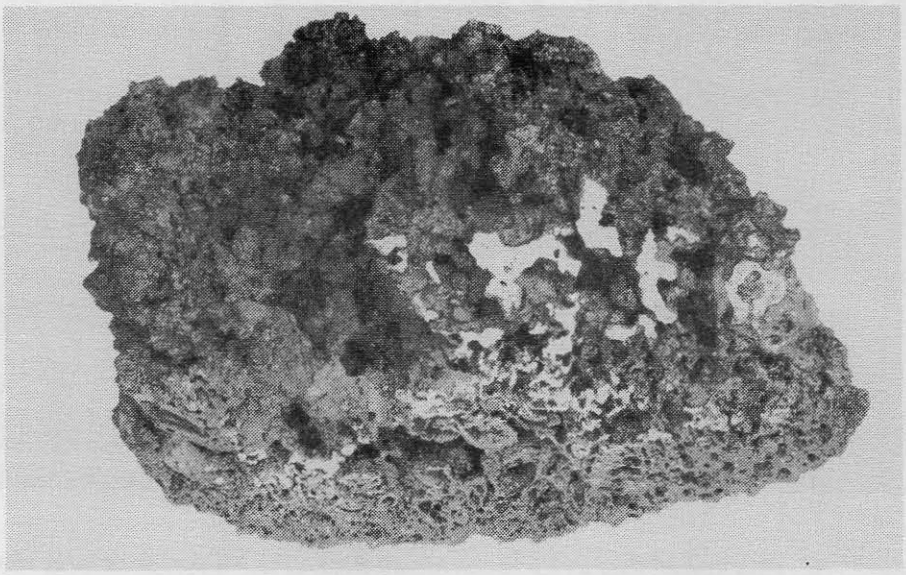


Fig. 6. *This oblique view of waste material from the Mount Riga forge site shows the early stages of the fining process. Iron melted in front of the tuyere had solidified as it dripped to the hearth bottom below. A section cut through the specimen has been polished to show the distribution of iron and slag. The width of this section is 120 mm. (Photograph by William Sacco.)*

power privilege was to ironmasters: teamsters had to haul all the ore smelted there up from the mines at the base of the mountain more than a thousand feet below.

The stone stack of the Mount Riga furnace has been stabilized and can be easily inspected today. It was evidently rebuilt in 1845, the date carved in one of the large stones on the left side of the casting-arch. The proprietors never converted to hot blast, and the basic fabric is undoubtedly that of the original furnace. It is at the end of a field that parallels the stream emerging from South Pond. The casting arch faces downstream, and the single blowing arch is on the stream side of the stack, where the waterwheel and bellows would have been located. The stone walls of the furnace bank are to the south. No traces of the furnace sheds are visible; excavations would probably define them, however. A number of iron tie rods run through the stonework, several under the wooden beams visible in Fig. 2. They are hammered, rectangular bars, and the keys are missing from their ends. The fore part of the furnace crucible is missing. Broken-up slag is found downstream from the furnace. Holley, Coffing & Pettee built a finery forge a half mile downstream from their furnace in 1810 and fitted it with fining hearths and water-powered hammers. Here they converted much of the pig made at the Mount Riga furnace to bar iron. In addition to making anchors and other forge products, the proprietors specialized in gun iron, the wrought-iron plates that armorers welded into musket barrels at the public and private armories. Records at Springfield show that through its first six decades armory managers considered obtaining high-quality, uniformly reliable of gun iron their most difficult technical problem. Roswell Lee, the Springfield superintendent from 1815 to 1833, found that the failure rate of musket barrels in proof was dramatically lower when his armorers used Salisbury iron; he preferred it to all others. Holley & Coffing established themselves as the most successful supplier of gun iron.

The site of the Mount Riga forge is marked today by a large, breached dam (Fig. 3) rather than any above-ground furnace remains. The notch on the south side of the dam accommodated a flume that delivered water to a wheel that powered the forge hammer; hold-down bolts for a helve-hammer frame are still in place below the notch (Fig. 5). The forge hearths would have been nearby, on the level area below the dam. Excavation should reveal the forge layout. Although we lack a full archeological investigation, we can deduce aspects of the Mount Riga forgemens' metallurgical technique from waste materials that they left on the site.

To make a superior grade of gun iron, forgemen had to produce metal that was free of phosphorus and had a uniform distribution of finely-divided and dispersed slag particles. The artisans at the Mount Riga works used ore from the Old Hill and Davis mines that typically would yield metal containing 0.15 percent phosphorus if this element were not

removed in smelting and fining. There are two kinds of waste near the blast furnace, fragments of slag that had drained from the furnace crucible over the damstone of the open forehearth, and slag that the furnace keepers dug out of the forehearth in a partially solidified state. The latter contains drops of metal large enough to analyze: they show that the furnace produced an iron containing 0.4 percent silicon, 4.5 percent carbon, and 0.15 percent phosphorus, a typical product for a charcoal-fired blast furnace. No phosphorus was removed during the blast-furnace smelting. The finers at the Mount Riga had to remove nearly all of the silicon, carbon, and phosphorus from the pig to make gun iron. To do this, a finer melted the pig in the strongly oxidizing flame in front of a tuyere blasting air into a charcoal fire, collected the metal in the forge hearth, and shaped the purified iron into a loup, a mass of solid iron and slag. A hammerman then worked most of the remaining slag out of the reheated loup with a helve hammer. Finally, he shaped the product into bars.

A sample of waste from the forge site shows the first stage of fining (Fig. 6). The finer had melted it in front of the tuyere, and the drops of liquid iron had solidified in a partially congealed mass when the finer's work was apparently interrupted. Analysis showed that the finer had removed all carbon, and left 0.06 percent each of silicon and phosphorus in the metal. Later in the process, the finer would remelt this metal and assemble the drops into a loup submerged in a bath of slag rich in iron oxide. He used the oxidizing flame in front of the tuyere and the excess iron oxide in the slag to remove the remaining silicon and phosphorus in the metal. Bringing these reactions to completion was the final test of his skill. Examples of tap slag drawn from the finer's hearth and slag from the bath under which the finer formed his loup both contained droplets of fined metal that were on their way to joining the loup when the slag solidified. We found this metal to be free of carbon, and to have a silicon and phosphorus content less than 0.01 percent. This level of purity is comparable to that of the best grades of the highly-prized Swedish Dannemora iron. The size of the slag "skulls" at the site suggest that the loup would have been a disk with a depression in its top, and about 300 mm in diameter and 150 mm thick. It would have weighed about 70 kg. A hammerman would have converted it to bars under a helve hammer and perhaps done the final shaping with a tilt hammer. The purity and low slag content of the resulting iron would have assured its uniformity and toughness, the requisite properties of gun iorn.

Its geographical setting makes the ironworks on Mount Riga nearly unique. We know the source of the ore and flux used in the blast furnace, and that the forge got its pig iron from this furnace. It is highly unlikely that anyone would have hauled pig from another furnace up the mountain to be fined, and even less likely that, once having hauled ore up to the works, anyone would reduce it in a bloomery hearth, where a large fraction of its iron content would have been lost in slag. Consequently, we can be confident that we know the raw materials used at both furnace and forge. Our reconnaissance of the wastes left at the works shows that we can reconstruct the chemical transformations achieved by artisans at the furnace and forge. Additionally, we have a documentary record from one of the forge's principal customer. The remains in place at Mount Riga could, therefore, tell us much about an important component of American ironmaking that is largely missing from the documentary record. A careful archeological excavation of this site would be a particularly valuable contribution to the history of American technology.

Robert B. Gordon
Yale University

New England Archivists Spring Meeting

The semiannual meeting of the New England Archivists (NEA) will be held May 5-6 at the Aetna Conference Center in Hartford, Connecticut.

The meeting this year will focus on the relationship between archivists and historians. Three workshops and six panel sessions have been planned. On Friday, May 5, a day-long workshop on using the *Arts and Architecture Thesaurus* will include hands-on exercises and discussion of access and description of archival and special collections material. In addition, there will be two simultaneous workshops on Friday afternoon. One will explore preservation microfilming, and the other will focus on exhibit design. The program saturday, May 6, will consist of three morning sessions and three afternoon sessions. The panels include discussions on the documentation and business community, digitization, and the internet, as well as the access and use of literary manuscripts, and the challenge of researching the lives of women. The program will begin with a keynote address by John Demos, Professor of History at Yale. He will discuss his experience and observations of New England archives as he researched material for his recently published book, *The Unredeemed Captive.*

Members of NEA should receive registration materials in the mail. Others who wish to receive pre-registration materials, or who would like more information on the meeting, should contact Colleen Paliwoda, NEA Spring Meeting Registrar, Corporate Information Center, S-112, Aetna life & Casualty, 151 Farmington Avenue, Hartford, CT 06156; tel. No.: (203) 273-9636.

Update on NNEC Blast Furnace Recording at Franconia, NH

Nearly two dozen volunteers participated in a 3-day weekend of blast furnace recording, surface inspection, and surveying at Franconia, N.H., last fall. The effort was co-sponsored by NNEC-SIA and the Franconia Area Heritage Council, and the main object of the exercise was recording the standing ruin of a ca.1805-1884 blast furnace, currently on private property but being considered by the Heritage Council for possible inclusion into a local historical park.

Prompted by a 1993 letter to the late Bill Taylor from Jewell Friedman of the Heritage Council, NNEC decided to do what it could to document the remains of the furnace grounds. I agreed to be project leader and coordinated between Jewell and the Chapter for a workable date. Since the Chapter was already committed to a spring 1994 weekend for continuing work at Richmond Furnace, Mass., the Franconia weekend was set up for September 9-11, 1994.

While Jewell made local arrangements (property owner's permission, parking space, bathroom facilities, brush clearing, list of local motels, heavy tools and ladders, etc.), I solicited the membership for interested volunteers and setting dates and work schedules. In addition to Donna and myself, the following volunteered all or part of their weekend for the project: Krista Butterfield, Karl and Eleanor Danneil, Bill, Allison, and Jonathan Edwards, David Engman, Dennis Howe, Matt Kierstead, Gloria Miller, Woody Openo, Marjorie Robbins, Walt Ryan, Megan Battey Todd and husband George, Carol Weatherwax, and Duncan Wilkie. Most are members of the Vermont Archaeological Society and/or the Northern New England Chapter - SIA.

Property owners Kevin and Patricia O'Brien cooperated fully, patiently negotiating our sometimes erratic parking, yet allowing us the use of their indoor bathroom, a few minutes' walk from the site.

The blast furnace stack of the New Hampshire Iron Factory Company, as seen from the west side of the Gale River. That's Woody Openo standing at lower left. (Rolando photo.)

Through Jim Garvin, a transit and associated equipment was made available to us for the weekend from the New Hampshire Division for Historical Resources. Bill Edwards and Karl and Eleanor Danneil utilized their Richmond Furnace expertise and gave us two full days of surveying. They gave the transit a good workout, using it not only on flat, clear ground (and up and down village streets and into peoples' driveways), but at times on edges of embankments, on shaky boulders, and even on ledges in shallow parts of the Gale River. I wish I hadn't seen some of the places I found the transit crew working, but I thank them for the valuable data they provided.

Jewell Friedman had the site cleared of brush ahead of time, and while we were there, continually ran back and forth between the site and her headquarters across the river from the furnace site, providing all manner of assistance.

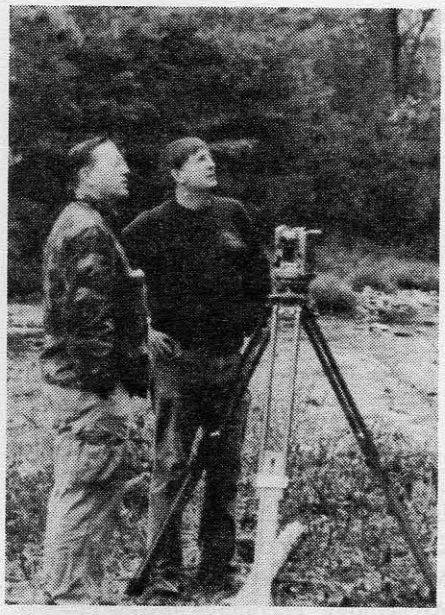
Non-participating spouses of the volunteers also helped by taking pictures, holding strings, making critical assessments of our goings on, but especially by helping carry our gear in and out of the site through the high (and sometimes wet) grass in addition to providing timely morning snacks.

Although the weekend was more on the chilly, drizzly side, much was accomplished. Our 246 volunteer-hours produced 47 sheets of field sketches that recorded data obtained from the furnace stack, associated grounds features, and the upstream dam site. Additional sheets of data were the result of two days of surveying nearly 75 points in and around the furnace grounds.

Physical field work was preceded by an excellent, informative paper, researched and written by Jim Garvin, titled "Chronology of the Development of The New Hampshire Iron Factory Company from 1805 to 1884," which outlined significant points of development of the industry. It contributed immensely toward our understanding what we did (and didn't) find at the site.

Walt Ryan led the furnace recording crew, and we obtained all manner of measurements and construction/operation details. Many rolls of photos and slides were taken of the stack, inside and out, and grounds. Through a hole in a side wall, we were able to squirm inside and see that most of the lining was intact, but the hearth was fully choked with the frozen-solid remains of the final charge. This means that the stack might have been abandoned while under operation or maybe the result of an accident too expensive for the owners to fix. Megan Battey did some shallow excavating through mostly surface debris at the mouth of the east archway where Jonathan Edwards' metal detector showed an unusually high reading (mostly rusted nails). Woody Openo and Krista Butterfield dug through breakdown in front of the hearth inside the main archway in an attempt to find the tap hole but to no avail. The tap hole is probably below floor level, which means that the original work floors are much farther down (future work). A number of different kinds of firebrick were recorded, some made in Amboy, N.J.

The Franconia blast furnace stack's most visible characteristic is its eight-sided configuration, the only one of this



Karl Danneil and Bill Edwards look at the furnace and plan strategy for their next reading. Gale River in background; dam site is just upstream to right. (Rolando photo.)

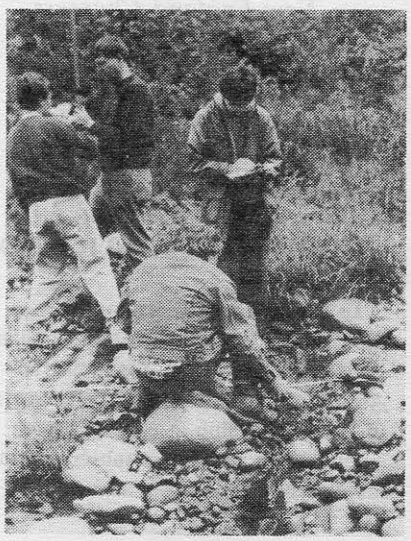
type known to exist in the Northeast. Close inspection of the furnace's interior binder hardware appears to indicate, however, why the stack was built with eight sides rather than the usual four. A name and date engraved into granite on an inside archway wall — "S. Pettee, Jr. 1859" — lends new information on the travels of Seneca Pettee, Jr., who was previously connected with blast furnaces in Maine, Massachusetts, and Connecticut. Richard S. Allen, fellow ironworks researcher, speculates that Pettee might also have been involved in building the Richmond, Mass., blast furnace in 1830, from his close association with builders of record: Holley & Coffing (formerly Holley, Coffing & Pettee of Salisbury, Ct. — see article by Robert B. Gordon in this Newsletter). Pettee's brother, Hiram, lived at Lenox Furnace, Mass., for a time, and when Seneca became manager of a nearby glass works, Hiram moved and became manager of the Briggs Iron Company in Lanesboro, Mass (Ca. 1850s). Seneca also co-purchased land in Cheshire, Mass., in 1848 where another blast furnace was built in 1851. But he disappeared from the scene soon after that, Franconia possibly being his final local connection with the iron industry. Rick Allen speculates that he went out west to Michigan or Ohio to follow new iron ore discoveries. (Or maybe he died in some quiet corner of New Hampshire?) A Pettee family history indicates he died in 1889 but doesn't say where.

Aided by Duncan Wilkie and local residents, we found the east and west ends of the upstream dam, and Duncan set a crew to work measuring the submerged/underground cribbing remains of the east end. Remains of the west end had been washed away, except for a telltale iron pin driven into ledge.

It's an exciting site for a number of reasons. First of all, of course, the stack is still fully standing, the only one in New Hampshire, although I understand there once were others. Although the grounds show evidence of having been machine-graded some years past, much data probably exists undisturbed below the surface. For example, a low, narrow tunnel, probably a tail race, extends from near the southeast corner of the stack toward the river, opening to the surface about halfway between the stack and the river. There are stone walls everywhere, outlining the extant of buildings that once stood here. Miscellaneous pieces of hardware lie here and there, some probably debris dumped here from elsewhere, but some identified as part of the ironworks. You can almost walk down the head race as it hugs the west shoreline from the dam right into the furnace grounds. And although the O'Brien home and garage were built exactly where charcoal and ore sheds once stood uphill and behind the stack, other foundation walls in the proximity give evidence of industrial activities. This is all on the west side of the river.

On the east side of the river is Franconia village on Routes 18/116. Slag not connected with blast furnace operations is eroding out of the shore and into the river on that side. Historical accounts mention an "air furnace" (puddling furnace?), a "forge shop with four fires" (bloomery?), and "a third furnace for making steel." These operations consumed much fuel and ore and produced much slag compared to the small amounts of specialized iron that were made. We found slag on the east side of the river that, through slag analysis being done by Matt Kierstead, might relate to these processes and point to important discoveries that could be waiting for future archeological work on that side of the river. Deed research would also help pinpoint "what happened where" on the east side.

Throughout most of the weekend, locals and tourists alike watched us from the east side of the river (some with binoculars), where the Heritage Council has a small park with illustrated panels that explain the function of the "Stone Iron Furnace" (as the nearby state historic marker identifies it). Some eventually found their way across the bridge and into the site, contributing what they knew about it, but most watched from the other side. Reporters and photographers from *The Union Leader* (Manchester, NH), and *The Boston Sunday Globe* also made an appearance, resulting in such sensational headlines



Jonathan and Bill Edwards level the stadia rod (left), while Duncan Wilkie (measuring) and Megan Battey record remains of dam footing. (Rolando photo.)

the following week as "A Big-Time Blast From the Past, Now a Monument to Days of Ore" or less hyped "Franconia Stone Furnace Stands as Monument to Iron Industry." One of the photographers was quite disappointed I wouldn't have one of us climb a ladder to the top of the stack for a "fantastic photo." Some stones at the top lean well outward, discouraging any furnace-top recording, although I was told that the local kids have no qualms about rock-climbing to the top.

Lunch for all volunteers was paid by the Chapter (we got a good break on the local lunch boxes). Saturday morning breakfast was provided to us compliments of Polly's Pancake Parlor. On Saturday evening the Heritage Council and dozens of locals turned out to treat us with their company, a fine potluck dinner, and find out exactly what was going on. I did a slide-illustrated program on blast furnace history in general, tying it to the local stack for context. Duncan Wilkie also provided information on previous work he did at the site.

A few of us plan a return session on May 26-29, the Memorial Day weekend, to check some measurements and fill in a few gaps in the data. Julie already knows we're coming. Two or three volunteers are all I need to help wrap things up on the west side. For anyone interested in joining (or watching), I plan to work noon to 4 p.m. Saturday (rain date Sunday), to allow people time to come and go without the expense of staying overnight (Donna and I are going to make a vacation weekend of it). Please contact me if you decide to come and work (don't forget your bug spray/net). With that done, I plan a day or two at various New Hampshire libraries and archives for additional data and map work, and I hope to have my comprehensive site report to the Heritage Council and the N.H. Division for Historic Resources by late summer 1995.

Thank you, everyone.

Vic Rolando
Manchester, VT

New Members Sought

The Southern New England Chapter (Massachusetts, Connecticut, Rhode Island) and the Northern New England Chapter (Vermont, New Hampshire, Maine), Society for Industrial Archeology, encourage anyone interested in the industrial heritage of the region to participate in their activities and research. Please use the form below.

NEW MEMBERS SOUGHT

Both the Southern & Northern
New England Chapters
are *eagerly seeking*
NEW MEMBERS

MEMBERSHIP APPLICATION

To apply for membership in either the Southern or Northern New England Chapter of the Society for Industrial Archeology please fill out the following form. Membership in either Chapter automatically includes a subscription to the Newsletter.

Northern New England:

_____ Regular $10.00 U.S.

_____ Student $3.00 U.S.

Make checks payable to: Northern New England Chapter, Society for Industrial Archeology, and mail to:

Walter Ryan
Tresurer, NNEC
PO Box 1321
Claremont, NH 03753

Southern New England:

_____ Regular $10.00 U.S.

_____ Student $5.00 U.S.

_____ Life $100.00 U.S.

Make checks payable to: Southern New England Chapter, Society for Industrial Archeology, and mail to:

Jack Yerkes
Treasurer, SNEC-SIA
108 Mountain Extension Road
Tariffville, CT 06081

Name: _____

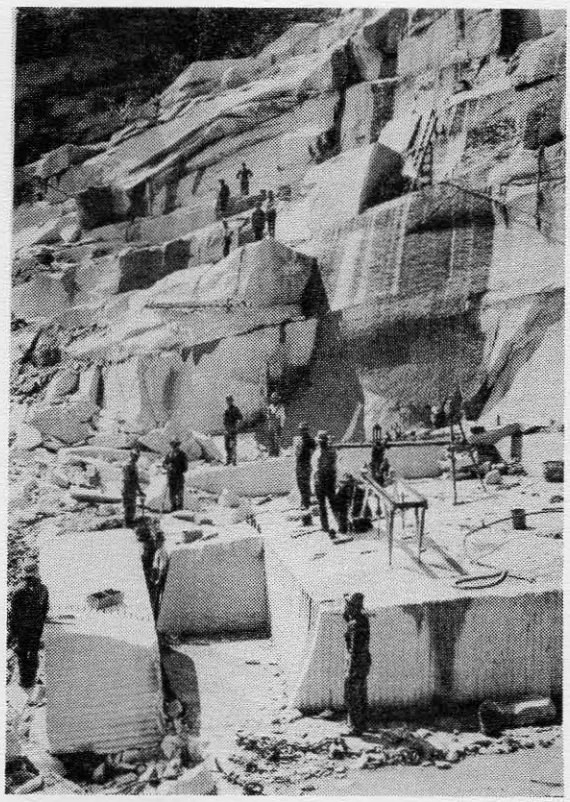
Address: _____

_____

Telephone: _____

Capital Views
A Photographic History of Concord, New Hampshire, 1850-1930

A new book published by the New Hampshire Historical Society and Heritage Concord, Inc.



New England Granite Company about 1910

The first study of New Hampshire's capital to appear in many years, *Capital Views* presents a unique insight into history. The 160-page book describes the ambience, architecture, industries, economy, and daily activities of a small but vibrant community through a wide variety of photographs. Many of the images, which were derived from family albums, private collections, and archival sources have never previously been published.

The book is organized into thematic chapters: transportation, industries, city and state government, culture and clubs, buildings and views, institutions, events, businesses, and parks and recreation. The ninety photographs are accompanied by clearly written essays which identify the view and photographer, and place the image in a broad historical context. Throughout its pages, *Capital Views* presents the history of a community that parallels that of towns and cities across New England.

Capital Views is co-authored by Elizabeth Durfee Hengen, an architectural historian, and Gary Samson, an award-winning photographer. Both are well-known to New Hampshire residents for their work on a broad range of preservation, publication, and photographic projects.

Order your copy of Capital Views today!

Name _____

Address _____

City/State/Zip _____

Telephone _____

	Quantity	Amount
Softbound Edition at $19.95	_____	$_____
Hardbound Edition (out of print)		
Shipping & Handling		$_____
Total Amount Enclosed		$_____

Add $3.00 postage & handling for the first book; $1.00 for each additional book to the same address.

Mail this order form with your check, made payable to the New Hampshire Historical Society, to: Museum Store, N.H. Historical Society, 30 Park Street, Concord, N.H. 03301-6384. Need more information? Call the Historical Society at (603) 225-3381. Thank you!