Society for Industrial Archeology · New England Chapters

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CONTRIBUTORS

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Call for Papers

for the: 28th Annual
New England Industrial Archeology Conference
March 7, 2015
hosted by:
Southern New England Chapter – Society for Industrial Archeology

Fire Alarm & Telegraph Building
230 Park Avenue
Worcester, Massachusetts

The Southern New England Chapter of the Society for Industrial Archeology invites proposals for papers to be presented at the 28th Annual New England Industrial Archeology Conference. The conference is alternately hosted by the Southern New England and Northern New England Chapters as a forum for presenting research of our industrial past. The conference is to be held at the former Fire Alarm & Telegraph Building (managed by Preservation Worcester) in Worcester, MA, on Saturday, March 7, 2015. Papers are welcomed on all topics related to industrial history, archeology, manufacturing, preservation, engineering, architecture, etc., in New England and elsewhere. Proposals may be submitted for individual papers, team papers, or reports on works-in-progress. The time limit for each presenter will be 30 minutes. Student Papers are welcomed.

Format: Each presentation proposal must include: (1) title; (2) an abstract of not more than 300 words; (3) a brief resume of the author(s), including postal address, telephone, and e-mail; (4) final presentations shall be in MS PowerPoint or PDF format, or presenters may bring their own laptops for connection to the a/v equipment.

Deadline: Proposals must be received by January 31, 2015.

Send via E-mail: proposals in PDF or MS Word format to: mnbelanger@comcast.net or via USPS to: Marc N. Belanger, 161 Highland Street, Taunton, MA, 02780

Theodore Zuk Penn

10/5/40 – 10/27/14

Obituary:
Theodore Zuk Penn, of Charlestown, RI, died at home, surrounded by his family, on Monday, October 27th at age 74. Ted had lived his whole life with enthusiasm, courage and grace even though a major stroke challenged him in 1999. He was born and raised in Washington, D.C., where he mainly worked on hot rods until college and two Master's degrees. His life's work spanned research in historical technology, two museum directorships and website design. He enjoyed all manner of things such as building stone walls, playing guitar, working hard, all of his life. His kindness, sense of humor, faith and fortitude touched many. He is survived by Nancy, his wife of more than 50 years; his son, Trevor; daughter, Jessica; grandson, Taylor Theodore; sister, Lynne; brothers Mark and Tony; cousin Margaret; sisters and brothers-in-law, Howie, Laura, Chuck, Andrea, Carol and beloved nieces and nephews. A memorial celebration of Ted's life was held on Monday, November 3 (All Soul's Day) at 1:00 p.m., at his parish The Church of the Holy Spirit, 4150 Old Post Rd., Charlestown, RI 02813. In lieu of flowers please send donations in honor of Ted to The Church of the Holy Spirit or to a charity of your choice.

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When Richard Candee sent me this obituary, I remembered how Ted and Dick had worked together for years at Old Sturbridge Village, and it reminded me that many of the founders of the Society for Industrial Archeology are now beginning to reach that age. We all have a host of wonderful memories of Ted and especially of seeing him each year at the annual meetings and tours of the SIA. He was invariably patient and thoughtful, a real mentor for us younger industrial archeologists. I will never forget the time he was consulting with me at Canterbury Shaker Village in New Hampshire. It was in the late 1970s, and we had just arrived at the edge of one of the Shaker mill ponds. Ted ripped off his clothes and jumped into the water so fast that I barely knew what was happening! Later, he explained that he liked to do that on all of his consulting projects—he jumped into all of the mill ponds on his projects! We will never see his like again. Ted was one of the greats in our field.

David Starbuck

Passing of Rick Greenwood

It is with great sorrow that we report that long-time SIA member and former SNEC president Richard E. Greenwood died on October 22 at his home in Barrington, Rhode Island. The cause was advanced cancer.

From Pat Malone: "As you know, Rick was a wonderful guy and a dedicated industrial archaeologist. We will all miss him very much. Our field has lost one of its best practitioners. Rick was one of the finest writers I know. He always did superior work as a preservationist and as a scholar. He was equally adept in archives, classrooms, and preservation meetings. He could read a building, examine a waterpower site, or dig through archaeological strata as well as anyone. Whenever he led a tour or delivered a conference paper, you knew you were listening to an expert with a genuine enthusiasm for industrial history."

You can read on obituary for Rick Greenwood on the SIA website: http://www.sia-web.org/passing-of-rick-greenwood/

SNEC-SIA President's Report

Fall 2014

It has been a surprisingly active year for us, with a total of six tours attended by more than seventy different people. This could not have been possible without the help of several individuals who stepped up to help, including: Greg Galer who introduced me to Tony Sapienza of Joseph Abboud Manufacturing in New Bedford, where we had an excellent tour in April; and Ron Klodenski who with the help of Bill Gerber organized the very well-attended tour in May of the Middlesex Canal Museum – including a bus excursion along the historic canal route; and Richard Casella [SIA], who introduced me to George and Tim Rhodes of M.M. Rhodes & Sons in Taunton which we visited on June 21; and Sara Wermiel, who organized a fascinating tour of the MWRA Deer Island Wastewater Treatment Plant on June 30; and also Darrell Petit who gave us a great tour of Stony Creek Quarry in September. Thanks to all those who helped make these events possible! The write-ups for these tours can be found elsewhere in this issue of the newsletter. I'd like to encourage all members to make an effort in 2015 to participate in the chapter in some way. Whether it be suggesting a tour, helping spread the word ("networking") about SNEC, or simply providing tips and information for the newsletter. Our chapter covers a large area, and most of us don't know what is going on in other places, specifically if it affects a historical industrial site. Remember the Department of Homeland Security slogan: "If you see something, say something!"

On November 1, SNEC members and guests gathered at the Attleboro Area Industrial Museum for the annual fall business meeting. We started with a reading of Rick Greenwood's obituary prepared by Pat Malone. Treasurer Sara Wermiel gave a brief summary of the chapter's finances year-

to-date. We are in very good shape financially. There was also a discussion of the petition which we had introduced earlier this year that requested a change to the section of the SIA bylaw that requires chapter officers to also be dues paying members of the national organization. In an effort to promote unity, and possibly entice more people to come forward and serve as chapter officers, it was instead agreed upon that the SNEC shall adopt a new policy, and shall pay the SIA membership dues for its officers, beginning with the 2015 calendar year. There was also a discussion relative to the future of traditional mailings versus e-mail distribution of newsletters, tour notices and other correspondence. The new SNEC membership renewal form (included in this issue and posted on the website) will include check boxes by which you can state your preferences on this matter. I kindly ask all of you (including life members) to provide us with this information, so we can make the communication process more efficient, while possibly saving us time and money in the long run.

The annual meeting also included a discussion of the long term continuation of the chapter, including the possibility of a merger between the SNEC and NNEC. This is not as far-fetched as it may seem, since we already have a long tradition of cooperation and shared resources, including the newsletter, winter conferences, website and other activities. There would be tangible benefits to a merger, such as streamlining finances and communications. It would be important to continue having leadership and activities in both the northern and southern parts of the region. A merger would also make it easier to have a single, unified message ("branding") to promote our efforts throughout New England. This is not something that will or needs to happen overnight. This should only happen if and when the time is right. NNEC president David Dunning and myself have agreed that our chapters should continue "as-is" for now. During the meeting, there was also a vote that SNEC member dues will remain at their current levels for the coming year. The annual election was also held, with Sara Wermiel remaining as treasurer, Mike Green remaining as secretary, and myself remaining as president for another year. We are pleased to announce that Erin Timms will serve as vice-president/program coordinator for 2015.

The part of Attleboro surrounding the museum was once one of the largest jewelry manufacturing centers in the nation. I had planned a short walking tour for the afternoon, but unfortunately the cold rainy day prevented this from happening. However, the map and info I prepared has been posted on the website under the "events" page, in case you happen to be in the Attleboro area and would like to check it out.

Lastly, the Call for Papers for the 28th Annual New England Industrial Archeology Conference to be held on March 7, 2015 in Worcester is included in this issue of the newsletter. It will be held in a new location for 2015 – the historic former Fire Alarm & Telegraph Building located at 230 Park Avenue. The 1925 building sat vacant for many years and has recently been renovated. The conference will be held in the new community room managed by Preservation Worcester. If you have anything to present, please contact me no later than January 31, 2015.

Marc N. Belanger
Taunton, Mass.
mnbelanger@comcast.net

NNEC-SIA President's Report

Fall 2014

Election Results

We had our annual meeting with the fall tour in Windsor, VT, on October 25th. The minutes are posted on the chapter web site www.nec-sia.org . The following board members agreed to serve another term: David Dunning - President, Ray Breslin - 1st VP, David Coughlin - 2nd VP, Dennis Howe - Secretary. Richard Coughlin was elected Treasurer to replace outgoing Carolyn Weatherwax. We thank Carolyn for her 16 years of dedicated service to our chapter.

New Member Organizations

Welcome Kathleen Wheeler, President of Independent Archeological Consulting, LLC. With a staffed office in Portsmouth, NH, IAC provides a full range of archeological assessment services to clients in Northern New England. IAC assists civil engineers, planners and developers to meet state and federal regulations and guidelines. Jesse Cofelice, a staff member, says that while IAC does what they do for income, they are more interested in what SIA does for satisfaction. We look forward to a mutually beneficial relationship.

Also welcome Jeanne Williams, Executive Director of the Feeder Canal Alliance. The FCA, in Glens Falls, NY, does industrial archeological research (including digging) and preservation efforts in the Champlain Canal region. Jeanne is looking forward to a very close working relationship with NNEC. We will plan a tour of some of FCA's canals.

We need more new members - you can help.

Some historical museum visitors may be glad to learn that SIA exists. If they picked up one of our flyers, they could go to our web site and learn all about us and perhaps join. We all have several historical museums near us. Almost every town has a local one besides the big regional ones. E-mail David Dunning at dunmark@tds.net and he will send you some flyers and racks to put them in. Most small historical museums are closed for the season now but start searching them out and we'll gear up for this with the spring newsletter. Our tour guides at the American Precision Museum and the Attleboro Area Industrial Museum both plan to join.

Waterwheel Puzzle

The next time you go by a sign for Old Mill Properties real estate, see if you think there's anything wrong with the wa-

terwheel in the logo. The owner declined my request to print it here but you can see it at www.OldMillProps.com . E-mail your thoughts back to me at dunmark@tds.net .

DIY Industrial Archeology (cont.)

When exploring old sites, we often see or uncover a cast iron machine part that has a company name and location on it. That's a good starting point to figuring out what they used to do or make there, if we don't already know. That casting is part of the equipment that was used there. You can Google search the name on it when you get home (or write then on your smart phone) and often learn what type of equipment that company made. Even if they'd been out of business for fifty years, it may still appear. If the company made tannery equipment, then you'd know that they were digging up a tannery. If the Google search comes up dry, call the historical society or the library's reference room in the city where the machine was made. If you can inspire their curiosity, they'll be glad to help. Then from knowing what type of machinery was used at the site, you can start to figure out what they made or did there. (However, if the casting reads Smith Boiler Works, keep digging because you've only learned that they made and used steam.) Use creative research, like an investigator.

David Dunning
NNEC President
dunmark@tds.net
603-526-6939

Middlesex Canal Museum Visit and Bus Tour

May 3, 2014

On May 3, 2014 about thirty people took part in a joint SNEC/NNEC-SIA and Middlesex Canal Association (MCA) tour of the Middlesex Canal Museum in North Billerica, Mass., followed by a guided bus tour along the route of the historic 27-mile-long canal. The Middlesex Canal connected the Merrimack River in today's Lowell with Charlestown and the Charles River in Boston from 1803 to 1851.

MCA Director Bill Gerber introduced participants to canal history and its geography with the "Journey Along the Middlesex Canal" video and a presentation at the museum. Bill and MCA President J. Breen then led a narrated bus tour extending from the canal's northern end in Lowell to the Mystic Lakes in Winchester. The bus tour included a pass-by of the Shawsheen Aqueduct on the Billerica-Wilmington line, and a stop at the 1803 Gillis Lock House in Wilmington. At the site of today's Mystic Lakes, a Middlesex Canal aqueduct carried boat traffic over the brook that was later dammed to form the lakes. In its day, the canal continued south to Charlestown, but almost none of the canal between Winchester and Charlestown is still visible today.

Tour participants stopped for lunch at the Loammi Baldwin Mansion in Woburn. The mansion is now the Sichuan Garden Asian restaurant, but the historic décor and features of the house have been preserved. Baldwin was the canal's

Bill Gerber leads the tour during a stop at the 1803 Gillis Lock House in Wilmington as part of the joint SNEC/NNEC Spring Tour of the Middlesex Canal.

The 1803 Gillis Lock House in Wilmington, now a private residence.

superintendent of construction, and part of the canal is still visible within a few feet of his mansion.

Bill Gerber produced a comprehensive 18-page handout for reference during the tour. Below is a sampling of the many interesting points in Bill's publication:

- While the canal was in business from 1803 to 1851, its most prosperous period was 1819-1833.
- The canal had eight stone-and-wood aqueducts, which are bridges with troughs for carrying water. Such structures allowed canal boats to cross over streams and other obstacles. (Tour participants viewed the restored remains of the aqueduct spanning the Shawsheen River.)
- During its lifetime, the canal carried mostly New Hampshire timber and granite to Boston for use there and for shipment throughout the world. It also carried agricultural and manufactured products.
- Canal boats ranged in size from 45 to 75 feet in length and from 9 to 9-1/2 feet in width.
- Loammi Baldwin, the superintendent of construction,

Middlesex Canal tour participants walk along the former Middlesex Canal bed near Mystic Lakes in Winchester, MA. All photos by Marc Belanger, May 3, 2014.

was responsible for adapting the formulation of hydraulic cement for use in canal building. Hydraulic cement is capable of hardening while under water and had been known since ancient times. Baldwin formulated his cement by finely grinding volcanic ash and mixing it with lime and sand.

- The railroad became the canal's greatest rival and the mechanism of its demise. Ironically, the railroad builders used the canal to transport rail construction materials and the first steam locomotive used by the Boston and Lowell Railroad.
- The early success of the canal helped to inspire construction of the Erie Canal in New York and canals in other parts of the U.S.
- The canal gave practical experience to engineers of the period and is considered by many to be the birthplace of American civil engineering.

Much more information, including maps and sketches of the canal, is available on line at www.middlesexcanal.org. The Middlesex Canal Museum and Visitors Center, 71 Faulkner St., North Billerica, MA, is open Saturdays and Sundays from 12 - 4 pm. Admission is free, but donations are appreciated.

Ron Klodonski,
Newburyport, MA

SNEC-SIA Tour of M.M. Rhodes & Sons, Taunton, MA

June 21, 2014

A member of the Rhodes family has gone to work at M.M. Rhodes & Sons Co. at 12 Porter Street in Taunton, Massachusetts, almost every day since 1861. Sundays and holidays were often excepted, but not always, and even if work was not done, per se, boilers had to be turned on and security had to be checked. Saturday, June 21, was no different, except that the factory was officially out of business after more than 153 years and six generations of family operation. It was opened that day for members of SNEC-SIA to take a tour arranged by chapter president and Taunton resident Marc Belanger. There was great interest in the event and about seventeen people showed up, with one coming from Pennsylvania, others from Connecticut and Rhode Island, and the rest mostly from Massachusetts. One person saw all the cars and just came in out of curiosity. He stayed until the end.

The company was founded in 1861 by Marcus Morton Rhodes for the manufacture of small metal fasteners like coffin nails and glazier points. At some point in the 1860s Rhodes invented a machine to produce papier-mâché shoe buttons. Sales were not good until the Franco-Prussian War in 1870 cut off shoe buttons from France. At that point the business boomed. Shoe buttons were the main product until around 1913. The company was deemed to be the first successful shoe button maker in the country and supplied most of the market for years.

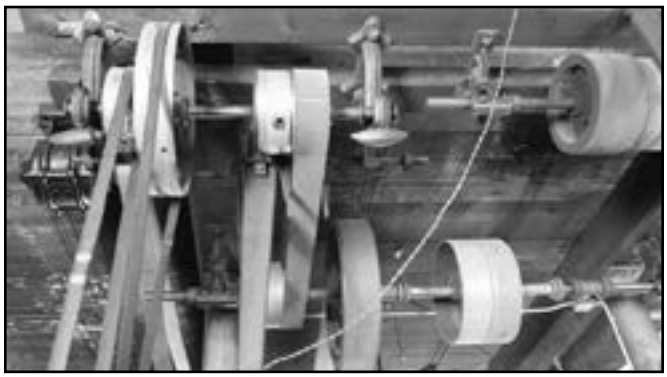
After 1913, when shoe buttons fell out of use, the company turned to the production of electrical and telephone wire fasteners to supply a growing need for the new technologies in a rapidly expanding nation. Those products, including insulated staples and cable clamps, became the base of the business for the next 100 years until closing this year. While the company survived for more than 150 years, much of the technology of the late 1800s remains in place, including belt-driven machinery (originally powered by steam, now powered by antique electric motors), and much of the original knob-and-tube wiring (still live).

Overhead belt drives were state-of-the art in 1880 when the company built a three-story brick building to house its burgeoning shoe button business. However, little need was seen to change it over the years and it was maintained for a number of machines throughout the plant until closing in May of this year. It was no doubt one of the very few businesses to keep belt-driven machinery in place for such a long time.

There was great interest in the oldest building on the property which dates from the 1850s. It is known as the paint shop.

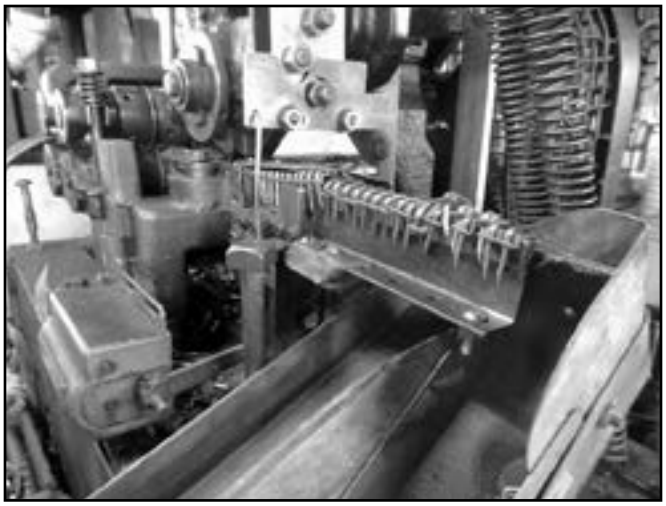
At left, the main three-story brick building of M.M. Rhodes & Sons, Inc., built in 1880. The older wooden building on the right dates from the 1850s. It was originally an umbrella factory, purchased by Marcus Morton Rhodes in the 1860s and adapted as a "Japanning house" for finishing small metal items and papier-mâché shoe buttons, which was the company's primary product for many years.

The oldest building on the property dates from the 1850s. According to the owners, it was originally an umbrella factory. It was purchased by Marcus Morton Rhodes in the 1860s and converted to a "Japanning house" for finishing small metal items and papier-mâché shoe buttons, which was the company's primary product for many years. The drying ovens inside were later used to paint and dry other small metal items such as tacks, staples and cable clamps.



Detail of the pulley-and-belt power system in the main shop. Note the antique electric motor on the left and the knob-and-tube wiring still used for lighting. The wiring for the motors has been upgraded to modern standards.

A view of the "main shop" containing an array of antique machinery (mostly small presses), modified slightly over the years to produce a variety of small metal items such as insulated staples and cable clamps for telephone and electrical wiring. The machines in this room are still run by an overhead shaft-and-belt system – originally powered by a steam engine in an adjacent building, it is now operated by antique electric motors.



Detail of an insulated staple machine.

The old forge.
All Photos and captions by Marc Belanger.

As its name implies, it was used to paint products. Steam heated ovens were used to dry millions of pieces at a time. A rail and trolley system was used to load the larger ovens.

The tour was also attended by the company's historical consultant, Rich Casella, who documented it with video filming and still photos. The company is presently preparing an application for listing on the National Register of Historic places and is looking for ways to further document its history from numerous records that are available. The owners are looking for ways to preserve some of its equipment for historic purposes. Any suggestions would be appreciated. George and Tim Rhodes can be contacted at 508-824-5321 or at mmrhodes@tmlp.net

George Rhodes,
Taunton, Mass.

View of the "rattler room". Freshly painted metal items are loaded into the belt-driven drums with sawdust and rolled to remove bumps and provide a smooth finish to the products.

A view of the oven and trolley system inside the paint shop (aka "Japanning house"). Freshly painted items were placed on metal trays and onto the racks. A two-way track system allowed the carts to be rolled directly into the drying ovens. The tracks extend into a nearby storage room. This building contains twelve of these large ovens, and several smaller ovens in which the trays are loaded in by hand. It also contains belt-driven mixing drums where the paint was applied to the products.

SNEC Tour of the Massachusetts Water Resources Authority's Deer Island Treatment Plant

June 27, 2014

Touring Deer Island: process and structures

You see them across the harbor from South Boston, or when flying out of Logan Airport: the gigantic eggs, which are set among tall wind turbines and a network of structures. The eggs are sludge digesters, and the site is the Deer Island Treatment Plant (DITP). This former island is now the end of a finger of land extending from the town of Winthrop (the gap between them filled by the hurricane of 1938). It has been used in the regional sewerage system since the 1890s, and today is the place where wastewater from the Massachusetts Water Resources Authority (MWRA) service area is treated before being discharged into the ocean. SNEC members took a tour of the plant on June 27, 2014 and got a very thorough introduction to, and view of, the operations and facilities of this vital part of Boston's public works infrastructure.

SNEC tourons gathered on a sunny afternoon in a room that had been the former coal storage shed of the Deer Island Pumping Station, predecessor to DITP. Erected between 1895 and 1910, the historic pumping station building has been preserved and renovated as reception and training space (Fig. 1). Our tour leader was Charles W. Tyler, Program Manager, Process Operations at the DITP, and a long-time worker at the plant.

Tyler began by giving an overview of the history and operation of the plant (for more on the history, see below). The treatment process begins with wastewater (from homes, businesses, and streets) arriving at the DITP through tunnels and then being raised by pump stations (Fig.2). The first

Fig. 1. *Former Engine/Pump House addition (1909-10) to the historic Deer Island Pumping Station, now rehabilitated and part of a reception and training building.*

Fig. 2. *The round brick building is the South System Pump Station; beyond it are odor control and centrifuge buildings and egg-shaped digesters rising in the distance.*

step in treatment is to remove large pieces of junk called grit. Then the wastewater receives primary treatment in clarifiers: scum rises and sludge settles out (Fig. 3). This step removes roughly half of the solids and toxins. The partially treated water goes on to secondary treatment, which involves mixers, reactors, and clarifiers, which treat the remaining solids through biological processes – microorganisms that eat organic matter – and gravity. The plant manufactures oxygen to support the biological process. Meanwhile, the scum and sludge removed by the treatment phases goes to anaerobic digesters – the eggs – of which there are twelve (Fig. 4). Digestion yields methane gas, which becomes fuel to run boilers at the plant that provide heat and steam to run a turbine generator that produces electricity. The digested sludge is sent via a tunnel to a facility at Fore River where it is processed into fertilizer. Finally, the treated wastewater is disinfected in basins on the east side of the island near the start of the outfall tunnel, and then flows out through this 9.5-mile-long tunnel to be diffused into ocean water. As you can imagine, huge pipes are a feature of the plant, transporting waste in various states to the different treatment stages, and carrying chemicals and so on to where they are needed. Our walk through the plant started on the west side. We went into the South System Pump Station (Fig. 2). Outside we walked among the digesters (Fig. 4) and past the gravity thickeners with their curious-looking, scalloped pink roofs. The last main feature we saw was the area with primary clarifiers, secondary reactors, and secondary clarifiers (Fig. 3). At this point, I must say, the odor was pretty bad. Odor control is a challenge; there are several odor control facilities at the plant. We ended our walk back at the historic former pumping station and heartily thanked our host and guide for a fine tour.

While Mr. Tyler said the plant has about 235 listed positions and more people than that actually work at the DITP, I can't recall seeing anyone working (apart from our guide and the tour coordinator). We of course didn't visit any offices.

Fig. 3. *Looking north over the tanks for primary clarifiers, secondary reactors, and secondary clarifiers, with a water tower and wind turbine in the distance.*

Fig. 4. *Walking amongst the digesters. Each is about 90 feet in diameter and 130 feet tall made of boiler steel. Most were built by the Chicago Bridge & Iron Co.*

Nevertheless, this is evidence of the extent of computerized control of its operations. Computerized systems help operate the plant, assess the plant's discharge, and also keep track of the condition of equipment.

History of the Deer Island water treatment facilities

Deer Island was still an island when it was made part of the Boston area's first regional sewerage system (the Metropolitan Sewerage System): it was the site of the final pumping station in the North Metropolitan District. Construction of sewers and facilities for the District began in 1890. The boiler and engine/pump houses at Deer Island went into operation in 1895. Other initial facilities were completed by 1896. Sewage arrived at the plant from sewers throughout the district where it was raised by steam-driven pumps to a height that allowed it to flow continuously through the outfall conduit running form the island out into Massachusetts Bay.

The process involved discharging the raw sewage – the combined (un)sanitary wastewater and runoff from the service area – into the harbor through the approximately 1,900-foot-long conduit, under the assumption that tides would carry it off … eventually. Early on, it was noted that except at ebb tide, "sewage fields" formed and moved around the harbor (like today's Great Pacific Garbage Patch). Moreover, water far from the field became "discolored." And the outfall conduit ended a few hundred feet from the Deer Island Light, built just as the sewerage system was being constructed, in obvious ignorance of the city's plans. This must have meant some stinky times for the lighthouse keepers.

The quantity of wastewater kept growing along with population. The plant was expanded at various times (e.g., 1909-10) and in 1968 a primary treatment plant was added. Federal laws, such as the 1948 Water Pollution Control Act and 1972 Clean Water Act, forbade the dumping of wastewater and then sludge into the ocean. But Deer Island continued to discharge raw or partially treated sewage.

The state's failure to invest adequately in sewage treatment infrastructure resulted in a thoroughly polluted harbor. In 1982, the city of Quincy sued the Metropolitan District Commission (MDC), which at the time had control of regional sewerage, water, and parks, over fouling of a Quincy beach. This lawsuit uncovered the extent of the harbor's degradation. As a result of bold action by the judge and his special master, the legislative impasse was broken. The MWRA was established in 1985 to take over the water and sewer responsibilities of the MDC. Construction of the new plant at Deer Island began in 1988 and parts came online during the next decade.

Preservation and parks on Deer Island

The original plant at Deer Island included a connecting sewer line, wharf, outfall conduit, housing for resident staff, and a pumping station with a boiler house, engine/pump house, coal house, screen house, and other spaces. The historic pumping station survives and has been preserved and adapted; the other structures and facilities are gone.

The original 1894-96 section of the pumping stations is a one-story, brick building with terra cotta trim and a slate-covered roof. It was designed by Boston architect Arthur F. Gray. In 1909-10, a double high addition was made to the east end of the engine/pump house (Fig. 1), and the original coal and screen houses at the west side were also enlarged.

The DITP today occupies about 160 acres, nearly all of the island, which once also accommodated the Suffolk County House of Correction. The plant is off-limits, except for tours. But as part of the mitigation for the expanded plant, land on Deer Island it does not use was made into a park, which goes by the charming name Deer Island Public Access Area. Most of the parkland is on the north side of the island, and there are paths on the east and west, and an area on the south. It's nicely landscaped and judging from the cars in the park parking lot, popular with joggers and walkers.

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Some sources: "Deer Island Pumping Station," HAER No. MA-120, Nov.-Dec. 1990; "The Deer Island Sewage Treatment Plant," http://www.mwra.com/03sewer/html/sewditp.htm ; Charles M. Haar, *Mastering Boston Harbor: courts, dolphins, and imperiled waters* (Cambridge: Harvard U. Press, 2005); Clarence A. Moore, "Extension of the North Metropolitan Sewerage System Outfall at Deer Island, Boston Harbor," *Journal of the Boston Society of Civil Engineers* 4 (March 1917): 113-122.

Sara E. Wermiel,
SNEC treasurer and tour organizer

Stony Creek Quarry – Tour Summary

September 12, 2014

On September 12, 2014 a small group of SNEC members met in Branford, Connecticut, under a brilliant blue sky for a tour of Stony Creek Quarry led by Darrell Petit. Many of you will recall Mr. Petit's presentation given at the 2014 Winter Conference in Plymouth, NH, where he gave a detailed overview of his collaborative work as a sculptor and director of business development at Stone Creek Quarry Corporation. Petit began working at the site in 1990, and as an international architectural sculptor, he forged relationships with a number of renowned architects - including Cesar Pelli, Kevin Roche and Diana Balmori, among others.

The Stony Creek area is known for its distinctive "flowing" pink and black granite (technically a biotite granite gneiss), first quarried in 1858 by Benjamin Green. By 1900, 1,800 men, mostly European immigrants, were employed in about a dozen quarries in the area, including the well-known Beattie Quarry on Leetes Island in Guilford, established by John

Beattie in 1870. The Beattie quarry is probably most famous for supplying the granite for the pedestal of the Statue of Liberty. Stony Creek Granite has been widely used in dozens of other notable structures, ranging from South Station in Boston to the postmodern AT&T Building in New York City.

The current Stony Creek Quarry property was originally established in 1887 by the Norcross Brothers of Worcester, who also developed a rail spur from the site to the New Haven Railroad mainline (over what is now Quarry Road), with a connection to its dock on Long Island Sound. In 1923 the property was sold to Dodds Granite Company of Milford, Mass., who operated it until 1929. The quarry was inactive until 1957 when it was reopened by the Castellucci family of Rhode Island. In 1977, over 400 acres of land surrounding the quarry were sold to the Town of Branford for conservation purposes, while the 55-acre parcel containing the quarry was leased back to the quarry operators. In 1987, a new quarry was opened directly north of the old one. It was developed with the help of technology brought from Finland. Unlike the "old hole" which utilized a traditional "deep-cut" operation utilizing derricks, etc., the new quarry is a "drive-in" type, employing heavy machinery to efficiently cut and remove standard 25-ton "quarry blocks," measuring approximately ten feet by six feet by four feet. The configuration of the modern quarry operation is enhanced by the relatively horizontal beds by which Stone Creek granite was naturally formed over 600 million years ago. The lease is currently controlled by Stony Creek Quarry Corporation, with Doug Anderson as president. A portion of the property, containing the old Norcross Brothers Quarry, was added to the National Register of Historic Places in 2003.

During the tour, Mr. Petit demonstrated some of the various granite finishes available, including "split face," "flamed" and "polished" versions. At first glance, some in the group could not distinguish between the natural split face and the flamed finish. However, the advantage in the sparkle and natural beauty of the rock crystals from the split face was obvious in bright sunlight. Petit also explained how some fabricators might cut corners and provide the flamed finish for a project, unless the specification clearly indicated the proper finish. He also explained how the company works with a number of preferred fabricators to properly meet the various specifications required by their customers. Unlike other, more uniform granites, the highly variable nature of Stony Creek often means that no two samples are exactly alike. A major part of their business over the years has been to provide consultation services to properly educate others in the unique natural beauty, historic relevance and proper application of Stony Creek Granite.

Petit also described how the quarry operation has evolved to produce product on an "on demand" basis with very little backlog in inventory. Smaller pieces that do not meet the strict dimensional standards for architectural work might be utilized by the Army Corps of Engineers for shoreline

protection projects. The remainder is processed on site into crushed stone of varying specifications for a variety of construction projects.

The tour progressed into the bottom of the quarry shelf to the location of a massive block, destined to become part of the new city hall plaza in Brockton, Mass. The block had already been "flamed" on one edge to create a deep channel roughly four inches wide. The block was to be later drilled along its upper and lower edges to be "lightly" blasted to nudge it from the shelf, allowing it to be moved and further divided with the use of heavy machinery. Petit explained how just the right amount of explosive is required to avoid damaging the rock. He also pointed out an area of the quarry where the company recently experimented with "wire saw" technology that is now widely used in the industry. The company is still evaluating their options for acquiring the new equipment, which would constitute a considerable investment for a small operation. Until then, they will continue to employ a mix of old and new technologies and techniques. Other recent projects where Stony Creek Granite has been used include the Smithsonian Institution National Museum of American History, Washington, DC, and Battery Park in New York. For more information, refer to the links below.

References

National Register of Historic Places Registration Form - Norcross Brothers Granite Quarry (2003). http://pdfhost.focus.nps.gov/docs/NRHP/Text/03000315.pdf

Stone World: Revitalizing an American stone legacy, November 1, 2009. http://www.stoneworld.com/articles/revitalizing-an-american-stone-legacy

Darrell Petit website: www.darrellpetit.com

Stony Creek Granite Corporation website: www.stonycreekquarry.com

Marc N. Belanger
Taunton, Mass.

Maine Shipbuilding Tour

Last May, the SIA covered a lot of topics and territory in southern Maine as part of its Annual Conference headquartered in Portland. During the event, David Dunning lead a tour up the coast to Bath; here are some highlights, leaving out timing details. (Dave Coughlin lead a tour of the old forts in Portland harbor and has prepared a separate write-up.) Parts of this article have been copied with permission from a tour report prepared by Steve Muller and published in the SIA Newsletter (Vol. 43, No. 3, Summer 2014).

The Maine Maritime Museum, in Bath, is a must see if you're ever planning a vacation to Maine. It shows and explains the history of shipbuilding in great and very interesting detail. It's one of those museums that you go into thinking you already know all about it and leave realizing that you actually knew very little on the subject. The museum is built on the grounds of the old Percy & Small shipyard which docents showed us around and told the story of.

Percy & Small Shipyard operated from 1897 until 1920. It specialized in schooners (rigged fore-and-aft), which were well suited for the coastal cargo trade because they could sail closer to the wind than square-rigged vessels. A schooner also required only a crew of about 15 instead of 50-60 to operate. Several of the former shipyard buildings, including the mould loft, carpentry shop, and the paint and treenails shop, still exist, and most are open to visitors. On what was the main building way, a sculpture of steel ribs indicates the dimensions of the *Wyoming*, the largest schooner built in the yard. At 329.5-ft. long, 50-ft. wide, and 30-ft. high, it would be a respectable-sized ship even now. The keel of the Wyoming was laid in 1907, and the ship served in coastal and war transport until 1924, when it was lost in a nor'easter.

Skeleton of the schooner Wyoming's *bow at Percy & Small Shipyard. It was more than a football field in length.*

We couldn't get into Bath Iron Works (BIW) for safety and security reasons, but they sent a speaker to address us at the Museum. He was retired from BIW and also the Navy. American shipbuilding started near Bath in 1607 when members of an unsuccessful colony at Popham built a ship to sail back to England. BIW itself was founded in 1826 and consolidated with several other firms after the Civil War to become the principal builder of iron ships in a region still dominated by builders of wooden ships. BIW is now a subsidiary of defense contractor General Dynamics. BIW built its first military ship in 1892. During WWII it launched a Liberty ship in only 17 days. For some time the yard has built only military ships, and to date it has delivered 266 to the U.S. Navy. The yard currently is building five Burke- and two larger Zumwalt-class guided-missile destroyers. It is also bidding to build cutters for the U.S. Coast Guard. The yard has 6,000 employees and is looking to expand the work force by ten percent. Besides the ship assembly facility at Bath, it has factories in Brunswick and Hardings for subassemblies. Hassett also showed a BIW video detailing the construction and commissioning of the Burke-class destroyer USS John Chafee. He said the first Zumwalt-class destroyer was commissioned in April. Each of these ships costs $3 billion.

Lowell Brothers boat yard, better known as Even Keel Specialties, is one of only about four remaining family-owned board builders left on the Maine coast. Their family has been building boats for six generations, starting in Nova Scotia. Their primary products are custom built lobster boats and similar work boats. Here we really felt at home seeing them build boats literally in their back yard, a stark contrast to BIW.

Bath Iron Works' largest crane.

Views of older Carlton Lift Bridge (center) and new Sagadahoc Bridge (left).

Historian Bud Warren gave us a presentation on Tide Mills. He has documented over 223 tide mill sites in Maine, the first one having been built in 1634. Maine is particularly suited for power generation by tide mills with its strong tides and its many inlets. For more information, you can go to www.tidemillinstitute.org .

The final stop for the day was in Bath at a spot on the Kennebec River that offered views of BIW as well as the Carlton Lift Bridge of 1927. The Carlton bridge is a double-deck structure: the lower deck is for the railroad and the upper deck is for motor vehicles. (Maine was able to persuade the railroad to share the cost of construction.) It is a steel truss bridge with a vertical lift section in the middle. The bridge replaced ferry service, but with only one lane in each direction it became a traffic bottleneck as vehicle use increased. Maine eventually approved the construction of a bypass highway bridge, the Sagadahoc Bridge (Bath is in Sagadahoc County), sufficiently elevated to avoid the need for a lift section. This bridge, a precast-concrete-segment design just under a mile in length, was completed in August 2000.

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Historic Island Forts of Casco Bay, Maine

The national SIA conference took place in Portland, Maine, from May 15-18, 2014 and thirty members enjoyed a visit to three island forts on Hog, House, and Cushing islands. We were led by retired professor Joel Eastman who had previously led the NNEC on tours of the Lake Sebago-Portland canal, and the Grand Trunk railroad terminating in Portland. Captain Hal Cushing ferried us from Portland to the islands and back on his tour boat.

Our first stop was Hog Island which consists mainly of Fort Gorges. The fort is open to the public and is owned by the City of Portland. Construction was started on the fort in 1858 as part of the harbor defense on the eastern seaboard. Similar in size to Fort Sumner, Fort Gorges is a fully enclosed fort built of granite rather than brick. Construction continued through the Civil War and 34 guns were placed on three levels of the fort. Housing and officers' quarters were built but the fort was never manned. The last use of the fort was to store mines used to protect Portland during the Spanish-American War. We were able to walk all through the fort, climbing the circular granite staircase for a great view of Casco Bay, and viewing the one remaining Parrot rifle at the top. The fort was turned over to Portland in 1960 with limited maintenance since then.

Our next stop was Fort Scammell on privately owned House Island. This island is 24 acres and contains the oldest fort in Casco Bay. In 1808 the fort was built of brick to protect the main shipping channel into Portland harbor. During the War of 1812, the fort fired upon a British privateer in August 1813. The next year a detached earth gun battery was built to the rear of the fort to defend the landward approach. As the years passed the fort was extended to allow the mounting of more and larger cannons and by 1850 a fully enclosed fort with parade ground had been built. Unlike Fort Gorges, during the Civil War Fort Scammell was manned with 13 inch and later 15 inch Rodman guns in casements. During the Spanish American War the fort was used to control a minefield in Whitehead passage. The last construction of the fort was during World War One when 3 inch anti-aircraft concrete bases were built inside the 1808 fort but the guns were never mounted on their base. The island came into private hands in the 1950's when Captain Hal Cushing's parents purchased the island. This summer it was sold for millions to a private owner with plans for building expensive houses and tearing down the only three buildings on the island when it served as a federal quarantine station in the 1920's and 1930's. We did see these buildings which consist of the doctors house, quarantine hospital, and detention barracks. Currently all plans are on hold as the City of Portland is looking into preserving these buildings and providing access to the fort and the outcome of the island is unknown at this time.

Our final stop was Fort Levett on Cushing island, also a privately owned island. Fort Levett was built during the late 1890's and early 1900's of concrete and had gun batteries with large rifled guns mounted on disappearing carriages. By 1905 the post quarters, hospital, barracks, bakery, officer quarters, quartermaster warehouse and stable had been built of brick. The fort was manned during World War One then anti-aircraft guns were mounted soon after the war. Over the years older guns were replaced with longer range guns pointing out to sea. The fort was again manned during World War Two and more housing was built on the island. Two fire control towers were built to direct the fire of long range guns and they still remain along with a seacoast radar station at the top of Whitehead Cliff facing out to sea. By 1950 the fort was declared surplus and acquired by the Cushing Island Association. The World War Two wooden buildings were demolished while the older brick buildings have become homes for summer residents. At this time, no one lives on any of these islands over the winter.

Dave Coughlin

Report of the 2014 Annual Meeting of The Northern New England Chapter of the Society for Industrial Archeology

The 2014 Annual Meeting was called to order at 1:00 PM on October 25 by President Dunning at the Windsor Diner in Windsor, Vermont. 20 people were in attendance.

Old Business
No old business was presented.

New Business
The only new business to be addressed was the election of officers.

President Dunning announced that currently serving as officers are:
David Dunning, President
Ray Breslin, 1st Vice President
David Coughlin, 2nd Vice President
Dennis Howe, Secretary
Carolyn Weatherwax, Treasurer

President Dunning announced that Ms. Weatherwax wished to resign as Treasurer, and that the other officers wished to remain in office if there were no new nominations.

There were no new nominations for President, Vice President, or Secretary. Pres. Dunning opened nominations for Treasurer after reading the duties of the office.

Dennis Howe nominated Richard Coughlin as Treasurer of the Northern New England Chapter, seconded by David Coughlin. No other nominations were made.

With a show of hands, President Dunning announced that Richard Coughlin would become Treasurer.

Other New Business
The subject of declining membership due to changing interests and the influence of new communications technologies was presented. Several ideas and suggestions were stated by members and discussion followed:

1. The chapter might benefit and do well by extending communication and cooperation with other organizations and museums with similar interests. Such actions as sharing links on web sites and use of internet social media were discussed. Adding other organizations to the newsletter mailing was suggested. President Dunning told the group that the Chapter officers would follow up on the suggestions.
2. Conducting process tours might increase the number of participants in the Spring and Fall tour programs. One stated drawback was that few companies operated on Saturday and about a quarter of the chapter members present were not able to attend tours on a weekday. Special, unconventional tours outside the standard program were suggested, such as those requiring overnight stays. Field recording projects, such as documenting industrial site ruins, were suggested as a way to stimulate members' interest and participation. Persons wishing to organize such activities were encouraged to do so by President Dunning.
3. There was discussion of a proposal to combine the Southern and Northern Chapters into one with a single board of officers. Greater travel distance to tour sites over a larger region was stated to be a difficulty. The two Chapters do share the newsletter and cooperate with the website, which works well. No motion to combine was presented. Therefore, no conclusion of Northern New England Chapter intent was reached.

The meeting was adjourned at 2:00 PM.

Respectfully submitted by
Dennis Howe, Secretary, NNEC

NNEC Fall Meeting and Tour in Windsor, VT

Saturday, October 25, 2014

After days of rain, the skies cleared for a beautiful fall day to look at five covered bridges in Vermont and New Hampshire.

Our first stop was the Bowers covered bridge in West Windsor which had washed downstream during Hurricane Irene in 2011. This is a small covered bridge with a tied arch and built around 1884. It's also listed as late as 1919 which must have been a rebuilding of the bridge, since the year 1903 is carved in the arch. After finding the bridge downstream, the top and sides were removed, then the lower section of the bridge including the arches was put on a lowboy truck by crane and returned to the site. Months of work followed as the bridge was reconstructed and set back over mill brook approximately one year after being washed away.

The next bridge we visited was close by and also a tied arch covered bridge. The Best Bridge was built either in 1869, or 1889, as both dates were given, and like the Bowers Bridge the builder is unknown. The length is 37 feet and the interior and exterior are painted gray, unusual as you rarely find the interior of a covered bridge painted. Both of these bridges are still being used daily and we were able to drive through them.

Going from very small to very large, we next visited the Cornish-Windsor covered bridge, the longest in the country from the 1800's; at 450 feet it is more than twelve times longer than the Best Bridge. It was built in 1866 of Town lattice truss design by Bela Fletcher and James Tasker and was the fourth toll bridge built on this site spanning the Connecticut River. The state of N.H. acquired the bridge in 1936 from the "Proprietors of Cornish Bridge" and the tolls were removed in 1943. It was closed in 1987 and after extensive rehabilitation work was reopened for traffic in December 1989.

Next were a couple of nearby NH covered bridges built by James Tasker, one of the two builders of the Cornish-Windsor Bridge. The Dingleton Hill Bridge was built in 1882 off site at a schoolyard and transported to its current location over mill brook. It's 78 feet long and of multiple king post design and was rebuilt by Milton Graton in 1983. The Dingleton Hill Bridge is still used today for automobile traffic like the previous three bridges.

Lastly we stopped at the Blacksmith Shop Covered Bridge which is 90 feet long and was built in 1881 for the private use of a farm family. It was abandoned around 1950, but was also rebuilt by Milton Graton in 1983. Not open for auto traffic today, we were able to spend considerable time looking at the multiple king post construction and nearby remnants of a water-powered mill and other old stone foundations.

The meeting was held at the Windsor diner built in 1952 by the Worcester Lunch Car Company. Richard Coughlin was elected as the new treasurer with all other chapter officers remaining in their current positions. We discussed the desire to have more "process tours" in that we'd see manufacturing taking place, but came up with the problem of most industries being closed on Saturdays when we hold tours. A hand vote was taken on who could make a tour on Friday and most hands were raised, so this may be attempted some time in the future.

The afternoon was spent looking at the many models constructed as part of the Model Engineering show taking place at the American Precision Museum and the nearby municipal building hall. We then had a tour led by Hub Yonker, a museum trustee and national SIA member at the museum, giving us additional information about the building's history of gun manufacturing, concluding a very nice day for the fall 2014 NNEC meeting and tour.

Dave Coughlin

Industrial Innovation: How Windsor, VT, Grew into Precision Valley

SIA tours have featured many individual companies that exemplified Yankee ingenuity & entrepreneurship. Other tours have explored planned multi-mill enterprises, like the Lowell and Manchester textile complexes. In Windsor, VT, however, one small company morphed into many other very large companies in a small region. Morphed meaning that many of the same people were involved. On October 25th, the NNEC toured the American Precision Museum, birthplace of Robbins & Lawrence and Precision Valley.

Industry in Windsor began with The Connecticut River Steamboat Company, 1824-1832. Then in 1833 came the Ascutney Mill Dam Company; and then the National Hydraulic Company, 1828-1839, which produced rotary pumps, revolving hydraulic fire engines and underhammer guns. Asahel Hubbard, the founder/inventor, convinced the state to let him be warden of the state prison in Windsor and then to let him build a machine shop in the prison. Soon his products were being made for an unbeatable wage of $.25 per day. (How's that for Yankee ingenuity?)

"The history of the Robbins & Lawrence Company begins about 1838, when Richard Lawrence came to Windsor from the Watertown, N.Y. N. Kendall & Company was regularly making guns at the Windsor prison (also). They hired him at once for two years at $100 a year. In 1843 Kendall and Lawrence hired a small shop in Windsor village and started a custom gun shop. In the winter of 1844 Samuel E. Robbins, a businessman, came to them and said that the Government was in the market for 10,000 rifles. The matter was talked over, a partnership formed, and a bid sent to Washington. In spite of the opposition of nearly all the other Government contractors, who said they could never do the work, it resulted in the award of a contract for 10,000 to Robbins, Kendall & Lawrence, at $10.90 each, attachments extra, to be furnished within three years. The contract was signed in February of 1845."[1]

"They bought land, built a shop, and bought or made the necessary machinery. It was in the performance of this and the subsequent contract that many of the early machine tools were developed."[1]

With only twenty five workers in their plant, they began to recruit skilled laborers and subsequently formed a highly competent factory crew of some one hundred and fifty men. In April 1846, laborers began the construction of a three and-a-half story brick armory on the south side of Mill Brook, just across from the firm's original gun shop. Most important, Lawrence pushed the development of new machine tools to be installed in the factory.[2]

Despite the long odds, the company fulfilled its contract eighteen months ahead of the deadline and made an excellent profit. Shortly thereafter, Kendall's partners purchased his interest in the firm, which then became the Robbins and Lawrence Company.[2]

The firm now entered its most notable period. Three men supplied the genius that established the company as an innovator and developer in the field of machine tools. Lawrence, who had been with the firm for several years, continued to contribute mechanical inventiveness and business acumen. In 1847, Frederick Webster Howe joined the firm as Lawrence's assistant and the next year became the plant superintendent. A superlative machinist and an original thinker, Howe invented several machines that were used in industry for years after their development. He produced a profiling machine in 1848 that became widely used in gun factories. In 1849 Howe, in conjunction with Lawrence, developed a milling machine that remains basic to industry, and in 1850 made the

Artist's sketch of the Robbins & Lawrence mill complex.

first commercially successful universal milling machine. The final member of the Robbins and Lawrence triumvirate was Henry D. Stone. In the 1850's he collaborated with Lawrence and Howe in devising improved machine tools, plus developing some on his own.[2]

"Robbins & Lawrence Co. was formed in 1850 by Samuel E. Robbins and Richard S. Lawrence as a reorganization of Robbins, Kendall & Lawrence. In all of their gun work, Robbins & Lawrence used the interchangeable system, and they contributed very largely to its development. Lawrence, Howe, and later Stone, were constantly improving the methods of manufacture. Fitch's article on Interchangeable Manufacture in the U. S. Census Report of 1880 describes and illustrates a profiling machine built by Howe as early as 1848. The design shown there was used for many years throughout all the gun shops in the country. He also designed a barrel drilling and rifling machine, and he and Lawrence designed and built a plain miller, which was the forerunner of the well-known Lincoln miller. They began selling the machine tools used for making guns as a secondary product."[1]

The brilliance of the work at Robbins and Lawrence achieved international fame in 1851. Taking advantage of an opportunity to participate in the Crystal Palace Exhibition in London that year, the Windsor concern exhibited six of the United States Army rifles that it had made. The firearms intrigued the Exhibition's visitors because of their interchangeability of parts, made possible by the machines developed by Robbins and Lawrence. A medal awarded by the Exhibition formally notified the world of the British opinion of the firm's rifles. Practically, the success of Robbins and Lawrence led to a contract with the British Government in 1854 for one hundred and fifty machine tools for a new state armory.[2]

Current view of the last remaining Robbins & Lawrence building.

The main dam for the Windsor mills was about a half mile above Robbins & Lawrence. Several smaller dams and mills were between this dam and the main mill.

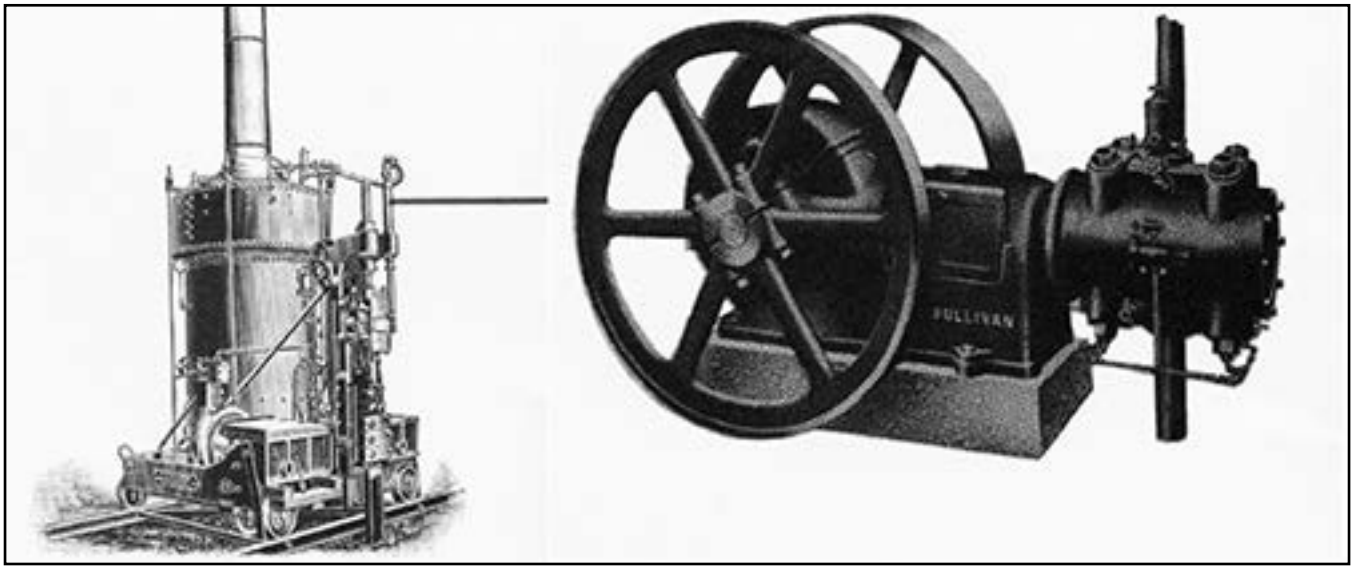
Despite its growing reputation, however, the firm was over extended financially and soon failed. It had erected a new plant in Hartford, Connecticut, in 1853 to expand its output. One contract was completed in the new factory, and another order for 325,000 rifles was expected. When 25,000 rifles had been produced, it was discovered that there would be no order for the remaining 300,000 because the Crimean War had ended. Robbins and Lawrence had invested too heavily in expanding its works and the incurred debts, plus old obligations, pushed the concern into bankruptcy. Another cause was a penalty they had agree to if deliveries were late and they were because a draught in Pennsylvania cut shipments of the black walnut they needed for stocks to a dribble.[2]

The firm failed in 1856 and the plant and equipment were bought in 1859 by Ebenezer G. Lamson, who then organized Lamson, Goonow & Yale. They fulfilled open rifle orders and continued to get and fill such contracts. This later became E. G. Lamson & Co., Windsor Mfg. Co. (1865), Jones, Lamson & Co. (1869) and Jones & Lamson Machine Co. in 1879.[1]

In 1889 the present Jones & Lamson Machine Company moved to Springfield, Vt. That same year, James Hartness entered the employment of the company as superintendent. With his advent the scattering of activities ceased and the Jones & Lamson Machine Company began concentrating on turret lathes, which Robbins & Lawrence and their various successors had been manufacturing continuously since the early fifties. A number of the old mechanics and foremen, who had homes in Windsor at the time the company was moving to Springfield, took over the old shops and organized the Windsor Machine Company which manufactured the Gridley Automatic Lathes."[1] Jones & Lamson and the other companies that they spawned in Springfield will be covered in the last section of this report. First, there are two other companies that came from the Windsor Machine Company.

Frank Lyman Cone learned carpentry, blacksmithing, and general mechanics on his father's farm. In 1891 he became a general repairman for the Connecticut River Railroad in a branch repair shop in Windsor, Vermont. In 1895 he moved to the Windsor Machine Co. which had started in the old Robbins & Lawrence Armory after Jones & Lamson moved to Springfield, Vt. George Gridley joined the company and began to develop his single-spindle automatics. When National Acme bought Windsor Machine in 1916, Cone resigned. He started designing a new automatic and formed Cone Automatic Machine Co. to build it. His first machine was a conventional single spindle, but the second was a four-spindle machine that broke with all previous designs. He put all the cams at the top on one long shaft. This made it possible to build large multiple-spindle machines that had the operating positions down at a convenient working height.3 Cone Automatic built a large building there in Windsor next to the railroad tracks. They employed over 1000 people during WWII. In 1972, the Blanchard Machine Company moved from Boston and joined Cone to make their Blanchard Grinders. The name was changed to Cone Blanchard Machine Company. Their primary market was the aerospace and automotive industries. They closed in 2002 due to declining domestic auto sales and foreign competition. Blanchard Grinders are now made elsewhere by another company.

The Sullivan Machine Company, across the river in New Hampshire, also had ties to Windsor, VT. What began as a general machine shop and foundry before 1851 became The Claremont Machine Works when it was purchased by James P. Upham, a recent Dartmouth graduate. At that time it pro-



Sullivan rock channelers (left) were used to drill patterns of deep holes to split rock without using explosives. Sullivan air compressors (right) were widely used in mining and road building also.

duced engine lathes, planers, paper mill machines and circular saw mills. It was also producing The Tuttle Water Wheel. That was soon superseded by the Tyler Turbine Water Wheel, invented by John Tyler of Claremont. Over 3000 of them were produced there in 30 years time. In 1856, this wheel was exhibited at the Crystal Palace in New York where it received the highest prize medal awarded to water wheels. Also, during the 1860's thousands of water wheel regulators were built and lines of agricultural machinery were added to the Claremont Machine Works.[4]

In 1868, while Mr. Upham was pruning apple trees along his Connecticut River property, two men from Windsor, VT, stopped by in their buggy, asking where Mr. Upham lived. They had drawings of a newly invented and patented diamond channeling machine for quarrying stone, especially marble. This meeting over a stone wall resulted in a signed agreement which became the inception of the Sullivan Machinery Company. One of those two men, Albert Ball, became Mr. Upham's Chief Engineer and received 130 mining equipment patents over his career. The first diamond channeler, completed in 1868, was a six spindle variable speed core drill, movable on a track with a gauging device to space the holes and set them at any angle[4]

By the 1920's, Sullivan had become New Hampshire's largest machine company and Claremont's largest employer with over 1200 workers. In 1946, Sullivan merged with Joy Machinery Company. (Many of us grew up seeing Joy rock drills and compressors building the interstate highway system.) Besides having other plants in other states, Joy moved from the old tall brick mill buildings along the river in Claremnt to a new, larger, single-story plant below town in the 1960's. Their foundry followed about ten years later to a new state of the art facility. However, alas, by the 1980's this like most other large equipment could be made much cheaper overseas by other companies; the Claremont operations were closed, idling the last 800 workers. Today, that already huge building has been doubled in size and height and houses CANAM Steel Corp. a Canadian company that fabricates giant I-beams for bridges.[4]

Back in Windsor, Vermont, Jones & Lamson Machine Company (J&L) had been designing and producing machine tools and textile machinery. By 1884, though, the textile machinery side of the business was facing increasing low-cost competition. That, along with some poor management decisions on that side, had put the company in financial jeopardy. Combined also with some poor health, death of a key investor and other problems, J&L needed help. Nearby, Springfield, Vermont, was looking for a way to bring new business into their town. They already had some manufacturing and an abundance of waterpower. A group of Springfield investors offered to buy J&L and move the company there. The town could offer them a ten-year tax exemption (allowed by state law). The townspeople voted almost unanimously, the funds were raised and J&L had new owners and a new home; that was 1889. This struck a harsh blow to Windsor.

The Springfield group sought out a new General Manager. They recruited James Hartness, son and grandson of master mechanics. He was an expert machinist, inventor, hobbyist astronomer and entrepreneur. Shortly after taking over, he invented and perfected the flat bed turret lathe which became J&L's primary product (line) for the company's future. They grew to several thousand employees during WWII and were never below several hundred. James Hartness was a generous manger and inventor. He encouraged his people to come up with new (related) ideas and then helped them to develop and commercialize them. The other three very big companies in Springfield -- Fellows Gearshaper in 1896, Bryant Grinder in 1909 and Lovejoy Tool in 1916 -- were all formed by J&L employees who were encouraged by their boss, James Hartness. Today, only Lovejoy Tool Company still exists. The reasons for the industry's decline are beyond the scope of this report.

Back to Windsor, VT, in the 1800s - Several other innovative entrepreneurs left and went on to start their own companies based on what they had learned at the Windsor Manufacturing Co.: Winchester Rifle Co., Smith & Wesson, Remington Arms, White Sewing Machine Co., and Brown & Sharp machine tools and inspection equipment.

References

1. General
1916 *English and American tool builders* by Joseph Wickham Roe.
2001 *American Lathe Builders: 1810-1910* by Kenneth L. Cope.

2. Periodicals
Hubbard, Guy. "Development of Machine Tools in New England," *American Machinist*, 59 (July 5 and December 20, 1923) and 60 (January 24, 1924).

Roe, Joseph W. "Early American Mechanics Robbins and Lawrence Shop," *American Machinist*, 41 (October, 1914).

Singer, Charles, *et. al., A History of Technology* (Oxford, 1958), Vol. IV.

3. 2014 www.americanprecision.org. American Precision Museum, Windsor, VT, web site.

4. 2012 *SIA-NEC Newsletter*, Vol. 33, No. 2, Page 6.

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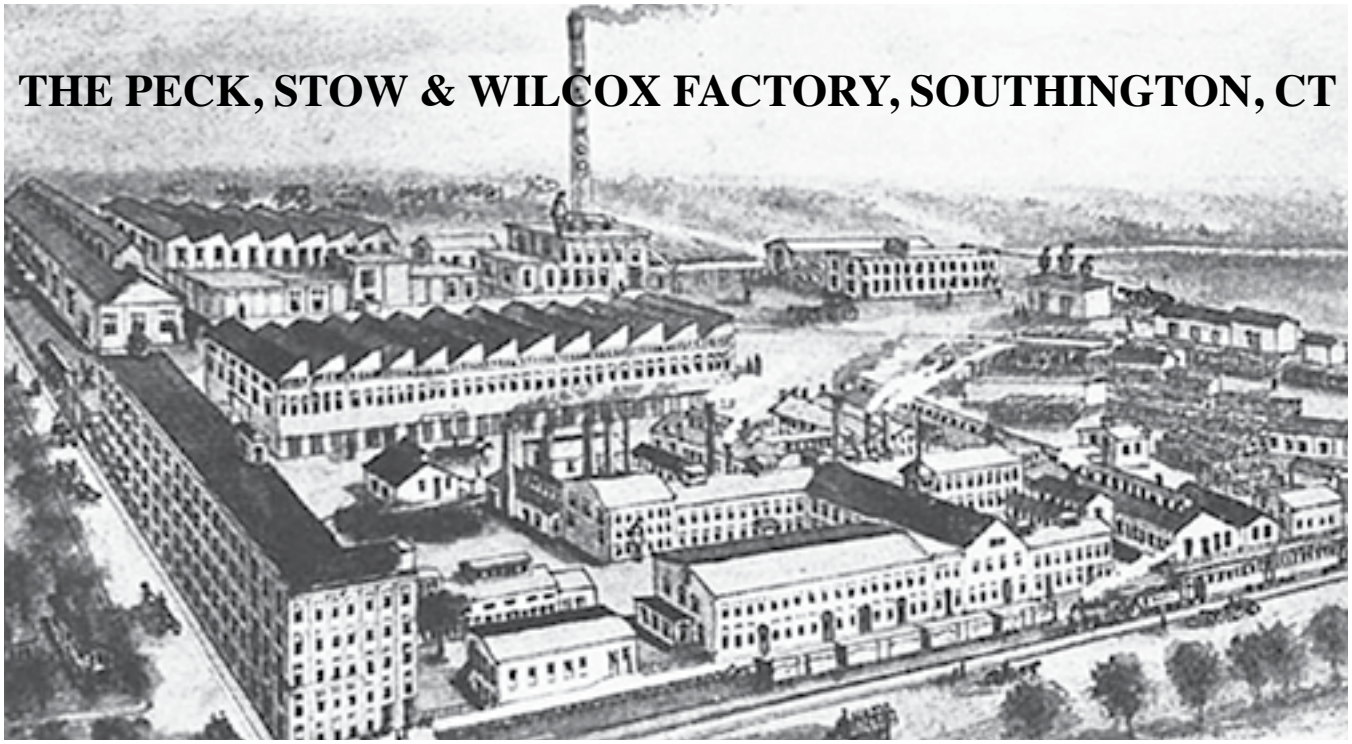
THE PECK, STOW & WILCOX FACTORY, SOUTHINGTON, CT



Drawing from: Caughey, R., 1893. Factories of the Peck, Stow & Wilcox Co., manufacturers of tinsmiths' tools and machines, mechanics' tools, meat cutters and general hardware. Main office, Southington, Conn. *D.H. Hurd & Company, Boston, Massachusetts.*

The former nineteenth-century site of the Peck, Stow and Wilcox Factory (PS&W, also known as PEXTO), a significant metal works manufacturer, sits on a 14-acre development parcel on Center Street in the Town of Southington, Hartford County, Connecticut. During the twentieth century, the site became the Ideal Forging industrial complex. At one time, PS&W was the unquestioned leader in the manufacture of tools for tinsmiths and sheet metal workers, including seamers, wiring machines, foot powered shears, and hand tools of every description. The property is bounded roughly by the Quinnipiac River on the west and Factory Street and the public Factory Square on the east. The extant PS&W structures on Southington's Center Street, the company's main plant, mostly date from a re-building campaign of 1912 and represent a very small percentage of the once thriving business. Identified in the 1981 Connecticut Industrial Archaeology Inventory (Roth), the PS&W complex was placed on the National Register of Historic Places (NRHP) in 1988, even though many of the early twentieth century buildings had been demolished or greatly altered. A number of Southington's former mill complexes were included in the same thematic resource nomination: Atwater, Blakeslee on Main Street, two Clark Brothers factories, Hurwood, and Pultz & Walkely, also on Main Street. As a unit, these local nineteenth and early twentieth century industrial complexes form a substantial statement on the industrial heritage of the Quinnipiac River corridor.

The history of the Peck, Stow, & Wilcox Company is intimately tied to the rise of the tin industry in Connecticut. As early as 1740, in Berlin, CT, tinware was manufactured by small tinsmith shops. As local tinsmiths continued to prosper throughout the state, Connecticut came to be recognized at least by the end of the 18th century as the tinware manufacturing center of the eastern seaboard. In Southington, tinware manufacturing began in 1795. Tin was laid on anvils, known as "stakes," and hammered into shape by wooden mallets (Atwater 1924: 163-164).

As the tinware manufacturing industry flourished, resourceful inventors conceived ways of shaping tin through varied experiments including passing the sheets of tin through steel rolls. The idea was taken over by a comb maker by the name of Edward Converse, an inventor, who came up with the idea of a pressing machine to manufacture tinware. His brother-in-law, Seth Peck, recognized immediately the potential for such a machine with the tinware industry booming, and, patented the design in 1819. Seth Peck had been up to that point a successful Southington businessman with his own prospering machine manufacturing business. However, the Peck's family shop worked without the use of water or steam power; the machine rolls were turned manually or by using foot treadles.

In partnership with Romeo Lowrey, Peck formed Seth Peck & Company in 1831. The success of the Peck family business would dramatically improve when, in 1832, they purchased from Edward Converse his shop on the Quinnipiac River. The tinware machinery in Mr. Converse's shop was powered through waterpower rendering the process much more cost-efficient. The arrival of the New York, New Haven & Hartford Railroad the following year would allow shipments of machinery to be made to outside markets. During the same year, the Peck, Smith & Company was officially

formed under the ownership of Orrin Peck, Wyllis Smith and Benjamin F. Seward with the intent of producing sheet metal machinery. In order to do so, the patent rights to the machinery were purchased from the Seth Peck & Company; eventually the original company would sell its buildings and equipment to Peck, Smith & Company.

In 1848, the company was reorganized with new owners including Lester Smith and William Clark. Orrin Peck eventually purchased Smith's shares and Clark's shares were purchased equally by Francis Wilcox and Benjamin Seward. This reorganization led the company to change its name to the Peck, Smith Manufacturing Company. The company moved its manufacturing facilities in 1856 to the location of what would eventually be the site of the Peck, Stow & Wilcox Company. The purchase of a wrench manufacturing company from Massachusetts permitted the Southington company to employ a number of mechanics that would allow it to be known for the manufacture of "Taft Pattern" monkey wrenches.

While the Seth Peck & Company was still in existence, Solomon Stow who originally was a clock maker, started his own business manufacturing machine parts for the Seth Peck & Company. The success of the company allowed Stow and his sons Orson and Enos to expand their business to manufacture sheet metal working machines and beading machines under the name of S. Stow & sons. The company expanded rapidly during the next few years, incorporating other local machine manufacturing enterprises including the Plant Neal, & Co. of Plantsville, Connecticut. The company, originally formed by Romeo Lowrey in 1833, had perfected through a number of successive designs the Double Seaming machine. When the company was absorbed, S. Stow & Sons benefited from the merger as it became known for the manufacture of these Double Seaming machines.

S. Stow & Sons eventually became a joint stock business in 1852, changing its name to S. Stow Manufacturing Company and acquiring waterpower from the A.P. & E.H. Plant located in Plantsville. The Company prospered for the next twenty years erecting new buildings at their manufacturing site until it decided to join with Peck and Wilcox.

The last protagonist to be involved in the formation of PS&W was Samuel Wilcox who had established a tinware factory in the 1830s in East Berlin, Connecticut under the name of Carpenter Lamb and Wilcox. At the same time, Franklin Roys and Samuel's relative Josiah Wilcox had set up a factory in North Greenwich. Soon thereafter, Franklin Roys returned to Berlin to start the F. Roys & Co., which in turn became Roys & Wilcox & Co., with Edward Wilcox as a general partner and Samuel C. Wilcox as a silent partner and its first president. The company prospered even after the main plant was destroyed by fire. Known for their manufacture of sheet metal cutting shears, the Roys & Wilcox Co. expanded their operations during the next fifteen years to include brick office buildings, an iron foundry, a machine shop and a forge shop.

PS&W was officially formed in February 1870 with the merging of the Peck, Smith Manufacturing Co., the S. Stow Manufacturing Co. and the Roys & Wilcox Co (The Peck, Stow, & Wilcox Company 1919). The merger was spearheaded by Roswell A. Neal who realized that, strong competition following the end of the Civil War, required drastic measures that would lead to the continuing success of the tinware manufacturing business. Neal had been a partner of Peck, Smith & Co. since the 1840s and became president of the company in 1860. When his company merged with the S. Stow Manufacturing Co. and the Roys & Wilcox Company, he was voted president of the newly merged enterprise. At the time, the company was one of two that had a capital greater than a million and half dollars. In 1887, E.E. Stow became president as Neal's declining health forced him to retire from the company. Under Stow's reign, the business grew rapidly, and new tools were added to the production, including the Samson Brace, a ball bearing jaw chuck that became the trademark of the company. The products, marketed as PEXTO tools, could be purchased through the company's catalog which was published monthly.

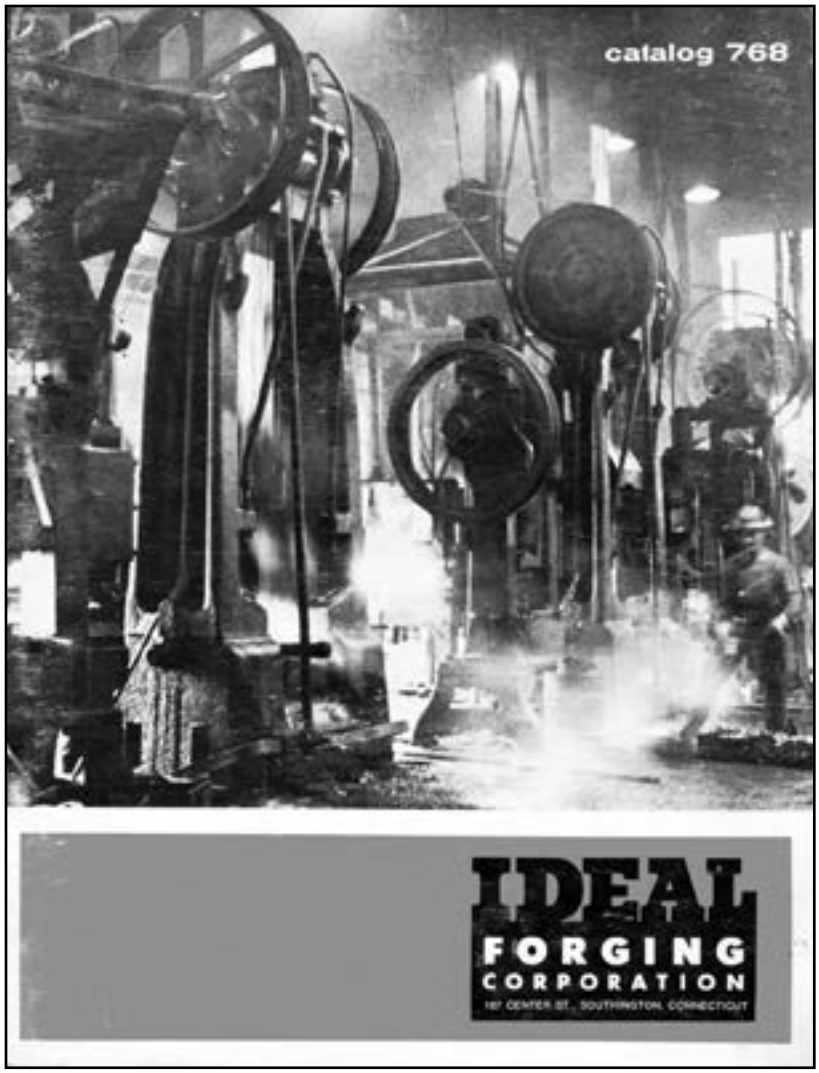
The company continued prospering at the beginning of the twentieth century with its new president, A. R. Treadway. Distribution of what was now known as PEXTO products reached a global market with delivery of tools in Europe, Africa and Asia. During Treadway's tenure, consolidation of the various plant sites occurred with the dismantling of the plants in East Berlin, Kensington, and Birmingham and the subsequent move to new facilities in Southington at the location of the existing factory. The factory was dominated by the massive, L-shaped five-story building that paralleled Center and Factory Streets.

In the early 1950s, the company began to decline and was eventually purchased by the Billings & Spencer Company of Hartford, CT though the name PEXTO continued to be used for some time after that. The Southington factory was abandoned and the buildings were either razed or partially demolished until the site was purchased in 1963 by the Ideal Forging Corporation.

The Ideal Forging Corporation was founded in 1927 by James Simone and initially specialized as a die shop. Eventually, the Ideal Forging Corporation specialized in the manufacturing of steel flanges and forging, becoming a world expert on the forging of stainless steel flanges. The company at its peak employed more than 170 employees and was known as the largest stainless steel forging company in New England.

Modern industrial forging is done either with presses or with hammers powered by compressed air, electricity, hydraulics or steam. These hammers are large, having reciprocating weights in the thousands of pounds. In closed-die work, such as practiced at Ideal, the prepared but unformed metal is placed in a die resembling a mold, which it is forced to fill by the application of pressure. Many common objects, like wrenches and crankshafts, are produced by closed-die forging, which is well suited to mass production.

Forgings are commonly used in applications where high strength is demanded, with a constraint on the mass of the part (high strength-to-mass ratio). The process of forging a



Left: Cover of *Ideal Forging Corporation, Southington, CT, Catalog 768, 1960s*

Below: *Illustration from page 4 of Catalog 768.*

Catalog on file at the Archives and Special Collections of the Thomas J. Dodd Research Center, UConn, Storrs.

part becomes cheaper with higher volumes. One particular variant, drop forging, is often used to mass produce flat wrenches and other household tools. For example, the work piece, such as a wrench, is created by hammering a piece of hot metal into an appropriately shaped die. The metal (in an easily produced shape like a rod or brick) is heated and placed on the bottom part of a die. The top part of the die then drops onto the piece, which gives the forge its name. The die may drop under gravity or be powered, but in all cases drop forging involves impact. The force of the impact causes the heated metal to flow into the shape of the die, with some metal squirting out of the thin seams between the dies. This thin metal is called "flash" and is cut away in the next stage of processing. The drop-forged pieces usually need further processing, like machining and polishing of working surfaces, to provide tighter tolerances than forging alone can provide, and to produce a good finish.

In hydraulic press forging, the work piece is pressed between the two die halves with gradually increasing force, over a period of a few seconds. The quality of the pieces is better than drop forging as there is more control over metal flow, but takes longer and requires more energy. It also makes the same shape continuously.

Ideal's forging process allowed for the production of a variety of designs that would tolerate greater stresses and higher loads. These quality products were economically competitive in the metalworking industry. The process of die forging at Ideal Forging Corporation went through a number of carefully monitored steps beginning with the skillful making of forging dies. Computer Aided Design (CAD) machinery was useful in producing high-precision dies allowing for controlled and tighter die specifications. The forgings were then produced either with the use of high pressure hammers or forging presses. The forgings were heat treated to improve their physical properties as well as passivated, wheelabrated and pickled allowing for the removal of imperfections and a subsequent improvement of their overall quality.

Passivation, which removes iron compound residues from stainless steel, was done at Ideal by dipping the forgings in chemical or acid baths for specified periods of time. The pickling stage completed the process where forgings were dipped in nitric or hydrofluoric acid to remove the outmost layer of metal from the stainless steel (Euro Inox 2004). Wheelabrating served the same purpose of removing impurities from the stainless steel forgings; it consisted of blasting the forgings, placed in a spinning paddle wheel, with an abrasive. Finally, the forgings were submitted to a finishing process and "smoothed" in a vibratory tub.

The Ideal Forging plant at Southington produced forgings and flanges for almost 40 years from 1963 until the plant closed its operations in 2000. During that time, the company sought to produce the highest quality materials by using the latest technology available including CAD technology and the most current machinery and equipment.

At the recommendation of the State Historic Preservation Office, a detailed documentation of buildings and machinery present within the Meridian project site was conducted as part of the environmental review process for the proposed development, a mixed-use complex, providing approximately 260 residential units and 25,000 square feet of retail space. The objectives were to properly evaluate existing resources and to determine adverse effects if any of the proposed project on these resources.

References

Atwater, Frances
1924 *History of Southington, Conn*. Compiled by Frances Atwater, New Haven, Conn.

Caughey, R.
1893 *Factories of the Peck, Stow & Wilcox Co., manufacturers of tinsmiths' tools and machines, mechanics' tools, meat cutters and general hardware. Main office, Southington, Conn*. D.H. Hurd & Company, Boston, Massachusetts.

Euro Inox
2004 Pickling and Passivating Steel. *Materials and Applications Series*, Volume 4.

Roth, Matthew
1981 *An Inventory of Historic Engineering and Industrial Sites*. Society for Industrial Archeology.

Roth, Matthew and Bruce Clouette
1988 *Historic Industrial Complexes of Southington Thematic Resource*. National Register of Historic Places Inventory – Nomination Form. United States Department of the Interior, National Park Service, Washington, D.C.

The Peck, Stow, & Wilcox Company
1919 *One Hundred Years of Progress. A Historical Review of the Development of one America's Century-Old Institutions. Issued in Commemoration of the One Hundredth Anniversary of the Peck, Stow, & Wilcox Company.* The Peck, Stow, & Wilcox Company, Southington, Conn.

THE BROWN COMPANY: FROM NORTH COUNTRY SAWMILL TO WORLD-LEADING PAPER MANUFACTURER

In February 2012 John K. Rule, a retired mechanical and ocean engineer and a volunteer archivist at the New Hampshire Historical Society, spoke about the history of the Brown Company at the 25th Annual Conference on New England Industrial Archeology, held that year in Plymouth. An expanded and well-illustrated version of the PowerPoint program he presented that day is now available in the Fall/ Winter 2014 issue of Historical New Hampshire. Copies of this publication can be purchased at $5.00 each (plus shipping and handling) through the New Hampshire Historical Society's online store at nhhistory.org or by calling 603-228-6688.

Known as the Berlin Mills Company until World War I when it was renamed after the Brown family who owned and managed it, the company flourished for more than a century and became one of the largest and most important pulp and paper manufacturers in the world. It owned or controlled vast timberlands not only in northern New England but also in Canada and left behind a rich record of achievements ranging from innovative technical developments to progressive forestry practices.

The article is based on extensive research within the Brown Company Records, now part of the New Hampshire Historical Society collections. Illustrations from the Society's Brown collection, together with others from the Library of Congress and Plymouth State University's Spinelli Center at the Lamson Library, supplement the narrative.

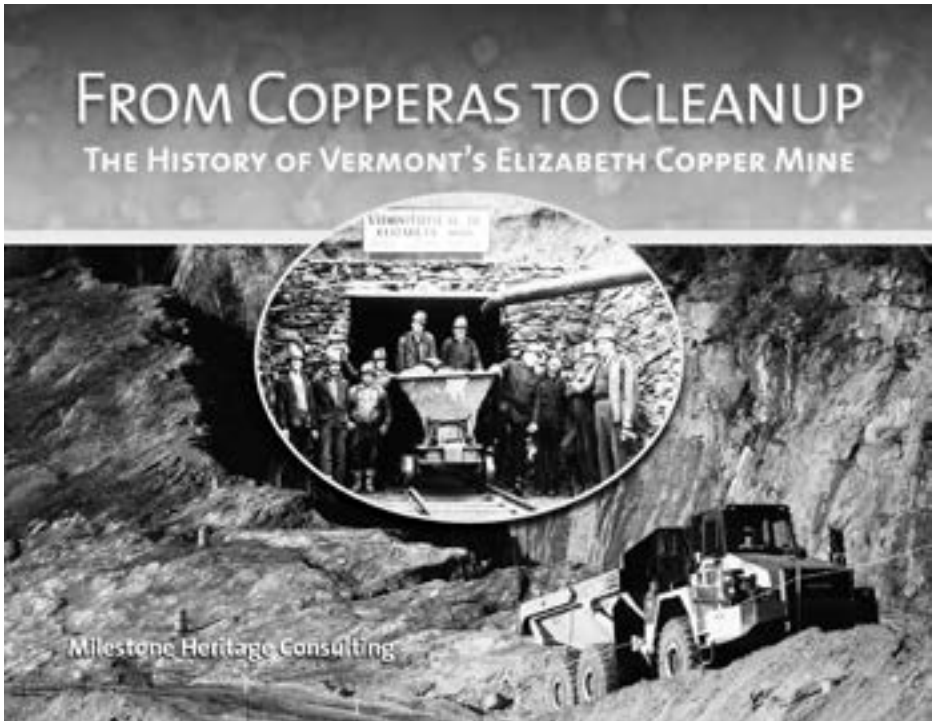
Left: *From New Hampshire Historical Society collections:*
"Cascade Paper Mill, Gorham , N.H. ," c. 1910. In 1904 the Berlin Mills Company expanded its pulp and papermaking operations into the adjoining town of Gorham.
This second mill complex, known as Cascade, produced both groundwood and sulphite pulp, as well as paper. Its papermaking machines were the widest in the world.

BOOK REVIEWS

From Copperas to Cleanup: The History of Vermont's Elizabeth Copper Mine, **by Matthew A. Kierstead.** Milestone Heritage Consulting, Beacon, NY, 2014, ii+61pp, 109 photos, 3 maps, biblio, 8½ H x 11 W. $15.00 (soft cover).

When two observant men noticed rusty stains in the snow while tapping sugar maples in the spring of 1793, it triggered a series of events that lasted into the middle of the 20th century, and to some degree, is still continuing as this review is being written. The place was a nondescript hill – soon to be called Copperas Hill – in southeastern Strafford, Vermont. The Revolutionary War had ended with the Treaty of Paris a scant 10 years before, and while the loser, Great Britain, was in the opening throes of another revolution, the Industrial Revolution, industrial technology in South Strafford was still a generation away.

South Strafford lies near the southeast corner of the town of Strafford, Orange County, Vermont, about 9 straight-line miles northwest of downtown White River Junction (twice that via best road). The copperas and copper mining areas are about 2 miles south-easterly up Mine Road from South Strafford. Some of the early mining property extended eastward into Thetford and southward into Sharon and Norwich in Windsor County. No railroad ever connected to the mining area, but a good road (today's Route 132) provided easy access to a railroad depot at nearby Pompanoosuc Station along the Connecticut River. Thus it was that a viable sulfide ore deposit was discovered and exploited, giving birth to a major copperas and copper industry in this quiet, remote corner of Vermont.



Industrial Historian Matt Kierstead has done a magnificent job in writing this well organized and understandable short book. In the first of the book's three major sections, he introduces contextual geology and historical information needed by readers to appreciate the complex individual technologies that resulted in the production of copperas and copper in the world, the Western Hemisphere, the US in general, and specifically at Strafford.

The middle section, comprising half of the book, describes where the ores were found at Strafford, the various technologies employed to extract and refine them, and how the end products of these processes at Strafford were used in an increasingly technology-driven 19th century America. It also describes who the investors with deep pockets were, their motivations for being in the copper business, the ups and downs of international trading and national economic challenges, and the series of various chemical and mining company responses and local mining technological improvements. When Strafford's copperas era ended in 1882, mainly due to its obsolete technology and new copperas sources, it was the largest and longest-operating copperas manufacturer of its kind in the U.S.

Copper mining and smelting at Strafford, which began in 1829 at Furnace Flat, went through its own roller-coaster challenges, successes, and disappointments. Although having two World Wars plus the Korean War to benefit its bottom line, copper production also succumbed, in 1958. Vastly overshadowing its smaller sister's copperas business, employment reached a high of 220 workers with an annual payroll of over $1 million. It was the country's 19th-largest copper producer in 1953 (final year of the Korean War), mined from about 5 miles of tunnels that are estimated to have provided enough ore to have made over 100 million pounds of copper (50,000 tons).

All that mining and extraction processes produced another end product: industrial waste. How that aspect of the industry was attended to and resolved is the subject of the last section of (and the main reason for) the book. In 2001 the U.S. Environmental Protection Agency designated the mining sites one of the largest Superfund sites in New England. Cleanup was completed in 2013. As the land was being reclaimed, the archeological survey of the site documented the remaining surface and accessible subsurface features, as described and illustrated in the book.

Over 100 photographs, maps, and sketches grace the book's pages, from Daguerreotypes to halftones to modern color prints (all captioned) that accompany the text – the next best thing to having been there. Four full-page Historic American Engineering Record drawings of the Elizabeth Mine area produced in 2003 depict the mining areas from various viewpoints, including an oblique translucent view of the subsurface mining workings, and an ore processing flow chart.

The author's writing style is crisp and concise: no excessive or repetitive discussions; every word counts. Two pages list sources consulted (no footnotes or in-text references). Slick, shiny, no-expense-spared heavy gauge paper and a printed spine all for $15.00 postage-paid in the continental U.S. Make checks payable to Milestone Heritage Consulting at 156 Western Ave., Marlboro NY 12542. See www.milestoneheritage.com or contact matt@milestoneheritage.com for further information about the book and author. (845) 234-9497 and Land/Fax (845) 236-3480.

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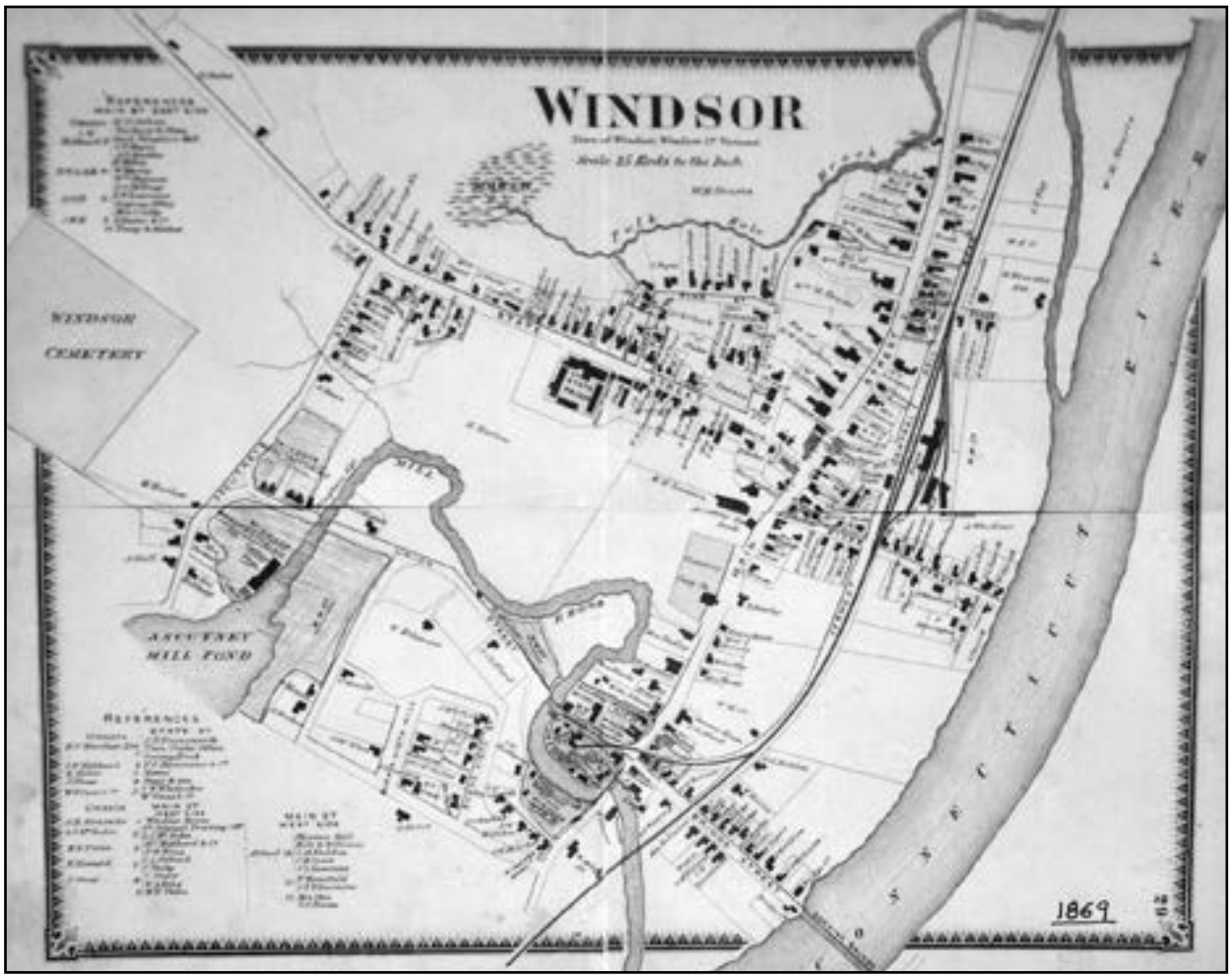
Bennington, Vt.

A History of the Belknap Mill: The Pride of Laconia's Industrial Heritage by Carol Lee Anderson. The History Press, 2014, www.historypress.net, ISBN: 978.1.62619.241.6, 160 pp., $19.99.

The waters of the Winnipesaukee River powered Laconia's industrial might. Laconia's Belknap Mill thrived in the boom of the Industrial Revolution. The historic mill swiftly rose to the forefront of the city's hosiery industry in the nineteenth century. Lakes Region historian Carol Lee Anderson reveals the mill's unique history, including its inventive, entrepreneurial owners, their climb to industrial success and the challenges they overcame. This fascinating story encompasses the saga of countless French-Canadian immigrants whose arrival in the Lakes Region influenced the course of industry and daily life in the city of Laconia. The mill's story continues, and the preservation of this historic textile mill includes a fierce struggle of historic values versus urban renewal. Learn how this early symbol of the Industrial Revolution fought to become the pride of Laconia's industrial heritage.



An 1869 plan of Windsor, Vermont, where the NNEC held its 2014 Annual Meeting and Fall Tour. See page 14.

Membership Application to the Northern and Southern New England Chapters of the Society for Industrial Archeology

The Society for Industrial Archeology promotes the identification, interpretation, preservation, and modern utilization of historic industrial and engineering sites, structures and equipment.

Northern New England Chapter (ME, NH, VT)

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