Society for Industrial Archeology · New England Chapters

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EDITORIAL

There are two upcoming meetings that should be of interest to Chapter members. The first is a joint Southern and Northern New England Chapters meeting to be held in Shelburne Falls, Massachusetts, on May 9. (See "Shelburne Falls to be Site of Joint Spring Meeting" by Peter Stott.) Two hydro-electric tours are planned, and the Shelburne Historical Society will be hosting the meeting.

The second is the 16th Annual Conference of the Society for Industrial Archeology, to be held in Troy, New York, from May 28-31. This will be the first time that an annual SIA conference has been held twice in the same city, and Troy is close enough that most of our New England Chapter members should be able to attend. If you need registration forms, please contact Duncan Hay, c/o New York State Museum, Historical Services, 3097 CEC, Albany, NY 12230. Or, if you have questions about the paper sessions, to be held at Rensselaer Polytechnic Institute on May 30, then please contact me directly at RPI (518 266-8503).

David Starbuck
Rensselaer Polytechnic Institute

Yankee Typesetters' owner, John Stone, demonstrates some detail of the operation of a Linotype machine to SIA members during a NNEC tour. See article on page 13. Photo by Dennis Howe.

PRESIDENT'S REPORT, SNEC

The Southern New England Chapter has gone on the offensive in the past several months in its efforts to bolster membership rolls and spread the IA gospel. In addition to the circulation of the new membership brochure, which is being greatly assisted by a promotional mailing courtesy of Mike Folsom and the Charles River Museum of Industry, the Chapter has launched a 1987 Winter-Spring Events Program. The program, the brainchild of Program Coordinator Peter Stott, offers NNEC and SNEC members the chance to visit some old and new IA sites in the region on a monthly basis. Beginning in January, Peter has orchestrated tours of: MATH's Machinery Hall; Yankee Typesetters' "hot type" shop in Concord, NH; and East Boston and Deer Island Sewage Pumping Stations. Other scheduled trips include the Chain Forge at the Charlestown Navy Yard and Wilkinson Machine Shop at Slater Mill Historic Site. In addition to his work getting this program off and running, Peter has also been busy laying groundwork with NNEC members for a proposed annual New England IA symposium.

SNEC's fall meeting was held at the Dedham Community House and the Barrows Mill on Mother Brook (1984 Spring Tour). Notable events in the business meeting included the establishment of a SNEC lifetime membership category and a vote of thanks to Fred Roe, our resigning treasurer, and Herb Darbee, our secretary emeritus. The tour of the Burrows Mill led by Mike Folsom included a hands-on investigation of the mill's power plant, which the Charles River Museum of Industry plans to preserve in situ, and a review of Bergemeyer Associates' plans to rehabilitate the complex as condominiums. The architects' proposal includes the reconstruction of the original gable roof and monitor which were destroyed by fire in 1911.

For its spring meeting, SNEC is once again joining forces with NNEC, this time for a tour of Shelburne Falls, MA. Highlights will include visits to two Deerfield River hydroelectric plants, the 1912 plant #4 at Shelburne Falls and the 1974 Bear Swamp Pumped Storage facility in Rowe, MA.

Rick Greenwood
Barrington, RI

PRESIDENT'S REPORT, NNEC

The large attendance at the Fall Meeting and Tour in Claremont was gratifying. We thank Walt Ryan for planning and arranging the fine meeting and tour of Claremont's mill area along the Sugar River, and we thank the staff of New Hampshire Vocational-Technical College for the use of their facilities.

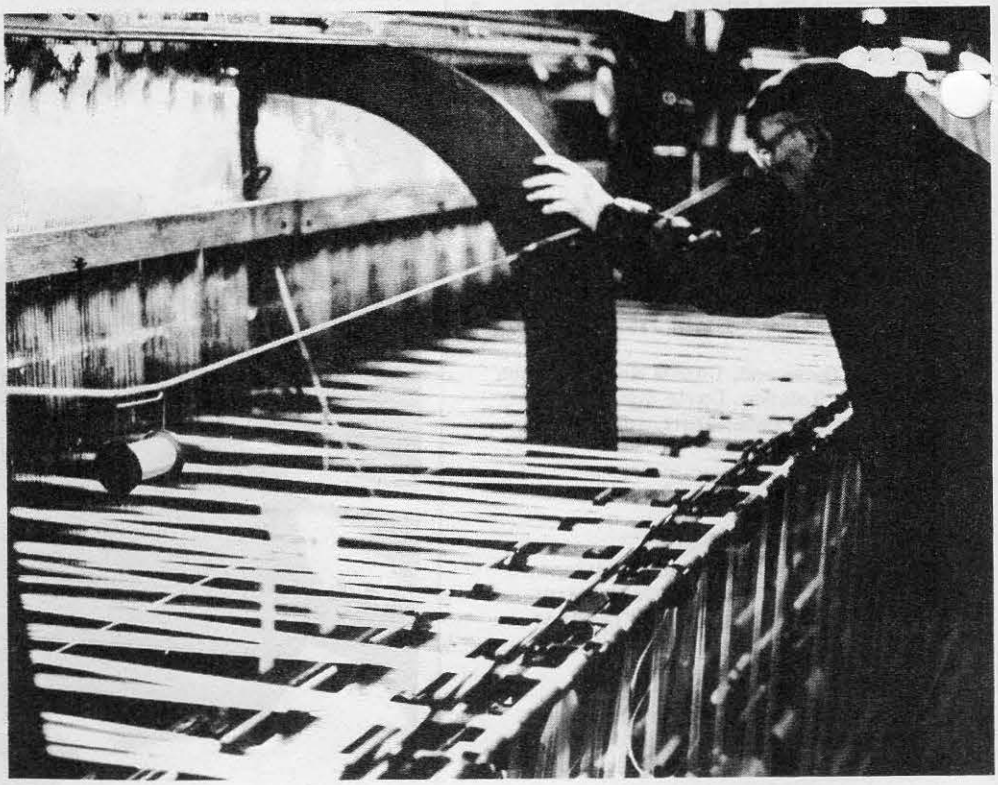
At that meeting we revised our By-laws, changing the makeup of our executive board and adding a new officer. Congratulations to our new First Vice President, Walt Ryan; to our new Second Vice President Stewart Read; and to Vic Rolando who was reelected to another term as Secretary/Treasurer.

Also at that meeting we took significant action by establishing a committee to work with the SNEC to plan a symposium on New England Industrial Archeology. (Please see Peter Stott's article, "Chapters Plan New England Winter Conference on Industrial Archeology".) This symposium is a good way for a maturing chapter such as ours to reach a more general audience with our IA message.

The special tour of Yankee Typesetters, Inc., in February was also a success and has resulted in a fine article by Jerry Wolfe in this Newsletter. This tour-article is something I would like to point out as a model of how we should handle future tours as much as possible. Recording what we have observed and researched should always be the goal of a process tour. This way, the word "archeology" in our name keeps the meaning intended. Archeology is a process of observing and recording. After all, we are not a Society of tourists.

Please try to attend the SIA Annual Conference in Troy, NY, on May 28-31. It will be well worth your time and not very expensive.

Dennis Howe



A Jaquard loom of the Claremont Woven Label Company is inspected by an SIA member during the tour following the NNEC's fall meeting. The tour also included a review of the redevelopment of the city's old industrial center, and a process tour of CMC Paper Company.

CURRENT RESEARCH IN NEW ENGLAND

Massachusetts

QUINEBAUG MILL SURVEY RESEARCH

The Research Department at Old Sturbridge Village is conducting an archeological and historical survey of low technology, water-powered mills in the Quinebaug River Valley located in central Massachusetts. The survey is one component of a large research project, partially funded by NEH, entitled "Tradition and Transformation: Rural Economic Life in Central New England 1790-1850." Research focuses on changes over time in agriculturally-based water-powered industries, the effect of emerging large-scale industry on non-commercial mills, the technological traditions and innovations evident in milling techniques, and the analysis of economic and social networks generated by milling activities. Approximately 250 sites have been identified in the watershed area through cartographic and preliminary documentation research and will be further investigated and documented. Field survey, hydrological assessments and some measured drawing of selected sites will also be undertaken.

In addition to the general mill study, the Research Department is initiating an intensive study of grist mills and milling in central New England from settlement to 1860. Persons with information, documents, and photographs of grist mill structures, machinery, and sites throughout New England please contact Martha Lance, Research Department, Old Sturbridge Village, 1 Old Sturbridge Village Road, Sturbridge, MA 01566. Tel. (617) 347-3362.

FALL RIVER FIRE: 1888 KERR THREAD MILL DESTROYED

On January 12, a devastating fire destroyed the eight-building Kerr Thread Mills, one of more than two dozen significant textile mill complexes in Fall River. The fire was the second major mill fire to strike the Spindle City in this decade. In November 1981 the Richard Borden Mill (1871) was also destroyed by fire.

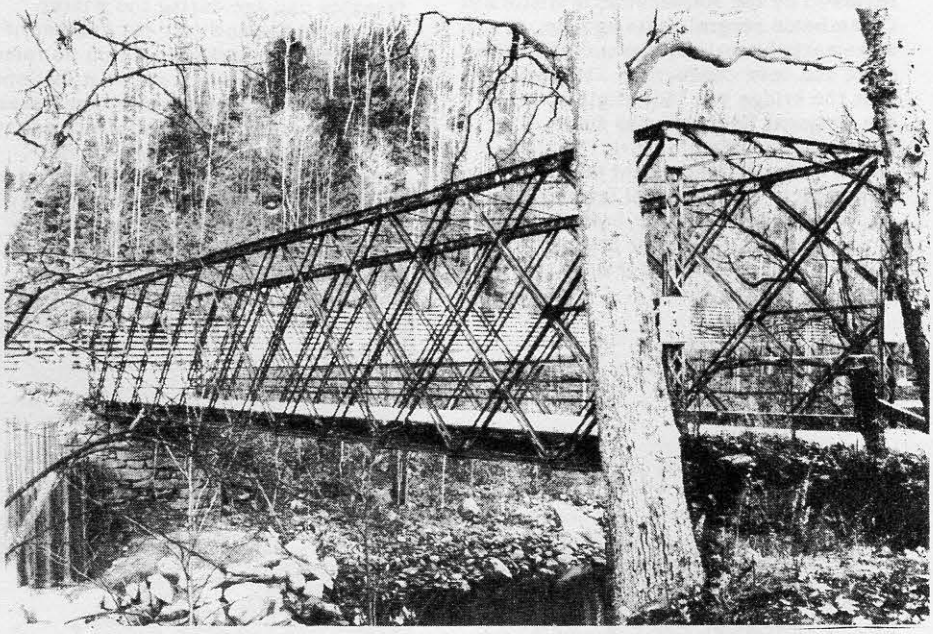
The Kerr Thread Company, established in 1888 for the manufacture of fine cotton yarns, was founded by the Scotsmen, Robert C. and John P. Kerr. The original five-story brick Mill #1 was erected in 1890 with a capacity of 24,000 spindles for the manufacture of "Kerr's six cord spool cotton and fine yarns." In 1897 the company became part of the American Thread Company. Additional mills were constructed in the 1890s and 1907. With the completion of a bleachery and finishing mill in 1916 and 1921, respectively, the Kerr Mills expanded into finished cotton cloth. The company survived the depression and by 1944 produced 3.5 million yards of cloth annually. The mills remained in operation until the early 1950s. After the mills closed, the building continued as an integral part of Fall River's economy. When fire struck the mill complex, it housed eleven smaller companies providing 800 jobs. In 1983 the buildings were listed on the National Register as part of the Fall River Multiple Resource Area.

The fire is believed to have started in the basement of Mill No. 3, at the west edge of the complex, and within three hours the three principal mill buildings had been reduced to flaming shells. Some brick walls still standing when the fire was put out have since been demolished.

Peter Stott
Newton Highlands, MA

RARE LATTICE TRUSS BRIDGE DUE FOR REPLACEMENT

The Florida Bridge, the earliest known example of the R.F. Hawkins Bridge Company, spanning the Deerfield River between the Massachusetts hill towns of Florida and Charlemont, is to be replaced later this year by a new bridge on a new downstream alignment. The 131-foot lattice through truss has recently been identified by the Massachusetts Dept. of Public Works as the earliest known example of its type. According to Stephen J. Roper (SIA), DPW Historic Bridge Specialist, the bridge is one of six known lattice truss bridges in the



The 1886 Florida Bridge over the Deerfield River, between Charlemont and Florida, Mass.

state.

The Florida Bridge was constructed in 1886, a year prior to the construction of the Great Northampton Bridge, 9 lattice truss spans carrying the Mass. Central Railroad over the Connecticut River. Both bridges were constructed by the R.F. Hawkins Iron Works of Springfield. Richard Fenner Hawkins (1837-1913) was one of two major Massachusetts bridge builders in the late 19th century, the other being D.H. Andrews' Boston Bridge Works. Hawkins' parent firm, Stone & Harris, in the 1850s held the New England rights to the Howe truss. After Hawkins joined the company in 1853, it was among the earliest to begin experimenting with all-iron bridges, in New York, as well as western New England.

According to bridge authority Victor Darnell (SIA), the lattice truss with riveted connections and plate girders was early favored by the New York Central Railroad, particularly for longer spans. The Irish engineer Howard Carroll introduced the through lattice truss to the railroad in the late 1850s. His successor at the New York Central, Charles Hilton (1829?-1884), modified the form, introducing a short horizontal member between the intersection of the lattice web and the endpost. This feature, Darnell noted, together with Hilton's recommended panel length, is repeated in the Florida Bridge.

Despite these discoveries, the bridge is due to be demolished. When the original demolition proposal was reviewed by the Massachusetts Historical Commission several years ago, no systematic historic bridge survey of the state had been conducted. The decision, that the bridge was "not eligible" for the National Register, was made. The lesson that all state historic preservation offices should take from this debacle is the crucial importance of a comprehensive state bridge survey.

Peter Stott
Newton Highlands, MA

FIRE IN LOWELL

Fire of undetermined origin ravaged the Lawrence Manufacturing Corporation complex in Lowell. Discovered by a passing fireman at 5:30 P.M., March 23, the conflagration led to eleven alarms and burned furiously into the middle of the next day.

Sadly, the central part of the complex, containing the most impressive edifices, including two six-story stair-towers, was lost. The two original 1832 buildings and the 1855 connection, with its impressive appearance and imposing towers, were destroyed, as was the 1835 cotton storehouse and numerous nearby structures. Other buildings suffered varying amounts of fire and water damage. Several hundred people were put out of work by the blaze. Lowell University's plans to expand into the space will apparently proceed.

Both stair and toilet towers were left standing after their interiors burned. Six-story factory walls crumbled from the intense heat. Despite firemen's efforts to establish water curtains around the buildings first involved, radiant heat carried the fire from structure to structure. The mill's location at the river prevented access from that direction, and narrow alleyways within the complex, while passable for trucks, could not be used because of the danger of falling walls. Firemen were left to work from the ends of the complex and from the roof of the ca. 1900 structure (which survived) at the top of the yard.

The fire was sad because of the jobs and investments lost. Many tenants were small businesses in partially occupied buildings and thus were unable to obtain insurance (said by one to require 80% occupancy). The sprinklers in the first building involved were shut off, apparently as the result of freezing damage during the winter.

Lowell has now lost yet another of the major companies on which its fame was based. More important, it lost one of the few remaining major complexes which stood visible as a discrete entity in all its imposing stature. Of the nine major original companies, only three (Boott, Massachusetts, Suffolk) stand but are not readily identifiable in terms of scale or impact as separate entities. Since these mills represent the only extant memorials to the hundreds of thousands who labored there, this loss is a particularly harmful one for those who interpret this history artifactually. The visible record has been seriously diminished.

Larry Gross
Museum of American Textile History

Rhode Island

THE BIG RIVER RESERVOIR

For two hundred years, a succession of millers, blacksmiths and textile factory owners were ponding and re-impounding the waters of the Big River watershed as they flowed through the rural upland towns of West Greenwich and Coventry, RI. Now the remnants of their hardwon engineering feats are faced with a larger and more permanent inundation, as plans proceed, once again, for the construction of the Big River Reservoir by the Rhode Island Water Resources Board. The Public Archaeology Laboratory, Inc., of Providence, which conducted a pilot study of the reservoir area in 1978, began a more intensive survey of the proposed flood pool in the fall of 1986. The field study by PAL's industrial archeological team of Rick Greenwood and Marsha King has identified a rich lode of IA sites on the area's four waterways, ranging from isolated sawmill sites from the early 18th to the early 20th centuries, to intensively developed waterpower complexes, where the pattern of industrial use has been complicated by successive rebuilding and reworking of the waterpower systems by textile manufacturers in the 19th century. While the Congdon Mills, Nooseneck Mills and their neighboring mills and factories never held a prominent place in the Rhode Island industrial scene, they are significant as representatives of the type of small-scale rural industry that was common to all of New England. As the project moves from the initial fieldwork phase, it is anticipated that the data recovered will provide valuable insights into the evolving nature of rural industry, both in terms of its role in the rural economy and its adaptation to technological change.

Rick Greenwood
Barrington, RI

STATEWIDE BRIDGE SURVEY

The State of Rhode Island has recently selected the team of historic resource consultants composed of Matt Roth, Bruce Clouette and Pat Malone to conduct a statewide survey of historic highway bridges. The project is to begin in the near future.

GLENARK MILL BURNS IN WOONSOCKET

The Glenark Mill, a prominent brick and rubble stone textile mill in Woonsocket, RI, was destroyed by fire on April 7th. The four-story brick and rubble stone complex was built about 1865 on the bank of the Blackstone River by Woonsocket's prominent Ballou family, serving originally as a cotton mill. Expanded in 1885, the building later served successively as a knitting mill, a worsted mill, and in its last use as a dye works. The building had remained vacant and subject to vandalism for several years, although developers had recently announced plans to construct 80 new apartments in the complex. The Glenark Mill occupied an important location in Woonsocket, opposite the oldest part of this industrial city and just upstream from the Bernon Mills visited during the 1984 SIA/TICCIH tour.

Peter Stott
Newton Highlands, MA

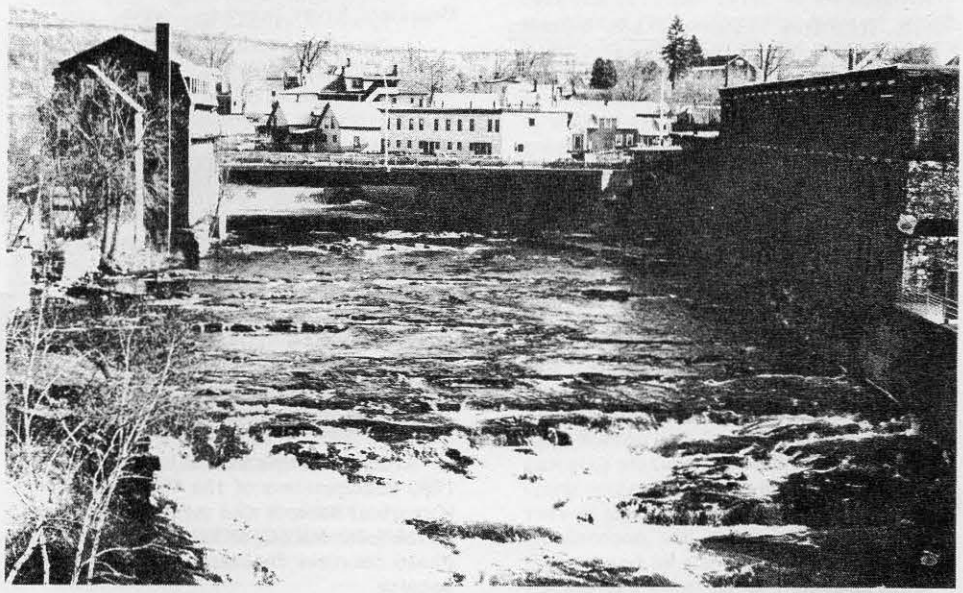
Vermont

RECTANGULAR CHARCOAL KILN RUIN FOUND IN VERMONT

Finding a charcoal kiln in Vermont is not news. Over 130 kiln ruins and remains have been found in the state in the last three years. But all of them are remains of mound, round, or conical kilns. This one is rectangular, which makes it noteworthy. A 19th-century paper on charcoal-making discusses merits of rectangular, round, and conical charcoal kilns in New England as well as outside New England, leading to the conclusion that rectangular charcoal kilns should have been a common occurrence in Vermont (Eggleston 1879:378-85). Accordingly, a watchful eye was maintained for clues to rectangular charcoal kilns as part of the continuing IA survey of Vermont, but finally finding one was more accidental than intentional.

On a cold Saturday afternoon (May 3, 1986), Bob West and I were inspecting an area about a mile southeast of Chittenden Village for remains of a "coal kiln," as indicated on Scott's (1854) Map of Rutland County. While we were querying some local residents, someone asked if we meant "the old kiln near Lefferts Pond." It wasn't what we were looking for, but since we were having no luck in our search for the 1854 "coal kiln," we followed directions to the site, which led us about 2 miles east of Chittenden Village along the dirt road that skirts the southern edge of Lefferts Pond. To our surprise, what we found in some low brush was the ruin of a rectangular, stone-built, partially standing charcoal kiln.

Outside dimensions of the ruin (VT-RU-156) are 37 feet long, 16 feet wide, and walls generally 4 to 6 feet high. One section of wall stands a precarious 10 feet high. The kiln is made of stone throughout, insofar as the remains indicate. The insides of the walls are blackened with hard, black pitch. Except for some breakdown outside one end, most of the collapsed stonework has fallen into the kiln; the actual floor of the kiln is hidden beneath many feet of breakdown. The walls are about 2 feet thick with signs that some



In Claremont, NH, site of the NNEC's Fall Meeting, the Sugar River provided the power for the early mills which helped the city develop into an important manufacturing center for western New Hampshire. Today the river continues to provide hydroelectric power for the area's industries.

mortaring was used. It was common practice not only to mortar the stones in place, but also to liberally coat the outside walls with lime mortar during the burning process to prevent air leakage into the kiln.

Vent holes are visible in the walls in generally horizontal levels starting at the ground and spaced about 2 to 3 feet apart up the walls, and the same distances laterally from each other. Dimensions of the vent holes suggest that bricks were used to close the holes, another common occurrence in almost all stone-built charcoal kilns found thus far in Vermont.

Charging and discharging the kiln was apparently carried out at one of the 16-foot-wide ends of the kiln, suggested by indications of an opening at that end. Much loose surface charcoal was found outside this opening. A large, flat sill stone is the base of the opening, possibly supporting a ramp from it to the slightly elevated ground adjacent. Also at this end, a 2-foot-wide ditch runs the width and a few feet around each corner of the base of the kiln, probably to keep rain runoff from leaking through the base into the kiln floor.

There is no visible indication of how the kiln was roofed. The walls are vertical with no visible reinforcement to support a peak or arch-type roof. The roof might have been large, flat sheets of cast iron, removable to facilitate additional charging and discharging access. The only significant piece of hardware found, a section of railroad track sticking up through some stone wall breakdown outside one end of the ruin, further hints at a flat (or slightly slanted) iron roof supported by railroad track, spanning the tops of the walls across the width of the kiln. But there might not have been a structural roof. The top of the kiln could have been left open and the cordwood covered with wet leaves and coal dust, another common occurrence and one similar to covering techniques employed in older mound-type kilns. There is insufficient stone breakdown inside the ruin to justify speculation of a stone arch roof to the kiln.

In his report on charcoal kilns, Eggleston described rectangular charcoal kilns in New England as measuring 12 to 15 feet wide, 40 to 50 feet long, and 12 to 15 feet high. The capacity of the kilns was 55 to 70 cords of wood. These kilns, however, were described as having been made of brick, with arch roofs, and with walls supported on the outside by vertical wood beams. Cast iron rods were tied at the bottoms and tops of opposite beams and the rods run through the inside of the kiln. There is no evidence of that type of construction/reinforcement at this kiln site.

The advantage of rectangular over round and conical kilns was its ease, speed, and low cost of construction. Also, larger rectangular kilns could be constructed in sections, divided by internal walls across the width of the kiln, so that each section could be operated separately. But savings at the construction end cost at the production end. The square corners made for inefficient burning due to lack of proper venting and air circulation. To avoid the waste of partially-charred wood, some operators of rectangular kilns didn't stack wood into the corners, thus effectively creating an oval/circular mound of cordwood inside the rectangular kiln.

Child's Gazetteer lists "Benjamin N. Lampman, manufacturer and layer of concrete roofing and pavement, coal kiln, and farmer" (Child 1881:310). Chittenden local historian Bert Muzzy confirmed this as the kiln operated by Lampman, making the operating period of this thus-far unique Vermont charcoal kiln contemporary with Eggleston's description of rectangular kilns in New England. The site is on the property of a cooperating landowner and within the proclamation boundary of the Green Mountain National Forest. (Later in 1986, we found a second, more recent-vintage, rectangular charcoal kiln in Stratton (VT-WD-66), built of modern concrete blocks and operated in the 1950s, however unsuccessfully, by an enterprising Vermonter. We never did find our 1854 "coal kiln" in Chittenden.)

References cited:

Child, Hamilton. Gazetteer and Business Directory of Rutland County, Vt., for 1881-82. Syracuse: Journal Office, 1881.

Eggleston, Thomas. "The Manufacture of Charcoal in Kilns". Transactions of the American Institute of Mining Engineers, Vol. 6, May 1879--Feb. 1880, pp. 378-386.

Vic Rolando
Pittsfield, MA

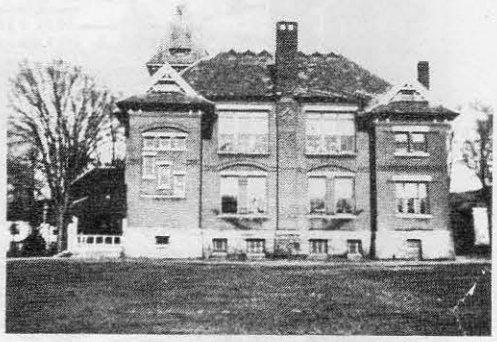
MEETINGS AND ANNOUNCEMENTS

SHELBURNE FALLS TO BE SITE OF JOINT SPRING MEETING

Shelburne Falls, Massachusetts, in the western foothills of the upper Connecticut Valley, will be the location of the joint meeting of the Northern and Southern New England Chapters on May 9th. Through the cooperation of the Massachusetts Electric Company and its parent, New England Power, two hydroelectric tours are planned for the daylong meeting: a visit to the 1912 Deerfield River plant #4, and by way of contrast, an afternoon tour of the 1974 Bear Swamp Pumped Storage Facility.

The meeting will be hosted by the Shelburne Historical Society, whose 1880 Queen Anne landmark, the former Arms Academy, will be the meeting location, beginning with coffee and doughnuts at 9 A.M. There, after a brief business meeting, Hugh Sullivan, New Hampshire Power's Director of Hydro Production, will make a slide presentation on the historical development of hydroelectric power in the region.

Following the slide presentation, we will tour Mass. Electric's Deerfield River plant #4. The 1912 hydroelectric plant, one of five built on the Deerfield River between Conway and



Arms Academy in Shelburne Falls, 1882 headquarters of the Shelburne Historical Society and meeting location of the joint NNEC/SNEC Spring Meeting. Photo courtesy Shelburne Historical Society.

Vernon, Vermont, between 1909 and 1912, is the best preserved of all of the Deerfield River facilities, the system which inaugurated the New England Power Company, pioneer in the introduction of long-distance power transmission in New England. Its electrical engineer was E. Lovette West (1875-1944), former general manager of the Central Colorado Power Company, whose 150-mile Denver transmission line over the continental divide was the pioneer long distance transmission line in the world. Long distance power transmission made possible the location of major generating facilities far from the centers of power demand.

After a box lunch at the site, we will drive into the steep gorge of the Deerfield River, a region sometimes referred to as "the Switzerland of America." Here, the Bear Swamp Pumped Storage Plant uses surplus electric power at night to pump Deerfield River water into a storage reservoir over 700 feet above the river. During hours of peak demand, the water is released back through the two reversible pump-turbines, generating 600 megawatts of electricity, 120 times the quantity supplied by the 1912 plant and 6 percent of the total Massachusetts generating capacity. Bear Swamp is one of two large examples of its type in New England, the other being Northfield Mountain, less than 30 miles to the east.

The Shelburne Falls meeting is seen both as a means of attracting new members from a region with little current representation, and as a way of introducing present members to Franklin County, the upper third of the Connecticut Valley in Massachusetts. In terms of IA, the county is one of the richest and least explored areas of Massachusetts. Our route to Bear Swamp will take us past both the east portal of the Hoosac Tunnel and the ruin of the pumping station which supplied the tunnel's pneumatic drills. However, numerous bridges, textile mills, and cutlery factories all offer visitors unusual opportunities for exploration. Meeting organizers anticipate producing a brief guide to some significant IA sites in the area. The region is also being viewed as a possible site for a National fall tour, in 1989 or 1990.

Shelburne Falls is located on Route 2, just over two hours west of Boston, approximately ten minutes west of Greenfield and Interstate 91.

Peter Stott
Newton Highlands, MA

SOUTHERN CHAPTER LAUNCHES EXPANDED EVENTS PROGRAM

At the Chapter's annual fall meeting in Dedham in November, SNEC Program Coordinator, Peter Stott, announced that the Chapter would inaugurate an expanded series of IA events, beginning in January. The Chapter has traditionally depended on meetings held twice each year, often dominated by business matters. The day-long events often involved considerable advanced planning, and the time required to prepare for such meetings has generally discouraged any increase in the number of such events. These semi-annual meetings will continue, Stott explained, in conjunction with a series of less formal visits to interesting and/or significant IA sites in Southern New England. These events would be announced via a program announcement, sent out to members twice a year.

The first announcement was sent out in December to members of both the Northern and Southern Chapters. Five events were listed, including one in Concord, NH, co-sponsored with the Northern Chapter. Inaugurating the series was a tour of the Museum of American Textile History's Machinery Hall. Guides for the tour were curator Larry Gross and Tom Rockwell. Despite the snow, which limited the turnout to a select band, the tour provided a view of what is easily the world's largest collection of textile machinery built between 1810 and 1970. In viewing the Machinery Hall collection, most of which will go on display when the museum's new headquarters in Lawrence opens in 1988 or '89, SNEC tourists received a glimpse of what must be considered the awesome potential of the Lawrence exhibit!

On Saturday, February 14, some two dozen Northern and Southern Chapter members met in Concord, NH, for a tour organized by Dennis Howe and the Northern New England Chapter to view some of the last operating Linotype machines. (See "Hot-Metal Surviving at Yankee Typesetters", by Jerry Wolfe in this issue.)

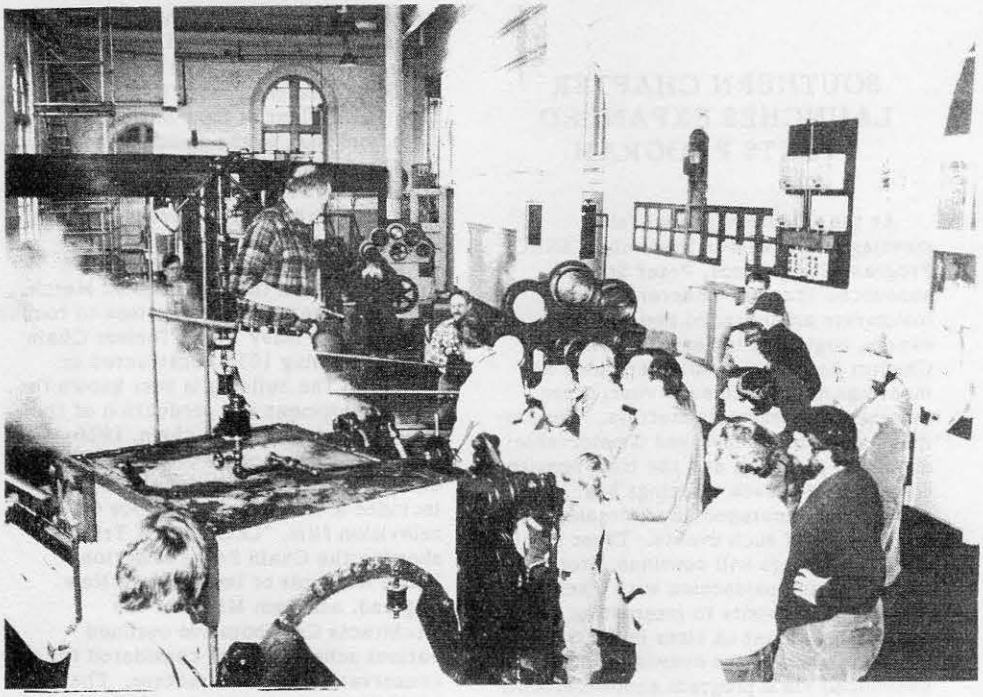
The third tour in the series, on February 28, was a combined visit to the East Boston and Deer Island sewage pumping stations. The 1899 horizontal triple-expansion engine in East Boston, viewed in steam during the 1984 National Conference, was again in steam, interpreted by the Mass. Water Resource Authority's Director of Pumping, John Markley. It is expected that the engines will be dismantled in the near future. At Deer Island, MRWA's Joe Monestere led the group first to the 1896 sister plant of East Boston, now in ruins, and then to the "modern" 1960s Nordberg engines of its successor plant. SIA members from as far west as Colorado and New York helped to produce a good turnout for the event.

Boston was also the scene of the fourth event on the program, on March 21, when Chapter members met to tour the Charlestown Navy Yard's former Chain Forge (Building 105), constructed in 1904-05. The building is best known for the development and production of the Navy's die-lock anchor chain, 1926-1960s, and much of its production equipment remains in place. The visit included a viewing of the 1950s CBS television film, "Lets Take A Trip," showing the Chain Forge in action. Marie Richards of Immobiliare New England, and Pam Miller of the Architects Collaborative outlined various schemes being considered for the conservation of the structure. Their challenge is to retain two whole production lines of the die-lock process on the first floor, while building office and classroom space for Mass. General Hospital around it. The tour of the building which followed was possibly one of the last opportunities to see the structure before construction gets underway later this year.

The last event in the series, which had not occurred at the time of writing, was a planned tour of Slater Mill's Wilkinson Machine Shop in Pawtucket, RI, one of the most complete operating 19th-century machine shops in New England. Director Pat Malone and past curator Sandy Norman have planned a guided tour through the mill from the newly restored water wheel to the water-powered operation of the machine shop.

The second program announcement, covering events during the summer and fall, is expected to be mailed to Chapter members in May. Among the sites being discussed for possible visits are the steam engines of the Natick Paperboard Company on June 6th, the Crane Museum (paper industry) in Dalton, MA, and the Stanley Woolen Mills in Uxbridge. In Connecticut, the Newgate Copper Mine and Sloane/Stanley Museum and Kent Iron Furnace are being considered, and in Rhode Island, the Wireless and Steam Museum in East Greenwich. One unusual event, probably in August, will be a day-long bicycle tour of mills and bridges along the Mill River in Northampton, Mass.

Peter Stott
Newton Highlands, MA



MRWA Chief of Pumping John Markley explains fine points of steam pumping during SNEC visit to East Boston Pumping Station, February 28.

CHAPTERS PLAN NEW ENGLAND WINTER CONFERENCE ON INDUSTRIAL ARCHEOLOGY

At their joint meeting on May 9th, the Northern and Southern New England Chapters will be asked to approve a proposal for an annual winter conference, jointly sponsored by the two chapters. The motion calls for the conference location to alternate between Plymouth, New Hampshire, and Lawrence, Massachusetts, with the first meeting, in February or March of 1988, to be held in Plymouth.

The proposal springs from a meeting held January 17th in Lowell at which ideas for such a conference were aired. Representing the Northern Chapter were Dennis Howe, David Starbuck, Stewart Read, Dot Nadeau, and Bill Taylor. Peter Stott and Chuck Parrott represented the Southern Chapter. There was general recognition that the Chapters, in fulfilling their goals of promoting industrial archeology in New England, need to reach a much wider audience. An annual conference specifically geared toward New England industrial archeology was seen as an important means of addressing this need. Dennis Howe and Bill Taylor noted that although most states require the teaching of state and local history, more often than not high school teachers were unaware of many of the different types of resources available. Even long-time SIA members were not always aware of the different resources available in different states. The net result was the decision to make the conference a two-part affair: a series of general papers in the morning, and workshops in the afternoon. The afternoon will conclude with a wine-and-cheese event, coupled with a show-and-tell session.

Bill Taylor, past NNEC president and Director of the Institute for New Hampshire Studies at Plymouth State College (New Hampshire), offered to host the first meeting in 1988. The Chapters will be asked to consider one of two Saturdays, February 6th, or March 5th, 1988. Plymouth is near the center of the state, just south of the White Mountain National Forest. It is 43 miles from Concord and just over two hours from Boston via Interstate 93. It is proposed to hold alternate year conferences in Lawrence, Massachusetts, in conjunction with the new convention quarters being built in association with the Museum of American Textile History.

Although the conference is only planned as a single day event, participants will be encouraged to plan their weekend around the conference. Both downhill and cross-country skiing are available in the immediate vicinity of Plymouth, and conference organizers are looking at the feasibility of a cross-country IA ski tour for Sunday.

Peter Stott
Newton Highlands, MA

SNEC INTRODUCES LIFE MEMBERSHIP CATEGORY

At its annual fall meeting in November 1986, the Southern Chapter voted to introduce a new membership category, lifetime membership, for a one-time fee of $100. As of March 1987, six SNEC members had taken advantage of the new class of membership. The Chapter officers were gratified by this expression of support.

For the time being, the annual general membership remains at five dollars, but with the expanded events program planned, this rate must inevitably rise, and with it, the life membership rate. Program Coordinator Peter Stott observed that an announcement of this pending rise in the two rates might be a good incentive to members who are considering the life category while the rates still remain low!

Peter Stott
Newton Highlands, MA

OSV FIELD SCHOOL

The ninth annual Old Sturbridge Village Field School in Historical Archaeology will be conducted from June 22--August 7 at Old Sturbridge Village and at the Emerson Bixby and Cheney Lewis sites in Barre, Massachusetts. Bixby was a blacksmith and Lewis a shoemaker in a once-busy, early-19th-century, agricultural/crafts neighborhood known as "Barre Four Corners."

Following a week of intensive orientation to the historical and material culture of early-19th-century rural New England, students will spend six weeks learning methods and techniques of field archeology, working at the Bixby and Lewis sites. The Field School will involve students in excavation, survey, measured drawing, conservation, computer, and other field, lab, and recording activities. Lectures, workshops, and informal seminars will complement the work in field and lab.

This is the fourth season of a long-term project to develop new historical information for exhibits and interpretation at Old Sturbridge Village. The focus of the 1987 fieldwork will be excavation of several outbuilding sites on the Bixby homelot, and of the yard spaces of Bixby's neighbor, Cheney Lewis.

The Field School is designed as the equivalent of two full courses at either the graduate or undergraduate level. Eight semester hours of credit are available through Clark University in Worcester, Mass., for an additional fee of $100. The basic program fee of $500 covers all materials and fees and includes complementary admission to Old Sturbridge Village during the program. Local housing during the Field School is also available for an additional fee. Participation is limited to 20 students. The application deadline is June 1, though applications will be processed as received. For further information and application forms, please contact: David Simmons, Archaeology Field School, Old Sturbridge Village, Sturbridge, MA 01566. Telephone: (617) 347-3362.

RECENT PUBLICATIONS, ETC.

Romano, Frank J. 1986. Machine Writing and Typesetting. The Story of Sholes and Mergenthaler and the Invention of the Typewriter and the Linotype. Salem, NH: GAMA.

Starbuck, David R. 1986. The New England Glassworks: New Hampshire's Boldest Experiment in Early Glassmaking. Special Issue of The New Hampshire Archeologist, Vol. 27, No. 1. 148 pp.

Weible, Robert (ed.). 1986. The World of the Industrial Revolution: Comparative and International Aspects of Industrialization. Essays from the Lowell Conference on Industrial History, 1984. North Andover: Museum of American Textile History. 177 pp.

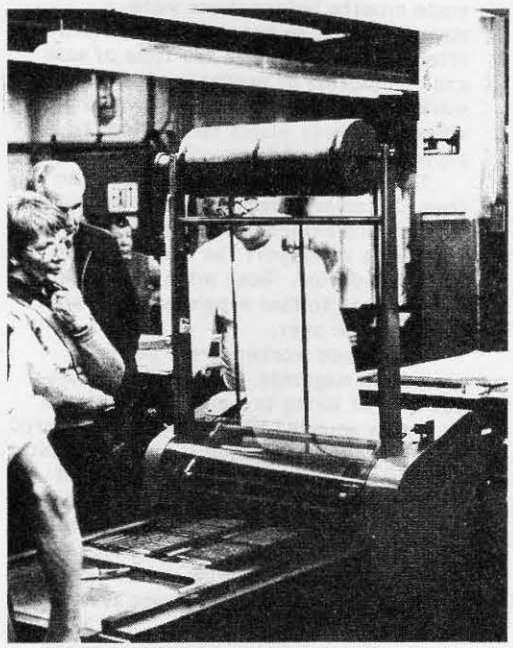
Newly Published: A Railfan's Guide to Eastern Massachusetts and Rhode Island. 24x36 fold-out sheet with maps of Eastern Massachusetts and the Boston area showing all extant rail lines. On the reverse side are lists of all operating passenger services; surviving railroad stations and other structures; other MBTA rapid transit lines; and more... $3.75 from Mass. Bay Railroad Enthusiasts, Inc., P.O. Box 360, Babson Park, MA 02157.

SIA Hats and 1986 Fall Tour Guidebooks Available: Spiffy, high quality baseball hats (adjustable bands) featuring the SIA 1986 fall tour logo and the full name of the Society are available. The tour logo shows a masted whaler and a submarine, symbols of coastal Connecticut and Rhode Island's maritime industries. Hats are gray with navy blue lettering. Also available are limited copies of the tourbook entitled Waves on the Industrial Shore: Industrial Archeology in Coastal Connecticut and Rhode Island (paperback, 60 pages). Hats may be purchased for $5.00 and tourbooks for $4.50. Please send orders to Mary M. Donohue, Connecticut Historical Commission, 59 South Prospect Street, Hartford, CT 06106. Make checks out to "SIA".

HELP WANTED

Drill or Punch Work
(See Vol. 6, No. 2 of SNEC/NNEC Newsletter)

Robert Talbot writes: "Betsy (Talbot) would like to know of other examples of drill work as interior decoration, not specifying location geographically. This past July I visited the George Read House, The Strand, New Castle, Delaware -- as stated, the sharp edged holes are easily filled by successive layers of paint so I could not see how they are made. I later experimented with a flat ground punch and hollow pointed punch. The results were not consistent depending on spacing and grain location. The sponsors of this house have an architect working on restoration, so there may be a source of information from his office re. the method used. It seems to me that this was a short-lived fad killed by thick lead paint, but nevertheless quite striking in appearance." If you know of any examples, please write to: Robert Talbot, 1536 Magnolia Street, New Smyrna Beach, Florida 32069.



SIA members watch a demonstration of the operation of a proof press during a recent tour of Yankee Typesetters, a hot-metal shop in Concord, NH. See article on page 13. Photo by Dennis Howe.

Article

HAVERHILL SHOE FACTORY STRIKE OF 1895

[This article is taken from a forthcoming book by Bertha Woodman that will be published by the Haverhill Public Library. Tentatively, the title will be Our Lives in the Queen Shoe City, The Early History of the Jewish Community of Haverhill, Mass., 1880 to 1940. It will be available for distribution on October 1, 1987, through the Haverhill Public Library, 99 Main Street, Haverhill, MA 01830. Copies of the original interviews and transcripts of the tapes will be available for research only at the Haverhill Public Library.]

Eighteen ninety-four was a bad year for the shoe industry. Economic conditions had been depressed, and sales were down. Shoe manufacturers, trying to keep factories afloat, asked employees to take a 33-1/3% cut in wages. This cut would have allowed shoe sales at a lower price to beat the competition of factories in other parts of the country. Prices and sales were made months before shoes were manufactured, so economic conditions often changed between the time of sale and completion of products. Hence, the workers were caught in a bind, having agreed to lower wages insufficient to support their families.

The shoe manufacturing season ran from December through June. Whatever wages were earned during that time had to stretch to support the workers over the slack period. Both male and female workers had to find supplementary work to tide them over.

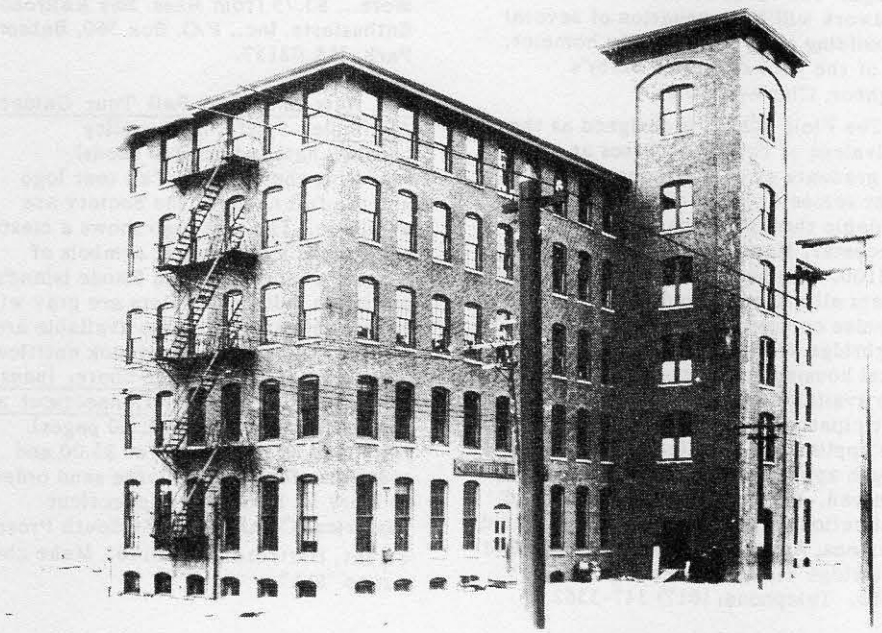
Many shoe workers were newly arrived immigrants. They did not know the cost of living in America. Any sum of money sounded like a fortune compared to what they had earned in the old country. The manufacturers were distrustful of these new workers. Management did not know if they would report to work on a daily basis, so Chick Brothers Shoe Company, W.W. Spaulding, and Swett Shoe Company developed a contract system to insure workers' loyalty.

There seem to have been two types of contracts. One contract stated that a sum of money be withdrawn from wages each week until $25.00 was accumulated. This was held to assure that workers would report to work each day. The other type of contract, referred to as the "iron-clad contract," dictated that a dollar a week or 20% of the weekly wage be withheld for a year, until a total of $50.00 was reached. The money withheld paid 7% interest. According to Mr. Chick, "withholding the money taught the workers thrift as they would have spent the money foolishly if they had it." Because the workers did not understand the American system, they agreed to these contracts. Failure to give two weeks notice by the worker meant loss of money. This threat kept them from striking or quitting. As the shoe workers became experienced in their jobs and familiar with life in Haverhill, they became dissatisfied with the inequities of their wages and contract system.

The contract system was not the only example of exploitation of workers. Max Maistrosky, who worked at the Chick Brothers Shoe Factory from 1893 to 1895, had to work for four weeks without pay in order to get a job. He was told that this was the way to learn the trade. Another example of exploitation was to bring immigrants fresh off the boat who had skills that were easily adapted to making shoes. The factory owners would train them to do the highly skilled work and pay lower wages. When the workers became proficient in their jobs the manufacturers would discharge the higher paid workers. This became the practice in the Chick and Winchell factories.

There were two major reasons for the strike. First, the contract system allowed the workers no control over the money withheld from their wages. Pay envelopes showed the full amount earned. Workers had no receipt or record of the money held in escrow. The second reason for the strike was the low wages agreed upon the previous year while the country was still trying to pull itself out of the economic depression of the early 1880s.

Labor had been trying to organize since the early 1830s when shoes were first produced in factories instead of as a cottage industry. Factory owners felt threatened by the unions that were being formed by workers. If shoe unions succeeded, the owners would have to deal with organized groups instead of individual workers. This struggle was a major issue by 1894.



Chick Brothers Shoe Factory, 414 River Street, Haverhill, 1890s. Courtesy of the Haverhill Public Library.

The lasters, all men, felt the advance of mechanization in the introduction of the "niggerhead" machine. This machine nailed the loose leather from the upper part of the shoe down around the back before the heel was put on. The process had been done by hand until technology developed the "consolidated method lasting machine" during the Industrial Revolution. This machine eliminated hand work and jobs (Newburyport Daily News, 12/27/1894).

On December 12, 1894, the machine lasters of the T. F. Finney shoe contracting shop went out on strike, demanding a 30% increase in wages. Fights between hand lasters and machine lasters broke out in earnest. Hand lasters attempted to drive the machines out of the factories. As the lasters struck, new men were employed. These men were trained to use the lasting machines, so hand lasters were no longer needed.

On December 14, 1894, eight hand lasters employed by Husseey and Hodgen struck because the employees' new price list was not accepted by the manufacturers. The lasters' union saw conditions more favorable for a successful strike against the use of lasting machines. On December 15 the shoe manufacturers' met to protest against the workers' demand for increase in wages and the proposed increase in tariff on shoe shipments.

On December 16, 1894, about 200 unionized lasters from the Chick Brothers factory struck in the dispute over wages. On December 31, thirteen hundred lasters headed by a brass band paraded through the streets of Haverhill. William M. Chick, owner of Chick Brothers Shoe Company, reported:"... I heard the sound of a drum corps and saw a large body of men and women coming. They appeared headed for my factory, and a large crowd assembled directly in front of my factory, while a thousand marched back and forth in front of my factory with a drum corps ... The crowd stayed for an hour, and from 350 to 400 people left my factory and joined the crowd. The crowd shouted and hurrahed."

Although Jews were involved in the strike of 1895, few played prominent roles. Max and Sam Sibulkin were Jews important in the strike. Their concern for organized labor with a strong union motivated their participation in the strike. According to the Haverhill Gazette, 1/15/1895, "The two Sibulkins were seen in Tuesday's parade and nearly every day after as pickets." (as quoted by William Chick at the hearing in Salem Court).

The manufacturers were desperate for workers to fill shoe orders. They sent agents to New York and Boston to bring newly arrived immigrants to Haverhill to work in the factories. Among those to come as strike-breakers were Jews (referred to as "Hebrews" in the newspapers), Italians, Armenians, and Huns. Mattresses and clothing were brought to the factories so workers did not have to leave the shops and be confronted by the strikers. The newly-arrived immigrants had no idea of what was happening. They did not know they were employed as "scabs."

Jacob Blastein also played a role, not as a striker but as a victim. The Haverhill Evening Gazette of January 4, 1895, contains the following report:

"Abraham Goldstein alleges that Jacob Blastein, a McKay stitcher, was forcibly detained when he attemped to leave one of the factories, and locked in. 'What right had they to keep that man from coming home? 'asked Goldstein last night. "They would not dare to do that to an Italian, for Italians carry knives, and know how to use them. We were going to get a policeman to take the man out, and his wife wanted us to do it, but we thought it might be bad for the union cause, so we let him stay until tomorrow. They will have to let him go in the morning, or we will find out the reason why... .

" We will notify our people in Boston and New York that they must not come here to take our jobs... .

"The reasons that Blastein was detained, the strikers say, was because he was the only McKay stitcher left in the factory, and it would be impossible to get work through the factory if he went out.

"Swain Chick was today questioned relative to the statement. Mr. Chick declared that there were men in the factory every night, and that at the present time an additional force had been acquired to serve as night watchmen.

"He refused to state whether any Hebrews were confined in the building and added that the doors were always open and the men could go out whenever they pleased. No member of the firm, he said, had ever attempted to detain any of the Hebrews by force, and the story that he had seized one of the foreigners by the coat, and compelled him to return to his work was false."

By mid-January the strike was in full swing, involving over 3000 workers. On January 15, 1895 the manufacturers bought an injunction against the shoe unions to stop the strike and return to work under the same conditions that existed before the strike. The strikers were represented by their agents, T. T. Pomeroy and Secretary Hodgkins.

The women stitchers, native-born Americans of various ethnic groups, were skilled workers. They wanted pay for their work equal to men's pay. The women stitchers who went out on strike in January were very militant in their demands and played a very active roll in the strike and the organization of the union.

The workers presented six requests:

1. That employees return to work without discrimination on the part of the employers at the established prices pending a settlement, and that none of the union help be fired.
2. That prices be settled by the local board of conciliation and arbitration or by the state board.
3. That prices agreed upon go into effect February 15th and continue through 1895.
4. That the contract system be abolished.
5. That forfeited contract money held by the firm be returned to the people who deposited it.
6. That all grievances which cannot be settled by manufacturers be referred to the board of conciliation.

(Haverhill Evening Gazette, 1/15/1895)

The Strike lasted until mid-March, 1895. Help to sustain the strikers came from many sources. Donations came from garment workers unions, shoe unions nation-wide, the Women's Christian Temperance Union, and various women's charities concerned with the welfare of the lady stitchers. The union organized their members into shop crews to distribute the three or four dollars a week to feed strikers and their families. Relief funds for rent insured that strikers were not evicted from their tenements and rooms.

Finally, when relief funds were no longer forthcoming, the workers tried to form a strong branch of the Boot and Shoe Workers Union, now a part of the American Federation of Labor, to negotiate an end to the strike. The strike committee agreed that the strike was partly successful, and the "ironclad" contract system was done away with. Wage cuts were halted, and 118 factories signed agreements to

arbitrate a uniform price list.

The Haverhill Evening Gazette reported at the end of the strike:

> Not a man or woman is a whit poorer than he or she was when the strike began last December. We have won many things. We have brought into existence the local board of conciliation and arbitration and have established the right to articulate with our employees on all our grievances. The board will make out a price list, and no firm in the city, big or little, will do work unless it pays the scale of wages demanded by the price list...If they don't they will get another strike, for the men and women will come out as quickly as they did last December and January.

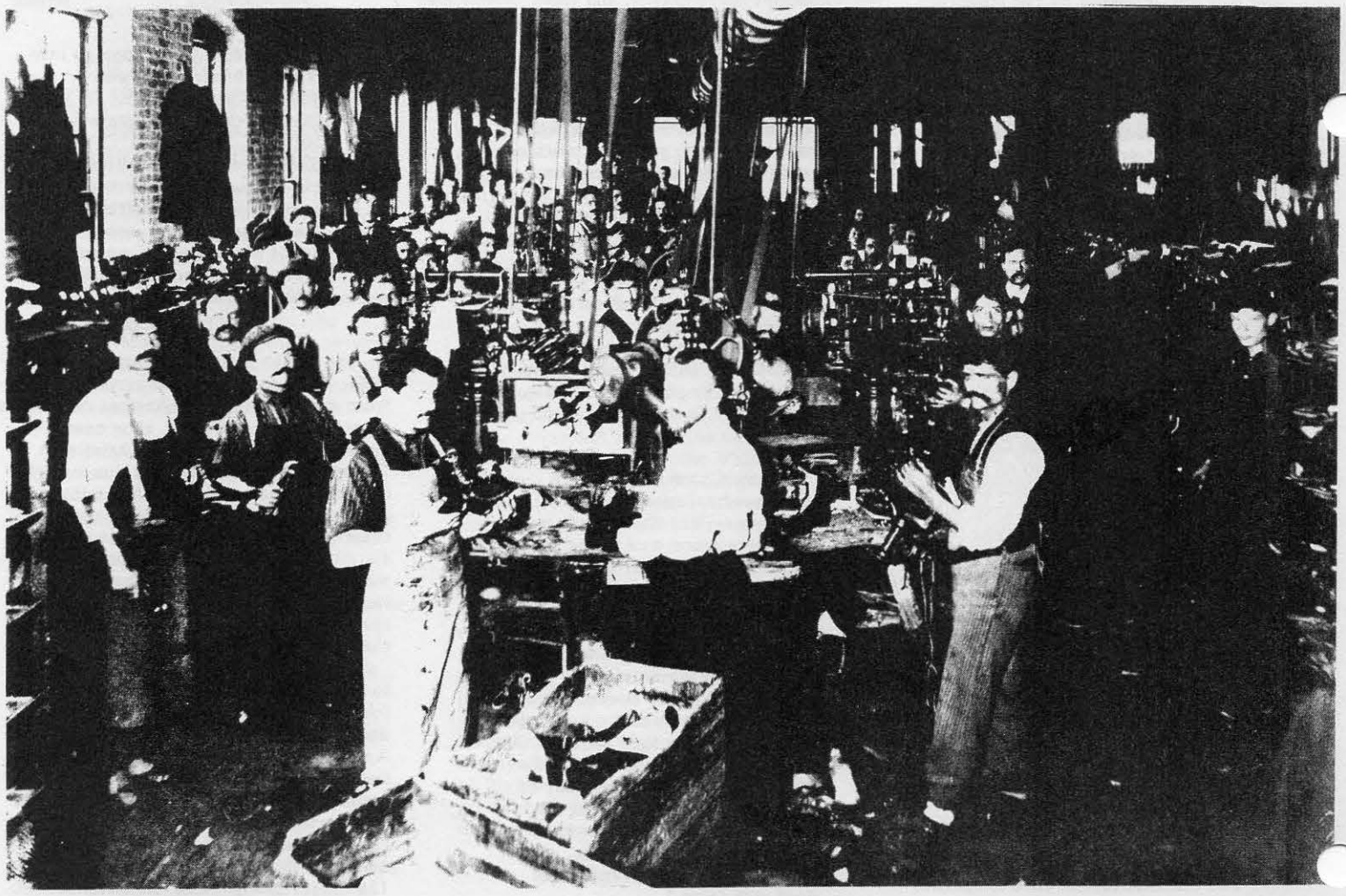
The strike of 1895 had a great impact on the Jewish community. Hundreds of Jewish people moved into Haverhill during the 1890s, many unknowingly as strike breakers. The Jews played a positive role in the strike despite their smaller number when compared to other ethnic groups. In a feature story on the strike in the Boston Herald, the writer commented that the Jews he interviewed were better informed of the goals of the strike than many of the other ethnic groups.

Many Jewish immigrants began American life as laborers in the shoe factories. Charles Court had been one of the first Jews to work in a shoe factory. He went to work for Chick Brothers in the cutting room. Harry Snyder left the factories in 1895 when he realized that there was no future there. He went into business buying leather pieces and selling them to cutters for facings and trimmings. Louis Maistrosky, Zundel Karelitz, Elie Karelitz, Barney Sulkin, and Jacob Brown went to work in the Lennox and Briggs tannery which was located on Essex Street behind the building renovated in 1984 for Senior Housing.

The Jews soon realized that they would have to use their ingenuity to create ways of making more money to support their growing families than it was possible to earn as laborers in the shoe industry.

Bertha Woodman
Newburyport, MA

Workers at the Chick Brothers Shoe Factory, 414 River Street, Haverhill, ca. 1900. Courtesy of the Haverhill Public Library.



Article

HOT-METAL SURVIVING AT YANKEE TYPESETTERS

[A tour of one of the few remaining "hot-metal" typesetting shops in the United States -- Yankee Typesetters, Inc., of Concord, N.H. -- was the focus of the Feb. 14, 1987 special meeting of the Northern New England Chapter of the Society for Industrial Archeology. Approximately 20 members attended the engaging demonstration of Linotype operation.

For comparison's sake, an exhibit of hot-metal's nemesis -- photo-typesetting -- followed at the Sir Speedy Printing Center (owned by NNEC President Dennis Howe). This report was compiled by Sir Speedy employee Jerry Wolfe.]

The Linotype. Some observers say its rolling cams and reciprocating parts remind them of a "Rube Goldberg" contraption. Literary critic Hugh Kenner in his new book The Mechanic Muse [Endnote 1] calls it "as complicated a piece of lever-and-gear technology as you'd want to think about." Thomas Edison reportedly dubbed it "the eighth wonder of the world". But to the people at Yankee Typesetters, Inc., the Linotype is more than a mechanical curio, it is the marvelous means by which they make their living.

Yankee Typesetters serves book publishers by producing reproduction-quality galleys from authors' typewritten manuscripts. The publishing houses usually take responsibility for the book's design (specifying typefaces and sizes, page layout, etc.). The Concord, N.H., company sets the type and handles pagination, billing the labor-intensive service according to a formula that blends the number of characters of a given size and the complexity of typography involved.

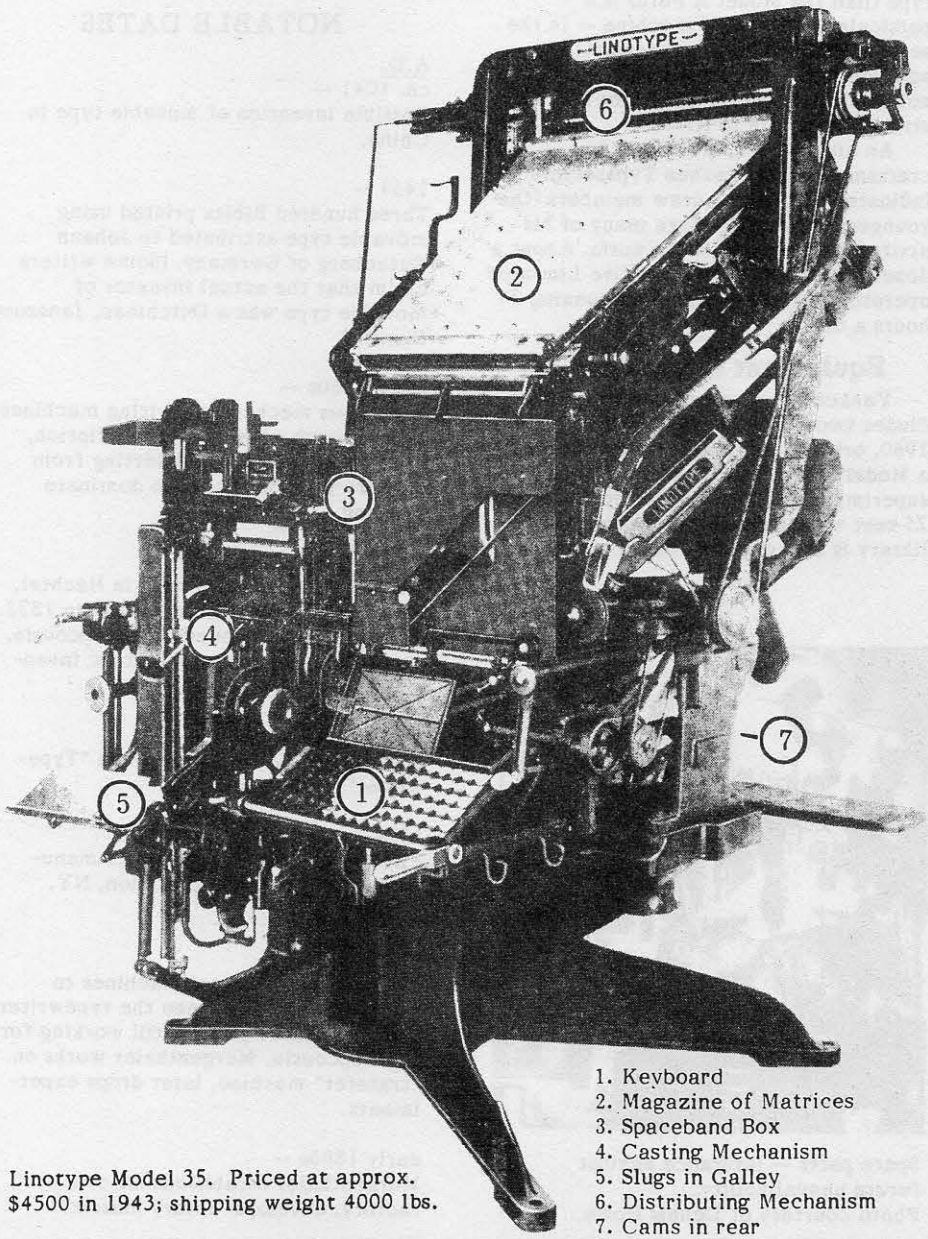
The publisher forwards the final "repro proofs" to the printer, who arranges them according to the press's configuration, makes printing plates and begins the actual book manufacturing process.

The New Hampshire firm's regular customers include Simon & Schuster, S. Jay Lasser's annual tax guides by Hilltop Publications, New Directions (often poetry), Duke University, Columbia University and Oxford University presses. Content ranges from typographically straight-forward novels to textbooks and legal or scholarly works. A heavily-footnoted manuscript in the latter category may undergo multiple revisions and take a two-year period to complete.

Yankee Typesetters' owners, John and Jean Stone, are life-long veterans of printing who have worked side by side in a variety of businesses almost continuously since they were married. In 1959 they were approached by American Book Stratford Press who wanted to buy out their successful Stone Typesetting in Brattleboro, Vt. The Stones sold, and in 1960 they opened Yankee Typesetters in Concord. Several former employees followed them to the new business.

Low Key

The Concord operation has changed little since opening day; John distrusts "bigness." In a day when printers sometimes seem more interested in hype than type, Yankee Typesetters remains notably low key. There is no outdoor sign at the plant, reached through a side entrance at the Page Belting Company and a stairway to space on the second floor. Locally, their public profile is a simple Yellow Pages listing. And while many typographers produce elaborate specimen books to flaunt all their type-



Linotype Model 35. Priced at approx. $4500 in 1943; shipping weight 4000 lbs.

1. Keyboard
2. Magazine of Matrices
3. Spaceband Box
4. Casting Mechanism
5. Slugs in Galley
6. Distributing Mechanism
7. Cams in rear

faces in all of their permutations, John simply lists the font names and sizes.

He does not seem to regret deciding to close a branch in Biddeford, Me., which he ran for five years. "In any business you have to make money," Stone says. "But I've never put that foremost."

One of the things that does appeal to John is having the opportunity to take part in producing fine books. "If you've done a nice job, you can take it out later and look at it," he says. "That's what I think is important."

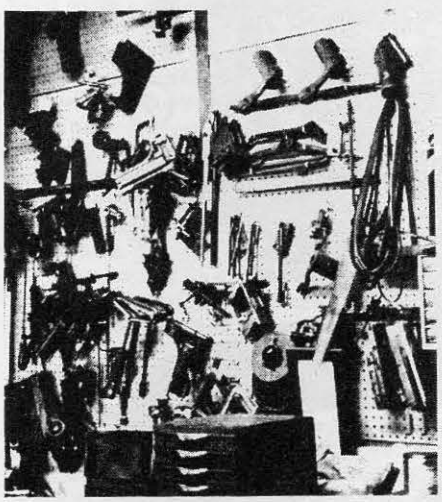
The Linotype itself also is appealing. Now in his mid-70s, John remarks that he first saw a Linotype at age 11, and that he knew then he "just had to get involved with it." The Linotype (like the Model A Ford) is a particularly "elegant" machine -- in the sense that a brilliant mathematical solution may be called "elegant." It is not at all unusual for people to feel a strong attraction to it.

An air of quiet, efficient craftsmanship at Yankee Typesetters indicates that John's crew members (the youngest is near 40) share many of his attitudes. Overtime is the norm. About a dozen full-time employees (five Linotype operators) keep the machines running 24 hours a day.

Equipment Inventory

Yankee Typesetters' equipment includes two Linotypes: a Model 5 (circa 1960, originally introduced in 1906) and a Model 8 (circa 1930, with three superimposed magazines). Approximately 25 text typefaces are available, and the library is still growing. Since production of new matrices is projected to cease within the next five years, John often buys fonts and spare parts from shops that are closing down.

Besides the Linotypes, the operation uses Models I and III Vandercook proofing presses; an Elrod strip-casting machine to make borders, rules, and blank spacing material; a Hammond metal saw; a pig caster to recycle unwanted type metal into new ingots for the Linotypes; several cases of foundry type for hand-setting, and (with some reluctance) a vintage Photo-Typositor [Endnote 2] for "display" size type.



Spare parts -- insurance against future unavailability.
Photo courtesy of Dennis Howe.

Faster is Better

Ottmar Mergenthaler introduced the Linotype in 1886. Before that, type had been set by hand. Foundry-cast characters were stored in a compartmentalized wooden rack called a "job case." The typesetter or compositor picked up a character out of the case with one hand and placed it next to the previous character in a shallow tray ("composing stick") held in the other hand. When all the words that would fit into one line had been set, the compositor "justified" the line by distributing extra spacing

NOTABLE DATES

A.D.
ca. 1041 --
Possible invention of movable type in China.

1454 --
Three hundred Bibles printed using movable type attributed to Johann Gutenberg of Germany. (Some writers claim that the actual inventor of movable type was a Dutchman, Janszoon Coster.)

1714-1860s --
Numerous mechanical writing machines pass through conception, description, prototype phases. Hand-setting from foundry type continues to dominate printing.

1854 --
Ottmar Mergenthaler born in Hachtel, Germany; he emigrated to U.S. in 1872. He was first employed by a stepcousin, creating watches and scientific inventions.

1867 --
Christopher L. Sholes presents "Typewriter" working model.

1874 --
First shipment of typewriters manufactured by Remington's Ilion, NY, plant.

1870s --
Interest shifts toward machines to "bridge the gap between the typewriter and the printed page". Still working for his stepcousin, Mergenthaler works on "transfer" machine, later drops experiments.

early 1880s --
Mergenthaler establishes his own factory, develops "rotary matrix" machine followed by "band" machines. "...Vertical bars containing an alphabet of female characters descended at the touch of a finger key, were brought to a common alignment and metal forced through a mold into the depressed characters in the bars, thus forming raised type on the front edge of a slug in the mold. The slug was ejected through trimming knives into a galley and the vertical bars were lifted to their original position, ready for the next line." [Endnote 4]

1885 --
Mergenthaler develops machine using small circulating matrices rather than characters fixed on bands. The New York Tribune sets type for July 3, 1886 issue using this model. Circulating matrices were the final major breakthrough in the development of the Linotype as it existed for the next 100 years.

1899 -- Ottmar Mergenthaler dies.

Twentieth Century --
Linotype undergoes continual mechanical refinement, but no radical changes. Most improvements involved increasing the number and variety of matrices usable at one time on a particular ("mixer") machine. Other advances: matrix slide block (for casting decorative borders), self-quadder, six-mold disk.

early 1950s --
Fotosetter released. An unsuccessful attempt to overlay phototypesetting concept onto the linotype's well-perfected keyboard and distribution system.

1986 --
Linotype celebrates 100th year, with new-tech digital laser unit as one of its major products.

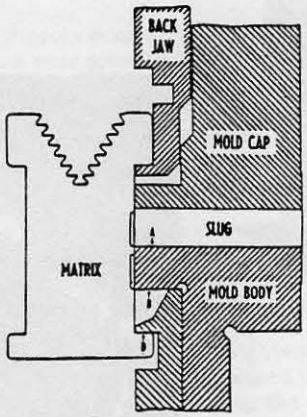


Figure 5. Relationship of matrix, mold and resulting slug.

drops by gravity into the magazine channel from which it originally came. Each channel contains up to 20 matrices of each character.

etaoin shrdlu

The Linotype keyboard has three color-coded sections: lower-case letters at far left, capitals at far right, and figures, fixed spaces and punctuation in the center. The layout follows the approximate pattern of distribution of letters in the English language. The lower-case "e" is used most often, so it occupies the upper-leftmost corner of the keyboard. (It occurs so frequently, in fact, that most magazines contain two "e" channels to ensure a sufficient supply of matrices.) The letter "t" is second most common, "a" is third.

When an operator runs a finger down the first two rows of the keyboard, it produces the sequence "etaoin shrdlu". It's a quick way to fill a line with matrices, roughly equivalent to a typist's use of the "x" key to strike out a typewriting error. The custom was so common among newspaper Linotypists that "etaoin shrdlu" inevitably found its way into print by mistake. A great deal of lore developed around "etaoin shrdlu". The sequence has been the subject of numerous humorous stories, limericks, and mock letters to the editor; some readers concluded that it was a person's name, or an obscure swear word.

The Linotype keyboard has a hair-trigger touch, made possible by an ingenious series of cams, rods, levers, springs, pawls, and escapements (Figure 2). The operator's downward finger pressure, whether light or heavy, is translated into a uniform mechanical motion that releases one matrix per stroke.

Justification of lines is accomplished by spacebands dropped between words. Each consists of two thin steel wedges mounted in opposite directions so that the outside faces remain parallel (Figure 3). When the spaceband hangs freely, its width is at the minimum; upward pressure on the spaceband will increase its total width.

When the operator has finished filling a line with words and spaces, he lifts up a lever which raises the assembling elevator that contains the matrices and spacebands. They are subsequently delivered to the casting mechanism.

Linotype slugs are cast from lead (alloyed with tin and antimony) which is kept molten in a gas- or electric-heated pot. (Kerosene and gasoline have also been used.)

Actual justification of a line of matrices and spacebands occurs just before the slug is molded. A horizontal rod pushes up on the dangling ends of the spacebands, which makes each one expand in width until the line fits tightly into the allotted space (Figure 4).

When the line has been wedged to its full width, a plunger forces hot lead through a mouthpiece to cast the bar of metal with raised mirror-image letters along one edge (Figure 5). The casting mechanism has built-in safeguards that stop the action if a line is too long for the vise-jaw, or too short to justify properly. This prevents mechanical damage or a dangerous squirt of molten metal.

After casting, the water-cooled mold disk rotates, trimming the bottom of the slug as it passes a knife. The slug is then ejected from the mold through a pair of knife edges that trim the sides.

Completed slugs (Figure 6) collect and cool in a removable slanted tray ("galley") on the front left of the Linotype. After the job has been printed, the unwanted slugs can be remelted and cast into fresh pigs (ingots) to feed the Linotype pot.

While the machine is trimming and ejecting the slug, the line of matrices and spacebands is raised to an upper level of mechanisms. One of the most noticeable moving parts of the Linotype, a long arm called the "second elevator," swings down to collect the toothed matrices on its grooved bar. Driven by a cam, it then pivots up to carry the matrices to the distributing mechanism above the magazine, discussed earlier (Figure 1).

The spacebands, having no teeth, do not slide onto the second elevator's grooves. Instead, they are raked into a box to replenish the supply of spacebands for subsequent lines of type.

Linotype speeds up to about 20 lines per minute have been claimed, but actual production runs much less --

Figure 6. A stack of Linotype slugs. Hot-metal printers are adept at reading mirror-image raised type.

perhaps 2 to 8. If an operator keyboards faster than the machine can accept the lines, it is known as "hanging the elevator".

While different divisions of the Linotype have their own independent mechanisms, the overall mechanical action and timing of the machine is controlled by large cams at the rear (Figure 7) driven by a 1/3 horsepower electric motor.

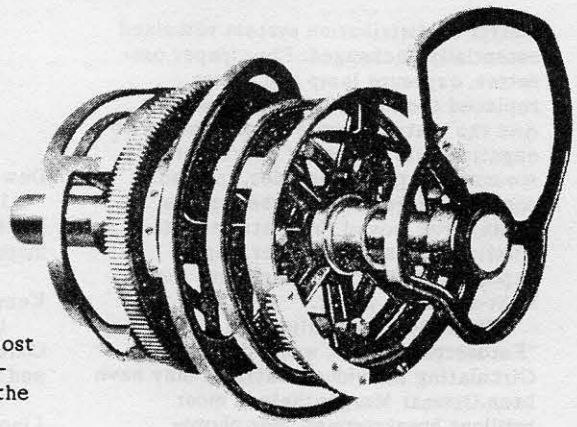


Figure 7. Cams actuate and control most of the mechanical actions of the Linotype. A 1/3 horsepower motor drives the entire machine.

Linotype Survives

Published information on the history of the Linotype and other print-related developments is in ready supply; after all, those associated with the industry have never lacked access to the media. Readers who wish to pursue the subject in detail are referred first to a recent book, Machine Writing and Typesetting, by printing consultant and editor Frank J. Romano. Somewhat "popularized" in tone, the book nonetheless seems trustworthy and is the source of much of the information in this report. Romano's bibliography would be invaluable to any student of the Linotype and printing.

Romano notes that the typewriter and mechanical typesetter are branches of the same evolutionary stem and encourages readers to observe that the branches converge today in the silicon-based world of word processing, digital typesetting and computer graphics. This view is supported by the fact that the Linotype company, founded in the heyday of mechanization a century ago, has survived to prosper in the era of multinational boardroom maneuvering.

As part of its centennial celebration last year, the Linotype Group presented three "experimental forerunners of the original Linotype machine" to the Smithsonian's National Museum of American History. The trade press item announcing the gift billed the company as "one of the world's largest manufacturers of typesetting and photocomposition systems", claiming 1986 revenues of $230 million, up 28.6 percent from the previous year. At the time of the announcement, the profitable trinational firm was part of Allied-Signal, Inc., "one of the 30 largest industrial corporations in the U.S.A." Allied had plans to divest itself of Linotype to raise cash.

Linotype's best-known product today is a high-resolution digital text and graphics typesetter -- the result of at least 40 years' development that began with attempts to "improve" the original Linotype. One of the first stages of automation involved driving the machines with punched paper tapes rather than by direct keyboarding. The theory was that (at least for uncomplicated text type) operators using typewriter-style keyboards could produce copy more cheaply than could traditionally-trained Linotype operators. And since many of the keyboarders were women drawing less pay than the predominantly male operators, the theory proved valid. One former Linotypist could monitor several tape-driven machines simultaneously.

Another advantage was that tapes could be punched via impulses sent by wire services such as the Associated Press and United Press International.

The concept began to yield diminishing returns when further attempts were made to marry electronics and mechanics. Instead of decoding punched tapes mechanically (with a row of spring-loaded pins that sensed the combinations of holes), new tape readers used light beams, photosensors and solid-state electronics. It worked, sometimes too well. The new devices could read tapes faster than the Linotypes could properly assemble the matrices. And with less cooling time between casting cycles, the mold disk tended to overheat.

Early in the 1950s, the linotype was facing competition from an entirely new species of typesetter -- machines that created type not from cast metal but from photographic images. (See endnote on Typositor.) Reacting quickly, the Harris Intertype Corp. created a half-breed. The keyboard, magazine and electronic "digital" form instead of film are now beginning to elbow phototypesetters out of the market. The newest versions create the final image via laser or electrostatic technology, and some can handle graphic material in addition to letterforms.

ENDNOTES

[1] Kenner's characterization appears in a chapter entitled "In Memoriam Etaoin Shrdlu". Type for the book was produced by Yankee Typesetters using the very technology Kenner eulogized.

[2] The Typositor is a bare-bones phototypesetter. The font characters are transparent windows in long strips of film. The operator cranks the desired letter into position and actuates a light that exposes the image onto photographic paper. The strip of paper is then advanced, the next character is positioned, the exposure is made, and so on. As the photosensitive paper exits from the machine, it runs through developer and fixer solutions to make the visible image.

Devices of this kind are direct antecedents to computer-driven phototypesetters that currently dominate the industry. But machines using fonts in

[3] This section on Linotype mechanics uses information provided by Yankee Typesetters and by a 1951 Linotype Maintenance Manual published by the Mergenthaler Linotype Company of New York. The author also draws on personal experience gained while working for his father, retired Linotype operator, machinist and newspaper production manager C.B. Wolfe of Hastings, Nebraska.

[4] Romano. Machine Writing and Typesetting.

matrix re-distribution system remained essentially unchanged. Photopaper cassettes, exposure lamp and lenses replaced the metal casting apparatus. And the matrices were re-designed with negative film images of characters mounted on their flat sides, instead of punched impressions on their edges. A chain drive moved the matrices into position, one after another, for exposure of the characters onto the light-sensitive paper.

The hybrid was called the "Fotosetter," and it was a dead end. Circulating individual matrices may have been Ottmar Mergenthaler's most brilliant breakthrough. For photo-typesetters, however, the key to success was to put the master characters onto rapidly spinning drums or disks. As the desired character came into alignment, the exposure lamp flashed.

The Mergenthaler company eventually saw the light (a laser, in fact), and after 100 years in the market, Linotype still commands a major share of the typesetting machine business.

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