

Technical Communications and IA

Case Studies from the Iron & Steel Industry

Behind many industries is a web of paper communication. Like archeological artifacts, written and drawn documents can provide evidence about industrial sites and how they functioned. These documents provide us with a rich resource for understanding not only how the technology developed and changed but also about how the people who created them communicated with each other. By looking at the technical communication surrounding a certain industry, you can reconstruct some of its physical and social past.

In my case, I was initially interested in 18th- and 19th-century ironworks in northwestern New Jersey. After seeing many of the archeological remains, I started looking for documentation. I found records in the New York and New Jersey historical societies, county and town historical societies, and town libraries. After I widened my focus to iron and steelmaking in general, I found that there was technical communication in many places, often as the last remaining evidence of an industry. This material can be hard to find; much of it is unprocessed, in boxes. For instance, the Senator John Heinz History Center in Pittsburgh has 56 pallets of records from the Jones & Laughlin Steel Co., unprocessed. The U.S. Steel archives are in a mine outside Pittsburgh, also unprocessed. The Mount Hope Mine in New Jersey recently tore down its

changing house (the site is now occupied by Tilcon, a gravel producer) but the Rockaway Historical Society managed to save boxes of records, which are now safe in a local church.

Sometimes these records are spread far and wide. Principio Furnace, the first successful iron industry in the colonies, was in Maryland. The majority of its records, however, are at the Delaware Historical Society and there are more at the Maryland Historical Society and in the Hall of Records in Annapolis. A large group of the correspondence of Charles Carroll, who was a principal in the ironworks, found its way to the New York Public library. Historians who follow these trails, such as Charles B. Dew in *Bond of Iron: Master and Slave at Buffalo Forge*, find their sources are scattered by time and chance; he began researching near the site of the forge in Virginia, found further documents in North Carolina, South Carolina, Georgia, and Alabama, but eventually found the mother lode at the State Historical Society of Wisconsin.

Many industrial sites, when they close, discard their documentation. There are enough cases, however, where the business owners keep the documents, put them in a box, and they are inherited by the next generation, eventually finding their way to a public collection. Even when records are missing, those of an equivalent industrial site can be used to recreate, at least, the context.

The image shows a handwritten journal page. On the left, there is a calendar grid for August 1808. The columns represent the days of the week, and the rows represent the days of the month. The entries in the grid are small, handwritten notes, likely indicating daily activities or events. On the right side of the page, there is a list of 30 numbered entries, each providing a more detailed account of a specific event or task. The entries are written in a cursive hand and include names and locations, such as 'George Taylor had the Constable of the town Mr. Carter, that he had 1000 lbs of iron...'. The overall appearance is that of an old, well-used diary or work log.

Martha Furnace Journal (1801-1815) near Batsto, N.J.



Christopher Andreae 2008 General Tools Award Recipient

At the May 31 Annual Business Meeting in San José, the 2008 General Tools Award was presented to Christopher (Chris) Andreae. The combined education, career and professional accomplishments of this year's recipient demonstrate an unequivocal commitment to bringing industrial archeology into sharp focus in studies of historic places. Since the 1970s, Chris has been untiring in his willingness to share his knowledge about the industrial past with students, youth, colleagues, enthusiasts, and academics. He has led fights to preserve historic industrial sites and has demonstrated the value of industrial archeology as an integral part of heritage recording and conservation strategies.

Chris has been a member of the SIA since 1974 and has made significant contributions as a Director, Vice-President, President, and organizer of tours and conferences. He has been a key figure in Canadian industrial archeology through his participation in IA organizations, teaching, site studies, and publications, including the remarkable book, *Lines of Country: An Atlas of Railway and Waterway History in Canada*. His scholarly work includes dozens of heritage recording studies that have set a high bar for interdisciplinary approaches and for furthering our

understanding of industrial technologies, science, and economics.

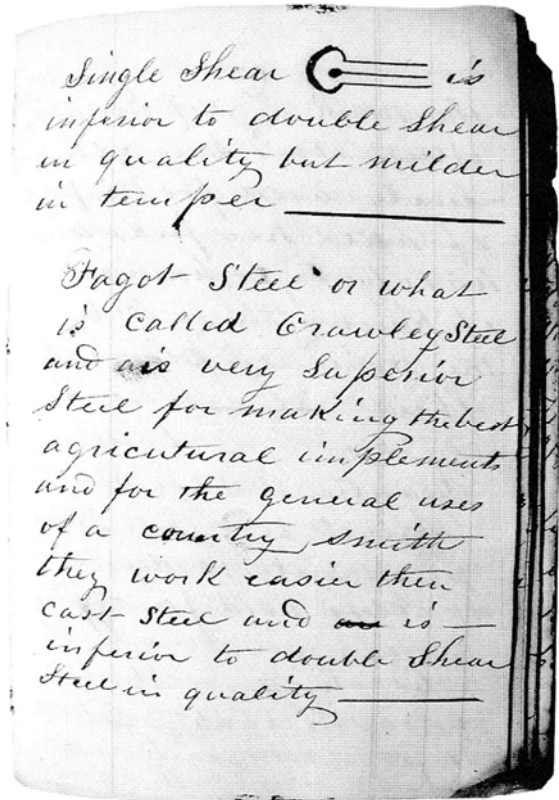
The General Tools Award was established in 1992 through the generosity of Gerald Weinstein [SIA], chairman of the board of General Tools Manufacturing, Inc. of New York City, and the Abraham and Lillian Rosenberg Foundation. The Rosenbergs founded General Hardware, the predecessor to General Tools. The award consists of an engraved sculpture ("The Plumb Bob") and a cash prize. The recipient of the award is determined by the members of the General Tools Award committee, which consists of three members appointed by the President of the SIA.

The General Tools Award is the highest honor that the SIA can bestow. The award recognizes individuals who have given sustained, distinguished service to the cause of industrial archeology. Criteria for selection are as follows: (1) the recipient must have given noteworthy, beyond-the-call-of-duty service, over an extended period of time, to the cause of industrial archeology; (2) the type of service for which the recipient is recognized is unspecified, but must be for other than academic publication; (3) it is desirable but not required that the recipient be, or previously have been, a member of the SIA; (4) the award may be made only to living individuals. ■

There is a fascinating furnace journal in the Hagley Museum & Library, Wilmington Del.: the Martha Furnace Diary. Most furnace journals contain mainly financial information but this one contains notations of daily events. From it we can reconstruct life in an ironmaking village in the early 19th century, better than from any archeological evidence. Daily life depended on the weather; hauling was one of the largest parts of the industry; drunkenness was rampant; employee turnover was large. Some of the entries mixed the mundane and humorous, such as the entry of July 29, 1811: "Joseph Walner quit. Abner Cross with his Team. The general topic of conversation here is respecting a dog that passed by today. It was said that he bit several dogs and was raving mad & some say that he yet retains his Mental Faculties." The Martha journal has been transcribed by Henry Bisbee and his daughter, Rebecca Bisbee Colesar. The transcription, however, is itself rare and hard to find. All that was left of the site, as of the date of its publication (1976), was a grass covered mound in a state park.

Sometimes people keep things because they have an idea they may be important. In the historical papers of the American Iron & Steel Association, deposited at Hagley, there is a tiny furnace journal called *George Nock, His Book, Ramapo Works, Oct. 3rd, 1837*. Although the journal starts out in standard journal format (largely an accounting document), it quickly gives way to recipes to harden and temper cast steel. Someone knew this book was important, kept it, and it worked its way to the present.

(continued on page 8)



A journal named *George Nock, His Book, Ramapo Works, Oct. 3rd, 1837* which provides recipes for making steel.

TECHNICAL COMMUNICATIONS *(continued from page 7)*

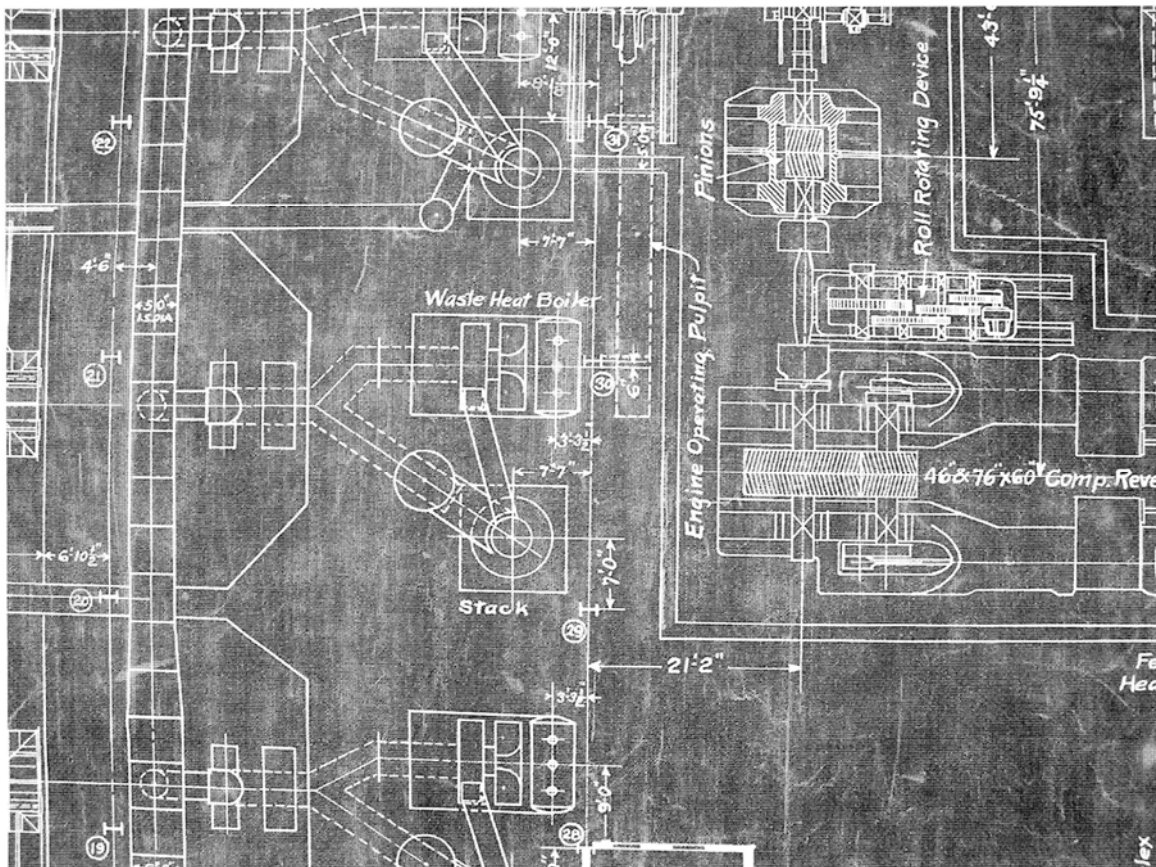
I chose to research a single company across time, to see how the technical communication changed and that study revealed to me how the technology changed as well. Lukens Steel was owned by the same family for 188 years and they gave their records to Hagley. I learned that written and drawn technical communication, in general, did not start until the late 19th century; prior to that date it was mainly account keeping and letter writing. The first documents that were used in the factory itself were records—lists of tonnage, defects, “car books” with information about the contents and movements of railroad cars, and other, mainly quantitative, information. It wasn’t until the turn of the century that workers, foremen, and managers began to communicate amongst themselves in writing and drawing. In 1910, after carbon paper came into wide use, typists took over that role and the workmen themselves did less writing.

At Lukens Steel very little changed in the technical communication between the years 1810 and 1870, and then it began to change rapidly. That reflected the state of their industrial technology—they used the same technology (with the same workers) for the first sixty years of their business. In 1870, when they went from water to steam power (a late advance given that they manufactured boiler plate), the amount of technical communication began to increase.

Suddenly there were boiler reports, indicator cards showing the amount of work produced by the steam engines, and other records kept by the employees themselves. By the end of the 19th century, workers of all sorts were carrying pocket notebooks to keep records of the results of various processes.

The greatest leap forward, in both writing and drawing, was when they installed an open-hearth furnace. It was then that they entered the world of trying to make steel with a specific tensile strength and ductility to withstand the changes in temperature in boilers. This was a world of unseen chemical and physical processes, taking place inside a closed furnace, the molten steel then poured into a mold, and it caused them to start keeping detailed records. They began to experiment and test as well, continually increasing the amount of technical communication and using new tools, such as photography and microphotography.

Both writing and drawing became an essential part of the industrial process after the turn of the 19th century. Knowledge had grown too extensive to be contained in a single mind—groups of people worked together to solve problems and one of their major tools was technical communication. At Lukens Steel, as the equipment became more complex, each machine was drawn and as the interconnecting parts of the plant grew and became more



Detail from a 1918 blueprint of Mill #5, the “Big Mill” at Lukens Steel.

2008 Vogel Prize Winner—Patrick M. Malone

Each year the SIA recognizes outstanding scholarship within the field of industrial archeology with its Robert M. Vogel Prize. The award honors the author of the best article to appear in the Society's journal, *IA*, within the past three years. Articles under consideration have a clearly stated thesis, a well-constructed narrative, and an understandable conclusion. The analysis of material culture plays an important role in articles considered for the prize, as does the use of high-quality illustrations. The prize consists of a cash award and a wooden foundry pattern and plaque engraved with the recipient's name.

Patrick M. Malone's article, *Surplus Water: Hybrid Power Systems and Industrial Expansion in Lowell*, has earned the 2008 Vogel Prize for most outstanding article to have appeared in the last three years of *IA*. He has discerned that the sale and use of surplus water by the Proprietors of Locks & Canals above and beyond the textile mill's normally contracted allotment was the key to business operations of the entire Lowell hydraulic system. In a place where surplus waterpower was cheap, but not always available, a system of interconnected prime movers, eventually working in concert with stationary steam engines, was needed.

As Malone makes clear, not all rivers are suited for industrial development. Early 19th-century industrialists looked for factory sites with both a substantial drop and an annually steady flow. They also

stroved to make use of additional or "surplus" water. Perhaps the pioneering leader in this quest was James B. Francis who served for many years as the agent and chief engineer of the Proprietors of Locks & Canals at Lowell.

James B. Francis gained international fame for his successful development of sophisticated devices and techniques for the precise measurement of the water that was used by each of the mills in the interconnected Lowell canal system. He was the first investigator to gauge the importance of surplus water to the mill operations and developed a proportional system for the rates that the proprietors would charge for the additional water flows that the mills would utilize. His work was directly responsible for the rapid replacement of breast wheels by far more efficient hydraulic turbines at the Lowell mills during the 1860s.

As early as 1858, Francis had predicted, "The result of the surplus power at Lowell will be, I think, to run it in connection with steam." As Malone concludes, it is probable that the industrial expansion of Lowell would have stalled in the 1870s without the use of surplus power.

Malone's article is cogent, well-written, and exhibits much original research. He has shined the light of inquiry on a previously neglected aspect of Lowell as one of America's earliest planned water-powered industrial communities.

Lance Metz
Chair, 2008 Vogel Prize Committee

complex, they were drawn as well. As the plants changed, the blueprints were revised, drawn on with different-colored ink and sometimes extensions were glued to the original. Many of these documents were so well-used that they are torn and covered with fingerprints and black ash from the factory.

Lukens was sold to Bethlehem Steel in 1998. After Bethlehem went bankrupt, the plant eventually was acquired by ArcorMittal, the world's largest global steel corporation, but they only operate its modern part—the rest sits, intact, behind wire fence. Even the original house of Rebecca Lukens is there, under new architectural layers, attached to the abandoned employee store. In the past it was possible to tour the plant (see *SIAN* Winter 2005, Fall Tour, Wilmington). I was unable to do so, but by becoming immersed in the documentation I created a workable mental image of the environment as well as the industrial processes. In 1810 it was a water-powered, seventeen-man operation; by 1925 it had three main mill buildings; three open-hearth complexes; a flange shop; myriad railroad sidings; cranes; chemical labs; power-, pump-, and ice houses; and hundreds of other structures: gas producers, acetylene generators, machine and smith shops, offices, and garages. As I wrote, I had a blown-up version of a 1927 blueprint map on the wall

next to me. I was able to imagine the industrial processes from hearth to mold to soaking pit to mill and into the flanging shop or railroad cars for shipping.

The existing documentation surrounding an industry, especially the technical communication, can be a part of industrial archeology in recreating lost industrial processes. In any business after the 19th century, technical documentation was probably an integral part of the process and should be viewed as another form of evidence. Sometimes it is the most detailed evidence that remains.

Carol Siri Johnson

Carol Siri Johnson [SIA] is a professor of technical communications at the N.J. Institute of Technology. For a more detailed look at how she has used technical communications to gain insight into the evolution of the iron and steel industry, see *Prediscursive Technical Communication in the Early American Iron Industry in Technical Communications Quarterly*, Vol. 15, 2 (2006), p. 171-89. Also, *The Steel Bible: A Case Study of 20th Century Technical Communication in Journal of Technical Writing & Communication*, Vol. 37, 3 (2007), pp. 281-303.