FROM FOREST, TO COMPANY TOWN, AND BACK AGAIN:

HISTORICAL ARCHAEOLOGY AT THE COPAKE IRON WORKS

A Thesis Presented

by

FREDERICK E. SUTHERLAND

Submitted to the Office of Graduate Studies,
University of Massachusetts Boston,
in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

August 2008

Historical Archaeology Program

FROM FOREST, TO COMPANY TOWN, AND BACK AGAIN:
HISTORICAL ARCHAEOLOGY AT THE COPAKE IRON WORKS

A Thesis Presented

by

FREDERICK E. SUTHERLAND

Approved as to style and content by:

_____
David Landon
Adjunct Associate Professor, Chairperson of Committee

_____
Stephen Mrozowski
Professor of Anthropology, Member

_____
John Steinberg
Senior Scientist at Fiske Center for Archaeological Research, Member

_____
Stephen Silliman, Program Director
Historical Archaeology Program

_____
Stephen Mrozowski, Chairperson
Anthropology Department

ABSTRACT

FROM FOREST, TO COMPANY TOWN, AND BACK AGAIN:
HISTORICAL ARCHAEOLOGY AT THE COPAKE IRON WORKS

August 2008

Frederick E. Sutherland, B.A., Boston University
M.A., University of Massachusetts Boston

Directed by Professor David Landon

The site of the 19th century Copake Iron Works is now located within the Taconic State Park. This park is adjacent to the Village of Copake Falls, New York which is on the western side of the Berkshire Mountains along the border of New York and Massachusetts. Within the last year the Copake Iron Works has become a National Historic District because of the many original buildings still standing. Despite this positive development, the site is understudied and is underappreciated by the thousands of visitors to the park each year.

A careful and systematic survey has been conducted of all the historic features that are visible on the surface of the park. The survey utilized global positioning systems equipment and ground penetrating radar to precisely locate and map features above and below the ground at the site. This survey, combined with a thorough study of historic maps and primary documents, presents aspects of the Copake Iron Works history that were underrepresented in previous research. In particular, this thesis presents a careful study of the uses of land and resources at the Copake Iron Works. The use of land and

resources are then compared with the changes seen in historic maps and census data to learn more about the working community at the Copake Iron Works. Modern survey data helps to show the modification of the landscape caused by the dumping of furnace wastes, debris, and scrap material which is not reported in any historic text.

Information describing the changing working community and the modified landscape are brought together to show how deteriorating local conditions and resources forced changes upon the working community. These changes to the landscape and community led to the dissolution of company run housing and a reduction of employees until the Copake Iron Works was closed in the early 20th century. A series of recommendations are provided at the end of the thesis to show where the research done on the Copake Iron Works can be applied towards improving protection and interpretation in the future.

ACKNOWLEDGEMENTS

So many people have influenced and supported me since I began my research into the Copake Iron Works. The studies done at the Boott Mills in Lowell, Massachusetts by professors Stephen Mrozowski, Mary Beaudry, and many others was an inspiration to me in how they threw many kinds of analysis at the project and wove a narrative that held all the data together. I am grateful to Taconic State Park manager Ray Doherty and his Wife Janet Doherty for granting me access to the park and the collections at the Roeliff Jansen Historical Society. Without the help of the surveyors Jessica Bishop and Sarah Rehrer there would have been little hope of collecting all of the data in a timely manner. Professors John Steinberg, David Landon, and his daughter were also indispensible in their surveying and technical assistance. Victor Rolando was generous to lend his expertise by walking with me over the site and sharing his personal file of information he's collected over many years on the iron works. William and Peter Miles shared so much of their local history with me that I can only hope this thesis is fair compensation. I would like to thank the Columbia County Historical Society, the Hillsdale Public Library, and the New York State Library for granting me access to their texts and collections relating to the Copake Iron Works; and also providing me with help when I was confused or lost, which was more often than I'd like to admit. Lastly, my parents Fred J. Sutherland and Linda A. Sutherland for reading through so many drafts. They also helped me organize and compile the massive amount of deed records and census data in my thesis. Both of my parents went above and beyond anything I asked of them and for that I am eternally grateful

TABLE OF CONTENTS

APPENDIX Page

LIST OF FIGURES

LIST OF FIGURES (CONTINUED)

Figure Page

LIST OF FIGURES (CONTINUED)

Figure Page

LIST OF FIGURES (CONTINUED)

Figure Page

CHAPTER 1

INTRODUCTION

The control and use of land at the Copake Iron Works reflects the social organization of labor and the impacts of technology upon a changing rural landscape in the 19th and 20th century. This thesis investigates how the Copake Iron Works organized its working community around local resources and how that use compares to other industrial communities in North America. These comparisons can show how technological and social organization of space had a direct impact upon working communities in the past. A detailed survey of the modern landscape around the Copake Iron Works reveals which changes in the technological and social organizations of space have had lasting effects into the present.

Technological changes like the introduction railroad lines adjacent to the Copake Iron Works allowed for better access to distant resources. The railroad also served as a mechanism to rapidly bring in new laborers while allowing others to leave. The charcoal that the furnace relied upon required vast amounts of timber, leading to frequent purchases of woodland and logging deals with local land owners. The alternative would be paying the ever increasing costs to ship in charcoal from more distant sources.

Controlling the land also meant controlling the housing for many of the workers at the Copake Iron Works. Corporate paternalism is a phrase used to describe a system of management often utilized at industrial areas of the 19th Century. This form of control involves company ownership of the housing, stores, and any other system or service the working community needs. At the Copake Iron Works it is known that workers were paid in script, a form of currency that could only be redeemed at the company run store. Examples of the script currency can be found at the museum of the Roeliff Jansen Historical Society in the nearby Village of Copake Falls, New York. At least three locations on the property of the former Copake Iron Works are known to have had company housing for workers (figure 1). This system helped to ensure that company management had plenty of laborers in close proximity to the resources and industries that required their labor. Often the corporate control in these systems extended into the personal lives of the working community. Corporate paternalist systems often imposed middle-class notions of living upon a working class society that did not share the same beliefs as their overseers. The curtailing of drinking, smoking, and littering were common regulations enforced by companies over their working communities. Several studies for example, Mrozowski and Beaudry (1989), Mrozowski (2005), and Wood (2004) demonstrate that workers resisted imposed standards of behavior and continued to carry out banned behaviors discreetly in places where they believed that the overseers could not observe them.

Previous documentary research has only identified the sequence of owners and basic developments on the Copake Iron Works site and the region (Gobrecht 2000:9-16). Many of these facts are from a single historical source, local historian Franklin Ellis's

History of Columbia County New York from 1878. This main historical account has only been supplemented with more recent information by scholars up to the present day. Additional sources of primary information about the Copake Iron Works must be investigated to either support or refute the historic account given by Ellis.

Historical archaeology combines documentation with archaeological studies of historic sites to reveal aspects of the past which are unclear or undocumented. The nearby Roeliff Jansen Historical Society has hundreds of photographs and related documents from the Copake Iron Works. However, very little if any serious historical research and publication has been done using the documents in the Roeliff Jansen Historical Society to understand the history of the Copake Iron Works while it was still in operation (Gobrecht 2000:7). The material remnants around the site can be put into context with the underutilized texts of the Roeliff Jansen Historical Society in order to say something definitive about the working community at the Copake Iron Works. Investigating the physical landscape of the Copake Iron Works along with historical research about the working community provides information that can be presented to the public in order to help them understand the impact of working people on their environment.

Historical Background

The Copake Iron Works began operation in 1845, shortly after the closing of the oldest iron works in New York State, the Livingston Iron Mill, also referred to as the Ancram Iron Works (Naramore 1993:13, Stott 1993:56). The Ancram Iron Works had operated just 15 kilometers (9.3 miles) southeast of the Copake Iron Works (figure 2).

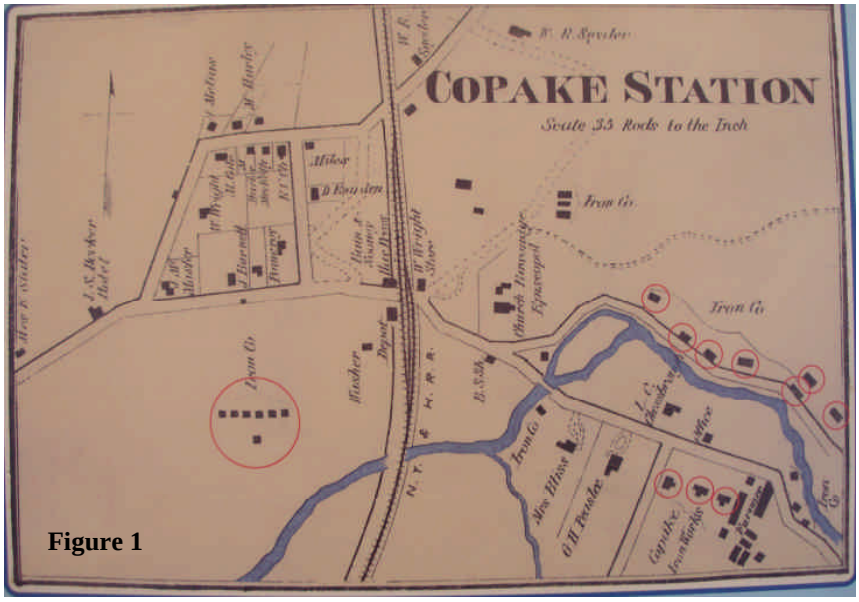


Figure 1

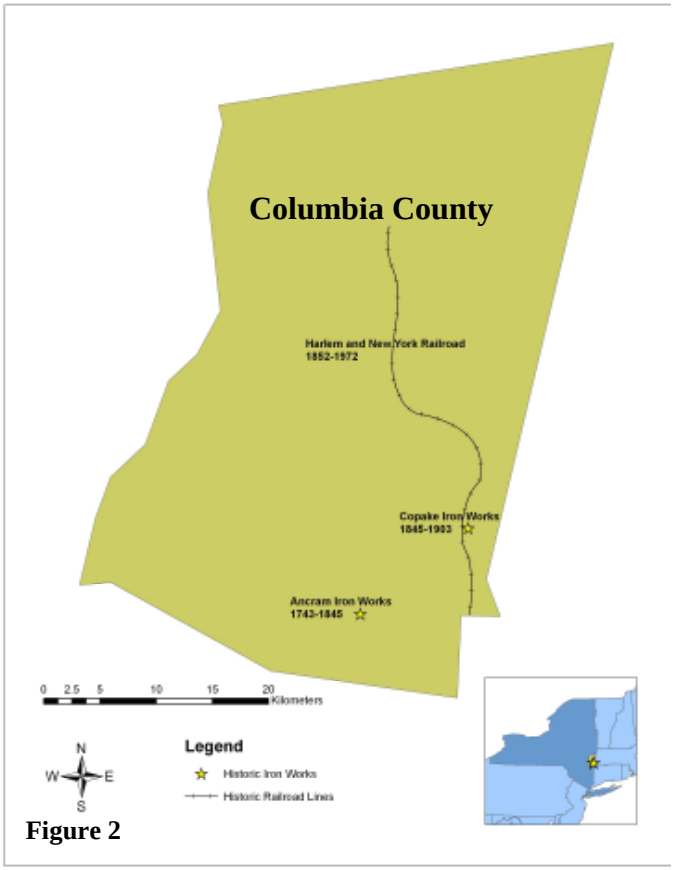


Figure 2

Figure 1: Map locating the company housing at Copake Iron Works. The locations of company housing are in red. On display at the Taconic State Park.

Figure 2: Map showing historic locations of rail lines and Iron Works.

The Ancram Iron Works were operated by Lemuel Pomeroy II, the same individual who went on to sponsor the construction and operation of the Copake Iron Works (Krattinger 2007, Section 8:3). The Copake Iron Works was thus a direct successor to a regional iron industry that began with the construction of the Ancram Iron Works just over 100 years earlier in 1743 (Gobrecht 2000:10, Naramore 1993:13).

The sources listed below all agree that Pomeroy had selected the site of the Copake Iron Works because it fulfilled three basic requirements for a successful iron works. The site had good quality ore, a source of running water (Bash Bish Brook) to power the needed equipment, and plenty of nearby timber to burn as charcoal for the furnace (Krattinger 2007, Section 8:3, *Columbia County* 1900:735, Ellis 1878:392). Another reason for building an iron works at this location that is not listed in most historical sources is that Pomeroy may have anticipated the building of a rail line nearby. The railroad line adjacent to the site would eventually connect the iron works to New York City. Peter Stott notes that Lemuel Pomoroy was "one of the leading spokesmen for the New York and Albany Railroad, which was projected to follow the course adopted by the Harlem Railroad" (Stott 2006:113). This anticipated rail line is clearly depicted (figure 3) on county maps as early as 1839 and running almost exactly where it would (as Stott noted) when completed in 1852 (figure 4). Pomeroy may have selected this site in anticipation of this rail connection because it would remove his dependence on shipping goods by cart to Hudson, New York (20 miles/32 kilometers to the west), where the goods could then be transported on the Hudson River.

Stott (1993) reveals that towards the end of operations at the Ancram Iron Works "in about 1830-1835" it began to use ore "from the Copake Mine" (56-57). This remark

suggests there were already iron deposits near the site of the Copake Iron Works that were being excavated. Therefore, Pomeroy would not have had to establish mining operations on his own, which would have made it easier for him to develop the Copake increased facilities" to transport and receive goods beyond the immediate region (Ellis 1878:392). Ellis notes that a year later in 1853 Lemuel Pomeroy II passed away and the remaining business partners carried on operations of the iron works until 1862 (1878:392).

An 1858 map of the Iron Works (figure 4) gives a more detailed view of the property and includes many more buildings, at least 12 more, than the three listed on the 1851 county map. The 1858 map is also the first to locate the "Ore Bed" where mining was taking place and to name Chesbrough's home along with the home of Lemuel Pomeroy's (Jr.) brother William. This map clearly labels an office building, perhaps the one that is standing today between the Chesbrough house and the pattern shop. The map shows the Harlem Rail Line and the Copake Iron Works rail depot where they are located today. Not far from the rail depot is a building listed as "Iron co. Store" which suggests the Copake Iron Works operated under a paternalistic system, supplying its workers with goods and housing, early in its history.

The reason for the sale of the iron works in 1862 is not disclosed in any known historical source. The date may suggest the sale was involved with American Civil War speculation of industrial properties valuable to the war effort. The first buyer, John

Figure 3: Portion of 1839 historic map, depicting the Harlem Rail Line where it would appear in 1852. On file at the Columbia County Historical Society. Kinderhook, New York.

Figure 4: Portion of 1858 Columbia County Wall Map, depicting the early lay-out of the Copake Iron Works and Owners of surrounding farm buildings. On file at the Columbia County Historical Society. Kinderhook, New York.

Beckley, sold the iron works within a year, further suggesting the iron works was sold to capitalize on war-time demand (Ellis 1878:392). Stott notes that Beckley was a regional iron company owner who built many forges and furnaces in the region at this time (2006:113). Beckley may have had plans for the Copake Iron Works, but then decided not to follow through with them and he sold the property instead. The final buyer of the Copake Iron Works as an operating business was Frederick K. Miles who, along with his descendents, would operate the iron works for almost 40 years (Ellis 1878:392, Columbia County 1900:735). Stott notes that Miles was a relative newcomer to the iron industry at the time he purchased the Copake Iron Works. He had only operated iron furnaces in the Salisbury, Connecticut region for four years prior to buying the furnace in Copake (2006:113-114). Frederick K. Miles probably purchased the Copake Iron Works to supply his other iron working operations in Salisbury, Connecticut with cast iron and ore (Stott 2006:114).

An 1862 property map (figure 5) that has been reproduced on park displays is attributed to plan drawings by Isaac Chesbrough. This is the only map known that lists several key structures of the early iron works before changes were made by Frederick K. Miles ten years later. It lists a “Trip Shop,” a “Wheel House,” and the location of the “Old Dam and Wall”; all these were necessary structures to an iron works described in Ellis’ account of the pre-1870s Copake Iron Works. This map also places the office and furnace in the same location as today, but the area for washing ore was very different on later maps. This 1862 map shows a “Wash Place House” just south of the St. Johns Episcopal Church (labeled as the “Church Lot”), where later maps in 1873 and 1888

(figures 6 and 7) show the ore washing area much further north and east, adjacent to the mining area.

Both maps and known historic accounts are silent for the next ten years leading up to 1872 when Frederick K. Miles begins to renovate the Copake Iron Works. While the original 1845 furnace was never described in any detail, the 1872 furnace is described as built from Dover Marble, from quarries 30 miles (48 kilometers) south of the iron works (Ellis 1878:392). Dover's location along the same rail line (The New York and Harlem) as the Copake Iron Works, which facilitated the easy transportation of quality building materials. The dimensions of the furnace given in 1878 match modern observations of the surviving structure (39 x 39 feet or 11.8 x 11.8 meters) and height (about 32 feet or 9.7 meters high) (Ellis 1878:392).

The light rail lines had "just been completed" in Ellis' 1878 account and do not appear on the Columbia County Atlas map of 1873 (figure 6), so this suggests there may have been a gradual renovation or that the renovation was done in at least two parts (Ellis 1878:392). Ellis' 1878 account of the iron works has other interesting observations as well. Ellis notes the renovated furnace is primarily run by an overshot water wheel (about 20 feet or 6.1 meters in diameter) and "a fine steam engine, which is used in times of low water" (Ellis 1878:392).

The operation of the nearby iron mine is mentioned in Ellis' accounts. By 1878 the iron works was still obtaining most of its ore from the local mine (five thousand tons), but a substantial amount (nearly three thousand tons) was now being brought in from Pawling, New York (40 miles or 64.3 kilometers south along the rail lines) and from the Weed Mines (8 miles or 12.8 kilometers) south of the Copake Iron Works (Ellis

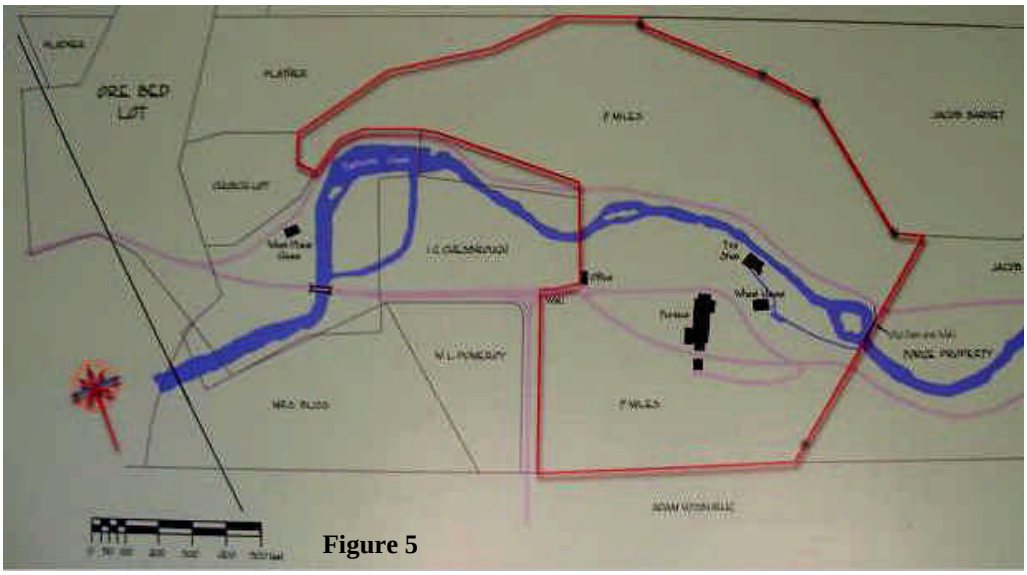


Figure 5

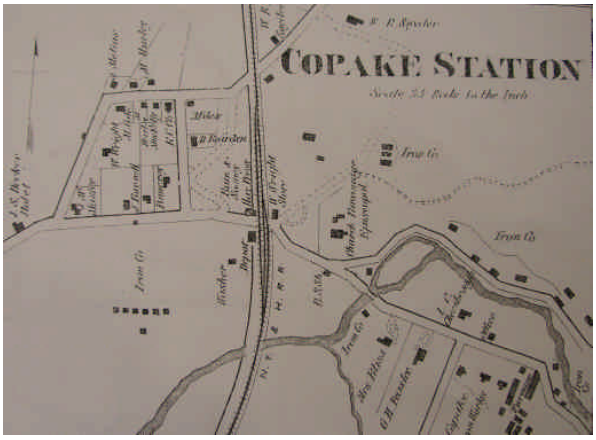


Figure 6

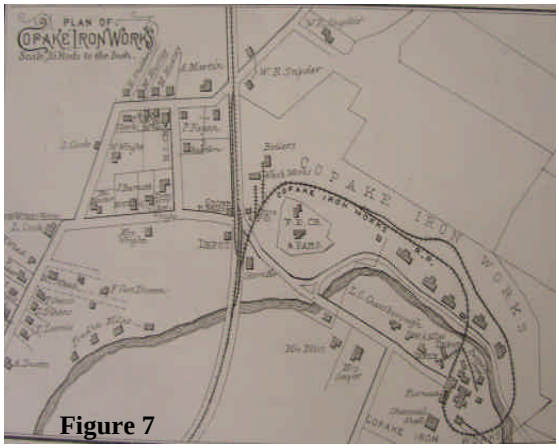


Figure 7

Figure 5: Reproduction of 1862 Chesbrough property map. On Taconic State Park display. Copake Falls, New York

Figure 6: 1873 Columbia County Atlas map of Copake Iron Works. On file at the Columbia County Historical Society. Kinderhook, New York.

Figure 7: 1888 Columbia County Atlas map of Copake Iron Works.

1878:392). Ellis specifically names the types of ore processing equipment as a “Bradford washer” and a “Blake crusher” (figures 8 and 9) working adjacent to the mine (Ellis 1878:392).

Frederick K. Miles and his son William A. Miles were very proud of their furnace and mining machinery. William wrote two articles in different trade journals describing the use and functioning of the machinery (see appendix 3 and 4 for the full reproduction of the articles). In the earliest article Miles describes the Bradford Ore Washer and the special modifications he made to improve its use (William A. Miles 1886: 6-11). In the later journal article William A. Miles (the presumed author) describes “a blowing engine somewhat peculiar in arrangement and correspondingly interesting” being used at the Copake Iron Works (1888: 881-883).

Ellis gives clear measurements of the size and scale of the works in 1878. He records the total number of iron works buildings (nine in all) and that “the proprietor owns about twenty buildings that are occupied by the workmen” (Ibid). These clues are vital to understanding the size and social organization of the Copake Iron Works. Ellis goes on to mention that the iron works employs “about 50 hands” and consumes “eight thousand tons of iron ore, twelve hundred tons of limestone, and four hundred fifty thousand bushels of charcoal” to yield “three thousand seven hundred and fifty tons” of iron each year (1878:392). Interestingly, the 1878 history mentions that a plow works is being “contemplated” foreshadowing the eventual construction of the Copake Plow Works near the iron works property (Ibid).

The first map to show the completed renovations of the 1870s, including the light rail line, is the 1888 Columbia County Atlas Map (figure 7). This 1888 map shows 19

non-residential buildings as part of the works; specifically naming the office, two "depot" buildings, a store house, a boiler and wash works for the mines, a charcoal shed, the pattern shop, and the furnace itself. The 1888 map also identifies nine residential buildings, probably the worker's housing, as belonging to Frederick K. Miles.
Stott mentions that by the 1870s demand for charcoal iron (like that produced at the Copake Iron Works) was diminishing in favor of iron made by anthracite coal (2006:114). By this time the works had already stopped trying to manufacture the rod and bar iron that it had produced in its earliest days (Ellis 1878:392, Stott 2006:114). The restriction in demand forced Frederick Miles to shift production into specialized products such as railcar wheels and eventually to plows in order to keep the Copake Iron Works in operation (Stott 2006:114).

The text, *Columbia County at the End of the Century* gives the most details about the Copake Iron Works for the next 22 years after Ellis' accounts. In 1883 an additional mine was bought by Frederick K. Miles in Dutchess County, which borders Columbia County to the south (*Columbia County* 1900:735). This suggests that the mine cuts nearest the Copake Iron Works were running out of easily accessible ore. Elinor Mettler's transcriptions from the Fagan sisters, Agnes and Sally, state that "he (Frederick K. Miles) and his son Willam operated the mine until 1888 when the pumps were removed" flooding the mine and turning it into a pond (2000:11). By 1895 the Copake Iron Works halted production "owing to a depression in the market" (*Columbia County* 1900:735). The following year Frederick K. Miles passed away and left control of the struggling iron company to his two sons William A. Miles and Frederick P. Miles (Ibid). Frederick P. Miles passed away in 1898 leaving his share of the company to his children who are not

named in the text (*Columbia County* 1900:735). Lastly, the text mentions that the iron works is being leased out to the Salisbury Carbonate Iron Company until 1901(*Columbia County* 1900:735). The *Columbia County* history notes that the majority of ore for the works is coming from Amenia, New York "thirty miles south on the Harlem Branch," that a small portion is arriving from Pawling and New Medford, Connecticut, and that the "home mines are not operated" (Ibid). It appears that by the end of Copake Iron Works operation most local resources were exhausted or had become too difficult to exploit efficiently because crucial resources like ore were having to come from greater and greater distances away.

Sources such as Krattinger (2007, Section 8:4), Kirby (1998:113), Stott (2007:114), and the Taconic Park's display materials all agree that the Copake Iron Works was last put into blast in 1903. After the iron works fell into disuse, the nearby plow works was the last remaining industry on the site to continue operation. *Columbia County at the End of the Century* records that in 1900 the plow works (figure 10) was owned by William A. Miles and the descendants of Frederick P. Miles (1900:735). The works produced 500 plows (in eight different styles) annually along with "a large number of extras," perhaps indicating they made other tools and farm implements as well (*Columbia County* 1900:735). No source officially documents when the Copake Plow Works fell out of use, but Stott records that the plow works site was in use as late as 1929 when a nearby Hillsdale plow works company used the site temporarily while it was rebuilding its own foundry (2007:114). Historical records are not clear on the relationship between the plow works and the Taconic State Park which then owned most of the Copake Iron Works property by 1927.

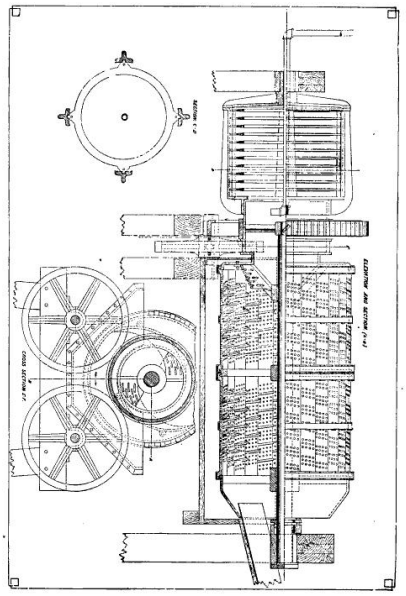


Figure 8

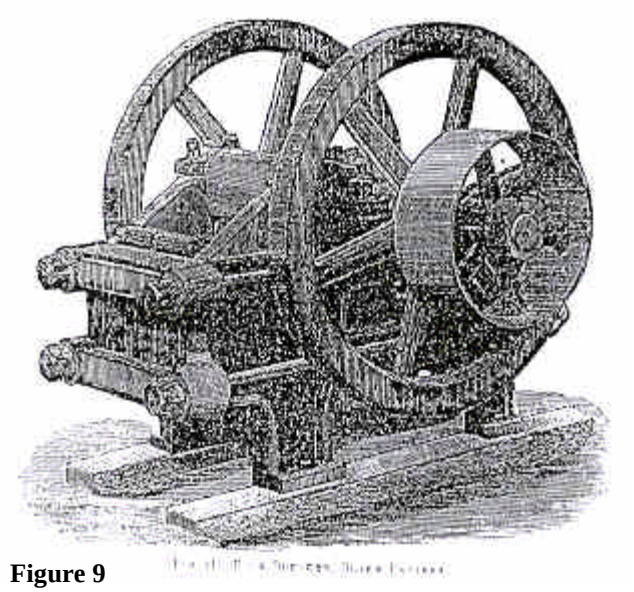


Figure 9

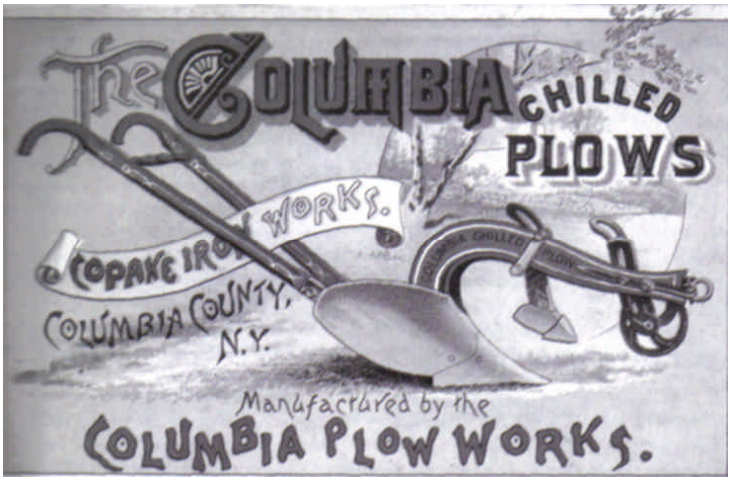


Figure 10

Figure 8: Image of Blake Ore Crusher. Figure 11 from "California Gold Mill Practice", Preston E.B. 1895, Superintendent State Printing, Sacremento, CA.

Figure 9: Image of Bradford Ore Washer. From: Miles, William A. "Ore Washer and Separator at the Copake Iron Works". *Journal of the United States Association of Charcoal Iron Workers*. Vol. 7. Page 7. 1886

Figure 10: Copake Plow Works promotional image. The reverse of the card contains listings for the styles and costs of plows offered. On file at the Columbia County
Historical Society. Kinderhook, New York.

Elinor Mettler's interviews of two Copake residents, Sally and Agnes Fagan, help to complete the picture of what became of the Copake Iron Works community after the furnace and plow works were closed. Both sisters were were a part of the Copake Iron Works community that was transitioning from a more insular company society towards merging into the broader rural community. Their accounts of family and neighbors gives a more vibrant picture of what life was like near the end of the Copake Iron Works' operation.

One of the challenges for former Copake Iron Works employees to integrate into the broader society was discrimination against workers of Catholic faith. Interestingly, the sisters note that all of those in the community who were Catholic were called "Irish" even when Catholic immigrants came from places other than Ireland (Mettler 2000:16). One of the sisters, Agnes, recalls facing challenges getting a job because some places feared reprisals from groups like the Ku Klux Klan in the 1920s and 1930s (Mettler 2000:36-40). Agnes concluded that "It was about jobs, and scaring people so they wouldn't say anything, they wouldn't voice their opinion" and that "other than the job situation, they (both sisters) claimed never feeling personal prejudice against them or their family (Mettler 2000:40). The tension and conflict seen during this time in the early 20th century seems to stem from the increased competition for local jobs between immigrants (along with their descendants) and workers from families that had lived in the region for over 100 years. The closing of the Copake Iron Works, which had been a haven for immigrant labor might have been one of the triggering events that caused some members of the rural community to intimidate and resist members of the immigrant working community from merging into the local social and economic system.

Elinor Metler briefly mentions that two homes not far from the central area where Isaac Chesbrough's house stands were used by the Church of the Heavenly Rest for camping retreats for youths out of New York City some time from early in the 20th (Mettler 2000:51). The two houses served as "the boys house and girls house" for the camp" (Mettler 2000:51). During this almost 20 year period it seems portions of the Copake Iron Works property were already undergoing transformations into use for scenic camping get-a-ways for travelers. The popularity of other nearby establishments like the Bash Bish Inn may have led others to see the housing at the Copake Iron Works as a potential way to exploit the growing tourism into the area during the early 20th century.

The remaining 80 years of the Copake Iron Works history is dominated by New York State's acquisition and transformation of the property into a scenic park and campground. Larry Gobrecht, a New York State Archaeologist working for the Office of Parks, Recreation, and Historic Preservation (OPRHP) gives the most detailed and thorough account. Gobrecht notes that efforts to acquire the lands around the scenic Bash Bish Falls for public use had been a mission for a few conservationists as far back as the 1880s (2000:43). Very little progress was made toward that goal until 1924 when Ella Masters, a woman from a prominent New York City family, purchased the lands from their various private owners (Gobrecht 2000:43). Ella Masters then donated the lands to the states of New York and Massachusetts "for no gain" (Ibid). This donation inspired New York State to develop a regional park system and purchase more lands in order to consolidate the various parcels donated by Ella Masters (Ibid). Ella's husband Francis Masters became the first park commissioner when the Taconic State Park was opened to the public in 1927 (Gobrecht 2000:43-44).

Sometime between 1924 and 1927 William A. Miles was approached by New York State with an offer to buy the property of the Copake Iron Works (Krattinger 2007, section 8:5). A detailed inventory of the remaining equipment at the Copake Iron Works was made as part of the sale of the property to New York State (Gobrecht 2000:18). Krattinger reports that the steam engine and blowing cylinders are among the major pieces of equipment still on the property in the early 20th century (2007, section 8:5). In the 1930s the Taconic State Park began to modify or demolish many of the structures that were once a part of the Copake Iron Works. Stott reports that "several of the buildings surviving at that time [post 1920s], including the casting house and foundry, were demolished" (Stott 2007:114). Another major structure which was dramatically affected by these renovations is the furnace stack (figures 11 and 12). Sometime in this period the limestone blocks that encased the brick, stone, and mortar interior of the furnace were removed, reportedly to build a retaining wall to hold up the eroding hillside along route 344, just northeast of the Copake Iron Works Property (Gobrecht 2000:15). Several authors, in particular Larry Gobrecht (2000:16), have lamented the state of the furnace stack which has suffered greatly from the effects of erosion and is susceptible to collapse more and more each passing year.

These transformations must be seen in their historic context. The Taconic State Park was and still intends to be a safe and scenic destination for tourists. The most dilapidated structures that the park had acquired were considered a hazard to visitors. Therefore, the park decided to raze the most unstable structures soon after it acquired the Copake Iron Works property. It is quite impressive that the Taconic State Park has found uses for so many of the buildings that survive today. Gobrecht lists six other former iron-

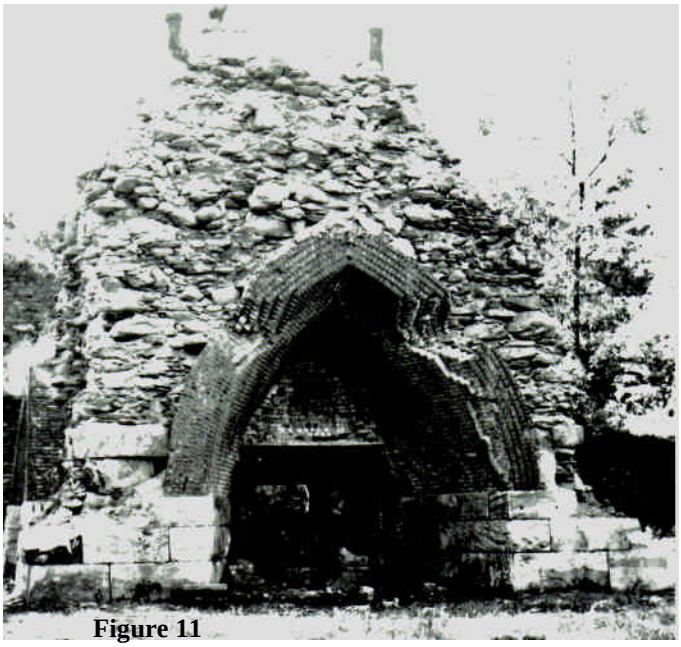


Figure 11: Post 1920s image of furnace after casing stones removed. The image is likely from the early 1930s showing the furnace from the northern arch after the casing stones had been removed. From files at the Bureau of Historic Sites. Peebles Island, New York.

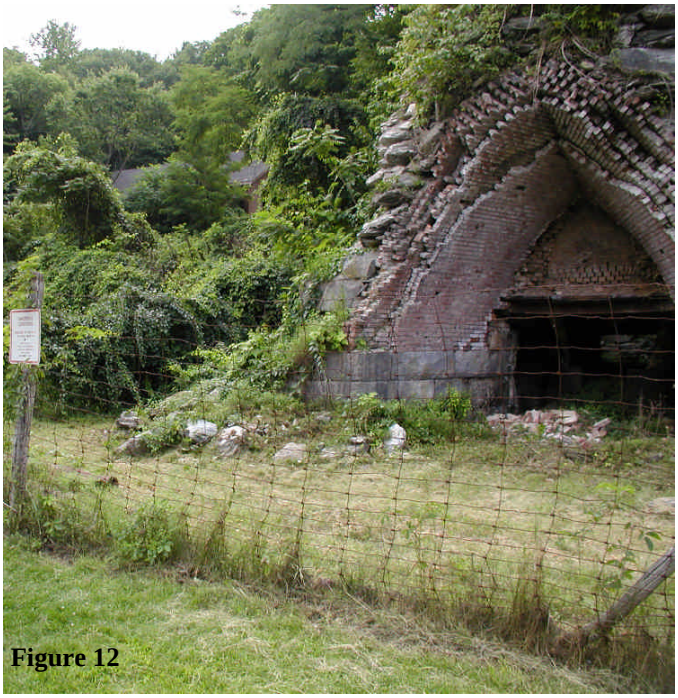


Figure 12: Recent image of furnace showing progressive deterioration. Note the extensive plant growth and collapsed masonry surrounding the foundation.

working sites that are near the Copake iron works, these sites have only their furnace stacks remaining and have limited or no public access (2000:45-48). Compared to the state of preservation and public access of those locations, the Copake Iron works at the Taconic State Park is truly remarkable. The site's unusually good state of preservation is what allows more in-depth research to be conducted. This research can be used to better present the noteworthy portions of the Copake Iron Works to more of the general public.

Studying the history and landscape of the 19th century Copake Iron Works provides a unique window into the past lives of an industrial community. The many standing 19th century structures, from the workers' duplex houses to a pattern shop with intact belt driven machinery, comprise a significant portion of what makes the Copake Iron Works a rare and important historical place. Several authors who have studied the Copake Iron Works site conclude these unique features must be preserved and should receive greater public attention. William Krattinger, a member of New York State's Office of Parks, Recreation, and Historic Preservation (OPRHP), successfully nominated the site to become a National Historic District. Krattinger states the Copake Iron Works is "generally regarded as the best-remaining example of a rural ironworks complex in the four state Salisbury Iron District –which encompasses portions of New York, Massachusetts, Vermont and Connecticut" (2007, Section 8, page 1). Larry Gobrecht who assessed the historical and archaeological potential of the Copake Iron Works in 2000, concludes "there is no other comparable collection of accessible structures and artifacts surviving" in the region (2000:2).

The unusual state of preservation is due in large part to the efforts of New York State and the Taconic State Park. The park has an average annual attendance of around

200,000 people (Ray Doherty 2007, Personal Communication). Larry Gobrecht judged the park's attendance at "over 100,000 a year" (Gobrecht 2000:2). Despite this high attendance relatively few tourists visit and appreciate the site of the Copake Iron Works. The park has made efforts to display and promote the history and significance of the iron works to the public, but much more can and should be done.

Archaeology of Industrial Sites

The introduction to Robert Gordon and Patrick Malone's *The Texture of Industry* highlights the divide between people in modern society from the processes that make all the products they depend on. Gordon and Malone lament that "today young people are rarely allowed to enter workplaces for fear of lawsuit. The tactile experiences of making and shaping materials are being replaced by manipulation of images on video screens" (Gordon and Malone 1994:4). The authors believe that studying historic documents alone is not the answer:

> Participants in past industries left few records and only fragments of oral histories describing their work experiences. Business records yield information about finance and sales, but rarely about how work was carried out. Most descriptions of what went on in factories, mines, and mills were written by nonparticipants, who were often advocates rather than objective reporters (Gordon and Malone 1994:4-5).

Reconnecting modern people to the toils and accomplishments of a 19th century working community is not an easy task.

The field of industrial archaeology is well positioned to solve many of the challenges mentioned by Gordon and Malone. Industrial archaeology aims to look at how industry has affected humans and their world in the past. Places like the Copake Iron Works offer rare insights into the lives of working communities and the environment in which they lived and worked. Using the methods of industrial archaeology to investigate how the Copake Iron Works was organized both socially and technologically will allow for valuable comparisons with other studies of working communities.

Industrial archaeology is a relatively young academic discipline that began in Britain during the 1950s and 1960s focusing on the preservation of places and structures believed to have importance to the rise and development of industry (Symonds 2005:37-39). This early movement to document and preserve industry simply for its own sake has developed into many diverse types of analysis.

Individual site analyses can include using surveys to study the lay-out of buildings and other features found above ground; devices like ground penetrating radar (GPR) can be used to study to see features hidden below the ground. Direct comparisons and spatial analysis can be done between modern survey map data and historic maps of an industrial area. These techniques of identifying and documenting industrial sites are not particularly new except in their use of technologies like GPR or in using global positioning systems (GPS) to record modern features above and below the ground surface.

Regional scale analysis is another important way to study former industrial sites. Industrial Archaeologists now appreciate that industrial sites are not isolated entities and have been interested in studying and preserving the industrial heritage of entire regions and landscapes in last several decades (Gordon 2001:145). Analysis of several industrial

sites at once allows researchers to track the growth and development of an industry across a region. For example, in the book *American Iron*, industrial archaeologist Robert Gordon has grouped iron working sites of the Eastern United States into districts that shared similar characteristics with one another (1994:59). Studying iron working sites at the regional level allows researchers to track the rates of adopting technological innovations, identify patterns in social organization and culture, understand how regions adjusted to different aspects of the economy, and what were the impacts of industry was upon the environment of the region. Comparing a certain industrial site, like the Copake Iron Works, to furnaces from different regions is helpful to identify what aspects of the site were unusual or unique for its region.

Newer types of analysis, many of which were brought in by historical archaeologists in the late 1980s (see Mrozowski and Beaudry 1989), focus on learning about the working community and the challenges they faced. These analyses include using oral testimony, historic documents, and photographs to gain a fuller appreciation of the daily lives of working communities at industrial sites (Symonds and Casella 2006:152). These types of historic documents include written historic accounts, federal census records, and deed agreements over the use of land. All of the approaches listed above can be of immense value when understanding the Copake Iron Works and its role in transforming the physical and social landscapes surrounding it.

A study of the Copake Iron Works should treat the working community as a diverse and complex network of relationships. Mrozowski (2005) uses material remains and remains of living conditions from the Boott Mills in Lowell, Massachusetts to demonstrate the divisions between managers, overseers, skilled labor, and unskilled labor

(2005:248). Also, Beaudry highlights that understanding the divisions within working classes by gender, ethnicity, and cultural beliefs is very important to the study of industrial communities (2005:307). Beaudry takes this analysis further by remarking that in order to understand the linkages between individuals in a working society they must be studied at multiple levels from the local to the global (2005:307-309). The saying goes that, "all politics is local", this is also the case in studying the working society at the Copake Iron Works. All of the "politics" between individuals living and working at the Copake Iron Works played out at the local level. However, these local interactions can only be fully appreciated when they are understood within the context of regional and global interactions of the period.

Neither Mrozowski (2005) nor Beaudry (2005) have abandoned the study of technology in their investigations of working communities. Beaudry notes that timing and rate of industrial and technological penetration of a region greatly affects the social development and outcome of working communities (2005:304). For Mrozowski, the importance of sanitation technology and its uneven application across the Boott Mills complex forms one of his most insightful conclusions. He states, "The original commitment to worker well-being was replaced by a new form of managerial capitalism that saw the distance between worker and owner grow immeasurably" as worker's privies were not updated or maintained when sewers and running water were replacing privies elsewhere in the region (Mrozowski 2005:256). The corporate neglect for worker sanitation even fell below standards set in legal mandates, while the facilities for those higher up in the company during the latter part of the 19th century were being updated and maintained (Mrozowski 2005:256). Therefore, any successful study of working

communities must combine an awareness of technological development over time along with the social relationships visible across local, regional, and international scales.

Human influences on the environment can be seen around the Copake Iron Works in substantial ways; the massive piles of slag and rubble, the remnants of railroad cuts in the hillsides, and the ponds that now cover mines dug over 90 feet into the earth are dramatic changes to the landscape made by workers in the past. Gordon describes the study of the long-term impacts of industrial sites, like iron furnaces, as the "Industrial Ecology in Historical Perspective" (2001:3). He believes it is important to understand how these industrial sites shaped their local communities and the surrounding environment. Gordon's examples of communities in Michigan and Pennsylvania show there is a modern need to understand the impacts of industry on local and regional scales(Gordon 2001:8-10). It is important to study how these regions transitioned away from an industrial focus in order to provide insights that can help modern communities, like those in Michigan and Pennsylvania that still recovering from their recent industrial decline (Ibid).

All of these different forms of analysis can be brought to bear on the site of the Copake Iron Works to provide a broader and deeper understanding of the furnace's impact upon the local society, regional industry, and its surrounding environment. These research methods augment the existing historic record and can help improve how the Copake Iron Works is interpreted to the general public.

CHAPTER 2

HISTORIC DOCUMENT RESEARCH

Deed Research

Historic deeds and land agreements are important documents in understanding control of the landscape in and around the Copake Iron Works. These documents speak directly about when and what the intended uses were for that land. Many of the deeds and land agreements complement or augment the established history of the Copake Iron Works. These land agreements reflect patterns and changes in local resources, economic fortunes, and social forces at the Copake Iron Works.

Record books containing all deeds and land transactions for the Copake Iron Works are located at the Columbia County Court House building in Hudson, New York. Land deals between the owners of Copake Iron Works and the people of the surrounding communities of Copake, Hillsdale, and Ancram were investigated. Sixty-two separate land deals involving the company have been identified over the fifty-eight year history of the Copake Iron Works.

Deed records support the theory Stott (2007:113) proposed that Lemuel Pomeroy anticipated the construction of Copake Iron Works along the future route of the Harlem

Railroad several years before the line was completed. Land deals between Lemuel Pomeroy and John Livingston indicate Pomeroy purchased the first lands that would become a portion of the Copake Iron Works as early as 1839 (Log book CC:277). The first in a series of purchases made by Lemuel Pomeroy in 1845 were to acquire a portion of the ore bed adjacent to the Copake Iron Works property. Interestingly, 1845 is the same year construction on the Copake Iron Works began. Additional purchases in 1845 were made with the other stake-holders in the Copake Iron Works company to buy wooded lots near the iron works (Log book NN:61).

Pomeroy and his partners continued to purchase between 100 to 200 acres of "wooded land" or parcels of land "known as a wood lot" nearly every year after 1845 until 1853. Typically, the woodland was bought for between 400 and 500 dollars (Log books PP:127, PP:143). These wooded parcels were probably used to supply the timber needed to fulfill the perpetual need for charcoal to run the furnace for extended periods of time.

The company stake-holders appearing in many of the pre-1862 deed agreements include Lemuel's brothers Theodore, Robert, and sometimes his son William Pomeroy. Two Pittsfield, Massachusetts investors named Sylvander Johnson and Nathaniel Hathaway bought a half share of the company in 1849 for seventeen thousand dollars (Log Books PP:578, RR 204). The agreements did not specify what the seventeen thousand dollars would be used for, but most likely it was used to invest in the infrastructure or specific types of machinery at the Copake Iron Works.

Interestingly the purchase of wooded parcels by the Copake Iron Works ceases abruptly after 1853, which happens to coincide with the completion of the Harlem

Railroad (Log book XX:171). This change in land purchasing practices suggests that Copake Iron Works quickly transitioned from highly localized supplies of charcoal to more distant regional supplies as soon as the railroad made that feasible. Another possibility for why wood lot purchases were suspended was that the death of Lemuel Pomeroy in 1853 created turmoil within the Pomeroy family and the company owners over who had rights to the remaining property. A land deal made in 1856 notes that when Lemuel Pomeroy died in October of 1853 he had not made out any legal will, describing that he had "died intestate" (Log book 5:608). It appears that many of Lemuel's relatives made claims on various lots and shares of company property including Lemuel's share of the ore-bed property claimed by his wife (who had remarried and became Aurelia Bliss) (Log book 5:608).

The flurry of sales and transfers of ownership between members of the Pomeroy family and to outside investors appears to go from 1853 to about 1860. Many of the properties appear to be sales of homes and cleared land. Most of the plots with homes appear to have been sold to other investors who became landlords. These homes held workers of various occupations from "laborer" to "railroad agent" according to the 1850 census suggesting the homes were not exclusively iron works employee housing, but were rental properties which had supplemented the Pomeroy family income (Log books 1:386, 1:430, 1, 467, 9:470).

No land deal was found relating to the brief ownership of the Copake Iron Works by John Beckley in 1862 mentioned in Ellis (1878); however, the land deal transferring the ownership of the Copake Iron Works from Isaac Chesbrough and three Pomeroy descendants to Frederick K. Miles was available to study. This document outlines three

important agreements. The first agreement details the number of acres comprising the Copake Iron Works (26 1/3 acres) being sold for $19,500 dollars. The second agreement ensures Frederick K. Miles the right to build a new dam “on the east side of the old furnace dam and flowing to the outlet of the forge tail race.” The final agreement ensures Isaac Chesbrough the right to a thousand square foot plot of land surrounding his home near the furnace along with the right for him to access the public roads nearby.

This 1862 agreement does not mention anything about the hundreds of acres of former wood lots purchased from the 1840s and 1850s by the Copake Iron Works Company. They were likely to have long since been cleared of timber and sold off as part of the land deals following the death of Lemuel Pomeroy. The second agreement suggests there were at least two phases of dam construction and that the water flowing from the later dam was brought towards the forge area. This description supports the information about a dam and channel depicted running toward the forge area and connecting to the wheel and trip hammer houses as shown in the 1862 Chesbrough map (figure 5). Lastly, it is interesting that Isaac Chesbrough’s home was not part of the Copake Iron Works property, at least while he was still alive, after the 1860s. Chesbrough’s ability to define and control his residence separate from the company is in stark contrast to most of the employees of the Copake Iron Works who had little control of their land beyond the walls of their company houses.

Starting in 1865 Frederick K. Miles begins to make additional land purchases directly relating to the Copake Iron Works. Frederick K. Miles bought back the rights to use the Ore Bed for $15,000, but had to honor a deal made by the previous operators of the mine involving a foreign investor. This investor was named Willard Parker and his

agreement requires the payment of “a schilling per ton” of excavated ore plus tariffs in order to repay the cost of machinery being used. This deal shows that the mines at the Copake Iron Works were tied to global networks of investing and trade (Log book 20:292, 25:117). The fact that Willard Parker is listed as being based out of New York City supports the assumption that the products from the Copake Iron Works reached beyond the local area and into the global marketplace after reaching New York City (Log book 25:117). This deal also demonstrates Frederick K. Miles attempts to unify the resources, like the ore pit, around the Copake Iron Works after they had been divided among Lemuel Pomoeroy’s relatives and other investors.

A deal Frederick K. Miles made in 1869 involves a strip of land bounded on the north by the “highway running from the rail depot south through to the Copake Flats” (a portion of modern day Route 344 and Route 22), on the east by “the Harlem Railroad” and on the south “by the Bash Bish Brook” (Log book 36:88). This land in later Columbia County Atlas maps of 1873 and 1888 depict a tight cluster of small company buildings (figure 1). Federal census records from 1870 and 1880 suggest these buildings were housing for ore bed miners, furnace workers, and wagon teamsters.

The second major land purchase made by Miles in 1869 involves a purchase of 5 plots that totaled 133.5 acres for three thousand dollars (Log book 36:537). All of these lots are listed as “wooded lots” and suggests Miles was starting up the practice of buying up available wooded lands in order to continue utilizing a local source for making charcoal. Unlike the regular and relatively less expensive purchases of wooded lots by Pomeroy and his partners in the 1840s and 1850s, the cost to buy wooded land seems to have risen substantially by 1869. Also of note is that where Pomeroy and his partners

purchased unified parcels of 100 to 200 acres, Miles had to piece together a deal for five disconnected parcels in his agreement. There is no subsequent pattern of Frederick K. Miles' purchases, unlike Lemuel Pomeroy who had purchased wooded lots on a yearly basis.

Later deals that Frederick K. Miles made (post 1869) were significantly different from the types of land deals made by Pomeroy in the mid 19th century. In an 1872 deal with Josephine Douglass, Frederick K. Miles only purchased the right (for 3 years) to "cut such wood and timber as is practicable" and to pay her at the rate of "one dollar per chord" of wood harvested (Log book 65:463). The agreement allowed Miles "all the usual rights and privileges necessary and proper for making charcoal" and the right to make the charcoal on her land (Log book 65:463-464). Unlike earlier deals where the intended use of the wooded lots has to be implied, this agreement specifies that Frederick K. Miles is only interested in using the land to make charcoal. This agreement and others like it were a clever strategy for Miles to use, allowing him to collect any remaining local resources on land that was not for sale. Ed Kirby in his book *Echoes of Iron* states that the availability of local woodland in the region was rapidly declining after the 1840s (1998:47). Despite some efforts made by iron companies to conserve and grow new forests, "the regrowth plan worked well at its inception, [but] it began too late. As a result, charcoal transportation from greater and greater distances would become a necessity" (Kirby 1998:47). By 1880 there are no additional land agreements made by Frederick K. Miles mentioning timber; therefore, he was probably reliant on using any remaining timber on lands that he already had access to and received the remainder by freight car from more distant sources.

In 1870, Frederick K. Miles paid $122 to secure rights to access and pipe in additional water for five years from the neighboring farm to the south owned by Adam Vosburgh and channel the water directly into the furnace area (Log book 36:581). This purchase suggests Miles was seeking additional reserves of water to guard against the possibility of not having enough water power to run the Copake Iron Works effectively. This deal is another example of Frederick K. Miles gaining access to resources without having to purchase the land outright.

Miles was also interested in acquiring nearby lands which had potential to be mined for iron ore. In 1878 Frederick K. Miles bought the explicit "mineral rights" along with the right to "explore" and operate any "mine or mines that may be found" on the property less than a mile north of the ore pit then in use at the Copake Iron Works. In Franklin Ellis' history of the Copake Iron Works, written the same year this mineral deal was made, shows that nearly half the ore being used had been shipped in from sources up to 40 miles away (Ellis 1878:392). While it is not known if any serious attempt was made to extract ore from the property mentioned in the 1878 land deal, it does highlight the interest Frederick K. Miles had in trying to exploit every available local resource and keep his freight costs to a minimum.

The land deals recorded in the deed logs are often a reflection of the behaviors and intents of only the wealthy and powerful in the region. However, when company workers begin to purchase their own property from the Copake Iron Works in the later 19th century, an obvious transition between company and individual control took place. In 1893 Peter O'Hara, a man that photographic (figure 13) and federal census evidence (1870 and 1880) confirms was a worker for the Copake Iron Works, bought a parcel from

Figure 13: Historic photograph of Peter O'Hara (1837-1915). He is driving his horse as a teamster in front of the Copake Iron Works. On file at the Roeliff Jansen Historical Society. Copake Falls, New York

William A. Miles that was a part of the housing cluster for ore bed workers and teamsters that Frederick K. Miles had established in 1869 (Log book 94:166). At least three other land deals between 1891 and 1893 appear to be sales of company housing near the parcel Peter O'Hara bought from the Copake Iron Works (Log books 91:25, 91:564, 92:365, 94:166). These sales demonstrate a fundamental breaking down of the paternalistic system that had controlled worker's lifestyles at the Copake Iron Works for almost 40 years prior to that point. Miles may have felt pressured to sell some of these properties due to increasing financial difficulties from a decrease in demand for charcoal iron and the increasing costs related to shipping in resources from further away. The costs of properly maintaining the worker's housing may have been getting out of hand as the buildings became older. *Columbia County at the End of the Century*'s mentioning that the furnace went out of blast in 1895 suggests the Copake Iron Works was falling on hard times in the 1890s and the sale of company housing may have been an attempt to stave off some of those financial troubles (*Columbia County* 1900:735).

The last land deals of note are the 1927 and 1928 sales of the Copake Iron Works property to the State of New York by Frederick K. Miles' son William A. Miles. In total, William A. Miles sold about 300 acres of land to the state for over twenty thousand dollars (Log books 197:49, 201:250). Interestingly, this is only a little more than what 26 1/3 acres of the Copake Iron Works sold for when Frederick K. Miles bought the property in 1862 (Log book (18:440). The 1927 and 1928 deals involve 4 parcels of land, all of which appear to be "east of the Harlem Railroad" but vary widely in their location north to south (Log books 197:49, 201:250).

Federal Census Analysis

Federal Census records reveal the jobs, ethnicity, place of birth, and sometimes the personal wealth of those who transformed the landscape of the Copake Iron Works. Federal census records for 1850-1880 and 1900 were studied at the New York State Archives in Albany, New York. Foreign laborers from France, Ireland, England, Germany, and Canada represent distinct cultures, faiths, and ideals which they brought into the area surrounding the Copake Iron Works. Workers that were born in states further to the south (like Virginia, Kentucky, and South Carolina) brought their own distinct regional practices and culture to the Copake region as well.

The skills of charcoal-makers, many of French descent, were required to sustain the Copake Iron Works. Many workers of Irish descent excavated the mines, drove the carts or worked on the railroads servicing the Copake Iron Works. Laborers of African descent, born in Virginia or South Carolina, are also present at the Copake Plow Works and in the broader community. One African-American individual, Henry Fryman, was a skilled and successful blacksmith in the community for over 30 years.

Patterns and changes between census years can also be studied. These census records show changes in the composition of households and neighborhoods, fluctuations in the degree of specialized labor, and occasionally in the changes in personal wealth of some individuals. These valuable and meaningful relationships are hampered by a few problems with the different Federal Censuses taken in the last half of the 19th century. The first two census records that contain data on the working community around the Copake Iron Works (1850 and 1860) categorize many of those who perform unskilled

jobs simply as “Laborers.” Because of this lack of detail it is difficult to distinguish unskilled employees at the Copake Iron Works from laborers that later census records list as “farm laborer” or “general laborer.” The federal census of 1890, a critical year in regards to the shifts in social and financial fortunes of the Copake Iron Works, was destroyed by a fire in 1921 (Szucs and Wright 2001:39). New York State Census records do not cover the years between 1880 and 1900, so there is no effective way to directly study the population in the 1890s. Lastly, the numbering systems used to count the houses visited was different in every federal census. While neighborhoods can be roughly identified by matching occupants from multiple censuses, it is nearly impossible to trace movements of individuals within communities or neighborhoods since the house numbering systems are so different. Regardless of these challenges the federal census records provide a useful means to study the working community at the Copake Iron Works.

The 1850 census (figure 14) identifies only eleven people that can be directly tied to the operations at the Copake Iron Works. This is due in large part to the previously mentioned broad “laborer” category given for all unskilled laborers in the region. The trades listed includes two colliers (charcoal makers), four iron founders, an “iron refiner,” three “iron masters” (Pomeroy and two of his sons), and a “civil engineer” listing for Isaac Chesbrough. Only the “iron masters” and three of the four “iron founders” lived within a few houses of each other; the other workers appear to be more broadly scattered. The “iron founders” come from various places in the northeastern United States, including, Connecticut, Maine, New York, and Vermont. Neither of the two colliers appearing in the 1850 census came from Canada or France, as later colliers would. The

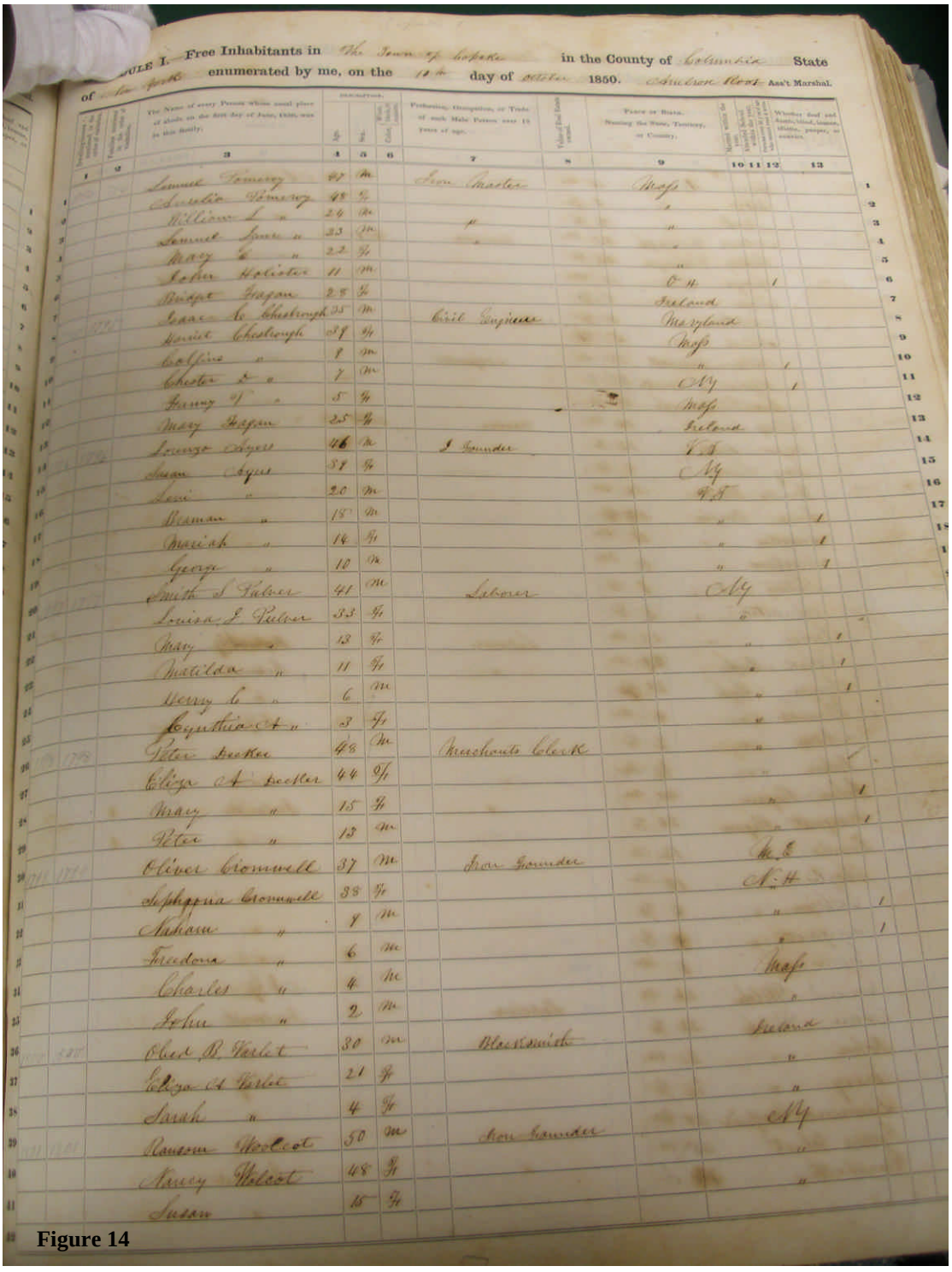


Figure 14: Page from the Federal Census of 1850. Note numbers on left hand column: #1 is Lemuel Pomeroy, #8 is Isaac Chesborough, #s 14, 30, and 39 are "Iron Founders" from various New England states and New York. On File at the Columbia County Courthouse. Hudson, New York

two colliers are listed as being born in New York and Massachusetts. All of Lemuel Pomeroy's family appears to be from Massachusetts, Isaac Chesbrough came from Maryland, and the "iron refiner" came from New York. It is surprising to see how many of the skilled workers at the Copake Iron Works (eight out of eleven) were born outside of New York. There are a significant number of Irish-born laborers in the region around the Copake Iron Works in 1850, including two sisters (Bridget and Mary Fagan) who appear to be servants at the homes of Isaac Chesbrough and Lemuel Pomeroy. It is interesting to see two potential ancestors of Sally and Agnes Fagan living at the Copake Iron Works almost from the beginning of its operation.

In 1860 there are only two workers who can be tied to the Copake Iron Works; one is a "foundryman" and the other is listed as a "miner." Neither appears in the 1850 census. The "miner," Cornelius Snyder, is particularly unusual since he is listed as having lands worth $600 and personal wealth of $800. Snyder was probably not a basic level ore-bed worker since this amount of property was more than some skilled laborers. For example, Snyder's income was even more than the "foundryman," who is recorded with a little over $300 in personal wealth. Although the federal census of 1860 does specify different types of laborers, there are no ore bed laborers, colliers, or other iron workers listed except for the single foundryman. In 1860 the Copake Iron Works had been without the leadership of its founder Lemuel Pomeroy for seven years and was about to be sold within the next two years, so it is possible it was not in blast during this time. Some workers may have left to find iron working jobs elsewhere and others may have stayed in the region and taken up other kinds of work. Henry Fryman, an African American blacksmith in the 1850s appears to have switched to become a butcher by the

time of the 1860 census. By 1870 Fryman would return to being a blacksmith. This transition back to being a blacksmith may have been tied to more iron working opportunities brought by the re-opening of the Copake Iron Works after 1862.

The Federal Census of 1870 is the first to specify the types of unskilled labor being performed by everyone in the community around the Copake Iron Works. There are two overseers at the furnace, 18 “furnace workers,” 41 “ore bed workers,” and two colliers. The owners from this period (Frederick K. Miles and his son William A. Miles) are not listed in the 1870 census for the Copake region since they were residents of Salisbury, Connecticut. No fewer than 16 of the 18 furnace workers and 31 of the 41 ore bed workers had emigrated from Ireland. Both of the colliers listed had emigrated from France. None of the emigrant labor at the Copake Iron Works appears to have owned their own property in 1870. Some Irish immigrants in the community not affiliated with the Copake Iron Works, like those working for the nearby New York and Harlem Railroad, are listed as owning property valued between $400 and $1500.

Many of the 1870 census house numbers for workers at the Copake Iron Works were clustered together suggesting that they were living in close proximity to one another. Most of the houses contained workers and families of the same national origin. For example, both of the French colliers lived together. With two exceptions, all of the Irish workers and their families lived with only other Irish emigrants. In two houses that contain individuals of different national origins the first contains one man from England and two from Ireland, the other house contains one man from Ireland and two born in New York State.

The Federal Census for 1880 is the first to divide up the housing between the Village of "Copake Iron Works" (now named Village of Copake Falls), the Village of "Copake Flats," and the "Town of Copake" making for much easier analysis of where many of the workers were living. The company housing that appears on the southern edge of the modern Village of Copake Falls, just west of the Copake Iron Works, was probably where most of these ore bed workers were living that are recorded in the Federal Census of 1880. Many of the plow workers (now that the Copake Plow Works was in operation), furnace workers, and foundry workers appear to be living in the "Copake Iron Works" area immediately surrounding the furnace. There are five instances where two families are living in the same house; this pattern supports the historic atlas maps of 1873 and 1888 that depict five duplex cabin structures across the Copake Iron Works property. The Town of Copake itself is not without some workers who may be related to the Copake Iron Works, five ore bed workers and one furnace worker apparently resided about two miles away from the furnace. The Copake Iron Works was not the only potential employer of these residents in the Town of Copake. The Hiram Weed mines and the Maltby furnace were located only a few miles south of the town of Copake about the same distance away as the mines and furnace at the Copake Iron Works.

Many of the unskilled labor positions are still held by Irish born immigrants in 1880, but the labor force had become more diverse after 1870. Workers from France, Canada, and Germany appear in 1880 as ore bed workers or furnace workers. The first African American employee at the Copake Iron Works appears in the census of 1880. Washington Thomson is listed as a resident on the Copake Iron Works property and

employed at the Copake Plow Works. He appears to have moved north from his birthplace in Virginia. Despite this increase in the diversity of the population at the Copake Iron Works and neighboring areas only four households contain families or workers of different national, ethnic, or regional origins.

The 1880 census specifies more types of occupations at the Copake Iron Works. Pattern makers that made the sand molds for cast iron objects are distinguished from other furnace workers starting in the 1880 census. Many of the wooden patterns used to create the sand molds are still present in the pattern shop building and suggest they were casting rail car wheels, cannon shot, ceremonial cannons (used only for flash and noise), gears, various tools, and iron parts of the plows made at the Copake Plow Works.

Although the United States Federal Census for 1890 no longer exists there are some tantalizing hints revealed through photographs. A historic photograph dating to "about 1889" lists members of the working community that operated the light rail lines servicing the Copake Iron Works (figure 15). All of the members shown in the photograph were born within New York State. The three adults in the photograph are Norman Melius (identified as the engineer in the train), Charles Clark, and Jim Reynolds. In the 1880 Census all of the railroad workers listed at the Copake Iron Works were Irish-born or of Irish descent. The youngest of these Irish railroad workers was 45 in 1880. The workers who would later be in the photograph in 1889 were not working for the Copake Iron Works in 1880. All three were either listed as farm laborers or stable hands in 1880. What is interesting about this photograph is that it may be showing a fundamental shift in the working population at the Copake Iron Works occurring in the late 1880s to 1890s,

which by 1900 when the Census is taken again shows a small, but almost entirely locally-born population at that Copake Iron Works.

By the next available census taken in 1900 there is a large drop in the number of workers at the Copake Iron Works, from 78 in 1880, to 12 in 1900. There are only six furnace workers, two foundry workers, one pattern maker, and no ore bed workers. The ore-bed had been shut down and flooded by 1888 according to the recollections of the Fagan Sisters (Mettler 2000, 11). These remaining workers in 1900 are all born in the United States; only one of them appears to be a first generation Irish-American. This reflects a dramatic shift from the large numbers of immigrant laborers employed in the 1870s and 1880s. The small numbers employed reflects the economic hardship during the last portion of the Copake Iron Works History; 1900 was just five years after the furnace was temporarily put out of blast due to economic difficulties (Ellis 1878:392) and only three years before it was last put into blast (Kirby 1998:133). Interestingly, exactly half of the workers (six of the twelve) remaining at the Copake Iron Works in 1900 owned their own homes. These home owners are evenly divided among the different jobs recorded at the Copake Iron Works (two foundry workers, three furnace workers, and one "iron molder"). All of the renters are furnace workers, perhaps some are still living in the duplex cabins remaining on the property of the Copake Iron Works. However, the worker's housing numbers on the census log are relatively far apart from one another suggesting they were no longer in rows of company run homes as they had in the past. Those who did own their homes were only a few houses apart from one another, perhaps indicating they had bought their former company homes that were close to one another. The difference in age of the workers who owned or rented their homes was minimal (35

years old for owners, 38 years old for renters) so it does not appear that older, and possibly more established, workers had bought their own housing by 1900.

From the beginning when the Copake Iron Works was built until it last went into blast the census records for the Copake region show a huge influx of foreign born immigrants from many countries. The rise of new technologies, in particular the railroad, allowed direct access to more resources, immigrant laborers from New York City, and access to new markets for local products. The impact of technology on social and industrial systems led to a rapid transforming of the landscape in places like the Copake Iron Works with the clearing of forests and building of company run settlements. Understanding how immigrant labor at the Copake Iron Works was organized and how workers structured their own daily lives sheds light on the challenges faced by immigrant workers in any society. Clearly, the census records show fluctuations in the community when other histories record changes in technology and resources. Studying how changes in technology, labor, and the environment affected the working community of the Copake Iron Works allows for a better understanding of any region undergoing industrialization in the past and today.

CHAPTER 3

SURVEY OF THE COPAKE IRON WORKS

The survey of the area once occupied by the Copake Iron Works was conducted from August 13th, 2007 to August 31st, 2007, with a follow-up visit from October 19th to 21st, 2007. The primary goal of this survey was to thoroughly and systematically document all historical features of the Copake Iron Works that could be seen on the surface. The field survey included a combination of photography, exterior plan drawings of buildings, and mapping with global positioning system (GPS). These techniques were used to collect data about the surviving historical structures, features, and artifacts remaining on the site. In addition to the techniques listed above, one area was studied using ground penetrating radar (GPR) in order to confirm the potential locations of foundations shown on maps, but no longer visible on the surface.

The goal of thoroughly identifying and recording historic features on and below the surface of the park is threefold. Gathering modern survey data helps further any research into the past at the Copake Iron Works by establishing a baseline for comparison. Features and buildings that survive today can be compared with those buildings that are mentioned or depicted in various historic records to learn about how the Copake Iron Works developed and changed through time. The modern survey was able to

record certain features and remains of industry that were not depicted on any map or mentioned in any historic document. Some types of undocumented features found in the modern survey include waste piles of slag, scrap metal, remains of furnace machinery, ore tailings, and building debris.

Second, this process will help to better protect sensitive historic areas from accidental disturbance by park personnel, site visitors, and other processes. For example, in 1984 a new water line accidentally disturbed foundation walls of buildings that once stood around the furnace (Workmaster 1984:1). By identifying, documenting, and presenting this research to park authorities the data can provide a better chance that the areas of historical significance (on the surface or below) will be protected from further disturbance. With this information the Taconic State Park can also ask the OPRHP to recover and secure materials that are at risk of being stolen, damaged, or destroyed by human and natural forces. A few locations along the stream bank have a high potential eroding and taking any material remains within those features along with them (figures 16 and 17). Carefully documenting the location and composition of these eroding features is the first step in properly recovering material remains within the features.

Lastly, gathering surface data from around the park in a comprehensive way benefits the Taconic State Park's ability to present the historic significance of the iron works to the public. Current park manager Ray Doherty wants to raise public awareness about the site and get the attention of state authorities who may be persuaded to provide additional funds to help protect and interpret the unique historic features of the park. Mr. Doherty, with the help of William Krattinger's nomination, has already been successful in placing the Copake Iron Works on the National Register of Historic Places as a historic

Figure 15: Historic picture of workers on the light gauge railroad; with notation on the back: “about 1889, Norman L. Melius Sr. –Engineer, Theodore Melius –Between engine cab and man sitting on coal car, Emmett Clark –Standing and leaning against coal car, Charles Clark –Sitting on coal car, Norman Melius Jr. -Sitting on Coal Car, Jim Reynolds (with Derby Hat) -Standing near coal car, others unknown.” On File at the Roeliff Jansen Historical Society. Copake Falls, NY.

Figure 16: Eroding shoreline with scrap metal and artifacts, northeast of the pattern shop. Showing light gauge rail line, a cast iron pipe, leaf spring to a cart and several iron straps eroding into the streambed.

Figure 17: Another image of the eroding shoreline , but 20 meters further west. Remnants of a sickle-bar harvester, cast bar iron, and narrow gauge iron pipes visible among the scrap metal.

district as of March 2007 (Pierpont 2007:1). A well documented survey benefits new efforts at interpretation of the iron works to the public. Mr. Doherty envisions a time when a system of interpretive trails will guide the public to the many places of historic interest in the park. This survey could be invaluable to making such a vision a reality (Ray Doherty 2007, personal communication).

Mapping the Copake Iron Works

A combination of historic maps and modern survey information using GIS (Geographic Information Systems) software helps explain how the Copake Iron Works developed and changed over time (figure 18). GIS software allows many kinds of visual information to be layered together and compared in order to see patterns and relationships which may not have been obvious before. The software is also a useful tool to better inform New York State archeologists and Taconic State Park managers about the potential historic resources around the park property. New York State archaeologist Larry Gobrecht proposes creating a GIS database for the Copake Iron Works at the end of his report (2000:57). He believes that GIS would help to prevent "accidental disturbances" and would help co-ordinate park efforts to monitor archaeological areas prone to erosion or looting (Gobrecht 2000:57-58). Four historic maps, one modern park engineer's map, and the GPS survey data collected in August 2007, were used to build a GIS database on the historic buildings and features that are or once were in the Taconic State Park.

The four historic maps used in this project come from the *1888 Atlas of Columbia County* (48-49), the *1873 Atlas of Columbia County* (36), a reproduction of an 1862

property map attributed to Isaac Chesbrough, and an 1858 Columbia County wall map. The two atlas maps and the 1858 wall map are available at the Columbia County Historical Society located in Kinderhook, New York. A wall map from 1851 was also available, but the lack of detail and the large scale of the map prevented it from being used in the final process. The 1862 reproduction was available on a display panel in the former blowing engine house next to the pattern shop at the Copake Iron Works.

These maps were carefully layered together using a combination of the GPS points taken by the survey and a detailed 2004 park map provided by Taconic State Park engineer James Holdridge. It was critical to link extant historic buildings visible in the present with their map counterparts, especially those that appear on multiple historic maps. Isaac Chesbrough's house stood out because it was the only building that definitely appears on every historic map studied. This made the house one of the key buildings to link all the data together. Other key buildings in this linking process included the St. John's in the Wilderness Church, the pattern shop, known bridge crossings, and the four remaining duplex houses.

Once the maps were layered together, a new layer was created that showed all the historic buildings and features around the park. This layer also includes a database which lists each type of building (when the historic maps list their function), its visibility on the surface today (yes or no), and on which maps each building appears (figure 19). These features make the final GIS database and map layer a useful tool for research and conservation of historic archaeological resources.

When the map layers were put together it became very clear that map makers from different periods depicted portions of the Copake Iron Works with varying levels of

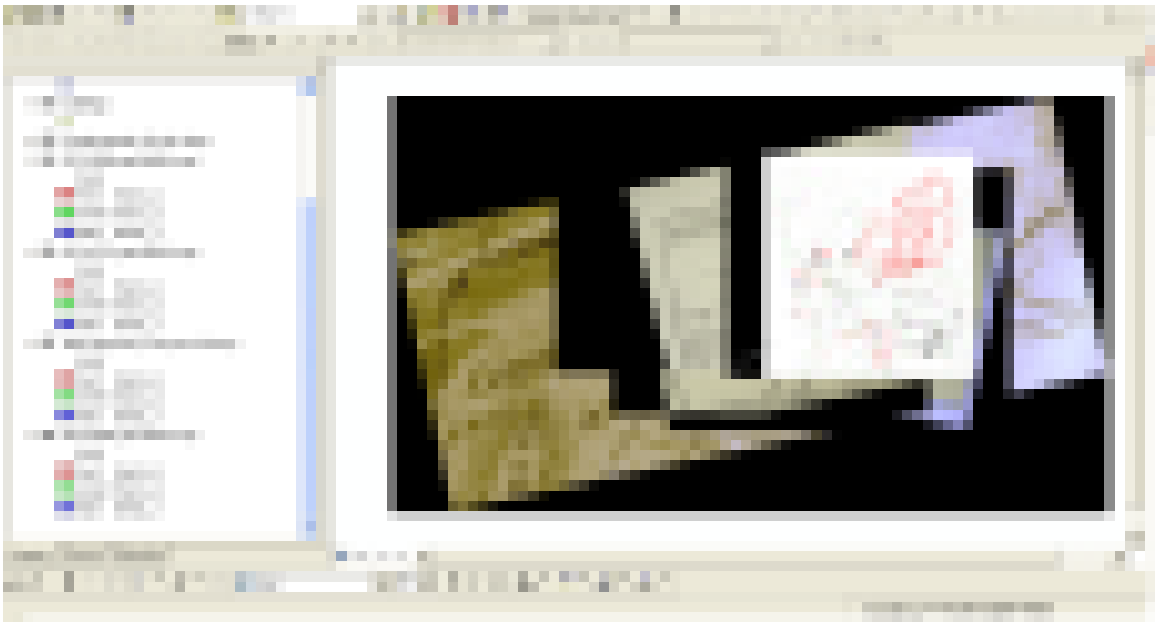


Figure 18

Figure 18: Layered maps in Arc GIS.

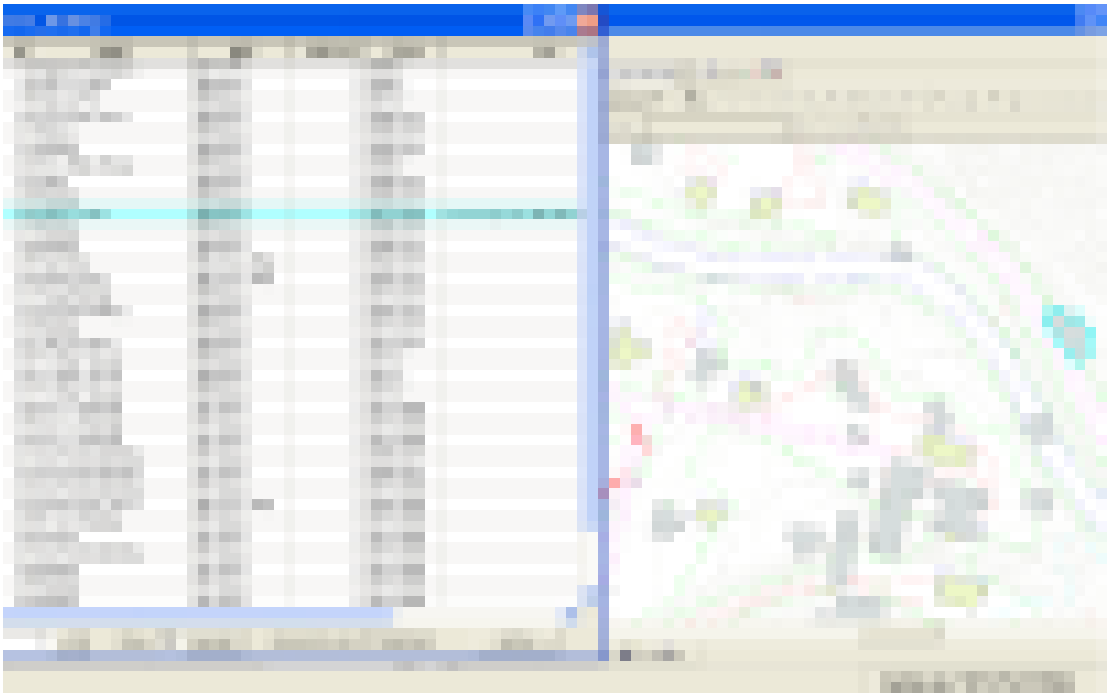


Figure 19

Figure 19: Building layer and data table example.

detail and accuracy. All of the buildings in the 1858 map were depicted as squares marking their relative location. No attempt was made to draw the general outline of any building. The distances depicted between buildings and major features like roadways and the Bash Bish Brook is incorrect. Most buildings are drawn further away than they actually are, based upon the modern locations of the surviving buildings drawn on the 1858 map. The cartographer may have generalized the shape and locations of the buildings because the scale of the map covers the entire county and at the scale used it was difficult to add anything more than the basic lay-out of the Copake Iron Works.

The map supposedly drawn by Isaac Chesbrough in 1862 depicts only a handful of buildings, but the map includes details about property boundaries and features along those boundaries that no other map describes. Another unique aspect of this map is the detail of the waterways shown is more detailed than any other map. A linear waterway coming off of the main Bash Bish Brook and connecting to the “Trip House” and “Wheel House” may represent the location of the sluiceway supplying water power to the Copake Iron Works. The 1862 map is only one that depicts this waterway. The only buildings shown are industrial structures, no residences appear on the map. The reason for this may have been that the map was drawn as part of the land sale between Isaac Chesbrough and Frederick Miles for the purchase of the Copake Iron Works in 1862.

The County Atlas Map of 1873 captures a moment in time just before a series of major renovations were made by Frederick Miles to the Copake Iron Works. The 1873 map shows several buildings that do not appear on maps before or after this time. This may reflect that these buildings were constructed after the previous 1862 map was made or that the 1873 map maker chose to include structures omitted in previous maps. Several

buildings which only appear in the 1873 map surround the area of the ore bed. Perhaps these buildings, only identified as “Iron Co.” were removed during the renovations that occurred after 1873. One other depiction of interest in the 1873 atlas map is the area of the unskilled workers housing in the southwest portion of the map. Seven buildings are represented by boxes placed in an area that does not show any roads or pathways that would have allowed workers to travel to and from their jobs. It may be at that time that there were only simple shelters and unimproved pathways that the mapmaker chose not to represent with any detail. Frederick K. Miles had only purchased the land for the unskilled housing in 1869, four years before this map was drawn.

Lastly, the 1888 Atlas map shows the most detailed information regarding the shape and location of buildings from before 1903, when Copake Iron Works ceases operation. This map shows all buildings by their general outline, including the unskilled housing on the southwestern corner of the map. Interestingly the duplex cabins along the northern shore are drawn in a “T” shape; however, modern maps and GPS record the duplexes with a rectangular shape, lacking the projection to make a “T” shaped outline. This shape was most likely a generic way to represent the duplex structures rather than a feature of the buildings that has been removed in modern times. The four unskilled workers cabins to the west are not represented in the same way as the duplexes further east, these smaller rectangular representations of unskilled residences may show they were in fact smaller single dwelling homes.

Interestingly, the three duplex buildings south of the office and west of the furnace do not appear on the 1888 Atlas map. These three structures appear in both the 1873 and 1858 maps and one of those three houses continues to stand to this day (the

Original Duplex). This fact casts doubt that the 1888 map maker chose to include every standing structure, including many others shown in earlier maps of the Copake Iron Works. These historic maps, despite their omissions and misrepresentations, can be understood by their intended uses for marking property, generalizing the layout of structures and facilities, and to promote local industry in the County Atlas. Layering these maps together has helped to make these biases more obvious and shows how the Copake Iron Works developed over time. This information is valuable not just for historic research, but also for future preservation of historic remains below the surface where many Copake Iron Works buildings once stood.

Workmaster (1984:3-4) describes an incident where Taconic State Park maintenance crews disturbed at least two historic foundations because they had no prior knowledge that buildings once existed there. This disturbance could have been easily prevented if the park and the New York State archaeologists had one map showing all the historic structures that exist and once existed on the Copake Iron Works Property. A simple test that was performed using the GIS software found sections of road that are near former historic buildings and features. These areas could be easily disturbed though routine road maintenance and traffic. A simple map generated from this data can help the park monitor sensitive areas like those depicted in the map (figure 20).

The area where the GIS found the most at-risk buildings along modern roadways was exactly where Workmaster states that the park work crews disturbed the historic foundations (1984:1-2). Another relatively simple test using the data was to find former buildings and features along the banks of the Bash Bish Brook. The areas which the GIS

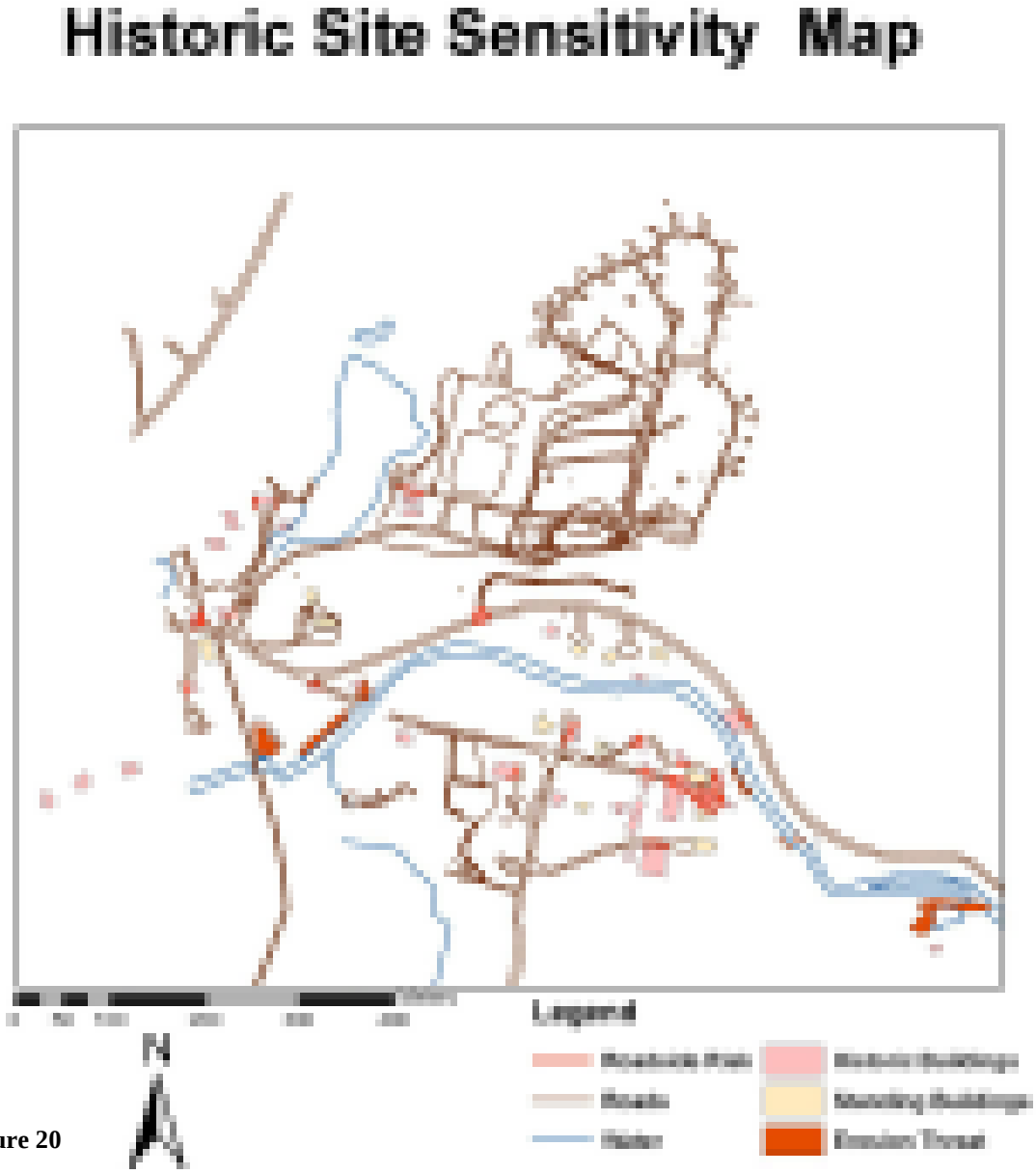


Figure 20

Figure 20: Sensitivity map based on roadway and erosion threats to sites. Areas where modern roads intersect or are within 2 meters of historic buildings and deposits are highlighted red. Features within 3 meters of moving water are highlighted orange as under threat of erosion.

highlighted must be at high risk of erosion, especially around the time of spring floods when the brook runs much higher than at other times of the year. Highlighting these areas can allow the park to better monitor these places and potentially recover any materials at risk.

Another valuable asset of this GIS database is its ability to be easily integrated into pre-existing or regional databases of historic buildings. The nearby Town of Copake and the offices for the New York State archaeologists at Peebles Island can quickly integrate the data from this project with their own and can thus serve as a valuable assessment and research tool. The Copake Iron Works GIS can help assess archaeological potential of a particular location before construction or it can answer broader questions on regional patterns between the Copake Iron Works and other historic areas in the region and state.

The current data being used for the GIS is not without its share of problems. These maps were layered together, but were originally based on different scales and levels of detail. In the layering process every attempt was made to be certain the buildings were the correct size and orientation. Also, the database and historic maps list a single building description for each structure, but this does not mean that the structure could not have had other uses over time.

Remote Sensing Survey in the Forge Area

Ground penetrating radar (GPR) was used on a thousand square meter piece of land directly south of the pattern shop and east of the furnace. The Columbia County

Atlas map of 1888 (figure 7) depicts this area as where the forge building once stood. The 1862 Chesbrough property map (figure 5) shows in addition to the forge that the water wheel house and trip hammer buildings may have been within the area surveyed with GPR. Today this land is covered by a mixed asphalt and gravel road loop with a grassy field further east. A park shed along the southern edge of the GPR survey appears to have been built into a wall that once was a part of the forge complex.

The GPR investigation of the area was able to record buried features up to a depth of 3.87 meters (about 12 and a half feet). Images of the buried features were captured and studied at 20 centimeter intervals over the entire GPR survey. Near the southeastern corner of the area surveyed, at a depth of one meter to about two and a half meters there is an “L” shaped anomaly which happens to line up with the southwestern corner of the water wheel house based on the 1862 Chesbrough map. The eastern foundation walls of the forge building appear to be intact underground near the center area surveyed with GPR. The depth of the forge walls appears to be similar to that of the water wheel house foundation. This analysis of the forge area using ground penetrating radar helps to validate the usefulness of combining historic map data together in a GIS. The GPR helps to demonstrate the map layering process can locate areas where former iron works structures once stood, but are no longer visible.

In the following sections major clusters of historic structures and features have been divided into regions (figure 21). Each is discussed going from those located furthest east to those located on the western extreme of the park. The majority of the regions where historic remains were found are along the Bash Bish Brook. This brook generally

Figure 21

Figure 21: 1888 County Atlas map with survey areas highlighted . The colored areas depicting regions (added by the author) discussed in the survey chapter. Mill pond area is brown rectangle in the southeast corner. The red square represents the eastern rail crossing. The blue square represents the furnace area. The green rectangle represents the western rail crossing. The purple square represents the Office, Chesbrough House, and Original Duplex area. The light blue region is the St. Johns Church area. The orange triangle is the plow works area. The magenta region is the ore pit area.

runs from east to west forming what looks like a spine dividing building clusters of the former iron works in the north and south. Historic maps of the 19th century were extremely helpful in locating potential areas of historic remains and interpreting where and what the remaining historic features might have been.

Above Ground Survey Results

Mill Pond Area

A map drawn by the Copake Iron Works supervisor Isaac Chesbrough in 1862 (figure 5) shows an area east of the furnace and along the Bash Bish Brook labeled as "Old Dam and Wall." Investigations east of the furnace and along the southern shore of the brook revealed a noticeable depression and a shallow pool of standing water apart from the brook (figure 22). A closer inspection of the western and northern walls of the depression reveals they were composed of slag and rubble from the iron works. The western wall extends northward approximately 50 meters from the nearby shale ridge and is almost uniformly 10 meters wide. The northern wall of rubble extends almost 30 meters east to west and is only about eight meters wide. The northern wall may be thinner due to erosion that has removed a portion of the northern wall.

On the northern bank of the brook, just northeast of the depression, there is a concentration of large quarried stones (figure 23). These stones are significantly larger than stones found in the surrounding area. Several of the largest ones exhibit drill holes and marks from being quarried. These stones may have been a part of a dam listed on the

1862 map and might have helped to divert a portion of the brook into the adjacent depression, forming a mill pond that could be used to power the iron works.

Another possibility is that these stones are a part of the modern (Post 1930s) retaining wall just north of this area that currently keeps the roadway of Route 344 stable. This concentration of quarried stone just south of the road may be serving as a way to reduce erosion of the slope south of the road. The stone could also have been placed at this location to prevent the stream from undercutting the slope.

Just east of where the depression was located there is a known historic foundation that appears on the 1902 topographic map of the region. A slight depression and a few pieces of brick and slate appear around the surface of the former structure (figure 24). Most of the foundation is now covered by a park demonstration of how charcoal was made from cut logs (figure 25). Two small ponds located just south and east of the building foundation depression were once a part of the Park's water system (Ray Doherty, Personal Communication). A 20th century-looking vent and pipe system can be seen in the ponds and was probably made by the park service sometime after they acquired the property in the 1920s. These ponds seem to take advantage of a nearby spring from the bedrock slopes south of the ponds.

A 1919 photograph (figure 24) identifies the former structure where the charcoal-making display now stands as the "Fish Pond Cottage." Elinor Mettler's transcription of local history from the two Fagan Sisters reveals that when William A. Miles ran the Copake Iron Works he lived "at the 'Pond Cottage' east of the furnace" (2000:13). This comment suggests that the former cottage site along the small ponds in the mill pond area


Figure 22


Figure 23

Figure 22: Eastern dam wall of mill pond. The western retaining wall is completely man-made from slag, bricks, and other rubble just visible under the leaf litter.

Figure 23: Large boulder concentration on northern stream shore, some of which is chiseled and quarried stone (see drill hole just right of the photo's center). Note how the size and density of rocks drop off further left or right of this concentration. Possibly a check-dam remnant?

Figure 24: Historic image of "Fish Pond Cottage" dated 1919, looking east. The cottage no longer exists, but the pond on the right remains and appears to be spring fed. On file at the Roeliff Jansen Historical Society. Copake Falls, New York.

Figure 25: Log pile in location of former pond cottage building . The logs are currently standing inside the foundation of the former cottage. Looking south towards the pond behind the log pile.

Figure 24


Figure 25

east of the furnace could have been William A. Miles residence. If so, then this site could be investigated in the future along with any deposits at the standing Chesbrough house to compare the assemblages of management with those from domestic trash middens seen elsewhere.

Eastern Rail Bridge Crossing

Between the millpond area and the furnace is a region shown on the 1888 Columbia County Atlas map (figure 7) where one portion of the light rail line crossed the brook. This rail line was placed here in order to reach the upper slopes behind the furnace so supplies of raw materials could be stored at the furnace site. Remains of this rail crossing area can still be seen on the surface. Three mortar and stone retaining walls are visible on the southern shore of the brook. The southernmost wall is the tallest at nearly 11 meters and is over 18 meters wide, with both sides flanked by steep slopes that are covered by rubble and slag (figures 26 and 27). Based on a few places where trees have pulled up the ground on these slopes it is clear that these slag and rubble deposits are greater than 20 centimeters thick in some places. Near the bottom on the eastern side of the wall are fragments of firebrick mortared between larger stones. This suggests the walls were built sometime after the original iron works were constructed. This is consistent with written accounts of the modifications to the iron works including the change in rail lines (Ellis 1878:392, Columbia County 1900:735) visible between the 1873 and 1888 on the County Atlas maps.

The two northern retaining walls are shorter, at only four meters (central wall) and six meters tall (northernmost wall). The two walls are between 10 to 15 meters long, being partially obscured by slag and rubble (figures 28 and 29). They are separated by a narrow gap of about 90 centimeters which is partially filled by two large iron pipes (75 centimeters in diameter) made from riveted plates. Both of these pipes have one end sealed by iron plates and the other end filled with mortar and rubble. On the eastern ends of both pipes are flanges that look like they held bolts to hold these pipes onto a floor or other support in the past. These pipes seem to have been removed from their original location, filled with mortar and debris, and then dumped between these walls. Perhaps their purpose at this location was to brace the bottom of these walls to prevent any debris washing down in floods from affecting the wall foundations.

The fact that these large diameter pipes are made from many riveted pipes means they were most likely for conducting a dense fluid like water. The frequent joints along the riveted pipe would offer many points where the pipe could fail causing less dense materials, like gases, to escape. If these former conduit pipes were used for water, then they are mentioned in a deed agreement from 1870 that states that Miles has “the right to take water as it now runs in a pipe in the ground from the stream of water near the barn of said Adam Vosburgh and through said Vosburgh’s land to the furnace of the said Frederick K. Miles for the term of five years” (Log book 36:581).

The northernmost wall, closest to the southern shore of the brook, is built upon shale bedrock. This location is the only place in the immediate area where exposed bedrock exists. Bedrock outcrops along the brook’s shoreline appear much further to the

Figure 26: Southernmost wall at eastern rail crossing, looking south.

Figure 27: Thick slag deposits along hillside. Tree-fall just east of the southern retaining wall showing the thick deposits of slag and debris covering the hillside.

Figure 28

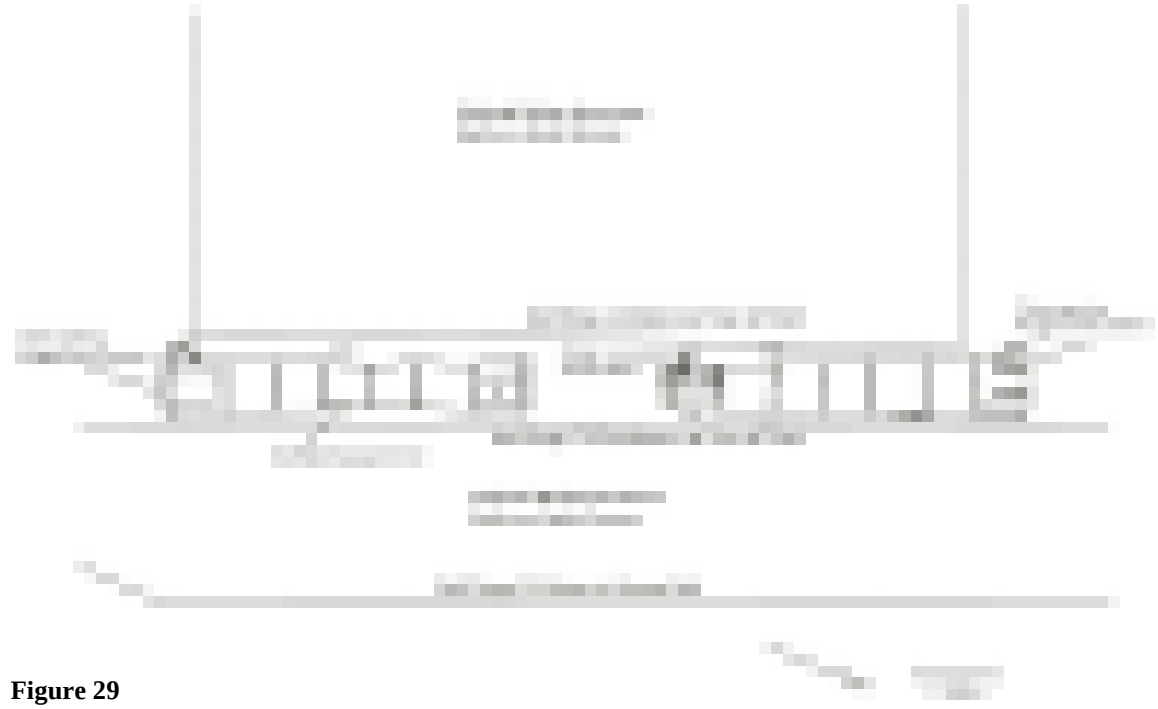


Figure 29

Figure 28: Southeast view of pipes between rail bridge supports . Note the iron pipe opening in the center is filled with stones and cement.

Figure 29: Plan drawing of pipes and rail bridge supports.

east (upstream) except for this location. This outcrop on the southern shore may be the reason the rail crossing was placed here.

In the stream bed itself there are four iron pipes (figure 30). The most complete one has been sketched (figure 31). These pipes all appear to have been radiator pipes like the ones depicted in the diagram of the furnace shown on the billboard beside the furnace stack. Most of the pipes are partially buried by cobbles. The most complete and visible radiator pipe appears to be 2.6 meters long and has a shallow groove extending down the middle of the pipe. The base of the pipe is badly broken, but one side does have a cylindrical knob which may have helped link this pipe to others, or be mounted into a wall. On the northern bank of this area there are 31 visible wooden timbers with ends oriented approximately north to south and partly buried in stone rubble (figure 32). These appear to have been the remnant of a bridge deck or perhaps timber cribbing for the northern portion of the crossing. There are no bedrock outcrops on the northern shore. There are many large stones; some show remnants of mortar on them while others show signs of having been carved and quarried. Because the northern shore lacks stable bedrock on the surface, it is likely that the poles and rubble were once the supports for the rail bridge on the northern bank, but eventually since they were less stable than the southern supports the structure collapsed. East of the wooden poles is a retaining wall, built in a similar manner to the ones found on the southern shore of the Bash Bish Brook. This wall is approximately 4 meters tall, less than 10 meters long, and runs mostly north to south rather than east to west like the southern retaining walls. Finally, amongst the rubble on the northern shore is a two meter long segment of steel rail line protruding from stones.

Figure 30

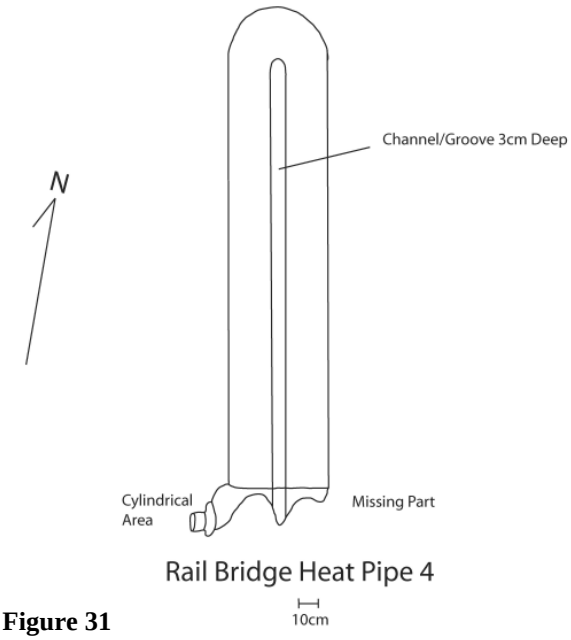


Figure 31

Figure 30: Radiator pipes in streambed, found in the middle of the streambed between the rail bridge retaining walls and the wooden poles with collapsed rubble. Note the third pipe from the top is to the far right and is completely underwater so that only its central groove is visible.

Figure 31: Plan drawing of mostly intact radiator pipe. Pipe 4 (pipe at the top-left in the top-left image). Note the shallow groove in the center and cylindrical knob to the left.

Figure 32: Wooden poles and rubble at north shore of east rail crossing. A series of wooden poles that might have been some part of the bridge deck or supports that have collapsed into the streambed.

Figure 32

Furnace Area

All historic maps show several buildings surrounding the furnace. The earliest person to identify some of the buildings was Isaac Chesbrough in the 1862 property map (figure 5). The map lists two buildings in addition to the furnace, the "[water]wheel house" and the "trip[hammer] shop" (bracketed text added by author). These two buildings appear to have a water channel or sluiceway adjacent to them that runs further east to the "Old Dam and Wall" mentioned in the millpond section. In addition to the photographs and plan drawings made of the standing structures in this area, the ground penetrating radar (GPR) survey was conducted here in order to find remnants of the buildings and the sluiceway shown in the 1862 map.

A later plan map of the area was drawn by a retired civil engineer, Herbert Keith, sometime before the 1920s (figure 33). This plan map notes a forge located directly to the east of the furnace, set in the retaining wall southeast of the furnace; this area is now partially covered by a park shed. It also shows the full extent of the casting shed built around the furnace and how it extended northward almost reaching the entrance of the pattern shop.

The pattern shop building (figure 34) is directly north of the furnace and may have been the original building (or at least the original location) of the wheelhouse listed in the 1862 Chesbrough map. The building contains many tools and equipment from when it was used by the Copake Iron Works. The loft area of the pattern shop contains many wooden molds used to create sand impressions for cast-iron work. A handful of surviving plaster patterns may have also been used to make molds here as well. One

important feature of this pattern shop is the mostly intact belt drive system inside that is attached to a drill press, lathe, and band-saw (figure 35). It appears that the park service fitted an electric motor in the roof supports to continue using the belt drive in the 20th century. It is possible that this belt drive and building have witnessed three phases of power use (water, steam, and electricity) over its history.

The pattern shop building has visible buttressing (figure 36) on the northwest and western brick exterior walls, where the steam engine is known to have been placed based on Herbert Keith's sketches (figure 33). Keith lists this portion of the building as the "Engine House." A narrow hole in the eastern interior wall between the main pattern shop room and the engine house room appears to be where a drive shaft powered the belt system in the past. A later addition to the brick pattern shop building is made of coarse cement and slag fragments with light rail lines for roof supports. This late addition is along the westernmost wall of the engine house. The ends of several large iron bolts with screw threads project out of the western wall of this structure, but their past function is unknown. Victor Rolando, an expert on historic iron works has speculated this structure is a coal bunker for the adjacent engine house (Personal Communication 2007).

Northwest of the furnace is an area of raised earth (six meters by eight meters oriented southeast rising to the northwest) that now serves as a ramp to offload campground garbage into a large dumpster. Conceivably this ramp could be historic as it would be a good area (like today) to bring waste and other products from the iron works/Taconic park area. This ramp is directly south of the western rail crossing shown in the 1888 county atlas map. In addition to the rail crossing, there is a "depot" listed on the 1888 map between the site of this ramp and the brook to the north. Perhaps this ramp

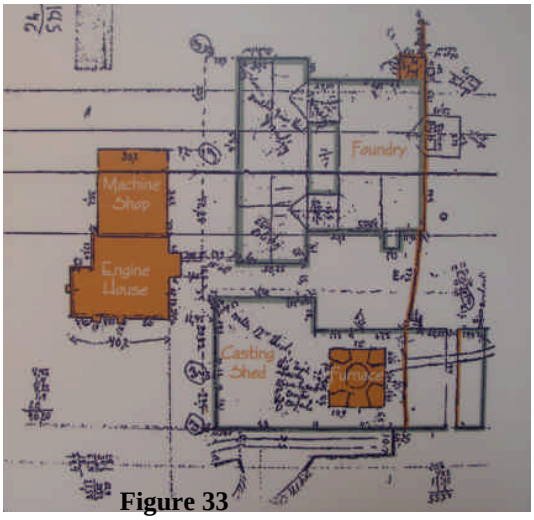


Figure 33


Figure 34

Figure 33: Herbert Keith plan drawing of furnace area. Orange buildings are still standing today. Image on display at Taconic State Park. Drawing originally from the notebook of retired Civil Engineer Herbert Keith. Local historian Hiram Todd acquired the notebook and contributed it to the historic collection on file at the Bureau of Historic Sites. Peebles Island, New York.

Figure 34: Image of Pattern Shop Building. Note from left to right, the concrete coal bunker, brick engine house with a wooden pattern mold for a ceremonial cannon in the window, the wooden shop building with an original Copake plow in the left most window.

Figure 35: Interior view of Pattern Shop machinery, showing intact belt-drive shaft connected to a band saw.

Figure 36: Brick buttressing of engine room in Pattern Shop (looking south). Note the brick buttressing in the center and the decorative stained glass trim around the edges of the window panes.


Figure 35


Figure 36

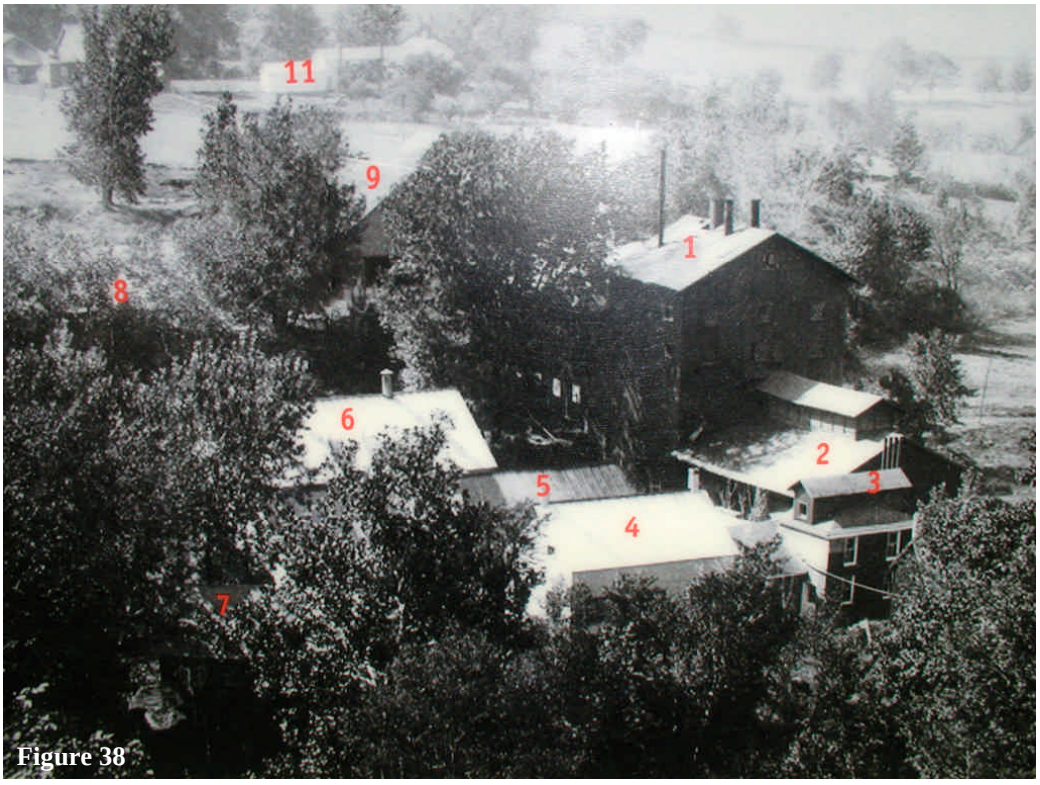
was a part of the rail system that offloaded products from the furnace. Lastly, the ramp's construction is consistent with other Copake Iron Works structures that have a retaining wall with fill backing it. The current wall is a more recent 20th century timber frame cribbing, but this may have replaced an earlier structure supporting the ramp.

Immediately south of the furnace there are two retaining walls. The first wall is about six meters high and the second wall further south is about eight meters tall (figure 37). Both walls have significant amounts of rubble (bricks, mortar, cement fragments) on their surface just behind the furnace. Some of the bricks and cement slabs have maker's marks. The western portions of the walls have different kinds of refuse along them. The southernmost wall has some concentrations of slag and a few salamanders (a mixture of iron, impurities, slag, and charcoal), but the surface is predominantly late-19th to early-20th-century refuse. This area has a higher concentration of glass vessels and can fragments when compared to the trash elsewhere that is predominantly a mix of ceramics, bottles, and scrap metal. The northernmost retaining wall has a series of piles: one pile of charcoal, three piles of crushed limestone (all of different coarseness between ¼ inch and ½ inch in diameter) and lastly on the eastern side of this wall, a pile of iron ore.

Historic images show these retaining walls once supported a charging deck that allowed workers to feed the raw materials (limestone, charcoal, and iron ore) into the top of the furnace stack (figure 38). It is interesting to see that the raw materials of this process remain piled nearby the furnace. Behind these walls, further to the south, are two more structures. Sixty meters to the south of the furnace there is a large 20 meter by 20 meter square shaped cut into the hillside supported by a five meter tall retaining wall. On the 1888 county atlas map (figure 7) this place is labeled as the "Charcoal Shed." The

Figure 37: Wall support for charging deck to the furnace. The section of the wall once supported the charging deck that fed the raw materials for making iron into the top of the furnace

Figure 38: Historic Image showing charging deck and furnace building looking south. 1 is the furnace encased in a wooden building, 2 is the casting shed, 3 is the brick engine house adjacent to, 4 the pattern shop, 5 and 6 are the forge and foundry buildings, 7 and 8 are storehouses for the foundry and furnace respectively, 9 is the charcoal shed, 10 (out of picture range) and 11 are buildings from the Wyckoff farm south the iron works, between 9 and 1 is the charging deck (partially obstructed).



area now holds scrap lumber, logs and serves as a parking place for park vehicles. There is a fragment of light gauge rail protruding out of the ground near the southeast corner, suggesting that rail lines may have extended all the way to the back of the shed. A few meters northeast of the charcoal shed is another historic building used by the park service to fuel, service, and to store park vehicles. This structure has two interesting doorways facing south on the second floor that may have served to unload and store raw materials for the furnace.

The furnace itself was extensively documented. External photographs of each arch were made and photographs of the hearth and inside the stack were taken as well (figures 39-42). A detailed investigation of the remaining pipes revealed three upper portions of downcomer pipes, one in each of the smaller arches facing west, south, and east. There are four bowl-like gauges present that helped show the level of water in the iron plates surrounding the base of the furnace which helped control the temperature (Kirby 1998, 113). The floors of all the arches are covered in brick and rubble, especially the north arch which has a substantial pile of firebrick and standard building bricks at the base of the arch (figure 43). Many of these bricks have clearly visible maker's marks giving the manufacturer and often the location of where the bricks were made. The largest arch faces north, this is consistent with Keith's drawings of a casting shed north of the furnace connected to the northern arch (figure 33). A very detailed plan map of everything within the fenced area surrounding the furnace was made (figure 39). These details note the locations of rubble and debris in the archways, major pipes, and the number and types of iron supports near the central chamber of the furnace.

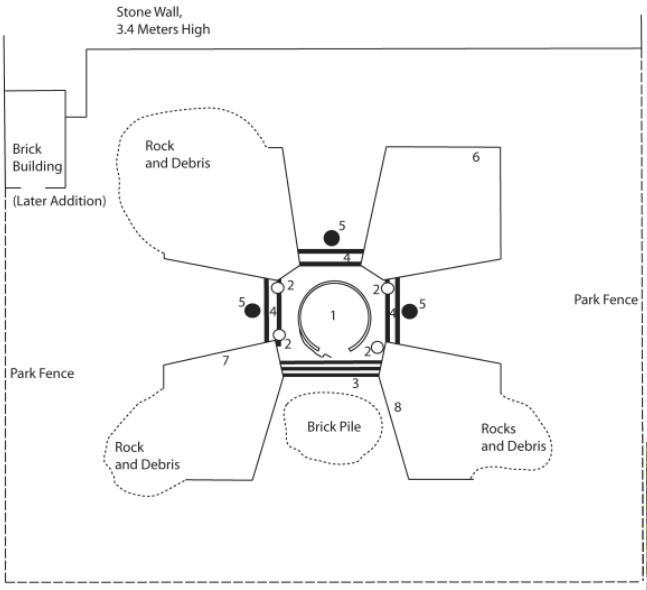


Figure 39

Figure 40

Figure 39: Plan of furnace stack ruins. Note the downcomer pipes and I-beam supports are from the ceilings of the arches and not from the bottom.

Figure 40: View of north arch at furnace stack ruins. This arch would have connected to the casting shed and where molten iron would flow out of the furnace. Note large pile of brick rubble directly below the arch.

Figure 41: Image of surveyors collecting GPS points at furnace; the author (left) and assistant Sarah Rehrer (right) taking GPS coordinates of the furnace stack.

Figure 42: Interior view of furnace hearth. Note detail of the hollow iron plates that made up the water cooled hearth looking through the eastern arch. The two bowl shaped pipes on either side of the arch were water gauges to measure the level of water in the hearth system. Note on the right of the upper-most plate a small spigot that may have also controlled water flow.

While investigating the furnace, three locations were found to have graffiti carved into the limestone casing blocks that surround the foundation of the furnace. The first piece of graffiti was found on the outer wall of the southwest corner (figure 44). This area is relatively sheltered since it is only a short distance to a retaining wall south of the furnace. The marking is difficult to decipher since the markings are shallow and crudely carved into the surface of the stone. The word, or series of letters, appears something like "ZEEAR." It is difficult to speculate when or why this carving was made. It could be anything from a modern carving to one made not long after this furnace was built in 1872. The next piece of graffiti is located along the northern wall inside the eastern archway (figure 45). The marking consists of a single letter "C" that is finely carved, very symmetrical, and slightly larger than any of the other pieces of graffiti. It is tempting to speculate what this letter represents. It may be from a stonecutter practicing the forming of letters; or the letter could be a mark to represent "C" for stones going to Copake. Others have suggested this letter could represent an abbreviated name or its former use as a corner stone (Peter and William Miles 2008, personal communication). It is doubtful that any recent person carving into the stone wall would bother to write a single, symmetrical, well formed letter.

Finally, and possibly most significantly, are two small crosses carved on the western wall of the northern archway (figure 46). The northern archway is noticeably larger than the other three archways and was the archway that had the opening to let molten iron flow into the adjacent casting shed north of the furnace. The simple carved crosses at this location may have been significant to the workers who probably put them on the wall. The location of the graffiti is very close to the chamber where the

dangerously hot and molten material was being heated and could, if not properly cared for, explode kill anyone not paying close attention to the base of the furnace. Also, being a site of intense heat, fire, and smoke, one could imagined the place conjured visions of hell itself while workers toiled around the base of the furnace. Considering that there were at least three distinct and strongly Christian communities working at the Copake Iron Works (Episcopal, Catholic, and Methodist) carved crosses may have served to give those workers some peace-of-mind in a potentially hazardous area. During recent talks (Fall 2007) given about the Copake Iron Works findings, audience members have also suggested the crosses might represent fatalities at the furnace.

Immediately adjacent to the furnace on the eastern side is a brick and concrete structure (2.98 meters by 1.74 meters) that abuts the stone retaining wall (figure 47). This structure looks to be of a later vintage than the retaining wall or the furnace itself. A few indeterminate markings made in the concrete around the entranceway (facing north) of this structure may indicate what it was used for in the past. Stott has speculated this building was constructed between 1926 and 1929 when the Hillsdale Plow Works briefly occupied the site while rebuilding its own facilities (2007, 114). Very little evidence remains inside or outside of the structure to suggest its function. It may have been a small furnace or a storage building of some sort.

Chesbrough House, Office, and Original Duplex

The next set of standing structures the survey studied are directly west of the furnace buildings and are associated with the individuals that once managed and operated

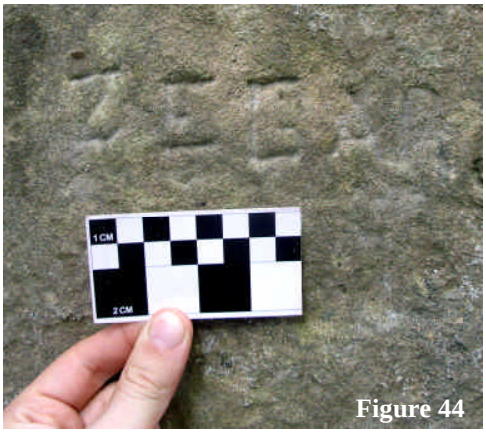


Figure 43: Various bricks with clear makers-marks beneath the northern arch of the furnace stack.

Figure 44: Graffiti “ZEEAR” on furnace wall, crudely carved on south-western exterior corner of the furnace.

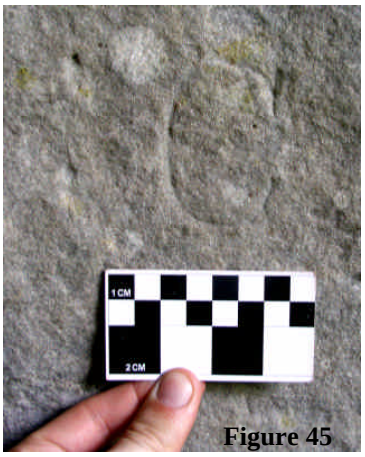
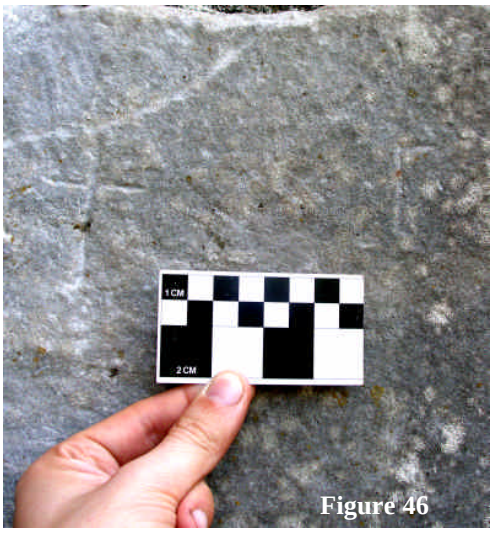


Figure 45: Graffiti letter “C” on furnace wall, finely carved on the northern interior wall of the eastern arch of the furnace.

Figure 46: Two graffiti crosses on furnace wall of the northern arch. These crosses are very close to where the molten iron would be tapped from the furnace into the casting shed.

Figure 47: Concrete and brick structure near furnace stack to the east of the furnace. Perhaps associated with the Copake Plow Works.



the iron works. Directly west of the furnace is a building which the survey has labeled the "Original Duplex" (figure 48). The house was labeled this way to differentiate this structure from the three duplexes across the north shore of the Bash Bish Brook that were converted by the park to become tourist cabins.

This building was left in its original state, but why this was done when other buildings of no use were torn down is not known at this time. William D. Miles, a descendant of the former owners and a local resident believes this house may have belonged to the last Copake Iron Works overseer Peter N. Campbell (2008, personal communication). Campbell is known to have died in 1913, but his family may have continued to live in the house after the park acquired the land surrounding it.

The Original Duplex building has a two floor structure to the north and a narrow one floor addition on the south side of the building. The foundation of this addition is not stable; a section of wall is bending outward and may eventually collapse (figure 49). Documenting this building while it is still standing is important in order to compare how the park has modified the duplexes along the north shore of the Bash Bish Brook from their original state.

North of the Original Duplex, but south of the brook is the building labeled as "office" in the 1873 and 1888 county atlas maps of the Copake Iron Works. The building now houses park signs, equipment, and serves as a mock "company store" for park visitors looking around the area near the furnace (figure 50). The main building served as a place for the surveyors on this project to leave equipment, gather for lunch, and to process digital photographs at the end of the day. Just outside the southern entrance to the office is an area that has a high concentration of metallic slag and blobs of once molten

iron. There are two lines of large cobbles just barely visible on the surface running perpendicular to each other, forming a right angle corner. There is a possibility this place may have been where a blacksmith worked, but there is not enough evidence to be certain. Lastly, the main building of the office has several cylindrical projections along the roof awning above entrances or near loft doorways on the second floor. Perhaps these were used to hoist materials to and from the upper floor.

Adjacent to the main office building along its eastern wall is a narrow brick structure which was the "powder house" that stored explosives (figure 51) for the iron mines northwest of the office (Ray Doherty 2007, Personal Communication). Krattinger has deduced, using his architectural knowledge, that the office and powder shed represent two different phases of construction. The style and construction of the main office is circa 1860s while the powder shed appears to have been built circa 1875 (Krattinger 2007, section 7:4) The powder shed building currently houses mowing equipment. The way the roof is attached to the wall and the connection the brick masonry has to the main timber office building is typical of historic explosives storehouses. The roof rests on top of the brick, but is not connected to the brickwork below. The roof was built this way to direct the force of any explosion upward and minimize any damage to nearby facilities. The brick structure is flush against the office building, but again is not connected in any way to the other structure.

The Chesbrough house belonged to Isaac Chesbrough, one of the original managers and earliest stakeholders in the Copake Iron Works Company (figure 52). The central portion of this grand-looking Greek Revival style house has been standing since at least 1850 and appears on every known historic map depicting the Copake Iron Works,

Figure 48

Figure 48: Eastern view of Original Duplex building, showing the two level main building to the left and the one level later addition.

Figure 49: Plan drawing of Original Duplex. Note the bulge in the foundation along the northernmost wall.

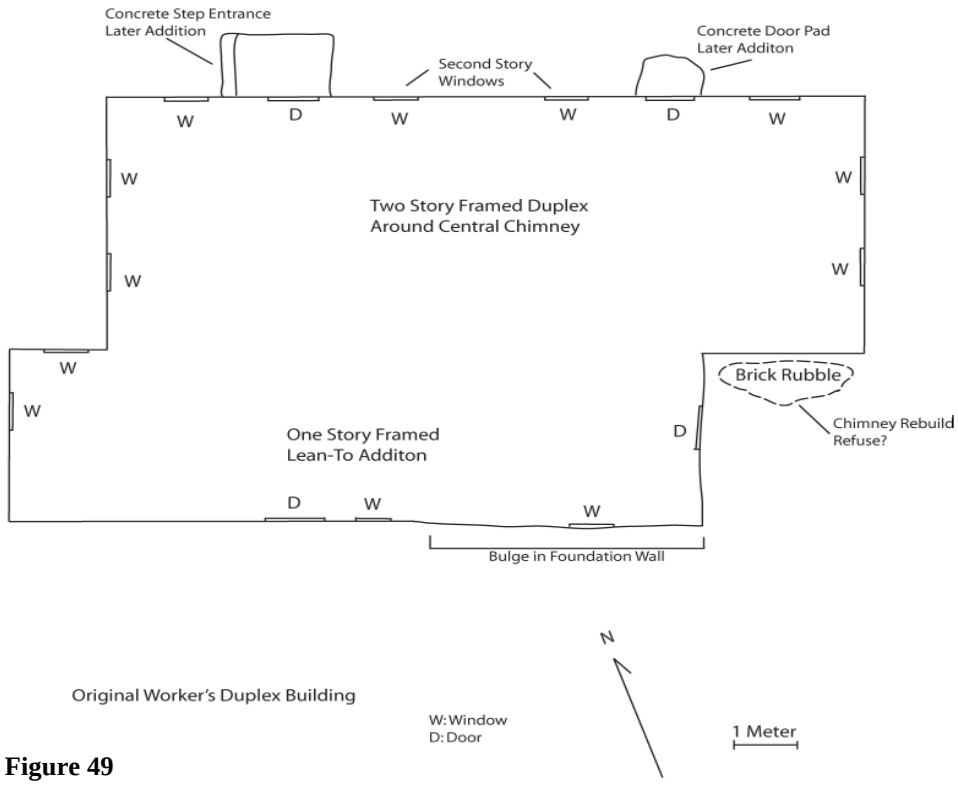


Figure 49

Figure 50

Figure 51

Figure 50: North view of office building, note later addition attached to the right.

Figure 51: Powder House structure adjacent to office building , but not connected to the office building

Figure 52: Northern view of Chesbrough House. Now the house is the residence of the Taconic Park supervisor Ray Doherty.

Figure 52

with the earliest known being from 1851. It is one of the few buildings that can be definitively tied to the Copake Iron Works during its entire operation. The house has had several additions, one of which appears between the 1873 and 1888 versions of the County atlas map. It is currently occupied by the park manager Ray Doherty and his family.

Western Rail Crossing

The shores of the brook just northeast of the office and the Chesbrough House are very close to where the 1888 county atlas map shows the light rail line crossing the Bash Bish Brook to finish the circuit from the main rail station to the furnace and back. The area today is very overgrown and the buildings in this area depicted on the 1888 map are no longer visible on the surface. Very little evidence of the crossing itself survives; however, along the southern bank there is a partially exposed section of mortared stone and concrete wall surrounded by slag piles (figure 53). The 1888 map lists many small buildings in this area including a "depot" that may have been located here. The area near the wall is mostly obscured by piles of rubble and slag, but a visible concrete cap on top of the mortared stone wall and a 20th century pipe protrude beside the wall. William D. Miles, a descendant of the former owners and a local resident, recalls a concrete and metal "lattice-style bridge" that supported water pipes connected to four duplex cabins sometime in the late 1940s (2008, personal communication). Apparently, the eastern-most cabin was lost during a flash flood in 1955 and subsequent flooding may have removed much of this former bridge system for the pipes (W.D. Miles 2008, personal

communication). At least two wooden timbers similar to the ones that formed the deck of the rail bridge east of this location, were found as recycled materials put into a crude recent dam. This dam, mixed with more modern pipes and cement fragments, creates a small pool near the three camper's cabins (formerly iron works duplexes) just north of this location.

Despite having very little surviving structural evidence on the surface there are a lot of historic machine parts, salamanders, slag, rubble, and historic trash in the area. Some mounds of slag are two to three meters high (five to eight feet) and extend for five to ten meters (15 to 30 feet) in all directions. The slopes of the stream bank in this area are completely full of slag, scrap metal, and fill material eroding into the streambed. A large 15 foot (about five meters) long boiler is lodged into the shore of the northern bank (figure 54), approximately where the rail bridge once stood in this area. Finally, some large stones have quarry marks and drill holes similar to those found at the mill pond and eastern rail crossing areas. Two of these stones are blocks of quarried marble located to the northeast of the western rail crossing area. The one on the south shore of the brook has a trapezoid shape that makes it look like a possible keystone used in peak of the archways that once encased the furnace (figure 55). The other block of marble is more rectangular, but is partially obscured because it is in the brook itself. Why or when these blocks were brought to this location is difficult to determine. Perhaps they were dropped here when the park tried to build the retaining wall along Route 344 several hundred meters from their current location.

Figure 53: Concrete and mortared stone wall at western rail crossing, with a modern pipe protruding from a pile of slag and leaf litter near the southern shore where the light gauge rail crossed on the western half of its circuit.

Figure 54: Riveted iron tank on north shore of western rail crossing . The tank is lodged on the northern shore close to the western rail crossing.

Figure 55: Marble keystone block in woods near western rail crossing, that was likely one of the arch supporting stones removed by the Taconic State Park. Located in the woods just southeast of the western rail crossing.

Copake Plow Works

The only maps that could mark where the Copake Plow Works Building once stood are the 1888 county atlas map or the 1902 topographic map. However, the area near the rail line and the edge of the iron works property where the Copake Plow Works would be located on either the 1888 or 1902 map is not detailed enough to determine if there is a building located there. The archaeological assessment of the park done by Larry Gobrecht identified a foundation and ruins in this area as the location of the Copake Plow Works (Gobrecht 2000:32). Only two walls of the structure are visible, the northern and western portions of the wall are buried beneath fill and rubble (figures 56 and 57). The eastern foundation wall section is 25 meters long, one and a half meters wide, and two meters high. The southern-facing wall section is taller at four meters, eight and a half meters long, and one and a half meters wide. The foundation wall is made of mortared stone similar to the walls of the eastern rail crossing and furnace retaining walls.

Within the area where the ground floor once stood there is a narrow cement wall. The wall is about six meters high, two meters wide, and ten meters long. The cement wall appears to be more recent than the foundation beneath it. The cement wall runs east to west and has seven iron rings (total) attached to its sides and ends with remnants of barbed wire imbedded in the cement near the iron rings. Just to the north of this foundation, and up a steep hillside is a low mortar and stone wall; both the top of the mortared wall and the cement wall downhill seem to be almost the same level. This height is approximately where one would expect to find a second floor if this foundation supported more than a one level structure. The small stone wall to the north is uphill from

Figure 56: Southern view of Plow Works ruins. Note the height of the cement wall is about the same height as the hillside in the background which happens to be where the New York and Harlem Railroad once ran.

Figure 57: Plan drawing of Plow Works ruins. Note rings on cement wall represent iron loops set into wall about half-way up the wall (1.5 meters approximately)

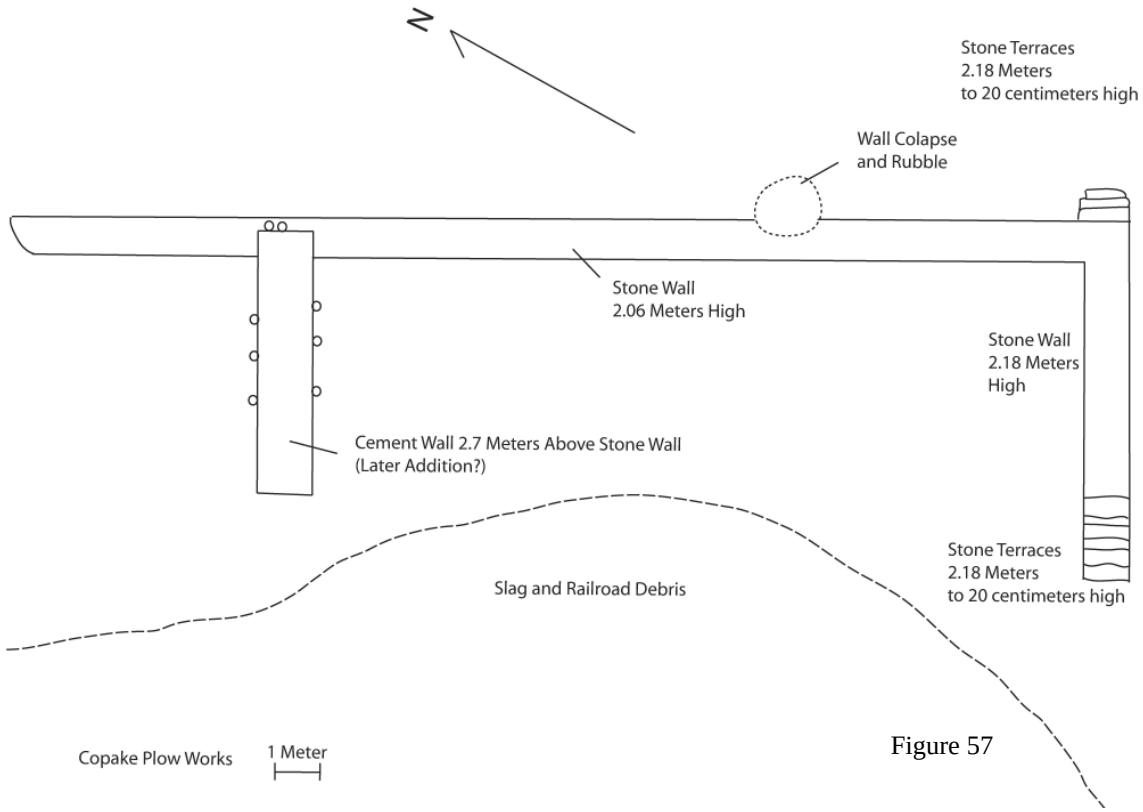


Figure 57

the main foundation and on level with the height of the former New York and Harlem rail line. This northern wall may have helped to support a rail spur running into this structure.

The plow works area is completely surrounded by man-made fill. The rail bed for the former New York and Harlem Railroad to the west of this foundation is raised 10 meters or so above the level of the foundation. Some of the rubble and fill from this bed has been pushed over the western section of the foundation, likely from when the rail bed was converted into a hiking trail after the 1970s (Ray Doherty 2007, Personal Communication). There is a fair amount of slag and historic trash in this area, but far less than the western rail crossing or behind the furnace. Just northeast of this foundation is a steep hill of ore waste; fist-sized blobs of hematite ore mixed in with gravel are piled about 20 meters high (very steeply) spreading over a 50 square meter area. This hill is placed directly south of where the ore mine operated and would be a logical nearby location to dump mining wastes.

Saint John's Church Area

Northeast of the plow works area is another distinct hill that is the site of St. John's in the Wilderness Episcopal Church (figure 58). This church was built in 1852 and the adjacent parish hall and minister's home were built later. A small graveyard occupies the eastern end of this prominent and lightly wooded hill. The oldest headstones belong to members of the Pomeroy family that originally owned the Copake Iron Works Company and sponsored the building of the church in the 1850s. The northern edge of the property is defined by a clearly human made cut into the slope that was made for the bed

of the light rail line coming off from the main New York and Harlem line (figure 59). The rail bed and the surrounding railroad cut contained two salamanders (a type of furnace waste) and one railroad spike visible on the surface. The 1873 county atlas map shows some sort of structure just north of the St. John's Church and east of the Ore Pit area. This land is now covered by a paved parking lot for the park adjacent to the park's camping grounds.

East of the hill where St. John's church stands and southeast of the railroad cut is a narrow but thick deposit of slag, rubble, and historic trash from the end of the 19th century covering an area of about ten meters wide by 150 meters long. This trash was the richest exposed deposit of historic material in the park. Many distinct bottles of patent medicines could be identified (figures 60 and 61). Spring water bottles with markings from Hudson, NY, Albany, NY, and Baltimore, MD, were found. Other distinctive trash included very large horseshoes which, according to one surveyor familiar with horses, must have come from a large draft horse. Interestingly, when the deposits of exposed slag trailed off at approximately 150 meters southeast from where it began, the historic trash trailed off as well.

An audience member from the talk about the survey done in August 2007 suggested that when St. John's in the Wilderness Church was built fragments of slag were found at the bottom of the foundation. This seemed to indicate the hill (or portions of it) were man-made. The story is unlikely since there is no evidence of slag anywhere on the top of hill. Perhaps the thick deposits of slag to the southeast of the hill made some speculate that the base of the hill must also be slag. Determining if the hill's origin was natural or man-made is difficult to know from surface observations. The ore mine is very

Figure 58: Entrance to St. John's Church.

Figure 59: Western view of rail cut into hillside north of the church.

Figures 60 and 61: Trash deposits on surface northeast of church (60) and another trash and slag deposit east of church (61). Note the drain pipes, whiteware bowl, bottle glass and slag present on the midden in the center photo. Note the many bricks, bottle glass, and slag just visible through the leaf litter in the bottom photo.

close to this location. The large hill south of the church, adjacent to the plow works, is clearly ore mine waste. However, the top and slopes of the St. John's Church hill are more overgrown and covered with dense leaf litter that hides the actual soil surface making it much more difficult to determine its origin from surface observations.

Ore Pit Area

Northwest of the St. John's Area is one large pond and two smaller ones just to the west of it. This area, according to park signs and several historic maps was the area where iron ore was mined. The area of most intense mining was an open pit mine that has now become a pond with a wading area on the shallower southern end and a swimming area in the remaining northern portion. Lifeguards at the pond claim there is still equipment on the bottom of the pond, including a crane, bulldozer, and a truck. Another story about the pond was that sometime in the last 30 years one or more scuba divers have investigated the bottom of the pond locating the truck near the southern end, the bulldozer somewhere in the middle, and the crane along the deep northern end of the pond (Ray Doherty 2007, personal Communication). At the moment, no documents have surfaced about these scuba explorations. One lifeguard actually pulled up a small pail from the southern end of the pond in the summer of 2007. This pail appears to be old and to have come from the late 19th century. One possible reason why so many large pieces of equipment could be along the bottom would be that it is a convenient place to "lose" vehicles and machinery placed on the ice just before spring thaw in order to claim insurance money (William D. Miles 2008, personal communication).

The land around the pond has been greatly modified since the park took control of the property. Several buildings are shown east of the main ore pit and north of the St. John's Church in the 1873 county atlas map (figure 6). This location is now covered by a large parking lot, a playground, and a basketball court. No visible trace of historic structures has been found along the eastern shore of the main ore pit.

The southern end of the ore pit area in recent times held a small paved wading pool. In the fall of 2007 the pool area underwent renovations and has been excavated by construction equipment (figure 62). The soils found in the excavation hole are a mix of fills, gravel, and small slag fragments. The northwestern wall of the excavated area has a distinct stratum with brick fragments extending down from the surface to about 20 centimeters depth. Perhaps this is debris from buildings documented along the southwestern edge of the main ore pit. The 1888 county atlas map (figure 7) shows two buildings along the southwest edge of the ore mining area, one called a "wash house" and the second labeled as "boiler." These titles probably refer to an ore washing building and a boiler room for a steam engine to pump water out of the mining area. Today that area is occupied by a modern changing room building and a lawn leading down to the dock area where campers sunbathe and dive into the ore pit pond.

The western shore area north of the changing room has a large amount of brush and dense undergrowth covering undulating steep hills of ore mine waste. These hills appear to be mostly oriented north to south, but a few stretch east to west. The average hill is estimated at about eight meters high, five to ten meters wide, and at least 30 meters long. These hills are mostly concentrated along the southwestern shore and their frequency and size drops off rapidly further north along the shoreline. No substantial

surface features were found along the northern shore; there were some large boulders found in the northern area of the ore pit, but they may have been deposited there glacially rather than by mining activity.

West of the northernmost ore waste hills is a narrow winding channel or trench that generally runs north to south. This strange feature is about 60 centimeters wide and 30 centimeters deep. The land around this channel is flat compared to the undulating hills of ore waste due west of this feature. A nearby tree-fall reveals the soil is a rusty-colored clay. The length of the trench is about 20 to 25 meters and gradually widens and shallows on both the southern and northern ends. One tree is growing into the edge of this channel suggesting it was not dug in the recent past. Unfortunately there is no evidence on the surface to suggest whether this channel was made in the 19th or 20th centuries.

Along the western edge of the park, just west of the ore pit area, is the Harlem Valley Rail Trail (HVRT). This trail follows the rail bed of the former New York and Harlem Railroad that was constructed in 1852, discontinued passenger service in 1972, and all service by 1976 (Stott 2007:115). The trail north of the park is an unimproved dirt trail with some of the original railroad ties used to line the edges of the trail path. Other railroad ties are piled along the sides of the trail a few meters away. South of this unimproved trail area, where the Taconic Park entrance meets Route 344 the trail is paved and signs along the trail note this paved area extends several kilometers south.

Just west of the intersection where the park entrance road and Route 344 meet is the location of the former rail depot at the Copake Iron Works for the New York and Harlem Railroad (figures 63 and 64). William D. Miles, a local resident and descendant

Figure 62: Debris and soil layers south of ore pit area. Note the bricks and slag fragments in the darker topsoil overlaying orange glacial clays. The rubble fragments may have come from the pump and ore processing buildings that used to be in this area.

Figure 63: Modern view of rail depot looking south, now called the “Depot Deli” was once the rail station at the Copake Iron Works.

Figure 64: Historic image of rail depot looking south. On file at the Hillsdale Public Library. Hillsdale, New York

of the former owners of the Copake Iron Works remembers that in the early 1960s the rail depot was sold to the Copake Lumber and Supply as a storage building (2008, personal communication). In January of 1974 an arsonist attacked the building "severely charring the rafters over the ticket office and waiting room" (Ibid). Afterward the structure was sold to and rebuilt by its current owners. The building has become a general goods store named the "Depot Deli."

Effects of the Charcoal Iron Industry on the Copake Landscape

One of the most revealing aspects of the survey conducted at the Copake Iron Works is that many locations are greatly modified by humans or are entirely man-made despite the superficial appearance of a natural setting throughout the park. Most of the heavy deposits of slag and industrial wastes are in areas where the former light gauge railroad lines ran. In particular the eastern and western rail crossings have a large amount of slag and scrap parts dumped in their vicinity. Therefore, the technology of the railroad facilitated a major change to the landscape around the iron works. The lines brought charcoal from the cleared forests and ore from the excavated pits to the iron works. Not only did the light gauge rail lines bring out finished iron goods to the main New York and Harlem Railroad lines, but they also facilitated the rapid removal and distribution of tons of waste products, greatly modifying many surfaces of the site. These modifications include the building entire hills ore mine tailings beside the mine and northeast of the plow works area. The southern shoreline of the Bash Bish Brook is completely made of slag, fill, and debris (see figures 16 and 17) extending east from the shores near the

Chesbrough house to the shores around the eastern rail crossing (about 330 meters of shoreline). Recycled slag and debris are used in the western and northern dam walls of the mill pond area. This recycling of waste material indicates that some of this debris was being used consciously to modify a part of the landscape in order to make a structure utilized by the Copake Iron Works.

The technology of manufacturing iron in charcoal blast furnaces took a huge toll on local woodland. Deeds indicate that at least a thousand acres of local woodland were purchased to be cut and burned for use at the Copake Iron Works. Agreements made by Frederick K. Miles gave him access to additional local timber on privately owned wood lots. Historic photos, such as the images showing the Copake Iron Works Depot (now the Deopt Deli), (figures 64 and 65) indicate the land around the Copake Iron Works had many less trees than photos from the present-day survey depict. Industrial historian Ed Kirby gives the best description about the type of environment a charcoal iron works created,

> The environment was entirely different than that known by present residents. Smoke, dust, and vapors clouded the air around the ironworks; smoldering piles of charcoal added more contamination to the atmosphere. Robbed of the once substantial forests, much of the valuable topsoils washed in heavy spring rains, further damaging the land (1998, 47).

The air may have cleared and the trees have grown back, but the land itself contains the marks of being mined, eroded, and having wastes strewn across its surfaces from the 58 year operation of the Copake Iron Works. The combination of charcoal iron technology

and the ease of transport provided by the railroad allowed industrialists and the working community to completely change the landscape around them in fundamental and long-lasting ways.

CHAPTER 4

COMPARING THE COPAKE IRON WORKS TO OTHER WORKING COMMUNITIES

Identifying and comparing the Copake Iron Works with nearby iron working sites is important to understanding what made Copake unique in its region and what types of practices it likely shared with its neighbors. Robert Gordon's *A Landscape Transformed* studies the development, growth, and decline of the iron working district in Salisbury, Connecticut. Gobrecht (2000:1) names this area the "Litchfield Iron District", and Kirby (1998) calls it "Connecticut's Northeast Corner" on his title page. Both Gobrecht and Kirby are referring to the same iron making region as Gordon describes in *A Landscape Transformed*. Gobrecht and Kirby include the Copake Iron Works within this district. Interestingly, Gordon's interpretation of that region does not extend outside the borders of Connecticut and therefore he does not include the site of the Copake Iron Works in his analysis of the region. Gordon's earlier work *American Iron* defines many of the iron making districts of the eastern United States, including the Salisbury Iron District he later studies in *A Landscape Transformed*. The location of the Copake Iron Works falls exactly between Gordon's districts of Salisbury and the New York/New Jersey district parallel to Salisbury further to the west (1996:59). This leads to the obvious question of

whether the Copake Iron Works developed more like an iron furnace in the New York/New Jersey district or if it more closely followed the Salisbury district's pattern of development. Gordon's description of the New York District shows its furnaces readily adopted technological innovations, focused on the production of large quantities of bloomery and pig iron, and produced very large iron products (anchors, cannon, ect) (1996:69-73, 2001:117) . The Salisbury district furnaces that Gordon describes had a far more conservative nature by retaining older charcoal furnace technologies and iron mining practices (2001:51-53, 85-86). Gordon clearly illustrates that the Salisbury district was trying to capture the very profitable "top end" of the iron market by making high quality gun iron for government contractors and later specializing in high quality iron rail car wheels (2001:47). The chart clearly illustrates that from the beginning of the 19th century into the 1860s that the price per ton of pig iron remained flat and the price of bar iron declined slightly while the price and demand for gun iron rose steadily (Ibid). For furnaces in New York that chose to primarily produce pig and bar iron they had to invest in the most efficient technologies and methods to remain profitable. Salisbury's alternative strategy worked well with the region's resources and social background;

> Concentration on quality over quantity placed a premium on artisan's skills and managers' close supervision. Before construction of the Housatonic Railroad, [this strategy] lessened the difficulties of shipping large quantities of products overland. The choice fitted comfortably with the community and individual values that focused on the quality of life in Salisbury instead of prominence in national industry (Gordon 2001: 113).

The reason for the Salisbury Iron District's reluctance to adopt newer technologies was at least partially driven by the attitudes of the buyers in the high quality iron market. For example, the fuel efficiency of hot-blast furnaces was known and it was

being quickly adopted across the iron industry in the 1830s and 1840s; however, key buyers in Salisbury's market (into the 1850s) suspected it lowered the quality of the iron it produced (Gordon 2001:75). As a result, the cautious furnace owners in Salisbury did not update their furnaces until 20 or 30 years after it had been adopted in other regions.

The social organization in the Salisbury district seems focused around the skilled artisans and the connections they had with locally based owners and management. The outside owners and investors of iron industry in Salisbury had all been bought out by three local families in the mid 19th century (Gordon 2001:112-113). Several of the iron works operating before the mid 19th century actually had owner/artisans that worked side-by-side with other skilled employees to craft various iron products (Ibid). It was also not uncommon for these early 19th century artisans to hire each other for different projects (Gordon 2001:112). While this did not continue into the later 19th and early 20th century in Salisbury, the artisan oriented culture seems to have survived. Gordon recounts how an outside consultant in 1915 complained that one remaining Salisbury iron company was "top heavy" with unnecessary staff and that they were paid with an "extravagant amount of earnings" (Gordon 2001:93). Apparently, the owner was unwilling to let go of artisans/employees with whom he had long standing connections.

The Copake Iron Works displays aspects of both the New York/New Jersey district and the Salisbury district depending on what period in time is investigated. Early in the Copake Iron Works history it was operated by Lemuel Pomeroy Jr. who had run the Ancram furnace for the Livingston family before building the iron works at Copake. It is likely he ran the works at Copake in a similar fashion to the one he supervised for the

Livingston Family. Gordon briefly mentions that the management system of the Livingston family furnace and forges "discouraged the cooperation among artisans and managers needed to make high quality metal" (Gordon 2001:117). Ellis's accounts of the early Copake Iron Works note it was producing rod and bar iron from 1847 to about 1854, which was nearly the same period of time when Lemuel Pomeroy supervised the furnace (1878:392). However, contrary to Gordon's assessment, Ellis's article does mention the early furnace at Copake was attempting to make higher quality iron products like gun barrels and rail car axles (1878: 392). From this account it seems like the early Copake Iron Works had yet to find a niche in either the mass-produced or high quality iron markets and was catering to both up until Lemuel Pomeroy passed away in 1853.

Stott notes that when Frederick K. Miles acquired the Copake Iron Works in 1862 he "must have seen the Copake Iron Works as a means of supplying his Salisbury works with a larger supply of cast iron and ore" (Stott 2007:113). This statement would imply the main output of the Copake Iron Works around the time of its sale to Frederick K. Miles was pig iron bars and iron ore. Over the nine years after the death of Lemuel Pomeroy it appears that the managers of the Copake Iron Works attempted to focus on mass production of iron like other furnaces in the New York/New Jersey district rather than like those in the Salisbury district.

Ellis notes that by 1872 Frederick K. Miles had raised iron production at the Copake Iron Works almost six fold (from 50-60 tons to 300-350 tons per month) with the new furnace that was constructed (Ellis 1878:392). The new furnace at the Copake Iron Works included a hot-blast oven to inject pre-heated air into the furnace. Gordon notes this technology was being quickly adopted by iron makers in the 1830s and 1840s but

was only being slowly adopted in the Salisbury district into the 1860s (2001:75). Another technological innovation adopted for the new furnace at the Copake Iron Works was the water cooled hearth, a technology that less than half a dozen other furnaces in the Salisbury district ever adopted (Kirby 1998:63). Despite this raise in production and modernization of the furnace at the Copake Iron Works, all other indicators seem to show the focus of the iron works had shifted towards being more like a furnace in the Salisbury district. Ellis's account of the Copake Iron Works under the direction of Frederick K. Miles indicates the iron produced there is "of a fine quality, excellently adapted to the making of car-wheels" (1878:392). Another enlightening connection between the Copake Iron Works and railroad car wheel production was that the Copake Iron Works went out of blast within the same year (1903) that Gordon reports Pennsylvania steel works began producing solid steel railroad car wheels (2001:92). These steel wheels were designed for the recently standardized all-steel railroad cars, making cast iron railroad car wheels obsolete overnight (Gordon 2001:91-92). While this second connection is indirect it is interesting to speculate that William A. Miles must have seen the "writing on the wall" when the market for iron railcar wheels fell out from under his struggling iron works.

In regards to the social organization and ethnic composition at the Copake Iron Works, historic texts provide little evidence to compare how the community at Copake compared with those in the New York/New Jersey or Salisbury Iron Districts. Gordon does not specifically go into the social organization of any iron district other than the Salisbury district in his book *A Landscape Transformed*. When Gordon does mention social organization in the Salisbury district he emphasizes the unusual if not unique intimacy that owners and artisans seemed to share compared to other iron making

districts across the eastern United States. The organization of the early Copake Iron Works is not known since historic maps of that period are not very detailed and known historic texts describing this early period do not cover much about the social structure. Census records up to 1860 are vague and lack descriptive detail about the occupations of the unskilled employees working at the Copake Iron Works. Many of the skilled artisans at the Copake Iron Works from the earliest period seem to have come from Massachusetts, Vermont, or Connecticut, but a few were born in New York. Lemuel Pomeroy seems to have drawn on the local pool of skilled artisans in the region to produce a modest amount of iron. When the Copake Iron Works came under the direction of Frederick Miles, federal census records show the majority of skilled furnace workers are Irish-born immigrants and a handful of locally-born workers. This was mirrored at the unskilled level with the majority of the unskilled teamsters and ore miners being Irish-born immigrants with a few locally-born laborers. By the 1900 census this had changed as there were no unskilled employees left and only one of the furnace workers came from Irish immigrant parents; the remaining skilled employees were all from families that had been in the United States for at least two generations.

Gordon's descriptions of the Salisbury Iron District imply that the artisan/owner culture continued over generations of artisan families in the region. However, "about 80 percent of the miners were Irish, and the rest, mostly Cornish," demonstrating a predominantly immigrant unskilled labor force similar to that used in Copake (Gordon 2001:91). As for the closeness of management with the skilled artisan employees at Copake there is also little direct historical evidence available with which to make conclusions. Lemuel Pomeroy lived very close to the Copake Iron Works, as did the rest

of the top management, and many of them went to St. John's Episcopal Church. This would suggest a closeness like that seen during the early 19th century in the Salisbury Iron District. After Frederick K. Miles took over as owner of the Copake Iron Works there appears to be more foreign-born skilled laborers and by the 1880s there were two additional faith communities established that employees of the Copake Iron Works were probably attending. Frederick K. Miles did maintain a house at the Copake Iron Works as Lemuel Pomeroy had done, but Frederick K. Miles was also active in Connecticut politics either at the state or national level from 1879-1883 and 1889-1891 and would not have been able to spend as much time at the Copake Iron Works as previous owners did (Stott 2007:113).

After discussing the social make-up of the Salisbury Iron District Gordon mentions the fact that compared with other iron making regions the Salisbury Iron District made less of an environmental impact than other districts (2001:114-117) . The main reason for this was in the limited size and wide distribution of the various furnaces across the region (Gordon 2001:116). Another important reason for this limited impact was the widespread practice recycling of waste products, in particular slag, in the Salisbury region (Gordon:116). Early in the history of Salisbury furnace slag with high concentrations of iron was crushed and the remaining iron removed from the slag. Later, in the mid to late 19th century when furnace slag contained less iron it was crushed to be used for additives to shingles, roadbed material, and aggregate for concrete (Ibid). At the Copake Iron Works there are several large hills of ore mine tailings surrounding the western and southern ends of the former ore pit. Major deposits of slag are visible and form substantial portions of the stream bank and slopes near the furnace area and along

the former light gauge rail road course. The only apparent effort to recycle slag was in its use as fill for the dam to the mill pond that held back water for the water wheel system. Overall it appears the Copake Iron Works did not follow quite the same policy on recycling slag or in minimizing its environmental impact as furnaces in the Salisbury Iron District had done.

Overall, the Copake Iron Works shares many of the aspects of furnaces in the Salisbury Iron District and deserves to be included among those neighboring it to the southeast in Connecticut. However, under the management of its two principle owners the Copake Iron Works did not strictly follow all of the patterns of a typical Salisbury furnace. In the early to mid 19th century the Copake Iron Works was not specialized in either mass production or in high quality iron goods, but it may have had the close-knit owner/artisan relationship that other Salisbury furnaces had. After the American Civil War, the new owner, Frederick K. Miles focused on production of high quality railcar wheels and plows like the furnaces in Salisbury were producing, but he probably had less of a presence in daily operations and relied upon more skilled immigrant laborers than Salisbury's furnaces did. Lastly, Frederick K. Miles saw little incentive to recycle the waste products of the Copake Iron Works other than to use a portion as fill to impound the nearby Bash Bish Brook. Meanwhile, Salisbury furnaces regularly processed their slag into new products and thus reduced the visual impact of their wastes upon the surrounding environment.

By adding the information about the Copake Iron Works to the extensive data tables provided by Gordon (2001) on the construction and closings of furnaces in the Salisbury district, broad comparisons between the furnaces can be made. There were

approximately 25 furnaces constructed in the Salisbury district from 1762 to 1918; 21 are listed by Gordon (2001:120-121) and four others are mentioned by Kirby (1998:92-113) and Gobrecht (2000:45-47) when discussing the same district. The majority of the furnaces that were built in Connecticut occurred between 1825 and 1850 (15 furnaces), with only three built from 1762 to 1824 and three built after 1875. Two of the New York furnaces were constructed between 1825 and 1850 and another two built from 1850 to 1875. This information fits well with the construction date of the Copake Iron Works in 1845, near the end of the peak period of furnace construction in the district. The average length of time these furnaces were in operation was just under 42.5 years. The longest and shortest operating furnaces in the Salisbury District were the Beckley furnace lasting 82 years and the Joyce furnace only lasting 7 years (Gordon 2001:121). The original and rebuilt furnaces at the Copake Iron Works operated for a total of 58 years, well above the average age for a Salisbury Iron District furnace. The furnace at Copake may have stayed in production longer because of the business generated by the Copake Plow Works.

Comparison between the workforce and labor organization at the Copake Iron Works with other working communities in 19th and early 20th century North America should be made. This analysis can help give better impression of what working life at the Copake Iron Works may have been like during the 19th and early 20th century. In *They Worked Regular* Mathew Palus and Paul Shakel study the working community on Virginius Island, West Virginia from the early 19th into the early 20th century. The authors divide the history of the working community into three ages. The first period in the early 19th century covers the early settlement of small specialized craft industries. The next period covering the early 19th century up to the American Civil War follows the rise

of unified corporate control on the island which used strong paternalistic policies to structure working life on the island. Finally, in the late 19th and early 20th century the authors study the shift to absentee owners and replacing skilled laborers with unskilled immigrants. This final period also saw a closing of many smaller industries on the island in order to focus production on a single industry, the pulp mill (Palus and Shakel 2006).

Palus and Shakel are interested in exploring the landscape and environment of the island and how it affected community life in the past. Their interest in landscapes is strictly regional. Palus and Shakel's pollen, historic, and oral testimony supply them with information on how the island was utilized and perceived by various individuals. In the late 18th century the island goes through phases of pastoral and unplanned building (Palus and Shakel 2006, 106-108). This is followed in the early 19th century by the imposition of "order and efficiency" with new standardized buildings and organizing the landscape under a single owner (Ibid). Finally, by the late 19th century the new owners follow a policy of selective decay and maintenance of the built environment with less focus on clearing weeds and undergrowth (Ibid).

Palus and Shakel present their view of corporate paternalism as part of a system and not a monolithic force to be opposed by workers, unlike the portrayals of corporate paternalism given by authors such as Margaret Wood (2004). In an interesting twist, the authors note that workers nostalgically looked back upon the antebellum period of Virginius Island's history when corporate paternalism was at its zenith, often referring to buildings and places using names specific to that time (Palus and Shakel 2006, 103). The authors state,

> We think it is not an accident that residents of Harpers Ferry, comprised mostly of merchants and working class families, ignored -or forgot- much of the town's [Virginius Island] Victorian industrial history. The postbellum industrial entrepreneurs who controlled the town's economy and labor opportunities were outsiders who did not take a paternalistic view toward their workers. While the town had industrial success, people chose to forget their own exploitation as well as that of their relatives (2006, 4).

Palus and Shakel structure the above quote in such a way that makes it seem the lack of a paternalistic ethos was one of many traits that the working community disliked about the absentee owners in the late 19th century. The authors depict corporate paternalism as just a part of a management structure that later workers came to look back upon more favorably than how they perceived their situation in the late 19th and early 20th centuries.

Some important comparisons can be made between the working communities on Virginius Island, West Virginia, and at the Copake Iron Works, New York. First, they both underwent major transitions, both physically and structurally, between management that was local and directly involved in daily operation prior to the 1860s and that of more remote management in the later 19th century. However, under the management of Frederick K. Miles, the Copake Iron Works had new structures built including the light gauge railroad, the new furnace, and job diversity increased with the building of the Copake Plow Works. On Virginius Island the absentee management apparently invested less effort in building or maintaining existing structures and reduced job diversity down to a single industry. While the owner of post-1860s Virginius Island discontinued policies

of corporate paternalism, Frederick K. Miles not only continued, but augmented the system with additional company houses until financial hardship brought the policy to an end in the 1890s. Corporate paternalism declined on Virginius Island as non-local, unskilled laborers entered the industrial community. At the Copake Iron Works unskilled immigrant labor was present at or very near the start of the enterprise and only decreased during the last decade of its operation.

Historian Anthony Wallace makes insightful comments about the income and livelihoods of various mill workers of Rockdale, Pennsylvania by using census and company documents in his lengthy text *Rockdale: The growth of an American Village in the Early Industrial Revolution*. Using these documents Wallace is able to determine how much income was available after rent and other living expenses in this 19th century working community. His conclusions about employees of Rockdale in 1850 reveals "wages were, in fact, substantial in comparison with subsistence expenses" and that "Rent thus claimed a very small proportion of subsistence expenses for even the lowest paid mill-working family, far less than the cost of food, which was the main expense" (Wallace 2005:61-62). In several examples of different worker's incomes he demonstrates almost all would have approximately one quarter of their income to save and to spend for themselves after other necessities were factored (Wallace 2005:62-63). He does note that boarders, while a significant source of income to the families hosting them "would, in effect, be spending nearly half his income for bare subsistence" (Wallace 2005:63). Wallace's study of the Census for 1850 shows only workers who made above the basic laborer's pay could afford to be a boarder.

Despite the ability of most workers to accumulate a significant portion of their income to spend or save as they wished, there was extremely high worker turnover. Wallace's analysis shows that in the first twelve years of the mills (1832-1844) there was an attrition rate of 95 percent (2005:64). Even into the 1850s and 1860s the attrition rate was still as high as 88 percent (Ibid).

Wallace's other important observation about the working community at Rockdale was that the majority of workers lived with their families and that many kinship ties extended across the working community. He concludes that "the web of kinship was probably even more complex than the available data indicate…there were certainly brothers, sisters, cousins, and in-laws of close degree working together in the same department or in the same mill whom we cannot identify now" also, "in addition to being tied together by kinship, were many of them close neighbors" (Wallace 2005:60-61).

At the Copake Iron Works there are many workers, especially over the age of 30, who have a wife and children living with them. In several cases fathers and sons are working in the same job, either at the furnace or in the ore-bed especially. Those workers without a wife or children with the same surname tend to live with families and, like in Rockdale, may be related in ways the documentation fails to highlight. The nearly complete worker turnover within the span of 10 years is also seen at the Copake Iron Works, especially in the occupations of ore-bed workers and furnace workers. Between 1870 and 1880 there was a time of relative prosperity for the Copake Iron Works with less reason for workers to be fired or laid-off. In this prosperous 10 year period only 3 of the 77 total employees (in 1880) had been working at the iron works since 1870. That is a worker turnover rate of approximately 96 percent, which fits well with Wallace's

observations at Rockdale. One piece of data on the Copake Iron Works of 1880 that does not fit Wallace's accounts of Rockdale is that several of the basic level laborers for the ore bed are listed as boarders. If the cost of boarding was prohibitive in Copake like it was in Rockdale then there should be few boarders listed at the lower-paid laborer level. Perhaps the average rental rate for a boarder at the Copake Iron Works was low enough that even ore bed workers could board and make enough to subsist. On the other hand there may have been an extreme shortage of housing, so much so that becoming a boarder was the only option for obtaining work in the area, despite the higher costs involved. Lastly, there is a chance that these boarders are relatives of the other occupants, but as mentioned by Wallace, the connections between members of the community have been obscured over time.

If families and mobility are two key features seen at both Rockdale and the Copake Iron Works, perhaps disgruntled employees were able to use their social networks to find work elsewhere with other kin and close friends. The ability to accumulate a significant proportion of income to use freely would likely be needed to afford moving frequently and to ensure against the financial hardship and ruin to families that accidents could cause. Therefore, surplus money, strong social ties, and mobility could serve as a strategy to avoid or resist exploitation at 19th century industrial centers in the eastern United States. While no extensive company records of payroll and rent are known to exist for the Copake Iron Works, it is fascinating to see some similarities between the working communities by using census data from Rockdale and Copake.

Margaret Wood investigates the working community in early 20th century Berwind, Colorado. This community was one of several in its region that was involved

with the Ludlow Massacre of 1914. Her objective is to better understand "the ways in which working-class people organized themselves in their daily lives and how that organization was instrumental in the formation of effective class action" (Wood 2004:211). One such barrier to working class unity was the company policy of mixing the households and neighborhoods with families of different ethnic and regional origins (Wood 2004:215). Wood's study shows how the working community overcame ethnic differences and was able to utilize their ethnic identities to resist and strike against the management of the company town at Berwind. The tensions and pressures caused by the company's tight control over who could enter, where they could live, and when (if ever) they could exit the community may very well have been a key difference between Berwind and the communities found at the Copake Iron Works and elsewhere in the eastern United States.

It appears the workers in more mobile communities could "vote with their feet" as a strategy to resist difficult and unfair working conditions that industrial life offered. Workers at Berwind could not freely choose to enter or leave the community as their peers could further east. The tensions that led the community at Berwind to spearhead the strikes and violence of the Colorado Coal Field Wars may have been enflamed in part by the difficulty workers had in escaping poor living and working conditions. The fact that neither Rockdale, Virginius Island, nor the Copake Iron Works faced violent worker strikes or uprisings like Berwind may have something to do with their use of corporate paternalism and granting workers the mobility provided by transportation systems compared to the community in Berwind.

Although there was no documentation of organized strikes or violence at the Copake Iron Works that does not mean that working life was not without some perils. One legal document in the files at the Roeliff Jansen Historical Society details an accident at an iron mine owned by William A. Miles in Dutchess County. The worker was lowering a pump into the mine when "the pump from some cause unexpectedly commenced to ascended the shaft carrying the deceased with it, cutting off in the ascent his left foot" an attempted amputation at the local hospital was unsuccessful and the worker died shortly thereafter. The conclusion of the jury panel was that the man died "by his own neglect and carelessness." This document shows how working life has serious hazards and unlike today where the legal burden of proof would be on the owner to show the working environment was safe and supervised, the 19th century laborer was often working at his or her risk to earn a living. McGuire and Reckner note that one of the major reasons why the miners at Berwind, Colorado became organized was to ensure safety laws were being enforced (2005:219).

Margaret Wood's study of the written, oral, and material contexts about the Berwind community reveals the importance of the workers' wives in supporting their families by keeping boarders, as well as forging ties across ethnic divides through informal socializing and coffee drinking (2004:222-231). Wood demonstrates that the documented increase in boarders taken in by working families matches the same period when an increase in the number and weight of tin can remains were found across the site (222-225). The increase in boarders and use of tin cans to feed them demonstrates that "by extending the feminine gendered domestic labor into profit-making ventures, women

did not overtly challenge the role of men as providers" and still contributed significantly to the wealth and well-being of their family (Wood 2004:226).

Wood's study of household ceramics, specifically the remains of tea and coffee wares, demonstrates "similarity and commonality through an emphasis on plainness" (Wood 2004:230). When the ceramics found had decoration or style Wood concludes "it is likely that they were drinking from mismatched cups and saucers. Through variety and variation in vessel forms, women were extending a vision of commonality and shared experience" as well as a non-threatening show of individuality and identity (Wood: 230-231).

At the Copake Iron Works census records do not show any attempt to divide households in the community along ethnic lines. Most of the working households seem to be all of one ethnic or regional origin with distinct enclaves of all-Irish housing in some places. Even when the population appears to be at its most diverse at the Copake Iron Works in 1880, there are only about four or five different regional and ethnic groups represented. At Berwind, Wood found at least nine different and distinct ethnic and regional groups represented with no group having more than 40 percent of the total population (2004:217). The working population at the Copake Iron Works in 1880 is split almost evenly between workers born in Ireland (44 percent) and those local to the northeastern United States (48 percent), with much smaller proportions (about eight percent) coming from Canada, continental Europe, and the southern United States. These differences may just be a reflection of different labor pools in Colorado and New York, but the way the community of Berwind was organized clearly demonstrates an unusually ethnically diverse and divided population. This more diverse population appears to

coincide with the relatively higher degree of control the company management at Berwind held over who could enter, leave, and where they could live within the remote working community.

An important observation made by Wood at Berwind is that most families were composed of only a single ethnicity and that when the working community struck against the oppressive policies of the company they left the workplace "as distinct ethnic blocks, not as a distinct working class" (2004:217, 220). This observation by Wood shows there were strong (perhaps stronger) ethnic ties than class ties, but that both were important facets of identity maintained by and between working families in the community. It is very likely that strong ethnic ties existed among the Irish residents at the Copake Iron Works and that important ties must have also existed between the Irish working community and the substantial population of locally born workers. Wood's analysis demonstrates that women in working families were important to creating and maintaining cross-ethnic ties while forming class identity. This could be the case in many other working communities, such as the Copake Iron Works.

Every single worker at the Copake Iron Works was a part of a household that had at least one woman, often married to the head of the household, listed as "Keeping House" or less often as a "Seemstress." Both of these listings for women suggest they had important roles that were considered distinctive occupations by the census-taker. This consistent pattern of female "kept" households and their listing as an occupation in the census supports the notion that women in the Copake Iron Works community were important and valued members who enabled the entire system to function.

Studies by authors Palus and Shakel (2006), Beaudry and Mrozowski (eds, 1989), and Wood (2004) all use material culture from working communities to investigate ways workers found solidarity and resisted the moralistic authority company owners imposed. Examples of this material culture include items such as clay tobacco pipes, glass vessels, and ceramics. Overseers and the rest of the management of company towns enjoyed alcohol and tobacco products as well, but often purchased, used, and disposed of them differently than working class employees. However, 19th century upper and middle-class notions of sobriety and decency often influenceded management's policies toward controlling or restricting working and lower-class forms of consumption and the behaviors associated with them. At some future date a valuable study of the material culture at the Copake Iron Works may lead to better understanding of how members of the working community shared identities among themselves and how they differed from management.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

The main topic investigated by this thesis involves the uses of land by the management and employees of the Copake Iron Works over the 19th and early 20th Century. Evidence revealed through the archaeological survey and the study of primary historical documents shows the Copake Iron Works to have been organized around the availability of resources; particularly ore, timber, water, and transportation. Certainly by the early 1870s there was a clear division of housing for skilled and unskilled laborers. As new technology like the railroad brought access to new markets and materials the working community frequently used the mobility of the rail lines to find new work and opportunities. Newer and competing iron working technologies eventually restricted the demand for goods from the Copake Iron Works. The drain on local resources caused by the charcoal iron technology used at the Copake Iron Works caused increasing financial hardship as more raw materials had to be brought in from outside the area. This economic hardship directly affected the working community by ending features of corporate paternalism. These features include the selling of company homes, to offset the rising costs to ship the needed materials to the furnace. Economic hardship and dwindling local iron resources led to the closing of the nearby iron mines and likely caused many of the

unskilled immigrant employees to find jobs elsewhere. The apparent hiring and retaining locally-born laborers in the last decade of the Copake Iron Works operation probably reflects a cost-saving measure that didn't require the maintenance of company housing or stores.

One clear division between various groups in the Copake Iron Works community would have been in their religious affiliation. At least some in the working community appear to have closely identified with their faith to have carved the crosses near the entrance of the main casting archway to the furnace. As mentioned before, the Fagan sisters recalled that anyone who was Catholic was considered "Irish" by the others in the community regardless of their regional heritage (Mettler 2000:16). The religious differences between the management and a majority of the workers from the 19th century could have reinforced the divisions of class, as well as ethnicity, at the Copake Iron Works.

The first owner and overseer of the Copake Iron Works, Lemuel Pomeroy and Isaac Chesbrough, were two founding members of the St. John's in the Wilderness Episcopal Church when it was constructed in 1852. They provided the land that the church was constructed on, which is a prominent hill beside the former ore mining area. In *The Fagan Sisters*, it notes that after the church was constructed it had strong attendance, including many members of the company management (Mettler 2000:85). However, the number of parish members began to dwindle soon after "Chesbrough and Pomeroy sold their Copake Iron Company" (Mettler 2000:85).

The Fagan sisters mention that around the 1850s and early 1860s a visiting Catholic priest or missionary would hold services at one of the worker's houses whenever one was available to perform a mass (Mettler 2000:77). The two Fagan sisters recount

how the land for the local Catholic church was donated by a local Irishman named Michael Hurley (Mettler 2000:77). Census records note that Michael Hurley worked for the New York and Harlem Rail Road. The church was completed in 1867 at a cost of five thousand dollars and named Saint Bridget's Church (Mettler 2000: 77).

By the 1880s there apparently were a significant number of Methodists within the community and their congregation began to hold services at the Saint John's in the Wilderness Church. In one memorable incident, Fanny Pomeroy Peck, a descendant of both the Pomeroy and Chesbrough families locked herself and the few remaining Episcopalians inside Saint John's in the Wilderness Church in order to prevent the Methodist Congregation from holding services there (Mettler 2000:85-86).

The original deed granting the land for the St. John's church was found after apparently being "lost" and negotiations between the clergy of both denominations led to a resumption of Episcopal services at the church (Mettler 2000:85-86). The Methodist congregation constructed their own church near the center of the village Copake Falls (then called the village of Copake Iron Works) in 1892 (Mettler 2000:85-86). In the deed logs this "lost" land deal appears out of sequence near the very end of the deed listings supporting the story that the agreement was lost. The agreement can be found today in Log book 180 page 493. Notations in this deed mention it was filed in Berkshire County, Massachusetts in 1852. Apparently several of Lemuel Pomeroy's brothers lived in Pittsfield, Massachusetts and the agreement was filed there. A copy of this agreement was not filed with the Columbia County Clerk's Office until 1923 (log book 180:493). This information does not fully explain why the deed was not immediately filed in New York, but it does help explain why it was considered "lost" in the 1880s.

The events involving the three largest religious communities near the Copake Iron works in 19th century helps reveal how members of the working community identified themselves. None of the other studies on industrial communities that were mentioned earlier in this thesis specifically address religious affiliation as part of ethnic or social identity. Historic accounts of the Copake Iron Works community certainly appear to show that religious affiliation was an important facet of their identity. Clearly, the early management of the Copake Iron Works supported their own faith community in the funding and building of a church which overlooked the entire area around the Copake Iron Works. At this same time Catholics, many of whom were Irish immigrants, had to manage their own religious needs with visiting clergy. Only after the Copake Iron Works had been sold off to Frederick K. Miles did some members of the Catholic community acquire enough land and resources to construct their own church. While housing and supply stores were constructed by the company for the benefit of their employees, the same attitude did not extend to building or granting lands for churches to the different Christian denominations living in the working community.

Interestingly, when census records show that the diversity of national and regional origins peaked in the 1880s is exactly when the Methodist congregation clashes with the remaining Episcopalians over the rights to use Saint John's Church. The increase of immigrant laborers not from the predominantly Catholic Ireland may be a reflection of the increasing numbers of Christians entering the community that were neither Catholic nor Episcopal. It is difficult to say with the records currently available which members of the community were Methodist, but it would be interesting to see if there was a preponderance of skilled laborers in the later 19th century that were Methodist. If this was

true then it would replicate in religion the divisions that likely existed by class, task, and (to some extent) ethnicity between management, skilled laborers, and unskilled laborers at the Copake Iron Works.

The relationship of the housing within the Copake Iron Works reveals that for most of its operation workers with tasks related to the furnace and plow works lived close to the manufacturing center while teamsters, miners, and railroad workers lived in the neighboring Village of Copake Falls, closer to the mining area. Direct comparison between company housing in the former Copake Iron Works property and the housing in neighboring Copake Falls is not possible today. The former worker's housing at Copake Falls has been replaced or significantly modified from at least the 1950s to the present, judging from the appearance of more modern structures there today.

The division of housing by task at the Copake Iron Works is different from the divisions found in Margaret Wood's Berwind, Colorado site. At Berwind, Wood demonstrates that division by ethnicity was one facet of corporate control over the working population. At the Copake Iron Works, distinct ethnic clusters are recorded in the census records throughout the 19th century. Wood demonstrates that the dividing of the Berwind community into diverse ethnic neighborhoods was not by the worker's choice and was purely for the company's benefit. The scale of industrial operations at Berwind and at Copake was very different. This may help explain why a larger industrial mining operation like at Berwind needed to divide and weaken employee loyalties to anything other than the company.

The mining community at Berwind, Colorado was one facet in the Colorado Fuel and Iron (CF&I) company. The CF&I was "one of the hundred largest firms in the United

States" when it purchased the coal fields around Berwind in 1892 (Wood 2004, 215). Her data shows that around 1905, there were 797 residents in Berwind (Wood 2004, 217). The community of Berwind was only one of several company towns in the region owned by CF&I with housing for an estimated 6000 miners plus their families (Wood 2004, 215). At Copake, Ellis's 1878 account puts the employee count at "about 50 hands" and federal census records suggest the number of iron works employees never rose above 80, meaning that perhaps only 150 residents (workers plus wives and children) were a part of the working community at the Copake Iron Works (1878: 392). Frederick K. Miles owned other industrial sites in Connecticut, but it is highly unlikely his combined holdings matched the size of the operations around Berwind, Colorado.

Frederick K. Miles and the managers of the mining community at Berwind used policies of corporate paternalism to retain and support a workforce they needed to make their operations productive. However, each used these policies differently in order to retain their employees. While operating on a smaller scale than Berwind, Frederick K. Miles let workers at Copake settle into ethnic enclaves close to the sites where they were needed as part of an effort to keep workers more content and less likely to leave for other work. In the early 19th century the managers at the Boot Mills built well made and maintained housing to attract and retain its workforce while reducing the potential for unrest (Mrozowski et al. 1996: 2, 39). The fond memories of corporate paternalism at Virginius Island in the mid 19th century reported by Palus and Shakel suggest the ownership there instituted polices that (for a time) made workers more content and loyal to the company (2006, 4).

Corporate paternalism at the mining community of Berwind, Colorado was used on a larger scale upon a larger population than in the studies discussed above. The CF&I appears to have systematically indebted many of its workers through unpaid working hours for certain tasks and tampering with scales used to calculate the amount paid to each worker for coal that was mined (Wood 2004: 215). To protect against workers voluntarily leaving the community armed guards controlled who could enter or leave the settlement (Ibid). Wood demonstrates that boarding employees was one of the few options working families had to make enough money to survive (2004: 220-226). Because of these factors, once workers entered a CF&I town like Berwind it was financially and physically difficult to voluntarily leave. Eventually these unfair wages and unsafe working conditions led to the destruction and death of the Ludlow Massacre.

Company settlements like the Copake Iron Works sacrificed some type of efficiency, (either in lavishing company houses or letting workers live in ethnic clusters for example) for better loyalty to the company. Larger establishments that desired more efficiency to raise production, as seems to be the case in Berwind, tried to indebt workers to the company in order to ensure they were dependant on the company and could not leave. Where in the smaller scale system, the use of corporate paternalism was used to entice and retain loyal workers, in a larger scale system corporate paternalism was used to divide and subordinate workers in order to extract more labor and profits while preventing them from easily resisting by leaving.

The historical analysis of the working community at Rockdale, Pennsylvania demonstrates a pattern of high worker turn-over during the 19th century. In Rockdale this turn-over rate was high despite the ability of even the lowest paid workers to save a

significant portion of their earnings. At the Copake Iron Works records suggest workers faced potentially fatal accidents with no support provided by government or labor groups. Therefore, fatal or crippling accidents may have been another cause for high worker turn-over not addressed in studies like the one done at Rockdale.

At the Copake Iron Works the housing was not divided by ethnicity, but by distinct groupings of skilled and unskilled labor. Census records for the Copake Iron Works show that within those skilled and unskilled housing clusters there were distinct areas of housing exclusively of one particular ethnicity or regional origin. Women of working families in Berwind interacted with each other across ethnic lines through coffee and socializing, however at the Copake Iron Works it is difficult to say if a similar kind of cross-ethnic socializing was occurring. The clustering of workers by familiar regional and cultural backgrounds at the Copake Iron Works might have caused some reluctance to seek social interaction across cultural divides. Wood's study of Berwind stands as an important example of how a working community can create a class consciousness in order to protect the interests of the community as a whole. Important ties across social and ethnic lines probably existed at the Copake Iron Works, but the extent of those ties is difficult to discern. As the legal judgment for the deceased miner's "negligence" reveals, there was little institutional sympathy or support for working communities in the 19th century. Social ties across the community would have been vital to providing some kind of support to its members. Further study is needed to understand the extent of social ties between immigrants from various regions and their ties with locally born laborers at the Copake Iron Works. Comparisons to other working communities like in Berwind would

make a study like this valuable to the broader understanding of 19th century working communities in the United States.

The barriers between skilled and unskilled communities would have been a greater impediment to casual interaction between employees at the Copake Iron Works than possible ethnic divisions. These two groups of housing for skilled and unskilled workers, while relatively close to each other, were separated by the physical barriers of the Bash Bish Brook and the New York and Harlem Rail lines. Also the areas where unskilled and skilled laborers worked and traveled the most were quite different. Within the Copake Iron Works property most skilled workers would have traveled toward the furnace, forge, and pattern shop that was south and east of their housing. The unskilled laborers at the iron ore mine traveled north and west from their housing to reach the mine. While none of these facts makes interaction across the two housing areas impossible, it demonstrates that traveling between the communities to interact was probably not as easy or as frequent as interactions with fellow workers and working families with the same level of skill would have been.

The location of the owner and overseer's housing during most of the 19th century lay directly between the housing of the skilled and unskilled laborers along the main access road to and from the furnace. This location suits a corporate paternal system because it allows the company management to observe and be observed by everyone within the working community. Both the homes of Isaac Chesbrough and William A. Miles (no longer standing but was directly east of Chesbrough's house, see 1888 Atlas map, figure 7) were in close proximity to the furnace and company housing during the 19th century. During the early 20th century the company overseer, Peter N. Campbell's

house (the original duplex) was in this central location as well. Having the management homes along the main access road leading to and from the furnace allowed managers to easily monitor the movement of people and goods around the furnace. If the comment by the Fagan sisters is accurate that William A. Miles preferred to live out at the "Pond Cottage" east of the furnace by the early 20th century then it demonstrates a physical distancing of his presence from the everyday operations at the Copake Iron Works (Mettler 2000:13). This physical distancing occurred just as census records demonstrate a sharp decline in foreign-born laborers and deeds record the selling of company housing to employees. In other words, three key aspects of corporate paternalism at the Copake Iron Works were ending. These aspects include the decline of direct company supervision, sale of company housing, and discontinuing the use of non-local labor.

The decline of corporate paternal practices in the eastern United States occurred in other places during the very late 19th and early 20th century. Palus and Shakel's (2006) study of Virginius Island, West Virginia demonstrates that starting in the late 19th century company owners no longer lived in the region and their policies did very little to impact the everyday lives of the mill workers. In the later 19th century at the Boott Mills in Lowell, Massachusetts Mrozowski observed a decline in the upkeep and maintenance of workers housing and privies by the company. This change in policy indicates a shift in corporate paternal practices away from what had been well kept and maintained facilities during the mid 19th century (2005:256-257). By the early 20th century some of the housing at the Boott Mills had become private rentals rather than company homes, reflecting a decline in corporate paternalism over time (Mrozowski et al. 1996:7).

Interestingly, in the very late 19th and early 20th century, when paternalistic systems were at their most repressive in Berwind, Colorado they were breaking down in places farther east like Virginius Island and at the Copake Iron Works. It is far too oversimplifying to say Berwind was at an earlier "pioneering" stage of industrial development and that it too would abandon corporate paternalist practices over time. The deterioration of corporate paternalism at the Copake Iron Works appears more to do with a decrease in local resources and economic hardships caused from a drop in demand for charcoal iron. As long as managers saw a financial benefit to controlling their workforce, there would be no incentive to change their corporate paternal systems. As mentioned above many industries in the eastern United States appear to have abandoned corporate paternalism around the late 19th century. This trend is most likely a reflection of changing market trends and the movement of labor and resources on a global scale.

The closing of the ore mines in 1888 reduced the company's demand for unskilled laborers dramatically. Some of the older workers who had lived and toiled in Copake for many years, like the teamster Peter O'Hara, may have chosen to buy out their company houses and live out their remaining years in the community they had been a part of for so long. For many of the other unskilled laborers they may have chosen to leave the area completely to find new employment. Towards the end of the 19th century the Copake Iron Works management seems to have decided to retain and recruit more locally-born workers to fill the places of foreign-born laborers because there would be less of a need for the company to house and support them. This may have been a choice of necessity by the 1890s when the Copake Iron Works was under significant economic strain.

It is very unlikely that the decrease in foreign-born workers was from ethnic bias. The Fagan sisters note how the Copake Iron Works was one of the first and few places north of New York City where many recent Irish immigrants were welcomed to work (Mettler 2000:13-16). After closing in the early 20th century many of the former laborers from the Copake Iron Works found other jobs across the region. The Fagan sisters recall that many Irish immigrants continued to work on the main rail lines of the New York and Harlem Railroad. The sisters note how Irish train workers would sometimes clash with members of the Ku Klux Klan during nighttime deliveries to Chatham, New York about 20 miles north of the Copake Iron Works (Mettler 2000:39). The Fagan sister's own father, Daniel Fagan, made the transition from worker at the Copake Iron Works to working at the New York and Harlem Railroad. Agnes Fagan mentions her father's employment during the time she grew up "he'd been on the train at the orebed first' Agnes says, 'then he went on the Harlem" rail lines (Mettler 2000:26).

After the State of New York acquired the lands once belonging to the Copake Iron Works they turned the property into a scenic wooded park and demolished, modified, or recycled many buildings and features to further suit their aim of creating an idyllic camping area. These efforts ultimately preserved many historic buildings that would likely not have survived to this day otherwise. This state of preservation has made the Copake Iron Works unique in its region and a worthy site for continued study and research.

CHAPTER 6

RECOMMENDATIONS AND FURTHER RESEARCH

This thesis covers a diverse range sources, but focuses directly upon the uses of land and the working community at the Copake Iron Works. Through the processes of surveying and research many sources of information were compiled. Portions of these sources were outside the range and scope of this thesis, but they do offer potential for further research about the Copake Iron Works and its relationship to the region.

In at least two locations on the former Copake Iron Works property (just south east of the hill with St. Johns Church, and just southeast of the "original duplex" cabin) there are dense deposits of historic domestic trash partially visible from the surface. Often the ground gives way slightly and crunches underfoot, attesting to the density of the layer of tin cans and other domestic refuse below the surface of leaf litter. A targeted and controlled sampling of these two areas could be done at a future date in order to better understand the social dynamics of the working community at the Copake Iron Works and how they compare to other communities in studies such as Margaret Wood's (2004) of Berwind, Colorado and Mrozowski and Beaudry's (1989) study of the Boott Mills in Lowell, Massachusetts. What could be of particular interest is if deposits from unskilled

and skilled housing areas could be compared from the Copake Iron Works to learn how significant the differences were within those communities.

One important type of artifact found across the site of the Copake Iron Works are the bricks in rubble piles. The survey conducted in the summer of 2007 has identified several areas where bricks and other rubble were dumped. Bricks were used to line the inside of the furnace and had to be changed out periodically. Many of the bricks found have distinct maker's marks that can be traced to individual brickworks operating for known periods of time. A careful study of the bricks found across the site can reveal more about where the Copake Iron Works was receiving supplies; perhaps it can show if Copake had closer economic ties to the New York/New Jersey Iron District or to the Salisbury Iron District. Knowing the mean date and function of the bricks found can help reveal how often the lining of the furnace would have been changed out and test if technologies like the water cooled hearth actually did reduce wear and tear over the life of the furnace. Lastly, the locations of bricks can be compared to their relative date in order to better understand how and when certain wastes were distributed across the site of the Copake Iron Works. This study can easily be done now that the rubble piles have been located. Limited excavation might be needed to recover enough bricks from beneath the surface of some rubble piles.

Research into the business and social relationships of the Pomeroy and Miles families could prove valuable to understanding their roles in the rise and fall of industry in the southern New England and eastern Mid Atlantic regions. Deed agreements have already revealed many business partnerships, exchanges, and investments from local on up to international scales (as with the case of "schillings-per-ton" agreement at the

mines). There are still many potential sources, like the deeds, that with further study and research might reveal what relationships and investing patterns helped to shape the region around the Copake Iron Works in the past.

Genealogical work with the descendant families of known employees at the Copake Iron Works may help to unravel what kinds of relationships existed across the working community. Elinor Mettler's interview of the Fagan sisters has set a good standard for how local history studies should be done. Additional stories from other descendants of Copake Iron Works employees can give a more complete picture of what the community life would have been like. This effort would have to involve locating descendants and studying their family histories from when Copake Iron Works was in operation. Various census records and documents found at the Roeliff Jansen Historical Society in Copake Falls, New York could help lay the groundwork for further local genealogical research.

Additional surveys similar to the one conducted in this thesis should be done in the future. These surveys will allow park staff to monitor the changes and deterioration of key features and buildings over time. In particular the "original duplex" building and the eroding features along the stream banks should be closely studied to gauge their need for stabilization before they are lost forever.

The range of the surveys could be expanded into areas outside the current bounds of the Taconic State Park in order to investigate and possibly date the remains of charcoaling that deed records indicate took place in the region surrounding the Copake Iron Works. The expanded surveys could also more closely investigate the lands where the company housing in the Village of Copake Falls once stood in order to determine

their possible location. Once the areas of interest are found the survey can identify if anything of the original structures might survive above or below the ground. This expanded survey would add valuable spatial information to the already existing GIS database on the historic structures within the Taconic State Park. However, one difficulty that must be overcome is coordinating the effort to obtain permission to explore the properties of many private owners.

One aspect of Taconic State Park's interpretation of the Copake Iron Works that could be strengthened is how it conveys to its visitors the amount of change the iron works had on its surroundings. In particular the clearing of timber and the deposition of industrial wastes (slag, ore tailings, and scrap metal) around the property need to be emphasized. Currently, the tours and talks do discuss this transformation, but park interpretive panels and guides should contain more about this important aspect of the park's history. An important connection between the environment and the historic working community should be established. Park interpretation about the decline of local resources eventually causing fundamental shifts in the size and composition of the working community could help visitors appreciate the effects the iron works had on the local environment and the community that lived here in the past. If new trail systems are completed they may help bring more casual visitors to places that emphasize the ways in how the Copake Iron Works has shaped the landscape into the present.

Many of Larry Gobrecht's recommendations at the end of his assessment published in 2000 still need to be implemented in order to fully protect and present the unique aspects of the Copake Iron Works to the public into the future. Several of his recommendations involve clearing vegetation, removing modern construction debris,

doing structural repairs and stabilization (especially the furnace if possible), and artifact conservation (2000: 52-57). Many of these preservation and stabilization efforts could be done by staff with minimal training and skill, however, there are probably not enough staff working at the Taconic State Park to dedicate some towards these tasks. Attracting greater attention and government resources could be one solution. Another possible solution would be for supervised volunteers to dedicate a day or two each year to preserving and monitoring the site. In order to do the needed structural stabilization and artifact conservation, only trained professionals should be brought in. Government funds or fund-drives must be done to collect enough money to hire a trained specialist to conserve and stabilize the historic artifacts and structures of the park.

Gobrecht also recommends an assessment and cataloging of all the historical artifacts stored within the pattern shop. One such assessment was done in the 1920s after New York State had acquired the Copake Iron Works (Gobrecht 2000:18). Another assessment would allow for a comparison of what items have been acquired by the park and also what items have been sold or lost since that time. Assessing and cataloging the artifacts in the pattern shop will also allow trained conservators to know how many of which items will need their attention to be preserved. Any further archaeological work that could involve excavation should first make an attempt to better document the artifacts already stored at the pattern shop before adding to that collection.

These efforts to catalog and preserve the artifacts and structures of the former Copake Iron Works are vital to ensure it will benefit future generations by allowing them to walk through the original remains of an industrial community from over 150 years ago. These standing 19th century structures are a unique historic and archaeological resource

which has only recently become a National Historic District. In order to sustain the interest at the federal and state levels more efforts to study and preserve the Copake Iron Works have to occur in the near future. The results of new studies must be promoted to the public; only then will the difficult work of preservation and research of the Copake Iron Works be able to truly give visitors to the park a real appreciation for industrial life in the 19th Century.

In conclusion, this thesis has focused on the uses of land and resources over time and what they can say about the changes occurring within the Copake Iron Works community while it was in operation. In particular, this thesis has investigated how the community of the Copake Iron Works was shaped by technology, ethnicity, skill, religious faith, and social class. Previous research on the Copake Iron Works, such as Gobrecht (2000) and Stott (2007), are dependent on Franklin Ellis's 1878 history to describe the Copake Iron Works. While these studies do contribute some new information, they structure their interpretations of this new information only through the history provided by Ellis. This thesis has investigated many sources of primary information not considered by other authors. While the conclusions of this thesis do not directly contradict the history provided in Ellis (1878) it does go beyond the limited scope and perspective of a single historic text. The results of this thesis and all other studies on the Copake Iron Works must be brought to the public. Presentations to the public will ensure that the unique qualities of this site can show what living in a 19th century company town was like, which will encourage public support to preserve the site.

Appendix 1:

POMEROY FAMILY TREE OF MEMBERS INVOLVED WITH THE COPAKE IRON WORKS

Family Tree Showing the kin and relationships between members of the Pomeroy family during the 19th Century. Note: Only the closest kin to the Pomeroy and Chesbrough family members involved with the Copake Iron Works have been included in this tree. From *History and Geneology of the Pomeroy Family: Collateral Line in Family Groups.* Toledo, Ohio: Franklin Printing and Engraving Company. 1912

Appendix 2:

TIMELINE OF EVENTS AT THE COPAKE IRON WORKS
1835-1861

Year	Resources	Railroad	Products	Social History	Local Events	National/Global Events
1835	Historic accounts suggest Copake Mine first in use			Aprox date of Methodist "grove meetings" in region leading to local revival of the faith		
1836						
1837						Panic of 1837, leads to economic depression for next 5 years
1838						
1839	L. Pomeroy buys land for Copake Iron Works	County maps depict planned route taken by Harlem and New York RR				
1840						
1841						
1842						
1843						
1844						
1845	100 acre wood lots purchased yearly ($400 aprox)			Early worker housing "crude" one room shacks	Ancram Iron Works Closes, Ancram supervisor founds Copake Iron Works	
1846	" "				Furnace at Copake first put into blast	U.S.-Mexican War Begins
1847	" "		Bar and Rod Iron produced at forge		Forge completed, trip hammer shop completed	
1848	" "			Company reorganized to include I. C. Chesbrough		U.S.-Mexican War Ends
1849	" "					California Gold Rush begins, sharp increase in westward migration
1850	" "			1850 Federal Census Taken		
1851	" "			Earliest County map depicting Copake Iron Works made		
1852	Final Pomoroy deal for wood lots	Harlem and NY Railroad completed, access from NYC to Chatham, NY		St. John's Episcopal Church built on land given by L. Pomeroy		
1853				Lemuel Pomeroy Jr. Dies, family divides property		
1854			Bar and Rod Iron production ceases		Trip Hammer shop falls out of use/reused?	
1855						Bessemer Process for mass-produced steel is patented
1856						
1857						
1858					County wall map with detail of Copake Iron Works made	
1859						
1860				1860 Federal Census Taken		
1861					John Beckley purchases Copake Iron Works	American Civil War Begins

Appendix 2:

TIMELINE OF EVENTS AT THE COPAKE IRON WORKS
1862-1892

Year	Resources	Railroad	Products	Social History	Local Events	National/Global Events
1862					Frederick K. Miles purchases Copake Iron Works	
1863						
1864						
1865	Mineral rights to Copake mines purchased by F.K. Miles					American Civil War Ends
1866						
1867				St. Bridget's Catholic Church completed with parishoner land and funds		
1868						Carnagie Steel Founded in Pittsburgh, PA
1869	Unskilled company housing land purchased by F.K. Miles, multiple wood lots acquired					First Transcontinental RR completed in North America
1870	F. Miles gets water access rights for furnace from farmer A. Vosburgh			1870 Federal Census Taken		
1871						
1872			Furnace stack rebuilt			
1873				Earliest depiction of unskilled housing on Atlas Map	County Atlas Map with detail of Copake Iron Works drawn	
1874						
1875						
1876						
1878					Lt. Gauge RR completed	
1878	Additional mineral rights purchased north of Copake Ore Pit		Iron RR wheels primary product	Ellis records history of Copake Iron Works	Plow works "being contemplated"	
1879						
1880				1880 Federal Census Taken		
1881						
1882						
1883						
1884				Methodists and Episcopals dispute use of St. John's church, Fanny Peck incident		
1885						
1886						
1887						
1888	Copake Mine closed and flooded			County Atlas Map with detail of Copake Iron Works drawn		
1889				Photograph of workers on the Lt. gauge rail lines taken		
1890				1890 Federal Census taken (lost in fire, 1927)		
1891	F. Miles begins to sell unskilled company housing					
1892				Methodist Church in Copake Falls constructed		

Appendix 2:

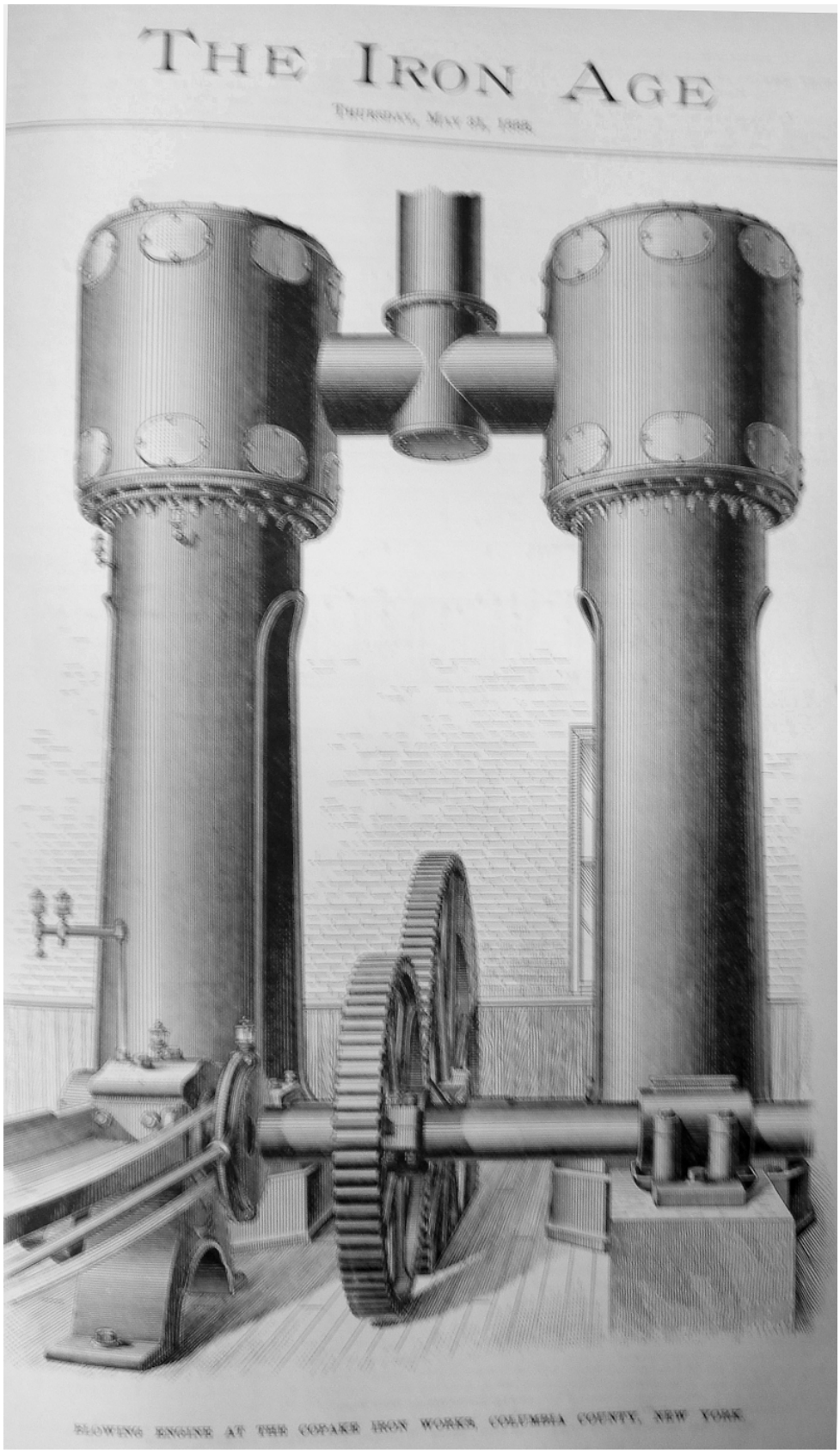
TIMELINE OF EVENTS AT THE COPAKE IRON WORKS
1893-2007

Year	Resources	Railroad	Products	Social History	Local Events	National/Global Events
1893	F. Miles sells company home to employee Peter O'Hara					
1894						
1895					Copake furnace taken out of blast due to market depression	
1896					Frederick K. Miles dies, ownership transfers to sons F.P. and W.A. Miles	
1897						
1898					Frederick P. Miles dies	Spanish American War begins and ends
1899						
1900					Copake Iron Works leased to Salisbury Carbonate Iron Company	
1901						J.P. Morgan founds U.S. Steel (combines Carnagie and Gray's Steel Works)
1902						
1903					Copake furnace last put into blast	PA furnaces produce Steel RR wheels, make iron RR wheels obsolete
^^						
1924					Ella Masters begins to organize NY State purchase of land for Taconic State Park	
^^						
1927	William A. Miles makes first sale of company lands to New York State					
1928	William A. Miles makes second sale of remaining company lands to New York State					
1929					Last known use of the Copake Plow Works as temporary site until Hilldale Plow Works rebuilt	
1930					Aprox. date for removal of furnace casing stones for Route 344 retaining wall	Great Depression Begins
^^						
1955					Major flood washes away the eastern duplex cabin on the north shore of Bash Bish Brook	
^^						
1972		Passenger service on Harlem Rail Lines discontinued				
^^						
1976		All service on Harlem Rail Line discontinued			Work crews disturb buried foundations around furnace area	
1984						
^^				Archaeological assement of Copake Iron Works written by Lary Gobrecht		
2000					Archaeological survey of Copake Iron Works conducted by Fred Sutherland	
2007					Copake Iron Works sucessfully nominated to become a National Historic District	

Appendix 3:

REPRODUCTION OF *IRON AGE* JOURNAL ARTICLE

The following journal article is from the *Iron Age* volume 41 number 22 from Thursday, May 31st 1888. The article does not list an author, but it may have been William A. Miles because the technical drawings and description of furnace equipment is similar to another article written by William that is reproduced at the end of these appendices. This article focuses on the blowing engine which supplied hot air to the blast furnace. In addition to describing the actual blowing engine the end of the article briefly describes what machinery in the pattern shop received power from the engine by way of a drive shaft and belt system. The journal reproduced here was part of the collections at the Boston Public Library, but other major metropolitan libraries probably have this journal or can access a copy through inter-library loan.



BLOWING ENGINE AT THE COPAKE IRON WORKS, COLUMBIA COUNTY, NEW YORK.

Blowing Engine at the Copake Iron Works.

A blowing engine somewhat peculiar in arrangement and correspondingly interesting was built some time ago by the Copake Iron Works, Columbia County, New York, for their own use, furnishing blast to their 32 x 9 foot charcoal furnace. The engravings which we publish represent an elevation and details and very clearly explain the nature of the design. As shown in the general view, the blowing cylinders, of which there are two, are driven by a separate engine, one of the Hardis-Corliss make being employed, and the power being transmitted by a set of large spur gears. The cranks are set at 90° and the cylinders were cast from hard charcoal iron, the product of the furnace being probably the only ones of the kind in the country.

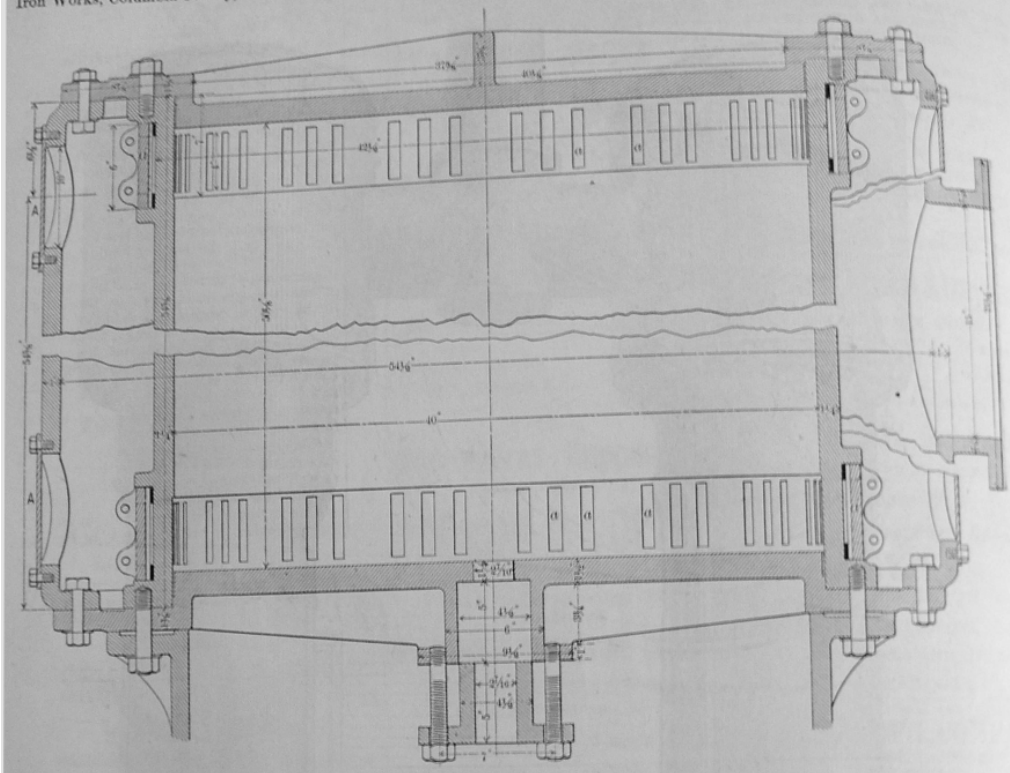


Fig. 1.—Vertical Section of Blowing Cylinder.

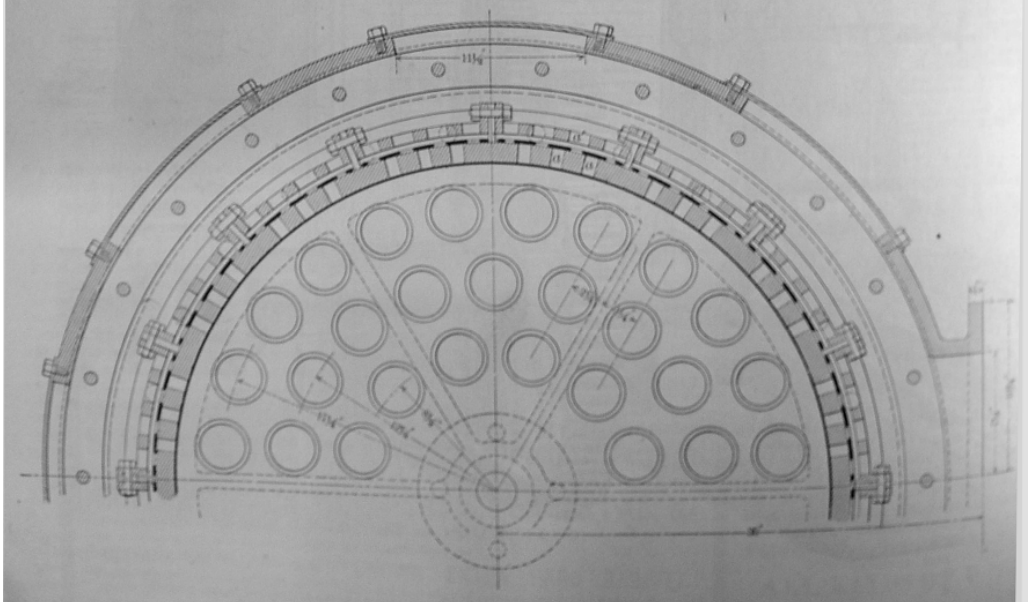


Fig. 2.—Sectional Half Plan.

BLOWING ENGINE AT THE COPAKE IRON WORKS, COLUMBIA COUNTY, NEW YORK.

They are 40 inches in diameter, have a 3-foot stroke and work at an average speed of 214 double strokes per minute; at this speed they will produce enough air to make 1 ton of iron for each horse-power of boiler capacity every 24 hours. The boiler is rated at 35 horse-power. The driving engine measures 18 x 42 inches and is of the condensing type. Figs. 1 and 2, representing respectively vertical section and sectional half plan of one of the blowing cylinders, require but little description. The inlet values are arranged in the cylinder heads and one of them with its seat is shown on an enlarged scale in Fig. 5, on page 883. Each valve is made up of a leather and a steel disk, the seat being of bronze. The valve stem is of steel and is controlled by a brass spring *s*. The leather discharge valves and openings are arranged in the cylinder walls at the top and bottom, the valves, represented by the heavy blank lines, flapping back and forth in the annular spaces formed by the cylinder walls proper and the valve gratings, as shown. It will be observed that the openings *a'* in these gratings are so placed, with reference to the ports *a* and the openings in the valves, that when the piston travels toward the end of the cylinder the compressed air has free exit into the air jacket, from which the main discharge pipe issues; when, on the other hand, the piston moves away from the cylinder-head, the valves flap against the ports *a* and tightly close them, so that the cylinder will draw its supply of air through the proper valves in the cylinder-head. The letters A A designate hand-holes, through which access may be had to the valves. In Figs. 3 and 4 we show a plan and section of the piston. The ring is of cast iron. We should remark here, also, that the driving engine supplies power, in addition to four emery and two polishing wheels, to four grindstones used by the company in connection with their manufacture of chilled plows. The gearshaft of the engine carries a fly-wheel and the power is taken off by belting.

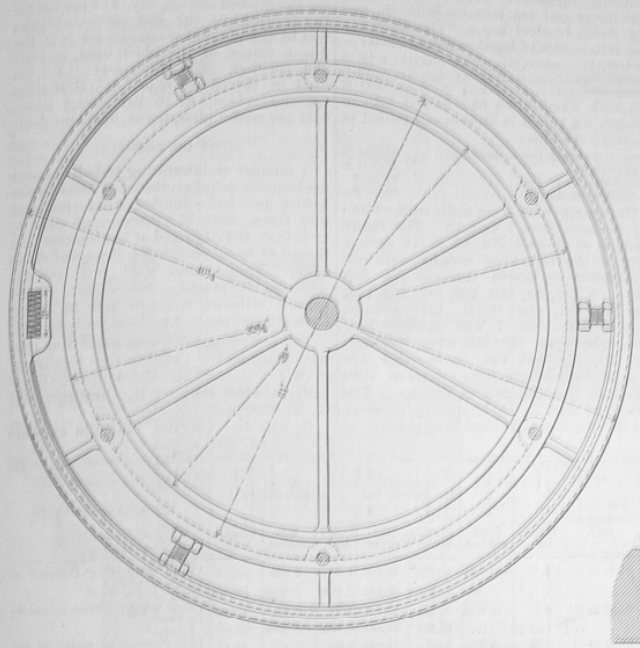


Fig. 3.—Plan of Piston.

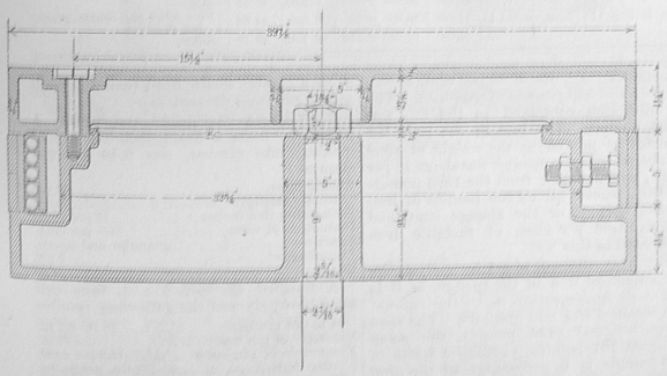


Fig. 4.—Section of Piston.

BLOWING ENGINE AT THE COPAKE IRON WORKS, COLUMBIA COUNTY, NEW YORK.

Cost of Engine Construction.

According to Prof. R. H. Thurston, in a paper recently read before the American Society of Mechanical Engineers, the costs of engine construction vary enormously with the type and general proportions of the engine. As a rule, the larger the engine, the less the cost per horse-power developed; the shorter the stroke and hence, the shorter the engine as a whole, in similar proportion nearly, the less the cost of building; and the simpler its design, and especially of its valve motion, the lower the expense of construction. The tendency of sharp competition, such as now exists in the general market, the result of which has been to reduce the profits in the business, in many instances, far below the paying point, is to lead to the design and construction of engines of very short stroke and of very high speed of piston and of rotation, a tendency also promoted by the fact that, other things being equal, high piston speed, and high speed of rotation give reduced wastes of heat in the cylinder, as well as lessened cost of building. Thus, though the proportions of the steam-engine cylinder are often determined by the judgment of the designer, or the exigencies of location, the relative strength of stroke and diameter of cylinder are actually related by definite principles.

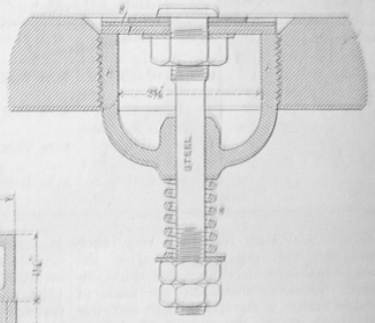


Fig. 5.—Enlarged View of Air Discharge Valve.

The practicability of employing electricity as a motive power for stationary plants is very well shown by some developments which have been made in New York within the past few months. Mr. Albert Gray, of 57 Park Place, has, we understand, made some very complete arrangements for the distribution of electricity for power purposes over the whole of the territory bounded by Broadway, Canal street, the North River and the Battery. Three engines capable of developing 450 horse-power are at present employed driving three Daft dynamos. At present only a fraction of the power is being used, though the demand will, no doubt, soon run up to the full capacity. The convenience of electric motors has long been a well-recognized quality, and as Mr. Gray proposes to furnish power at a cost which will bear favorable comparison with other systems of distribution a very lively demand upon his station may be expected.

APENDIX 4:

REPRODUCTION OF *UNITED STATES ASSOCIATION OF CHARCOAL IRON WORKERS* JOURNAL ARTICLES

The following pages are from the *Journal of the United States Charcoal Iron Workers* Volume 6, from 1885 and Volume 7, from 1886. The first article is a short description of a meeting at the Copake Iron Works told by one of the members. The Second article is a technical description of the Blake Ore Crusher and ore washing machinery used at the Copake Iron Works written by William A. Miles. A brief discussion between the association members (including Frederick P. Miles) is reproduced at the end where various methods of ore processing are mentioned

Further editions of the journal can be found for free online at the University of Michigan's online library:

http://quod.lib.umich.edu/m/moajrnl/browse.journals/char.html

COPAKE IRON WORKS,

the home of Mr. William A. Miles, President of the Association, who, ably seconded by his father, Mr. Frederick Miles, and his brother, Mr. F. P. Miles, made everyone feel at home. For the first time in the history of the Association, a president's wife was able to be present at the annual meeting, and all enjoyed the charming manner in which Mrs. Miles assisted her husband to make the meeting a success.

While the gentlemen inspected the ore mine, with its washer and wire-rope carriers, the furnace, the chilled-plow works, the machine-shops and the foundry, the ladies were entertained by Mrs. Miles at her home. Unfortunately, the furnace was not in blast, but the visitors found sufficient to interest them in the double set of wooden blowing tubs—one driven by water and one operated by steam power—the suspended-pipe hot-oven on the furnace stack, the water-jacketted crucible and the charcoal in which experiments upon external firing were made.

Carriages were provided to convey the party one mile up a most picturesque gorge to the Bash Bish falls, where we found the hotel ornamented with wreaths and festoons of "running pine," autumn leaves and other wood products, and a liberal supply of excellent native fruits and nuts provided, the fruits coming from the Twin-Lake farm of Mr. Miles, Sr.

Word pictures will not describe the beauty which nature has lavished upon this little piece of the State of Massachusetts (the line dividing New York and Massachusetts crosses between the furnace and the falls), and we make no attempt to say more than that far up in a cleft under the Eagle's Nest the stream is first observed, then disappears, and again emerges, until, finally, dashing over a precipice, it falls into a deep pool, to flow off again in other cascades at a right angle to its former course. At one o'clock, dinner was announced, and all sat down at tables whose snowy coverings could scarcely be seen for the wealth and variety of good things prepared for hungry excursionists. Ample time was given to enjoy this meal, and, after a few words of thanks, good-byes were said, and the carriages conveyed us to the railroad, where the party separated, and the Sixth Annual Meeting of the United States Association of Charcoal Iron Workers was of the past.

Ore Washer and Separator at Copake Iron Works, New York.

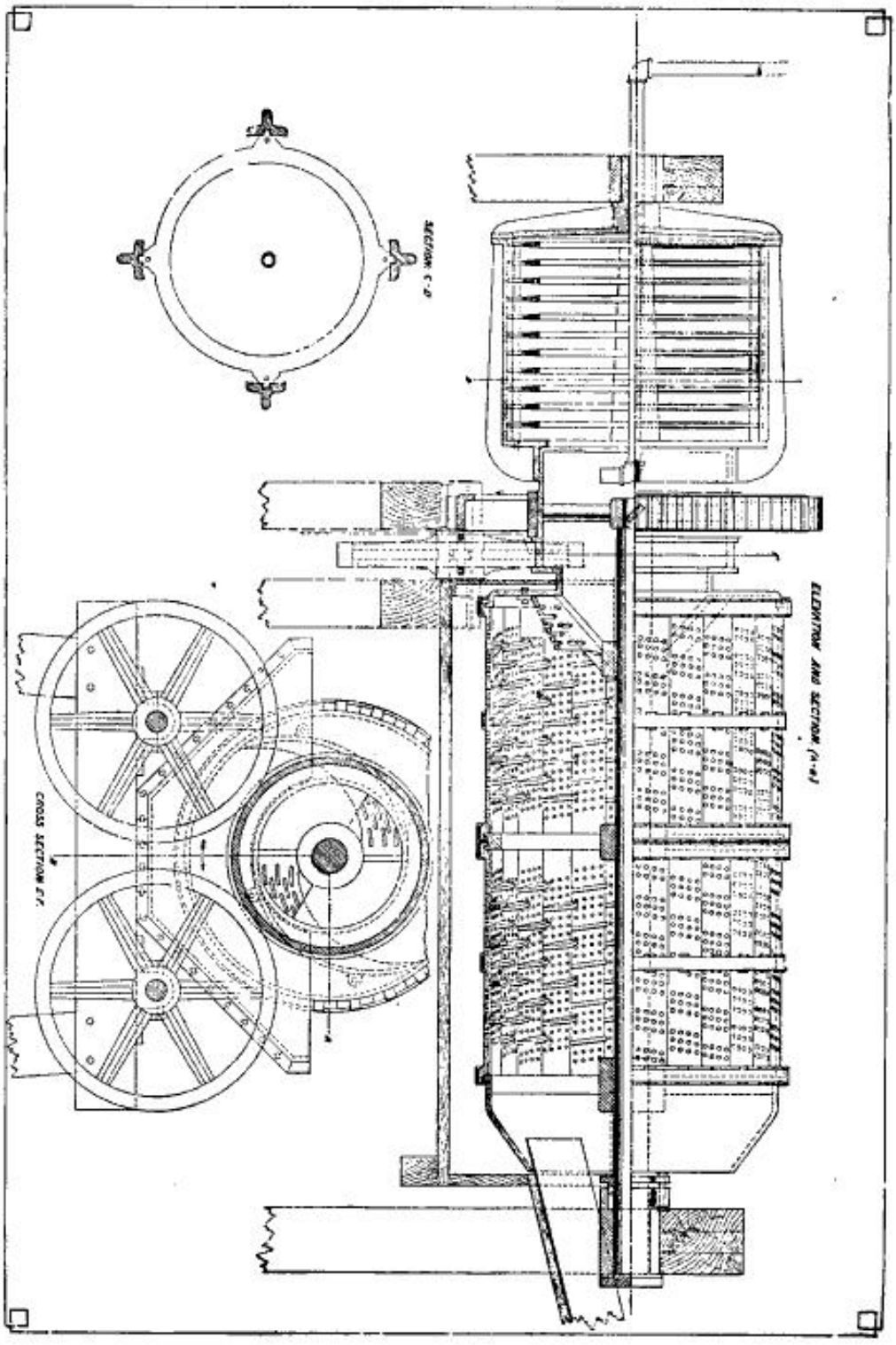
[Read at the sixth annual meeting of the United States Association of Charcoal Iron Workers.*]

By WM. A. MILES.

The general form of ore washer illustrated is familiar to most of the members of the Association who mine brown hematite ores, and is known to them as the Bradford washer. It consists of a series of iron staves, properly secured to spiders, forming a cylinder with conical end revolving by means of gearing, and to which the ore to be washed is fed from a chute which also carries an abundant stream of water. The staves are perforated with small holes, and have on their inner faces series of blades, or cutters, to break up clay lumps, etc. The arrangement shown embraces the latest inventions of the originator of this form of washer, and some modifications by the writer.

As will be seen, the staves are secured to the heads by grooved flanges, and are held together by bands; and the cylinder is immersed in a wooden trough, or box, in which water is maintained at a desired elevation by means of a gate. A large opening in the receiving head permits of feeding wash and lump ore up to eight inches in diameter to the cylinder, where it is carried around by the rotary motion, the lump ore assisting the blades to break the masses of clay, or ocher, containing fine ore, and the water entering with the ore carrying the mud and fine ore through the perforations in the plate. The blades force the ore, as washed, towards the discharge head, where it is lifted by perforated wings into a rinsing chamber, there meeting a stream of clear water, which cleans it of adhering mud, and carries this mud back into the washer, this water assisting in softening lumps. The rinsing chamber forms a connection between the washer and the separator, and is encircled by a gear which engages with a pinion, thus giving the rotary motion to both the washer and the separator.

*This paper should have appeared at an earlier date, but, owing to absence of the writer and a defective cut, it was necessarily postponed until the present time.—ED.


SECTION C-D
CROSS SECTION E-F.
ELEVATION AND SECTION (A-B)

Trunnions at the receiving end of the washer and at the discharge end of the separator sustain the extremities of the apparatus, and carrier wheels working in a groove of the rinsing chamber sustain the central portion.

The separator consists of a series of rings held in a suitable frame and spaced by means of bolts and thimbles, the bolts uniting spiders at either end; the spaces are conveniently altered by withdrawing the bolts and changing the length of the thimbles. The ore from the rinsing chamber passes through this separator, and all sizes small enough to pass through the spaces between the rings drop, while the larger pieces are carried to the end of the separator.

The water which is discharged from the wooden trough, carrying fine ore, passes into a revolving screen which saves all ore which will not pass through a sieve of No. 10 mesh.

At the Copake iron works, New York, we have, in a washer and separator similar to the illustration, prepared 20 tons of ore per hour from material carrying 20 per cent. of ocher, delivering the washed ore at from $\frac{1}{4}$ inch to $1\frac{1}{2}$ inches diameter, and separating the larger lumps for crushing.

The principal dimensions of this washer and separator are as follows:

Washer proper, 52 inches in diameter and 8 feet in length; the holes in the staves are $\frac{1}{4}$ inch diameter.

Gear, 62 inches in diameter, with an opening in what would be the hub of 38 inches, forming the rinsing chamber.

Rinser, 38 inches in diameter and 20 inches long.

Separator, 30 inches in diameter; inside length, 3 feet.

Length from trunnion of washer to trunnion of separator, 14 feet.

The illustration is on a scale of about 1 to 40, and exhibits a longitudinal view of the washer, rinser, and separator, the upper half being in elevation and the lower half in section on the line *AB*. The sectional portion shows the positions of perforations in and blades on the staves, and also elevating wings in the washer; it also shows the rings, bolts, and thimbles of the separator. From this view, which occupies the upper part of the plate, the position of gear wheel, trunnions, etc., can be determined.

The lower portion of the plate shows a part section and elevation on line *EF*, and also a section through the separator on line

CD. The former shows the two carrier wheels, a section of the rinsing chamber, exhibiting part of elevating wings in the washer, the contour of gear wheel, and the wooden water-trough; the latter view shows the detail of construction of separator.

It is, perhaps, unnecessary to explain that the ore and water pass by the chute at the right of the illustration into the washer, where it is carried to the left by the blades and lifted into the rinser, from which it falls into the separator, the lumps too large for the space being discharged to the left.

The advantages which the arrangement, as illustrated, possess are the large openings in the receiving and discharge heads, which, by admitting lump ore to assist in breaking balls or masses of clay, or ocher, permit of using but two lengths of staves, the ordinary form of washer requiring three or four lengths. The blades, or cutters, which are triangular in form, are so placed that the ore is raised by the tapering edge, and is kept falling back upon the clay balls, reducing them rapidly in size. The perforated wings which lift the ore from the washer proper to the rinsing chamber permit the muddy water to drain from the ore before delivering it to the stream of fresh water, and this rinsing prepares the ore free from accumulations of foreign matter on the surface. The possibility of washing lumps of ordinary size and all the ore as mined (except large pieces) is a point in favor of the arrangement shown, as in former designs the heads were too small to admit these lumps. The delivery of washed lump-ore to crushers prevents waste by screening, as, practically, the mass is all ore. The value of thorough sizing will be appreciated by blast-furnace managers, particularly those who operate furnaces of moderate dimensions; and no portion of the duties of furnace managment are more important than those which pertain to the preparation of the stock which is fed to the furnace. This has been prominently brought to the notice of members of the Association by editorials, contributions, or data published in the JOURNAL, and, believing that every arrangement to accomplish economies in the manufacture of pig-iron would be acceptable to the members, this brief note upon a washer and separator (which is believed to possess merit as above specified, and, in addition, to operate with less power than other forms,) is presented.

DISCUSSION.

Mr. W. A. MILES, upon concluding his explanation of the Bradford ore washer, said, in reply to questions:

"We must wash our ore and can get any size we desire from the separator. The ore in the Salisbury region is of all sizes, from No. 10 mesh to lumps weighing 1 ton. We crush all the ore that does not pass through the separator. We can save nearly all the ore to 18 mesh, and all the ore is saved to 10 mesh. Water will not readily dissolve the ocher—it must be powdered; but when the mass is allowed to freeze, the frost will crack the ocher so that it will fall from the ore."

Mr. LOBDELL, of Delaware. We use the old-fashioned shaft-washer, called a "buddle" in south-west Virginia, and have large quantities of fine ore, but it has so much sand mixed with it that we cannot utilize it. This fine ore with the sand will analyze 33 per cent. of iron, and when separated from the sand, is the best that is in the mine. The ores of that section are mixed with clay and loam, and occur in nests and pockets. He generally have to mine 4 tons of earth to get 1 ton of washed ore. After cultivating some of our land, we scrape the surface and pass it over a screen, using the ore that will not pass through it in the furnace without washing. The ore from the deposit that has so much sand is all passed over a screen after it leaves the washer—first over one of $1\frac{1}{4}$-inch mesh and then over one of $\frac{1}{4}$-inch mesh.

Mr. JOHN BIRKINBINE, in answer to a question, stated that in the Cripple Creek region, in Virginia, the water to wash the ore must be pumped $\frac{3}{4}$ of a mile, in one case, and cited instances where all ore, clay, etc, were carried considerable distances to be washed. In that region, all the washers are wooden shafts, with blades or paddles, but in the Salisbury region, most of the washers are of the general type described by Mr. Miles, without some of the newer features.

Mr. SEYMOUR BROWNELL, of Michigan, said that, in northern Wisconsin, the ore was separated from the ocher by roasting it, when the ocher drops off. In the absence of a crusher, the iron was pounded through iron grates to get it to a uniform size. Crushing the ore saved from 30 to 40 bushels of charcoal per ton in a

short stack. He roasted the ore before crushing, but at some places all the ore and flux is broken by hand.

Mr. CHARLES H. BROWN, of Tennessee. Our brown hematite ore is small; we wash it in an ordinary shaft-washer, and screen the sand from it by hand after washing—an 8-mesh screen is used. The ore yields about 40 or 42 per cent. of iron. The small ore is charged by itself. We get 1 ton of iron ore to 3 tons of dirt.

Mr. J. C. FULLER, Pennsylvania. We have been saving the fine material screened from the washed ore, at Pine Grove Furnace, and have a great deal of ore and sand mixed, which is screened by hand. The ore averages 40 per cent. of iron, and the screened ore about 30 per cent. We charge this screened ore with the other ore. The ore costs 5 cents per ton to screen, and 5 cents per ton to get it to the furnace by our cars; the pieces average about the size of buckwheat. The sand and ore are mixed about half and half before screening. We sell the sand screened from the fine ore to masons, as it makes good mortar; we get 40 cents per ton for it, and it costs 5 cents to load it. The sale of the sand pays for all work, and the small ore is free of cost to us. The ore will analyze from 30 to 32 per cent. of metallic iron. We opened a bank of ore 300 feet up the hill, and it took 8 cars of ocher and ore to give 1 car of cleaned ore; the ore, however, was very good when cleaned. A 7-inch hole was drilled down 300 feet, and when stopped, it was not at the bottom of the ore. We struck no water in drilling this hole.

Mr. LOBDELL. It is better to have the ore of uniform sizes, and I think by having it so, that we save fuel in a furnace 30 feet in height.

Mr. F. P. MILES, New York. We get our ore about the size of a hen's egg and save fuel, but, possibly, we might not save fuel if the furnace was higher.

Mr. JOS. D. POTTS. Pa. We crush our ore and limestone to the size of an egg and consider it good economy.

Mr. GEORGE H. RUSSEL, Michigan, said that his experience was almost entirely with the hard lake ores, and he thought that their better preparation and finer crushing had helped materially to better the work in the Detroit furnaces, besides lessening the amount of fuel required. These furnaces used to break the ores with a

hammer, and put in pieces as large as an egg; the fuel then required was from 115 to 120 bushels of charcoal per ton of iron.

Now the ores are crushed to smaller than chestnut size, and much more attention is paid to a small uniform size. The crusher jaws are oftener replaced than formerly, as a change in the work of the furnace is quickly noticed if the ore goes in unusually coarse. Iron is now being made at Detroit on 85 bushels of charcoal per ton. All of this difference is not attributable to the better preparation of the ores, but he thought it had contributed very largely towards it.

Mr. JOHN F. HOLLOWAY, Ohio. In furnaces, the fine ores may pack close, but the lumps would open up the charges and let the heat through; this is the case with soft ores.

Mr. LOBDELL. I think, all conditions being equal, that fuel will be saved by crushing the ore to a uniform size, and that the fine ore, if any, should be charged so as to be at the outside and the coarse ore in the center of the furnace, and that the coal should not be too large. We screen all the coal and use all that will not pass through a $\frac{3}{4}$-inch mesh.

Mr. F. P. MILES. I think the blast should be increased when the furnace stack is higher, and when it is using the same kind of fuel and ore as were employed in a smaller furnace.

Mr. J. BIRKINBINE. In all cases, I believe it to be advantageous that the ore should be of uniform size. The Warner furnace, Tennessee, is doing very good work largely on account of the carefully prepared ore.

Flaxseed ore is used at some of the blast furnaces in eastern Wisconsin, and I do not think large lumps of any kind are valuable in a blast furnace.

The charcoal is more uniform in size in the North than in the South. In the South the charcoal is charged too large. I think the furnaces would give better results in Alabama if the charcoal was of more uniform size.

Mr. LOBDELL. The pressure of the blast has an influence. We blow $\frac{3}{4}$-pound through two 4-inch tuyeres into a stack with an $8\frac{1}{2}$-foot bosh by 32 feet high. The tuyeres are of bronze and the blast is cold. The tuyeres are never moved until the blast is over. We use a Root blower, No. 4, and get $\frac{3}{4}$-pound pressure with it.

BIBLIOGRAPHY

Beaudry, Mary C.
2005 "Concluding Comments: Revolutionizing Industrial Archaeology?" in *Industrial Archaeology: Future Directions*. Eleanor Conlin Caesella and James Symonds (eds.). New York: Springer Science Publishing. 301-314.

Caesella, Eleanor Conlin
2005 "'Social Workers': New Directions in Industrial Archaeology." in *Industrial Archaeology: Future Directions*. Eleanor Conlin Caesella and James Symonds (eds.). New York: Springer Science Publishing. 3-32

1900 *Columbia County at the End of the Century: a Historical Record of its Formation and Settlement*. Hudson, New York: Record Publishing and Printing Company

Ellis, Franklin
1878 *History of Columbia County New York: Illustrations and Biographical Sketches of Some of its Prominent Men and Pioneers.* Philadelphia: J.B. Lippincott & Co. Press

Gordon, Robert B.
1996 *American Iron: 1607-1900*. Baltimore: Johns Hopkins University Press.
2001 *A Landscape Transformed: The Ironmaking District of Salisbury, Connecticut*. Oxford University Press

Gordon, Robert B. and Patrick M. Malone
1994 *The Texture of Industry: An Archaeological View of the Industrialization of North America.* Oxford University Press

Gobrect, Larry
2000 "The Copake Iron Works at the Taconic State Park: A Report on its Historical Significance and Development Potential". Peebles Island, New York. Office of Parks, Recreation, and Historic Preservation

Kirby, Ed
1998 *Echoes of Iron: In Connecticut's Northwest Corner, Including a Field Guide to the Iron Heritage Trail*. Sharon, Connecticut: Sharon Historical Society

Krattinger, William E.
2007 "Copake Iron Works Historic District" *National Register of Historic Places Nomination*. Washington, D.C.: United States Department of the Interior, National Park Service

Mettler, Elinor
2000 *The Fagan Sisters: History of Life in a New York Country Village*. Charleston, South Carolina: Acadia Publishing.

Miles, William A.
1886 "Ore Washer and Separator at Copake Iron Works, New York". *Journal of the United States Association of Charcoal Iron Workers.* 7 (1): 6-11
1888 "Blowing Engine at the Copake Iron Works" *Iron Age*. 61 (2): 881-883

McGuire, Randal H. and Paul Reckner
2005 "Building a Working Class Archaeology: The Colorado Coal Field War Project" in *Industrial Archaeology: Future Directions*. Eleanor Conlin Caesella and James Symonds (eds.). New York: Springer Science Publishing. 217-241

Mrozowski, Stephen
2005 "Cultural Identity and the Consumption of Industry" in *Industrial Archaeology: Future Directions*. Eleanor Conlin Caesella and James Symonds (eds.). New York: Springer Science Publishing. 243-260

Mrozowski, Stephen and Mary C. Beaudry
1989 "Discussions and Conclusions" in *Interdiciplinary Investigations of the Boott Mills: Lowell, Massachusetts.* Mary Beaudry and Stephen Mrozowski (eds). Boston: Center for Archaeological Studies, Boston University

Mrozowski, Stephen, Grace H. Ziesing, and Mary C. Beaudry
1996 *Living on the Boott: Historical Archaeology at the Boott Mills Boardinghouses, Lowell, Massachusetts.* Amherst: University of Massachusetts Press

Naramore, Sally B.
1993 "The Livingston Iron Mill" in *The Mill on the Roeliff Jansen Kill: 250 years of American Industrial History*. Roeliff Jansen Historical Society. Hensonville, New York: Black Dome Press. 11-28

Palus, Mathew and Paul Shakel
2006 *They Worked Regular: Craft, Labor, and Family in the Industrial Community of Virginius Island*. Knoxville: University of Tennessee Press

Pierpont
2007 "Re: Copake Iron Works District" *Letter to Raymond Doherty*. Peebles Island, New York: Office of Parks, Recreation, and Historic Preservation

Stott, Peter
1993 "The Paper Mill: Two" in *The Mill on the Roeliff Jansen Kill: 250 years of American Industrial History*. Roeliff Jansen Historical Society. Hensonville, New York: Black Dome Press. 51-66
2007 *Looking for Work: Industrial Archeology in Columbia County, New York*. Columbia County Historical Society. Syracuse: Syracuse University Press

Symonds, James
2005 "Experiencing Industry" in *Industrial Archaeology: Future Directions*. Eleanor Conlin Casella and James Symonds (eds.). New York: Springer Science Publishing. 33-58

Symonds, James and Eleanor C. Casella
2006 "Historical Archaeology and Industrialization" in *The Cambridge Companion to Historical Archaeology*. Dan Hicks and Mary C. Beaudry (eds.). Cambridge University Press.

Szucs, Loretto Dennis, and Mathew Wright
2001 *Finding Answers in U.S. Census Records*. Salt Lake City: Ancestry Publishing

Wallace, Anthony F. C
2005 *Rockdale: The Growth of an American Village in the Early Days of the Industrial revolution*. Third edition. Lincoln, Nebraska: University of Nebraska Press.

Wood, Margaret C.
2004 "Working Class Households as Sites of Social Change" in *Household Chores and Household Choices: Theorizing Domestic Space in Historical Archaeology*. Kerri Braile and Jamie C. Brandon (eds.). Tuscaloosa, Alabama: University of Alabama Press

Workmaster, Wally
1984 "Copake Falls Situation" *Memorandum to Gus Thomson and John Kenedy*. Peebles Island, New York: New York State Office of Parks, Recreation, and Historic Preservation