An Archaeological Survey of Three Historic Industrial Cement Complexes in Rosendale, New York.

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In the fall of 2008, Birchwood Archaeological Services conducted an archaeological survey of three historic industrial cement complexes as part of a new resort development project located in the Town of Rosendale, Ulster County, New York (Figure 1). These industrial remains include the remains of offices, kilns, warehouses, and extraction and transportation related features all dating from the mid 19th through the early 20th centuries.

Natural cement has had a long history extending back to the times of the Greeks and Romans. In the new world what has come to be known as natural or hydraulic cement was first discovered in 1818 at Chittenango New York near Syracuse, when a young engineer named Canvass White was looking for material to help build the Erie Canal (Figure 2). When plans began for the construction of the Delaware & Hudson canal, engineers originally planned on purchasing natural cement from Chittenango, but that all changed in 1825, when James McEntee discovered natural cement in High Falls near Rosendale. Soon a number of cement manufacturing companies sprang up in the Rosendale area, many of which were later consolidated into larger industrial firms. Because of its strength and ability to work in water, natural cement was a popular choice among architects and builders, and was used in such significant structures as the Brooklyn Bridge, the base of the Statue of Liberty, and the NY Customs House.

Methods and Materials

So you're probably asking yourself, what is natural cement. Simply put, pure limestone consists of calcium carbonate which when burned and ground into a powder produces quicklime, which is not very strong and decomposes in water (Figure 3). However, limestone containing 60 percent pure limestone, 35 percent clay and 5 percent other stuff

produces a much stronger material that reacts much slower in water, producing natural or "hydraulic" cement. The rock surrounding the Rosendale area is a dolomite containing just the right ingredients to make it perfect for cement manufacturing. Portland cement is made by mixing rock containing limestone and rock containing clay mined from different locations in just the right combinations (Figure 4). After 1890, Portland cement began being manufactured in rotary kilns, which greatly reduced the cost associated with its manufacture.

The first step in the manufacturing process consists of mining the limestone. Over 100 mines have been mapped just within our project area, many of which are large enough to drive trucks or automobiles around in (Figure 5). From the mines the limestone was transported to the top of the kilns, where the limestone was mixed with layers of coal and dumped into the hole (Figure 6). The kilns were fired continuously 24 hours per day from March through December, and were allowed to cool during the winter months to make repairs (Figure 7). After passing through the body of the kiln, which typical took about 12 hours, the fired limestone is then processed through a crusher and then a grinding system (Figure 8). Once it passes through the grinders they cement makes its way down to the barrel room, where it is packed into small watertight barrels (Figure 9). These barrels added considerable cost to the manufacturing process, and most of the square footage of the works themselves are devoted to the manufacture of barrels rather than cement.

We are very fortunate to have several sources of documentary information about these cement factories, including Sanborne fire insurance maps (Figure 10), historic photographs of some of the mill buildings (Figure 11), and old advertising (Figure 12). Archaeological remains associated with the three cement complexes include kilns (Figure 13), chimney stacks (Figure 14), and the remains several structures, including a barrel shed (Figure 15), and stone warehouse and barrel making structures (Figure 16).

The Lawrence Factory at Binnewater was producing around 5,500 barrels a day by 1892 (Figure 17). At that time this was one-third of the cement produced in Ulster County and one-eighth of that produced in the country. In 1902, all three of the mills were purchased

by the Consolidated Rosendale Cement Company (Figure 18). The Lawrence Cement Company opened another corporation in Pennsylvania and began making Portland cement. Because demand for natural cement dropped in the early part of the 20th century, the Consolidated Rosendale Cement Company began shutting down their different cement factories. The Lawrence Cement works ceased operation in 1918.

In addition to mapping and photodocumenting each of the landscape elements associated with the industrial works, a structural condition assessment was conducted at each of the kilns, providing more detailed information regarding the size, condition, and construction techniques in use at these sites. A Kiln Inventory Form was developed in consultation with the Century House Historical Society in order to standardize the collection of data (Figure 19). We really wanted the input from the historical society, which includes a core group of active industrial historians who were aware of the field data that would be useful in their research and we'd hoped that the form could conceivably be used to help document other kiln complexes in the Rosendale area. A total of 49 cement kilns from the three kiln walls were inventoried as part of the project.

The form includes basic information including the dimensions of the arches as well as the discharge ports for each of the two kilns within in the brick archway. Measurements were also taken of the bricks present within the arches, and bricks marked with their manufacturers' brand names were noted. Measurements were also taken from the tops of the kilns, including kiln wall height and the diameter of the individual kilns (Figure 20). We learned that the tops of the kilns varied from round to oval, so this was also noted on each of the kilns. Work along the top of the kiln walls was sometimes dangerous, with the risk of falling into a kiln or off the edge of the wall.

In addition to the documentation of minute details regarding the kilns, we also conducted a brief visual condition assessment. Brick arches and kiln discharge ports were rated on a scale of 1 to 5 regarding the structural integrity of the brickwork, the presence of industrial related wood or iron, and the presence of garbage or vandalism. We found that the majority of the kilns retained much of their integrity. Other cement kilns appeared in

poor condition, and more serious efforts would be necessary in order to restore them to their original showroom condition (Figure 21). It is hoped that this information can serve as a baseline for monitoring the structural condition of these decaying resources and to identify potential candidates for stabilization and long term preservation.

Research

These three industrial sites provide a valuable opportunity to examine the historical development of natural cement industry using archaeological methods (Figure 22). With the exception of Denis Howe's work at the Newark and Rosendale Cement works in Whiteport, little industrial archaeology has been done specific to the natural cement industry.

Test Briquettes

One avenue of research is the examination of test briquettes used to test the tensile strength of the cement being produced at the sites (Figure 23). These briquettes are common artifacts at kiln sites throughout the region, and several collections exist, the most expansive being at the Century House Historical Society. Because the briquette were broken as part of the testing process few complete examples are found. Many briquettes have dates and other information stamped on their sides relating the specific mine or vein that the sample came from (Figure 24). Many manufacturers tested their products daily, so large numbers of briquettes could potentially be found. Unfortunately, practices varied between manufactures, and much of the information related to the codes and numbers that appear on the briquettes is unknown.

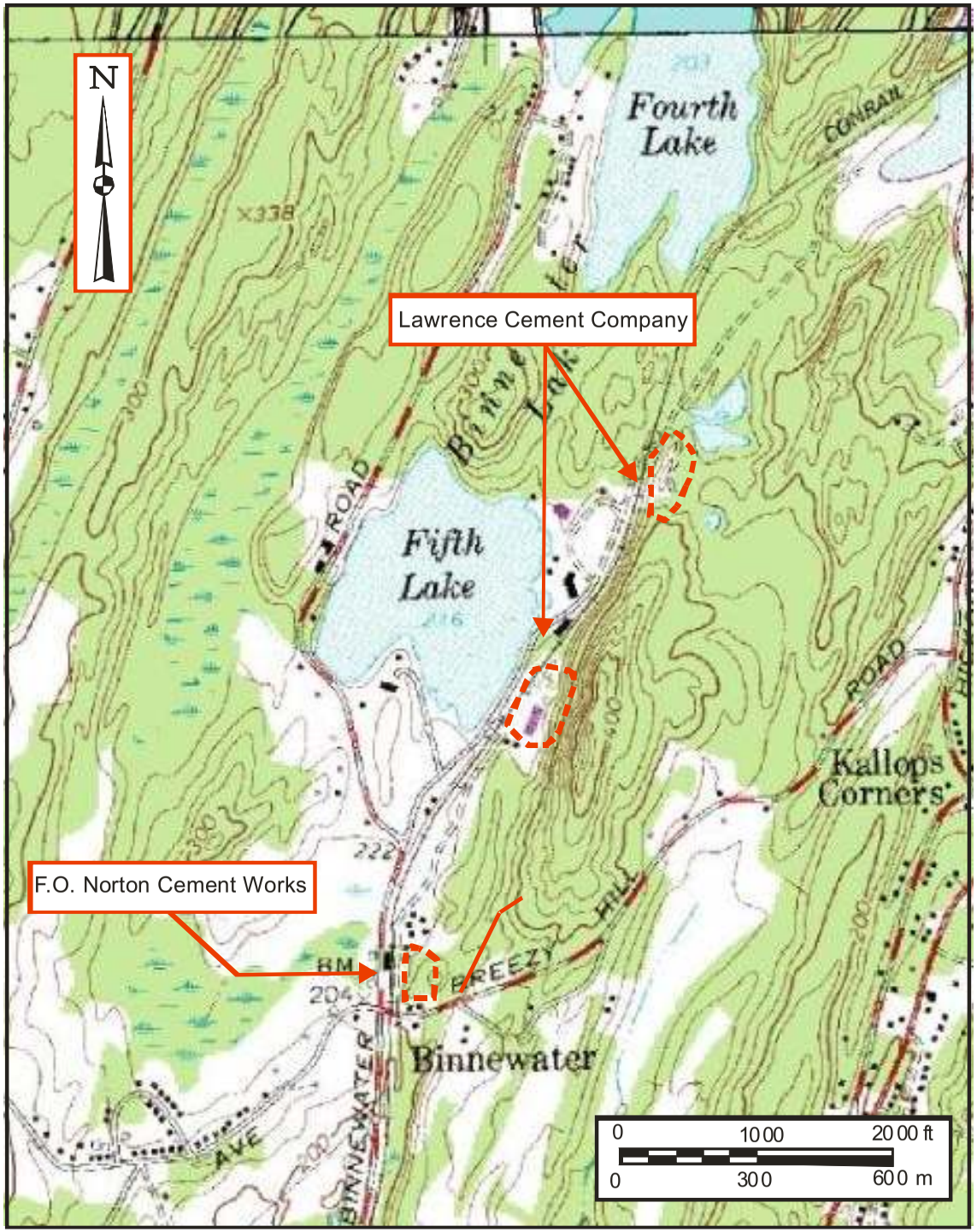
Bricks

Bricks can also be a valuable research tool in investigating change at Industrial Archaeological sites. A total of ten different marked bricks were encountered at various locations throughout the three kiln complexes (Figure 25). Research conducted on specific brick manufacturers suggests that much of the common brick was manufactured nearby, most notably in Kingston and Haverstraw, while fire brick was imported from other states. A comparison of marked bricks occurring at the three kilns sites indicated a

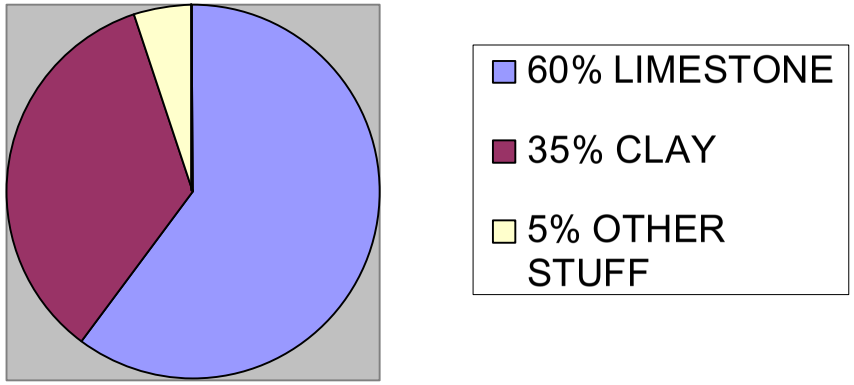
strong correlation between ownership of specific kilns and the brands of common brick used at the various buildings and kiln arches.

Many of the bricks encountered were marked Brigham (Figure 26). Henry R. Brigham was an Agent for A.J. Snyder & Son's Crescent Brand Rosendale Cement. His father was the founder (in 1858) of the Rosendale & Kingston Cement Company later known as the Hudson River Cement Company. “H.R.” worked for his dad's cement company. H. R. formed Brigham Bros with his brother William H. they manufactured bricks from works next to the Hudson River Cement Co. in East Kingston. Around 1891 H.R. became general agent for A.J. Snyder & Sons. A few years after the death of A.J. Snyder (in 1902) he also became the superintendent of the Snyder Cement Works in Lawrenceville.

Results further indicated what while marked common bricks show a strong correlation with regard to the individual kiln walls, fire brick was comparatively homogeneous (Figure 27). Also, little variation was noted within the kiln walls, specifically with respect to the breaks in the stonework that we think indicate later construction episodes. This lack of variation between kilns thought to have been constructed at different times is not too surprising since the fire brick lining of the interior kiln walls had to be replaced every few years after near continuous use. Thus, while the kilns themselves might have been constructed at different times between the 1860s and when plants ceased operations in 1926, the fire bricked interior lining of the kilns themselves all date to within a few years of one another.


N
Fourth Lake
Fifth Lake
Lawrence Cement Company
F.O. Norton Cement Works
Binnewater
Kallops Corners
ROAD
BREEZY HILL
BINNEWATER AVE
BM 204
0 1000 2000 ft
0 300 600 m

What is Natural Cement?



Portland Cement

CEMENT MACHINERY.

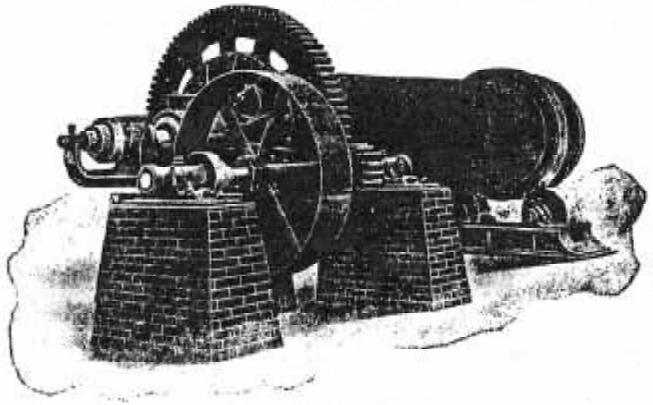
ROTARY KILNS.

WE build them in five different designs, especially adapted for electrical transmission and thoroughly modern in every respect.

TUBE MILLS,
BALL MILLS,
CRUSHERS,
MIXERS,
DISINTEGRATORS.

GRINDING PANS,
PUMPS,
ELEVATORS,
CONVEYORS,

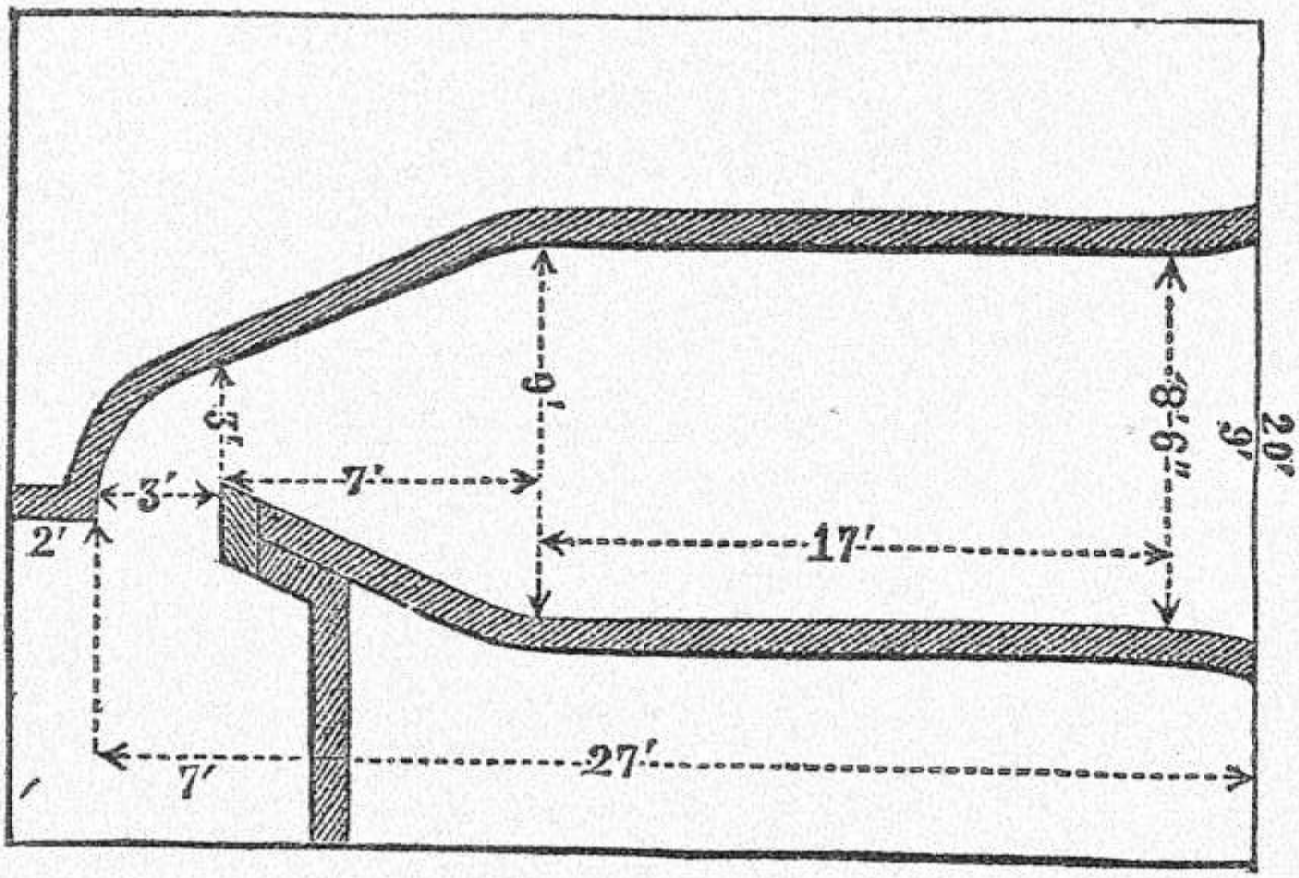
Tube mills of various sizes

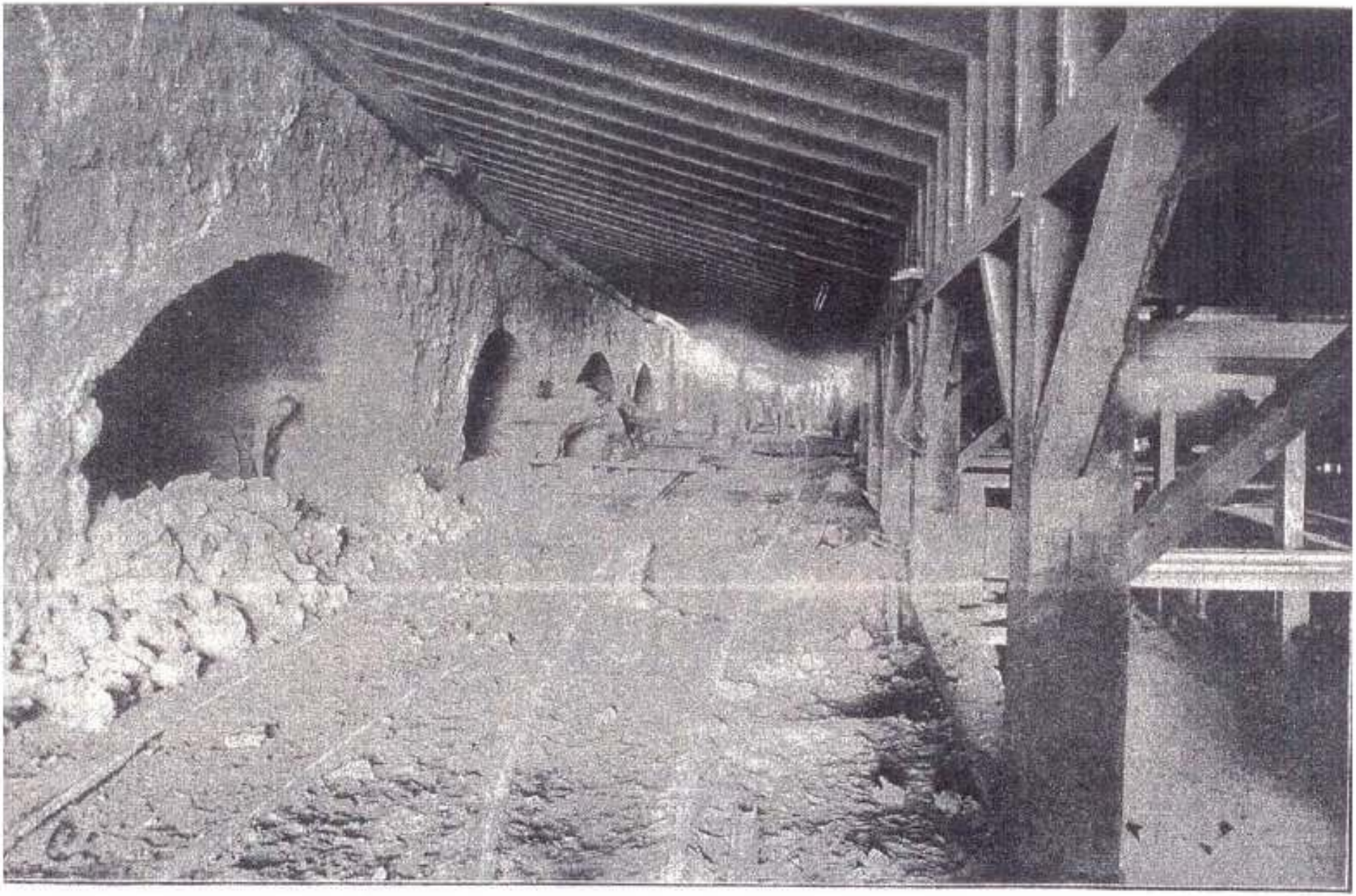


For both wet and dry grinding.

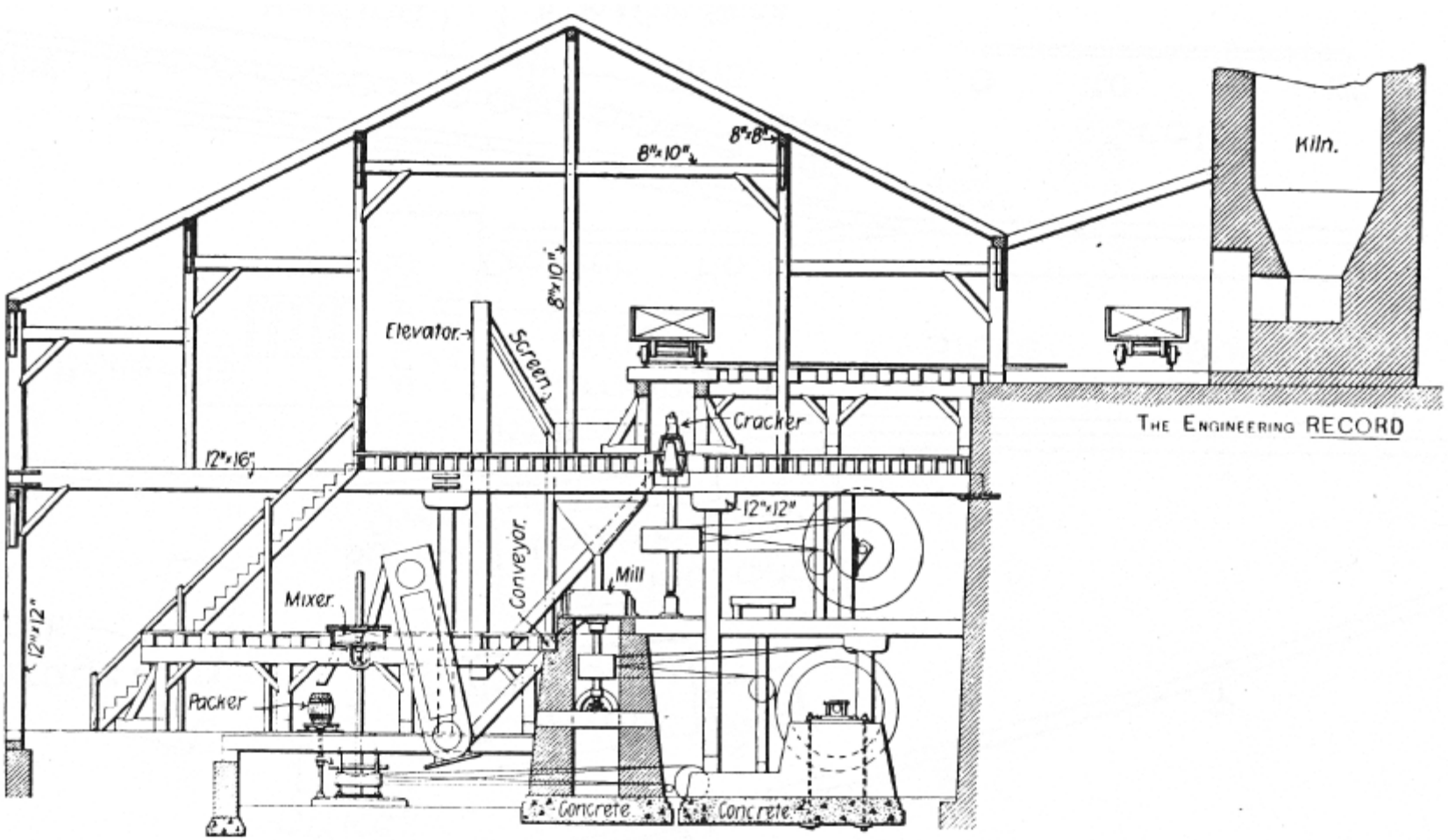
In the development of the Portland Cement industry in this country, our machinery has been widely used. We are able to refer by permission to a number of the best works in this country. Our line of machinery is strictly up-to-date, and we invite correspondence from those about to engage in the manufacture of Portland Cement.

THE BONNOT COMPANY, CANTON, O.


3'
7'
9'
8'-6"
20'
2'
17'
7'
27'

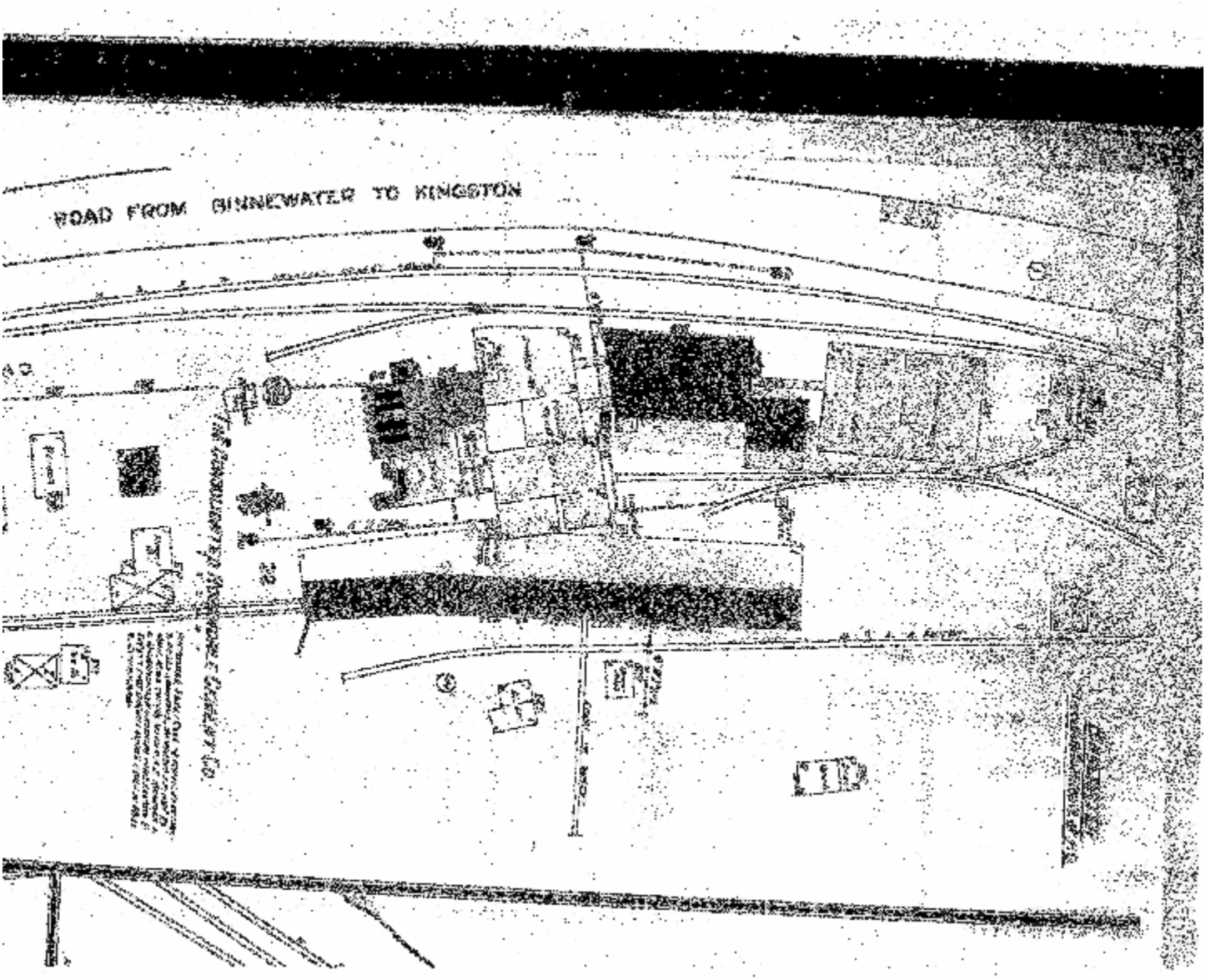


BOTTOM OF KILNS WITH CRACKER ROOM TO THE RIGHT.

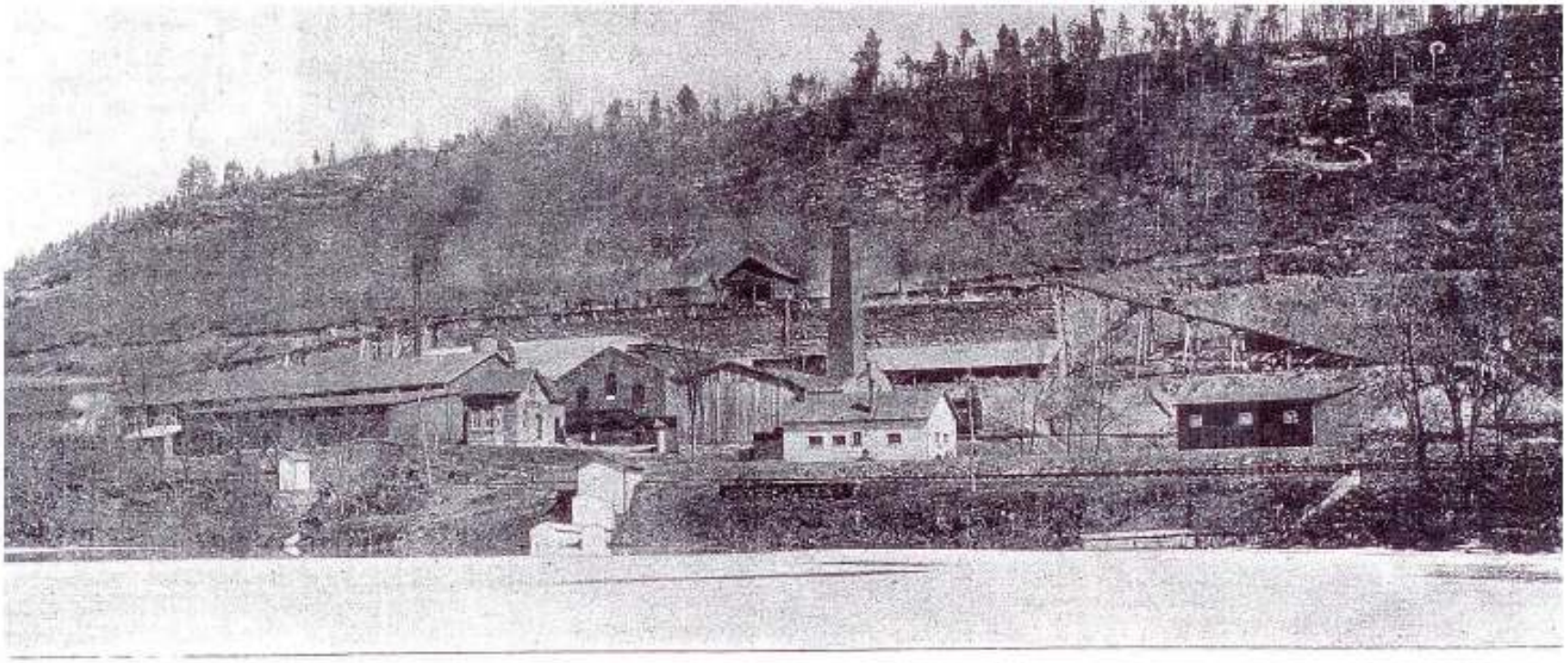

Kiln.
8"×10"
8"×8"
8"×10"
Elevator.
Screen
Cracker
12"×16"
12"×12"
Conveyor.
Mill
Mixer.
12"×12"
Packer
Concrete
Concrete
THE ENGINEERING RECORD

PACKING ROOM.

FIFTH RIVERWATCH LANE


ROAD FROM BINNEWATER TO KINGSTON

Lawrenceville Cement Company



THE BINNEWATER MILLS OF THE LAWRENCE CEMENT CO., ULSTER CO., N. Y.

Photo Courtesy Century House Historical Society

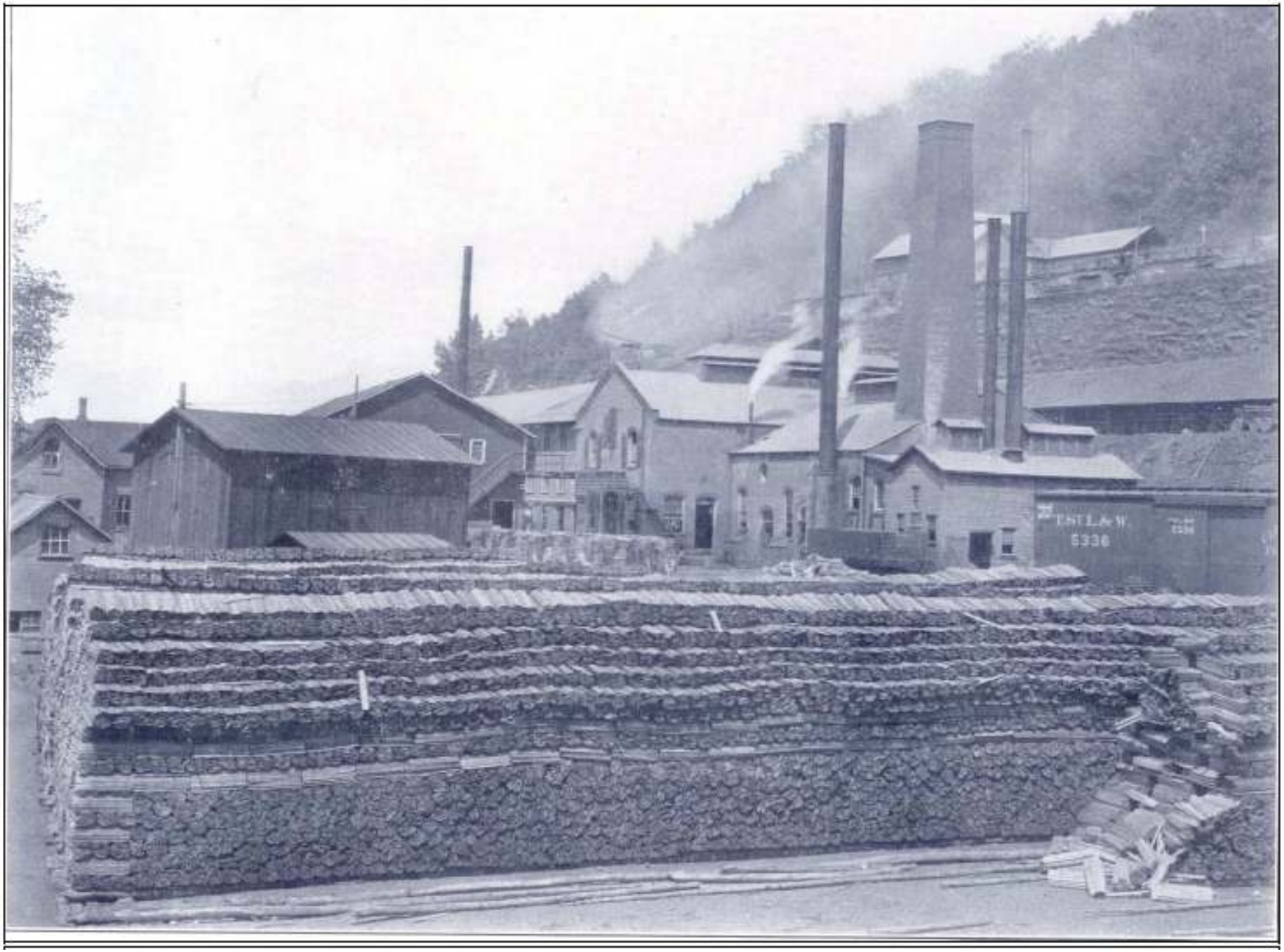
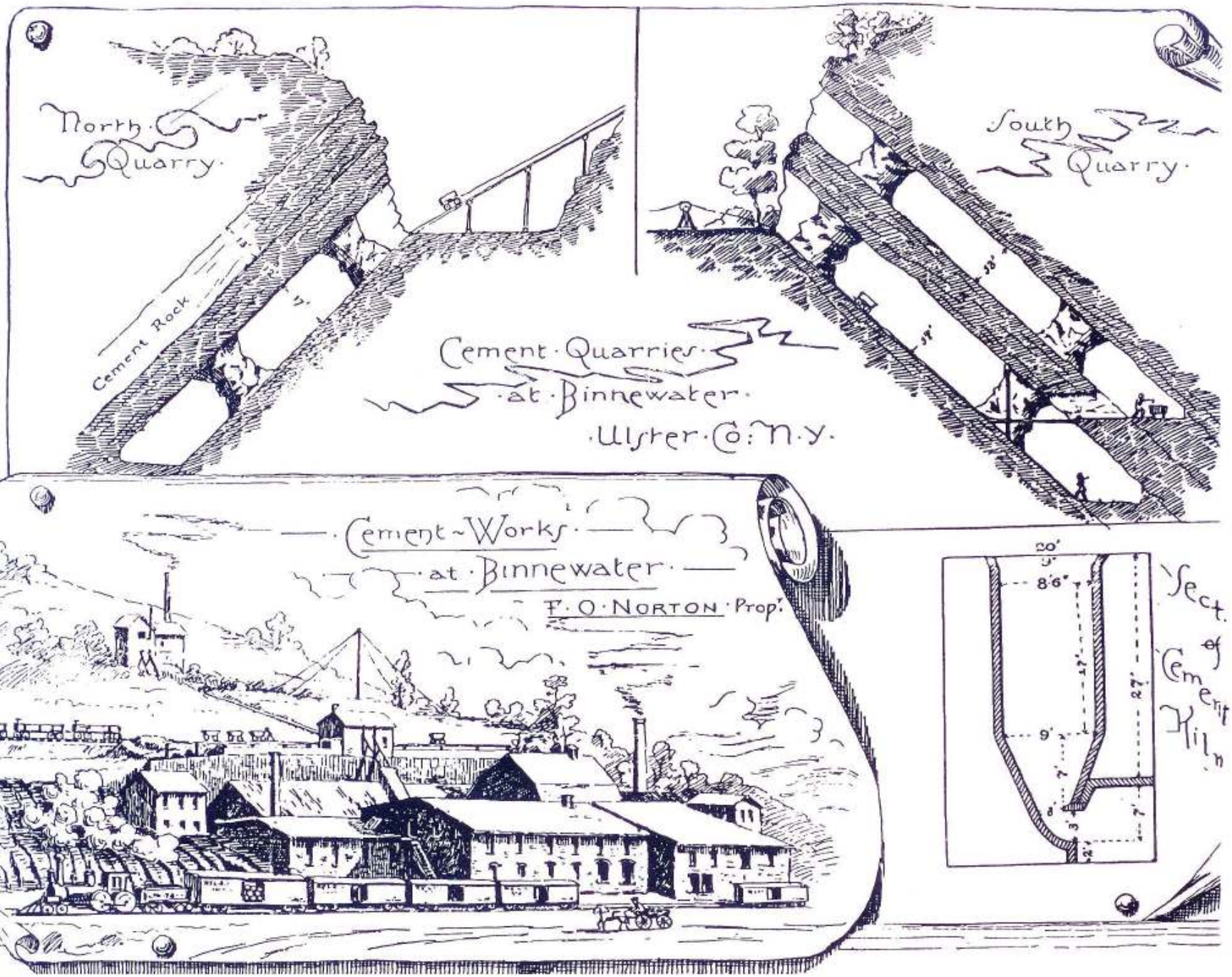


Photo Courtesy Century House Historical Society


North Quarry
Cement Rock
South Quarry
Cement Quarries
at Binnewater
Ulster Co. N.Y.
Cement Works
at Binnewater
F. O. NORTON Prop.
20'
8'6"
27'
9'
7'
3'
2'
Sect. of Cement Kiln

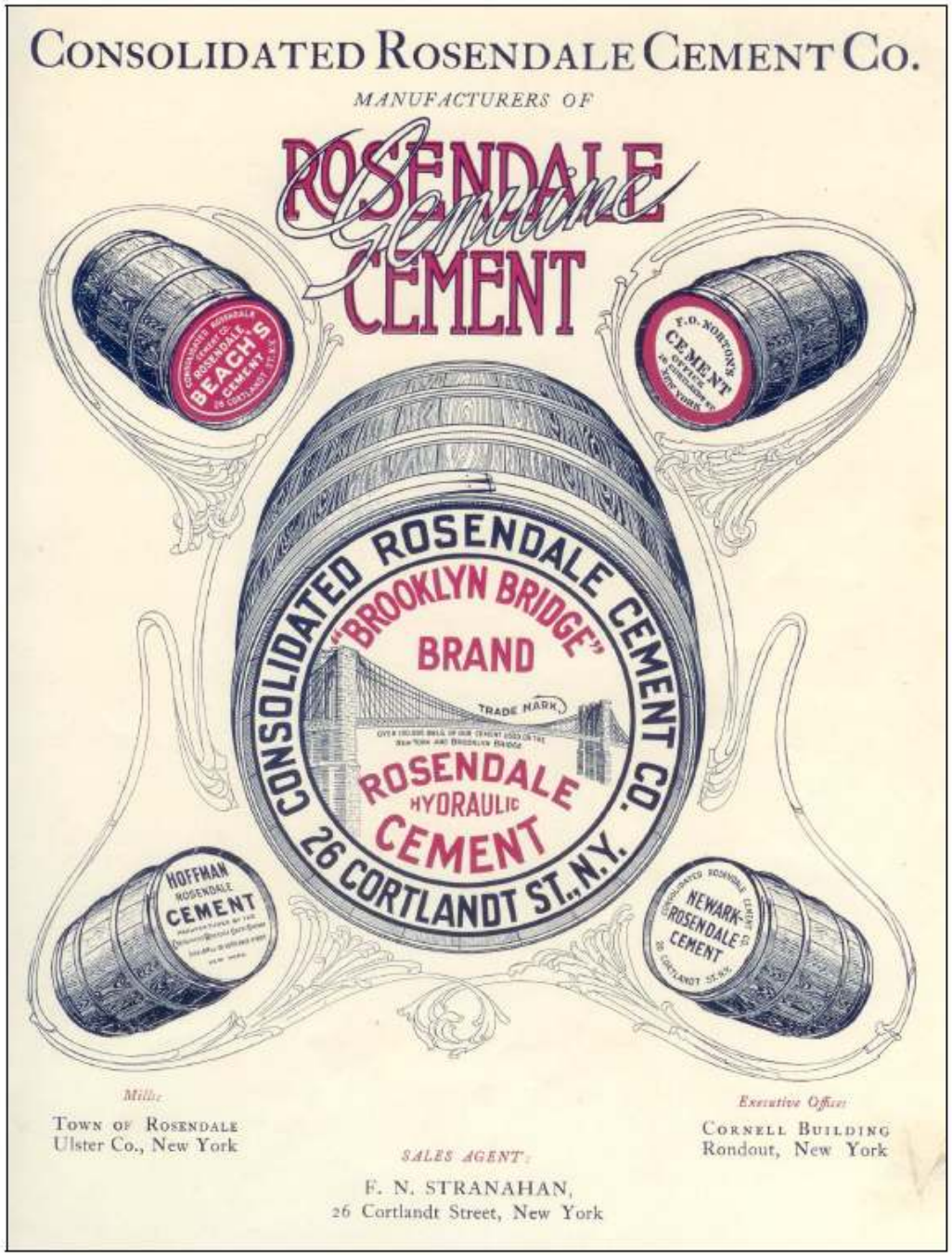


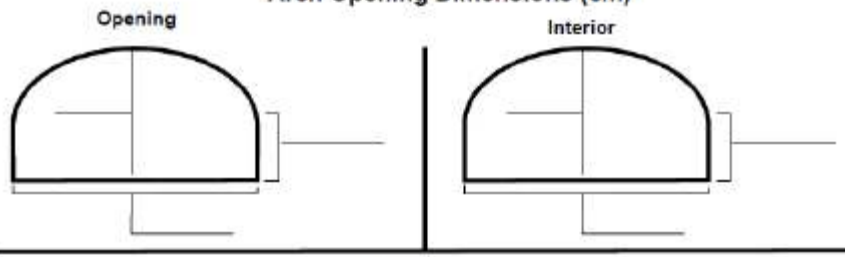
Photo Courtesy Century House Historical Society

Kiln Inventory Form

Project _____ Kiln Wall #_____

Date: _____ Arch# _____

Arch Opening Dimensions (cm)



Bricks (mm)

Brick Dimensions	Length	Width	Thickness	Makers Marks?
Common Brick				
Fire Brick				

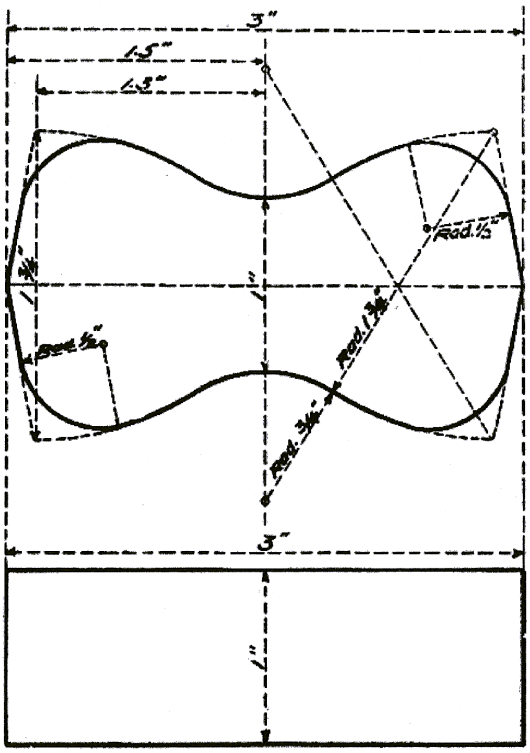
Kiln Opening Dimensions (cm)

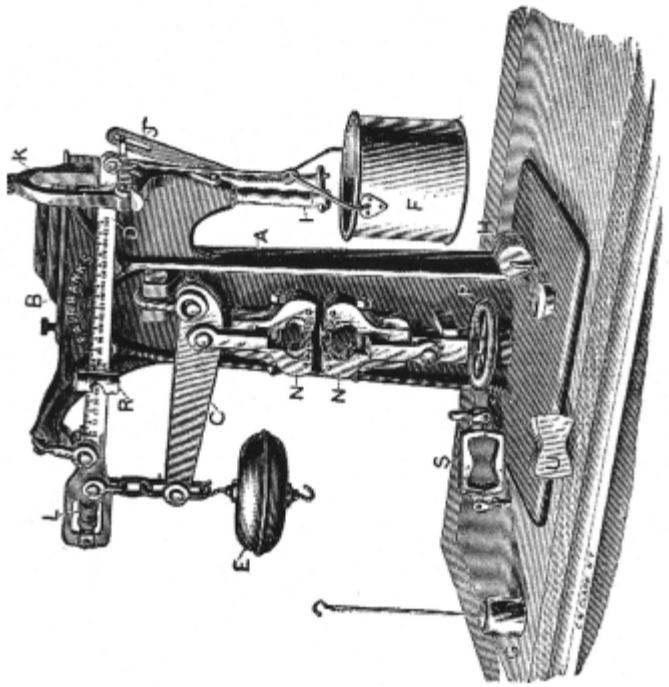
Condition Assessment

	Structural Integrity (Scale of 1 to 5)	Iron Present (Y/N)	Wood Present (Y/N)	Garbage/ Vandalism
Drawing Arch				
Kiln A				
Kiln B				

Comments:

Archaeological Research in Cement Manufacturing


3"
1.5"
1.5"
Rad. ½"
Rad. ¾"
Rad. 1¾"
Rad. ¾"
1"
3"
1"


K
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800.657.SPEX
OPTIRECTILINEAR®
USA
cm 1 2 3 4 5 6 7 8
cm 1 2 3 4 5 6 7 8

Common Brick

TELEPHONE: 771 BROAD.

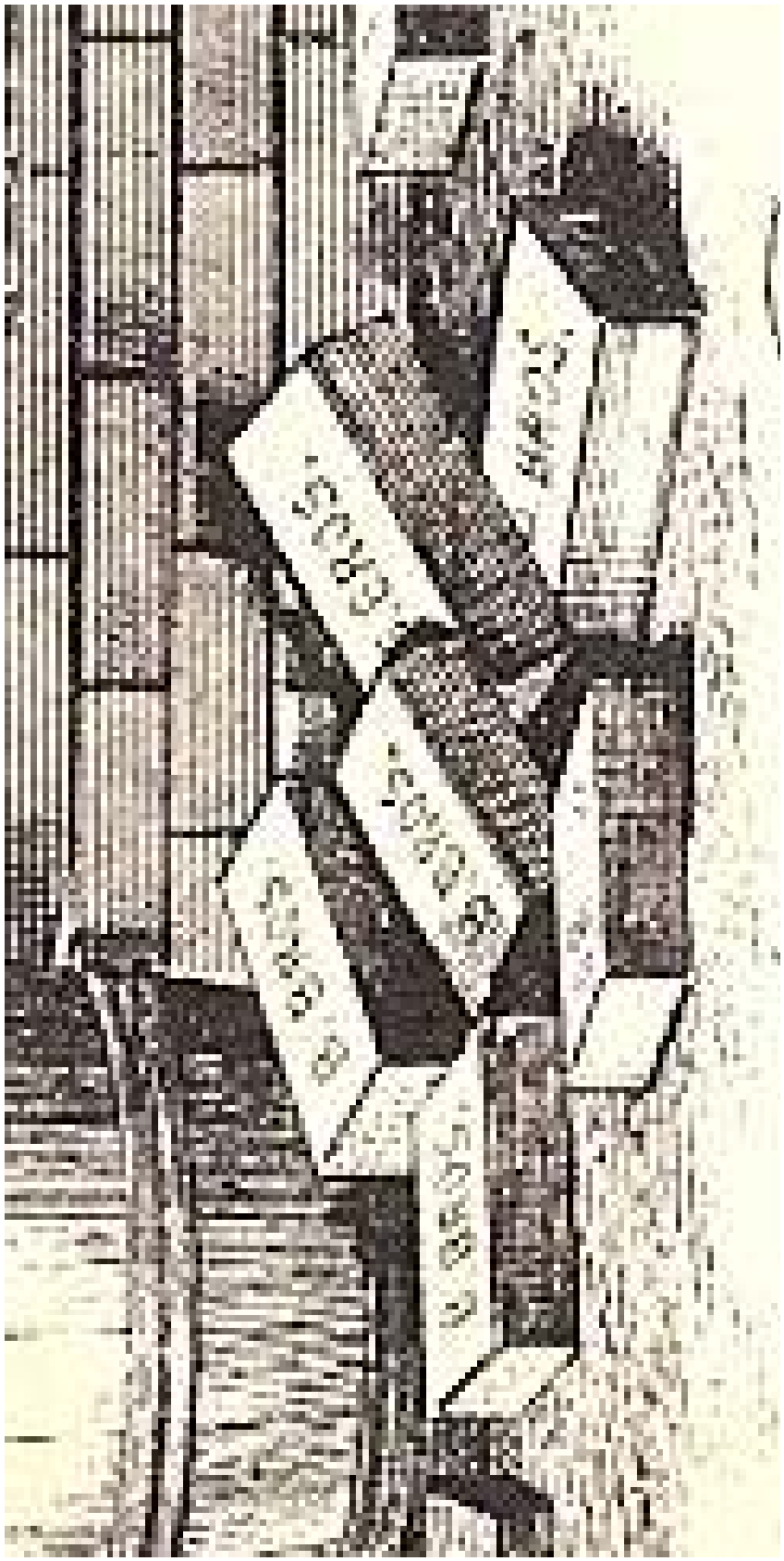
Henry R Brigham

Manufacturer and Manufr's Agent for

North River Brick AND Rosendale Cement

35 STONE ST.
CURTIS BLDG.
ROOM 77.

New York _____ 189__



FIRE BRICK

C-TYRONE

PHOENIX No. 1

MUNRO

Harbison-Walker Refractories Co. PA

RIDGE

General Refractories Company PA


THANKS
Royce Duda
Dennis Howe
Doug Idleman
Samantha Kerath
Tim Allred
Hudson River
Valley Resorts
Dietrich Werner
Century House
Historical Society

Society for Industrial Archaeology
2009 Fall Tour

- October 13-16th
- (Tuesday-Friday)
- Rosendale NY
- Contact: Dennis Howe

earlyhow@myfairpoint.net

SOCIETY FOR INDUSTRIAL ARCHEOLOGY