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Compiled by:

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March 15, 1991
file: C\DHP\Biblio.lk

Lime kilns

Victor R. Rolando
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July 14, 1995

Giovanna Peebles, State Archeologist
Division for Historic Preservation
135 State Street, Drawer 33
Montpelier, Vermont 05633-1201

Dear Giovanna:

Enclosed find six site survey reports as follows:

Hillside Lime Kiln, Plymouth, Windsor County VT-WN-279
Roadcut Lime Kiln, Plymouth, Windsor County VT-WN-280
CCC Road Lime Kiln, Plymouth, Windsor County VT-WN-281
Black River Twin Lime Kilns, Plymouth, Windsor County VT-WN-282
Day Lime Kiln, Ira, Rutland County (VT-RU-292)
Reynolds Lime Kiln, Proctor, Rutland County (FS-59(RU))

Please note the following:

1. Two of the above already have site numbers assigned.

2. Reynolds Lime Kiln, FS-59(RU), was previously written up and submitted (dated 2-28-94) before any field work was done. Please replace that original with the enclosed (the recent one is much thicker with up-to-date data).

3. I don't know but that Roadcut Lime Kiln might be on State Highway property, which if it is, raises some interesting questions. I was told that the State Highway people did some roadwork along Route 100 about two years ago, improving drainage by doing some shoulder digging and widening. As such, the sides of this site became exposed when an area of white, burned lime was uncovered by digging equipment. Assuming the highway boundary didn't change when this work was done, does this mean that highway work within the highway boundary doesn't go through any review process?

Since I have noticed the highway right-of-way in some places along Route 100 is up to six feet into overgrown area alongside the road, and most likely when the road was originally widened in the 1950s-1960s there was no review process in force, does that mean that no new walkover or review process is done for this type highway work? Should I (you?) notify/query AOT (Duncan Wilkie?) on this? Maybe something is falling through the cracks?

4. I have enclosed a post-card with the site names written on them, so maybe when the site numbers are assigned, someone could please transcribe them on the card and return it to me so I can update my files. Note that one site name on the card (McConnell/Buck Lime Kiln) was sent to you back in April 1995 and I didn't get the number that was assigned.

I promised you 16 reports on my donated services estimate so I have 9 to go, which shouldn't be too difficult to do, although I think my hours/mileage expenses will overrun the estimates. In keeping with my much-publicized "Magnificent Obsession", the reports contain "a completed site survey form, topographic map location, detailed sketch map, and additional information for **each** site." ... my pleasure.

I am thinking of investing in one of those little hand-held GIS instruments, which will readout exactly where I am on the ground. It should be especially useful for sites deep in the woods where there are little to no distinguishable landmarks to locate the site on the topo.

I am also about to embark on the Internet. I attended a 1-day introductory conference about this recently and now that Manchester has been assigned a local access phone number, I have no more excuses not to sign up. Watchayou e-mail!

Ciao!

Vic

SEE Reference files for full document

copy

Lime kilns

Paul A. Russo
The Public Archaeology Laboratory, Inc.
210 Lonsdale Ave.
Pawtucket, Rhode Island 02860

1/95
Presented @ SHA
Washington DC

"That Locality...for a Long Time Known as Lime Hollow":
A Case of Rural Industry and Identity Crisis.

The abandoned nineteenth century village of Sherman in Whitingham, Vermont is the backdrop for a discussion of rural industry, and by necessity rural abandonment. The goal of this paper is twofold. The first objective is to challenge the homespun ideal of early nineteenth century rural economy and industry by examining the history and archaeology of lime manufacturing. The second objective is to dispel the notion of a rural citizenry complacent in the face of dissolving village social, political and economic vitality. In the past sociologists, cultural anthropologists, and ethnohistorians have viewed complacency as a manifestation of the collective rural mentalité, fatalism. In conclusion, this paper will demonstrate the fallacy of this interpretation. Contradictions between the written record and archaeological and geochemical evidence suggest an elaborate marketing scheme concocted by ranking members of Sherman in an effort to salvage village viability.

Introduction

Much attention has been given to agricultural production in the effort to explain nineteenth century rural abandonment in New England. In contrast, relatively little attention has been given to the roll of non-agricultural production with regard to the same phenomenon. Perhaps because of the rural-agrarian/urban-industrial dichotomy, rural industry has traditionally been interpreted as pre-capitalistic, a supplement to the nineteenth century rural lifeway.

The goal of this paper is to provide a case study which focuses on the importance of non - agricultural production, lime manufacture, in the adaptation and later abandonment of an upland community in Vermont.

In july of 1993 the Public Archaeology Laboratory contracted to perform a archaeological reconnaissance survey by the New England Power Company. This included a reconnaissance of eight hydroelectric developments in the Deerfield Valley in Vermont and Massachusetts **[slide]**. These somewhat contiguous developments represent a land bank of approximately 17,000 acres along the Deerfield River. **[slide]** While surveying one of the developments in the southwest corner of Whitingham, Vermont, we stumbled on an abandoned nineteenth century settlement last known as Sherman [or Shermon(s)].

Historic Context

Settlement in the southwest corner of Whitingham took hold during the first quarter of the nineteenth century. Between 1820 and 1821 the town selectmen organized Whitingham into 16 school districts. Sherman became District No.14 (Brown 1886:51). During this time, and the decade or two following, the small settlement was referred to as Lime Hollow. The hills around the village contain a special variety of limestone called the "Sherman Marble" for a

SEE Reference files for full document

Copy

Limekilns

Paul A. Russo
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Pawtucket, RI 02860 4/95 Presented @ NEAA, Lake Placid

Assessing the Applicability of Landscape Theory in Assigning Historic Site Significance.

Results from a recent FERC-mandated Phase IA cultural resources survey conducted along the Deerfield River Valley in Vermont are used to evaluate the applicability of cultural landscape theories in the interpretation of historic resources. The *diachronic relict cultural landscape* concept, developed in the discipline of human geography and adopted by British archaeologists and preservation planners, appears to be the most useful in this respect, and may be the most logical framework for assessing individual site significance at the Phase IA level of investigation. The utility of this concept in meeting the research goals outlined in the Vermont State Historic Preservation Plan is then evaluated. Finally, suggestions for its application in answering questions identified as regionally important, i.e. nineteenth century rural abandonment, are made.

Introduction

As archaeologists working within Federally managed land, or in the private sector assisting clients through the 106 process, we are responsible for identifying National Register or eligible properties. In the case of large land surveys this is often performed on the Reconnaissance level, with little or no subsurface investigation. Often, in these cases, large tracts of land must be archaeologically sensitized without the benefit of site visits or walkovers. Instead we must resort to environmental attributes and historic documents, our predictive models, to accomplish this. I would like to introduce two landscape concepts, developed within the Monuments Protection Programme in England, which I have found useful in assessing and

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June 13, 1991

Giovanna Peebles, State Archeologist
Division for Historic Preservation
Montpelier, Vermont 05602

Dear Giovanna:

Something I stumbled across a few months ago while in the process of doing other things is that the French operated a lime kiln at Isle La Motte in the 1660s. They apparently made mortar here for use in the construction of Fort Ste Anne. Date of the kiln varies from 1664 to 1666, depending on what source you use for reference. I gather that the kiln was somewhere in the immediate vicinity of Fisks Point, about ~~a mile~~ 3 miles to the south of the Shrine, while the fort was more or less at the Shrine. The kiln was supposed to have been later used by the British and operated into the 1790s, which means that it ran for some 130 years!. I suspect that the kiln might have been rebuilt a number of times during those 130 years, however. There is a reference of someone coming over from New York to pick up lime at Fisks in the 1790s (I'm at GE now and don't have all the accurate dates at my finger-tips).

I last visited Isle La Motte in 1989, with Donna, when we drove to the Shrine. But I didn't know of the lime kiln at the time, naturally, so I have to make a special inspection visit this summer. I really don't expect to find anything but something as significant as this demands a visit so that I can report on it in the book. There's not all that much published about the early lime industry of the country so this site might or might not be the earliest in the country, but it is at least a good candidate for it. I'm planning to make a run to Burlington on July 13 for some archival work at Special Collections, then up to Fisks Point to see what there is to see.

Thought you might like to know of this - exciting, isn't it? I'm glad I found out about it now, while I still have time to get something about it into the book. Speaking of which, I have enclosed a dummy of what the announcement is going to look like. I have established "The Ironmonger Press" to handle the ordering and distribution of the book, to keep the bookkeeping separated from my other ventures.

This Saturday (15th) I'm meeting Bill Jordan (Castleton St College) for a look at the lime kiln he found at Bomoseen. Afetr that I drive to Larrabees Point to search for an early 19th-C lime kiln there, and if I have time, look for an elusive lime kiln ruin that everyone else knows of but I can't find in Clarendon, near Chippenhook.

All best - end of my lunch hour.

Vic

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June 11, 1990

Giovanna Peebles, State Archaeologist
Division for Historic Preservation
Montpelier, Vermont 05602

Dear Giovanna:

Bob West and I went out Saturday to try to find five lime kiln remains in the Cavendish-Weatherfield-Plymouth area; didn't find one of them but found three more at one place and came home with seven lime kiln ruin finds. Not a bad day. I am already starting writing them up.

Bob said that the work planned for the Routes 30 & 7/7A intersection at Manchester is some work on a crumbling side (west) of the marble bridge, plus replacement of the existing small-diameter water main with a larger one. Digging, as far as he knows, will be limited to the bridge area and possibly between it and the Northshire Bookshop building (old Coburn House), northwest of the bridge. This places the work within what I would feel to be a general circle of probability of the blast furnace site, and could yield information regarding possible concentrations of slag residue, if not a better idea as to where the furnace might have been. Bob said that he would phone me as soon as any digging commences. I plan to be there to watch what is dug up, hopefully spotting any slag or charcoal that might lie buried there. I realize that this is at least the third bridge to be built here, the previous iron bridge replaced a wood bridge, and that each succeeding bridge was raised a bit higher over the brook, but anything I can glean from the diggings should add to what little I know now.

I am working up a copy of the latest manuscript for you and hope to have it to you soon. As I remember, the latest you have at the office is January 1987, which is woefully deficient regarding the lime kiln work I have been doing since then. I am taking a vacation week the first week of July and hope to make a run up to the Division that week, or maybe the following Thursday, on my way to the VAS boadr meeting. I could have some of the recent lime kiln finds written up for you by then also. I want you to have the latest copy of the manuscript just in case I tumble down inside one of those lime kiln ruins some day and never come out. It's still more important to me to get these sites located and written up for you than get a book published. I guess I didn't fully relaize the amount of effort, expense, and time it would take to publish the book. Besides, I like archival and field work much more, and getting out and about Saturday felt great. Especially when I found a kiln ruin in a section of woods that a local said he'd hunted for 35 years and knew there wasn't anything there; "you're wastin' your time, fella". Good thing he wasn't still mowing his lawn when we drove back down the road; I might have grabbed him and rubbed his nose in the kiln ruin.

All best,

Vic

Norton Pottery
P 23

The Society for Historical Archaeology
NEWSLETTER

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VOLUME 23 NUMBER 3 OCTOBER 1990

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SHA NEWS

The SHA Business Office has moved from California to Arizona. Please address all correspondence to: Society for Historical Archaeology, P.O. Box 30446, Tucson, Arizona 85751. Telephone: (602) 886-8006.

The Newsletter Editor has new telephone and fax numbers: phone - (804) 221-1059; fax - (804) 221-1066.

PRESIDENT'S CORNER

The membership should take note of the new Society business office address announced on this page. One advantage of the new headquarters will be lower prices for some of the routine printing for the Society. With a reduction in membership due to the recent dues increase any savings we can make is important this year.

As you may or may not know, the Board of Directors did not hold a midyear meeting this year. Two factors were involved in this decision. Several board members called to point out that there was a lack of important issues to be taken up this year. This is not an unusual situation and is reflected in the fact that historically, midyear meetings have not been held more often they have been. Secondly was the consideration of Society economics. The midyear meeting involves major expenses for both the board members and the Society in a year when resources are below expectations.

A third consideration is the fact that two of our major concerns are being well taken care of by the respective chairmen of the concerned committees. Barto Arnold, serving as chairman of the membership committee, has done his usual job of going all out with innovative ideas and continuing pressure on the area and state chairs. Likewise, Martha Williams, chairman of the education committee has continually communicated with and revamped the membership of the education committee, pushed for sessions at other meetings such as SAA, and obtained space for publicity in several newsletters including SAA and the Federal Archeology Report. There are also plans for a regular column on education in our Newsletter to be assembled by Julia Longenecker [included in this issue].

The Public Awareness Working Group (PAWG) is the name now given to the former "No Name Committee" in Washington. Two board members, Ron Anzalone and Paul Johnston, are two Washington area members of this committee along with your President. Since we have been trying to save money, I have depended upon Ron and Paul to represent the Society. This is an interagency action committee established largely under the direction of Francis P. McManamon, Chief of the NPS Archeological Assistance Division. Ruthann Knudson is the group facilitator (202) 343-4101.

the project have been previously impacted, already destroying the integrity of the cultural deposits in those areas. A copy of this report is on file at the Vermont Division for Historic Preservation, Montpelier. The collections from this investigation will be curated by the Consulting Archeology Program, University of Vermont, Burlington.

Industrial Archaeology Survey: Field and archival efforts continue on the minimum-level survey of early industrial ruins/remains/sites in Vermont by Vic Rolando. The current phase of this survey, which commenced in 1987-88, has been concentrating on locating and documenting remains of lime kilns. To date, ruins/remains of 87 lime kilns at 56 sites have been reported to the Vermont State Archaeologist.

Lime kiln remains have been categorized, by period, into farm type, early-commercial type, later-commercial type, and modern type, as follows:

Farm type kilns (ca. 1800-1860s): These are primitive in appearance, round in shape, built of field stone with field stone or sandstone linings that are only slightly glazed (low-temperature burning). They measure about 4 to 6 feet inside diameter with 1- to 2-foot thick stone walls, 6 to 8 feet high. Built into low embankments in remote areas near small limestone outcrops, the kiln walls are sometimes mounded up with earth to insulate and seal holes. Farm type kilns were fueled by wood and burned limestone for local needs. They operated intermittently, as needed, by 1 or 2 workers. Ruins/remains of 14 farm type kilns have been found generally in south and southwestern parts of the state.

Early-commercial type kilns (ca. 1850-1900s): Ruins of these kilns are idyllic in appearance and are generally round. Some ruins contain decorative components (Gothic arches) and are built of field stone or cut blocks with refractory stone or firebrick linings that are somewhat glazed. They measure 6 to 8 feet inside diameter, 2 to 3 foot thick stone walls, and 8 to 10 feet high. Ruins of early-commercial type kilns have usually been found near small quarries, and alongside old roads or abandoned railroads. These ruins are usually more obvious than farm kiln ruins. They were fueled by wood and burned limestone for local and regional markets. Although some probably operated perpetually (called running kilns), most are believed to have operated intermittently by 1 or 2 workers. Ruins/remains of 44 early-commercial type kilns have been found generally in south and central parts of the state.

Later-commercial type kilns (ca. 1870s-1920s): Ruins of these kilns are impressive in appearance. They are round or square, built of stone block, have concrete bases, brickwork arches and flues, tall and distinctive iron stacks (usually rusted and/or perforated; some leaning badly; others tipped over and lying on their sides), and have strong internal and external iron binding. Some have heavy horizontal wood support beams built into their stonework. Base sections measure up to 18 feet square by 18 feet high; their 12- to 15-foot diameter iron stacks are lined with heavily glazed firebrick. These later-commercial type kilns were fueled by wood or gas, and burned lime for a regional market. Many show evidence of having been serviced by overhead trestles with tracks on which horse-drawn or cable-operated cars carried stone from a large nearby quarry. Some also had a spur railroad track to a main line. Operated perpetually, they were semi-mechanized and labor intensive. Ruins/remains of 25 later-commercial type kilns have generally been found in the northwestern part of the state.

Modern type kilns (1900s-1950s): These are definitely industrial in appearance, highly mechanized, and were housed in 2- to 3-story buildings. Ruins of these kilns had iron stacks up to 25 feet in diameter that were fed perpetually at top by skip cars or railroad cars on overhead trestles that connected with a nearby quarry. The iron stacks were lined with multiple layers of firebrick, fueled by gas and burned lime for the national market. Of two modern type kiln sites in Vermont, a 2-kiln unit at Winooski that operated to the 1970s was razed in early 1990 for scrap. (This was the most recent-operating lime kiln in Vermont.) A single rotary type kiln unit at Rutland operated to about the 1920s.

An additional 44 sites could yield ruins/remains of an estimated 60 kilns, which constitute current work in progress.

VT-WA-38 is located along Route 2 on a floodplain above the Winooski River in Duxbury. The site is on property which will be impacted by realignment of the highway and the bridge over the river. Phase I reconnaissance in 1989 uncovered an area of dense historic deposits from 50 cm to at least 170 cm below surface, overlain by later flood deposits. The cultural deposits, dating to 1800-1840, thus appeared to have been sealed by historic flooding.

Deed research indicates that Ozias Atherton bought the property (a 3/4 acre lot) for $22 in 1810. In 1815, he sold it along with "the buildings thereon" for $300. In 1827, the property with a house and barn was valued at $200 in an estate inventory. However, by 1830, the 3/4 acre lot, with no reference to structures, was sold for only $25, suggesting that the structures had been damaged or destroyed in the intervening two years, most likely during the damaging floods of March, 1828 and July, 1830.

The Phase II work was completed in June and early July of this year. A ground penetrating radar unit was secured from the Soil Conservation Service to expedite the identification of structural remains buried within the site's alluvial setting. The radar produced a readout of the patterns of the underlying site stratigraphy. Subsurface anomalies such as fill, rubble, or foundation stones sent out a very distinctive pattern in alluvial sand. The unit was used on the area around the cultural deposit located during Phase I to more accurately determine its shape, and in the immediate yard area to identify further disturbances in the natural stratigraphy which might indicate other features.

Any breaks recorded in the radar-produced patterns, which could represent cultural disturbances, were plotted on a site map. Six areas of disturbance were identified and investigated with 1 x 1 meter excavation units. Seven cultural features were found in four of them, including three separate features found in the general disturbance associated with the Phase I feature. The two other area of disturbance were found to be the result of natural forces such as tree fall or burn and root disturbance.

A large area of broken patterns appeared around the deep cultural fill and rock rubble found in the Phase I work. Excavation units placed along the edges of disturbance uncov-

Society for Industrial Archeology · New England Chapters

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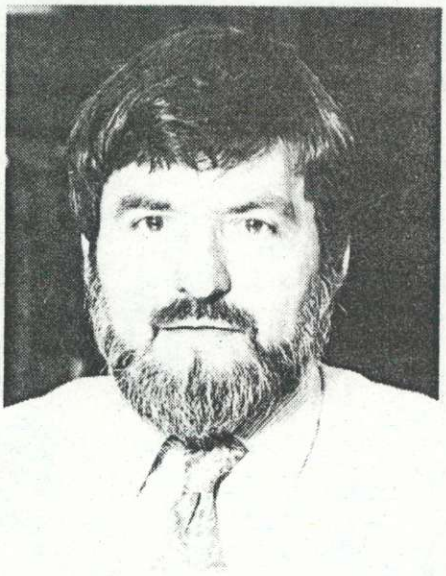


Michael Brewster Folsom

Michael Brewster Folsom died suddenly from a cerebral hemorrage on 12 December 1990. A long-time member of the Southern New England Chapter and the national Society for Industrial Archeology, Michael was known to us all for his curiosity, his interest in the way things worked, and has ability to write and speak about the way technological change affected the lives of people everyday.

A native of New York, he graduated from Antioch College in Ohio in 1961 and received a doctorate in English at the University of California at Berkely in 1972. Michael's introduction to industrial archeology in the early 1970s led him to pursue the postgraduate study of anthropology at Brown University between 1979 and 1981.

Michael moved to Boston in the late 1960s to teach in the humanities department of the Massachusetts Institute of Technology. He stayed there, offering instruction in the humanities at first and later in anthropology and archeology, until the early 1980s. In 1980 he founded and became the first Executive Director of the Charles River Museum, Waltham, Massachusetts. The museum is now an important center for the collection and interpretation of the history and archeology of the Charles River Basin. Michael's study of the industries and the people of the Waltham area led him to a research position at Brandeis University during the middle 1980s. From the late 1980s on, he worked as a free-lance exhibit developer and public historian.

Teaching children about the interaction between machines and people was one of Michael's special interests. At the time of his death he was helping the Tsongas Industrial History Center in Lowell, Massachusetts, to develop ways to help children understand water power and its role in the industrialization of early New England. He was active in the development of curriculum materials while at the Charles River Museum, and assisted a few years ago with the curriculum project of the Society for Industrial Archeology.

Michael loved to talk and write about industrial archeology and his projects were many and diverse. He wrote for children as well as for scholars. He participated in numerous national and chapter meetings as a speaker and worked closely with the 1982 Lowell Conference on Industrial History.

If no request is received by this date, the Connecticut Department of Transportation will certify to the Division Administrator of the Federal Highway Administration, that the opportunity for relocation of this historic structure has been offered to all concerned and approval of the project will be requested from the Federal Highway Administration.

Commissioner
State of Connecticut
Department of Transportation

Article

Individuality and Variability in Design of 19th- and 20th-Century Lime Kilns in Vermont

A Paper Presented to the VAS at Burlington, VT, on October 27, 1990

The state of Vermont constitutes 9,609 square miles, or less than 0.2% of the area of the United States. Yet, a total of 106 lime kiln ruins and remains were found at 65 sites in that small area during the 1984 to 1990 period of a continuing state-wide IA survey, and are now a part of the State Archeological Inventory. Of these ruins, 14 are farm types from the 1800 to 1860 period; 59 are early commercial tpes from the 1850s to the early 1900s; 29 are a later commercial type from the 1870s to the 1920s; and 4 are modern types from the 1920s to the 1950s. Fourteen other sites, at which inconclusive or no positive surface evidence was found, but at which subsurface material might exist, have been reported to the State Archeologist in the Field Site category. In-progress archival and field work continues at 28 more sites. The total number of reported and unreported lime kiln ruins and remains is therefore approximately 151 at this time. The earliest known Vermont lime kiln date is 1794, at Bennington, of which no known surface ruin survives. In terms of something visible, there are 83 ruins in various states of condition to be seen in the field.

Types of kilns employed in lime burning have been grouped into two main categories: intermittent and continuous types. Continuous type kilns have been further divided into mixed feed kilns, separate feed kilns, and rotary kilns. Vermont's only rotary kiln, which was a single unit 8 feet in diameter and 120 feet long, resembling a long smokestack lying on its side, was dismantled int he early 1930s. Only archival materials exist to describe it.

Ruins of 19th-century intermittent-type lime kilns were all constructed of stone, most of which came from the same quarry that provided the stone which was eventually burned inside the kiln. Although this sounds like a peculiar practice, the insides of these kilns soon glazed over from the heat of burning, and the glaze protected the kiln walls from further heat effects. The glaze also helped seal the kiln from unwanted outside drafts, keeping the heat inside and reducing fuel consumption. No mortared walls were found in the early to mid-19th century ruins. Some ruins were built into a hillside or low rise so that the top of the kiln was easily accesible for charging the kiln with stone, while the bottom was left open for supplying fuel and drawing out the burned lime. Some ruins not built into hillsides were covered with a hurdle, which was a coat of earth, leaves, and branches that insulated the kiln, taking care to leave a hole for access to the hearth.

Aside from the general configuration and character of the ruin, which differentiates it from, for example, a charcoal kiln or blast furnace, it is the presence of burned lime in the form of a gray-white grainy powder or small, cracked, white stones caused by the intense heat of burning, in the direct vicinity of the kiln's bottom opening. It was also found scattered about the top of some ruins. Because the bottom opening created a built-in weakness, the front walls of many early ruins were found collapsed and much of their internal stonework slumped outward on the ground, hiding any burnt lime in this area and giving the ruin a random stone-mound appearance.

In charging the kiln, the largest pieces of limestone were first selected and formed into a rough dome-like arch about 5 to 6 feet high, leaving openings around the stones for upward draft. Above this arch, the kiln was filled to the top with limestone fragments with the larger fragments toward the bottom. A wood fire was started under the dome, and the heat was gradually raised to prevent sudden expansion and rupture of the dome. After a bright heat was reached throughout the mass of stone, it was maintained for 3 to 4 days. Complete burning was indicated by a large shrinkage in volume of the contents, the choking up of spaces between the fragments, and the ease that an iron rod could be forced down into the mass from the top of the kiln. The fire was allowed to slowly die out, and the lime was gradually removed from the bottom. The process was simple and cheap, the main expense being for blasting the stone at the quarry and preparing the fuel. One or two kilns supplied a 17th- and 18th-century neighborhood for a year, operating for a week or two, and remaining idle for the remainder of the year.

Lime burned in this manner was used as a fertilizer that reduced the acidity of the soil, and was also used in the tanning and paper-making industries. It was used as a disinfectant, an alkalizer for medicinal purposes, as a filtering

agent in the production of coal gas for lighting city streets in the late 19th century. And, of course, it was used in the manufacture of mortar and cement.

Kiln remains found in Vermont were anything from an 18-foot square by up to 20-foot high stone-built ruin, to a barely distinguishable grass-covered stone mound in the woods. Depending on which direction a ruin is approached, from the uphill side it can appear to be no more than a hole in the ground, or from the downhill side the entrance to a crypt or stone chamber. Front openings varied from a simple square hole overlain with a single, massive stone lintel, to a small archway, or to a decorative Gothic archway with a pointed top.

As a demand for burned lime increased, so did the size and capacity of the kilns increase. Vertical inside walls gave way to slightly tapering walls, resembling an egg standing on end. A kiln 25 to 28 feet high was 10 to 11 feet at its greatest diameter, 5 to 6 feet diameter at the top, and 7 to 8 feet in diameter at the bottom. There was a 5- to 6-foot-high openening at one side to introduce the fuel, and there was a horizontal iron grate, on which the fire was built, placed 1 to 2 feet above the bottom of the kiln to allow space below for ash accumulation and removal.

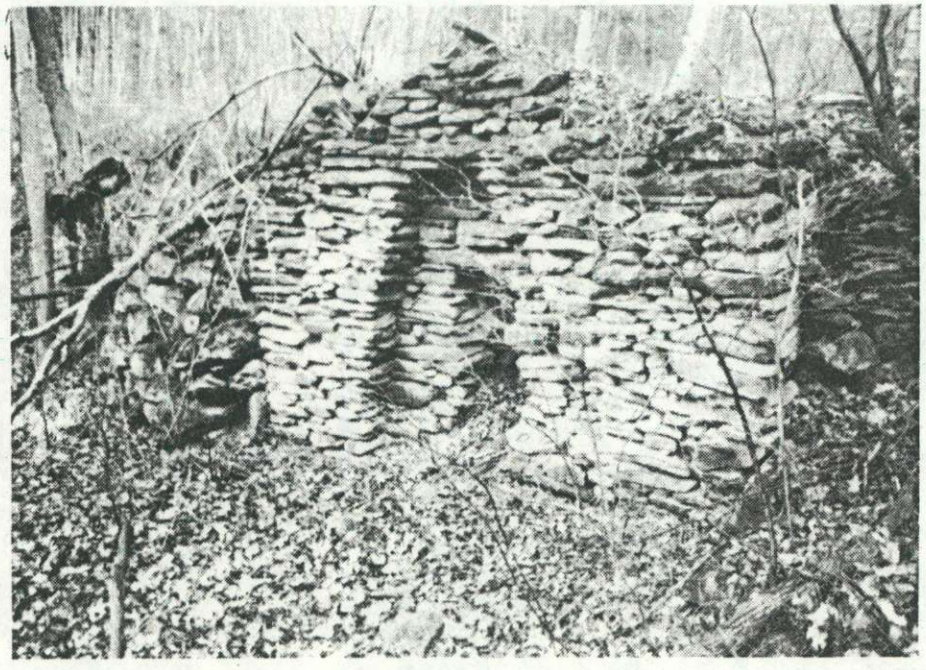
Due to the enormous loss of heat at each separate burning of the intermittent kiln, a continuous type mixed-feed kiln evolved in which limestone and fuel were introduced into the top of the kiln in alternate layers, with the burned lime drawn from the bottom. But the mixed-feed also produced a lime that was neither as evenly burned nor as white as that from the intermittent type kiln, which led to the development of the separate-feed kiln.

Separate-feed kilns, which were in operation throughout most of the country and Vermont by the early 1900s, were equipped with separate chambers, called "fireplaces", to burn the fuel. Fireplaces were set inside the kiln walls of those made of stone, or outside the walls of iron shell type kilns.

The kiln body proper contained the limestone charge while the fuel was fed into the fireplaces where it burned. The limestone, therefore, never came into direct contact with the fuel, but only the hot gases of combution, which rose upward through the limestone and out the top of the kiln. All things being equal, these kilns did not have as high a fuel efficiency as the mixed-feed kilns, but the burned lime was of a significantly higher quality and contained no discolorations or fragments of unburned fuel. These kilns were 35 to 50 feet high. The iron shells were 5 to 8 feet inside diameter, lined with firebrick, and had from 2 to 4 fireplaces.

Late 19th- and all 20th-century ruins were found with firebrick linings. Attention to both firebrick and red brick allowed for the approximation of operating dates of some ruins of which little or no archival material was found. One common firebrick contained markings of the McLeod & Henry Company, manufacturer of firebrick at Troy, New York, from 1887 into the 1890s. Another firebrick, similar in configuration to some found at the blast furnace at Forest Dale, is marked Sayre & Fisher, of Amboy, New Jersey. By the late 19th century, firebrick were being made in a variety of shapes to fit the needs of kiln and furnace designs.

Another indication of thecnological progress at lime kiln ruins was the use of binders to stabilize the stack and keep the stonework together. Most common binders were 1-inch diameter iron rods, threaded at ends that protruded out of the walls. The rod ends had large nuts screwed on with washers that snugged the assembly against the kiln walls, holding the structure tight through cycles of firings and coolings. At other ruins, slotted end binders with beveled iron keys were in evidence, much like the type of binding found at the Forest Dale blast furnace. In some



Mid-nineteenth century lime kiln ruin along Turkey Mountain Road in Jamaica, VT.

collapsed ruins, the internal lateral criss-cross pattern of these iron binders was revealed once the tangle of bent and intertwined hardware was figured out. Wood timbers were also used for support of the walls, especially wall areas over openings. Probably because they were so thoroughly dried by the internal kiln heat, these massive beams have survived to continue their function today at many ruins. But nowhere, however, did the strength of the lime kiln binding approach that of binding used at blast furnaces, which were much more massive in size.

Lime kiln sites were found to have as many as 1 to 7 ruins per site. There were 43 single-kiln sites; eight 2-kiln sites; one 3- and one 4-kiln site; two 5-kiln sites; two 6-kiln sites; and one 7-kiln site. Sites with largest number of ruins were those of combination stone and concrete construction with iron shells.

Anyone familiar with Vermont's landscape is familiar with the rocky nature of the land. Vermont is still known for its marble, slate, and granite industries, but Vermont farmers would rather forget the miles of stone walls they have built during the 200-year history of the state. Stone-built lime kilns reflect, therefore, the adaptive use of a natural resource to answer the need for a practical building material.

The variability in design of 19th-century lime kilns in Vermont reflect the ability of lime burners to adapt the needs of basic kiln design to the available resources. The consistant 8-9-foot inside diameter of early lime kilns, for example, indicates a common knowledge of one aspect of the technology. But the variability in binding, hardware, kiln configuration, and archway design testifies to the individuality that many enterprising Vermonters appeared to make the most of.

Vic Rolando
Pittsfield, Massachusetts

Early twentieth century lime kiln at Leicester Junction, VT. Note collapsed iron shell of second kiln to left of standing ruin.

Article

Moses Pike Steam Saw Mill

The Moses Pike Steam Saw Mill is an archeological site consisting of three disconnected groups of stone foundations. This industrial site is situated in the Town of Groton, New Hampshire. The mill is on the Cockermouth River which drains into the north end of Newfound Lake in west-central New Hampshire. The largest foundation grouping (N.H. site 27GR9) is that of the long saw mill (or main mill) in which logs were cut by moving them back and forth on a long carriage. The boiler house foundation and two additional unidentified foundations are attached to the main mill.The remains of a narrow canal are still visible extending from the north-west end of the boiler house to the south bank of the Cockermouth River. Just outside the boiler house to the north east is a noticeable circular depression of unknown function. East of the canal, between the boiler house and the river, is a separate foundation, also of unknown function, designated N.H. site 27GR11. North east of the main mill foundation on the bank of the river is the foundation of the millwright's residence (27GR10). The land in-between the residence and the mill is low and swampy with a small seasonal brook which passes through the main mill foundation.

The site is a short distance down river from Sculptured Rocks gorge which is heavily used by tourists, swimmers and hikers. The intervening land is steeply sloping with rock outcroppings and a dense cover of conifer trees making an effective natural barrier between the site and the heavily used part of Sculptured Rocks State Park. The stand of conifers continues on into the central part of the site and gradually

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C4/510

October 1, 1990

David Skinas, Survey Archeologist
Division for Historic Preservation
Montpelier, Vermont 05602

Dear David:

I have completed my field work for 1990 and want to settle up with you on the site numbers that we played around with earlier this year. The following site numbers are those you assigned based on my input to you in mid-August. The site names, in case it affects your bookkeeping, is also included as I had input them in the center column, and the new site names as I am actually using them are in the right column:

	was assigned to:	is now assigned to:
VT-BE-153	Amaden & Son Lime Kiln	Harmon Hill Charcoal Mounds
VT-RU-217	Conant Blast Furnace	Conant Blast Furnace (same)
VT-WD-87	West Wardsboro Lime Kiln	Bemis Lime Kiln
VT-WD-88	Grimes Lime Kiln	Pike-Bills Lime Kiln
VT-WN-138	Jewell Brook Lime Kiln	Moore-Calkins Lime Kiln
VT-WN-139	Holbrook Lime Kiln	Schiff Lime Kiln

The following site numbers, assigned to site names as follows per our mid-August communications, are not going to be used as such and not at all, and are hereby "returned" to you:

VT-BE-154	Hopper Brook Lime Kiln
VT-RU-218	Wallingford Lime Kiln
VT-RU-219	Wellman & Kelly Lime Kiln
VT-RU-220	Doran Lime Kiln

I need VT- type site numbers for the following, at which sites surface evidence is confirmed:

VT-FR-_____	Richford Lime Kiln
VT-FR-_____	Swanton Lime Works
VT-WD-_____	Grimes-Fitzgerald Lime Kiln
VT-WD-_____	Kenfield-Kaufmann Lime Kiln
VT-WD-_____	No. 9 Brook Lime Kiln
VT-WD-_____	Gray-Holt Lime Kiln

And, finally, the following are sites with otherwise good archival information and the sites have been inspected with no convincing surface evidence found, although I suspect from the inspection that subsurface evidence might very well exist. I would put these in the Field Site -type category:

FS___(AD)	Powers Lime Works
FS___(AD)	Swinington Lime Kilns
FS___(AD)	Plank Road Lime Kiln
FS___(BE)	Amaden & Son Lime Kiln
FS___(BE)	Readsboro Lime Kiln
FS___(CH)	Bates Lime Kiln
FS___(FR)	Rich Lime Works
FS___(OR)	Limehurst Lake Lime Kiln
FS___(RU)	Village Lime Kiln
FS___(RU)	Kelley & Wellman Lime Kiln
FS___(RU)	Doran Lime Kiln
FS___(WD)	West Wardsboro Lime Kiln
FS___(WD)	Lime Hollow - Bishop Lime Kiln
FS___(WN)	Hall's Lime Kiln
FS___(WN)	Jewell Brook Lime Kiln

(over, please)

I realize this is a lot to ask of you but I would appreciate getting the new numbers for the last two categories (VT- type and FS- type) as soon as possible so that I can incorporate them into the Chapter 10 manuscript, which I have finalized over this past weekend except for the site numbers, and hope to get in the mail to the editor in the next week.

I will, therefore, be owing to you some 27 more reports, which I will start work on soon and hopefully have completed by the end of December 1990 (in addition to the 11 reports I sent to you earlier this year). Not to worry, however; this still leaves me with about 30 lime kiln sites still in the "work-in-progress" category for 1991 (in addition to many ironworks and charcoal-related sites not yet resolved in the field).

All best,

Vic

Lime Kiln subject file

NATIONAL REGISTER ASSESSMENT
for the
CHAMPLAIN VALLEY LIME COMPANY
Colchester,
Chittenden County, Vermont

LOUIS BERGER & ASSOCIATES, INC.

100 Halsted Street
East Orange, New Jersey 07019

NATIONAL REGISTER ASSESSMENT
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CHAMPLAIN VALLEY LIME COMPANY
Colchester,
Chittenden County, Vermont

Prepared for:

THE JOHNSON COMPANY
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Media, Pennsylvania

November 1989

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I. INTRODUCTION

The subject of this report is the abandoned industrial plant of the Champlain Valley Lime Company, which is situated on the Winooski River in Colchester, Chittenden County, Vermont (Figure 1), which was originally recorded for the Vermont Division of Historic Preservation (VDHP No. VT-CH-284) in 1986. Although lime production has been recorded at the site since at least the middle of the nineteenth century, the property as it presently exists represents the remains of a production facility built in 1924-25 that remained in operation until late 1971. The purpose of this study has been to compile physical and historical information in order to evaluate the potential of the site to meet criteria of the National Register of Historic Places. Section II presents a brief overview of the history of lime production in Vermont. This is followed, in Section III, by a history of the site itself. Section IV describes field and research activities undertaken during the study. In Section V, the site as it presently exists is described, and a discussion of the lime production process as evidenced by the extant physical remains presented. Section VI contains an evaluation of the site according to National Register criteria. Section VII presents an assessment of physical condition as well as a discussion of preservation potential.

This study was undertaken in October-November 1989 for The Johnson Company, Montpelier, Vermont, by the Cultural Resource Group of Louis Berger & Associates, Inc. (LBA), with John R. Bowie, A.I.A., as consulting historical architect. The report was written by Martha H. Bowers, LBA Senior Architectural Historian; Benjamin Resnick, LBA Archaeologist, and Mr. Bowie. Historical research was conducted at the VDHP, the Vermont Historical Society Library, and the Bailey-Howe Library at the University of Vermont.

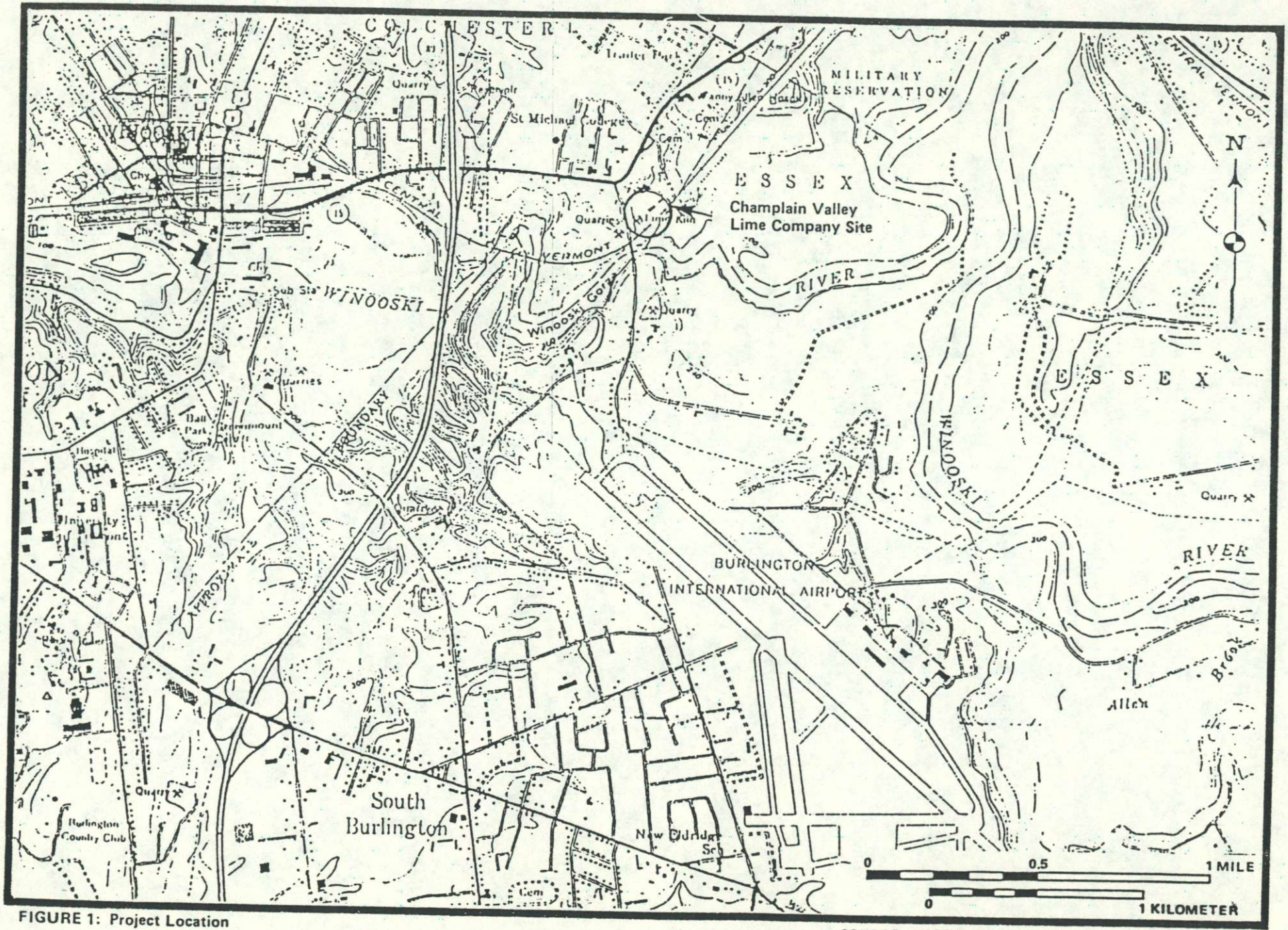

FIGURE 1: Project Location

SOURCE: USGS Burlington VT Quadrangle, 7.5' Minute Series

II. HISTORICAL BACKGROUND

As noted by the State Geologist in 1908, "limestone has never made a large showing in the assets" of Vermont, particularly when measured against other extraction-based industries, notably marble, granite, and slate (Report of the Vermont State Geologist [hereinafter cited as RVSG] 1908:46). To eighteenth- and nineteenth-century Vermonters, however, lime had its valuable uses, both in agriculture and in construction. As a soil corrective, lime neutralized acidity in soil; and lime-sand mortar "was the most common type used in structures located above water level until the late 19th century" when other products, such as Portland cement, came into widespread use (McKee 1973:62).

Limestone was present, in varying quantities, in many areas of Vermont. Numerous small lime-burning operations were undertaken by the would-be entrepreneur as well as the farmer fortunate enough to have a source of stone, and the inclination to build and run a kiln, on his own land. In the opinion of the State Geologist, most of the lime works operating in the mid-nineteenth century in Vermont were rather unsophisticated, generally consisting of one or more "rough kilns of rude stone" (RVSG 1846:232-3). In 1846, he noted the existence of quarries and lime-burning in various quarters of Vermont, including Tunbridge, Cavendish, Danville, Vershire, Mendon, Sherburne, and Bakersfield (RVSG 1846:242-3). The main producer at this point in the nineteenth century, Plymouth, was described as having "probably more lime-kilns...than in any other five [towns]" (RVSG 1846:242-3). Plymouth benefited from a white limestone which, when burned, produced a highly satisfactory gray lime. Customers came not only from Plymouth, but also from surrounding towns less blessed with sources of burnable limestone, and in 1840, some 2,000 hogsheads of lime were produced in the town (Cummings 1918:119).

Over 30 lime kiln sites have been recorded to date in Vermont, although these represent only a fraction of the whole number of lime-burning operations in the state during the eighteenth and nineteenth centuries (Victor Rolando, personal communication). Ten of the recorded sites are located in Plymouth, confirmation of that town's former prominence as a center for lime production in the state. In general, lime kiln sites range from truncated stone stacks to piles of rubble, almost invariably built into the slope of a hill or in front of a rock ledge. When whole, many are likely to have corresponded to Appleton's 1859 description of an "intermittent" kiln, so-called because the need to cool the structure in order to remove the burned lime resulted in production in "batches" rather than in a continuous process.

> The kiln is perpendicular, and constructed of the same limestone as that which it is intended to burn. It is

> placed at the side of a steep hill or declivity, so that the mouth is equally accessible for charging the kiln, as the fire-place for introducing the fuel....A projection or ledge is carried in the form of a ring all round the interior of the furnace, but not at the same height from the ground, inclining towards the stoking-hole....The lime-burner begins by constructing a pointed arch upon the ledge...He forms in this manner a kind of support or foundation, upon which the other limestones are then put in, at random, from above, the largest first and the smaller pieces afterwards...When the charge has been thus arranged, a pile of wood is erected in the space below the arch, and ignited...The furnace must be allowed to cool each time it is recharged... (Appleton 1859:223-224).

Due to lack of funding, the Vermont State Geologist published almost no formal reports during the last four decades of the nineteenth century. When publication resumed in the late 1890s, lime was still being burned on both sides of the Green Mountains: Whitingham, Plymouth, Townshend, Weathersfield, and Cavendish to the east, Highgate, Swanton, Colchester, Grand Isle, Brandon, and Leicester to the west (RVSG 1900:31). Although intermittent kilns of "rude stone" were still in operation, larger producers had by this time constructed "perpetual" kilns for greater efficiency and better quality (RVSG 1900:36). In a "perpetual" operation, lime could be drawn out of the kiln at intervals, while the stone above it continued to be burned (thus avoiding the delays associated with cooling the kiln after each batch). Perpetual kilns commonly used coal, rather than wood, as the fuel.

> A layer of brushwood is first placed at the bottom of the kiln, upon this some coal, then a layer of limestone, which is again covered with coal, and then another layer of limestone, and so on until the kiln is filled...As soon as the uppermost layer has sunk down to the level of the top of the kiln, another charge of coal and limestone is thrown upon it. In the mean time, at intervals of one-half to one-quarter of an hour, the lime which as sunk to the bottom of the kiln is drawn out through the holes [at the base of the kiln] (Appleton 1859:224).

As the industry entered the twentieth century, economies of scale resulted in an increasing concentration of Vermont's "larger producers" west of the Green Mountains, where the geology of the Champlain valley offered the largest deposits of limestone suitable for burning. Well before World War I, a handful of firms had emerged to dominate commercial lime production in Vermont, and would continue to dominate it into the middle of the century. As of about 1905, these were J.P. Rich's Swanton Lime Works, W.B. Fonda at St. Albans, L.E. Felton's Missisquoi Lime at Highgate

Springs, Brandon Lime and Marble, G.B. Catlin's works at Colchester, Leicester Marble-Lime at Leicester Junction, and, alone on the east side of the mountains, the Amsden works in Weathersfield (RVSG 1904:51; 1905:7). Twenty years later, most of these firms were still in operation, their numbers augmented by Vermont Marble of West Rutland (which burned not quarried limestone but dust from its marble works, and used a rotary, rather than vertical, kiln), the Green Mountain Lime Company at New Haven Junction, Pownal Lime Company, and Vermont Lime Company in Danby (RVSG 1916:101; 1928:386; Thompson 1926).

The twenties appear to have been a period of prosperity in the industry; despite competition from Portland cement and gypsum, lime still had an important market in the building trades as well as in chemical industries. The agricultural market for lime also received a significant boost, as beginning in the late 1920s and well into the 1930s, both state and federal agricultural departments and agencies mounted campaigns for the material's expanded use (Hurd 1978:128; Ledoux 1988:61). This prosperity was evidenced by the appearance of two new firms in 1923 (Vermont Lime of Danby and Leicester Lime), the erection of a new plant at the former Catlin works (by this time Champlain Valley Lime Company) in Colchester in 1924-25, new facilities at Amsden in 1927-28, and at Swanton in 1937 (see Thompson 1926; Hurd 1978:128; Ledoux 1988:61).

By this period, kilns were often made of steel, and the fuel (coal and/or wood) was consumed in separate compartments, called fireboxes, rather than coming into direct contact with the raw stone. In addition, the more "modern" kilns were emptied from openings directly beneath the furnaces, rather than from openings in the sides (Thompson 1926:10, 35). The latter feature resulted in kilns being built on raised "platforms" of one form or another, to elevate them sufficiently to permit the burned lime to be collected from beneath.

The character of the Vermont State Geologist's reports changed significantly during the 1940s, among the losses being the biennial "profiles" of the state's various mineral-based industries. A certain degree of consolidation appears to have taken place, however, after World War II, when Vermont Associated Lime Industries, based at Leicester Junction, acquired several other firms, including Green Mountain Lime at New Haven and Champlain Valley Lime at Colchester (Carlisle 1975:13; Farnsworth and Rodgers 1984:147). Since that time, the works at Danby, Highgate Junction, Leicester Junction, Fonda, Pownal, Amsden, Colchester, and New Haven have been abandoned; the Rich family's Swanton operations, however, are still active, although under new ownership and producing only crushed stone, rather than lime, with mid-twentieth-century equipment (Farnsworth and Rodgers 1984:147; Victor Rolando, personal communication; VDHP Site Survey Forms BE-119, WN-104, FR-178). It should also be noted that in the United States as a whole, 85 percent of commercial lime is now produced in rotary, rather

than vertical or "shaft" kilns. Although of poor thermal efficiency, the rotary kiln has been found to achieve a higher production rate, and to permit more precise control over time-temperature relationships (McGraw-Hill 1987:511-512). The rotary kiln was introduced to Vermont by the Vermont Marble Company, of West Rutland, about 1915 (see RVSG 1916:101ff; Thompson 1926:43ff).

III. LIME PRODUCTION AT THE COLCHESTER SITE

Lime burning near the "high bridge" over the Winooski River between Colchester and Burlington is believed to have begun about 1819-1820, on the Burlington side, by one Jabez Penniman (Rann 1886). Subsequently, an operation was established on the Colchester side by Robert Jackson and John McGregor (Rann 1886:794; Carlisle 1975:10). By 1864, Sidney H. Weston, a wealthy Colchester entrepreneur, had purchased half-interests in both operations, and eventually assumed full ownership (Rann 1886:793-94). Until 1898, the lime works produced under the name S.H. Weston. That year, Walton's Vermont Register listed the enterprise under Tobey and Catlin (Walton 1898:105). This partnership of brothers-in-law (G.G.F. Tobey had married Sidney Weston's daughter Matilda, while her sister, Ina, was married to George B. Catlin) lasted until 1907, when Walton's listed Catlin as sole proprietor (Rann 1886:795; Walton 1907:174).

In 1916, the works were first listed in Walton's as the Champlain Valley Lime Company (Walton 1916:250), although Carlisle (1975:13) states that this name was in use in 1907. The State Geologist's report for 1917-18 included an article on the lime industry in Vermont (see Jacobs 1918), which included a brief description of the "Champlain Valley Lime Corp. of [Worcester] Mass." According to Jacobs, the property occupied about 86 acres, including a 300 foot x 400 foot quarry. From the quarry, blasted rock was hauled by teams to the kiln building, where it was fed into three wood-burning kilns. One hundred barrels of lime were produced each day, much of it for use by chemical and paper manufacturers (Jacobs 1918:161).

The Worcester corporation which then owned the plant had, since 1907, operated a lime works at New Haven Junction, on 64 acres lying west of an earlier kiln site developed in the early nineteenth century by one Joseph W. Palmer. In about 1924-25, D.H. Brewer, then president of the company (called Green Mountain Lime Company), invested a substantial sum in what may have been almost complete replacement of the existing Colchester facility, with new buildings, structures and equipment. This "new Winooski lime project" was portrayed in the Sanborn Company's insurance map of Winooski in 1926. In the same year, Robert Thompson, a young University of Vermont civil engineering student, visited the plant, and included a description of the facility in his degree thesis.

As described by Robert Thompson, stone was quarried within a hundred yards of the plant, out of the face of a cliff some 150 feet high. It was crushed by hand to "one man size," and placed on an electric hoist that drew the stone up an inclined track arranged to permit dumping into any or all of the four kilns. A storage bin for dirt and unsuitable rock was positioned about halfway up the

incline, elevated high enough for trucks to be loaded with the discarded material from below (Thompson 1926:37).

The Champlain Valley Lime Company was furnished with four vertical steel kilns, with an inside diameter of 17 feet and a height of about 50 feet above the firing floor. The coal burned at these kilns arrived by rail car and was dumped into a storage pit, from which it fell into a crusher. From the crusher, the "powdered" coal was automatically fed onto an endless conveyor, which ran to a point above the kilns. A screw conveyor then carried the coal to bunkers situated on each side of the kilns. From the bunkers, the coal was fed into hoppers that released fuel into the fire-boxes according to the dictates of an electrically operated time clock (Thompson 1926:37-38).

The kilns were kept full of stone, for constant production, with lime being drawn off every four hours onto the sorting floor, which was positioned about 20 feet below the firing floor. The lumps were manually sorted for quality and size, then fed onto an endless conveyor to one of two crushers, depending upon the grade of lime desired. From the crushers, the lime was moved by elevator to storage bins, where it was "automatically barrelled" in 100- or 200-pound containers manufactured on-site. The output of the plant was about 30 tons of lime per kiln per day, a figure to which the extensive use of automatic conveyors no doubt contributed. Indeed, "the only time the lime [was] touched by hand [was] when it [was] drawn from the kilns and placed on the conveyor leading to the crusher" (Thompson 1926:38-39).

During the 1930s, despite the depression, Champlain Valley Lime remained active, producing building, chemical, and spraying limes under brand names such as Mason's Hydrate, Snow Fluff Spraying Hydrate, Agricultural Hydrate, and Sure Crop (RVSG 1934:30). In the last of the State Geologist's reports to contain information of this kind, 20 men were reported employed at the plant (RVSG 1946:93). In 1948, the works and its "parent" company, Green Mountain Lime in New Haven, were sold to John M. Dalgish of Brandon, and by 1950 both were operated as part of Vermont Associated Lime Industries. Champlain Valley Lime continued to operate until December 1971, when the firm lost the government contract which by that time was its primary source of income (Carlisle 1975:13; Farnsworth and Rodgers 1984:147).

IV. FIELD METHODS

The Champlain Valley Lime Company Site was first recorded for the Vermont Division of Historic Preservation by Victor Rolando in October 1986. This investigation did not include subsurface testing. The site was subject of an archaeological reconnaissance again in late October 1989; although this reconnaissance also did not include subsurface testing, the archaeologist was present during the excavation of backhoe trenches by The Johnson Company, the purpose of which was to obtain soil samples for testing for the presence of hazardous waste. This monitoring effort was undertaken at the request of VDHP, to ensure that archaeological features or deposits, if present, were not inadvertently disturbed or destroyed. During the reconnaissance, a generalized site plan was developed and a systematic walkover of the entire site completed.

Eight backhoe trenches, each about 4 feet wide, 8 feet long, and 10 feet deep, were excavated under the direction of Mr. Steve Wrenn, geologist with The Johnson Company (Figure 2; Plate 1). In general, these trenches contained up to two feet of lime, coal, and/or quarry spoil, depending upon their proximity to structures. Subsoils included up to eight feet of gray to grayish brown silty sands. Backhoe Trenches 5 and 6, located north of the kiln building and the processing plant, respectively, encountered the water table at less than four feet below surface. A deep lime deposit was identified in Backhoe Trench 4, which was excavated toward the northern portion of the site near the quarry bank. Not surprisingly, a heavy concentration of coal was revealed in Backhoe Trench 8, located near the coal trestle. This trench also contained a foundation for one of the trestle bents, at approximately three feet below the ground surface. This foundation consisted of two concrete footings, 2.2 feet wide and 0.5 foot deep, extending east-west across the trench; the footings were separated by an interval of five feet, corresponding to the base width of the trestle. Beneath the southernmost of these footings, the excavation revealed what appears to have been a large limestone block, extending over three feet in depth.

In early November, the Champlain Valley Lime Company Site was also investigated for the purpose of recording information about the buildings and structures and machinery still present at the works. This work was undertaken in association with historical research at the University of Vermont, the Vermont Historical Society Library, and the VDHP. The site and its associated quarries were systematically photographed, and the two major structures (kiln building and processing plant) were investigated to the extent consistent with safety considerations. The results of this effort are presented in the following section.

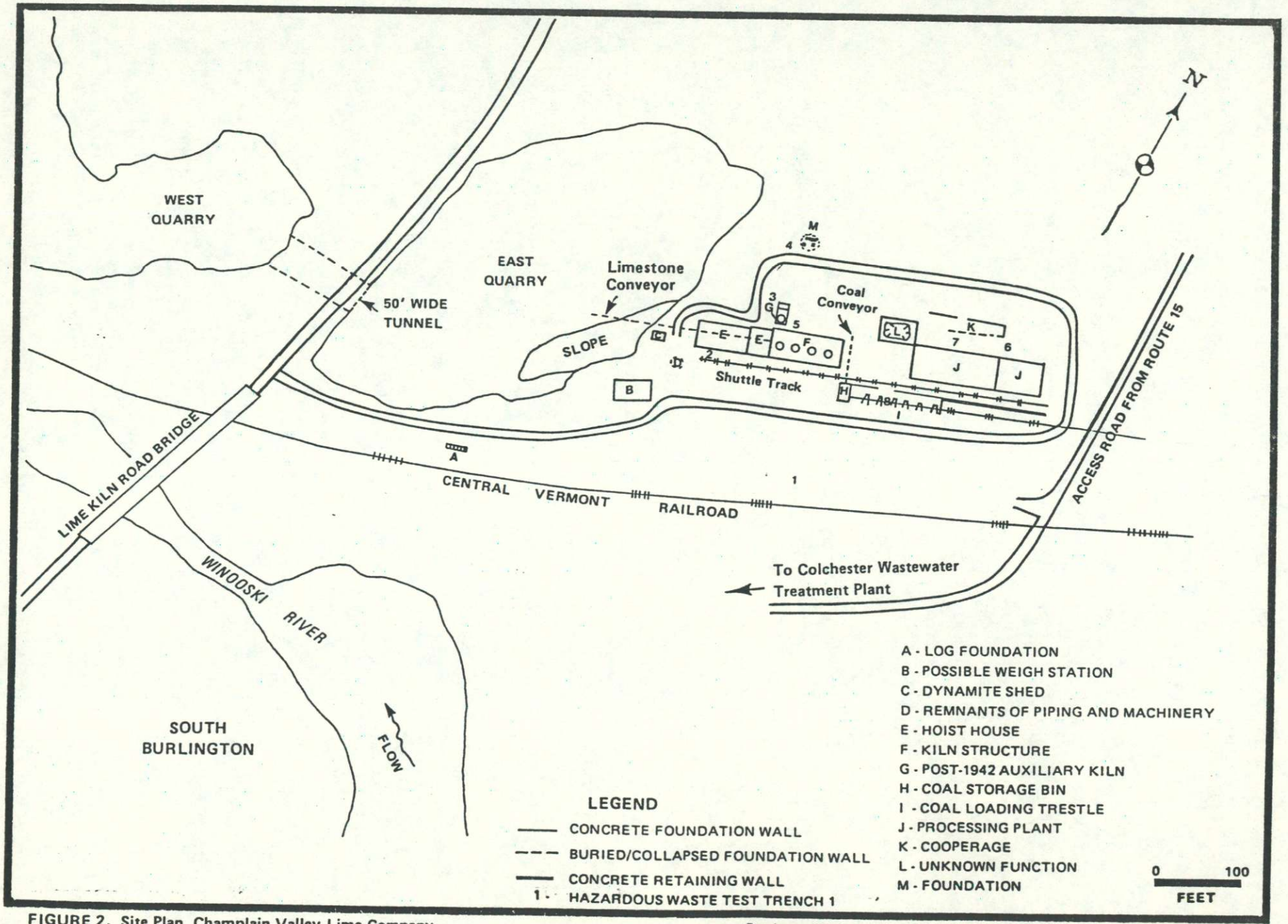

FIGURE 2. Site Plan, Champlain Valley Lime Company

Portions of This Map Were Traced From Town Engineers Aerial Photo, 1969

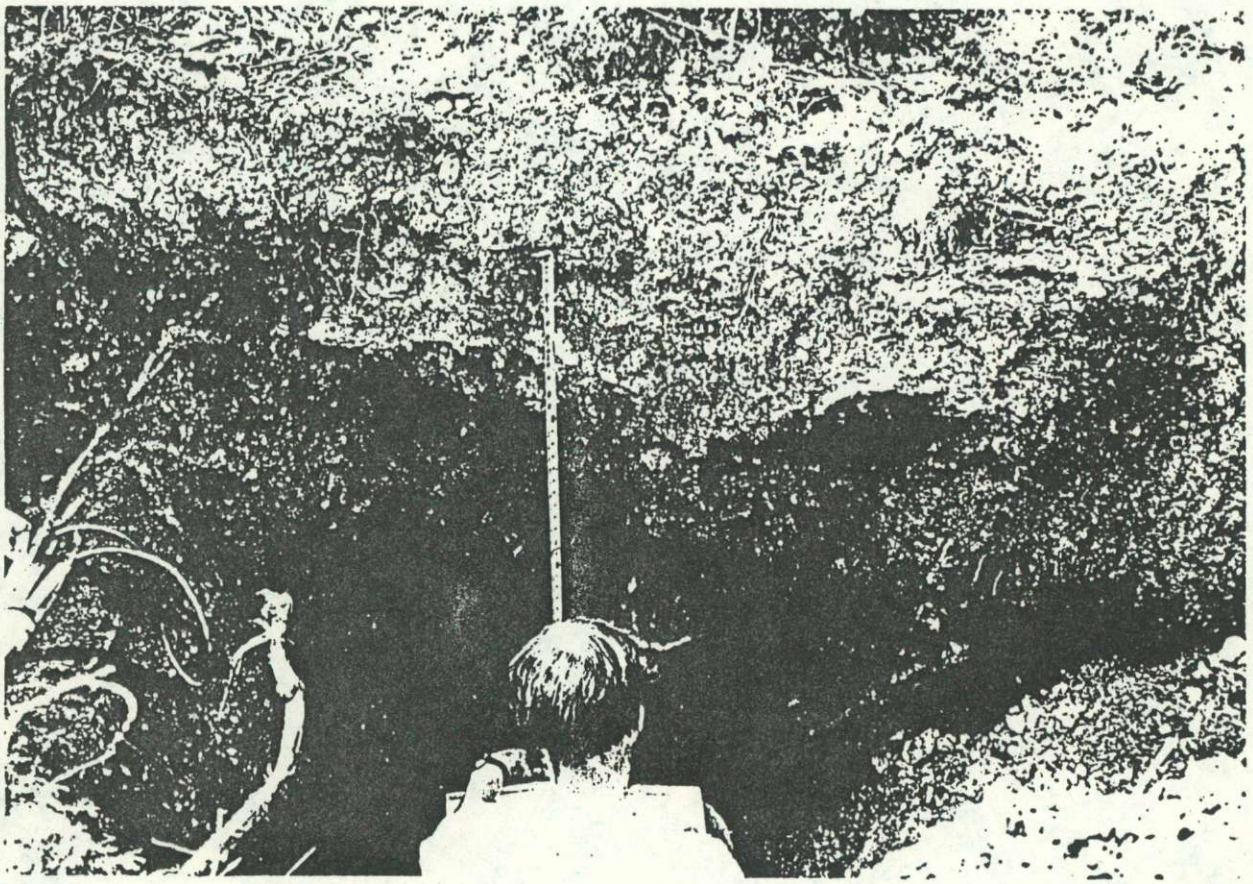

PLATE 1: Backhoe Trench No. 1, View to South

V. SITE DESCRIPTION

The Champlain Valley Lime Company Site is situated on the north side of the Winooski River in Colchester, Chittenden County (see Figure 1). The site, contained in Lot 9 on the tax map, is bounded on the south by the Central Vermont Railroad line, on the west by Lime Kiln Road, on the east by an access road from Route 15, and on the north by largely undeveloped land in the possession of St. Michael's College. The site contains remains of the twentieth-century lime production plant, as well as one of two quarries from which limestone was obtained (Plate 2) (see also Figure 2 for site plan). A second quarry (connected to the first quarry by means of a tunnel, now under water, beneath Lime Kiln Road) is located on Lot 6, on the west side of Lime Kiln Road. Both quarries are partially filled with water, the depth of which is unknown.

The structures extant upon the site are arranged in a generally linear fashion from west to east, following the process utilized at the plant. What appears to be the upper portion of an earthen ramp rises out of the eastern edge of the quarry; on the quarry bank at that point is a very small one-room, slant-roofed concrete building (Plate 3). A door and a window opening are present in the east wall of this building, facing toward a larger, gable-roofed building, approximately 50 feet to the east, which according to the 1926 Sanborn map was the hoist house. The west, north, and south walls of this latter structure are constructed of concrete, with steel trusses and purlins carrying the roof, which was constructed of concrete and steel mesh (Plate 4). Toward the east end of the hoist house, a steel tower rises from a large concrete plinth to support the remains of a steel framework for a conveyor. The east end of the hoist house, which abutted the kiln building, is no longer present, and the building is enclosed at this end with corrugated sheet metal.

These features are associated with the first steps in the production of lime, specifically the removal of limestone from the quarry and transport to the kilns for burning. The earthen ramp rising out of the quarry is interpreted as either an access road into the excavation, or a feature that supported one or more additional steel towers carrying the conveyor. The small concrete building at the edge of the quarry was identified on the 1942 Sanborn map as a dynamite shed (containing the charges used to blast rock off the faces of the quarry); the existence of electrical switches on the interior, however, suggests that the building was used, at one time, as an operator's shed for controlling the movement of the conveyor.

The conveyor itself may have been one of two types, either of which could have logically been used at the site; existing fragments of machinery associated with both types remain at the site. If the

conveyor were of the "endless loop" configuration, it would have been fitted with a continuous belt with large steel cups (two to three feet across), attached at regular intervals of four to six feet. These cups would have carried raw stone from a holding bin at the base of the quarry up to the top of the kiln. The stone would have then been dumped into the kiln; at the top of the conveyor, the belt would have gone around a pulley, dropped the raw stone, and continued back through the center of the conveyor framework down into the quarry, thus providing a continuous feed of stone as long as the conveyor was operating. Alternatively, a "batch type" of conveyor operation would mean that a series of small rail cars were run on tracks fastened to the topside members of the conveyor framework. The full cars would have been run up to the top for dumping, then pulled back down into the quarry for reloading. (No further movement of raw material could take place while the cars were returning to the quarry, hence the name "batch type.")

Regardless of the kind of conveyor system used, the system would have been powered by a reciprocating engine (probably a Corliss type) situated in the concrete-walled hoist house beneath the conveyor framework. The engine, which was gasoline-powered according to the Sanborn insurance map of 1926, drove a sheave (via a large spur gear) that provided power to the conveyor. If the "endless loop" configuration was employed, the sheave would have powered either a pulley or a chain gear at the top. If the configuration was the "batch" type, the sheave would have driven a large cable winding drum that would gather a steel cable connected to the cars via a pulley at the top. As the cable was gathered, the limestone-laden cars would be hoisted up the conveyor.

The four kilns of the Champlain Valley Lime Company are elevated above ground level on a massive cantilevered concrete platform carried on equally massive concrete piers (Plate 5). The kilns are of riveted steel plate construction and lined with firebrick; each is about 50 feet high and 17 feet in interior diameter. The firing level is contained on the cantilevered platform. Here, paired furnaces or fireboxes are positioned on the north and south sides of each kiln. They are constructed of firebrick within steel framing and are encased in riveted steel plate (Plates 6 and 7). The firing floor is partially enclosed by reinforced concrete walls, and sheltered by a galvanized sheet metal roof carried on steel trusses. Hoppers from which burned lime was removed protrude from beneath the cantilevered platform, along an "aisle" formed by the concrete piers that support the kilns and platform (Plate 8). At the west end of the structure, a steel spiral stair rises to the level of the top of the kilns. Beside it is a steel-framed materials elevator equipped with a continuous canvas belt and small steel cups, which may have been used as an alternative to the large conveyor for small loads, or to lift admixtures that might be needed in the lime.

At this "kiln building," raw limestone brought up by the conveyor was moved horizontally above the kilns, where it was discharged into each kiln from the top. Once full, the kilns would be heated by the combustion of coal at the firing level (approximately 30 feet below the tops of the kilns). The coal itself did not come into contact with the limestone, thus ensuring a uniform level of quality in the finished product. Combustion gases and heat generated in the process were channeled into the sides of the kilns and rose through them to escape into the atmosphere. As the lime burned, it settled and packed uniformly under its own weight into the steel hopper at the base of each kiln, where large, hydraulically controlled steel gate valves controlled its release into a horizontal conveyor at ground level.

Extant site features associated with coal-handling are located south of, and parallel to, the processing plant (see below), and thus southeast of the kiln building. These consist of a series of reinforced concrete bents for a slightly inclined trestle, a concrete coal storage bin, and structural fragments of a conveyor no longer present (Plate 9). The process of coal-handling proceeded from east to west (unlike the process of lime production, which proceeded from west to east). The fuel was brought to the site by rail car, on a siding off the Central Vermont Railway line which now forms the south edge of the plant site. At the end of the spur, the cars moved onto the trestle, from which the coal was unloaded into the storage bin where it was protected from rain, thus preventing its freezing solid during winter. As needed, coal was lifted from the bin via a steel conveyor (indicated on the 1926 Sanborn map) up to the firing floors along the north and south sides of the kilns. Here, a horizontal screw conveyor moved the fuel to the steel hoppers on top of each firebox. Flow of coal from the hoppers into the fireboxes was controlled by rotating steel plates encased in a cylindrical frame that acted much like a butterfly valve. Ash remaining from the burning of the coal collected at the bottom of each firebox, from which it could be removed through a large steel plate door.

The final stages in the production of lime are represented in the processing plant, a concrete and steel-framed building largely enclosed by riveted steel plate and corrugated sheet metal (Plates 10 and 11). The walls enclose a variety of elevators and conveyors as well as two crusher bins and several storage bins (Plate 12). The "ground" level of the building is several feet above existing grade, and the floor is almost completely covered with lime. The processing plant is situated approximately 100 feet east of, and directly on axis with the kiln building. A horizontal conveyor (non-extant) brought burned lime (still in lump form) from beneath the kiln building to the processing plant, where the material was lifted by elevator (a continuous belt with steel cups) to the top of the building, where it was dumped into one of the crushing bins. Within the bin, a series of closely spaced steel rollers would crush the lime, which would then be collected from below. The lime

was then either raised in a second elevator to a storage bin or crushed a second time, to a finer consistency, in another crusher in which the rollers were more closely placed. The crushed lime ready for end-user pickup was conveyed to the east end of the processing plant, where it was packed in barrels. As indicated on the 1926 and 1942 Sanborn maps, these containers were manufactured on-site, in a cooperage located directly north of the processing plant. The cooperage is represented now only by concrete foundation fragments.

The buildings and structures described above constitute the most obvious features of the Champlain Valley Lime Company Site, both physically and functionally. Other visible features are less open to interpretation. Almost due south of the dynamite storage/control structure at the east end of the quarry is a concrete platform and foundation which appears to represent the remains of a weighing station or platform scale (Plate 13). Also present on the site is a small shuttle rail track, which runs along the south side of the kiln building east to the east end of the processing plant. The purpose of this track (which is shown on the 1926 Sanborn map), beyond that of moving materials of some kind, is unknown. Directly off the northwest corner of the kiln building is a small, self-contained steel kiln unit with a fan attachment; this feature post-dates the 1942 Sanborn map, and may have been used for small-scale specialized processing. Adjacent to the northwest corner of the processing plant is a concrete foundation that appears to have supported a building at one time (after 1942, as it is not shown on the Sanborn map of that year). Within the foundation are two steel hoppers, one of square section, the other circular, the uses for which are unknown (Plate 14). Finally, remains of a foundation to which no function can at this time be assigned are present about 100 feet north of the kiln building. These remains consist of four concrete-filled steel drums of approximately 55-gallon capacity set into the ground at grade. Flanking these drums are two 2 foot x 4 foot concrete piers or pedestals which extend to a depth of at least three feet, with their upper surfaces even with the present ground surface. The area around and including the foundation, approximately 10 feet in diameter, is covered with limestone fragments.

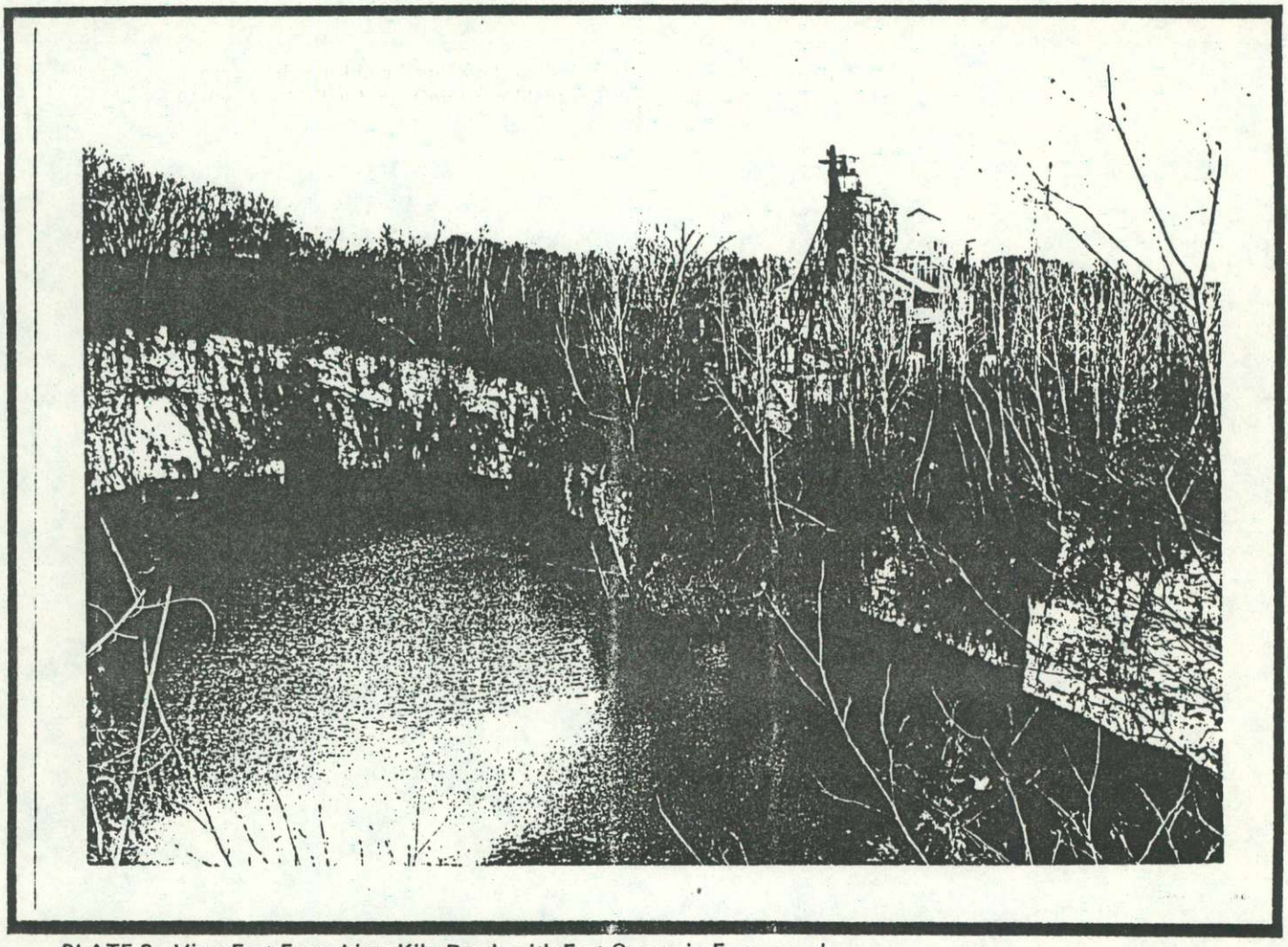

PLATE 2. View East From Lime Kiln Road, with East Quarry in Foreground, Champlain Valley Lime Company Plant at Right Rear

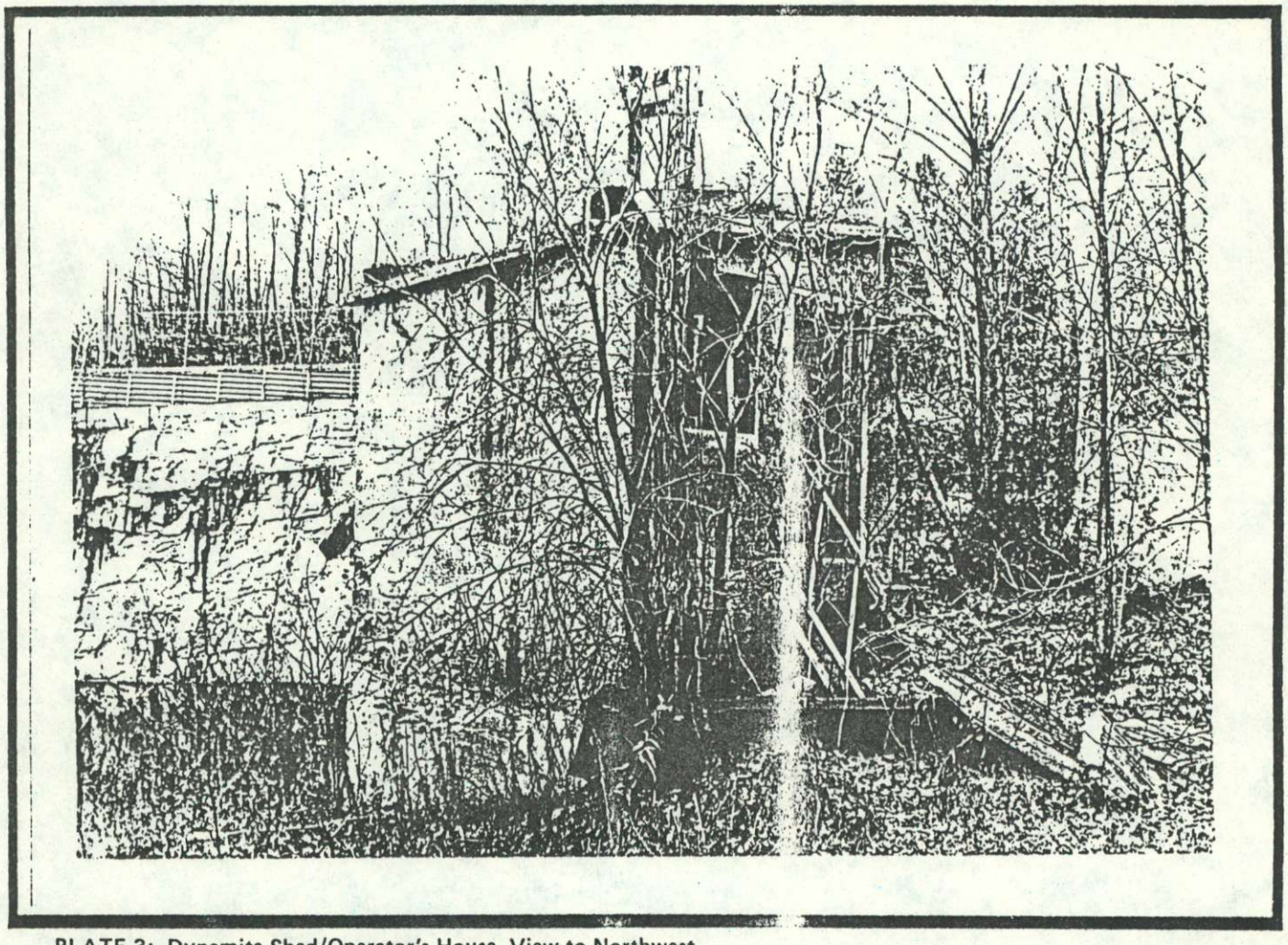

PLATE 3: Dynamite Shed/Operator's House, View to Northwest

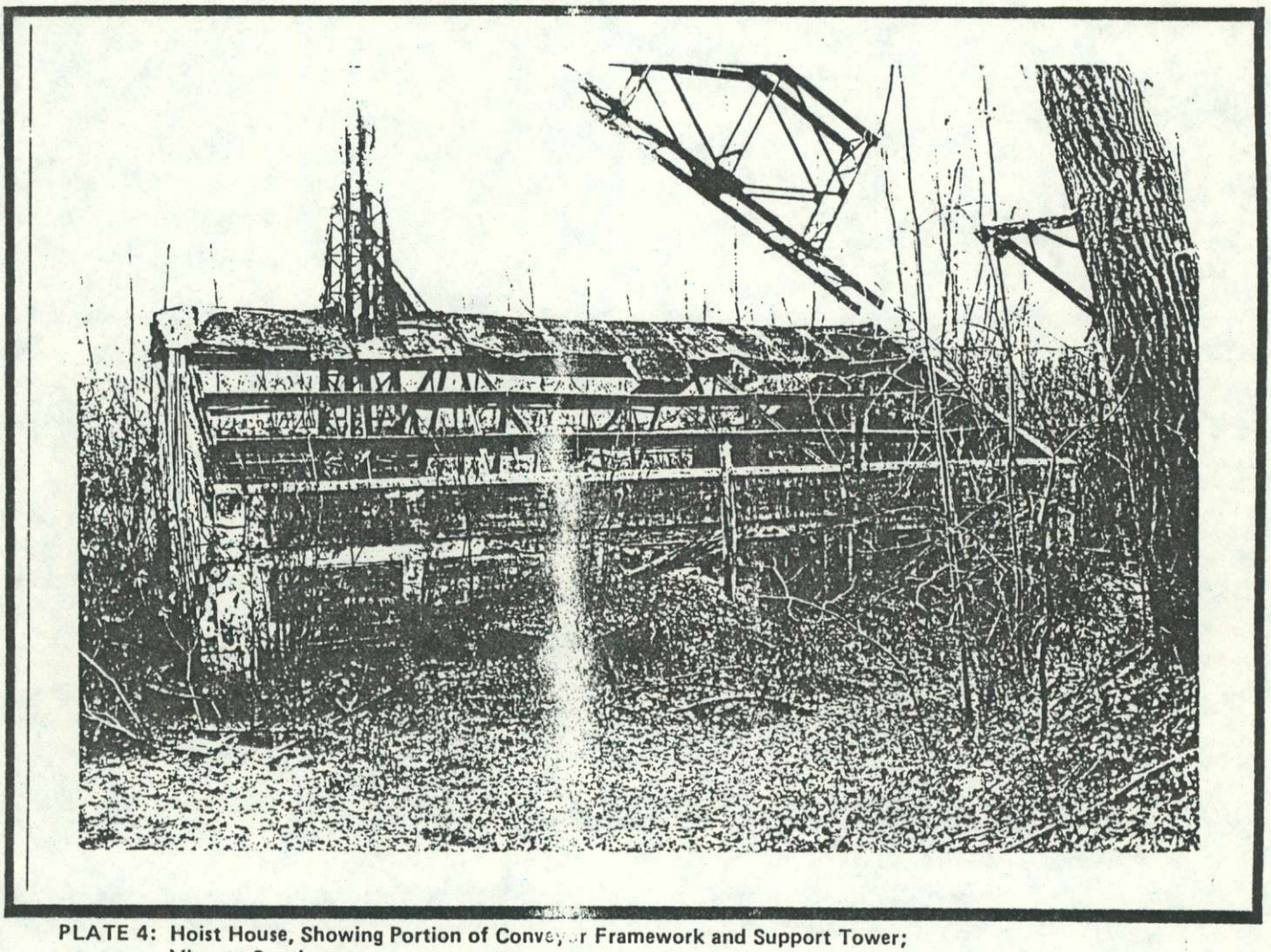

PLATE 4: Hoist House, Showing Portion of Conveyor Framework and Support Tower; View to Southwest

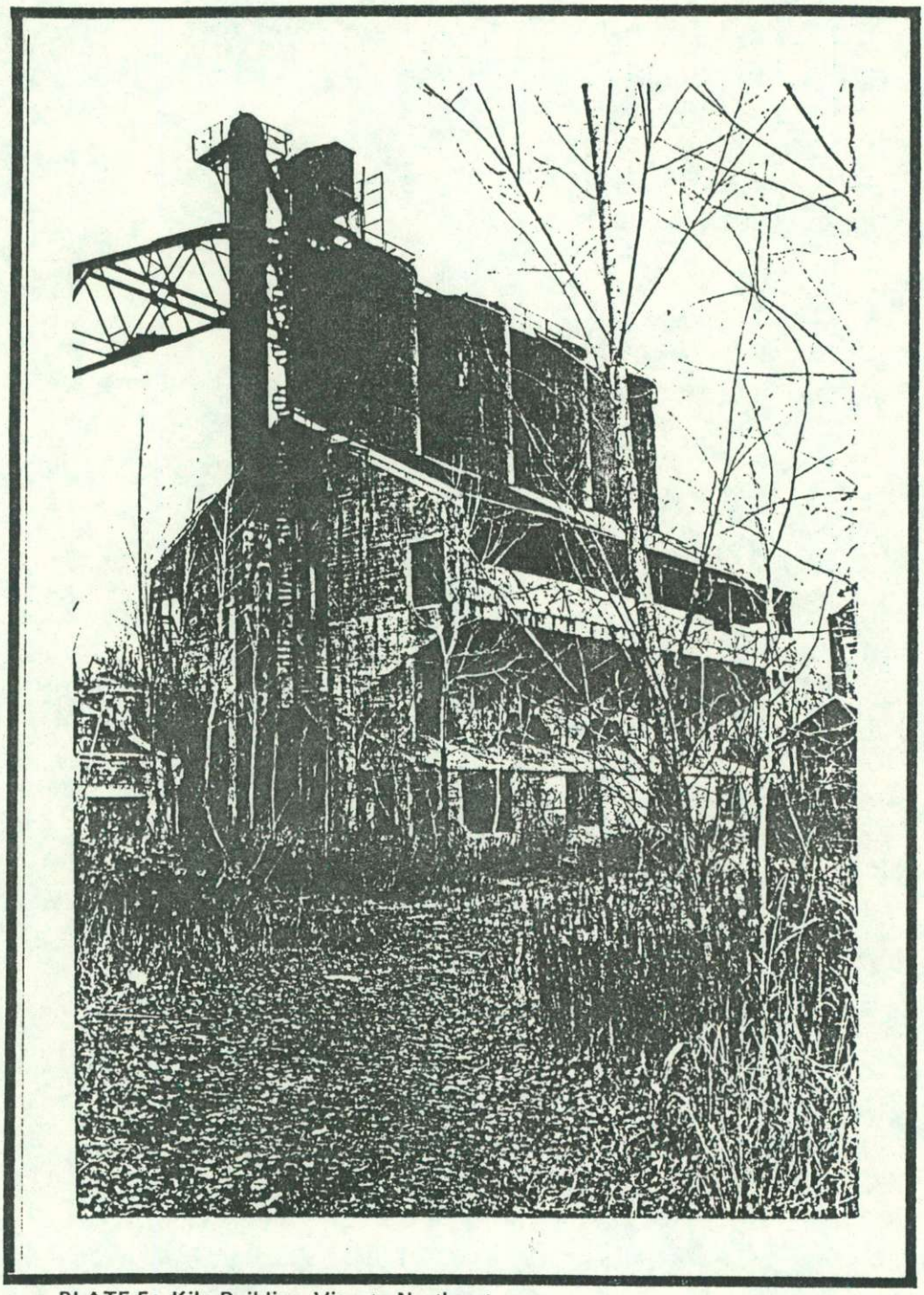

PLATE 5: Kiln Building, View to Northeast

The coal kiln was laid along this
Wall

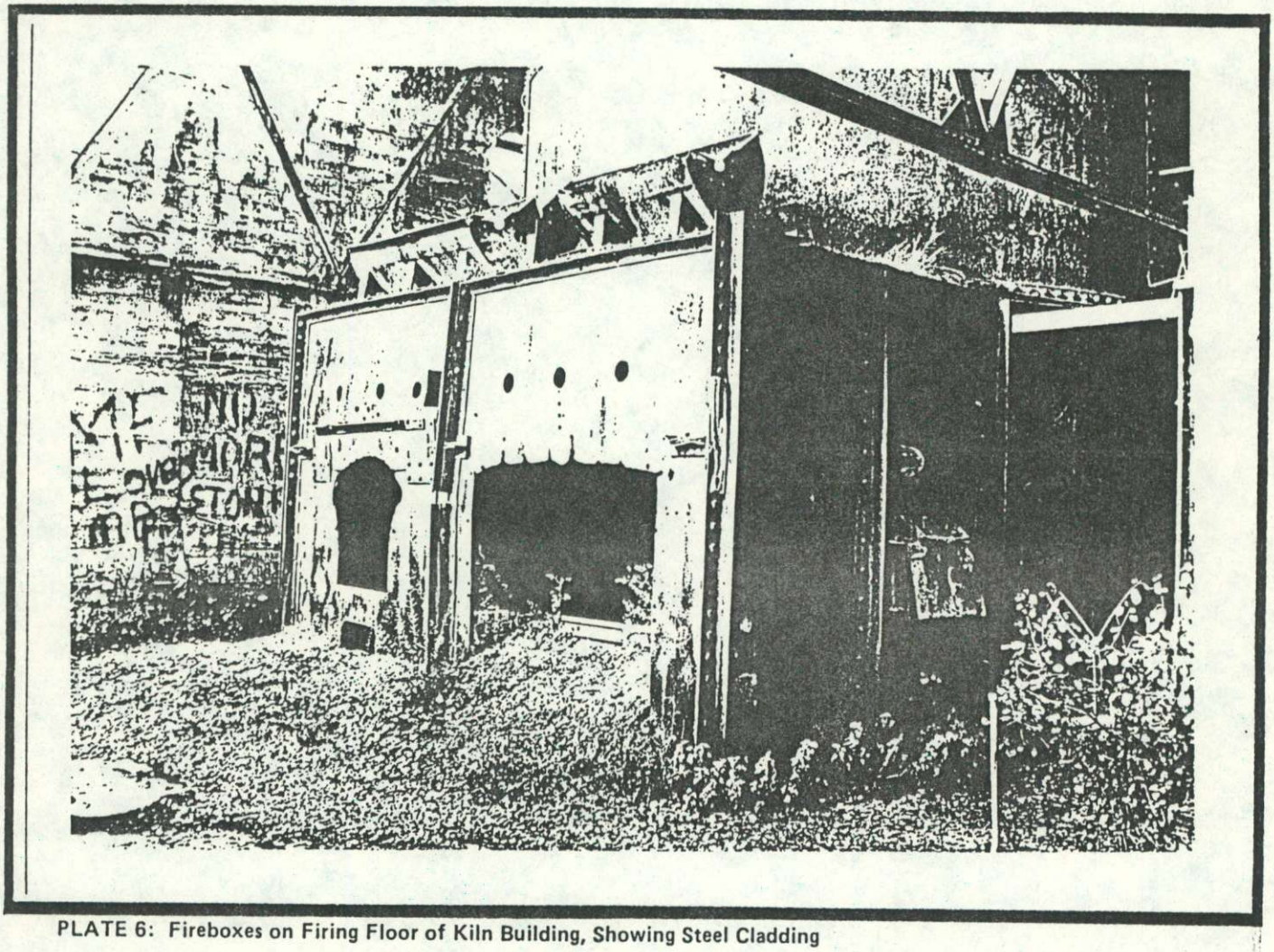

PLATE 6: Fireboxes on Firing Floor of Kiln Building, Showing Steel Cladding

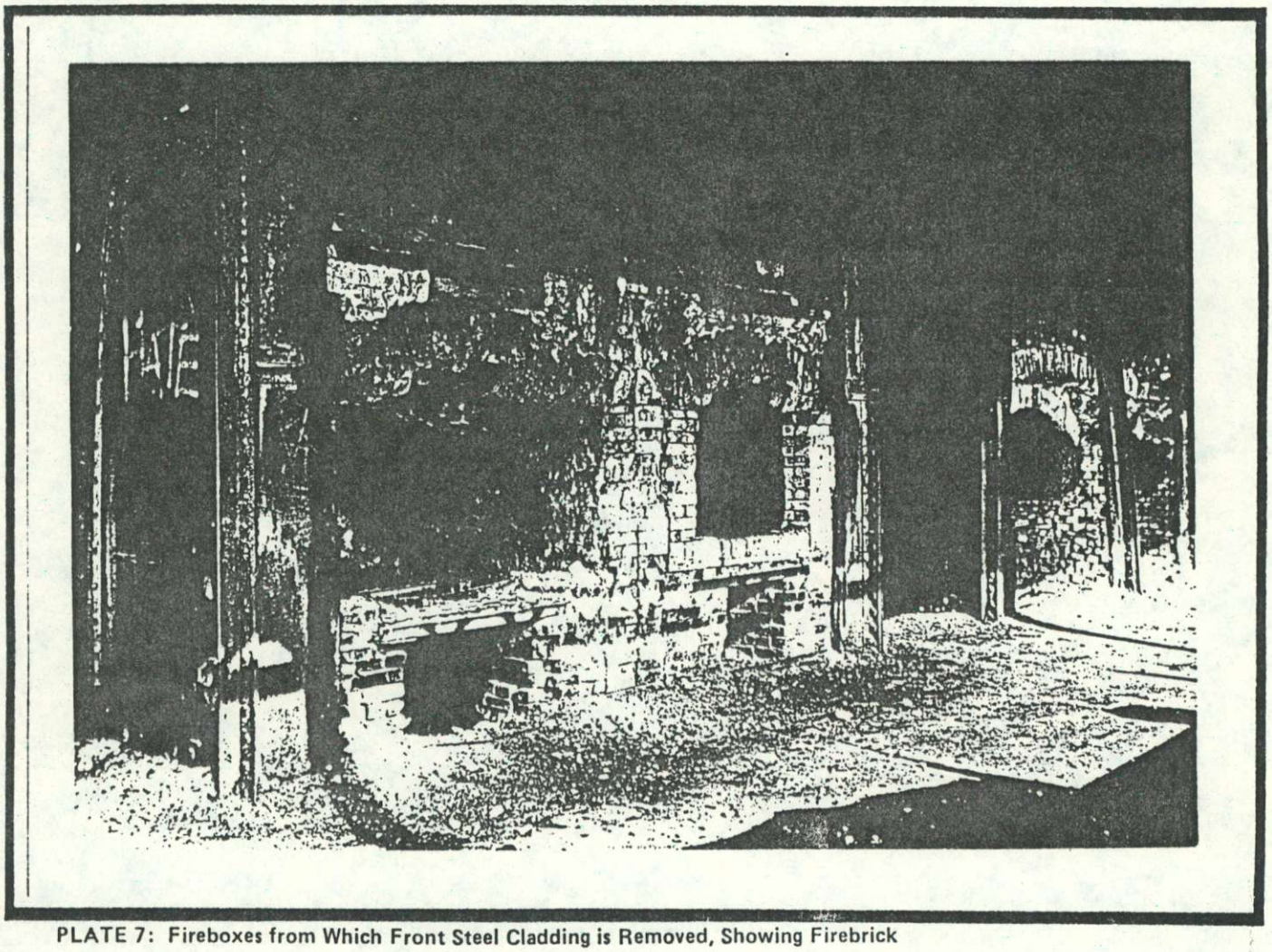

PLATE 7: Fireboxes from Which Front Steel Cladding is Removed, Showing Firebrick

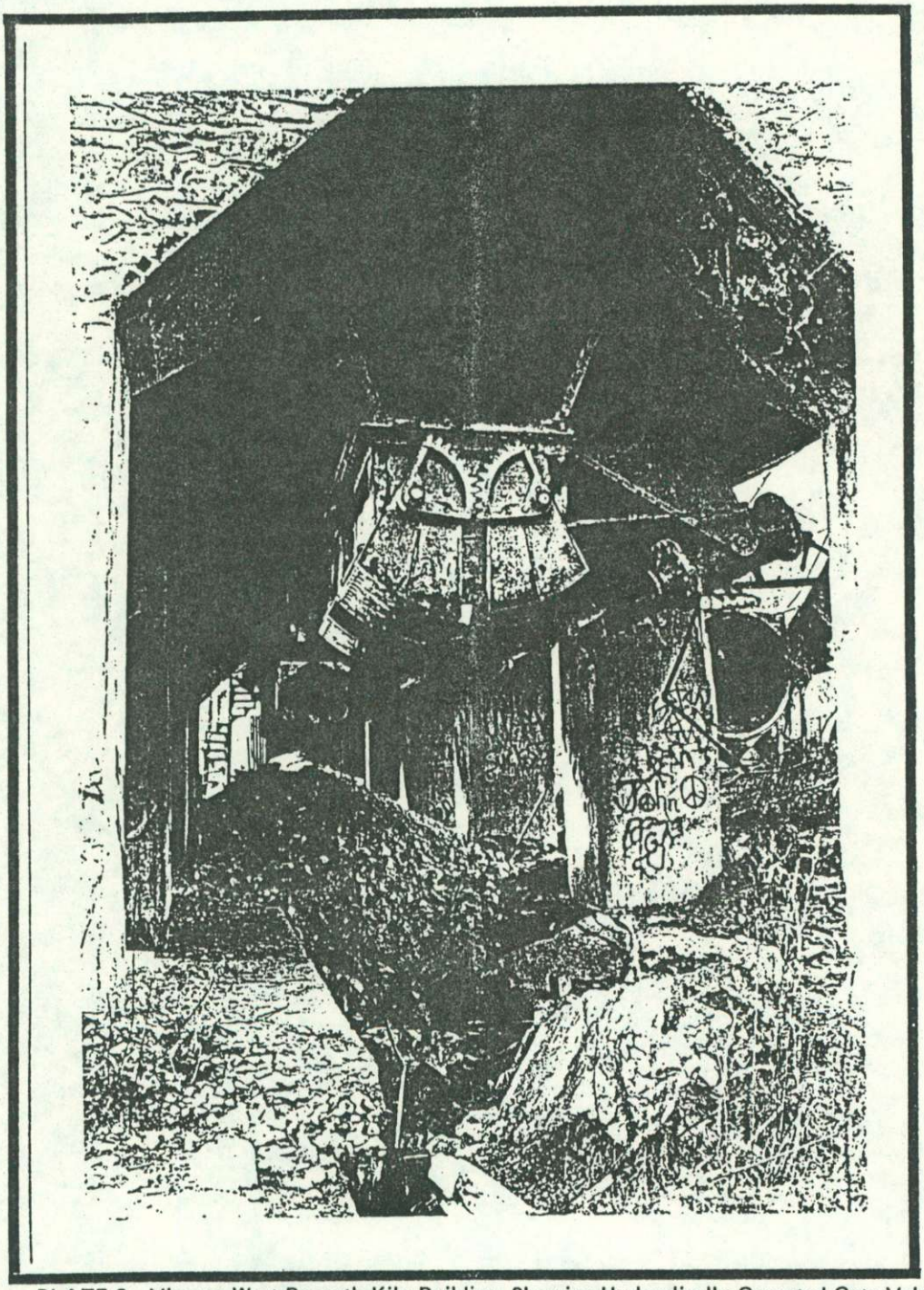

PLATE 8: View to West Beneath Kiln Building, Showing Hydraulically Operated Gate Valves of Hoppers at Bottom of Kilns

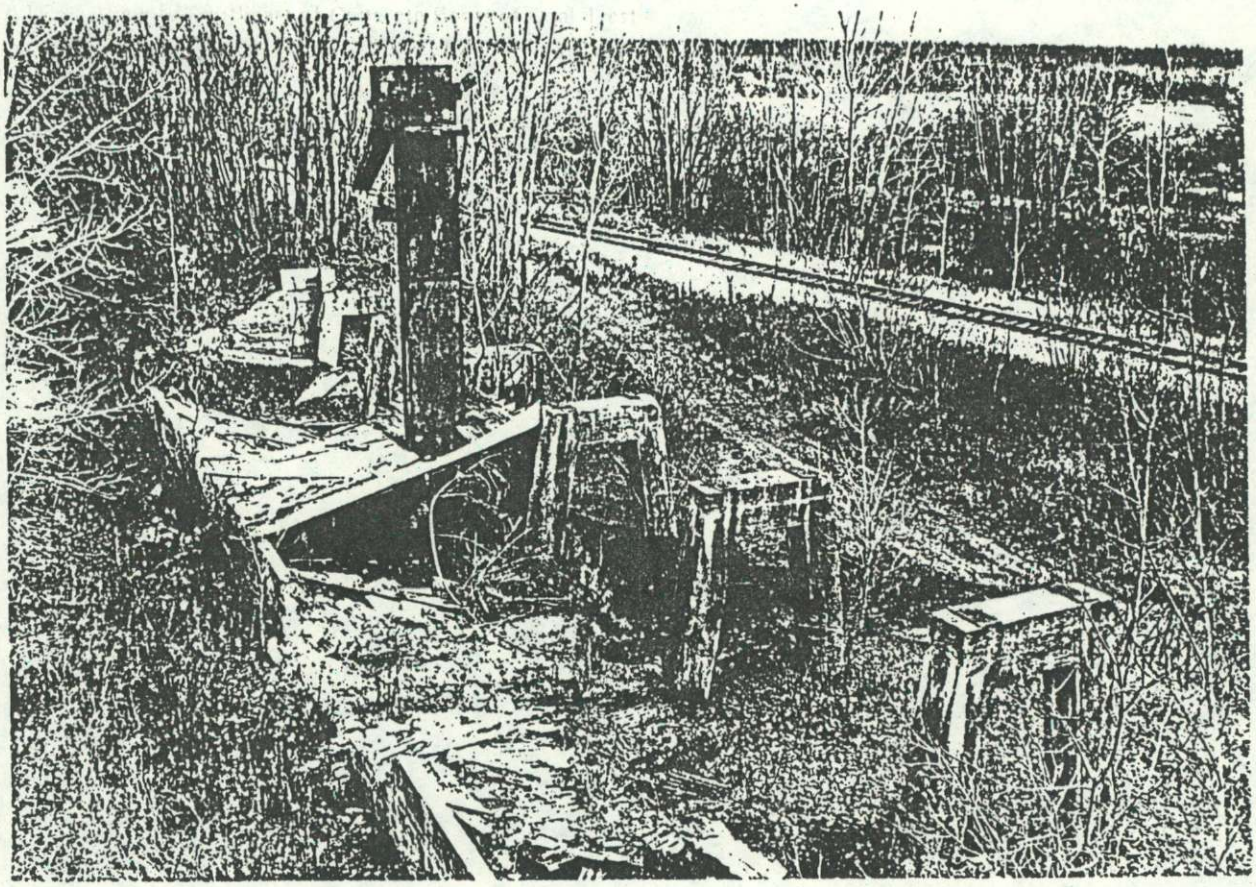

PLATE 9: View to Southeast of Concrete Bents of Coal Trestle

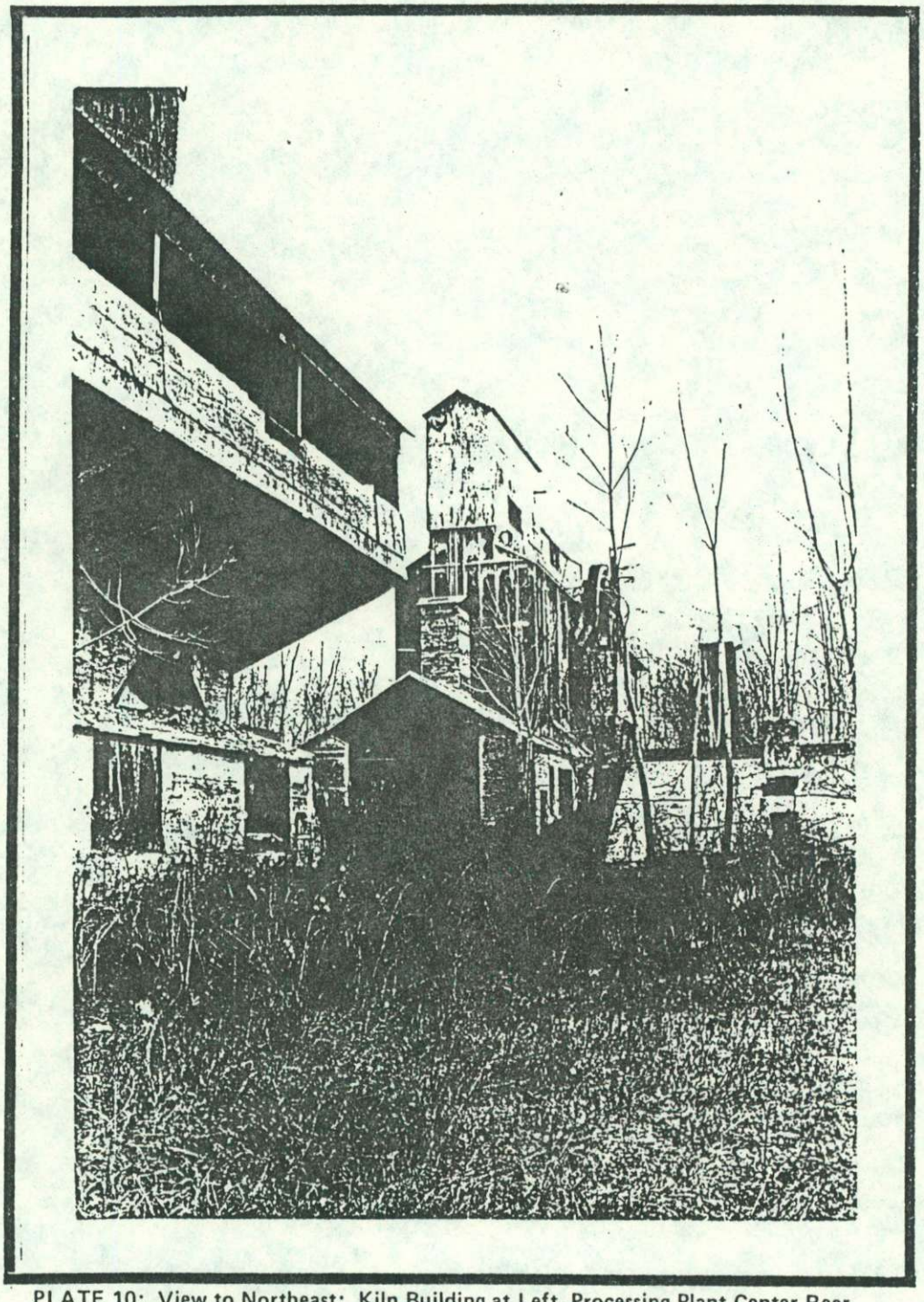

PLATE 10: View to Northeast: Kiln Building at Left, Processing Plant Center Rear, Coal Bunker at Right

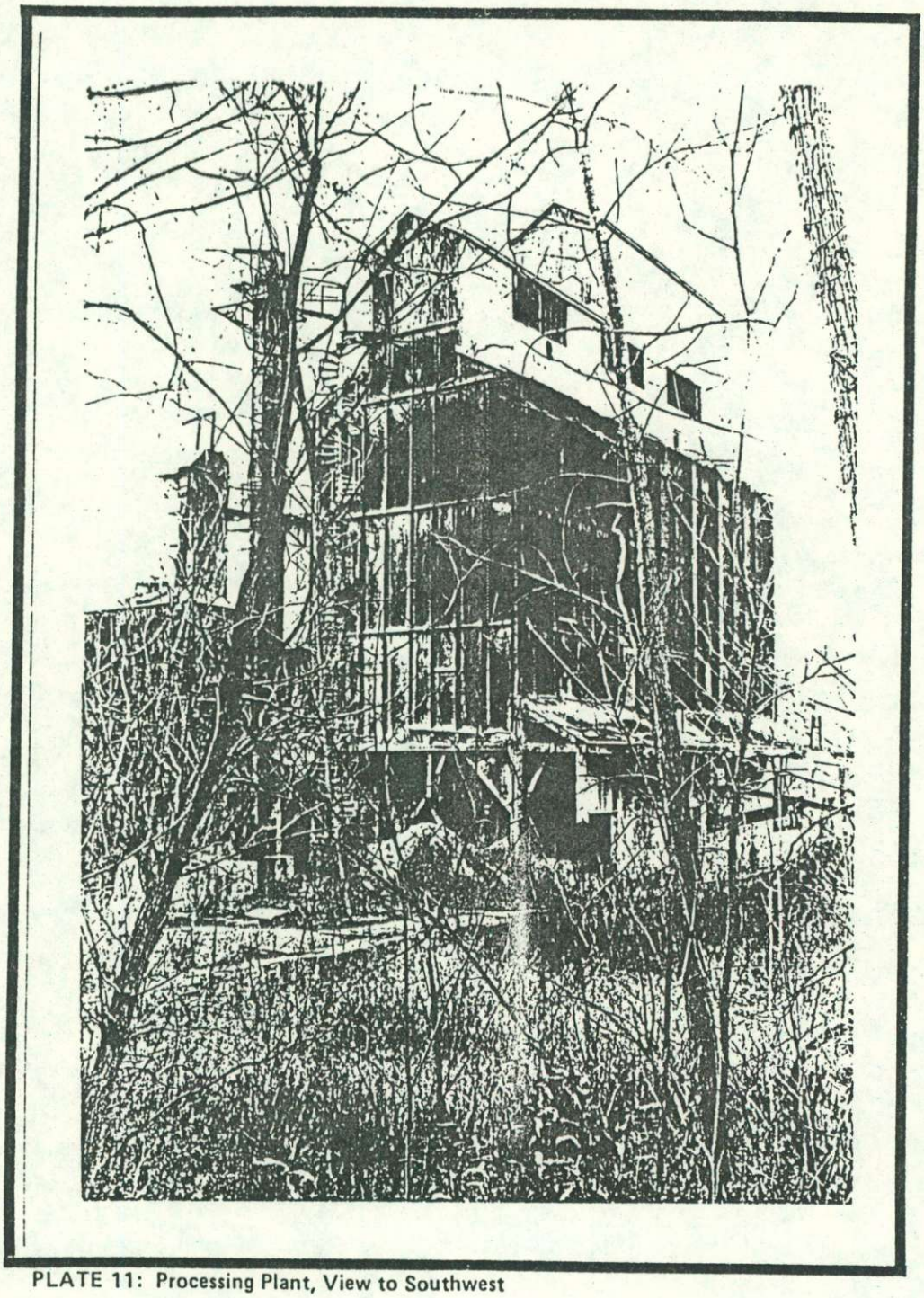

PLATE 11: Processing Plant, View to Southwest

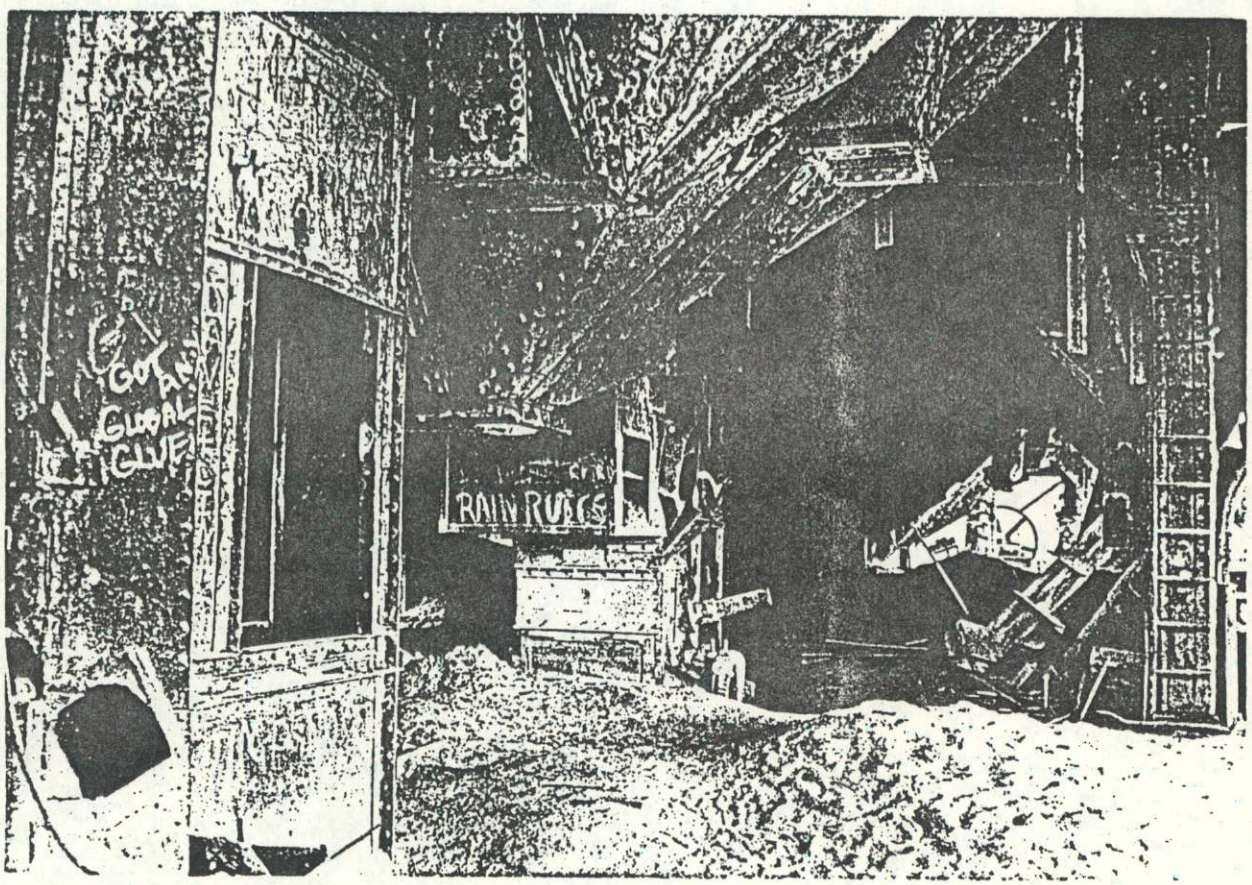

PLATE 12: Interior View, "Ground" Level of Processing Plant; Elevator at Left, Base of Hopper at Center

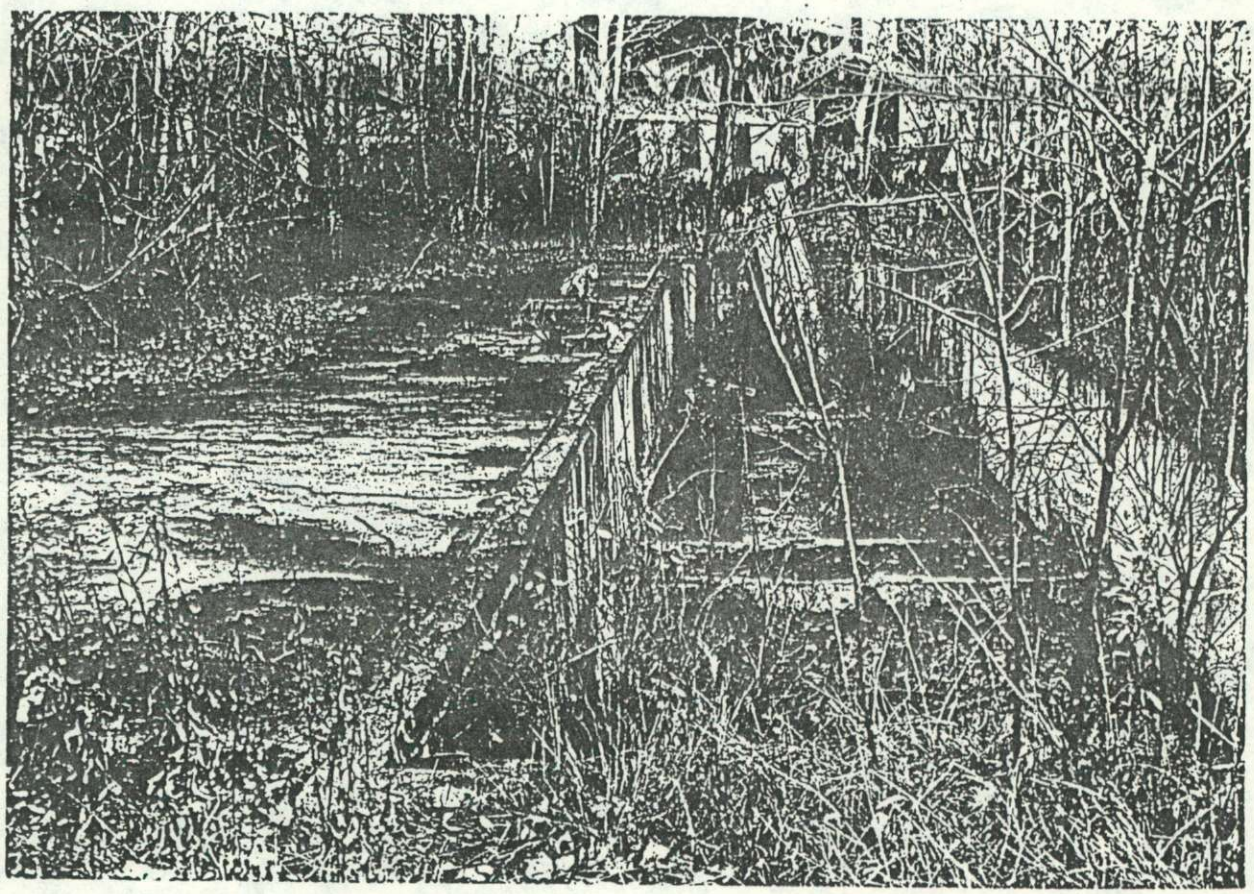

PLATE 13: Remains of Platform Scale, View to East

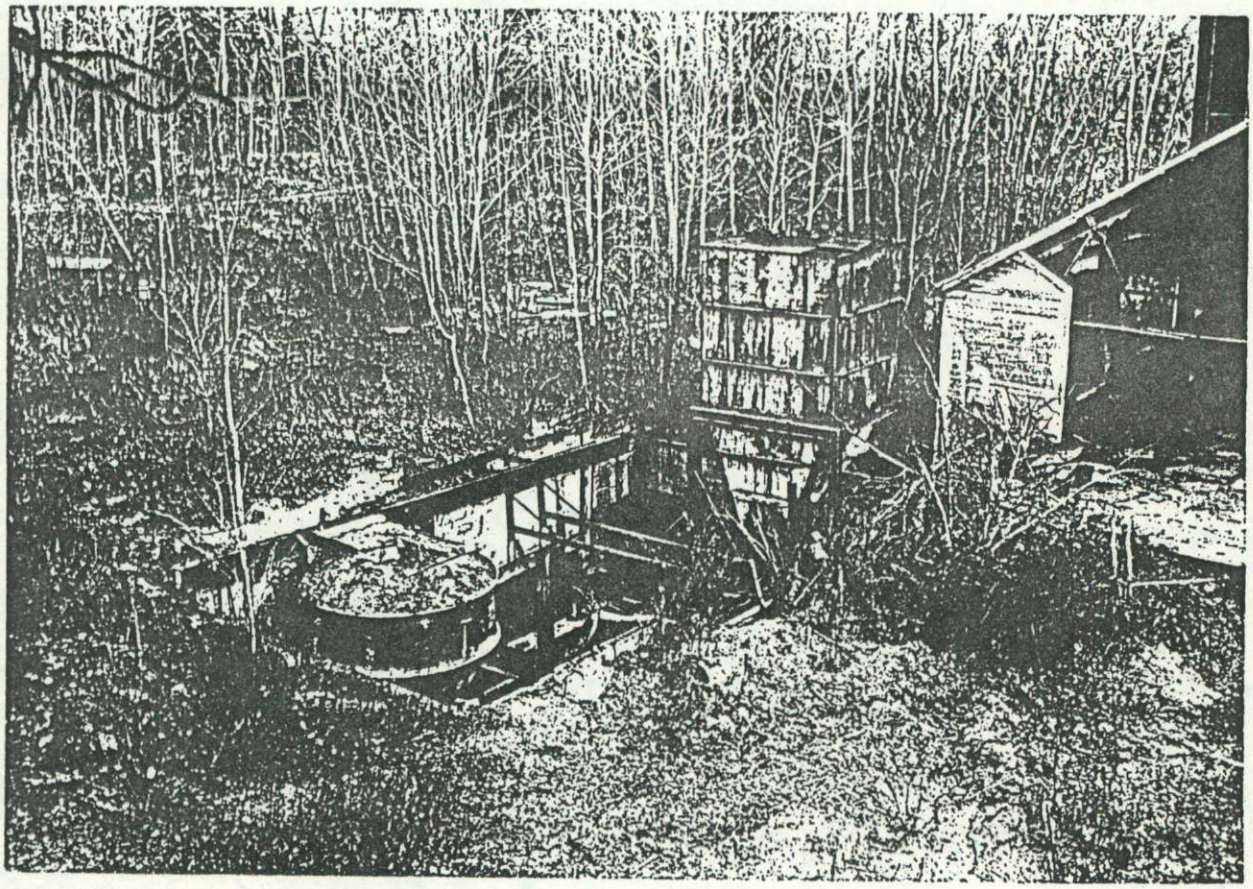

PLATE 14: Hoppers Within Foundation Off Northwest Corner of Processing Plant; View to Northeast

VI. NATIONAL REGISTER EVALUATION

The Champlain Valley Lime Company Site appears to be eligible for the National Register of Historic Places under Criterion A, for its association with Vermont's commercial lime industry. Although not among the most important industries in the state, lime production was one of several (such as the much larger marble and slate industries) that took advantage of Vermont's geologic history to produce both raw and processed materials for building throughout the nineteenth century and well into the twentieth century. Located at a site that had been a source of limestone and lime since the early nineteenth century, the Champlain Valley Lime Company was one of a handful of lime producers that emerged by the end of the nineteenth century as dominant in the state's industry. Most of these operations continued to produce lime until after World War II. Since then, however, nearly all the pre-war lime production facilities (such as those in New Haven, Leicester Junction, Fonda, Danby, and Swanton) have been abandoned, and now exist only as fragmented ruins (Victor Rolando, personal communication).

The physical remains of the Champlain Valley Lime Company plant are associated with an important period of prosperity, in the 1920s, when the market for lime was strong enough to warrant extensive investment in modern equipment. Placed in operation by 1926, the new production facility of the Champlain Valley Lime Company possessed the largest kilns (17 feet in interior diameter, significantly larger than those of its competitors, whose kilns averaged between 6 and 11 feet in diameter), the largest work force, and the greatest output -- some 30 tons of lime per day (Thompson 1926:28ff). Although abandoned for nearly 20 years, the plant possesses integrity of setting, design, workmanship, and association; integrity of materials is diminished due to removal of equipment and machinery once crucial to the production process, but sufficient fabric remains to generally identify the processes by which lime was produced here for some 45 years.

From information obtained during monitoring of backhoe operations, and in light of the apparent lack of noticeable subsurface disturbance, the Champlain Valley Lime Company Site appears to possess the potential to contain below-ground cultural resources associated with earlier (nineteenth century) phases of lime production at this location. However, the integrity of such resources is highly problematic, given the large-scale construction that occurred in the mid-1920s. The site files of the VDHP contain numerous entries for nineteenth-century lime operations in various areas of the state, and it is likely that many more such sites remain to be identified. Sites such as those would appear to have greater potential to yield important information about eighteenth- and nineteenth-century lime production than would the Champlain Valley Lime Company Site, if only because those production sites

were not subject to "modernization" in the twentieth century. It is also noted that the basic layout and technology of lime production is well-recorded in historical and technological literature; thus, information important to understanding that particular industrial activity may be obtained more readily through research than through archaeological investigation. In summary, it is concluded that further archaeological investigations at the Champlain Valley Lime Company Site are not warranted.

VII. ASSESSMENT OF PRESERVATION POTENTIAL

A. EXISTING CONDITIONS

The two most imposing elements of the Champlain Valley Lime Company Site are the kiln building and the processing plant. Owing to their height and size, they are visible from several directions and over some distance. However, years of neglect and weathering have resulted in noticeable deterioration, and the work of vandals, as well as former owners, is evident in the absence or destruction of features and machinery that would be important in any public interpretation of the site.

The kilns and kiln building, with their riveted steel and reinforced concrete construction, are extremely well-built, overdesigned with respect to loading and general use. The concrete generally appears to be sound and without major flaw. The steel, however, is generally deteriorated, with much evidence of rusting where visible; furthermore, the condition of steel in many instances almost encased in lime for nearly 20 years may be problematic. Within the kilns themselves, much of the firebrick has fallen away, in several kilns almost completely, to lie about the base of the building. Many of the winders in the spiral stair at the west end of the kiln building are broken or cracked, precluding access to the top of the kilns. The adjacent elevator, however, appears to be intact and almost operational, except for extensive rust.

At the firing level, the steel roof trusses may represent elements added in the last years of the life of the plant; although appearing to be in good condition, their presence (along with the galvanized sheet metal roof) has eliminated any traces of the conveyor system that brought coal to the hoppers above the fireboxes. The fireboxes themselves present a wide range of physical conditions: some are almost intact, with the exterior steel plate cladding in place; others are in a state of partial disassembly, exposing the combustion chambers and flues into the kilns; and several have deteriorated, or have been dismantled, to the extent that their principal remains are the steel lintels that support the kilns above.

The base level of the kiln building is obscured by a heavy buildup of lime and heaps of fallen firebrick. Some of the hopper gate valves appear to be in sound condition, despite heavy rust; others, however, have lost many important component elements. The horizontal conveyor that carried burned lime to the processing plant is almost completely covered with rubble, and that section of the conveyor between the kiln building and processing plant is no longer present.

The conveyor that brought raw limestone up from the quarry survives only as a structural skeleton, devoid of lifting equipment and truncated near the edge of the quarry. Thus, no physical evidence remains to demonstrate the actual way in which the raw material was introduced into the kilns. Similarly, only the partial shell of the hoist house survives, and neither the hoisting engine nor associated gearing and winding mechanisms are present (although several sections of a large steel gear, presumably the spur gear for a cable winding drum, are included in a pile of steel debris off the southwest corner of the hoist house).

All evidence to indicate how coal was transported from the storage bin at the trestle (from which the tracks have been removed) to the firing level of the kilns has been removed or destroyed.

The processing plant is a large concrete and steel frame building, the bins within it still partially filled with processed lime in crushed and powdered forms. The condition of this building is difficult to assess because of the enormous quantities of lime that overlie potentially dangerous areas and places of deterioration. The lime-covered floor is littered with pieces of concrete masonry and sheet metal. The spiral stair at the east end of the building contains several cracked and broken winders, and the top level is covered with an almost uniform layer of lime that disguises the openings into the 60-foot-deep storage bins and crushers. The damage to steel and concrete in this structure is difficult to assess without extremely close, direct inspection, which could not be done owing to the heavy coating of caustic lime throughout.

B. EVALUATION OF PRESERVATION POTENTIAL

Preservation of any large-scale industrial site such as the Champlain Valley Lime Company plant is a complex, multifaceted problem that requires attention to such issues as program development, safety, liability, maintenance, capital funding, and general public interest. It is difficult to justify the time and cost involved in "preservation" of such a complex without an underlying purpose, such as return to original use, adaptive re-use, or public interpretation as a historic property. The economic factors that led to the site's closure and abandonment in 1971 are likely to be present today, thus discouraging a return to commercial lime production; in addition, technological advances and environmental laws and regulations developed since then would necessitate extensive modernization of the facility to make it effectively operational. The very nature of the plant prohibits conversion to a new "use," since the design of existing "buildings" is so very specifically a function of the machinery and equipment they contain. There remains consideration of "preserving" the plant as an historic site, which, to be meaningful, would require extensive restoration and reconstruction, as well as public interpretation.

The site as a whole possesses sufficient integrity to sustain an evaluation of eligibility for the National Register, but as a site to be "preserved" and interpreted for the general public, it presents many drawbacks. Much of the machinery has been "harvested," and of the buildings, only the massive kiln building and processing plant have escaped reduction to ruins or simple foundations. It should be noted that these buildings constitute only the containers for the processes that occurred within them; many of their most important features (for example, the firebrick of the kilns, and the lime storage bins and crushers) are collapsed or in dangerously poor condition. Meaningful preservation of the plant site, therefore, would require replacement of many missing or damaged features, both structural and operational, or their abstract representation, in order for interpretation to be effective.

The costs of preserving or restoring an industrial site such as this would probably be prohibitive. Initial preparation would require environmental cleanup, followed by removal and salvage (for possible re-use at the site) of all equipment and machinery. After this, systematic repair and, as necessary, replacement, of structural elements and machinery would be required, on a scale that would far exceed that normally expected for a preservation project. Work elements required would include:

1. Structural repair of the four kilns; cleaning and rebuilding the kiln linings and the fireboxes; rebuilding the bases of the kilns.

2. Structural repair of the processing plant; cleaning and repairing the crushing and storage bins and elevators.

3. Repair to the remains of the hoist house, and reconstruction of the missing section at the east end.

4. Repair of the weigh station or platform scale.

Along with repairs to existing elements, replacements for missing structural features and machinery would have to be obtained, including:

1. A new engine (preferably of Corliss type) and hoisting system for the conveyor from quarry to kilns.

2. Reconstruction of the missing structural sections of the conveyor from the quarry.

3. Replacement for the missing section of the conveyor between the kiln building and processing plant.

4. A new railroad siding and coal dumping facility.

5. New conveyor systems to carry coal to the firing level of the kilns and into the hoppers above the fireboxes

6. Complete reconstruction of the cooperage and installation of appropriate equipment for barrel manufacture.

7. Reconstruction of the building that once enclosed the foundation, containing hoppers, at the northwest corner of the processing plant, and replacement of missing equipment.

In addition to these activities, consideration would have to be given to the adjacent quarry (should it be included in the "historic site" and if so, how can this be accomplished?). Also to be addressed are issues such as public safety in an inherently dangerous environment and development of programs by which the plant would be interpreted. Last, but philosophically foremost, is the question of relevance: is this a project that would have significant local, regional, or statewide interest? Or is it a site that would appeal to only a small segment of the general population? If the latter, does its cultural importance warrant extraordinary efforts to restore, reconstruct, and interpret it? The Sloss Furnaces in Birmingham, Alabama, are a massive complex of buildings and structures, once an operating steel mill, that have been restored and rehabilitated into an extremely popular industrial landmark for the residents of the area. However, most of the residents have some tie to the site, as descendants of people who worked on the railroads, or in the steel mill, or in the coal and iron mines that were associated with the furnaces and remain prevalent in the region. Could a similar relevance be found for the Champlain Valley Lime Company Site?

The nature of the Champlain Valley Lime Company Site is such that physical preservation will be very difficult, costly, and, possibly, of limited public benefit. Its historic functions are not readily appreciable by the general public, nor can it be made easily and safely accessible (in contrast to other industrial resources such as a bridge, or even a nineteenth-century stone lime kiln). If physical preservation is infeasible, preservation of information about the site is not. The compilation of information about the site, through documentation such as that of the Historic American Engineering Record, would result in a body of narrative and pictorial data (photographs and drawings) that could be made readily accessible (both in terms of use and of understanding the resource) to the general public.

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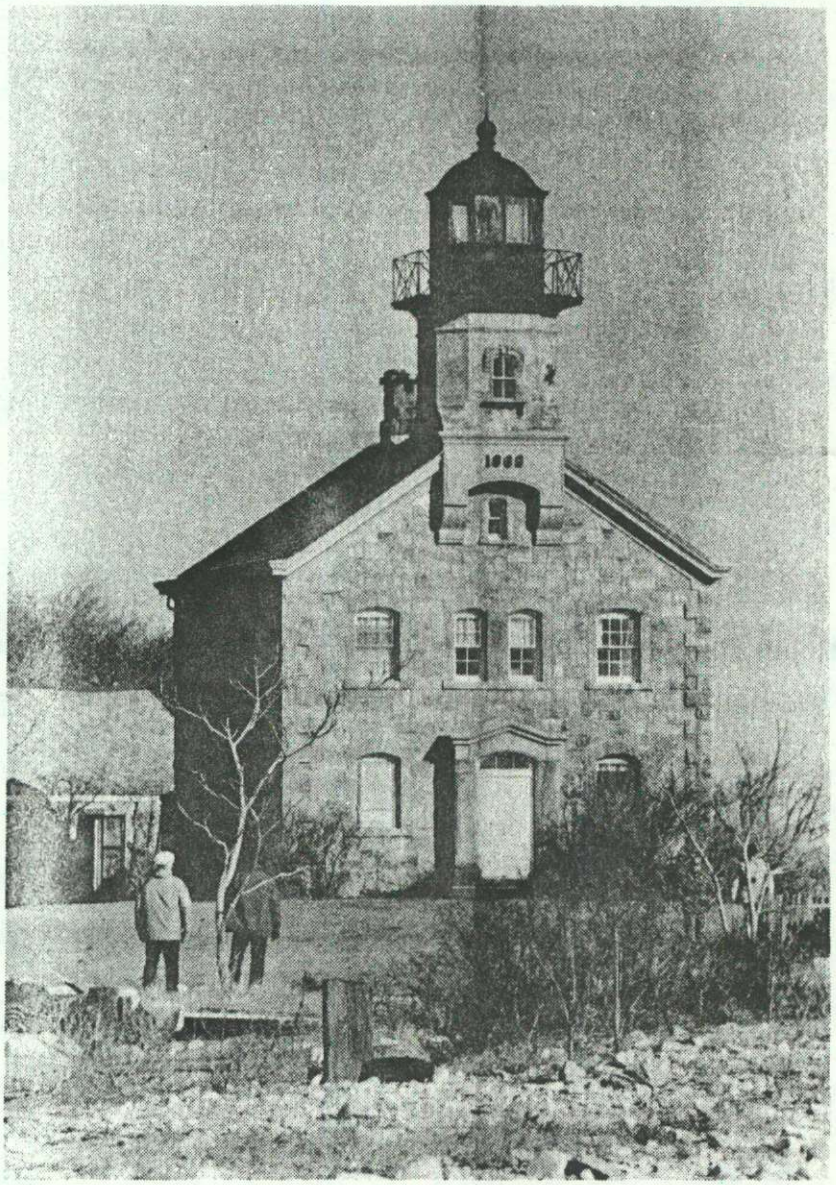

Norwalk Island Lighthouse, Norwalk, Connecticut. Built in 1868 and listed on the National Register in 1988. See "Historic Lighthouse Stations," page 23. Photo by Norwalk Seaport Association.

lished by Oxford University Press. Meanwhile, would-be readers of the report should contact the National Technical Information Service, or visit the recently reopened Springfield Armory Museum, whose library has a copy available for on-site perusal.

For articles on selected topics within the armory's history, see the profusely illustrated and superbly edited special issue of IA, Vol. 14, -1 (1988). It includes what may be the last-ever photograph (by Pat Malone) of the armory's Mill River "water shop" still intact. Its industrial space was leased out in recent years, and the tenants' product (swimming-pool chemicals) caused a devastating fire there in 1988.

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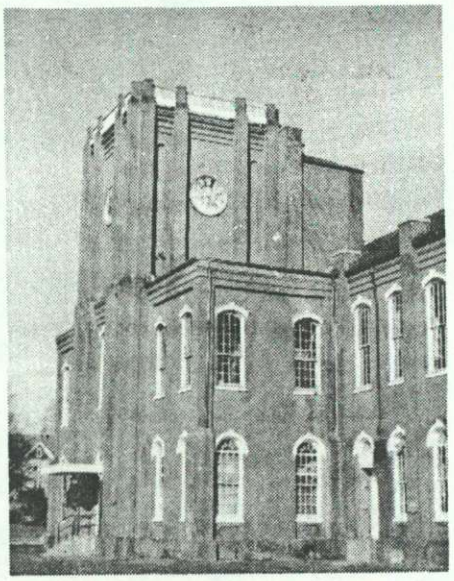
Hamden, CT



Part of Water Shops, Springfield Armory, built c1855-1860; burnt 1988. Photo 1986.

Vermont

IA Survey of Vermont Furnaces and Kilns Completes 11th Year

The IA survey of Vermont completes its 11th year with the end of 1989. What started in 1979 as a minimum-level inspection of blast furnace ruins in the state for inclusion in an MA thesis became, by the early 1980s, a serious archival research and field inspection project for ruins/remains of blast furnaces and bloomery forges. The recording of charcoal kiln sites began in 1982, and starting in 1986 lime kiln ruins and remains were included in the survey. To date, 144 iron-, charcoal-, and lime-related IA sites have been recorded and reported to the Vermont State Archeologist; 75+ more sites, either not precisely found or having little-or-no surface remains in evidence, are under continuing study for future recording and reporting. A breakdown of the work accomplished is as follows:

Blast furnace and bloomery forge survey:

Blast furnace ruins/remains generally are located in the western part of the state. Visible ruins (obvious furnace ruins, whether standing or collapsed) are at Forest Dale, Pittsford, West Haven, Clarendon, Tinmouth (2), North Dorset, East Dorset, Troy, and Bennington (2). Visible remains (no obvious ruins, but visible slag, charcoal, etc.) are at Highgate, Shaftsbury, Sheldon, New Haven, Tinmouth, Tyson, Brandon, Vergennes, Orwell, and Bennington. Additionally, sites documented in archival sources with questionable or no field evidence (but possible subsurface remains) are at Bristol, Waitsfield, Woodford, Manchester, Weybridge, and St. Johnsbury.

Nearly completely standing furnace ruins are at Pittsford, and at Forest Dale where NNEC and SNEC along with the VAS and other organizations and volunteers held an official recording session this past May. The Forest Dale ruin is associated with a deep, stone-lined waterwheel pit, remains of the head race, stone mounts for draft machinery, and a nearby tenement cellar hole. Various surface depressions and mounds hint at more archeological sites in this area. The site is on a 10-acre tract owned by the Division for Historic Preservation. Outside the state property stand the ironmaster's house (Royal Blake) and other structures that either were once part of the works complex or stood inside the 10-acre tract and were moved outside.

	Recorded and Reported		Not yet Reported		Totals	
	Sites	Ruins	Sites	Ruins	Sites	Ruins
Blast Furnaces	23	11	9+	?	32	11+
Bloomery Forges	22	3	40	?	62	3
Charcoal Kilns	55	176	8	9?	63	185
Lime Kilns	44	70	18	22	62	92
Totals:	144	260	75+	31	219	291+

Notes: Some of the above sites contain more than one component. Recorded iron mines are not included in the above table.

The Pittsford furnace is owned by a descendent of the 18th-century owner of the land on which the original furnace was built (1791; Israel Keith). The present ruin dates from Simeon Granger, who rebuilt the furnace from the apparently razed Keith furnace in 1824. Associated components here are stone walls on both sides of the furnace stack, cellar holes of the works store, charcoal and ore sheds, and standing structures of Simeon Granger's house plus nearby workers' housing.

Both the Forest Dale and Pittsford furnaces and grounds offer a wealth of knowledge and insight into the technology of 19th-century furnace operations in Vermont as well as interpretive social data on ironworker and ironmaster life styles.

Collapsed furnace ruins with significant associated interpretive remains are also at Clarendon, Tinmouth, Troy, and Bennington, all on private property and owned by cooperating property owners (except Troy - owner unknown). The standing ruins at North and East Dorset (NNEC Spring 1983 tour) contain much less visible associated remains than those mentioned above.

No standing or partially standing ruins of any bloomery forges were found in Vermont. Forge sites were identified mostly through archival references and slag finds. Slag found at some forge sites, however, appeared much like that found at some known blast furnace sites, which raised a number of questions regarding kinds of operations carried on here. Forge sites were found distributed in the same relative area as blast furnaces. Although it is felt that the greater proportion of bloomery forge sites in the state have been found and recorded, many more sites await discovery in the state.

The better identifiable forge sites are at Salisbury (2) and East Middlebury, operating and production capacities of which are documented in mid 19th-century ironworks reports by Neilson and Lesley. Most forge sites in the state operated during the 1790 to 1830 period and were apparently small, as judged from remains of slag deposits within their approximately 1000 square-foot areas and the relatively small streams and brooks alongside which they sought water power. These probably supplied purely local needs and were displaced by iron made more cheaply from outside the state with the completion of the Champlain Canal and construction of railroads.

Charcoal Kiln Survey:

A total of 131 charcoal kiln ruins/remains have been recorded at 45 charcoal making sites. Of the ruins/remains, 14 are stone-type, 8 are stone/brick-type, and 109 are brick type. All except 5 ruins are round, these being rectangular in shape. Three are brick-type, one is stone, and one is concrete block. Numbers of ruins per site vary from one to eight; the average is two to four per site. The additional sites of 45 mound-type charcoal kilns at 10 sites were found and recorded. The sites are generally in upland areas of the state with a higher concentration in the south-southwest area and a lesser concentration in the west-central area.

Brick-type kilns all measured a nearly consistent 28 feet inside diameter. Wall height varied with the remoteness of the site; those closest to trails, roads, and houses were no higher than ground level, while some a distance from much-used trails had walls up to 4 feet high (Bourn Brook area of Winhall). Wall thickness equaled two brick widths. Vent holes were at ankle, knee, and waist height (appropriately called ankle vents, knee vents, and waist vents). Most kilns were built into embankments to afford access via a bridge to the top charging hole of the kiln, much like a bridge to the top of a blast furnace or lime kiln. Two eight-kiln sites were found: at Bourn Brook, Winhall, and at Old Job, Mount Tabor. The former were in best condition and contained much associated hardware.

The best preserved kiln ruins are those of stone, possibly due to availability of stone throughout the state. Even the most remote brick-type kiln ruins were vandalized for most of their usable brick. Some stone-type kilns had standing wall sections up to 9 feet high. Stone-type kiln ruins resembling "beehive" kilns were found in Stamford, Glastenbury, and Winhall. Some remains at Readsboro suggest kilns made of a stone base with an arching "beehive" roof made of brick (photos exist of these in operation in the Stamford-Readsboro area).

One positive conical brick-type kiln remain was also found in Readsboro with a possibility of two to three others (which were dynamited beyond recognition many years ago by the Forest Service for safety reasons — hikers were camping in them).

Higher concentrations of brick-type kilns were found at Woodford, Winhall, Peru, and Mount Tabor where 78 kiln ruins were found, some with significant quantities and varieties of iron support and reinforcing hardware. They somehow escaped the World War II scrap metal drives. Ruins at Peru, Winhall, and Mount Tabor were generally at 2000 to 2300 feet in elevation. Lesser numbers of brick-type

kilns were also found at Danby, Chittenden, and Ripton.

Mound-type kilns were found at Sunderland, Glastenbury, Chittenden, Salisbury, and Ripton. At first the most difficult to recognize in the field, mound-type kilns are now found almost at will, up any draw along the western slope of the Green Mountains between Glastenbury and Winhall. One site on the high western slope of Bloodroot Mountain northeast of Rutland was found to contain remains of 20 mounds. This area was not exhaustively inspected.

Diameters of mound-type kilns varied from less than 20 feet to more than 30 feet. Many were built upon flat ground but some were built into embankments, much like the stone- and brick-type kilns. At many sites, the circular gutter around the kiln was visible. At one site, stones removed from the kiln site resulted in an area of high stone density immediately around the kiln, hinting at first of a stone-type kiln.

With few exceptions, charcoal kilns/mounds sites are within the Green Mountain National Forest.

Lime Kiln Survey:

The lime kiln survey started in 1986, the result of finding some of these ruins while in the process of searching for charcoal kilns. A total of 44 lime kiln sites containing 70 kiln ruins/remains have been recorded and reported. This phase of the project is still in progress with 18 out of 22 sites unrecorded from 1988-89 waiting for 1990 action.

The kilns were distributed in "clusters," with the most dense of these generally in the central to southern parts of the state. The highest concentration of lime kiln ruins/remains is at Plymouth, where 11 were found. Other areas are Jamaica, Weathersfield, Clarendon/Tinmouth, Leicester, New Haven, South Burlington/Colchester, and Swanton. Isolated lime kiln finds were also made at Pownal, Arlington, Danby, Manchester, Dorset, Fair Haven, Brandon, Townshend, Rochester, and Charlotte. Most are single-kiln sites; one site, at Fonda Junction, contains five standing ruins and one collapsed remain.

Early 19th-century lime kiln remains consist of stone-lined cavities built into low embankments in the immediate vicinity of small limestone outcrops, usually built by farmers to burn lime for fertilizer. Later kilns are stand-alone units, some with ornamental openings, such as one Gothic-arch kiln at Jamaica. Kilns operating into the 20th century were made of stone/concrete bases with firebrick-lined, 8- to 12-foot diameter, 15-to 25-foot high steel ovens set upon these bases. At some sites, only the base(s) remain. At others, such as Leicester and Swanton (Fonda Junction), the steel ovens remain, however bent, ruptured, or tipping in most cases. At Winooski, the standing ruin of a four-kiln unit stands that operated into the 1950's, next to two deep quarries that straddle Lime Kiln Road. Under the road, a now-flooded tunnel connects the two quarries. Activity is currently under way to place this site on the National Register.

Almost all lime kiln remains are on private property, some without the owner's knowledge that they existed or what they were. Many have been vandalized for construction stone, are caved in and used for dumping, or mostly destroyed as the result of road construction. The only known lime burning in the state today is a modern facility at New Haven Junction, where no response has been received to an inquiry.

This survey was totally funded by personal expense and carried out on week-ends, holidays, and vacations from full-time work at the GE Ordnance Systems at Pittsfield, Massachusetts. When possible, expenses and effort were recorded and donated to the Vermont Division for Historic Preservation for matching grants, used by the Division for other projects. This survey is the topic of a slide-supported paper to be presented by the author at the Third Annual Conference on New England Industrial Archeology at Plymouth State College, NH, in February 1990. A complete report on the survey will be published by the author in cooperation with the Vermont Archaeological Society sometime in 1990 as part of the Vermont Statehood Bicentennial. Major effort in 1990 is expected to go into the "wrap-up of loose ends" and renewal of efforts toward the thematic National Registration of blast furnace ruins, which was abandoned in 1987 due to work overload.

Vic Rolando
Pittsfield, MA

Connecticut

Eli Whitney's Apprentices Slept Here

The Connecticut Trust for Historic Preservation recently completed restoration of the 1820s boarding house for single men who worked at the Whitney Armory in Hamden, Connecticut. Removal of grey 20th-century fiber shingles revealed clapboards in surprisingly good condition. Newly painted its (nearly) original white, the building now houses the offices of the Connecticut Trust for Historic Preserva-

successful his innovation proved to be. He said that he caught dozens of rats when he chased them that night, most of them following their regular route of travel jumping right into the *Schtrohsack*. "The most fun," he said, "was drowning the rascals."

There was also reference made to the custom of stacking ears of corn in the corncrib. Although the writer could learn nothing of the practice among those contacted, except that several stated that corn was occasionally stacked along the outer edge of the opening on top of the corncrib and then the corn was thrown or shoveled over the opening if it could not be closed.

With the use of the mechanical, tractor-drawn cornpicker, the corn crop at present is harvested in far less time and with much less effort than in past years. The size of the corncrib is still a good indication of soil fertility and good farming methods. The early corncrib, like many outbuildings on the farm, has been left to deteriorate, many having been dismantled through the years because of non use; or it has been replaced by a larger type, different in design, many times constructed with metal, as the farmland devoted to corn or the yields increased.

(*) Publications of the PA. German Society, Vol. 6, Breinigsville, PA: The Penn. German Society

Furn: Amos Long 1972 the Penn. German Family Furn. (*)

XXIX.
THE LIMEKILN

The Pennsylvania countryside still shows evidence of the domestic lime industry because of the old limekilns which are found cropping out here and there in the areas underlaid with limestone or where lime was burned. The limekiln, *der Kallickoffe*, was in bygone years as much a part of the landscape in areas inhabited by the Pennsylvania Germans as were the barns and houses.

Early Lime Production and Use

Lime, an essential requirement in agriculture and industry, was first produced in America about the end of the eighteenth century. The lime was produced from limestone which was quarried and burned along the Schuylkill River and later throughout the many limestone valleys and surrounding areas of rural Pennsylvania. The use of lime for domestic and agricultural purposes began with the first settlements. The early Pennsylvania German settlers had learned the value of lime for domestic use when much of the area was only sparsely settled and still a primitive wilderness covered with virgin forests.

In 1685, Budd wrote, "There is no Lime Stone as we yet know of, but we make Lime of Oyster Shels, [sic] which by the Sea and Bay side are so plentiful, that we may load Ships with them."[1] Before limestone was burned, the early settlers produced lime by burning the shells in wood fires.

"Among the first to use lime were German farmers of Lancaster County. The use of lime as a "manure" began soon after the first farmers put the plow to their land."[2] "In 1754 Governor Pownall reported a limekiln on every farm that he visited in Lancaster County. . ."[3] A pioneer farmer from Franklin County in 1773 reported, "There is plenty of limestone for manure on every field and it does not cost much labor or expense to come at it and it can be burned with the wood which we grub up when we clear the land."[4] In 1698 Gabriel Thomas wrote, "There is also very good Limestone in great plenty, and cheap, of great use in Buildings, and also in Manuring Land, (if there were occasion) but Nature has made that of itself sufficiently Fruitful; . . ."[5]

The general use of lime on the soil was preceded by a period, from about 1780 until 1820, when gypsum (land plaster) was used as a soil amendment to promote the growth of clover. Gypsum was first imported from

[1]Thomas Budd, *Good Order Established in Pennsylvania and New Jersey in America* (Reprinted New York, 1865), pp. 35-36.
[2]Fletcher, 132-133.
[3]Williams, 77-78.
[4]Alexander Thompson, *Pennsylvania Magazine of History and Biography*, Vol. VIII (1884), p. 317.
[5]Thomas, 11-12 and Myers, 320.

Europe and later from Nova Scotia as ship ballast. Some was quarried in western New York where deposits were discovered in 1805. This later material was rafted down the Susquehanna. By 1810 there was evidence that gypsum was only a stimulant, beneficial on sandy and gravelly soils, and after a time crops began to decline. By 1825 gypsum had been quite generally supplanted by lime. Gypsum was used extensively for only about thirty years and was mainly responsible for bringing in more clover, more grass, more livestock and more manure. Gypsum broke down the prejudice of many farmers against the use of artificial fertilizers. By 1830 liming had become firmly established on many farms and "lime and manure" was a common slogan on Pennsylvania German farms.[6] An interesting belief concerning gypsum is that ". . . some of our Germans of this day believe that gypsum invites thunder and lightning and on the approach of a storm turn out their barns and houses the vessels containing this substance."[7]

Some farmers were fortunate enough in earlier years to have beds of marl on their land. Depending on its purity and if it did not have to be ground, the marl supplied their needs for lime. This usually proved much more economical than erecting a kiln and burning limestone or purchasing the lime.

Rush in his *Account of the Germans in Pennsylvania* tells of a group of immigrants who originally departed from the Palatinate for London in 1709 before venturing across to the New World. Among this contingent there were eight limeburners.[8] The first of this group settled mainly in Bucks and Montgomery Counties. Later they moved across the South Mountain and settled in the wide limestone valleys similar to those of their homeland. Some wrote to the homeland exclaiming that here was the same limestone soil they had worked for centuries.[9]

"Of several factors that contributed to the transformation of Pennsylvania agriculture between 1790 and 1830, lime and land plaster were the most important."[10] Since then liming has become firmly established as a standard farm practice.

Arrangement

The kiln, built by the farmer primarily for his own or local use, was usually constructed singly on an isolated hillside, in a woodlot, or on land too rugged for cultivation. Many of the kilns had a southern exposure which helped prevent strong winds from causing too rapid combustion.

Although many of the kilns were located near or within close proximity to a limestone outcropping, others were erected on farms which had little

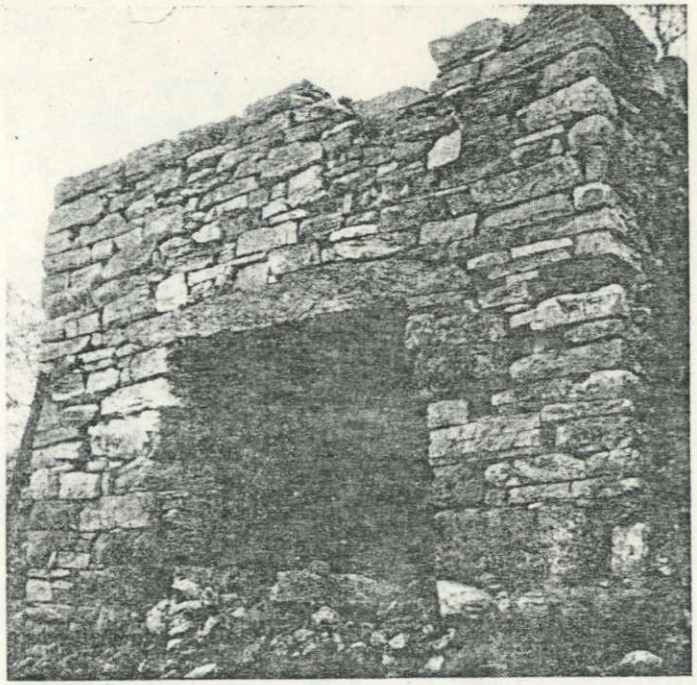
[6]Fletcher, 132-136.

[7]Richard Peters, *Philadelphia Society for Promoting Agriculture Memoirs*, 1808, p. 159.

[8]Kapp "*Frankfurter-Mess-Kalendar von Ostern bis Herbst*," 1709, pp. 90, quoted in Rush's *Account of the Germans in Pennsylvania*, ed. T. E. Schmauck (Lancaster, 1910), pp. 51-52.

[9]Arthur Graeff, *History of Pennsylvania* (Philadelphia, 1944), p. 33, quoted in Williams, 111.

[10]Fletcher, p. 132.



Limekiln showing corbelled rectangular opening with large horizontal stone to support opening. Located on farm near Buffalo Springs, Lebanon County.

or no limestone deposit but were located within reasonable hauling distance from where the limestone was quarried. Others were located in or nearby a heavily wooded area because of the large amounts of wood required for burning. It involved practically as much labor and expense to haul the wood to be used in the burning process if the kiln was located some distance from the supply as it did to haul the limestone. In either case, when lime was needed for the fields, the stone and wood were hauled to the kiln usually by the owner or his hired man.

When the lime could not be produced from one's own labor it frequently became a cooperative matter. Then one or several of the neighboring farmers in the area helped dig and haul the stone, cut and haul the wood or coal, and contributed their labor as other farm work permitted. The burned limestone not earmarked for any particular farm was divided among those who contributed their time, labor, and material or sold to other neighbors who expressed a desire for the product. Frequently lime was traded for wood or another item of barter with neighboring farmers. Although neither the limestone deposit nor the wood had too much value, the resulting lime proved to be of great value.

Even though at one time nearly every farm had a limekiln, most of them have crumbled into a pile of stones from lack of maintenance or they have

been demolished because of their unsightly appearance and because of the demand for better utilization of the land on which they were located.

Most of the limekilns had a similar design. They were constructed from large, rough, native stones similar to those which were used for burning. In some areas sandstone was used. The stones were placed one on top of another to the dimensions desired. Construction was similar to that of a dry wall since no mortar was found in the joints.

In addition to being built on a hillside, the kilns were built into the bank. The front of the kiln was nearly vertical with a slight backward slope from bottom to top. Usually square or rectangular in dimensions, the bottom width varied from sixteen to twenty inches. The height of the kilns varied from ten to twenty feet and the top of the kiln was constructed to meet the ground level in the rear.

Frequently the walls were extended from the sides to fit the contour of the slope and to support the roadway behind the wall leading to the top of the kiln. The roadway constructed to approach the rear of the kiln allowed the limestone and fuel to be unloaded from the dump carts or plank wagons into the shaft with far less effort.

When the area in which the kiln was constructed was not sufficiently sloped, a section to the rear of the kiln was filled in to provide a ramped roadway and access for hauling the limestone and fuel to the top of the shaft. Although relatively few of the roadways and retaining walls are in fact, there is still evidence of their existence.

At the base of the kiln was a large, central front opening which had the appearance of an entrance to a cave or underground passage. This larger or outside opening measured approximately six feet at the base, six to ten feet in height, and thirty inches deep. The top of the opening varied from several feet to but a few inches and if the opening happened to be triangular, it formed a point. A large flat stone was placed over the top of many of the outside openings which served as a lintel. Other openings were arched.

Within the larger opening at the base was a smaller aperture through which the fuel was ignited, through which air passed for combustion, and through which the burned limestone was removed. The smaller openings were rectangular or square or tapered toward the top. Of those measured, the openings were found to be eighteen to twenty-four inches at the bottom, and ten to sixteen inches at the top, and one and one-half to three feet high. Some kilns had such small openings that the lime had to be removed from the top by the use of an improvised derrick.

The dimensions of the cylindrical pot or shaft measured from eight to twelve or more feet in diameter across the top openings and tapered to three or more feet at the bottom. The depth of the shaft varied from twelve to twenty feet. At the bottom of the shaft a rectangular trough arrangement about eighteen to twenty-four inches wide and twelve inches in depth was constructed in line with the front opening of the kiln. This was located beneath the grate and assisted in the unloading operation.

Most of the shafts were vertically constructed approximately half the depth of the pot and tapered below that point to the bottom giving it a conical or egg-shaped appearance. Some of the later shafts were lined with firebrick throughout. The space between the firebrick lining and the outside walls was filled with native field stones of all sizes. Residue was found from the burning process still clinging to the sides of a number of shafts that were inspected. Most of the shafts have been filled in completely or fenced off to prevent children or animals from falling into them. A number of informants recalled incidents in which cattle were killed or had to be shot as a result of injuries from falling into such shaft openings.

In order to hold the layers of fuel and limestone, a framework of iron bars or railroad ties was placed cross-wise over the unloading trough at the bottom of the shaft and a like number of others was placed longitudinally over the first row to form a grate. In some kilns the bars were similarly arranged and were extended far enough through the opening in the front to allow some of them to be withdrawn at the completion of the burning process. The grates in some kilns could be moved or shaken with a device provided for that purpose.

The height of the grate above the top of the unloading trough varied from one kiln to another. As the burned charge fell through the grate area into the trough beneath, at the completion of the burning process, it was shoveled or hoed out.

Over the top of the shaft opening, a temporary roof structure of rough planks was frequently erected to keep out all forms of precipitation. The roof was usually supported by wooden trestles or other framework placed on opposite sides of the kiln allowing an air space between the top of the shaft and the cover. Toward the end of the burning period, the cover was removed to prevent it from igniting as the fire approached the top of the shaft. After the burning process was completed and the kiln was emptied, the opening on top of the shaft was covered for protection until the kiln was to be used again.

Deadly gases were frequently given off in the process of burning lime. A limeburner whom the writer contacted told of a vagrant who was found dead from asphyxiation one morning near the shelter covering the shaft opening of the kiln on his father's farm. Although the area around the kiln shaft provided warmth on cold nights, the gases which escaped were extremely dangerous.

The late Dr. Arthur D. Graeff related an interesting story concerning the dangers of escaping gases under the heading, "Why I do not own a dog." "Now we had a limekiln on the farm and in the fall this was filled with limestone, mixed with coal, then ignited. When it was nearly burned out I passed that way and stopped to get warm. Fritz was amusing himself in a neighboring field. I knew of the dangerous fumes emanating from the kiln but paid no attention to them. Soon I became drowsy and lay down at the limekiln for a nap. When Fritz returned I was unconscious. Somehow the dog sensed that there was something wrong and connected it with the

limekiln. With his teeth he took hold of my coat and dragged me away from the kiln. Then he stood guard over me until I gained consciousness. When I did, Fritz leaped and barked with joy. Then he pulled at my clothing in an effort to start me homeward. But I was too dazed, too sick and too weak to walk. Presently I was seized with vomiting after which I felt better and was able to stagger home."[11]

Some kilns, had a permanent shed roof, covered with wooden shingles or tin, constructed over the shaft and the area in front to protect against inclement weather. Numerous kilns, particularly those constructed in a multiple arrangement, had a pitched shed roof or rough boards extending forward in front. The roof was supported by upright posts placed at spaced intervals beneath the front portion of the roof. The roof when properly covered provided a shelter for the attendants while working at the kiln and protected the bottom of the kiln and lime from the weather. In very few instances do these roof structures remain. Most of them have been removed or have deteriorated and fallen together so that the brackets or hooks which supported the roofs are the only trace of their existence.

The capacity of the limekiln shafts varied considerably; some produced relatively small amounts of lime while many of the later types were large enough to produce several thousand bushels. Some of the kilns were large "containing three thousand bushels of lime stone, using six hundred bushels of coal for burning it."[12] Others "had a burned lime capacity equal to the requirements of fifteen acres."[13]

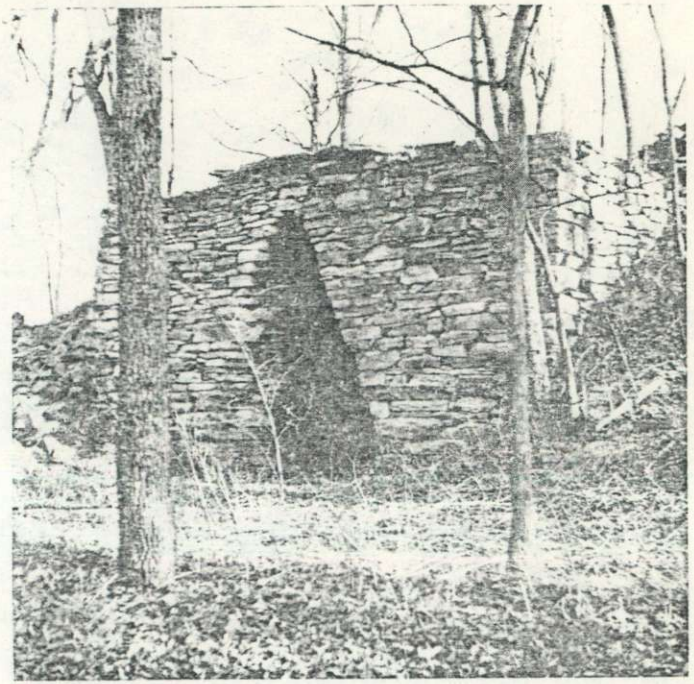
Limeburning

The limestone to be burned in the kilns was got from out-cropping ledges or from a pit or quarry found on the farm or neighboring farms. Even though many kilns have crumbled or have been demolished the abandoned limestone quarry hole, from which the stone was removed and hauled to the kiln by the farmer, is still evident in the fields of some farms. Many of the holes are overgrown with bushes and trees, are being used for dumping garbage and refuse, or have been filled in completely which makes them difficult or impossible to be recognized.

Stones of all sizes were used for burning. The larger rocks were broken loose into smaller sizes by a sledge hammer, hand drilling, or blasting with black powder charges. One informer stated that the best rock for burning lime was removed from beneath the ground surface and had a bluish tint. The stones removed from the outcropping ledge had lost some of their properties and did not burn as well or result in as good a lime.

If the excavation from which the limestone was obtained was large and deep, the wagon and carts were loaded in the quarry and drawn by mules or horses to the top of the incline. In some of the larger quarries which

[11]Arthur D. Graeff, "Why I do not own a dog" *Scholla, Reading Times*, Nov. 14, 1949.
[12]Fletcher, 133.
[13]Williams, 83.



Limekiln with triangular opening. Located on farm near Sheridan, Berks County.

supplied several kilns, cars attached to cables were used for the same purpose.

The average wage of a quarry worker in the early part of the nineteenth century was fifty cents a day. Raw hands and sore backs were common from the long hours and the continuous use of pick and shovel. The limeburner received slightly more, usually seventy-five cents a day; but in order to qualify one had to be well experienced. In order to help boost the morale, it was not at all uncommon to supply whisky or other strong drink to the workmen in the quarry and at the kiln.

The following excerpts taken from the account book of H. B. Eby, Salisbury Township, Bucks County, during the years 1832-1833, provide a cost index during those years for labor and products related to the operation of a limekiln.

1832

Sept. 7th Levi Hartley, Cr.
By quarrying 938 Bu. Lime Stone at .02¢ per hr. $18.76

To cart and oxen to clean quarry ½¢ per hr. 4.69

Sept. 13th Levi Hartley, Cr.
By chopping 6 3/4 cords of wood. 3.03¾

Sept. 15th Daniel Yemmans, Cr.	
By quarrying, filling, burning kiln lime	30.00
Sept. 19th Joseph Broudhurst, Cr.	
To 350 bu. Lime to be paid the same.	43.75
Sept. 19th Charles Yemmans, Cr.	
By measuring lime 2½ da.	1.25
Nov. 10th Levi Hartley, Cr.	
By quarrying 825 bu. lime stone at .02¢.	16.50
1833	
Apr. 12th Saml. Eastburn, Cr.	
By 16 Cords wood at 2.75	44.00
Apr. 19th Levi Hartley, Cr.	
By arching kiln	1.50
Filling and tending 2½ days and nights	2.25
May 5th Levi Hartley, Cr.	
By arching kiln	1.50
By tending	2.50
May 14th Levi Hartley, Cr.	
By 1½ days filling kiln	.75
By 1 night — 2½ days tending	1.75
By arching	1.50
By ½ day drawing coal	.25

Occasionally farmers began quarrying and burning operations only to find that the stones were too hard for burning and unsatisfactory for lime. An informant related how his father with the aid of Jacob Millard, the father of the late H. E. Millard of Millard Lime and Stone of Annville, Pennsylvania, now a part of Bethlehem Steel operations, began quarrying on a farm in the area of Houcksville, Lebanon County, with the intention of burning lime. The stones were found not suitable for the purpose and consequently they were used for road fill.

The wood burning limekiln was used before the discovery and availability of coal and continued in use until the beginning of the nineteenth century. "In some of the more remote districts of Pennsylvania wood was used for burning lime until after 1925."[14]

The wood burning kiln was similar in most respects to its successor except that it had a large independent combustion chamber for the wood fire and required continuous attention day and night. Men relieved each other in this arduous task of feeding the fire. This accounts for the many stories and events which were associated with the operations of the kiln at night. Although the wood burning kiln had many disadvantages, the use of wood as a fuel introduced additional moisture resulting in a better quality lime.

[14]Fletcher, 134.

All the kilns pictured and described are coal burning kilns. The writer found no wood burning kiln in existence. They have deteriorated, have been demolished, or have been rebuilt into or replaced with coal burning kilns. A wood burning kiln is illustrated in *Thorpe's Dictionary of Applied Chemistry*.[15]

The coal burning kiln received its entire charge from the beginning and after being ignited required very little attention until the burning process was complete. After coal was introduced and found to be a more practical fuel, many wood burning kilns were converted to burning coal. The use of coal in the kilns, beginning about the turn of the nineteenth century, eliminated night fire duty and simplified and cheapened the process of lime burning. "One ton of coal will burn about five tons of limestone and will produce about three tons of burned lime. About one-half cord of well seasoned wood is required to burn one ton of lime when wood is the sole fuel. On this basis one-half cord of well seasoned wood is the equivalent of one-third ton of coal in the burning of limestone to lime."[16]

The kiln was fired by placing kindling wood beneath the grate. On top of the grate at the bottom of the shaft, a layer of dry firewood was placed, then a three to six inch layer of coal, generally pea size, was spread over the wood and a twelve to eighteen inch layer of limestones was placed on top of the coal. The larger stones were usually placed toward the center of the shaft and the smaller sizes were placed around the outer surface next to the firebrick lining to avoid too solid packing and choking of the draft through the shaft. In this way there was better control of the draft and more even burning in the various layers of fuel. Coal and limestone were placed in alternate layers to the top of the shaft. The layers of coal became heavier and the limestone layer thinner until the shaft was filled.

An informant told of continuing the alternate layers of coal and limestone in the shape of a cone frustum to a height of four to six feet above the top of the shaft. The frustum of the cone was then plastered on the exterior with mud allowing an opening at the top for a flue.

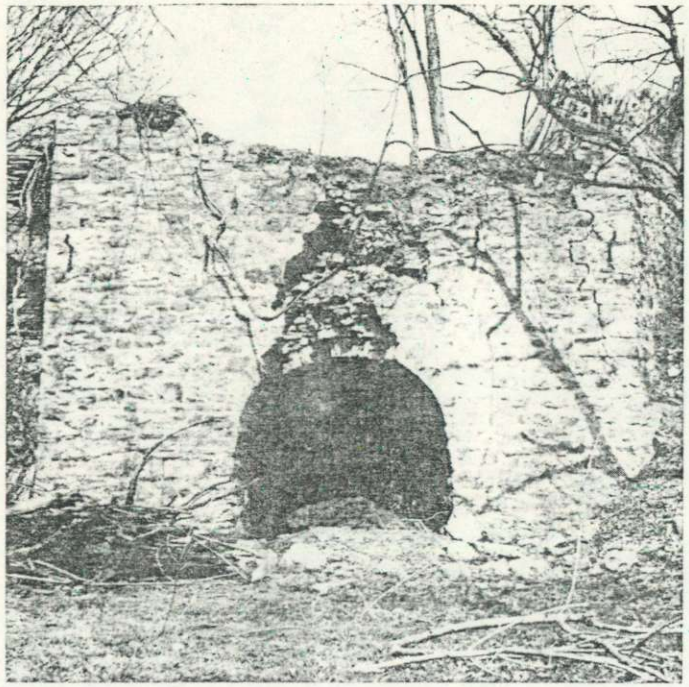
Frequently the kiln opening was sealed with clay or mud mortar, a piece of sheet iron, or other suitable material to help regulate the draft and prevent too rapid combustion.

Some informants recalled on several occasions that after the kiln had been ignited, the fire failed to burn because of too solid packing or from crumbling stone, and they had to unpack and repack the shaft in order to provide the necessary draft for combustion. There were times when the limestone had not burned properly resulting in poor lime and loss of time, effort, and expense. Stones broken into sizes approximately eight inches were best. The larger the stones the longer the burning process.

Some of the kilns were kept in continuous operation for long periods of time. One informant told of having a supply of stones piled within easy ac-

[15]J. F. Thorpe, *Dictionary of Applied Chemistry* (New York, 1937), Volume I, p. 732.

[16]Williams, 77.



Deteriorating limekiln with arched opening. Located on farm near Harpers, Lebanon County.

cess to the shaft opening. Each day or two, depending on the wind and weather, burned lime was removed from beneath the kiln and filled in with stone and coal from above. In this way the farmer could have a continous supply of lime on hand and attend to his limeburning operations while performing his other farm chores.

After the shaft had been filled and the kindling was ignited, the burning period took approximately one week. The burning was accompanied by loud bursts of noise caused from the stones as they cracked from the intense heat. According to the Bureau of Standards, calcium carbonate will break up and disintegrate at 898 degrees Centigrade (1648 degrees Fahrenheit). Generally the temperature for burning limestone is between 900 degrees and 1200 degrees Centigrade (1648 degrees and 2192 degrees Fahrenheit). Frequently temperatures upwards to 2000 degrees Fahrenheit and above were attained in the process. It was found that the lower the temperature at which the rock was burned, the better the lime. In some of the later and more efficient kilns, burning was done at lower temperatures with the introduction of steam into the kiln. It was frequently necessary for the attendant to venture out into all kinds of weather, day or night, to regulate the draft and the burning process, as the direction or velocity of the wind changed.

It was required approximately a week for the kiln to cool after it was allowed to burn out. After the kiln had cooled, the iron gate bars were removed or adjusted and the burned lime fell into the trough from which it was shoveled or hoed. It was now ready for hauling to the field for weather slaking or to be sold or shared with neighboring farmers.

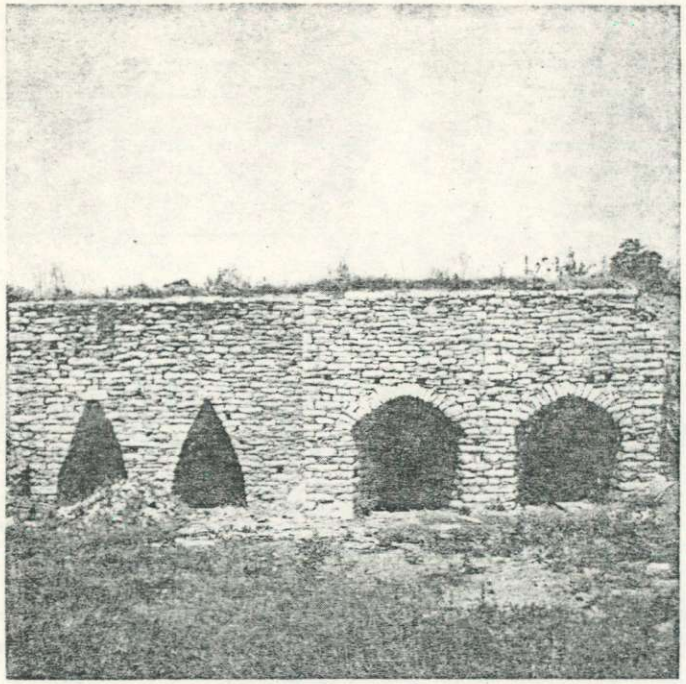
Limeburners Recall

Benjamin Hauer, now deceased, and Ray Walters, who during their earlier life assisted in the operation of limekilns, supplied considerable information relating to their use. Benjamin Hauer resided practically all his life in the Harpers area of Lebanon County. He started burning lime with his father, Amos Hauer, when he was thirteen years of age and burned lime in kilns in the Harpers area as late as 1951. He told that burning lime was done primarily between farm chores. Usually after seeding time in spring until hay making and from late summer until about Christmas, depending on the weather, the kiln was in continuous operation. He said they burned very little lime during the hottest and coldest months.

The time required to fill the shaft in preparation for burning depended upon the help available. He stated that it took a week and a half to two weeks and occasionally longer for his father and him to fill a kiln. He said they frequently filled in one or two layers a day depending upon time available. The stones were usually found right on the farm: sometimes they were brought there from the surrounding areas. He stated that within one area the quality and color of the stone could vary considerably and that it was important for the limeburner to know the stone. The stone varied in hardness and in color from shades of blue to yellow and white. The quality of the stone determined to a large degree the amount of coal required to complete the burning process. More or less coal was also required depending on the air movement and draft. They used coal which had been washed down stream in the Swatara Creek from the regions to the north where it was mined.

Occasionally limestone was bought. He recalled paying one quarter cent per bushel or four bushels for one cent and from $1.60 to $1.85 a ton in later years. He stated it was a common practice for a farmer who had limestone on his farm to build a kiln near the outcroppings and then hire someone to burn the lime. The limeburner may have been paid for his services or there may have been a barter arrangement allowing him to sell some lime in return for his efforts.

He said he helped fill some kilns that had a capacity of only two hundred to three hundred bushels of lime and others that had a capacity of fifteen hundred bushels. The average capacity of the kiln at which he worked was from three hundred to six hundred bushels. He told of removing as many as fifty bushels of lime a day from the kiln and as few as one or two wheelbarrows depending on combustion. He recalled that his father sold lime for five and one-half cents a bushel, and he told of selling it for six or seven cents a bushel during his first years of burning and for eighteen cents a bushel in 1951, the last year he burned lime.



Multiple limekiln arrangement. Roof structuring above shaft and lower openings having been removed. Located on farm near Stouchsburg, Berks County.

He related that lime was used in large amounts for mortar between stone and brick for the erection of the exterior walls of barns, houses, and out buildings. The stone were burned in the limekiln until they became fragile and calcified. The resulting lime when slaked in water made an excellent mortar and enhanced the appearance of masonry buildings.

Considerable quantities of lime were sold for white-washing, a common practice during earlier years. Since paint was scarce and expensive, walls, ceilings, stables, fences and tree trunks were frequently white-washed. As many as two hundred to three hundred bushels of lime were sold each year for white-washing. Some buyers bought as little as a peck at a time. Lime to be used for white-washing, he stated, was best obtained from good quality white stone.

He told of applying from seventy-five to one hundred bushels of lime per acre on their land and usually one field on the farm was limed each year. He recalled a Holstein cow that fell into a lime kiln and having to tear out the bottom of the kiln to remove the dead cow. In addition to vagrants who slept by the kiln, he told of a basket maker who lived in and about the kilns during the decade of the forties. The baskets he made there were sold in the neighborhood for a livelihood.

Ray Walters, from Buffalo Springs, Lebanon County, last burned lime in 1925. He told how two men quarried fifteen four-horse wagon loads of

stones in two days. This was the amount required to fill the kiln shaft and stack. After the stones were quarried they had to be hauled to the kiln and broken to about the size of a man's head.

Three men were generally assigned to "set up" the kiln and stack. Flat stones were placed on the bottom of the shaft. One four-horse wagon load was enough for two fifteen inch layers of stone in the kiln. Each layer of stone was alternated with a two inch layer of buckwheat coal. After the shaft was filled, a stack about ten feet high was put on. It consisted of numerous layers each of stone and coal. He said only two men could work on the stack and for the last several layers, only one man could be accommodated because of space. It required three days to fill the kiln shaft and stack.

After the stack was completed three cart loads of mud from a nearby creek were brought to be plastered over the stack. Then a cart or wagon load of wood was put into the mouth of the kiln and when the plaster on the stack had dried, the kiln was ignited. He recalled that it required about ten days for the stone to burn. Their kiln provided about seven hundred fifty bushels of lime. When this was hauled on the field on piles of one-half bushel each, it covered a ten acre field.

He related that limeburning operations in his area were discontinued about 1925 because of the high cost of labor and coal and because of the competition from commercial producers.

Another informant told of a limekiln which was used for the storage of ice during his youth on his parents' farm. A peak roof was constructed over the shaft and ice from a nearby pond was stored in sawdust within the interior. He said the ice kept well from one season to the next.

The entire process of changing limestone to lime was an arduous task and frequently became a cooperative enterprise. It was not uncommon for neighboring farmers and friends to gather together and jointly share the task of hauling limestones and wood or attending to the fire. This was particularly true when the kiln was located some distance from the quarry or wood lot.

The area around the limekiln frequently became a scene of many types of amusement and merriment during the early autumn evenings and nights. Corn roasts were common. Sometimes chickens were roasted and potatoes baked, making a suitable feast for a keen appetite at the end of a working day.

Burned Lime

"The weight of burned material removed from the kiln is about sixty percent of the limestone placed in the kiln because of the impurities and unburned carbonates in the lime."[17] Burned lime was generally sold by the bushel. Usually square wooden boxes or stave tubs were used to measure it. A bushel of lime weighs approximately eighty pounds and measures 1.25 cubic feet. Different methods were devised to record the number of bushels as the lime was loaded on the customer's wagon. Those who did not trust their memory often resorted to the use of a peg board. Each time a bushel

[17]Williams, 75.

of lime was loaded, the peg was inserted in the next hole, thus providing a more accurate record.

The cost of lime varied according to time and place of purchase. Records show that it sold for as low as three cents a bushel at the kiln. About the turn of the last century, the farmer paid eight to twelve cents at the kiln and as much as fifteen to twenty-five cents if transportation was involved. "In 1835 lime sold for twenty-five to thirty-five cents a bushel at the kiln."[18] The cost of lime plus the cost of hauling made frequent use or even necessary amounts too prohibitive for many farmers if it had to be purchased.

After the burned lime was hauled to the field in a wagon or cart, it was shoveled or hoed on piles, spaced according to the needs of the land and for convenience in spreading. After the lime had lain awhile and was slaked, it was spread by hand shoveling. A number of informants who experienced this task told how arduous the work was. The small particles of limestone occasionally found in some fields where there are no limestone deposits are from the unburned cores in the burned lime which was spread on the fields years ago.

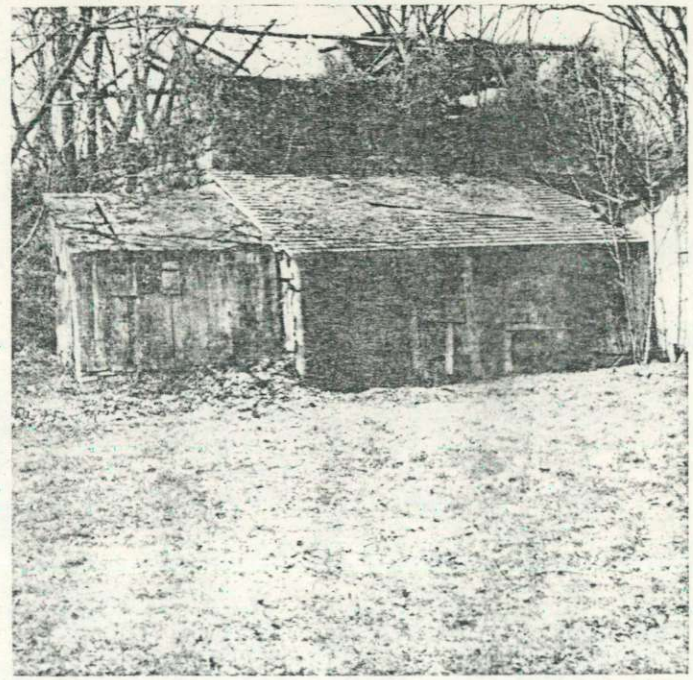
Several informants told how the lime became wet from a sudden rain squall as it was being transported. It produced enough heat to require that the entire load be dumped to keep the wagon or cart from igniting. If the piles of lime in the field became wet from a rainstorm, they would also frequently smoke and steam. Such piles produced a burning glow at night. During a period of drought, water was sometimes hauled to the fields and poured on the lime to slake it. "One ton of well burned lump lime will take up fifty gallons (415 pounds) of water to make about 2415 pounds of hydrated or slaked lime."[19]

If the farmer did not have a limekiln on his farm he found it necessary to purchase or barter for his lime. Bartering was a frequent practice. Jordan informs us ". . . in exchange with one of their neighbors forty-two bushels of lime were given for nine bushels of wheat."[20] It was not practical for some farmers to incur the expense of constructing and operating a kiln particularly when very small or unusually large quantities of lime were required or if a neighbor could supply the needs either through cooperative efforts or purchase. This was also true if the farmer had to purchase either the limestone or timber or if he was busily engaged in a more profitable enterprise. When time permitted, some farmers on their own carried through an entire operation of limeburning alone with the use of a cart and a mule or horse.

Stack Burning

A more primitive and crude method of burning, known as stack burning of lime, was used by some farmers who had readily accessible limestone

[18]Fletcher, p. 136.
[19]Williams, 77.
[20]John W. Jordan, "Scraps of 'Bucks' before 1750," *Bucks County Historical Society*, Vol. I (1908), p. 546.



Limekiln showing adjacent sheds and roof structure built over opening below where lime is removed and remains of roof above which protected shaft openings. Located on farm near Harpers, Lebanon County.

deposits or ledges on their farms and no kiln. When this method of burning was used, heavy firewood mixed with lighter kindling was placed on the ground in an open field, frequently in a field in which the lime was to be used. On top of the wood, coal and limestones were stacked in alternate layers similar in composition and proportion to kiln use. This huge pile was covered with mud or clay over the entire outer surface, except on the top, and then the wood was ignited. The opening at the top of the stack provided an escape for the carbon dioxide, which was essential if the burning process was to be satisfactory. Mixed with the burned lime at the completion of the process were the wood ashes which prove beneficial to the soil and the coal ashes which are harmless. As the demand grew, not only for agricultural use but for structural and industrial uses, lime was not only burned by individual farmers but burning was established on a commercial basis. Not only was limestone used in the construction of many houses and barns in the German settled areas, but large amounts of lime were used for mortar and plaster. The abundance of limestone deposits became an important factor in the development of local iron industries. Limestone provides the cheapest flux which is required in the production of iron. About the middle of the nineteenth century multiple or long lines of kilns began to

appear in or near some communities and the burning of limestone became a thriving and profitable enterprise.

With the continued growth and development of the commercial aspect of lime burning, many farmers were approached and offered a royalty for the quarrying of limestone on their land. The royalty offered and paid varied from place to place but the rate was generally twenty to thirty cents for each ton quarried and removed during the early part of the last century. It was not at all uncommon during the past century when farm lands were sold for the seller to reserve the right to allow him or his heirs the privilege to obtain limestone from the quarry hole or timber from the woodlot.

Transporting the Lime

Much of the lime was transported from the kilns over dirt or otherwise poorly constructed roads to the farmers' fields by horse and wagon. Transportation was frequently limited because of lack of roads and bad weather. The heavy loads of lime were tremendously hard on the horses and wagons. The advent of the canal and railroad meant that coal, limestone, and lime could be transported between more distant points. Many times these products could be shipped by canal or on sailing vessels on river and coastal waters and in later years by the railroad which began to compete with the canals. The cost of transporting the limestone from the quarry to the limekiln frequently involved a greater cost than the limestone. In some sections when the lime had to be transported any great distance by canal or railroad, the cost of transporting prohibited many farmers from using it.

After the farmers outside the limestone areas learned of the advantages of applying lime to the soil, they would travel great distances to obtain the product. It was not unusual for several farmers in an area to join together in travel and make a gay time of it.

With the growth of commercially operated kilns, Roberts points out that . . . "farmers came from points . . . ten to fifteen miles distant, and at times their teams, four and six horses to a large wagon, stood . . . covering nearly a mile in length. Some of them came . . . at three o'clock in the morning and waited till three in the afternoon before getting their wagons loaded."[21]

Ely relates that from a dozen to twenty farmers joined in conveying lime from the kilns to a farm, enough for a field a day, only to have the compliment returned later, either in lime-hauling or other enterprises. These frolics continued (during the past century) and "many a jovial crowd of farmers, have I seen drive up to the old limekilns, unhitch their horses and feed them from the wagonbed, the loading of the wagons continuing meanwhile, and too often the free circulation of 'liquid refreshments' increased the joviality to a dangerous point, leaving the men unfit to guide their teams on the return trip over many miles of hilly and none too good roads."[22]

[21]Charles Rhodes Roberts, *et. al., History of Lehigh County, Pennsylvania* (Allentown, 1914), Vol. I, p. 798.

[22]Warren S. Ely, "Lime Burning Industry, Its Rise and Decay in Bucks," *Bucks County Historical Proceedings,* Vol. IV (1917), p. 71.

Use of Lime

There is still a difference of opinion among some farmers concerning the merits and use of lime. Those who use it continually claim a material benefit. There are those who do not use it, not because it would not prove beneficial to the land but because of the investment involved. The wisdom of some farmers who entirely abandon the use of lime is questionable. Some used it to an extent beyond its real efficiency; this has often been more detrimental than if no applications had been made. The result has been declining yields and even sterility of the soil. Fletcher writes, "One thing is certain, that those who have been spreading lime on their farms for the last eight to ten years have been subjected to vast expense in pulling down their old barns and building greater. . . . The number of cattle and the quantity of manure have been so increased by it that much expense has been incurred. . . ."[23] There are still many farmers who prefer the burnt lime to any other form. In recent years most lime applied to the soil is pulverized which makes the calcium and magnesium content more readily available than with burned limestone.

In general, lime is hardly needed by the soil so long as a good stand of clover and grass is secured. Nor is it needed to ameliorate the physical condition of soils which have a mellow, loamy texture. Good drainage prevents a sour condition of most soils. However, liming on soils that have not received an application for some time would normally give increased yields. The effect of lime as a base to neutralize the acid condition on overfed or neglected land, in which a vegetable matter has accumulated, is extremely beneficial in producing crops. It has been used most extensively on clover and alfalfa and to bring about better yields on depleted soils.

Lime is usually applied on sod about once each rotation or approximately every five years. Generally higher, well drained land requires only half as much as low, poorly drained areas. Applications of as little as fifteen to twenty bushels per acre may be applied on upland areas and more than twice that much on low acres. Good results at present are being obtained on many farms with lime applications of 50 to 100 bushels (two to four tons) per acre.

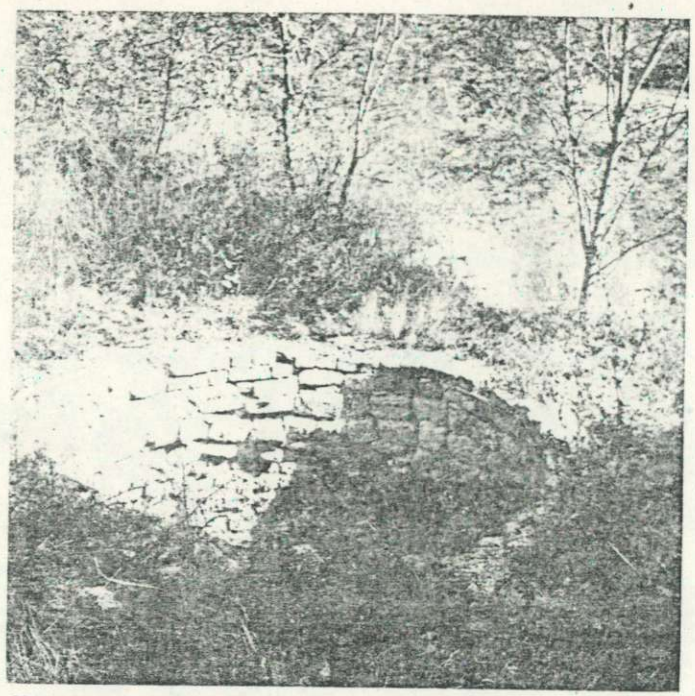
Even though the introduction of commercial fertilizers has caused the use of lime to drop considerably, it has made a substantial comeback in recent years. If lime does fail, it is usually because it is applied too late and in too small or too large quantities for efficient use.

Folklore

Many stories and folk beliefs relating to lime and its use have evolved through the years. Victor C. Dieffenbach, with all his wit and humor, used to say, "*Wann mer der Schnee heess unnerblugt noh iss er so gut ass Kallick.*" (If you plow the snow under while it is hot, it is as good as lime.)

In the files of the Pennsylvania Folklife Society is an interesting story relating to the use of lime for preservation of the body as given in the "Life and Confession of Alexander Anderson". He requested that his body be

[23]Fletcher, 136 and *Farmers' Cabinet,* Vol. II (1838), p. 355.



Shaft opening into which limestone, coal and wood were piled for burning. Located on farm near Stouchsburg, Berks County.

buried in the Poor House graveyard, along side of the grave of his child, and directed to have slaked lime put in the coffin with his body, so that the doctors could not use it. Before the coffins were closed, old Aaron, Anderson's father-in-law, produced a basket of lime, to put in the coffin, in pursuance of Anderson and his wife's request, but some of the physicians present persuaded him that lime would preserve the body and thus keep it in a fit condition for the doctor's use! The old man then concluded to dispense with the lime."

Fogel wrote "March snows are as efficacious as a coat of manure. Turning down snow with a plow is as good for a field as manure and lime."[24] "Slake lime with March snow. The membrane which forms on the water makes a good ointment."[25]

Lime has been put to use other than those ways previously listed. It has been prescribed many times in folk medicine as a kind of pancacea for many illness and torments. Again Fogel informs us how to rid oneself of warts, "Steal a piece of lime and rub it on a wart."[26] To keep the throat open, spray with water of slaked lime. . .[27] As a treatment for burns, "Take

[24]Fogel, 207, Nos. 1038 and 1039.
[25]Fogel, 271, No. 1414.
[26]Fogel, 325, No. 1731.
[27]cf. Brendle and Unger, *op. cit.*, p. 136.

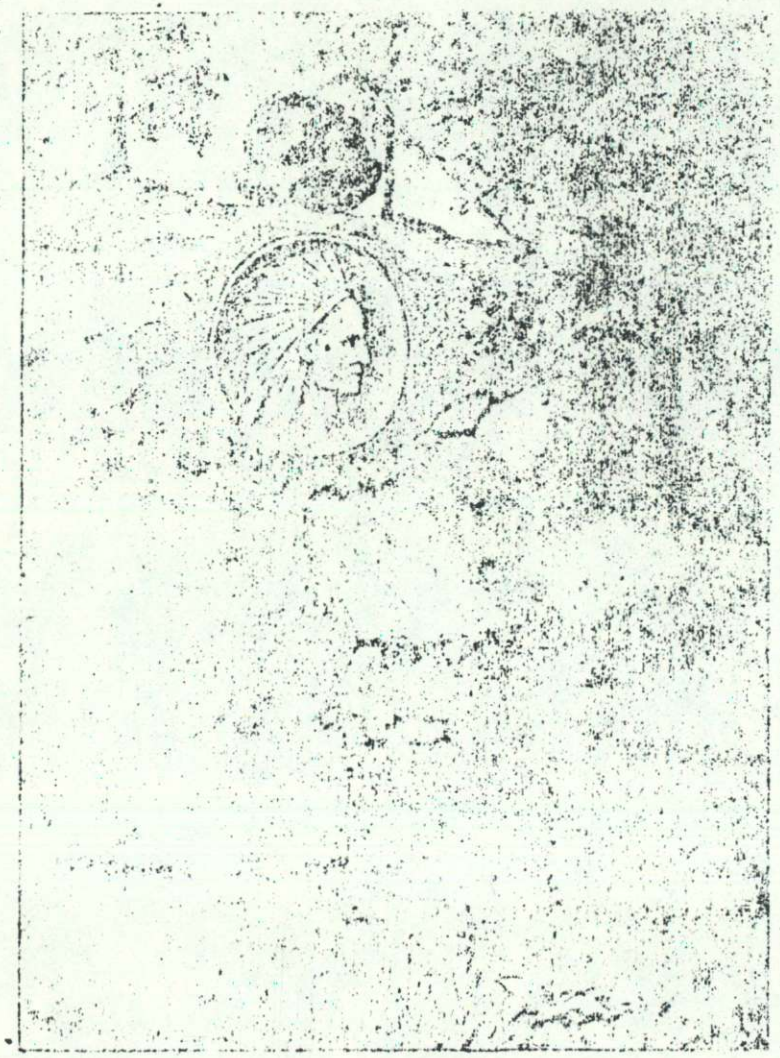
unslaked lime and pour water upon it and let it set until perfectly clear and then pour off the water add neat foot oil ('Flo-fät') and stir together until it forms a plaster."[28] As a treatment for gangrene (*brand, schwatz brand, un kalt brand*) to be applied externally: "Rye bread in water of unslaked lime-water in which lime was slacked."[29]

Lime has been prescribed as a very good remedy for the white swelling. "Take a quart of unslaked lime, and pour two parts of water on it; stir it well and let it stand over night. The scum that collects on the lime-water must be taken off, and a pint of flax-seed oil poured in, after which it must be stirred until it becomes somewhat consistent; then put it in a pot or pan and add a little lard and wax; melt it well, and make a plaster, and apply it to the parts affected — the plaster should be removed every day, or at least every other day, until the swelling is gone."[30] "If a heifer is bitten by a dog, take linseed oil and lime, mix and smear on the wound."[31] A good "receipt" to drive away moles "put unslaked lime in their holes and they will disappear."[32] A "receipt" to mend broken glass: take common cheese and wash it well, unslaked lime and the white of eggs, rub all these well together until it becomes one mass, and then use. If it is made right it will certainly hold.[33]

The bank-side limekiln, originally built to produce a cheap lime for application to the land has generally ceased to serve any useful purpose. Although once a familiar sight it is now so rapidly vanishing that relatively few good examples remain for study. Most of the kilns during the present century have been abandoned and have fallen into disuse and ruin. Most of them have fallen together so that the remaining piles of stones are the only physical evidence of an era passed. Others have been cleared away and have vanished completely. The use of the limekiln began to decline about the turn of the present century with the advent and competition of commercially produced lime and fertilizers and the general use of cement for construction purposes. Most of the small individually owned and operated kilns and quarries which earlier did a prosperous business, providing employment and revenue for many men, are now entirely abandoned because of the many farmers who have resorted to the use of commercial products.

The limekilns which remain stand as a silent witness to the past and reflect a historical message of their own. Although many related, worthwhile incidents and experiences have gone unrecorded, the impact of the limekiln will continue to be felt because of the part it has played toward soil improvement. This along with the constant effort of the farmers has largely accounted for the flourishing conditions of agriculture in Pennsylvania.

[28]Fogel, 153.
[29]Fogel, 154.
[30]Hohman, p. 19.
[31]Brendle-Unger, 215.
[32]Hohman, 27.
[33]Hohman, 20.



THE LANDS OF RHODE ISLAND

AS THEY WERE KNOWN TO

CAUNOUNICUS AND MIANTUNNOMU

WHEN ROGER WILLIAMS CAME IN 1636.

AN INDIAN MAP

OF THE

PRINCIPAL LOCATIONS

KNOWN TO THE

NAHIGANSETS

AND

ELABORATE HISTORICAL NOTES

BY

SIDNEY S. RIDER.

PROVIDENCE, R. I.
PUBLISHED BY THE AUTHOR.
1904.

SCATACOKE.

(16)

This is an Indian name of a locality. The precise situation cannot be fixed. It is a name to a locality, according to Trumbull, on the Housatonic River. It is also a name of a village in Rensselear County, N. Y., on the Hudson River, spelled Schaghticoke. The name there used Trumbull defines as "The place where a river branches or divides"—"at the branch". There is no such condition attached to *Scatacoke* in Rhode Island. This definition seems to have been a favorite with Dr. Trumbull. He defines Pascoag "land at the branch, or crotch of a river". Chepachet, "the division or fork of a river". Wunnashowatuckqut, "at the crotch of a river". Pishgachtigok, "the confluence of two streams". This indicates a copious condition which the Indian dialects have not been supposed to possess.

SACONASET.

(10)

This name appears in a Harris document of 1667 (Coll. Hist. Soc., v. 10, p. 207). In some transfers it is mentioned as a Hill. It is doubtless the hill Sockanosset of our times.

SHINSKATUCK—SHENSKONET.

(4)

These are names of brooks, or hills, in what is now Glocester. They were in transfers of land, the first in 1708; the last in 1705, recorded in the Proprietors' Records, which have now been destroyed by a fire in Providence.

SCAMSCAMNEK.

(18)

Is the name of a spring on the neck of land known to the English as Rumstick, opposite Warren.

SETAMACHUT.

(9)

This name is attached to a hill in the town of Johnston, on our Indian map. This hill is near the village of Manton on the southwest bank of the Wanasquatucket river. In order to fix the location of this hill I submit a few points. On the 27th July, 1703, the town of Providence ordered a committee "to repair a highway from said river westward over Sissamachute hill". The words "said river" refer to "Neotaconkonit river" (Early Rec. xi., 77). This river was the small stream which ran from what we now know as Ochee Spring, flowing across the Killingly road into the Wanasquatucket river.

In May, 1667, fifty acres of land was laid out to Thomas Harris in the division ordered two years before. This land was between "the Safoen mil lin and the fower mill line on the hea..er sid of Settemeechevt heall towards the Riavear ayt score polle long and fiftie broad". Here I follow the terrible illiteracy given in the printed Early Records (vol. 15, p. 115). I will attempt an English translation: "Between the seven mile line, and the four mile line, on the hither side of Setamachut hill, towards the river (Wanasquatucket) eight score (160) poles long, etc." In 1677 the town of Providence laid out to Roger Williams thirty-three acres of land on the northern end of a hill called Setamachut (Prov. Early Rec. 15, 177). Mr. Williams gave this land to his grandson, John Sayles. The town ratified the act 27th October, 1680. It was then stated to be on the east side of Setamachut. In May, 1667, fifty acres of land, "upon the second division," ordered in 1665, was laid out to William Harris. "It lieth in a vallie, on the north east side of Neotaconkanett river near Shichemachute hill" (Prov. Early Rec. 5, 317). In 1685, John Sheldon, of Pawtuxet, deeded land to his son "on ,or near, Sichamachute hill, bounded partly *with the common* and partly by the land of Daniel Williams" (Prov. Early Rec. 5, 47). On the 12th January, 1703, fifty acres was given on the right of William Harris "lieing and being about five miles westward from the salt water harbor in said Providence, on the eastwardly part of the hill called Sissamachute" (Prov. Early Rec. 5, 51). There are

other references in the Early Records, but these cited indicate clearly the exact position of this hill. My reason for this minute detail is the fact that there now exists upon this hill a very ancient Lime Kiln, and my purpose is to identify this ancient structure with that mentioned in the Providence Early Records, as follows:

(1)

The printed record reads: "——— as Hackelton makeing his request unto the Towne ——— have liberty to burne lime upon the Comon neere about ——— and to take stones and wood for the same purpose ——— by vote that he may have libertye until ——— next and no longer." (Prov. Early Rec. 3, 8.) The time of this action was 27 January, 1662.

(2)

Again: "It is ordered that those lime rockes about Hackleton's lime killne shall be ppetually common and that no land shall be laid out on the northeast and southeast of the said kilne within 6 poles, nor upon the other sides, or partes of the saide kilne within 60 poles. This saide kilne being att or neere a place called Scoakequanocsett." (Prov. Early Rec. 3, 66.) The time of this action was 27 October, 1665.

(3)

Gregory Dexter, on the 27th, 11th mo, 1672, gave to his son Stephen four acres of land "at a place commonly called Soconoxit which was laid out to me by Thomas Harris—also—I give him my right of meadow in one share in the new division all I say of the said 80 acres I do give to my foresaid son Stephen for him and his heirs * * as their own proper inheritance whilst mortality lasteth with all the immunities and privileges upon and *in that 80 acres, only excepting which I do really except*, this privilege for the Inhabitants of the town of Providence to fetch for their use as much lime rock from the Rock called Hackelton's Rock as they please" (Prov. Early Rec. 3, 229). Here were two different bodies of land, one, four acres near Sockanosset laid out by Harris; the other, 80 acres, which came "in the new division". This "new division" was made in February, 1665. Dexter drew the 15th chance (Prov. Early Rec. 3, 72). The reference to Hackleton's Rock applies only to the 80 acre parcel.

(4)

At a town meeting, 24th May, 1673, a return of lands laid out to certain individuals was made. One "lay out" reads as follows: "Laid out unto Gregory Dexter own lot adjoining to his own land at Hackington's rock, in length northerly and southerly one hundred and six poles," etc. (Prov. Early Rec. 3, 241). These four entries contain all that is known of Hackleton, or Hackleton's Rock, or Hackelton's Lime Kiln. The first was made in 1661-2; the last in 1672.

On the map of Providence Plantations (Coll. R. I. Hist. Soc., v. 10, p. 376), Hackelton's Rock is located in Smithfield, as being a part of the Dexter Lime Rocks. This view is maintained by a communication signed G. R. T. and published in the Providence *Sunday Journal*, 8th May, 1904. It is as follows:

To the Editor of the Sunday Journal:

I notice an article in the *Journal* of April 3 upon an old limekiln situated in Manton. This was identified with the Hackelton's limekiln so frequently mentioned in the early Providence records. As it can be proved without a shadow of doubt that Hackelton's limekiln was situated near the site of the present Dexter lime rocks in the town of Lincoln, I am taking the trouble to correct the statement in your article. On January 27, 1662, Thomas Hackelton was granted liberty by the town to burn lime at a certain place upon the common. On October 27, 1665, the town ordered that the lime rocks about Hackelton's limekiln, which was mentioned as being near Scoakquanocsett, should remain in common. On January 27, 1672, Gregory Dexter deeded to his son Stephen four acres at Scockonoxit, reserving the rights of Providence people to use lime at Hackelton's rock. This all proves that the rock in question was at Scockanoxett and was part of the Dexter land. Now there are many deeds in the Providence records to show that Scockanoxett was the region of the present Dexter lime rocks in Lincoln and that the brook flowing through it was called Scockanoxett Brook. For instance, in one

deed of 1723 from Thomas Thurston to William Jenckes a lot of 150 acres is described as being bounded east by the Pawtucket or the present Blackstone River, with Scockanoxett Brook flowing through the western part of it, the land extending "up the said brook westerly to the land of John Dexter." In fact, the region has long been known to students of local history to have been the site of the early Hackelton's limekiln, and the fact has never previously been questioned, so far as has come to my knowledge.

G. R. T.

CENTRAL FALLS, May 4.

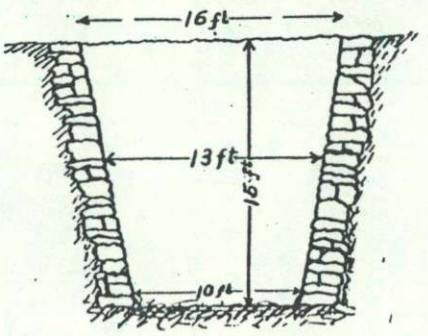
I am not in accord with the positions of "Hackelton's Rock and Scokanoxet" (sic) as fixed on the map in the Historical Society volume (Hist. Col., v. 10, p. 376). The compiler of the map seems to have followed the views of G. R. T. as set forth in the preceding communication. Both these statements are erroneous, as I will presently show.

Under the name Sockanossett is discussed the origin and meaning of the name. It was the name of a Narragansett Sachem. In 1677 William Harris brought an action against John Towers for trespass under "a pretended purchase of our (Harris's) land at Pawtuxet, Toskaunk & Soconaset" (Coll. Hist. Soc. 10, p. 207). Is it to be supposed that a parcel of land contiguous to the Dexter Lime rocks, could be at the same time contiguous to Pawtuxet, Toskaunk and Soconaset? It is an absurdity.

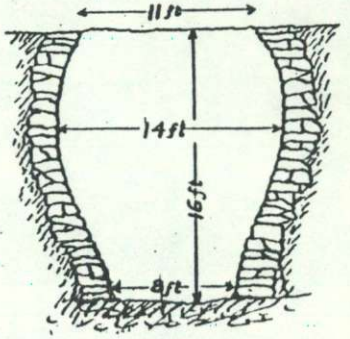
I here present the dimensions of the kiln on Setamachut—16 feet diameter at the top; 13 feet diameter at the center; and 10 feet diameter at the bottom. It is 15 feet in depth. This was the earliest form used. The second drawing represents the changes made in the form of construction in lapse of time. I give the measurements as given by Mr. Jackson: Diameter at top, 11 feet; center, 14 feet; bottom, 8 feet; depth, 16 feet. (Jackson's Geology of R. I., 80.) These facts show that the kiln at Setamachut is the rudest and most ancient now in existence in Rhode Island. These two drawings represent kilns on Setamachut Hill; one is now in existence; the others (there were two) have been torn down since 1840.

The orginal permission given to the inhabitants to burn lime in

Hackelton's kiln was in January, 1661-62. This permission was to be "upon the common near about". At that time the town meeting had no knowledge of the acquisition of the lands which contained the Smithfield Lime Rocks. These lands came by the "Confirmation Deeds" obtained by William Harris. The people knew nothing of



THE HACKSTON LIME KILLNE, 1662.



THE MODERN MANTON KILN, 1839.

these Deeds until they were put upon record in May, 1662. These lime rocks were ten miles north of Providence; while the Setamachut lime rocks were only four miles distant, west. When the town gave "Hackleton" permission, it was to burn "upon the common near about". This fact is destructive to the theory that Hackleton's Rock was a portion of the Smithfield Lime Rocks.

The town of Providence had no jurisdiction over "Common Lands" in 1661-62 in what is now known as Smithfield. There was a law which provided "that all the land in the Neck between Pawtucket river and the Moshausic river, beginning at the north end of the field, which lieth between Pawtucket River and the great Swamp, and to go upon a line unto the place where the third lake runneth into Moshausick river; all the land from these places prefixt between these two rivers *southwardly* unto the hill called Fox's hill, which hath not been orderly laid out shall remain still in common". (Prov. Early Rec. 3, p. 21.) This was absolute destruction to the idea that Hackleton's Rock was part of the Dexter lime rocks in Smithfield. The common lands did not extend north of this line,

but only south, while all the Smithfield lands were north. The "common near about" the town meeting, at Providence, did not lie north ten miles from that meeting.

The "third lake" mentioned above was the name of a small brook which ran from the Great Swamp into the Moshassuck river (Prov. Early Rec. 14, 208). The Great Swamp was the bound fixed by Miantinomi in 1642, to which the English then gave the name "Absolute Swamp".

The Smithfield Lime Rocks had not been discovered at the time when the town meeting of Providence made the first "Hackelton" order in 1661-2.

Mr. Jackson in giving an account of the Dexter Rock in Smithfield, writing in 1840, says: "The establishment is ancient, having been quarried and burnt for more than eighty years" (Jackson's Geology of Rhode Island, p. 67). This would be, making the beginning of the burning, between 1750 and 1760. I hold that Hackleton's Lime Rock was, and now is, on lands known in recent times as the Nathan Brown Farm, four miles from Providence. There were Lime Kilns, in modern form, on this farm when Mr. Jackson wrote in 1840. And a large excavation is still there, showing where Hackleton, or Hackelton, or Hackington, or Hackston's Rock, could be hacked by the inhabitants. Mr. Jackson says: "I visited the farm of Mr. Nathan Brown, four miles from Providence (in Johnston), and there examined an extensive bed of lime stone *which was wrought for lime before the discovery of the Smithfield lime Rocks*" (Jackson's Geology of R. I., 1840, p. 80). The third mention of Hackelton's rock above was by Gregory Dexter in his Deed to his son Stephen. I there followed the printed volume of the Providence Early Records. But a most significant error was made. The original Record reads *Hackstons Rock*, and not Hackleton's Rock.

These Early Records are again seriously in error (page 66, v. 3,) in giving the name "Hackleton's Lime Kiln". The name is as early "Hackstons' Lime Kiln".

Thomas Wright defines the word "Hackle" as meaning, in the provincial English dialect of Lincolnshire, "to dig up," and this is precisely what the inhabitants of Providence were permitted to do with "Hackstons" or, as it has been sometimes printed, "Hackleton's") (Prov. Early Rec., v. 3, p. 229). To form such words was characteristic of the English of that age. In Somersetshire, England, at a place called Stanton Drew is a huge stone to which tradition has fixed the legend that it was a quoit thrown by some one in the Middle Ages. To this stone has come down the name "Hackell's Coit". Shadwell in one of his "Plays" (1672) has a character, Captain Hackum. He was an impudent "bully" always in a row.

Richardson gives the word "Hackle" as having been derived from the Dutch word "Hackelen," which word meant "to cut or hack into small pieces". No man by name of Hackleton, or Hackelton, or Hackington, or Hackston, I think, ever dwelt in Providence; and certainly no man with such a name was then a freeman here. It was probably a fiction, or "man of straw," in the construction of which these ancient Englishmen were so fond. I will give a few specimens: John O'Noakes, Tom a'Styles, John Doe, and Richard Roe—all well known men of straw to the Providence Town Meeting, when in 1661-2 it gave permission to "——— as Hackelton" to Hack and burn Lime. At that time men supposed that a personalty was necessary in legal and legislative matters; just as the lawyers supposed that they must have a John Doe or Richard Roe in their legal documents.

The fact that a century, or a century and a half later there dwelt in Warwick men named "Hackstone", does not bear upon the meaning of the Act of 1661-2. The name disappeared in 1672, and does not again appear until 1763.

It remains only for me to consider critically the statements which I have denounced in the communication signed G. R. T. herein reproduced. By examination it will be seen that G. R. T. has not followed the record. There is no name "Thomas" upon the record. The words "certain place" used by him are not upon the record; and the words "neere about", which are upon the record, he has omitted. Let him follow the record, and his theory that Hackelton's or Hackington's rock was a part of the Dexter lime rocks at Smithfield is at once destroyed. G. R. T.'s reproduction of the second paragraph is worse than was his work with the first paragraph; and this following is worse than all the rest. He says: "On the 27th

January, 1672, Gregory Dexter deeded to his son Stephen four acres at Scockonoxit, reserving the rights of the people of Providence to use lime at Hackleton's rock." He continues: "This all proves that the rock in question was at 'Scockanoxett' (*sic*) and was part of the Dexter land". This is an utterly false statement. This Dexter deed covers two parcels of land. The first, of four (4), acres at a place (commonly called Socconoxit". The second conveys (80) acres" in the new division"; and it was in this latter parcel, all reference to which G. R. T. has omitted, that the reference to Hackston's rock, not Hackleton's rock, appears. The rights reserved to the people by Dexter were in connection with this latter parcel. G. R. T. says Dexter deeded to Stephen "four acres at Scocknoxit". Dexter's record read "four acres of land at *a place commonly called* Socconoxit". G. R. T. omitted the words "a place commonly called". Was there any place in the lands now known as the Dexter Lime Rocks, or the lands now known as Smithfield, which was commonly known in 1672 as Sockanosset? It is the merest sham. There is not a word of truth in G. R. T.'s communication. There is not now nor was there ever any limestone quarried at Sockanosset. The Deed of 1723 cited by G. R. T., even if true, has not the slightest historic bearing upon the question of Hackstons Rock or Hackleton's Rock.

The permission given to Hackleton applied not to an individual, but to every inhabitant of the town.

The name appears first in the original manuscripts as Hackleton; then twice as Hackston; and last as Hackington.

"I know not at present the time when Gregory Dexter and William Harris obtained titles to the lime rock quarries, now known in Smithfield. But it was after 1661-2, at which time the earliest Hackleton entree appears of record, and before 1669. It was in August of the latter year that Roger Williams wrote to Gov. Winthrop concerning the Dexter Lime Rocks, in which he said: "Sir, I have encouraged Mr. Dexter to send you a limestone and to salute you with this enclosed. He is an intelligent man, a master printer of London, and conscienable (though a Baptist), therefore maligned and traduced by William Harris (a doleful generalist). Sir, if there be any occasion of yourself, or others, to use any of

this stone, Mr. Dexter hath a lusty team, and lusty sons, and a very willing heart, being a sanguine, cheerful man to do yourself or any (at your word especially) service upon my honest and cheap consideration" (Narr. Club 6, 331). It is clear that Gregory Dexter acquired the ownership of the "Smithfield" quarries, at least, three years before he gave the deed of 1672 to Stephen hereinbefore discussed.

Is it probable that William Harris, or Gregory Dexter, having obtained individual titles to lands outside of Providence, now known as the Smithfield lime quarries, would recognize the Hackston concession made years before to hack and burn lime free of anybody?

If my conclusions rest upon a sound foundation, Hackstons, or Hackleton's, or Hackington's Lime Kiln is the most ancient structure built by English hands now existing in Rhode Island.

SOCKANOSSETT.

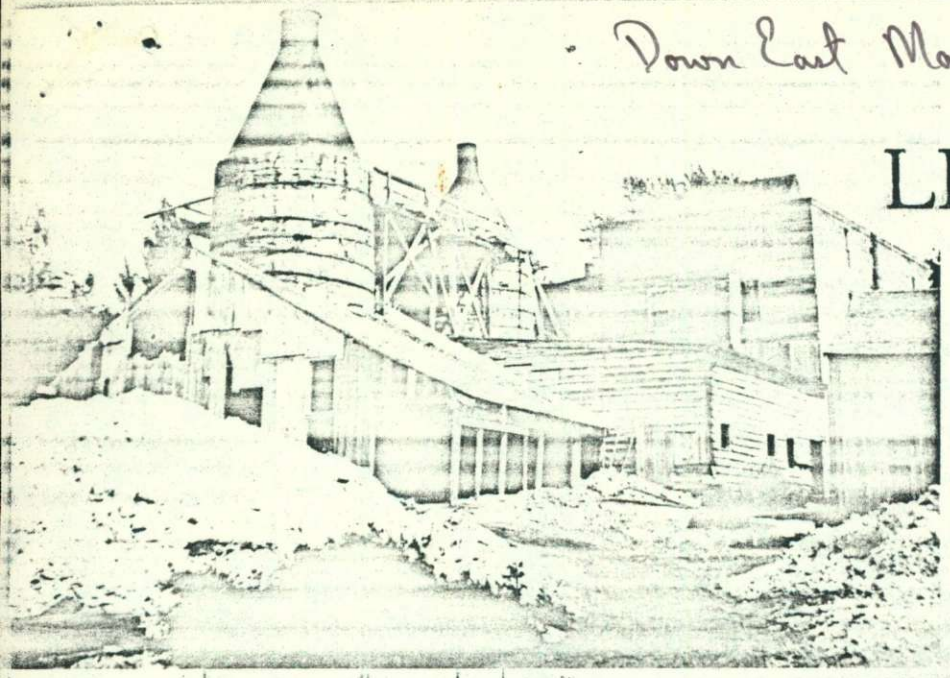
(19)

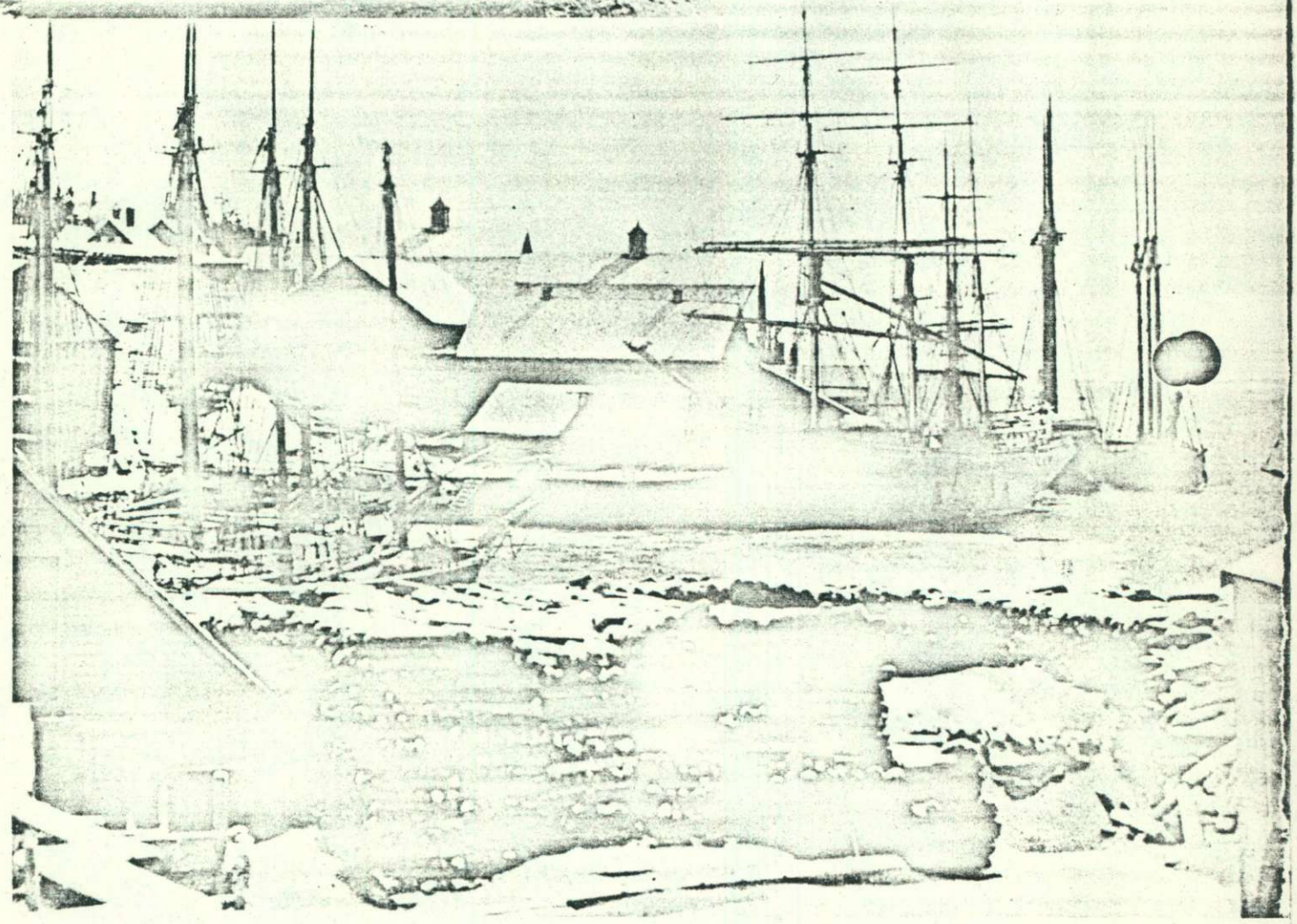
Such is the present recognized spelling of this Indian name (Sketch of Proposed Plan, Water Works, October, 1868). The earliest use, or origin of the name, was that of an Indian, Narragansett Sachem, who dwelt near the Hill now known by the name at the head of this note. A son of Saconocitts was witness in a case against another Indian for robbery (Prov. Early Rec. 15, p. 24). The time was 19th June, 1649. Here I note another error in these Early Records. It reads Uanheggen testified that he "went unto Paswonquitte with Saconocitts sonne and there he say all night". The word *say* is *lay* in the original manuscript. Paswonquitte was Occupasusatuxet—Spring Greene Farm, when Elizabeth and Sallie Francis so recently lived. Sixteen years later in 1665 the *locality*, Scoakequanocsett, appears on the Records in connection with Hackleton's Lime Kiln (Prov. Early Rec. 3, p. 66). In 1672 it again appears in the same connection, written Scoconoxit (Early Rec. 3, 229). Parsons give the spelling, Saccannosset, applied to a Hill. In 1677 W. Harris brought an action against John Tower for trespass, for his pretended purchase of our (Harris's) land at Pawtuxet, Toskaunk and Soconaset (Coll. Hist. Soc. 10, p. 207).

Down East Magazine, May, 1969

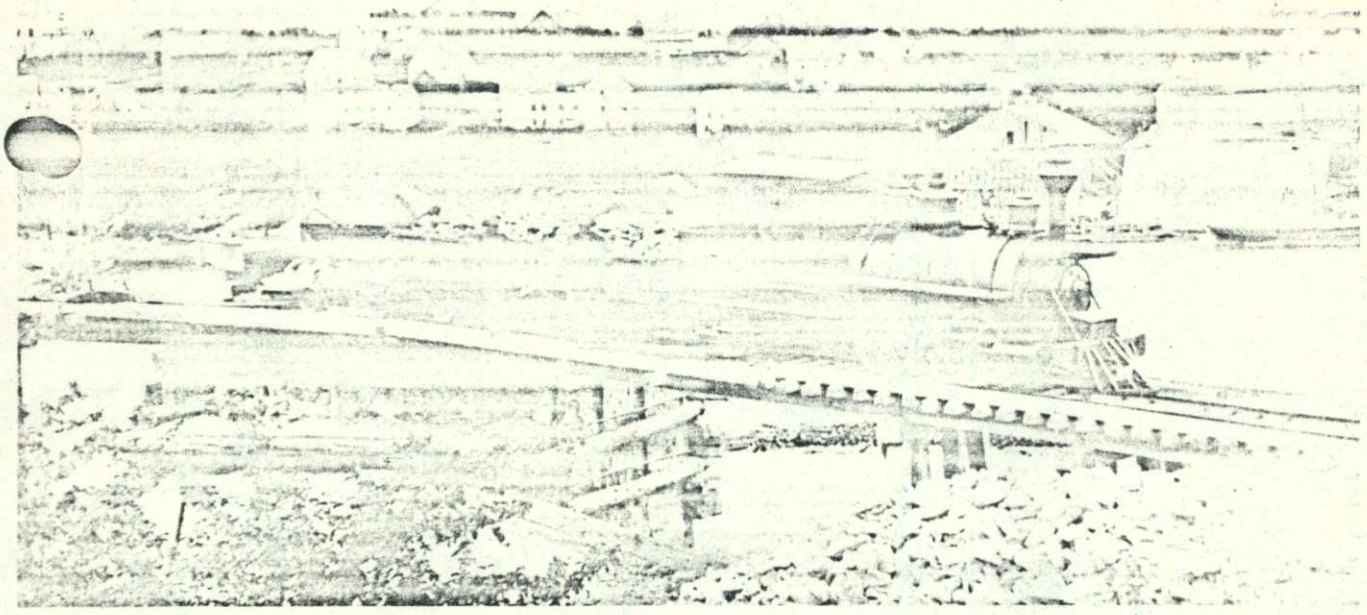
LIME KILNS OF ROCKPORT

By Arthur W. Wall





DURING the early years of the century, before 1910, the shorefront of Rockport presented a very different view than it does at present. Starting at the head of the harbor with the cooper shops and continuing down the western side were the coal sheds, Shepherd's grain elevator, the Martin lime-kiln, the cooper shop kiln and, nestled almost beneath the iron bridge, were the two Burgess kilns, known locally as the Cave. Across the river was the Smoke Stack – the house containing the steam boilers – and the electric lighting plant for Shepherd kilns, which also furnished steam



forced draft, necessary for the few kilns using coal for fuel. Next was the O. P. Shepherd kiln, the three Pet kilns, the Tramp kiln, and the big gas producers that furnished coal gas to fire the giant Gran Carleton kiln – still more or less in the experimental stage and not in full production at the time of the great fire in 1907. Before the shipyard was reached, there was the big Enterprise kiln, a giant by itself. On the other side of the shipyard was the Merriam kiln and, finally, the three Eells kilns.

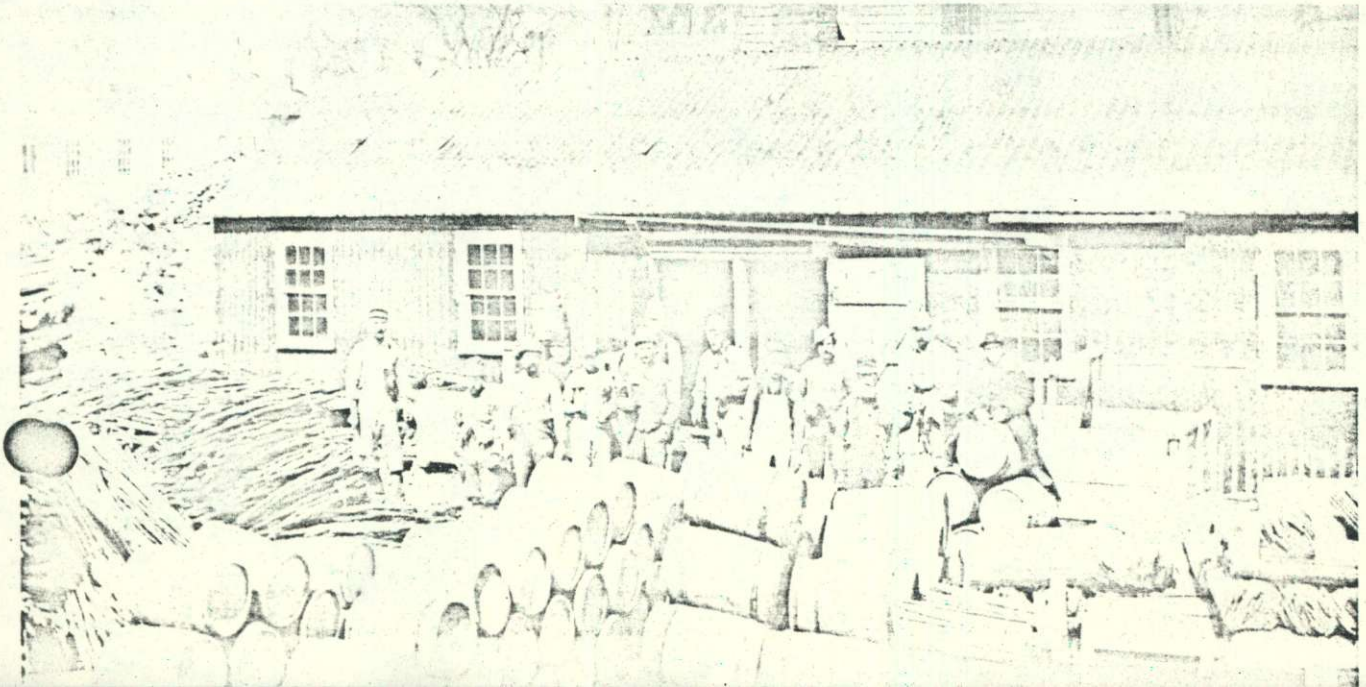
With the exception of the Burgess kilns, which suffered disaster by fire, most of this complex was destroyed by fires before 1910. These kilns were built of granite and field stone and did not actually burn, but the great flat-roofed sheds enclosing them and the big wooden trestles above them went up in flames.

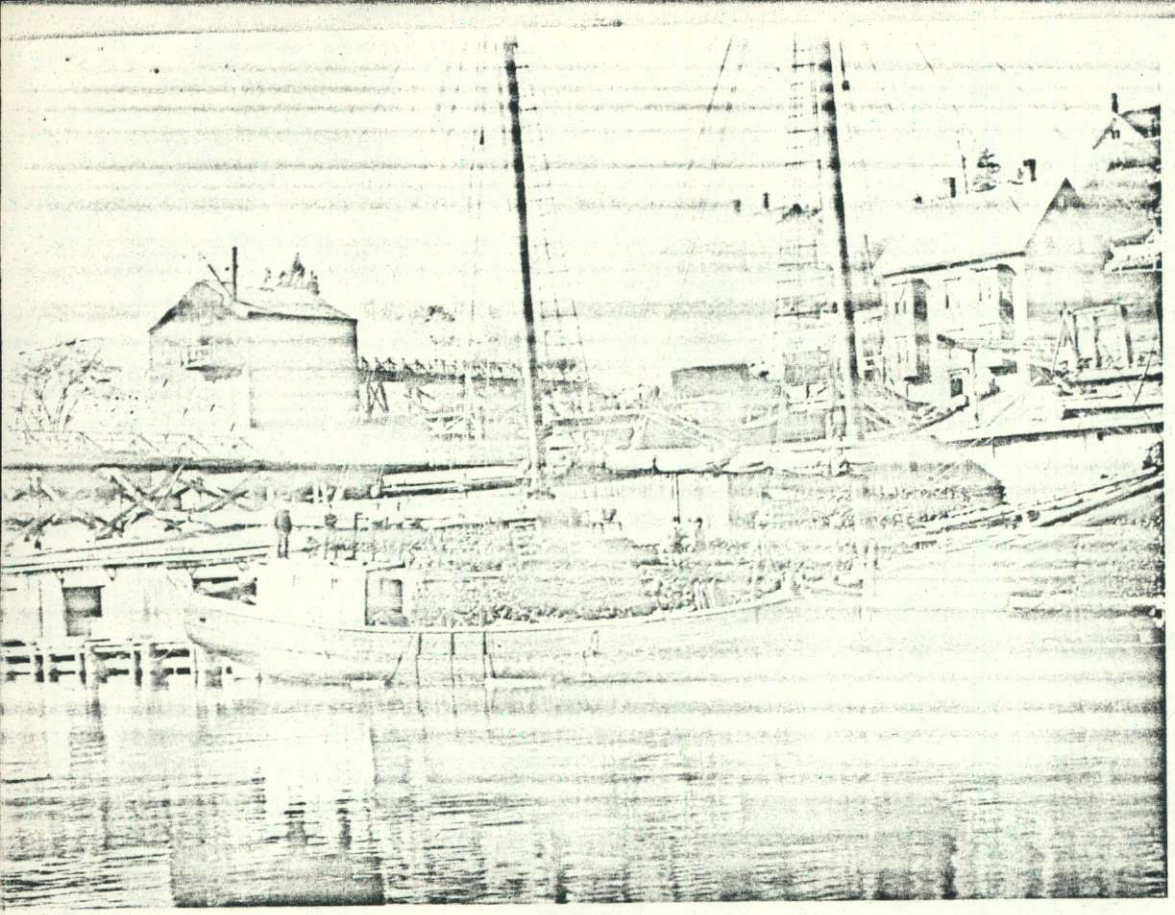
The Eells plant was rebuilt, and operated for years afterward. The big Enterprise, along with the Pets and the O. P. Shepherd kilns, also were put back into production, while the Burgess, the cooper shop and the Martin kilns continued to operate. The great rusted hulk of the Gran Carleton kiln stood idle for years until around 1919, when it was cut up for junk. Another fire – which I think occurred on Christmas morning in 1913 – destroyed the Pet shed for a second time, but it was rebuilt the following spring.

Outwardly, these limekilns were huge blocks of granite masonry or, as in the case of some older ones such as the Merriam and the Burgess kilns, they were constructed of field stone laid in mortar. They ranged in size from 16 to 22 feet square and from 30 to 40 feet high.

The interiors were circular, 10 to 15 feet in diameter, and lined mostly with fire brick, leaving the outer walls 5 to 6 feet thick, according to the size of the kiln. The inside diameter held its size from the top to about three-fourths of the depth, then tapered in a conical shape to an opening, two feet or so in diameter, at the bottom. This aperture could be closed by a pair of giant shears that, when opened, left the gaping hole from which the lime was taken.

Ten or twelve feet above the shears or drawpit, as it was called, were the fire boxes or arches, built into





Left — A kiln wood boat, the Nova Scotia schooner Heather Belle, *unloading fuel for the kiln at Rockport Harbor.*

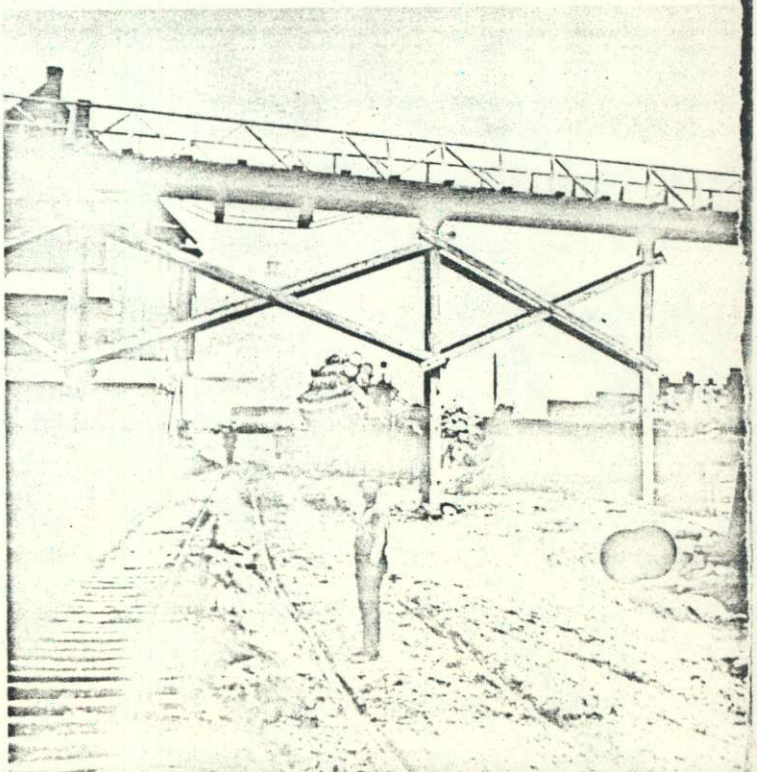
Below — Railroad tracks, overhead trestle and a wagon loaded with lime casks during the hey-day of the kilns.

the walls of the kiln, one on each side, and large enough to take a half-cord of 4-foot wood. Several feet above the arches, where the heat was less intense, there was a circular shell of heavy steel plate, instead of masonry walls, thickly lined with fire brick. At about ten feet from the top, the fire brick gave way to a lining of granite blocks, cut keystone shape to fit snugly into the steel shell, and continuing to the top.

Most of the kilns were wood burning. Exceptions were the three Pets, burning soft coal, and the O. P. Shepherd kiln which changed at times from wood to coal. Another exception was the monster of them all, the Gran Carleton kiln, which experimented with "The Water Gas Process," invented and patented by G. E. Carleton and using soft coal exclusively. The coal burners were of the same design as the wood-fired kilns, except that the arches were about half-way up the sides of the kiln, thereby leaving more lime in the hopper below the heat, with no red hot lime ever coming through the shears.

All of the kilns, wood or coal, were loaded with limerock at the top from a trestle built along the side, level with the top aperture. At the O. P. kiln, the Pets and the Enterprise, the trestles were of steel construction, but all of the others had timber trestles. At the three Eells kilns, the rock was hauled by horses and thrown piece by piece into the kilns by hand — a laborious task. In the early days of their operation, the limerock for the Eells kilns was hauled from the quarries at Simonton's Corner; then, in the late 'teens, a quarry for this plant was opened on the road to Camden, on the western side, but the rock continued to be hauled by horses until the final days of lime burning in Rockport. All of the other kilns had their rock delivered by electric railroad in small square dump cars, each holding several tons, that were dumped directly into the tops of the kilns from a trestle.

Thousands of cords of kiln wood were cut locally and delivered by teams. Other untold thousands of cords came from downeast ports, from up river and from New Brunswick and Nova Scotia by boat — two-masted schooners carrying 200 cords or more.

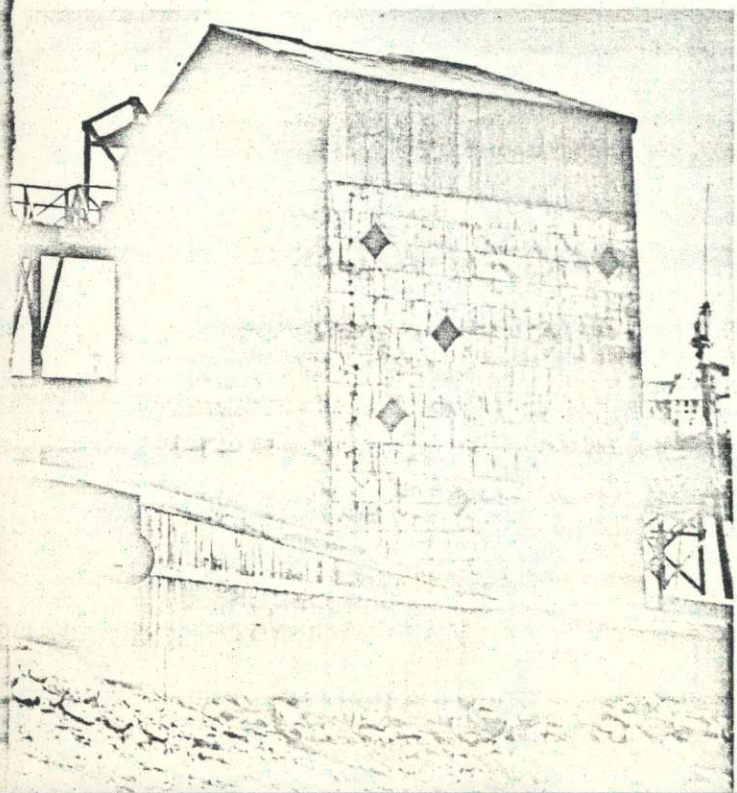


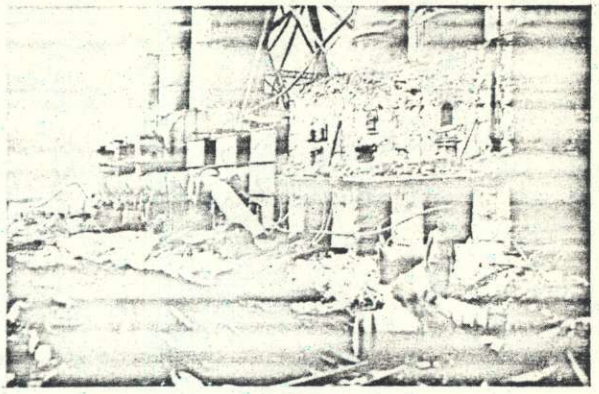
There were two Nova Scotia schooners I remember in particular, the *Mercedes* and the *Princess of Avon.* There was also the local Maine "smoke boat" fleet – hailing mostly from Little Deer Isle and Belfast – of small sloops carrying two to ten cords. Their cargo consisted of driftwood gathered from the beaches among the islands. During the last years of the lime kilns' operation, this wood brought $8 a cord, landed on the wharf, but I remember when kiln wood was $2.50 a cord, landed on the premises, and the old wood choppers were paid 50 cents a cord for cutting it.

FIRES in the kilns were fed continously, day and night, seven days a week, month after month – the only exception being a half hour before it was time to take out the lime at "draw time." Then the fires were left to burn down to a light bed of coals, thereby allowing the interior of the kiln to cool and the contraction to release the heavy load, weighing many tons. The lime was drawn every four hours around the clock.

A big iron wheelbarrow, placed in the drawpit beneath the shears and capable of holding three or four barrels of lime, caught the substance as it was dropped. These were not ordinary wheelbarrows, but two-wheeled ones, balanced to facilitate dumping over the front end. A barrel took a 15¼ inch head and held 185 pounds of lime. Years later larger barrels were used, with a 17¼ inch head and a capacity of 285 pounds. There were thirty to forty barrels in a batch of lime.

At the drawing, the first few wheelbarrow loads of lime came out relatively cool, although too hot to touch, but near the end it was red – or even white – hot, as now it was coming from the depth of the kiln, near the fires.





"THE BIG FIRE"

THE Eells Company "night gang" was on duty that July Sunday in 1907. Around eleven o'clock a fire was discovered in the woodwork of number one kiln-shed, and an alarm was immediately sent out. But by the time the hand engine of Rockport's volunteer fire department arrived, the lime sheds were "too far gone" to save and the fire was spreading to buildings on the eastern side of the harbor. Steamer and hose carts from neighboring Rockland and Camden rushed to the scene, although a Rockland newspaper observed that "the worst of the fire was over before they arrived."

The loss of the Eells Company alone was estimated at $15,000 to $25,000. Destroyed were three kilns, sheds and some 3000 barrels of lime awaiting shipment, as well as over 4000 lime casks and approximately 2500 cords of wood. Fortunately, part of the wharf was still standing, and a new building that was being erected had been untouched by the flames.

Captain Messenger who, for many years, had been bringing kilnwood from St. John, New Brunswick in his little schooner **Cepola,** had tied up at the Eells wharf the very night of the fire. The **Cepola** was a complete loss.

At the Rockland-Rockport Lime Company, the wooden yoke of an old-fashioned kiln was burned through, and a good deal of cooperage stock was destroyed.

Had it not been for a strong westerly wind, the fire would not have dealt its decisive blow to the Rockport Ice Company. Gone were seven icehouses, their contents (about 20,000 tons) and some 6000 feet of wharf, along with all the gear for loading.

There were dramatic moments as men fought to keep the flames from spreading from the icehouses to nearby residences. Capt. P. C. Morrill had to leap from a wharf and swim for safety. Horatio Miller and E. A. Morrill, nearly trapped on a burning roof, barely made their way to safety "in the midst of flames and thick, stifling smoke."

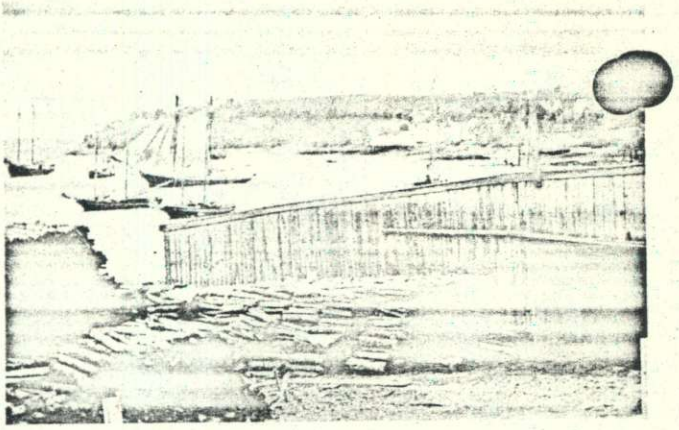
Fear for the rest of the town grew as the fire jumped onto Mechanic Street and engulfed Joseph Richard's house, a blacksmith shop, and partially damaged E. A. Morrill's home.

With typical Yankee confidence, Rockporters declared that the economic effect of the fire would be "but temporary" because "the enterprise and energy of her businessmen" would enable them "to meet a misfortune of this kind with courage and strength." They were quite right in predicting that the fire would "long be known in Rockport as 'the big fire.' "

— R. L. Grindle.

After the batch was drawn, the kiln had to be settled. This was accomplished by the use of long heavy iron bars, curved on the end. Using a bar through the arch over the hot coals, one man on each side would reach into the white hot kiln, prying and poking about the edges of the suspended load, breaking it loose.

(Continued on page 54)



THE KILNS OF ROCKPORT

(Continued from page 35)

It would settle with a roar, blowing coals and blazing gas out through the arches. Woe betide the kiln tender who got caught in this blast of heat! Eyebrows have burned off; faces blistered, and kiln tenders have been knocked back against the wood pile, several feet from the arch — but most always one could tell beforehand when the settling would come, and be prepared to sidestep the blast.

There was a time when drawing these lime kilns was a much different procedure. Instead of opening a set of shears to allow gravity to bring down the lime, the drawpit — with a big iron door two square — was recessed in the side of the kiln near the bottom. The door was swung open and the lime — resting on a flat, bricked-over base — was taken out by a shovel. The man with the shovel threw the lime behind him as far as possible, and his teammate hoed it back still farther on the hearth. These were bigger batches — ninety to a hundred barrels — and draw time was every six hours instead of four. As the drawing progressed the lime kept getting hotter, until it was red or white hot. When the shoveler neared exhaustion, he would exchange places with the man with the hoe. This went on for over an hour, each taking his turn as long as he

could bear the intense heat. With the iron shovel blistering hot, every few minutes the workman would rub the metal with a big square of pork rind so that the greased shovel would slide more easily on the hearth and also release the lime more readily. The pork rind was on sale at the company store and the kiln tenders had to pay for their own at a penny a square, out of their wages of $1 for a 12-hour day.

After probing with the iron in the open shears for the lime and cooling it on the hearth, the men broke up the larger pieces, using a big hammer on a three-foot handle. The hammer was called a "goat." The rock or unpicked lime had to be thrown on the core pile. As soon as the batch was picked over, it was shoveled into barrels, each carefully weighed. Then the barrel was headed up and trucked away for the trimmers to do the work of driving the hoops tight and nailing them solid.

An amusing episode occurred once when Henry Cox and Irving Ott were kiln tenders, during a run of poor quality limerock which left the kiln "rocky." The night watchman was ill and the town clerk, Charles L. Veazie, was asked to take his place and to leave a report of the night's activities on the superintendent's desk before going off duty in the morning. The pinch-hitting town clerk complied, and this is the report he left: "Irving Ott on the goat. Henry Cox picking rocks. Night watchman taking it easy. Yours truly, Charles L. Veazie."

There are great core dumps of partially burned lime still cluttering the banks of Goose River, upstream from the bridges, and another on Sea Street near the site of the Eells kilns. The waste was hauled to these big dumps by horses and dumpcart, regardless of its point of origin, as there were no rail facilities either at the hearth where the lime was sorted or on the route to the dump.

These and long-abandoned quarries, now water filled, that gash the landscape in the Rockport-Camden area of Knox County, are the only remaining evidence of what was once a thriving industry.

Aside from the labor required for the operation of quarries and kilns, there were many other businesses related to the lime industry. Lumbermen had to provide the hundreds of thousands of cords of soft wood used as fuel for the kilns, and still more thousands of cords to make barrels for the shipment of the finished product. There were hoop poles to be cut, split and shaved by hand into barrel hoops, and timber to be cut and sawed into staves and barrel heads.

In addition to the sloops and schooners that served the lumbering end of the industry, other two-masted schooners – the lime coasters – conveyed the lime to market. All of these related enterprises vanished from the Rockport scene along with the lime industry. Yet it was a spectacular period, while it lasted, for the quiet little town that now encircles snug Rockport harbor.

Stephen & Janet Greene

Greenemont
BOOKS

October 6, 1978

Mr. Chester Liebs
Room 300, Wheeler House
University of Vermont
Burlington, VT 05401

Dear Chester:

Deep in the woods of our home in Dover and next to a lovely brook is an old--a very old--lime kiln, now buried in dirt and with huge trees growing out of it. It has occurred to me that perhaps some archeologist might be interested in restoring this. Is this a crazy idea? If not, could you tell me who I should talk to about it?

Sincerely,

Stephen Greene

SG:pr

214 Main Street • P.O. Box 1232 • Brattleboro, Vermont 05301