

The Industrial Archeology of Henry Burden & Sons Ironworks in Southwestern Vermont

by Victor R. Rolando

Abstract

This paper presents in one cohesive document the total involvement of Henry Burden & Sons' ironworks of Troy, NY, in the exploitation of natural resources in southwestern Vermont in the 1860s-1870s. In order to fully understand what this New York company was, who they were, what they did, and why they were in Vermont at all, one must know something of its history. A brief background is therefore presented to introduce the principals involved in, and the roots of, the company, what issues brought them to Vermont, and what happened after they ceased operations here. Another equally important object of this paper is an attempt to address the archeological implications of H. Burden & Sons' industrial activities in Vermont and the status of the archeological remains impacted by later developments, whether they be intrusive or benign.

Introduction

The year 1822 found Troy, NY on the threshold of an industrial explosion. The very next year, the Champlain Canal opened for traffic, linking the city's small ironworks with the mineral resources of the Adirondacks. Two years later the Erie Canal opened and afforded access to mid-western markets. And it was into this mix that a future, but yet unknown giant of industry arrived in Troy - Henry Burden, recently of Albany, NY, but just a few years previous from Scotland (Figure 1).

Henry Burden was born April 22, 1791, in Dunblane, Stirlingshire, Scotland, the son of Peter and Elizabeth (Abercrombie) Burden. As a youth, while working for his father on a small farm, he was said to have shown evidence of inventive talent. He attended a local school of mathematics taught by William Hawley, and afterward studied mathematics, drawing, and engineering at the University of Edinburgh. He came to America in 1819 with Letters of Introduction from the American Minister at London to Stephen van Rensselaer, Lord of the 1,200-square-mile Rensselaers-

wyck Manor and former NY State Lt. Governor, obviously a very influential person for Burden to have on his side (Appleton 1872:567).

At van Rensselaer's suggestion, Burden went to Albany, NY, where he found work at the Townsend & Corning Foundry, manufacturers of cast iron plows and other agricultural implements, located in Albany's south end - near today's Port of Albany. The next year, he invented an improved plow, which took first premium at three county fairs, and a cultivator, which was said to have been the first to be put into practical operation in the country. He also made mechanical improvements on threshing machines and grist mills. On June 21, 1821, he married Helen McQuat in Montreal, who he knew from his Scotland years.

In 1822, he moved to Troy, NY, and worked for the Troy Iron and Nail Factory where he quickly became factory supervisor (Allen 1973:96). The factory was located on north side of the Wynantskill Creek in the south end of Troy, about a half-mile northeast of today's Troy-Menands bridge.

Burden's ingenuity earned him many patents, which began in 1825 and continued for the rest of his life, for new industrial products and machines that automated manual operations. One, for example, was his 1835 patent for a horseshoe-making machine. Up to now, horseshoes were hand-made, a laborious process in which no two shoes looked or wore alike. The original 1835 machine actually consisted of three separate machines - the first drew the wrought iron rod into the machine, the second bent it to the horseshoe shape, and the third compressed it into final shape while at the same time punching holes in it for nails. His 1847 patent combined the operation of the first two and 1857 and 1862 patents combined all the processes into one machine, resulting in a revolutionary increase in speed and efficiency that allowed the shoes to be made at one per second.

While visiting England in the 1830s, he noticed the English were converting to an all-iron railroad track, called an H-track because its cross-section looked like a

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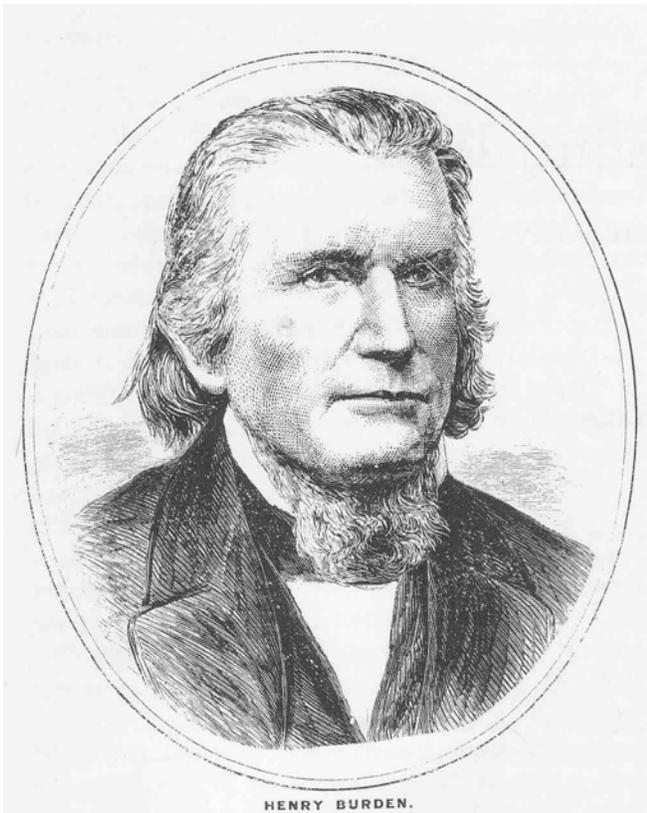


Figure 1. *Henry Burden at age 71, from a wood cut dated February 1, 1871, two weeks after he died; the image obviously made for his obituary (American Artisan; Vogel 1973:74).*

sideways letter H. These tracks were cast with holes every few feet along the base so they could be nailed to wood ties. But that limited where the ties could be set to line up with the pre-cast holes in the track. To simplify the process, Burden devised a machine in 1840 to produce a revolutionary railroad spike with an offset head that negated the need to cast track with holes and left it free to place wood ties where needed. The offset spike is still the standard nail for attaching steel railroad track to wood ties.

Through shrewd investment into the Troy Iron & Nail Factory, he owned a half interest in the factory by 1835, and became sole owner in 1848 at which time he renamed it the Burden Iron Works. It was also about this time, 1851, that he designed and built his famous “Niagara of Water Wheels” to drive his rolling mills along the Wynantskill Creek. Fully 60 feet in diameter by 22 feet wide, its variously calculated 500 to 1,000 horsepower made it the most powerful wheel in the

world (Rezneck 1973:83).

There has been much confusion regarding the various names of the Burden Company. The physical factory of Burden’s works was known as the Burden Iron Works from the time Burden became sole owner of the Troy Iron & Nail Factory in 1848 (Figure 2). It was owned and operated, however, by the corporate entity, or firm, of Henry Burden & Sons (which became H. Burden & Sons in 1864) as the senior Burden incorporated his sons into the business - Peter A., b. 1822; William F., b. 1830; James A., b. 1833; and Isaiah T., b. 1838. When reorganized in 1881, both the firm and plant became the Burden Iron Company (Rezneck 1973:73).

Also operating in Troy, NY, in the vicinity of H. Burden & Sons, were factories, foundries, and other ironworks, many of which evolved into the Albany Iron Works (1838) located on the Wynantskill Creek downstream from Burden’s Upper Works, the Rensselaer Iron Works (1859) located along the Hudson River about a half-mile north at the mouth of the Poestenkill Creek, and the Bessemer Steel Works (1863) which was south of the Wynantskill Creek between the Hudson River and the Albany Iron Works. All these merged to become the giant Troy Steel and Iron Company (1855-1887), taking along their giants of industry: John A. Converse, Erastus Corning, Chester and John A. Griswold, Alexander Holley, and John F. Winslow. By the time this complex evolved into the Hudson Valley Coke & Products Company in the 1920s, James A. and Isaiah T. Burden had become directors in that company.

During the Civil War, Burden’s ironworks became the Union Army’s main source of quality horseshoes. These demands pushed production to the company’s limits in the confining space along the upper Wynants-

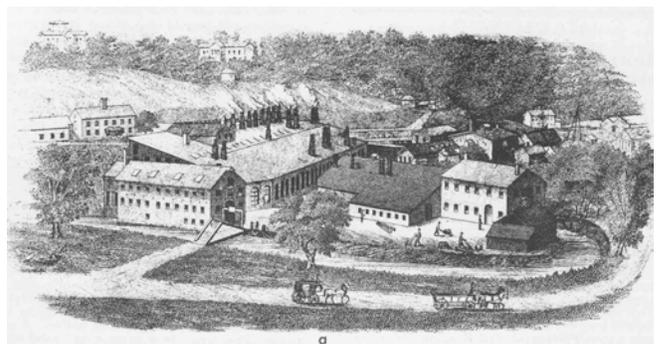


Figure 2. *Burden’s Troy Iron & Nail Factory, c1858, later his “Upper Works.” (Rezneck 1973:75).*

kill Creek and demand for expansion grew. Starting in 1862, a new complex of works was constructed on a 45-acre lot along the Hudson River, just north of the Wynantskill Creek outlet. These became known as the Lower, or Steam Works (steam-powered); the older upstream site became known as the Upper or Water Works (water-powered). Coal, iron ore, and limestone flux were brought in by rail and river from large tracts the company had by now acquired in southwestern Vermont, and the Adirondacks and eventually, Columbia County in NY.

Burden’s Early Ventures in Vermont

With the completion of the Troy & Boston Railroad to the Vermont state line in 1852, Burden’s access to known iron ore resources in southwestern Vermont was more practical (and closer) than shipping ore over 100 miles from Port Henry, on Lake Champlain. On July 14, 1852, the Troy & Boston Railroad linked up with the

Western Vermont Railroad (later the Rutland Railroad). Regular passenger service between Rutland and Troy started on Saturday, December 18, 1852, “amid great crowds at North Bennington, with speeches, bands and the firing of a hundred guns.” (Smith 1954:41).

About 2½ miles south of the railroad station at North Bennington was an already well-known iron mine, or more correctly, an ore pit, which by the 1850s had been worked for about a half a century. The existence of this mine had been known as early as 1807, when Austin Harmon, the principal land owner in that area, transferred roughly 100 acres located east of Orebed Road, to James Henry. The acreage included a lot known as “The Ore Bed Farm.”

“Significant at this early date is the inclusion of provisions for exploitation of ‘iron ores and minerals’ in the land documents for the parcels. Those same provisions carry the information that one Solomon Gale had discovered and opened an ore bed on the present Sherwood property sometime before 1809 and had discovered another ore bed on the present Henry property late in 1803.” (Werner 1995:13).

These deposits probably provided some of the ore for blast furnaces operating as early as 1793 in eastern Bennington (Rolando 1992b:134). Although the 1796 Whitelaw map of Vermont indicates an “oar bed” in northeastern Bennington, which was worked from ca1790s to 1803 by Fassett & Hathaway well up Furnace Brook, no indication is shown for ore deposits in western Bennington. One has to wonder if it was the increasing discoveries of more iron ore by Solomon Gale five miles to the west that mainly contributed to the closing of the Fassett & Hathaway blast furnace in 1803 and resulted in opening new furnaces adjacent to the main east-west road (today’s Vt. Route 9) and that provided easier transportation of iron ore to them from the western mining area?

The 1835 Hinsdill map of Bennington shows the presence of these deposits along another the east-west road, historically referred to as “the old road,” just north of Whipstock Hill (“Whip Stalk Hill” per the map) that connected today’s Orebed Road on the west with Vail Road on the east (Figure 3). The road detours slightly north around what appears to be a large open-pit ore deposit, possibly indicating that by 1835 the deposit was being worked - thus the detour. As the road is otherwise

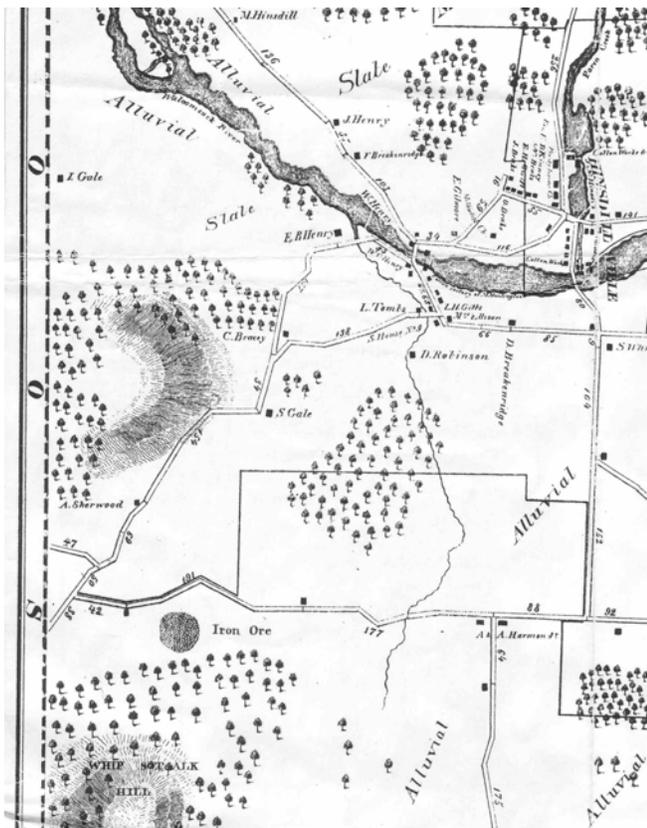


Figure 3. An historic ore-pit (“Iron Ore” at lower-left) near the NY-Vt. line that might have been worked since 1803 (Hinsdell 1835).

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Figure 4. *James A. Burden, ca 1898, many years after his Vermont years and by this time President of the Burden Iron Company.*

fairly straight, it can be assumed that at an earlier time the road ran straight between Orebed Road and Vail Road. The map also indicates a building on the road, 42 rods (about 700 feet) east of Orebed Road, possibly having some connection with iron mining. Some 21 years later, the 1856 Rice and Harwood map of Bennington County shows the east-west road still detouring north around the ore pit, but without the building at 42 rods.

One of Burden's earliest ventures into southwestern Vermont might have been in the 1850s when he "bought out Fuller & Frye, who had been digging ore." (Smith 1954:36). Smith didn't say where they were digging ore, but it is assumed to be in Shaftsbury. "Fuller & Frye"

possibly were Rufus Fuller and John Frye, who are mentioned in many Shaftsbury land transactions between them and James A. Burden, Jonathan Draper, and Samuel B. Sherwood in the 1860s. Rufus Fuller was connected with mining iron at South Kent, Ct., and John Frye was from Salisbury, Ct. Although records don't indicate so, it is assumed Burden's pre-Civil War interest in Vermont's iron ore was solely for shipment to his ironworks back at Troy, NY, now that the recently built railroad made access to Vermont's iron ore resources more practical.

Expansion of the Industry

The earliest mention of building a blast furnace at South Shaftsbury was in an agreement between Jonathan Draper and Rufus Fuller at Shaftsbury on March 26, 1863 that "said Fuller proposes to erect and build a blast furnace...." (Town of Shaftsbury, Book 20, page 96). Six weeks later on May 7, 1863, a limited partnership was formed between Rufus Fuller and James A. Burden for the business of mining ores and manufacture of iron from said ore in Shaftsbury "and other places where business may require." (Town of Shaftsbury, Book 20, pages 176-177). James A. Burden was Henry Burden's fourth oldest son and was to become the most involved of his sons in the operation of what eventually became a family iron business. He eventually succeeded his father as president of the company (Figure 4). On the same day of the partnership between Rufus Fuller and James A. Burden, in an agreement between Rufus Fuller and John Frye regarding the lease of the J.B. Sherwood ore bed in the west part of Bennington, mention is made of "grounds on which said furnace is erected...." indicating that sometime between March 26 and May 7, 1863, the furnace was at least built, if not yet operating (Town of Shaftsbury, Book 20, page 320).

It therefore appears that at least on the surface, the Burdens did not have a direct hand in the initial construction of the blast furnace at South Shaftsbury. Rather, either Rufus Fuller, or he and John Frye together built the furnace, both drawing from previous ironworks experience in Connecticut at Kent and Salisbury, respectively. Blast furnace operations in that northwest corner of Connecticut date back to before the Revolutionary War - 1762 at Salisbury (Lakeville). Kent Furnace went into blast in 1826 (Kirby 1998:116-117).

It isn't clear when the Burdens come into ownership of the furnace. May 7, 1863 appears to be a significant

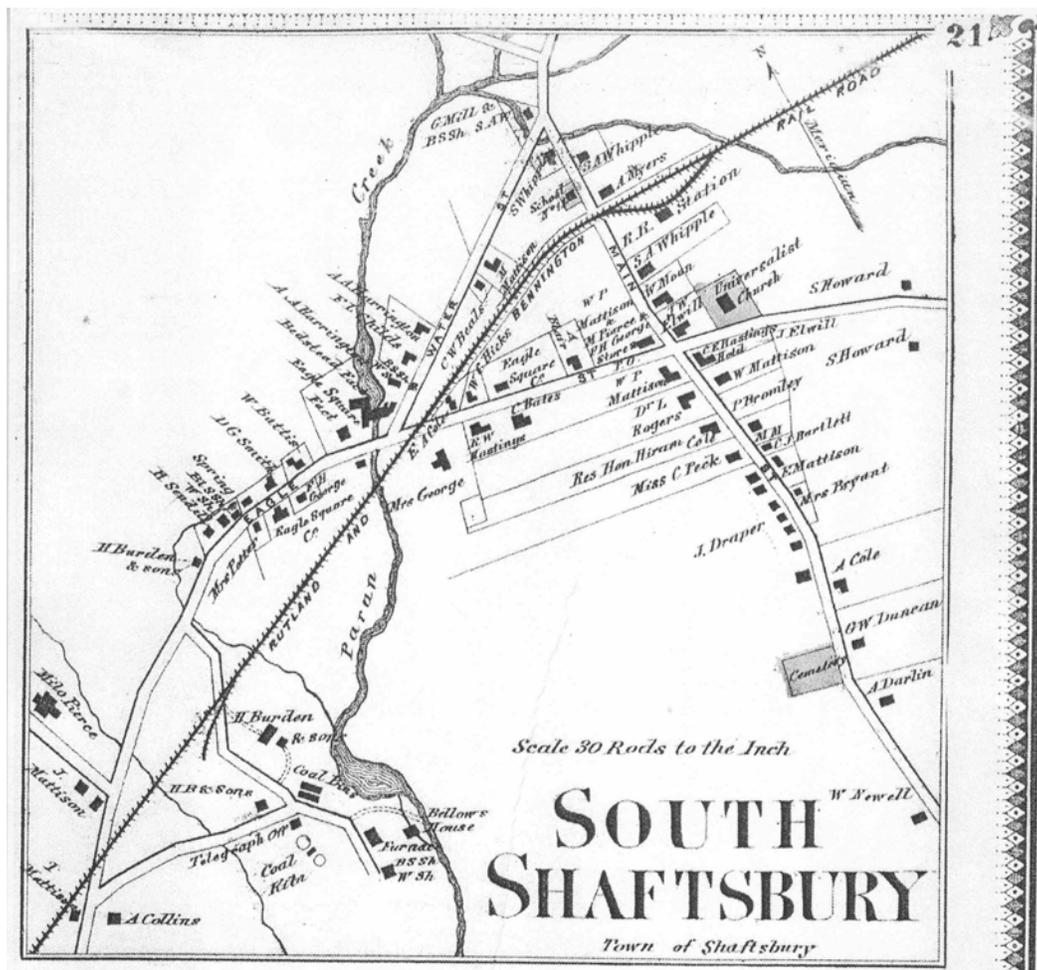


Figure 5. The H. Burden & Sons blast furnace complex in South Shaftsbury in 1869 (lower left). Note the house identified “H. Burden & Sons” across the road from the railroad tracks, home of John and Jennie Burden and family (Beers 1869:21).

date as Book 20, pages 176-177, recorded the partnership, and pages 320-322 recorded percentages of various holdings between the three principals: James A. Burden, Rufus Fuller, and John Frye. More research needs to be done on the Shaftsbury records, but it appears that James A. Burden owned 50% while Fuller and Frye each owned 25% of the business, at least as of May 7, 1863.

The Lower Works in Troy were also being completed in 1863. Steady shipments of pig iron flowed from Shaftsbury to Troy via a private rail spur on the Rutland and Bennington Railroad that was constructed about 500 feet from the blast furnace in 1863. With the Civil War in its second year and the demand for horseshoes by the Union Cavalry increasing, H. Burden & Sons found itself in excellent position to take

advantage of increased Federal contracts for military goods.

A Short Campaign in South Shaftsbury

The South Shaftsbury smelting works initially operated for a short time on locally mined ore, because Burden’s acquisition of mining properties in western Bennington didn’t begin until 1864 (Werner 1995:20). Fuller and Frye had been mining iron someplace in the Shaftsbury area in the 1850s, possibly a few hundred yards west of today’s Vt. Route 7A on the old Peleg Cole farm (later the farm of Robert Frost’s son, Carol Frost). Ore is also said to have been mined on lands of S.L. Godfrey, who was mining and processing ochre in Bennington.

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The furnace went into blast in November 1863 and depending on whose reference is used, the blast furnace was:

28 feet high by 10-foot diameter bosh (Neilson 1866:220)

33 feet high by 8-foot diameter bosh (Dunlap 1874: 117)

30 feet high by 9½-foot diameter bosh (*Ironworks of the United States* 1876).

The “bosh” was the widest part of the internal vertical shaft, closer to the bottom than the top.

Production of pig iron in 1863 was only 149 tons (measured in 2,000-lb tons), a small amount, reflecting the shorter period of operation - probably only the last month or two of the year before the waterpower froze for the winter. The furnace operated for 42 weeks in 1864, consumed 3,779 tons of ore, 778 tons of flux (limestone), 210,160 bushels of charcoal, and production increased to 1,602 tons. By 1865, with all the kinks worked out of the system and the works running smoothly, 2,315 tons of pig iron was produced. It was anticipated that the furnace would produce about 2,550 tons in 1866. “Utmost capacity” was estimated at 3,000 tons annually. The blast furnace only operated from spring to fall - maybe 9 months a year at best - limited by the winter freeze that disabled the waterwheel.

The hot blast was driven by an overshot waterwheel by means of a pair of 30-inch-diameter by 4-foot stroke blowing cylinders placed directly over the waterwheel, a common design for the time. The air blast of 1¼ pounds per square inch entered the furnace through two 4-inch-diameter tuyeres (blast nozzles). One gross ton of iron took about 2 tons of ore, 120 bushels of charcoal, hauled on average 5 miles in November 1866, and 700 pounds of limestone (Neilson 1866:218-220). It was the largest-capacity blast furnace to operate in Vermont.

Shaftsbury Town Records show contracts and indentures between James A. and I. Townsend for the Burden company and many others from 1863 through 1869. Rufus Fuller and John Frye are predominant of the “others” through most of 1863; significantly less during 1864-1865, and not at all during 1866-1869 (about this time, Isaiah Townsend Burden had started referring to himself as “I. Townsend Burden” as if to make a statement of who he was). References to wood availability in 1864 are most likely with respect to making charcoal; an entry acknowledged November 20, 1865, mentions “...beech, birch, maple, ash, poplar and cherry trees and all other kinds of hardwood suitable to be burnt into

charcoal” on Shaftsbury land that border the west line of Glastenbury (Town of Shaftsbury Book 21, pages 172-173).

Some contracts mention John Burden in 1865; on October 14, 1867 reference is made to land on the north side of the highway leading from South Shaftsbury to North Bennington “...corner of lot of land now occupied by John Burden as a homestead....,” which might be that identified by “H. Burden & Sons” in the 1869 Beers map of Shaftsbury. This might have been John Burden, son of Henry Burden’s younger brother Peter and 17 months younger than Henry’s son James A., so the ages make it possible (Reynolds 1911:779). By 1867, Henry Burden was 76 years old and James A. and I. Townsend are assuming much of the legal responsibility for running the company; both are usually listed in deeds and indentures as residing in Troy, NY. Living at the aforementioned South Shaftsbury homestead, 33-year-old John Burden is supervising Burden operations in southwestern Vermont. He is listed as Agent for the iron works in a birth record for his son, Henry Burden, born December 16, 1867, at Shaftsbury; wife is Jennie, both born in Scotland (Town of Shaftsbury, Book 2, page 11). School records show three of John and Jennie’s children attending Shaftsbury schools.

The 1869 Beers map of South Shaftsbury shows the small cluster of Burden’s ironworks buildings in the hollow between Paran Creek and the Rutland and Bennington Railroad, about three-quarter mile southwest of the village four-corners (Figure 5). Two roads lead into the complex from the road to North Bennington (today’s Route 67), joining at the work’s telegraph office and two “coal bins” (charcoal storage bins). Two buildings just to the east are identified “H. Burden & Sons.” The blast furnace, casting shed, a blacksmith shop, white shop (machine/finishing shop), and the furnace bellows house are at the east end of the complex. No dam is indicated on Paran Creek, but a canal that paralleled the outlet of the mill pond immediately to the west fed water to a waterwheel inside the bellows house that provided a steady blast of air to the furnace nozzles. Two “Coal Kilns” (charcoal kilns) sit across the road from the furnace. Conveniently close to the works on the road to North Bennington is a house identified “H. Burden & Sons,” the residence of John Burden, the works Agent, close by and from whence he could keep an eye on operations across the road. Altogether, the works appear to cover about 28 acres.

Another description of the site said “Besides the

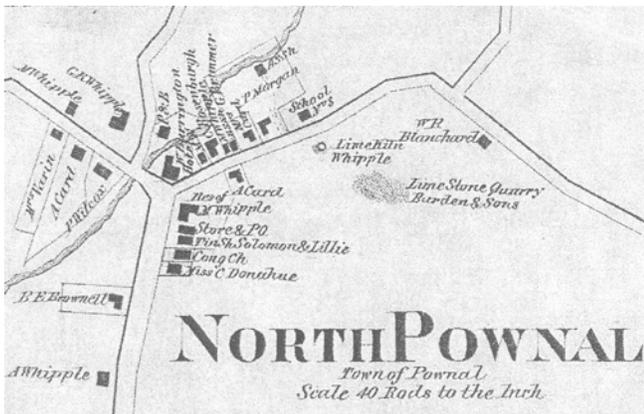


Figure 6. *The H. Burden & Sons limestone quarry at North Pownal, adjacent Whipple's lime kiln* (Beers 1869:28).

furnace proper there were large coal sheds, two coal kilns, a boarding house, stables for 30 horses, telegraph office and railway siding.” (Smith 1954:37).

Limestone is a key ingredient to the process of smelting iron. Called “flux,” it was added to the iron-making process to assist in producing a low melting temperature fluid slag, which helped remove impurities, such as sulphur, from the ore. Flux is normally a basic material containing calcium and magnesia, which reacts with sulphur to form slag. It might be contained in the ore, but is usually found as high calcium limestone or dolomite. Limestone for the Burden furnace might initially have been quarried from a ledge a few hundred feet east of the furnace, but later came from a well-known limestone quarry in North Pownal. The 1869 Beers map of Pownal indicates “Lime Stone Quarry Burden & Sons” just east of Whipple’s lime kiln about 1,000 feet east of today’s Vt. Route 346 and the North Pownal Road (Figure 6). Whipple’s lime kiln was a separate operation that had nothing to do with the iron industry - the blast furnace used raw limestone only. Limestone has been quarried in this area since the early 1800s; a 1739 petition to the colonial governor mentioned “Lime Mountain” (Parks 1977:15). The quarry was within three-quarters of a mile of the Troy and Boston Railroad, simplifying getting the stone to his blast furnace at Shaftsbury (and to his other furnaces at Troy, NY?); however, there is no there is no reference in any local history that he actually drew stone from the quarry.

Burden’s Exploitation of Iron Ore Resources in Bennington

Mainly through James A. and I. Townsend Burden, H. Burden & Sons began acquiring properties in the iron-ore zone east of Orebed Road in 1864; by the time the process was completed in 1866 the company had acquired over 400 acres of land, primarily between Orebed and Whipstock Roads to the north and northwest of Whipstock Hill (Werner 1995:20).

Two mines referred to as being the principal iron mines in 1866, were the Henry and the Bennington.

“The [Henry mine] is an immense deposit that has been extensively opened. The breast of the ore is of great depth, having been explored for some 70 feet; its length has been exposed for some 400 feet. The mine is 3½ miles from the furnace by wagon road (part way plank road).” (Neilson 1866:220).

The dimensions of this mine appear to closely match what WAC called a “Trench Depression....the result of an elongated open cast excavation.” (Werner 1995:39), and which Thomas described as being 25 feet deep, 600 feet long, and 300 feet wide (Thomas et. al 1979:205).

The 1869 Beers map of Bennington (Figure 7) shows a ‘dotted-line’ road circling what appears to be the old major ore pit that is shown in the Hinsdill 1835 map. The road aligns well with the location of WAC’s “trench depression” and might well, therefore, be the Henry Mine that the road is circling? The historic old ore pit just 100 yards to the south (the one indicated on the Hinsdill 1835 map), probably having become too deep and constantly filling with water, might have been abandoned by Burden in favor of digging a deep trench toward it from the north to intercept and more easily and efficiently mine the rich ore bed.

The road then leading northward about a mile from the trench intersected with Orebed Road just after it had curved eastward and then turned and continued north (Figure 7). The road has been referred to as “a plank highway” (Walbridge 1937:7), or “a plank road” (Werner 1995:46). It ran north through a seasonal wetland and was reinforced with planks laid cross-ways to give extra support under heavy wagon loads of ore carried northward to the ore washing mill. The plank road expedited hauling iron ore to Burden’s ore processing facility in Hinsdillville rather than having to

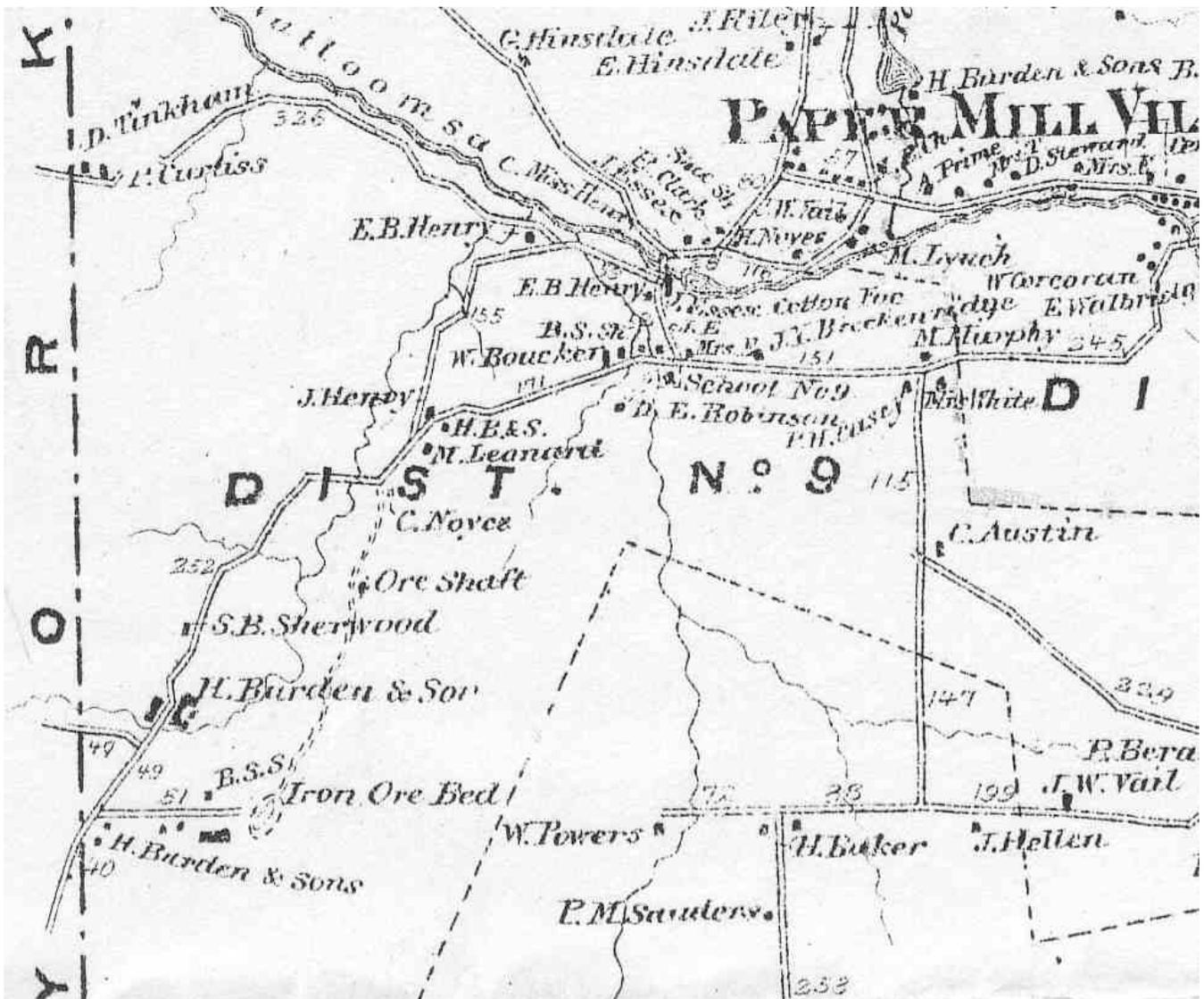


Figure 7. Details of Burden’s mining activities in western Bennington in 1869 near the NY-Vt. State line. Note the plank road (dotted lines) heading north from the main mining area at the old ore bed, past an ore shaft, and reaching Orebed Road at another H. Burden & Sons house (“H.B.&S.”). Ore was then teamed to his ore washing mill at Paran Brook, at the top-right (Beers 1869:22).

haul it back out to Orebed Road, thence northward (Burden was *very* conservative when it came to spending).

About two-thirds the way along the plank road between the Henry Mine and the juncture with Orebed Road the 1869 map also indicates an “Ore Shaft,” which can’t have any connection with properties acquired and mined at later dates, leaving unanswered the question - who sunk this shaft and when?

The 1869 map also shows a number of buildings

associated with the Burden operations. “H. Burden & Sons” is indicated in places along the east-west “old road” as well as along Orebed Road - nine buildings altogether. Only a blacksmith shop (“B.S.S.”), which might be a tenth H. Burden & Sons building, is identified as to function. The map also shows that the “old road” ends at the major ore pit and is marked 81 rods, or about 1,336 feet east of Orebed Road. Reason for this is probably due to enlargement of the old ore pit, which physically encroached into the old road and made

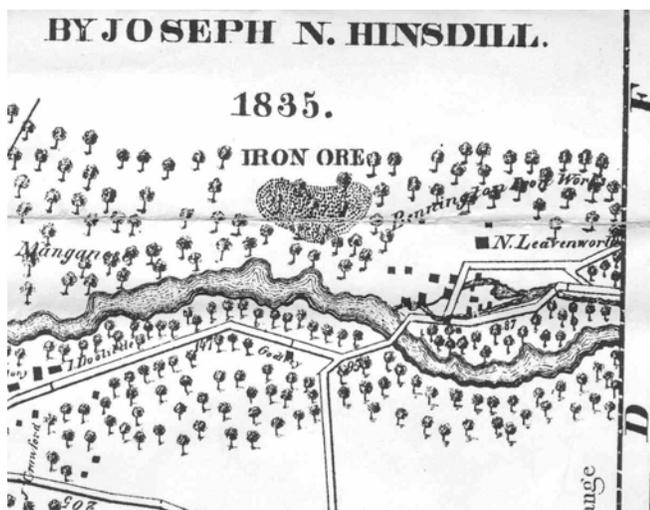


Figure 8. An iron ore bed west of the Bennington Iron Works complex. “Bennington Works” is barely visible written in the trees north of the N. Leavenworth residence (Hinsdill 1835).

it no longer useful as an east-west connection between Orebed and Vail Roads.

An 1876 report on hematite ore mines described the Henry Mine owned by H. Burden & Sons as “A very large deposit of ore located three miles south of North Bennington” and the ore was “very rich, easily smelted, and makes superior quality of iron.... When in operation, there were taken from this mine 20,000 tons per year.” (Lewis 1876:228). An analysis of the ore resulted in the following: Sesquioxide of iron 73.15%; Protoxide of manganese 2.313% (with traces of nickel and cobalt); Alumina 3.958%; Lime 0.725%; Magnesia 0.462%; Silica 5.244%; Sulphur 0.050%; Phosphoric acid 0.560%; Phosphorus 0.240%; and Water 13.333%. Metallic iron yield was 51.21% (Lewis 1876:235).

William F. Burden, Henry Burden’s third son, died on December 6, 1867 and his name appeared on some Shaftsbury land transactions in 1866 and 1867. Included in what appears to be a statement of his estate dated March 12, 1869 (acknowledged May 24, 1869), is mention of “Shield’s mines, so called,” in Bennington. (Town of Shaftsbury Book 22, pages 375-377). This was Captain Hamilton L. Shields, a Troy banker and creditor of the blast furnace complex in eastern Bennington near the Woodford line (Bennington Iron Works, 1822-1853). Shields eventually owned the ironworks in 1858 and summered there with his family until he died in 1889 at

Troy. Whether the Shields mine was one of those near his furnaces in eastern Bennington or was a mine he might have owned near Orebed Road was never known for sure.

The Hinsdill 1835 map of Bennington shows an iron bed just northwest of the Bennington Iron Works near the Woodford line (Figure 8). The ironworks buildings are shown without identifying them as such, south of the N. Leavenworth house, while “Bennington Works” is barely visible written among trees north of the house. Curiously, the 1869 Beers map of Bennington doesn’t show the iron mines even though they were being worked at the time.

This mine could also be the other mentioned by Neilson in 1866 as the Bennington mine. In discussing the blast furnace at South Shaftsbury, Neilson wrote:

“The Bennington mine is about 5 miles from the furnace by rail. The ore of this section is of great richness, yielding in the furnace about 50 percent. There is no mixture with other ores. Iron is neutral and well suited for castings. The mine [is] owned by H. Burden & Sons.” (Neilson 1866:220).

Unfortunately, Neilson doesn’t say which way the “5 miles by rail” is from the furnace, in addition to being misleading because the Bennington & Glastenbury Railroad wasn’t built to Woodford until 1872. Burden still had to haul his ore 2½ miles by animal power to the tracks in Bennington village.

A letter dated September 16, 1946 from William L. Shields of Troy, NY, to ironworks researcher Charles Rufus Harte of New Haven, Ct., makes a direct connection between Burden and the ore beds in eastern Bennington:

“...iron making in Bennington started late in the 18th century & the furnace ran until about 1853. About ten years later three ore beds were used but this ore [was] taken to a furnace built by the Borden [sic] Iron Co. of Troy N.Y. at South Shaftsbury Vt.” (Richard S. Allen to Rolando, ca1980s).

The 1876 Lewis report on hematite mines also made reference to a Bennington Mine owned by H. Burden & Sons: “Two miles east from Bennington on the Bennington & Glastenbury Railroad, with extensive water power and machinery for pumping and raising ore.” The ore was described as:

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“...rich and easily smelted, containing manganese, veins of pure oxide of manganese being found between strata of ore. Capacity, about 15,000 tons per year. When in operation, the ores were mixed with magnetic ore and smelted into anthracite pig iron in the company’s furnace at Troy.” (Lewis 1876:228-229).

Analysis of the ore from the Bennington Mine resulted in the following: Sesquioxide of iron 44.07%; Sesquioxide of manganese 29.51% (with 0.13% nickel and cobalt); Alumina 4.83%; Lime 0.42%; Magnesia 0.21%; Silica 9.54%; Sulphur, a trace; Phosphoric acid 0.44%; Phosphorus 0.19%; and Water 9.86%. Metallic iron yield was 30.85%. (Lewis 1876:235). The 30.85% iron yield compares unfavorably with the previous 51.21% iron yield from the Henry Mine near Orebed Road, except that the Bennington Mine is adjacent a railroad and therefore allowed for more efficient transportation to Troy, NY.

The two Burden brothers also acquired another large tract, 280 acres, in 1871, in the Orebed Road area from Samuel Sherwood. This included the Sherwood Home Farm, which might have been purchased for other reasons, agricultural or summer recreational. These properties are referred to on two later occasions, well after the cessation of mining activities, as “the Burden Farm.” (Werner 1995:20). “Samuel B Sherwood” is indicated on the 1869 Beers map of Bennington on the west side of Orebed Road, about a half-mile northeast of the NY-Vt state line; “L.E. Sherwood” is indicated in NY State, bordering Samuel B. Sherwood in Vermont (Beers 1876:27).

The Burden Iron Company was still prospecting for and mining iron ore in this area in the 1870s according to an article in the *Bennington Banner* in May 1874. The article stated that the Burden Company was employing a large work force to sink a shaft for iron ore on the lands of S.L. Godfrey. Location of this shaft remains a mystery although it might have been in the vicinity of ochre beds that Godfrey was mining in the 1880s along the Roaring Branch, just west of Shield’s ore bed (Resch 1975:89). Finding exactly where some of these mining properties were is difficult and often complicated by the fact that many times they were not acquired outright for mining, but leased. But easements for mining and access roads were recorded (Werner 1995:11).

Also acquired by Burden were three parcels of property in North Bennington where he built an iron ore-

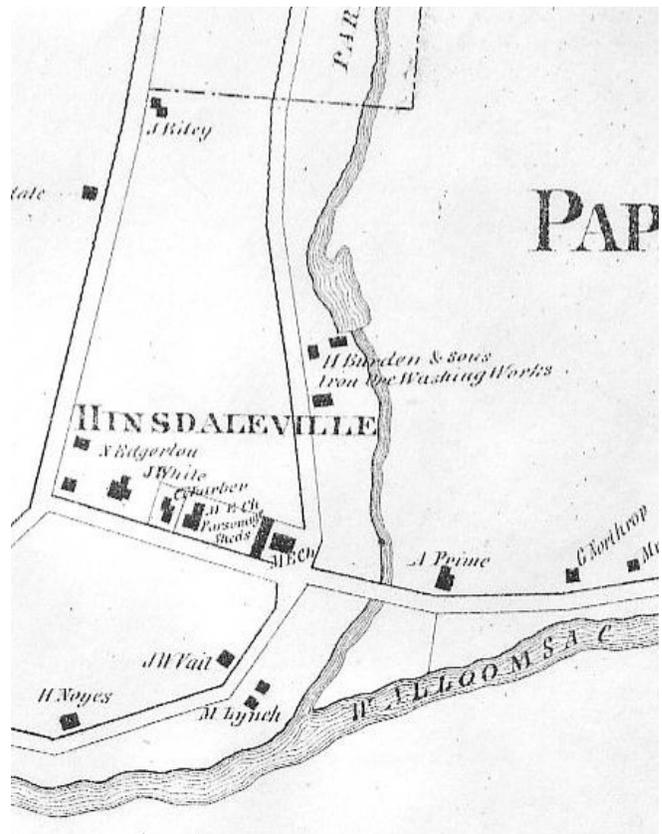


Figure 9. Burden’s ore washing mill at Paran Brook in “Hinsdaleville” (Beers 1869:25).

washing mill in 1865. The 1869 Beers map identifies it as “H. Burden & Sons Iron Ore Washing Works” and it was located a few hundred feet upstream of the present Route 67A bridge over Paran Creek (Figure 9). The area was then known as Hinsdillville (but was misspelled “Hinsdaleville” in Beers). It had previously been the site of a cotton mill. Burden might have built a new dam, since the cotton mill was abandoned in 1837 and its remains were washed away in an 1852 flood (Walbridge 1937:56). Burden also acquired the “rights to dam Paran Creek and create a mill pond” (Werner 1995:20). He built the ore washing facility here to clean the ore, which meant more than just running water through it to separate it from dirt and clay, but possibly also grind and magnetically separate the iron-rich ore from non-ferrous particles, thus reducing wasteful transportation and more efficient smelting. The washing mill was strategically located about half-way between the iron mines, about 2½ miles to the south, and his blast furnace, a like distance to the north.

At the Walloomsac River, the 1840 Henry Covered Bridge was reinforced to carry the heavy ore-laden wagons by tripling the lattices (Figure 10), a technique also used by railroads at the time, adding strength to the bridge but also adding to its dead weight. The bridge became locally known as “the Ore Bed Bridge” and it served well until replaced in 1989 (Barna 1996:35-36).

Summarizing the status of operations of H. Burden & Sons in southwest Vermont during the late 1860s we find the Burdens exploited huge tracts of iron-rich land in eastern and western Bennington (and possibly in bordering Woodford, Vt., and Hoosick, NY), hauled the ore by ox wagons 2½ north over the newly built plank road and reinforced Henry covered bridge to their ore-washing plant along Paran Brook at Hinsdillville where the ore was washed, screened, and separated. The refined ore was then reloaded into large wagons for the 2½-mile haul to their furnace at South Shaftsbury. Limestone for fluxing the furnace charge came from nearby quarries or as far away as their quarry in Pownal. Charcoal for fueling the highest-capacity blast furnace that ever operated in Vermont was made either at the



Figure 10. *Double lattices in the trusses of the original Henry Bridge that reinforced the bridge so heavy loads of iron ore could pass safely* (Congdon 1946:34).

pair of on-site charcoal kilns or at the half-dozen or so charcoal kilns that operated 1,500 feet above the valley floor in eastern Shaftsbury and western Glastenbury, then carefully carted down Bald Mountain to the blast furnace (Rolando 1992b:192-193). The resulting heavy bars of pig iron were shipped via railroad, conveniently close to this ironworks at Shaftsbury, 38 winding railroad miles over two separate railroad company tracks via North Hoosick, Eagle Bridge, and Valley Falls, finally to his hungry furnaces in South Troy, NY. Henry Burden and Sons (and nephew, John) didn't hesitate when challenged, as his “invasion” of Vermont testifies.

Sometime after 1869, Burden leased the furnace to George W. Swett, a Troy, NY, stove manufacturer, in exchange for every 20th ton of iron. Swett was proprietor of the Empire Stove Works in Troy, the second oldest stove foundry in the city (1840-1905). The foundry made parlor and cook stoves, ranges, fireplace heaters, and even cast iron railroad car wheels. Whether Swett had to buy iron ore from the Burdens or dig his own is not clear. The company shut down the blast furnace in 1873 during a national economic depression although Swett held on to it until 1877, waiting for better times that never returned (or possibly the end of his lease).

The 1870s was also the period when Burden's mining attention turned to the town of Livingston in Columbia County, about 5 miles south of Hudson, NY. Iron mining in Livingston dates back to the 18th century and days of Robert Livingston, the last “Lord of the Manor.” The mines were worked on and off and changed hands many times, coming into ownership of the Hudson River Spathic Iron Ore Company in 1875 (there might have been some Burden or Troy connection). In 1882, the Hudson River Ore and Iron Company was formed with James A. Burden the major share holder. Howard H. Burden was Agent (maybe Howard Hart Burden, son of the late William F. Burden who died in 1867), and the main miners' village was called “Burden.” About the same time, the company was also mining iron in the Adirondacks of northern New York at Minerva, Lyon Mountain, and Port Henry.

Transition

With the death of Henry Burden in 1871, the company came under direct control of his two sons, James A. and I. Townsend. The end of the Civil War had reduced the demand for iron which, in turn, sharpened competition in the iron trade. But the company's well-planned Troy

H. Burden & Sons in Southwestern Vermont

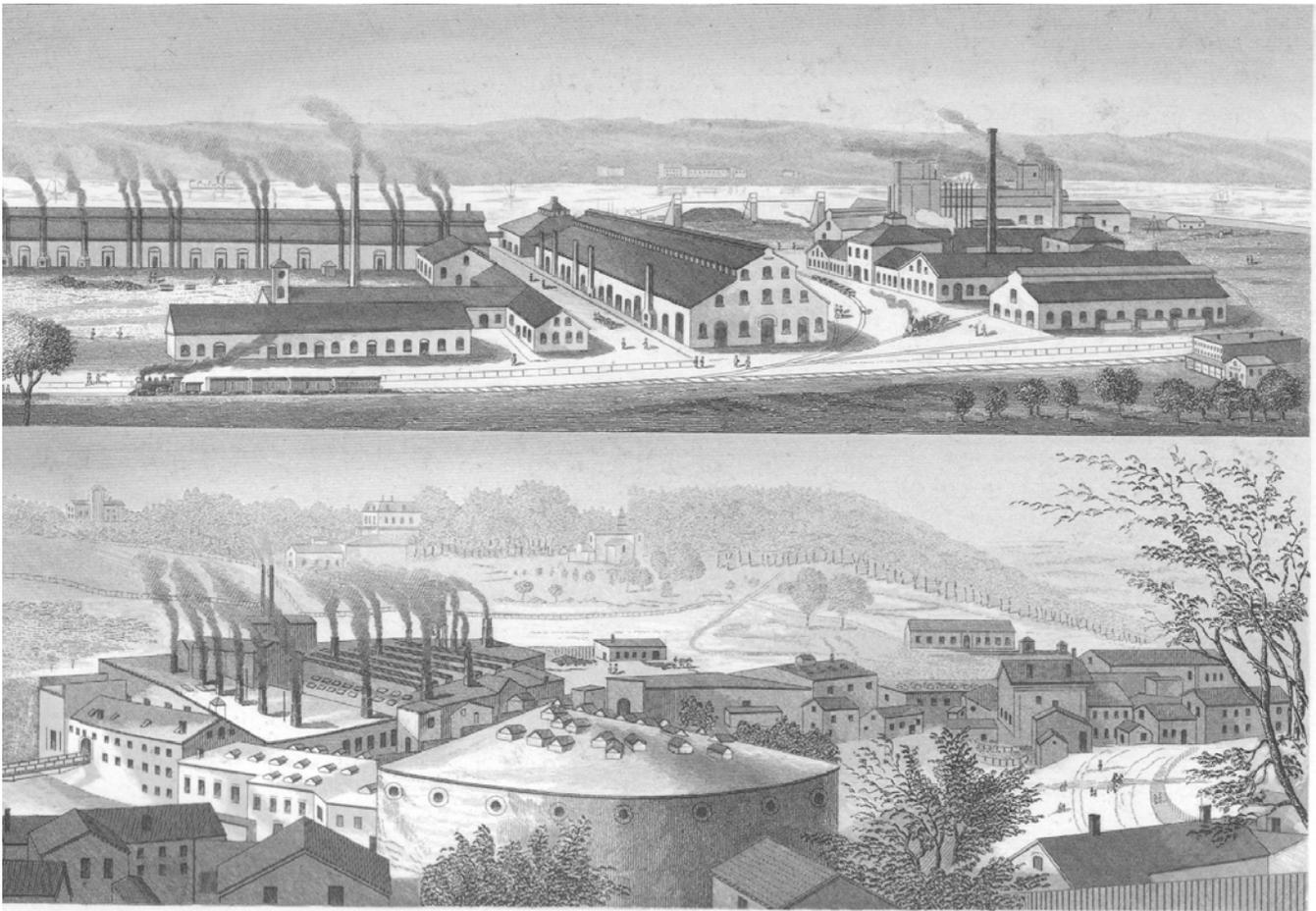


Figure 11. *The Burden Iron Company complex at Troy, NY, in as it looked in 1876, just as the company was starting to phase out its operations in southwestern Vermont. The newer Steam Works are at top, view to the west (blast furnaces are in distance, right); the older Upper Works are on the bottom, view to the southwest. Unidentified Burden family homes atop the hill in background* (steel engraving, Louis Dreka, Philadelphia; Rolando collection).

expansions in the 1860s had positioned them well and they prospered (Figure 11). After Swett ended his connection with the blast furnace in 1877, H. Burden & Sons, which had continued buying ore lots and opening new shafts near Orebed Road at least as recently as 1874, reversed course and sold its ore washing facility at North Bennington in 1879, thus signaling the start of the demise of iron mining activity in the area. A few years later, 1881, the company made a major realignment and became the Burden Iron Company with James A. Burden, President; I. Townsend Burden, Vice President; and J. I. Arts, General Manager (Allen 1973:96-97). The 1894 Miller map of Bennington shows seven buildings along Orebed Road still identified with the Burden Iron Company, but neither iron mines nor

deposits are any longer identified.

On August 23, 1879, Burden's former ore washing works property at Hinsdillville was purchased by the H.C. White Company, manufacturer of stereoscopes. An 1887 fire destroyed all the buildings (Walbridge 1937: 56-57). Whether H.C. White used any of the former Burden buildings before the 1887 fire, or built anew, is not known. A collection of H.C. White Company photos at the Bennington Museum dating to the early 1900s show the gradual industrial development of the site, but cast no light on what might have remained after (or survived the) 1887 fire. No pre-1887 photos have been located.

Although history points to a major decline in Burden's interest in southwestern Vermont after the

early 1880s, others, apparently, still had some interest. On July 1889, the *Bennington Banner* reported that a Troy newspaper had information that a 40- to 50-acre ore bed on the David Towslee farm in northeastern Pownal had been purchased by Russell P. Hoyt of New Jersey. The ore was said to have been analyzed and found to be the best car wheel (railroad wheel) iron in the country (exorbitant claims were the norm for the times). Twenty-two years earlier, H. Burden & Sons had considered buying the deposit but found it too costly to haul the ore by team to Bennington. The New Jersey company proposed to build a railroad to Bennington to transport the ore (Day Papers, reel "O" page 34; Rolando 2007:A30).

There is no record of any actual mining taking place (Parks 1977:91). This might have been at or near what later became the Strohmaier farm on Middle Road.

With the end of mining at Orebed Road in the late 1870s, some of the adjacent land was employed for agricultural production although most of the mining properties were rendered inappropriate for cultivation. The last of the Burden land holdings in Bennington, some 450 acres, were liquidated in 1940 and were sold to Mr. and Mrs. Ferdinand L. Mayer in 1942, who in turn acquired more land around Whipstock Hill until they had amassed over 800 acres. This in turn was sold in 1988 to a New Jersey realty company (Werner 1995:25).

Following the demise of the Burden Iron Company in 1940, the company records were given to the Manuscripts and History Section of the New York State Library in Albany, NY. In 2002, these records, totaling 155 packages and 33 boxes of ledgers, payrolls, day books, furnace records, sales records, etc., were all transferred to the Rensselaer County Historical Society at Troy, NY, where they are available for research.

Burden vs. The Bennington Bypass

First suggested in 1958, the Bennington Bypass project actually started with the construction of "New" Vt. Route 7 between Bennington and Dorset. The first phase of that work was the construction of a mammoth cloverleaf north of Bennington village that opened to traffic in 1974 and would eventually become the "Highway Connector" with the east-west Bennington Bypass (locals dubbed the connector "the highway to nowhere"). Then it hit environmental snags with the implementation of the Archaeological and Historic

Preservation Act of 1974 and the overall Bypass Project slowed to a crawl.

As originally conceived, the Bypass (now Vt. Route 279) would start at the Vt-NY state line, proceed clockwise around Bennington with exits at the "Highway Connector" (Vt. Route 7 north), next exit at Vt. Route 9 East, and end at Vt. Route 7 south of the village.

The first comprehensive study of the archeological impact of the project was led in the late 1970s by Dr. Peter A. Thomas of UVM CAP, assisted by Gina Campoli and Prudence Doherty. This Phase I study resulted in an approximately 250-page report (Thomas, et. al 1979). Much of the mining property formerly owned by H. Burden & Sons was impacted by the "Western Connector" of the Bypass and which directly threatened some of the mining remains (Figure 12).

"Almost at the western end of Alternate 5, just before the New York border, is the site of Bennington's last iron industry. Topographical maps reveal a feature 25 feet deep, 600 feet long and 300 feet wide, with a slight rise to the west. This depression lies squarely within the proposed alignment. Beer's atlas indicates that this was exactly where the Burden Iron Co. was located, with a long shaft leading south to a mine. An 1868 drawing displayed in the Bennington Museum presents a view of the Burden Iron Works with three buildings on an upper terrace, two more structures (slightly lower) on a second terrace, then a railroad track still lower, and finally, below everything, the foundry and slag heap. The topographical features may be the remains of this terracing. The entire complex may have covered an area in excess of 60,000 square feet." (Thomas et. al 1979:205-207).

Having taken for granted that the "1868 drawing" referred to by Thomas was, in fact, of an ironworks in the Orebed Road area of western Bennington, that area was inspected on May 21, 1992, while tying up loose ends of field work in anticipation publication of *200 Years of Soot and Sweat* later that year, with a copy of the drawing in hand (*The Shires of Bennington*, referred to it as a "painting done in 1865 by an I. Sackett"). To my surprise, nothing was found to indicate a blast furnace ever operated here - no evidence of the railroad, no slag or charcoal, no massive ironworks foundations (Rolando 1992a). So what was this a drawing (or painting?) of - what were Dr. Thomas and I looking at?

H. Burden & Sons in Southwestern Vermont

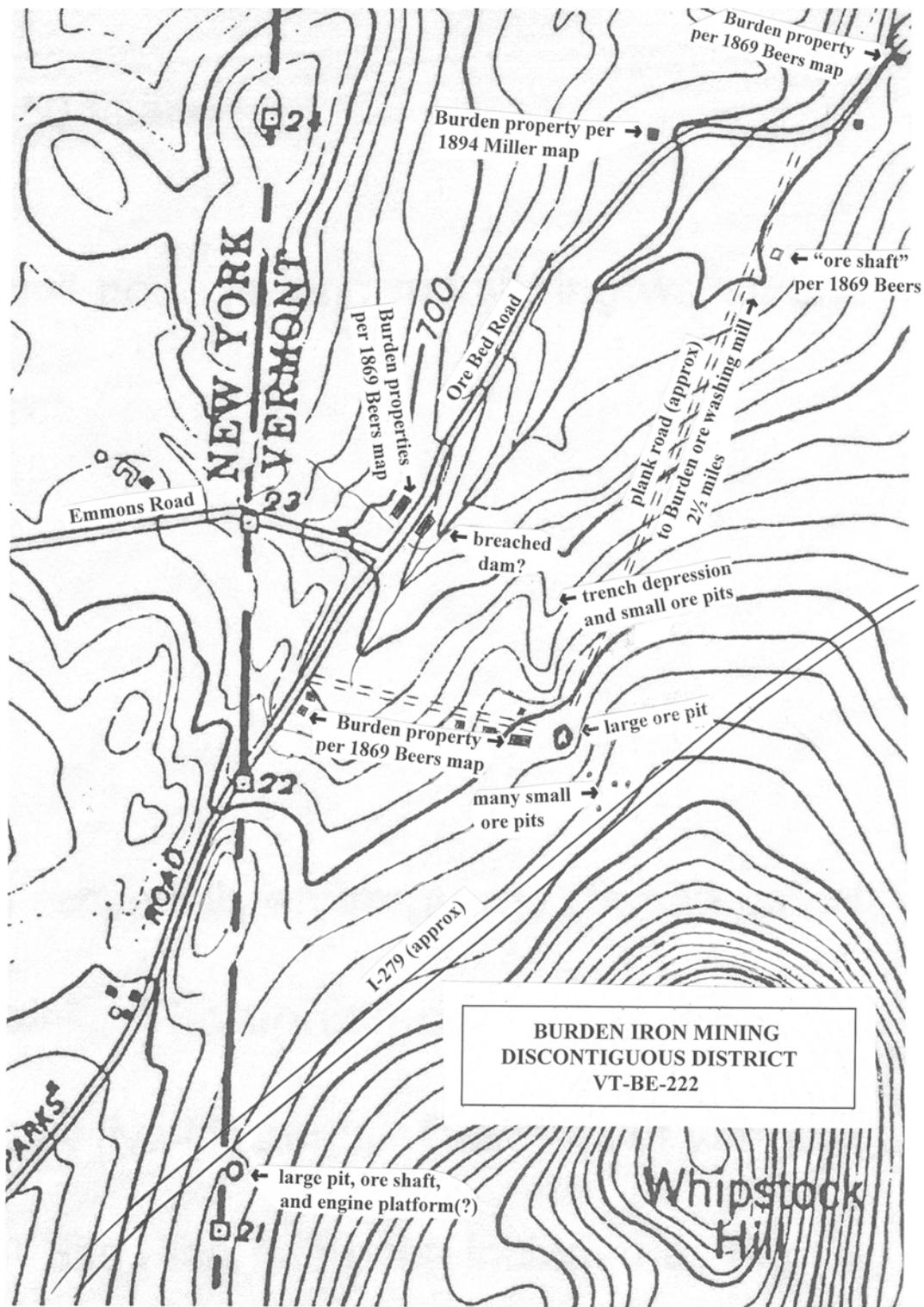


Figure 12. Burden mining features superimposed on a USGS topo map also showing the approximate path of the completed Western Connector, Vt Route 279, running northeast to southwest through the region. After various alternatives were considered and field checked by archeology field crews, a path was found to circumvent archeologically sensitive areas (USGS Hoosick Falls NY-VT., 1943, modified by Rolando).

Briefly, research in January 2006 resulted in discovering that it *was* a drawing and not a painting, it had nothing to do with Burden's operations anywhere, and finally, had absolutely nothing to do with anything in Vermont except that the 23-inch wide by 17-inch high drawing was part of the Bennington Museum art collection (see Rolando 2007:A27-A29 for complete details). But it *was* a drawing of an ironworks called "Bennington Furnace" in the Town of Alleghany, Penn., delineated by Charles Sackett, a local school teacher, in 1868 (T.C. Van Scoyec, Blair County Historical Society, Penn., to Rolando, January 12, 2006) The drawing was purchased by the Bennington Museum around 1946 from somebody who probably saw it for sale someplace in the northeast, contacted the museum due to the drawing title, and the museum purchased it since the town has a long history of ironworks.

At this writing, no photos or contemporary drawings or sketches have been found that show the blast furnace operations at South Shaftsbury, Burden's mining activities in eastern or western Bennington, or his ore washing mill at North Bennington.

As a result of the 1979 field check and report, and the later field studies by Werner Archaeological Consulting (WAC) in October 1993 and May 1994, the Western Connector section of the Bypass was realigned and constructed so as to avoid direct impact on any known Burden (or earlier) mining or other historic/archeology sites.

WAC's field checks, however, concentrated only on defined areas that were directly impacted by physical highway construction. Although the history and archeology of the whole mining area was taken into consideration in evaluating specific impacts, some specific bits and pieces were intentionally ignored due to shifting highway alignments, project boundaries, budget considerations, and schedule. Much of the overall mining area has, therefore, not been thoroughly inspected or fully researched, leaving to chance that much archeologically sensitive areas on unaffected private (or state) property are not yet identified. This is also true of Burden-impacted areas nowhere near the Orebed Road/Bypass mining areas such as the Burden blast furnace works site in South Shaftsbury, Burden's ore washing mill at Hinsdillville/North Bennington, and charcoal kiln sites/remains in Glastenbury and/or eastern Shaftsbury (and/or elsewhere not yet identified).

The Rolando survey and field check of industrial archeology sites and remains of Vermont ironworks,

charcoal kilns and lime kilns in the 1970s-90s provided initial data and site locations for the Burden blast furnace site at South Shaftsbury (VT-BE-36); field and site work in eastern Shaftsbury identified four charcoal kiln remains at two sites in what were called "the Burden lots" (VT-BE-62, -63). These two sites were reported and documented in Rolando 1992b.

Current Condition of Archeologically Sensitive Properties Formerly Exploited or Developed by H. Burden & Sons Operations

The following presents a more current status of the sites in southwestern Vermont that were exploited by H. Burden & Sons, what impact later developments might have had on the sites, a description of the properties' current conditions, and an assessment of their archeological integrity. Site names are those commonly used in site survey reports. Note that some site names and identification numbers, have been changed after consultation with the State Archeologist.

Note: Prehistoric and non-industrial historic archeology issues are not addressed here.

Burden & Sons Iron Mining Discontiguous District (area west of Vt Route 279 to NY-Vt line), VT-BE-222: Interest in the Burden mining area east of Orebed Road resumed the late summer of 2003 when the property owner, William E. Dailey, Inc., requested a walkover surface survey of his property for the purposes of identifying archeologically sensitive area in anticipation of logging (Rolando 2003). Due to the dense undergrowth, however, ground-level visibility was almost impossible in most areas, necessitating some brush cutting and clearing. Starting at Orebed Road, the old cross-road was bounded on both sides for about 1,000 feet by low rows of large disarticulated stones (Figure 16). This was mainly an area not previously impacted by the Bypass and therefore not documented by WAC during the 1993-94 field studies. No remains of any buildings indicated along the road in the Beers 1869 map were found, although they might still exist hidden in the heavy brush or buried by later landscaping and/or reforestation by the Mayers. Two substantial cellar holes were found in the southeast corner of Orebed Road and the "old road" in a stand of reforested evergreens.

About 1,000 feet east of Orebed Road, some hints of building foundations were found along the north side of

H. Burden & Sons in Southwestern Vermont



Figure 13. *This is either the Henry Mine or a massive excavation by Burden to intercept the old ore pit (figure 14, below). The view to the is northeast. The floor of the excavation contains what appear to be many small exploratory ore pits (Werner 1995:41, photo 26).*

Figure 14. *This historic ore pit, mined since the early 1800s, about 100 feet wide, and of unknown depth, with steep, slippery sides, is about 200 feet south of (and in line with) the above excavation. Might Burden's large excavation (above) been an attempt to intercept this old mine from the north? (Werner 1995:32, photo 16).*

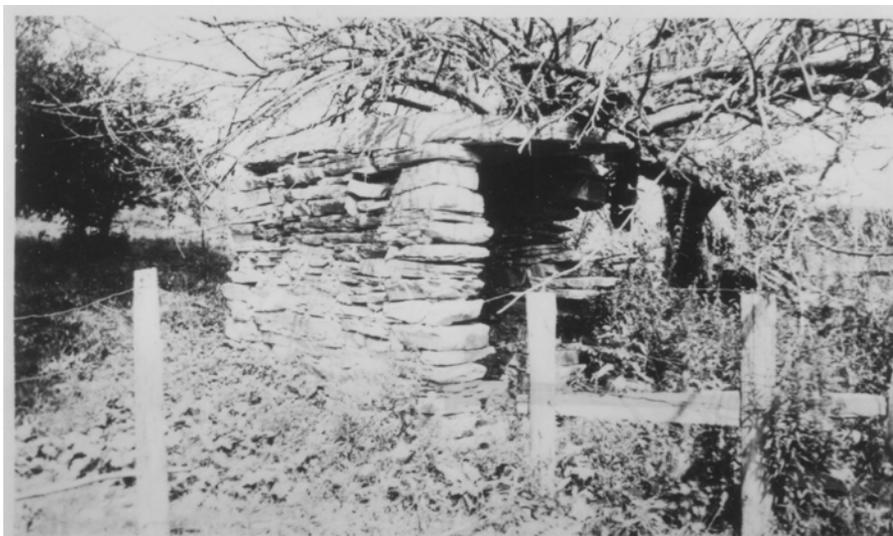


Figure 15. *Burden's dynamite bunker or a quaint garden shed? Now only a scatter of stones, this stone structure stood on the west side of Orebed Road opposite the mining area (courtesy of the late John Dostal, Bennington).*

the old road, which appears to end in a grassy opening. Two possible cellar holes indicated in figure 72 of Thomas et. al, 1980, the *south* side of the old road could not be found (which doesn't mean that they are not there somewhere in the dense underbrush). About 100 feet beyond, a cluster of what appear to be shallow ore pits, varying from 8 to 12 feet deep were encountered, and a few minutes walk beyond was the Bypass (Route 279) construction zone. As the foliage was so dense, nearby bypass construction noise was used for orientation. What appeared to be possible roads or paths leading off in various directions were followed for short distances. One, just east of the major circular ore pit, was followed to the southern edge of the trench excavation.

At least two houses identified on historic maps as owned or occupied by H. Burden & Sons still exist:



Figure 16. *The western terminus of the "old road" at Orebed Road; view looking eastward* (Rolando photo, March 6, 2006).



Figure 17. *Burden's open-pit ore bed just east of Route 279 at the NY-Vt. state line; view looking south. Other mining features are off-photo to right* (Rolando photo, October 24, 2007).

the Bugbee house, west side of Orebed Road $\frac{3}{4}$ -mile north of the Vt-NY line, and the Kachmar house, east side of Orebed Road, $\frac{1}{4}$ -mile east of Bugbee house.

In May 2004, the 118-acre William. E. Dailey, Inc., property east of Orebed Road (plus his quarry just southwest in Hoosick, NY) was purchased by Peckham Industries of White Plains, NY. A section of the Peckham property between Orebed Road and Route 279 in the vicinity of the large open cast excavation was logged sometime in late 2004 or early 2005 with unknown consequences to archeologically sensitive resources in that area. Requests to Dailey/Peckham dating back to 2006 for permission to reinspect the logged area to assess any impact on archeology resources have gone unanswered.

This area was initially identified FS-4(BE), Burden Iron Company, in September 1979 by Dr. Peter A Thomas and UVM CAP archeology crew as part of initial overall surveys of the area in anticipation of construction of the Bennington Bypass, today's Route 279 (Thomas et al. 1979:205-07; see also Rolando 1992b: 69). More recently in the early 1990s, with more intense design of the highway path through the 19th-century "mine field," archeology work identified proposed impacted sites as VT-BE-222, and -223. On June 25, 2007, the Vermont State Archeologist agreed that the whole overall Burden iron mining area and all the former site identification names and numbers should

H. Burden & Sons in Southwestern Vermont



Figure 18. *Brick, coal, and ash on the raised platform that hint of a coal-fired steam engine operation (Rolando photo, October 24, 2007).*

be combined under one site number, VT-BE-222, and one name, the Burden & Sons Iron Mining Discontiguous District - “discontiguous” because the overall mining area was physically bisected in the mid-1990s by the Western Leg of what today is Route 279, which opened to traffic October 8, 2004.

Despite the reforestation and landscaping by the Mayers in the 1940s-70s, construction of Route 279, and recent logging, the archeological integrity of the overall site is still good to excellent.

Burden & Sons Iron Mining Discontiguous District (area east of Route 279) VT-BE-222: This writer’s initial attention was drawn to the remains of an historic mining excavation on the NY-Vt state line on May 6, 2002, while with an on-site afternoon gathering of people from the Vermont Agency of Transportation (VAOT) and William. E. Dailey, Inc. Purpose was to discuss the route for a haul road that Dailey wanted to use for trucking crushed stone from their quarry a few hundred feet away in Hoosick, NY, to on-going Bypass construction in the immediate vicinity. There was concern of encroachment upon by the proposed haul road on the archeologically sensitive mining area..

The mining site is about one-half mile due south of NY-Vt State line marker monument #22 at Orebed Road. From the WAC 1994 report, the pit calculates to about 200 feet long (north-south), 130 feet wide and 20-30 feet deep as measured from the western edge (Werner

1994:Archaeological Plan 3) (Figure 17). Mounds of dirt at the northern end of the pit are remains of what was excavated. At the northwest corner of the pit is a road that leads in/out of the pit.

About mid-way along the western north-south edge of the pit are some mining features, 33 feet to the west. They include what appears to be an engine platform, a stone-lined channel, and a collapsed mining shaft.

The engine platform is 12½-feet long (north-south) by 21½ feet wide, by 12- to 13-inch high. The west side is dry-laid stone, about 18 inches high. Other walls are barely visible or buried. A pair of ¾-inch diameter by 18½ -inch high iron rods, threaded at the top with 7/8-inch square nuts still attached, protrude from the ground immediately adjacent the west wall of the platform at the south end. The pair of rods are 4 feet 1½ inches apart. Near the middle of the platform is a small scatter of unmarked red brick, pieces of coal, and firebox cinder (Figure 18).

Heading southeast from that corner of the platform is a stone-lined channel, about 3½ feet wide by at least 2 feet deep. The 14-foot long channel ends at what appears to be the remains of a collapsed shaft hole. This hole measures 15-foot square at the top edge but quickly narrows to 10-foot square at the bottom, some 15 feet deep. At the bottom are large stones and some old trash. No mining hardware, wall reinforcement, cables, etc., were in evidence. A low tailings mound lays just west of the shaft hole; from the amount of dirt, the hole doesn’t appear to have gone more than about 40-50 feet deep, only a little more than the excavation to the east.

The function of these features is unknown. Which was dug first, the large excavation or the shaft hole? Coal and ash hints of a steam engine. For operating a cable windlass to lift and lower a shaft elevator, or pump water from the shaft (which might explain the stone-lined channel from the engine platform to the shaft)?

A map of the area in Werner 1994 shows the NY-Vt line bordering the western edge of the large excavation (Werner 1994:Archaeological Plan 3). This would mean that most of the ore pit is in Vermont and the mining features are in New York. A stone wall, however, runs northward from state line monument #21 and it appears to run parallel to the edge of the current tree line, which more strongly appears to be the state line. If so, then the mining features are totally inside Vermont. The Town of Bennington tax map of this area also appears to show the whole excavation area totally within Vermont. A precise survey is needed to be fully certain.



Figure 19. *Is that ripple in Paran Brook just downstream of the dam behind BCIC a remnant of Burden's ore washing mill dam?* (Rolando photo; March 19, 2006).

In his summary of field studies for this section of the Bypass project, WAC wrote "At present, the Bypass alignment no longer effects the Burden Iron Mine features. However, for the features on the state line border at least a partial clearing and examination of one of the ore pits is recommended to determine, if possible, the function of the pit and its vertical stratigraphy." (Werner 1994:11).

At this writing, ownership of the Vermont part of this mining area, including the whole 435-acre large tract on which it resides on the southwest slope of Whipstock Hill, is in the process of being transferred from VAOT to the Vermont Agency of Natural Resources. A comprehensive walkover inspection of this whole, interesting "discontiguous" mining area, in New York and Vermont, has not yet been done by this writer (future work). Regardless, the archeological integrity of the overall state-owned tract is good to excellent.

Kachmar property at Orebed Road, Bennington VT-BE-222: The 49-acre Kachmar property borders the Dailey/Peckham Orebed Road property on the northeast. The eastern boundary of the Kachmar property appears to be the old plank road that short-cut across a low area to shorten the distance between Burden's mines and his ore washing mill at North Bennington. The property, therefore, might include the "ore shaft" indicated in the Beers 1869 map of Bennington east of the plank road. Mr. Kachmar has invited this writer to visit and inspect some ore pits on the property (future work).

This property falls within the Burden & Sons Iron Mining Discontiguous District, VT-BE-222. Archeological integrity is good to excellent.

Burden & Sons Ore Washing Mill, North Bennington, VT-BE-441: When the H.C. White Company rebuilt after the 1887 fire, nothing is mentioned of the fate of Burden's ca1865 dam. No date or identification plate could be found on the new dam. The Bennington 1996 Historic Site & Structures Survey Report estimated the dam's construction date to be ca1900, but the 1891 Sanborn insurance map of North Bennington shows it standing at that date, about where it is today with much of the same shoreline configuration surrounding it.

Careful measurement of the distance between Burden's dam as shown on the Beers 1869 map of North Bennington and the downstream east-west road (today's Vt Route 67A) indicates the dam might have been 643 feet north of the road. Measuring the distance between current dam and the same road on a current USGS Bennington topo map works out to be close to 800 feet. That leaves Burden's dam about 166 feet downstream of the current dam, or nearly under (if not totally under) a section of the L-shaped steel-frame 1950 warehouse that extends over Paran Creek, but leaving the creek free to run underneath it. No attempt has been made to explore the dark, tight confines under the warehouse, although it might not be totally impossible with proper safety equipment. Inspections of accessible sections of the creek bottom and shore area between the present dam downstream to beyond the Route 67A bridge during times of low water haven't resulted in finding anything that looks like stray pieces of iron ore.

Back upstream, a slight ripple across the width of the stream can sometimes be seen about 25 feet downstream of the present dam during periods of low water flow, hinting at the possible base to a previous dam (Figure 19). At the east end of the ripple is a small rock outcrop that could have anchored that end of a dam.

The overall site of Burden's ore washing buildings is today occupied by many large Bennington County Industrial Corp. (BCIC) buildings. Due to extensive industrial development along this stretch of Paran Creek and the depth of modern foundations vs. the probable temporary nature of Burden's projects, the chance of finding subsurface remains of any ore washing buildings is most likely poor; the chance of subsurface remains of his dam, however, might be good.

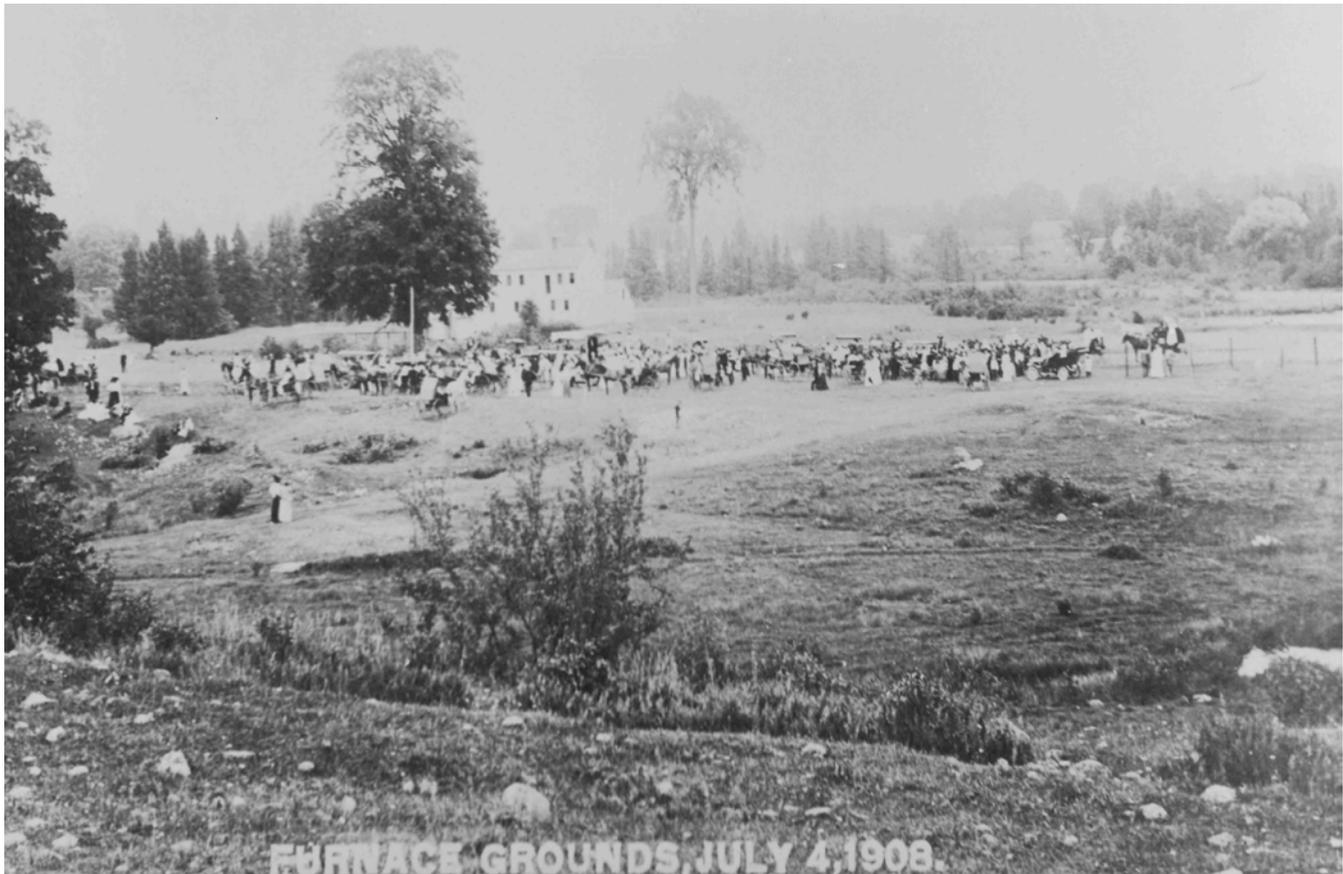


Figure 20. *The former furnace grounds at South Shaftsbury on July 4, 1908. This is the earliest photo of the grounds known, taken only 31 years after Burden's furnace closed in 1877. The view is looking northwesterly from the bottom of the hill just below the end of Holiday drive, on the south side of Paran Brook. The dam and furnace complex would have been off-photo to the right, but some disturbance on the ground at mid-right might have been where the charcoal kilns stood* (Courtesy of Bob Williams and the Shaftsbury Historical Society).

Burden & Sons Blast Furnace, South Shaftsbury, VT-BE-36: Sometime after the blast furnace was permanently closed in 1877, the works were razed. A July 4, 1908 photo (Figure 20) shows the furnace grounds as viewed from the east, probably near the foot of where a path/trail came down to the grounds from the western end of Holiday Drive. There is absolutely nothing showing in the photo to indicate that just 31 years before, this was a site of heavy industry for the time (Figure 21). When Burden made up his mind that the blast furnace complex no longer answered his needs back at Troy, he probably disassembled the entire site and either sold it for scrap or shipped it back to Troy for reuse. It was not in Burden's nature to merely walk away from anything that had value.

The former furnace pond backed up by the dam at

the furnace complex became a popular swimming and fishing spot until the dam was breached in the flood of 1927 and the Paran Creek returned to its historic downstream path.

This writer first visited the site in November 1978 and except for some brightly colored pieces of blue slag found in the creek just downstream of the breached dam, nothing was found to indicate the exact location of the blast furnace. Fellow ironworks researcher Richard S. Allen of Albany, NY, said that in 1955, while searching for remains of the blast furnace, he had found only a "burnt spot on the ground" where he thought it stood (Allen to Rolando, 1979). The dam was explored in 1978 and an iron door with its long iron control rod still in place was found at the gate opening (Figure 22). The breach in the dam appears to have occurred where

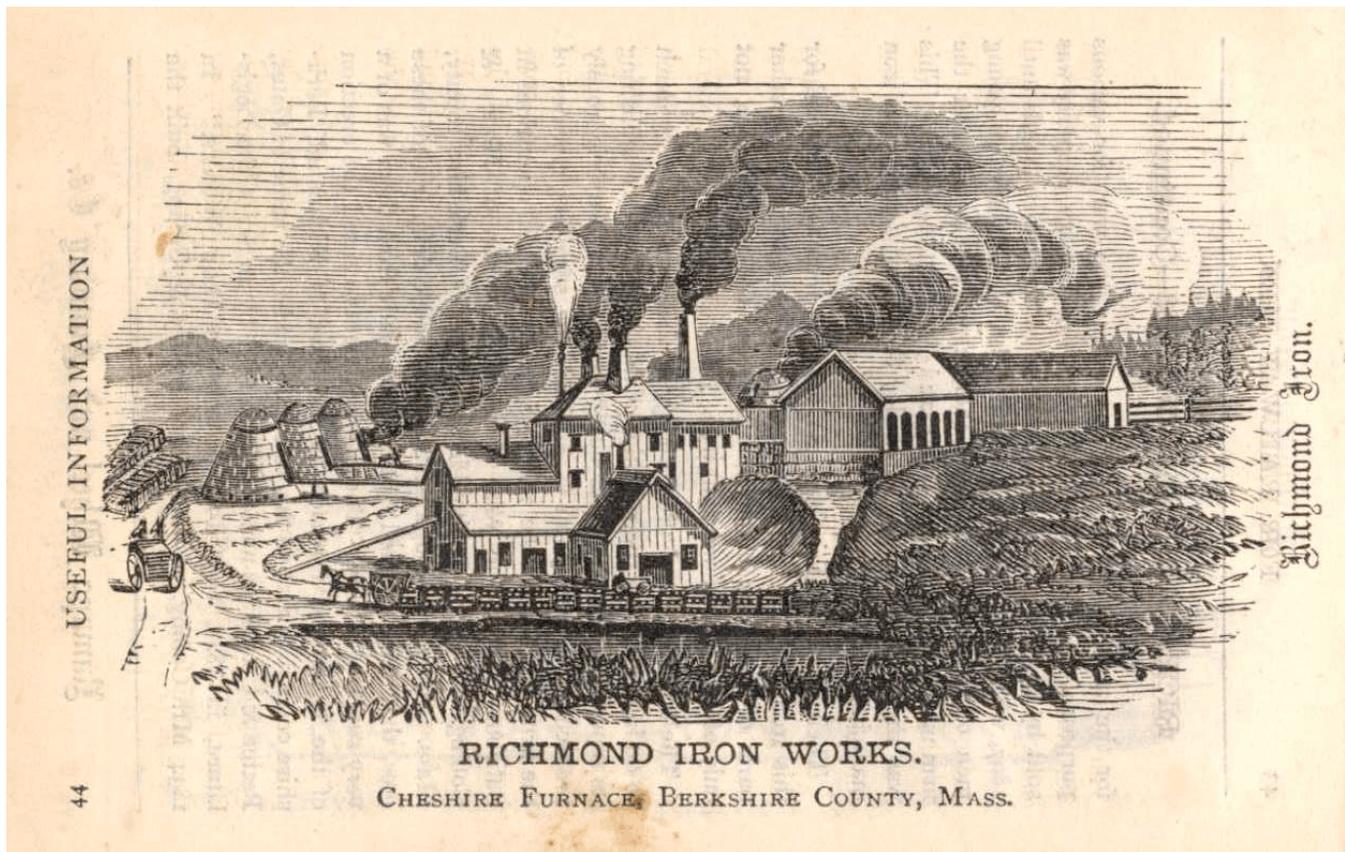


Figure 21. There is no known image of Burden's blast furnace at Shaftsbury, but this ca 1860s woodcut of the Richmond Iron Works at Cheshire, Mass., is similar in many respects to how Burden's might have appeared. Imagine standing just downhill from the end of Holliday drive at the edge of Paran Brook (as in figure 20, previous page) in the 1860s-70s and this is what you might have seen: the blast furnace in the tall, center building with the pair of side-by-side chimneys (exhaust from the furnace), three charcoal kilns at far left (Burden's had two), a stone dam holding the furnace pond off to the right, and smoke - lots of foul-smelling black smoke, from the furnace and charcoal kilns. The only change to the scene: reverse the locations of the casting shed with the roof-top monitor (at center, foreground) and the engine house (at left of center with the short chimney) (Hamilton 1869:44).

the power canal, shown in the 1869 Beers map west of the main creek channel, fed water from the dam to the bellows house. When the dam was breached, the force of the water rushing through the opening washed away all surface and subsurface evidence of the bellows house and the waterwheel mounts inside it.

While exploring the grounds in November 2002 with members of The Friends of Eagle Square (and permission of then owner property owner Ted Gladstone of Greenwich, Ct.), a large piece of slaggy material was found a few dozen feet southwest of the dam (Figure 23). The heavy, black, 18- to 24-inch diameter piece was a small section of the inside wall of the blast furnace; other

smaller pieces of the same material, firebrick, and slag were found in the vicinity, indicating that the furnace once stood very near to that spot. Blast furnaces required much ground excavation and preparation before actual construction could start. First of all, a large, deep hole had to be excavated well below the frost zone, and a timber cribbing laid down. Then stone fill was laid down atop which, finally, the furnace structure itself was constructed. The foundation extended outward beyond the base of the furnace some 6 to 8 feet, affording the heavy furnace a firm, stable footing, but also kept the foundation dry to avoid draining heat from the furnace hearth.



Figure 22. *The iron sluice gate for the Furnace Pond still in place in 2002; view from inside facing downstream (Rolando photo, November 6, 2002).*



Figure 23. *A “Friend of Eagle Square” inspecting a remnant of Burden’s blast furnace - a section of the inner shaft wall (Rolando photo, November 6, 2002).*

A few dozen feet to the southwest was a patch of flat, black ground, with tiny pieces of charcoal, indicating where the charcoal kilns stood. These also had a substantial foundation that addressed ground water issues.

As it is presently configured, the former furnace grounds in the hollow between Paran Creek and today’s Vt. Route 67 is divided into three separately owned tracts. Unfortunately, the three tracts have a common 3-way juncture very near to the site of the blast furnace complex (an iron survey marker is located within a few dozen feet south of the suspected blast furnace site).

The tract on which about 50-60% of the blast furnace complex existed is currently owned by Bernstein Displays (Leo D. Bernstein & Sons, Inc., Brooklyn, NY), manufacturer of mannequins in the former Eagle Square buildings. This approx. 22-acre tract is bordered on the north by the railroad tracks, east by Paran Creek, and south by the Peacock property.

Owner of the next most sensitive tract is identified as “Peacock” on the Shaftsbury tax map. This approx. 15-acre tract borders the Bernstein property on the north, Paran Road on the west, and includes maybe 30% of the former furnace complex site. On this tract would be the former Burden access road into the furnace complex from Paran Road and Vt. Route 67, the sites of maybe two or three Burden buildings, and possibly the site of the two charcoal kilns.

The third tract, owned by Colvin, generally borders Paran Brook on the west and might include 10% of the Burden furnace complex, possibly including the dam.

The house occupied for a few years by John Burden, works agent, still stands, the last house of a line of small houses on the north side of Route 67, just west of the former Eagle Square factory buildings.

The furnace complex site begs for some serious exploratory archeology to determine what was where, as the only documentary evidence we have that displays the site is the Beers 1869 map. Burden might have done a good job razing and remove everything about ground; it is doubtful he dug up the huge foundation stones that went deeply into the moist ground of that area to insulate the furnace hearth from the cold, surrounding ground, a great indicator of exactly where the blast furnace stack stood. Despite the razing of the site, lack of development here since the end of the furnace operations in 1977 make archeological integrity of the site good to excellent.

Burden’s Charcoal Kilns, Shaftsbury and Glastenbury, VT-BE-61, -62, and -63: As far as has been found to date, H. Burden & Sons drew charcoal from “hundreds of acres of hardwood on East Mountain” which was “burned in coal kilns made of brick and shaped like an old-fashioned beehive” (Smith 1954:36). Three charcoal making sites were located on the western flank of East Mountain on May 26, 1985, all about at a 2,200-foot elevation in eastern Shaftsbury and just over the line in Glastenbury, none of them brick-type kilns. Information regarding the location of the sites was provided by Rob Woolmington of Bennington and Ed Colvin of Shaftsbury; Colvin indicated that the area



Figure 24. *Remains of one of about a half-dozen charcoal kiln at “the Burden Lots,” located 2,200 feet up the side of East Mountain in Shaftsbury and Glastenbury. Most were conical in form and made of stone (Rolando photo, May 26, 1985).*

of the kiln ruins was once known as “the Burden lots.”

These three sites are addressed and described individually in the paragraphs that follow below.

Archeological integrity of all three sites is good to excellent.

Charcoal Kilns at “the Burden Lots,” Shaftsbury, VT-BE-62: This site contains the ruins of two partially collapsed, stone-built, somewhat conical-shaped charcoal kilns, 30 feet inside diameter, with 2½-foot thick walls each that rise 9 and 7 feet high (see front cover). The construction stone appears uncut, probably utilizing much of the stone that lies in abundance on the surface of the side of the mountain. Some of the vent holes still had their draft-controlling bricks inserted in them.

The pair of kilns stood on opposite sides of a trail through the area, about 200 feet apart. Iron kiln doors were found in proximity of each kiln; within 6 feet of the eastern-most ruin and 25 feet of the other. Both doors were found just under surface sod cover and measured 5' 11" wide by 3' 6" high. They were made of separate sheets of heavy gage iron, riveted together, with strong handles still attached. The configuration of the doors was similar to that excavated at a conical kiln site in Readsboro (VT-BE-51), and also seen at ruins of two standing charcoal kilns at Wassaic, NY.

Charcoal Kilns at “the Burden Lots,” Shaftsbury, VT-BE-63: This site was found about 1,500 feet north of VT-BE-62, and probably just east over the line in Glastenbury. As the town line was known to be in the vicinity, red paint on a north-south line of trees was

assumed to indicate the line.

Similar to the kilns at VT-BE-62, these two kilns were 30 feet inside diameter, but with 2½-foot thick walls that rose only to about four feet, due in part by remains of birch tress that had fallen against and into the kilns (Figure 24). The interior of the kiln contain much brick, leading to thinking that the area above the bottom thick stone walls was built of brick, similar to some kiln ruins found elsewhere in Vermont. No intact doors were found, but a small piece of sheet metal might have been the rotted remains of a door.

East Mountain Charcoal Mounds, Shaftsbury, VT-BE-61: The site was ‘happened upon’ while in the process of locating the two other sites in the vicinity. It consists one at least one, and possibly two charcoal mound-type kilns and is about 500 feet southwest of VT-BE-62.

The remains consist of a flat, round space bordered by about a 32-35-foot diameter circular gutter depression, typical for mound-type kilns. One corner of the feature was truncated by the trail; the opposite side of the feature cut slightly into the side of the low rise behind it. Much charcoal was found scattered within the circle. Remains of either a smaller stone kiln, or possibly a charcoal storage structure, was found about 25 feet southwest of the mound platform.

Due to the proximity of this site to VT-BE-62 in the “Burden lots” area, this site might also have had a Burden connection, possibly making charcoal here previous to construction of the stone conical kilns. Other kilns/mounds might yet exist undiscovered in the area.

H. Burden & Sons in Southwestern Vermont

Burden & Sons Lime Stone Quarry, Pownal, VT-BE-

442: The site of the H. Burden & Sons limestone quarry was field checked on June 10, 1993, while also searching for remains of the Whipple lime kiln (FS-13(BE)) The quarry was found to extend easterly from behind buildings on the east side of the intersection of Vt. Route 346 and Lime Kiln Road and continued behind (and parallel to) the trees to the south of Lime Kiln Road. At the time of the visit, it appeared inactive. Chances of finding any evidence of Burden's presence here is poor to none.

Postscript

In 2005, The American Society of Metals International (ASM) designated the Burden Iron Works, Troy, NY, an Historical Landmark:

“Headquarters of a giant 19th century iron manufacturer. Burden's patented horse-shoe making and concentric squeezing machines resulted in the automation and mass production of many essential iron products, a basis for the Industrial Revolution.”

Insofar as a significant amount of the Burden Iron Works success resulted from the raw materials that the earlier H. Burden & Sons exploited in this southwestern corner of the Green Mountain State, we can all take pride in our Vermont ancestors who also labored in the soot and sweat of the great American Industrial Revolution.

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His interest in Henry Burden & Sons' ironworks exploits started in 1975 while he was County Historian for Rensselaer County, NY, and had to write an impressive term paper for graduate studies at The College of Saint Rose, Albany, NY. Writing about Burden in this Journal issue, drawing from research and field work dating back to those days, and what he has since learned about Burden in Vermont and elsewhere, has been the culmination of a long-term aspiration (and work continues on this subject).