Allison, Edward P.  

Scharff, S. C.  
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Berry, Brian J. L.  

Hansen, P. M.  
PEARSE, JOHN B.
ALLEN, LANE, AND SCOTT, PUBLISHERS, PHILADELPHIA.

pg. 19. "The old Catoctin Furnace, about twelve miles northwest of Frederick, was built in 1774 by the Johnsons and rebuilt in 1787, about three-fourths of a mile up Little Hunting Creek, nearer the ore-banks. It left the hands of the firm in 1793 and was abandoned 1840. It was rebuilt, however, and is still running."
THE WORK OF IA

The Eaton (Hopewell) Blast Furnace: First Industry in the Western Reserve

The Eaton Furnace on Yellow Creek in Struthers, Ohio (S. edge of Youngstown), built in 1802, is the earliest blast furnace west of the Alleghenies and the oldest industry of any kind in the Western Reserve. When the furnace went out of blast prior to 1812, the seasons took hold collapsing the massive sandstone structure and covering the gorgeside site with up to seven ft. of erosional overburden. The only visible remains were the tuyere opening and a small rim section of the refractory inner lining.

Archeological excavation was begun in the summer of 1975 by the Youngstown State Univ. Dept. of Soc./Anthro. and in 1976 was expanded to include the workers’ habitation area beyond the furnace headrace. The furnace remains have been entirely exposed, as have the casting floor, trompe area, and the stone foundations and cellar of a dwelling. Hundreds of artifacts attest that the furnace produced not pigs but readily cast ware such as stoves, utensils, and tools. Also found, beneath 5 1/2 ft. of overburden, was a salamander representing the furnace’s premature last cast. This “blow-out” runner of iron and uncooked impurities extended from the hearth mouth 20 ft. onto the casting floor. No further attempts ever were made to refire following this accident.

Extensive metallurgical analysis by specialists at Youngstown Sheet & Tube Co. seems to provide the clue to the furnace’s relatively short duration: the poor desulfurizing capability of the slag created problems when the furnace switched fuel from charcoal to a mixture of charcoal and raw bituminous coal. This factor taken atop the sudden “blow out” may have been the final straw for Eaton. J.W.

HUDSON-MOHAWK INDUSTRIAL GATEWAY. The Gateway, under the guidance of Pres. Thomas Phelan [SIA Bd.] and Exec. Director Thomas McGuire [SIA], has made constructive progress during the year past in furthering its efforts to preserve, interpret, and adaptively use the IA of Troy-Cohoes-Watervliet, N.Y. A feature of the Gateway’s program has been a series of tours for both local people and outside groups. Last Sept. an all-day tour of the area’s IA was conducted by the American Assn. for State & Local History with Gateway sponsorship, combined with a series of talks on national and local matters of IA concern at key sites along the way.

HMIIG has published two important reports, both models of potential usefulness to similar undertakings. The Preservation & Utilization of 19thC Industrial Architecture in the Hudson-Mohawk Region resulted from a City Eagles competition grant that permitted an intensive study of certain buildings and complexes, their historical and architectural worth, and potential for tourism and creative adaptive use for industrial or community purposes. The Burden Iron Co. Office Building—A Historic Structure Report, prepared by Mendel-Mesick-Cohen, Architects, fully describes the 1882 building historically and architecturally (including an essay on its architect, R. H. Robertson), and presents a plan for its restoration and adaptation to a headquarters for HMIIG. (32 and 44 pp. respectively. HMIIG, 5 First St., Troy, NY 12180.)

BRICK KILNS. An extensive Report to the U.S. Agricultural Research Service on the Cultural History Values of the N.Y. Ave. Brickyard by architectural historian Dorothy R. Jacobson comprises an interesting account of the brick industry in Washington, D.C., and a detailed history of one of the city’s more interesting industrial sites. The report is in consequence of the site’s purchase by the Dept. of Agriculture for expansion of its Natl. Arboretum. (Executive Order 11593 requires such reports for any property to be affected by federally-funded projects.) The site’s most impressive feature is a battery of 12 beehive brick kilns, built c1930. The Report considers the potential for arboretum use of the kilns as visitor facilities. (USARS, USDA, Wash., DC 20250.)

PHILADELPHIA GAS WORKS. David G. Orr [SIA], Dept. of American Civ., Univ. of Pa., reports that work begun in 1974 at the Phila. Gas Works’ Point Breeze Station continues. Of the four original structures of 1854, two are gone—the Gas Holder and the Retort House—the survivors the subject of the study. The Meter House has been measured and drawn by architect Herbert W. Levy [SIA], and Orr’s students now are similarly documenting the Purifying House. A general inventory of all structures on the site is in progress and the company’s extensive photographic archive is being catalogued. The first section—a list of the paper prints—is complete, with publication planned. Orr’s Phila. Industrial Index, a card inventory, continues in work, entries for the Manayunk textile community, the Phila. Navy Yard, the Frankford Arsenal, and others, now complete.

1976 SUMMER INTERNS. George M. Danko [SIA], a Natl. Trust intern working at the State Hist. Soc. of Wisc., prepared an extensive report, The Development of the Truss Bridge, 1820-1930, with a Focus Toward Wisconsin. In the course of the work Danko located a large collection of early-20thC bridge construction progress photographs at the former works of the Wisc. Bridge Co., which have been donated to the Society.

Christopher J. Teasdale, a 1976 Skidmore graduate, for the Dutchess Co. (N.Y.) Landmarks Assn. prepared a report on the preservation of the Poughkeepsie (Cantilever) Bridge erected over the Hudson in 1889 by the Central New England RR; reinforced in 1906; discussed since a 1974 fire. It is heavily deteriorated and in jeopardy.
Forges and Furnaces in the Province of Pennsylvania

pg. 8 "Nearly all Colonial Furnaces cast stoves, and "hollow" works, — commonly called pots and kettles."

pg. 9 "Carrying their moulds from furnace to furnace, the German workmen wrought well..."
"On the Continent, as well as in England, various castings were made direct from the furnace, which for this reason was often called a "foundry." These castings ... embraced such domestic utensils of iron as pots, kettles, skillets, andirons, stoves, etc."
"Its main function was to provide crude iron, which was converted in the second unit, the forge, to wrought iron. But from the molten mass confined in the furnace crucible also came hollow- and cast-ware items, such as pots, skillets, weights, and firebacks."

"As the melting proceeded, the iron, being heavier, accumulated in the bottom of the crucible, and was run off through a tap hole into sand trenches where it cooled in the shape of cows or pigs, or was carried out in ladles and poured into clay molds."
Page 60: "Hopewell, like many of its competitors in Berks and Chester Counties, gave up its attempt to compete in the market for finished products. It sold its stock patterns to a small foundry at Parkersford, and many of the Hopewell molders moved there to find employment. Others went to furnaces which were still making castings."
Hart, Cyril E.
1968 A Resume of the History of the Forestry
Dean's Ironworking Industries,
Buletions of the Historical Metallurgy Group

Hart (pg. 11) notes a number of foundries in Forest of Dean complex, beginning by 1810. Some had a cupola (vertical coke-fired shaft furnace similar to, but smaller than, a blast furnace, used for re-melting pig iron).

"It appears that very little has been written on the technical aspects of such foundries."
"When the molten iron was released from the crucible, it poured out over the hearth in an almost blinding, luminous cascade. There it was guided into long channels in the sand to form pigs, or was ladled into molds."

"Mention should be made of the cupola furnace, from which excellent castings could be produced in a single smelting process. In the heyday of their enterprises, the Richards family gained a high reputation for castings they made in cupola furnaces by mixing imported Scotch pig iron with the native bog ore. Jesse Richards erected cupola furnaces at both Batsto and the Washington Iron Works."

Batsto date 1766-1858
Washington date 1814-1817
"New Jersey's iron plantations, resembling in particular those of Pennsylvania, were feudal establishments and often self-sufficient, or nearly so."

"material for the American Revolution was produced at Atsion... Boyer mentions the probable supply of 170 camp kettles to the Pennsylvania Committee of Safety..."

"1805, the Atsion property was sold at public auction in the Merchants Coffee House in Philadelphia. At that time the estate included a blast furnace, an air furnace "in good repair," a forge with four fires and two hammerheads, a sawmill, and two gristmills, together with the ore beds and approximately 20,000 acres of land."

"made iron stoves. "Additional products of Atsion's early days included pots, pans, kettles of varying sizes, and pewter firebacks molded with pleasing designs..."
1796 - Martha Furnace. "...there were then at Martha a forceful grist mill, a saw mill and some preparation towards erecting a forge. In the community there were a number of dwelling houses and a frame house with cellars, a large log barn, frame coal house, ore houses, the requisite buildings around the Furnace, a bellows house, bridge house and moulding rooms... large and commodious."

(Martha furnace). "Below and to the side of the stack were the great pair of bellows, also powered by the water wheel, which provided the forced draft in the furnace. (Martha used bellows of the tief type). Out in front was the moulding shed, where the molten metal flowed from the furnace tongs, and was diverted into rough gutters to be made into pigs or ladled into molds for casting various products."

"The products of Martha Furnace included the usual stoves and firebacks, each weigh, sugar kettle, shot, cannon whelk, and various utensils, among them "Houlé's Patent Cambuses," which probably were cast-iron cooking pots of some special shape. All these articles were cast in molds, directly from the molten iron, as there was no refining forge at Martha."
During the pre-Revolutionary days of the Cox administration at Batsto, production, previously concentrated on pig iron, was expanded to include a wide variety of commercial and household articles. This is shown in an advertisement from The Pennsylvania Gazette of June 7, 1775:

MANUFACTURED AT BATSTO FURNACE in West New-Jersey, and to be sold either at the works or by the subscriber, in Philadelphia, a great variety of iron pots, kettles, Dutch ovens and oval fish kettles, either with or without covers, skillets of different sizes, being much lighter, neater and superior in quality to any imported from Great Britain; Potash, and other large kettles from 30 to 125 gallons, sugar mill gudgeons, neatly rounded, and polished at the ends; grating-bars of different lengths, grist-mill rounds; weights of all sizes, from 7 to 56 lb; Fullers plates; open and close stoves, of different sizes; rag-wheel irons for saw-mills; pestles and mortars, sash weights, and forge hammers of the best quality. Also Batsto Pig-Iron as usual, the quality of which is too well known to need any recommendation.

JOHN COX

"Batsto in those days also produced large pans for evaporating salt water, in an effort to get from the sea the salt which was in much demand for the army."

"Perhaps he realized that the old-style furnaces were on the way out. In any event, about 1841 he built an entirely new one—a "cupola," or re-smelting furnace, which refined pig iron into finished products of higher quality than had previously been possible. A second cupola was built in 1848..."

"In May of that year, 1852, an entirely new cupola was constructed, but its operations were spasmodic as before. It solved no problems."
pg. 160. Etna Furnace. "Together with a small stamping mill and a great mill close to the furnace, and conveniences therein to grind and polish iron ware by water, there is in the furnace a variety of nice patterns and flasks for casting ware, for which as well as barre iron, the metal of this work is very fit." (quote from sale offering published in The Pennsylvania Journal, October 11, 1770).

pg. 160. "In connection with Etna Furnace Read built a three-fire forge. The works thus were equipped to produce not only bar iron - malleable iron refined from pig iron - but also ironware in the form of flatirons, kettles, iron handles, firebacks, and other articles in commercial demand."
Plate 92 "Cast Iron might be made in a separate foundry, but it was technically possible to cast certain objects right from the blast furnace..."

"Furnaces arranged to cast directly on tapping were known in France as FOURNEAUX EN MARCHANDISE (merchant furnaces), as opposed to the HAUT FOURNEAU which read pigs..."
Dr. Edward Heite who reviewed the sites uncovered in the intensive survey as a consulting archaeologist and specialist on furnace sites, believes the site to be a foundry; "My reasoning for the foundry is this: 1. The casting waste, in the form of vents and sprues, was abundant. 2. There was no glassy slag in the matrix to indicate the presence of primary refining (mine: very little). 3. The frothy mass of iron waste is a foam that forms in foundry sites, but is almost totally absent in a blast furnace." (Heite to Orr 6/17/77)

A young student archaeologist, W.H. Enslow took over the W.P.A. dig at Catoctin Furnace in August 1936. Most of his short time in the area was spent in the vicinity of Stack #2 casting house. Kentzer c. 1972 reports a significant part of his investigations concerning the original furnace location: "During his first nine days at Catoctin, Enslow had had the opportunity to talk with several residents "old enough to remember something about the old furnace. He also visited several places connected with the furnace by local tradition. Unfortunately, Enslow did not report on the conversations; he did summary one visit - to the legendary location of the original furnace Dr. Porter had mentioned.

(Enslow writes) "The site of the establishment of 1774 has been tentatively located on the highway about 3/4 mile south of the present furnace. The owner of part of the probable original site visited the work and corroborated our conclusion by saying that there were ruined walls about two feet below the surface on his truck-patch, and that he and his son had removed masses of iron and slag as much as two men could carry, and broken up others with a sledge, selling the iron for junk. The remains in sight from the road indicate the presence of an earth and stone dam of some size, which within the memory of middle-aged residents formed a considerable pond, and discharged its water into a ravine, over which the old Emmittsburg Pike at one time passed on a large brick arch. The old road has been abandoned, and ravine and arch alike been filled in by building the new road about 20 feet west. This fill, consisting largely of slag from the dumps of the new furnaces, will considerably complicate determination of the site."
(Enslow continues) 'Some of the older inhabitants insist that this was the location of a forge and trip-hammer for refining the iron produced above, but this may probably be rather heavily discounted, as some of the same people said that the middle furnace of the three at the present site was a puddling furnace - a manifest absurdity, well refuted by the evidence of men who worked here as early as 1873, when no 2 was still in operation.'

(Hentzer continues) 'Porter was elated with Enslow's findings. 'It is particularly gratifying,' he wrote him on August 22 after reading it, 'to learn that you have tentatively located the furnace of 1774, which we felt quite sure would be found about a mile or 3/4 of a mile from the present furnace stack. If we can positively identify this as the first Catoctin furnace, perhaps it can somehow be added to the part area, or at least a marker erected.'

**Interpretation**

The importance of Check 17 and Check 3 in settling basic problems concerning the history of Catoctin Furnace is clear. The presence of iron-working activities in the Auburn area is definitely established in the survey excavations at Check 3. The probability of discovering additional features, perhaps the "legendary original furnace" in Checks 14 and 3, is high.
pg. IV  "Iron manufacture in all parts of the country during the eighteenth century was quite similar to that of Pennsylvania. The forms of organization, the type of ironworks, the methods of production, the means of transportation, and the problems concerning markets were quite similar. Only in details were there differences and these were few."

pg. 11  "Maryland set up the first bloomery in 1715 about a year before the first forge was built in Pennsylvania."

pg. 19  "Although most of these communities, or "iron plantations," had their origins in the eighteenth century, many remained until the middle of the nineteenth and even later. With the development of large capitalist enterprises and industrial consolidation after the Civil War, they gradually disappeared and became mere memories."

BING, ARTHUR CECIL
1938  PENNSYLVANIA IRON MANUFACTURE IN THE EIGHTEENTH CENTURY. PENNSYLVANIA HISTORICAL AND MUSEUM COMMISSION, HARRISBURG.
pg. 23  "Pig iron was the chief product of the blast furnace, although pots, pans, bellows, stove plates, and firebacks were also cast."

pg. 37 "While the early furnaces and forges were organized on plantations, most of the other types of ironworks were not. Slitting mills at which was produced slit iron for making nails; plating mills where bar iron was hammered into sheet iron or tin plate; iron and steel furnaces where small amounts of blister steel were produced for making tools; and air furnaces, the progenitors of modern cupolas, were usually built in towns or boroughs. A few of these, however, could be found on plantations, such as the slitting mill on the Brandywine and the steel furnace at Coventry."

pg. 46 "Many air furnaces, tin plate factories, and nail works were established in Philadelphia from the time of the Revolution to the close of the century."
"Beside pig iron, the early Pennsylvania furnaces cast hollow ware, such as pots, pans, skillets, sugar kettles, Dutch ovens, stoves, and firebacks. The process was similar to that of casting pig iron. ... When the molten iron was tapped into the pig beds, a part of it was delivered into large ladles, and in turn was poured into small ladles and then into the molds for casting."

"By the end of the eighteenth century, air furnaces had been introduced into Pennsylvania, especially in the region of Philadelphia. These remelting furnaces, with a capacity up to five tons approximately, could make castings of all kinds from pig iron, and were the progenitors of the modern cupolas. These furnaces produced bloom, dry sand, flask, and open sand castings of forge hammers, slitting mill rolls, stoves, anvils, skillets, pots, pans, kettles, and other hardware."

With the introduction of the principle of the "high furnace," or blast furnace, toward the close of the Middle Ages, having as its object the utilization of the waste heat of the bloomery forge and an increased output, a different type of iron is found. In its journey through the blast furnace, the iron, being molten, absorbed from three to five percent carbon. This carbon was in two forms: (1) the combined form, that is, in chemical combination with the iron itself, and (2) as graphite flakes amid the particles of iron. The same is true of all cast iron made today. A microscopic examination shows black flakes of free carbon distributed throughout the alloy. This is the reason for the brittleness of cast iron.
As time went on, greater varieties of castings were made, as can be seen in the development of different types of stoves. In comparing stove plates made during different periods in the eighteenth century, progress can be noted throughout the century, not only in design but in the quality of workmanship. Cast iron came to be improved in quality by experimentation in mixing different ores. Ironmasters also began using iron recovered from cinder banks because it was discovered that mixed with ores it produced a much tougher iron than heretofore. The unfortunate Peter Hasenclever, in his enterprises in New Jersey and New York, was largely responsible for the widespread adoption of this plan.

While stove plates and a variety of iron wares were cast at the blast furnaces, the better grade of castings were made at air furnaces. Among those who carried on such furnaces in Philadelphia was John Nancarrow, a man of inventive genius. Nancarrow devised many improvements in the methods of casting and also in articles that were cast. Newly invented boxes for carriage wheels were made in Philadelphia in 1785, and during this period many improvements were made in tools and machinery made of cast iron. The cylinders required for steam engines during this experimental age were sometimes cast at the blast furnaces, but more often at the air furnaces.

"Many parts for steam engines were cast at such furnaces as Norwich and especially at the air furnaces at Philadelphia."

The potters were relatively highly specialized workers who worked at the furnaces only when small castings requiring a certain degree of skill were made. They were paid, in 1786, four shillings per hundredweight and allowed six pence a piece on hand ware, flanked ware, and on articles under twenty pounds in weight. As most of the furnaces produced pig iron or the heavier type of castings, the potters were required infrequently, and only for short periods of time. For this reason, they often traveled from one furnace to another.
pg. 163 “At Cornwall Iron Works, munitions and salt pans were made. With the supply of salt cut off, the need of salt for salting meats, curing fish, and for various domestic uses became acute. Salt works were established on the Jersey Coast making salt from sea water. Thousands of salt pans were cast at the furnaces.”

pg. 163-4 (during Revolutionary War) “Air furnaces were erected during the emergency to cast iron cannon from pig iron or old metal.”

pg. 164-5 (immediately after Revolution) “During this new industrial era, many slitting mills were established. Steel works were also built... Air furnaces were built. Tin plate works sprang up...”

pg. 165 “The manufacture of ironware and secondary iron products of all kinds received a major impetus after 1787 and on through the beginning of the nineteenth century.”
Pg. 166 "No accurate record of the extent of the Pennsylvania iron industry and of iron manufacturing appeared until the census of 1810. At that time there were 44 blast furnaces, 78 forges, 6 air furnaces, 4 bloomeries, 18 rolling and slitting mills, 50 trip hammers (plating mills), 5 steel furnaces, and 175 naileries in the state."
Heite — remelting furnace technology definitely present in 10th century.

Would not have been casting hollow ware of tripod base after 802 by 2nd quarter of 19th century.

$1.00 + 3.99 + 9.99 = 13.98$