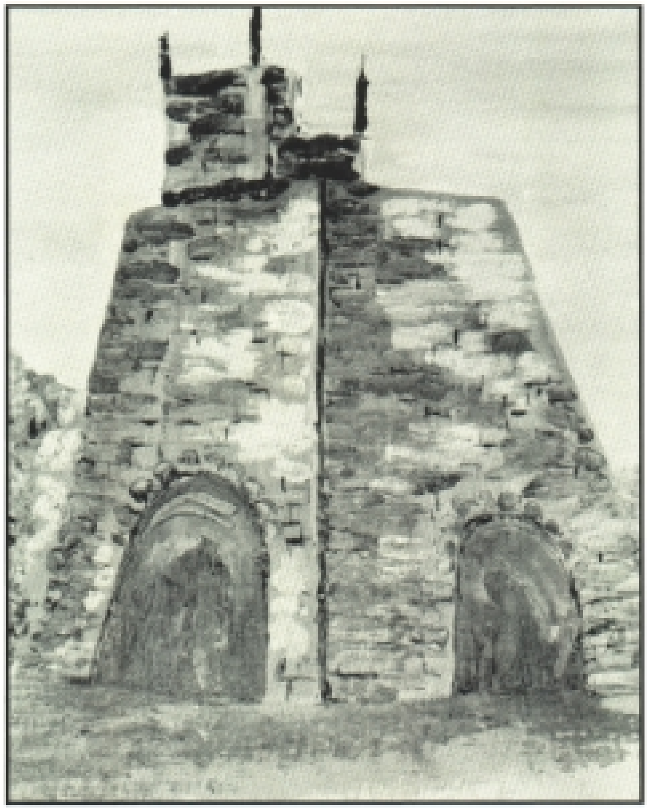
NASSAWANGO IRON FURNACE

ca1828-1850

NEAR SNOW HILL, MARYLAND



A NATIONAL HISTORIC MECHANICAL ENGINEERING LANDMARK

OCTOBER 19, 1991

The American Society of Mechanical Engineers

DelMarVa Group

FURNACE TOWN

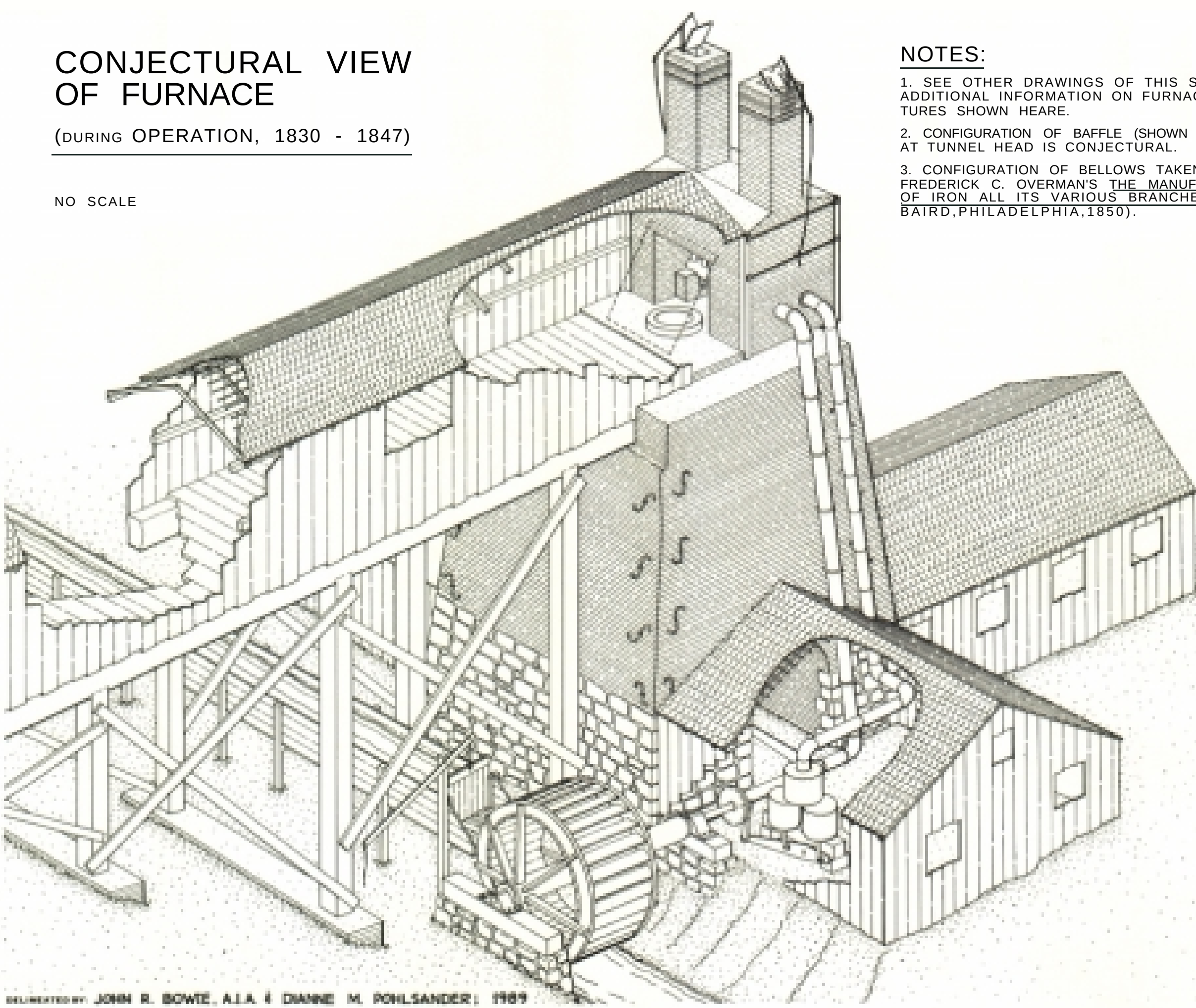
Nassawango Iron Furnace

HISTORY OF NASSAWANGO IRON FURNACE

Bog iron was first discovered in the swamps along Nassawango Creek in the 1780's and in 1828 the Maryland Iron Company was incorporated to extract and process it. In 1830, the Company constructed a furnace along the creek at a point roughly four miles northwest of its confluence with the Pocomoke River near Snow Hill, MD. Shortly thereafter, the Nassawango furnace began producing pig iron by the cold-blast process.

In 1836, two of the Company's creditors, Arthur Milby and Joseph Waples, foreclosed on the property; that same year they sold it to Benjamin Jones, a Philadelphia ironmonger. Jones, who owned other furnaces and had a formidable business that bought and sold iron products, only maintained the furnace at Nassawango a short time. In 1837, he sold the property and business to Thomas A. Spence of Worcester County. Spence was an energetic and enterprising ironmaster who produced over 700 tons of pig iron per year at Nassawango; Spence was also credited with the installation of the hot-blast stove on top of the furnace.

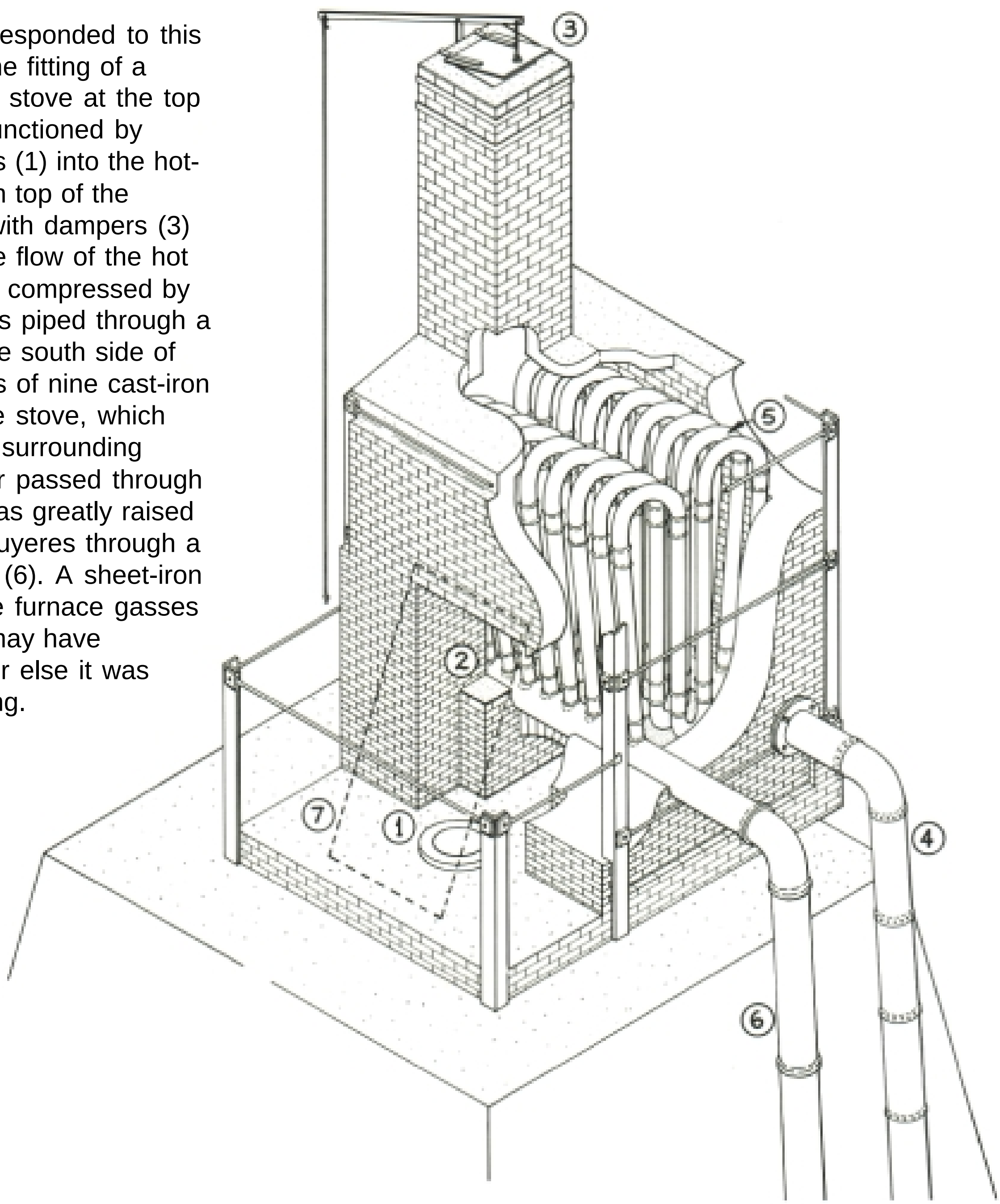
Iron was produced at Nassawango until 1847 when lack of labor and poor market conditions caused Spence (who fell into financial ruin) to shut down the furnace. The property sat idle from that time forward and was used by successive owners mostly for the timber rights. In 1962, the heirs of Georgia Smith Foster donated the property to the Worcester County Historical Society which undertook a systematic long range program to stabilize the furnace and cut back the plant growth of the previous 100 years. In 1978, the Furnace Town Foundation, Inc. was organized as a nonprofit group dedicated to the restoration and interpretation of the furnace site as a museum for public visitation.



ENGINEERING SIGNIFICANCE

About 1828 one of the most important developments in blast-furnace technology was introduced in England. This was the “hot blast”. The blast air, before entering the furnace’s tuyeres (air nozzles), was raised to a very high temperature by being passed through a heat exchanger or “stove” heated by the hot waste gasses as they left the furnace. This accelerated the combustion process within the furnace and decreased the amount of charcoal fuel necessary to reduce a given quantity of iron ore, but most significantly, it appreciably increased the production of iron.

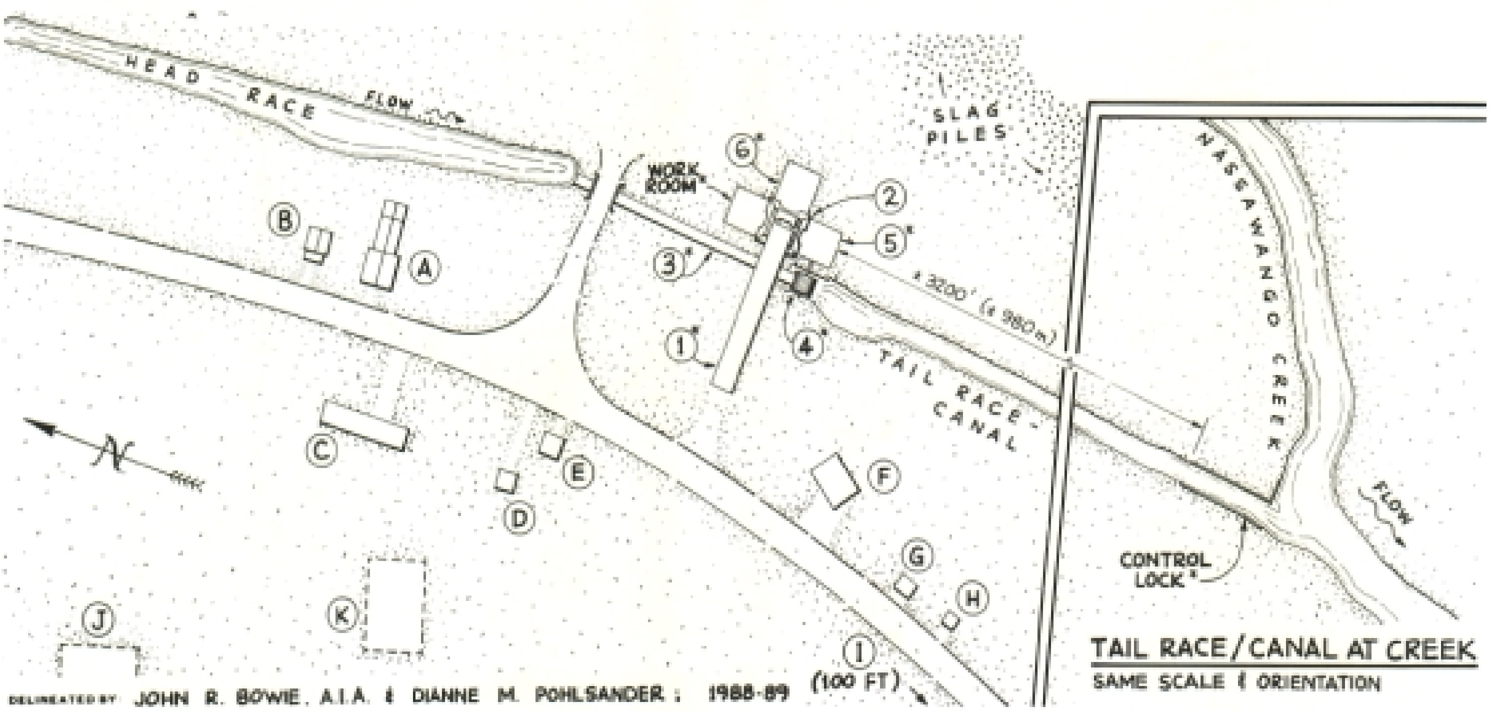
The Nassawango Furnace responded to this innovation about 1835, by the fitting of a brick-encased cast-iron-pipe stove at the top of the furnace stack. This functioned by channeling the waste gasses (1) into the hot-blast stove enclosure (2). On top of the enclosure two draft stacks with dampers (3) carried off and controlled the flow of the hot waste gasses. The blast air, compressed by the bellows (not shown), was piped through a sheet-iron air main (4) up the south side of the furnace and into a series of nine cast-iron labyrinth pipes (5) within the stove, which were heated by the gasses surrounding them. As the pressurized air passed through the stove, its temperature was greatly raised before it descended to the tuyeres through a heavy cast-iron downcomer (6). A sheet-iron baffle plate (7) deflected the furnace gasses into the stove enclosure. It may have contained a charging door or else it was moved aside during charging.



FURNACE OPERATION

Raw bog ore was dug from beds along the sides of Nassawango Creek and the adjacent swamps. It was then hauled to the wooden charging bridge (1) where it was carried up to the top of the furnace stack (2) and dumped into the furnace. At the same time, pine trees in the adjacent area were cut and burned to produce charcoal, which was also carried up the charging bridge and dumped into the furnace. The third element of the furnace was oyster shells, which were brought to the site by horse cart or perhaps by barge up the tail race-canal from Nassawango Creek and the Pocomoke River.

Each of these three components was loaded, layer-by-layer, into the furnace until it was full; then the charcoal was ignited. As it took fire, water was let into the head race from the large pond upstream; the water then traveled down a timber flume (3) and powered the large wood breast wheel (4) before being discharged into the tail race-canal. The water wheel provided power for a bellow that probably was housed in a blowing room (5). The compressed blast air from the bellows was piped to the hot-blast stove on top of the stack where it was heated by the furnace exhaust gasses. The hot blast air was then piped back down to the base of the furnace where it was forced into the hearth, providing the oxygen necessary for the smelting of the iron ore.



Since the molten iron produced by the smelting process was heavier than the impurities released, also in molten form, it collected at the bottom of the furnace hearth. Two or three times a day it was tapped off, flowing into depressions formed in the sand floor of the casting house (6), forming when cool the iron "pigs" that were the furnace's principal product. These were sold for remelting in foundries and casting into various products. A certain amount of the iron also was run directly into sand molds to produce a variety of cast-iron domestic and industrial articles.

After all the iron had run out, the non-iron impurities in the ore, combined with the lime from the shells, was tapped off as a molten "slag". This waste product was dumped in the nearby fields after it had solidified.

Meanwhile, the furnace was being charged with fresh ore, charcoal, and oyster shells about every two hours in a continuous process. Finished pigs and castings were loaded onto barges for the trip to the Pocomoke River, where they were transferred to ships bound for Philadelphia and Baltimore.

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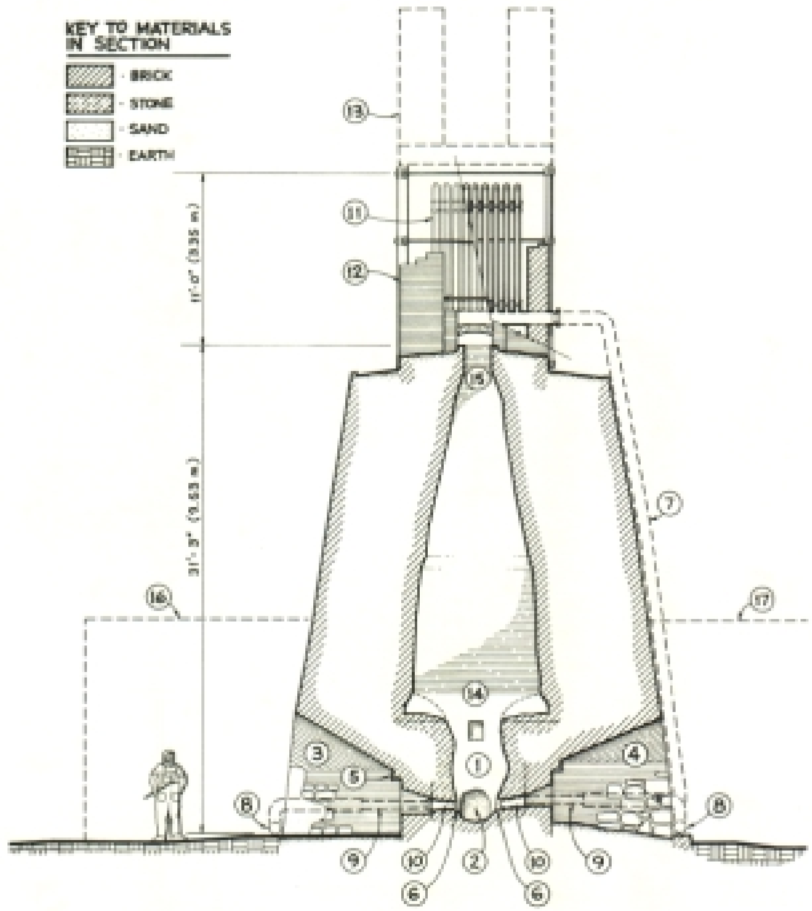


NOTES

1. LOCATION AND CONFIGURATION OF CHIMNEY TO HOT BLAST STOVE BASED ON PHOTOGRAPH FOUND IN THE ENTAILED HAT, BY GEORGE A. TOWNSND (REPR 1955, BY TIDEWATER PUBL'G)

KEY

1. HEARTH OF FURNACE
2. HEARTH OPENING
3. NORTH TUYERE OPENING
4. SOUTHH TUYERE OPENING
5. CAST IRON LINTEL THAT SUPPORTS BRICK FACE
6. OPENING INTO HEARTH FOR TUYERES
7. CONJECTURAL LOCATION OF CAST IRON DOWNCOMER THAT CARRIES BLAST AIR FROM HOT BLAST STOVE TO BUSTLE PIPE
8. CONJECTURAL LOCATION OF CAST IRON BUSTLE PIPE THAT CARRIES BLAST AIR TO BLAST PIPES
9. CONJECTURAL LOCATION OF CAST IRON BLAST PIPES-TAPERED TO INCREASE VELOCITY OF BLAST AIR INTO TUYERES
10. CONJECTURAL LOCATION OF CAST IRON TUYERE - REPLACEABLE TAPERED NOZZLE THAT FORCES BLAST AIR INTO HEARTH
11. TYPICAL CAST IRON RETORT
12. HOT BLAST STOVE
13. CONJECTURAL LOCATION OF CHIMNEY TO HOT BLAST STOVE
14. BOSH - WIDEST PART OF FURNACE
15. TUNNEL HEAD - WHERE RAW MATERIALS ARE LOADED INTO FURNACE
16. CONJECTURAL LOCATION OF WORK
17. CONJECTURAL LOCATION OF BLOWING ROOM ROOF

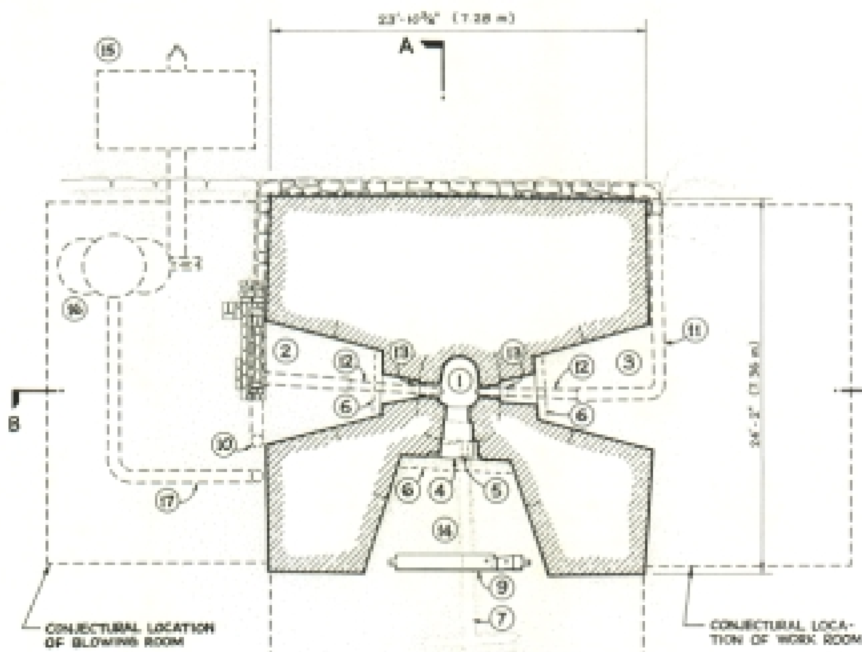
SECTION "B-B"

LOOKING EAST

SCALE: 1/4" = 1'-0"

0 1 2 3 4 8 12 16 FEET

0 1 2 3 4 5 METERS



NOTE:

JOHN S. HILL (BORN 1860), IN CHAPTER 2 OF HIS 1931 MANUSCRIPT DESCRIBED THE "LARGE UNDERSHOT WHEEL... WHICH FORMERLY WORKED THE HUGE BELLOWS...". CONFIGURATION OF BELLOWS TAKEN FROM FREDERICK C. OVERMAN'S THE MANUFACTURE OF IRON IN ALL ITS VARIOUS BRANCHES (H.C. BAIRD, PHILADELPHIA - 1850)

KEY TO MATERIALS IN PLAN:

- BRICK
- STONE

DELINEATED BY: JOHN R. BOWIE, A.I.A. & DIANNE H. POHLSANDER; 1988-89

KEY:

1. FURNACE HEARTH
2. SOUTH TUYERE OPENING
3. NORTH TUYERE OPENING
4. DAM STONE - HOLDS IRON IN HEARTH AND LETS IT COLLECT WHILE MELTING
5. TAP-HOLE - WHERE MOLTEN IRON RUNS OUT OF HEARTH
6. LINE OF CAST IRON LINTEL (ABOVE) THAT SUPPORTS BRICK FACE
7. CONJECTURAL LOCATION OF RUNNER CHANNEL THAT ALLOWS MOLTEN IRON T0 FLOW FROM TAP-HOLE TO SOWS (8)
8. CONJECTURAL LOCATION OF "SOWS", INTO WHICH MOLTEN IRON FLOWS, COOLS, AND HARDENS INTO "PIGS"
9. 11½" × 11½" TIMBER - ORIGINAL LOCATION AND USE UNKNOWN
10. CONJECTURAL LOCATION OF CAST IRON DOWNCOMER THAT CARRIES BLAST AIR FROM HOT BLAST STOVE TO BUSTLE PIPE (11)
11. CONJECTURAL LOCATION OF CAST IRON BUSTLE PIPE THAT CARRIES BLAST AIR TO BLAST PIPES (12)
12. CONJECTURAL LOCATION OF CAST IRON BLAST PIPES - TAPERED TO INCREASE VEL0CITY OF BLAST AIR INTO TUYERES
13. CONJECTURAL LOCATION OF CAST IRON TUYERE - REPLACEABLE TAPERED NOZZLE THAT FOCUSES BLAST AIR INTO HEARTH
14. HEARTH OPENING
15. CONJECTURAL LOCATION OF WATER WHEEL; EXACT SIZE. LOCATION, AND N^o^ OF BUCKETS UNKNOWN
16. CONJECTURAL LOCATION OF BELLOWS - POWERED BY WATER WHEEL
17. CONJECTURAL LOCATION OF SHEET IRON AIR MAIN - CARRIES COMPRESSED AIR FROM BELLOWS UP TO HOT BLAST STOVE

PLAN (AT GROUND LEVEL)

SCALE: 1/4" = 1'-0"

0 1 2 3 4 8 12 16 FEET

0 1 2 3 4 5 METERS

THE ASME HISTORY AND HERITAGE PROGRAM

The ASME History and Heritage Recognition Program began in September 1971. To implement and achieve its goals, the society formed a History and Heritage Committee, initially composed of mechanical engineers, historians of technology, and (ex-officio) the curator of mechanical engineering at the Smithsonian Institution. The Committee provides a public service by examining, noting, recording and acknowledging mechanical engineering achievements of particular significance.

Nassawango Iron Furnace is the 102nd National Historic Mechanical Engineering Landmark to be designated. Since the ASME historic mechanical engineering recognition program began in 1971, 148 Historic Mechanical Engineering Landmarks, 6 Mechanical Engineering Heritage Sites, and 3 Mechanical Engineering Heritage Collections have been recognized. Each reflects its influence on society, either in its immediate locale, nationwide, or throughout the world.

An ASME landmark represents a progressive step in the evolution of mechanical engineering. Site designations note an event or development of clear historical importance to mechanical engineers. Collections mark the contributions of a number of objects with special significance to the historical development of mechanical engineering.

The ASME Recognition Program illuminates our technological heritage and serves to encourage the preservation of the physical remains of historically important works. It provides an annotated roster for engineers, students, educators, historians and travelers. It establishes persistent reminders of where we have been and where we are going along the divergent paths of discovery.

The History and Heritage Committee is part of the ASME Council on Public Affairs and Board on Public Information. For further information, please contact the Public Information Department, American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017, 212-705-7740.

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MECHANICAL ENGINEERING LANDMARK

THE NASSAWANGO IRON FURNACE

NEAR SNOW HILL, MARYLAND
ca1828-1850

NASSAWANGO IS STRUCTURALLY TYPICAL OF ITS PERIOD WHILE DISTINCTIVE IN SEVERAL WAYS: IT SMELTED BOG ORE; IT IS PRINCIPALLY OF BRICK RATHER THAN STONE; AND OF GREATEST SIGNIFICANCE, IT IS THE EARLIEST SURVIVING AMERICAN FURNACE THAT EMPLOYED THE "HOT BLAST". BY THIS MEANS-NOW UNIVERSALLY USED-THE PRODUCTION OF PIG IRON WASGREATLY INCREASED. THE CAST-IRON BLAST-AIR "STOVE" AT THE TOP OF THE FURNACE STACK WAS INSTALLED HERE ca1835, LESS THAN A DECADE AFTER INTRODUCTION OF THE PROCESS IN ENGLAND.

The American Society of
Mechanical Engineers

1991

ACKNOWLEDGMENTS

The nomination of the Nassawango Iron Furnace as a mechanical engineering landmark was suggested by Raymond L. Jackson, then Chairman of the DelMarVa ASME Group, and was submitted by History and Heritage Committee Chairman, Scott L. Davidson, P.E.. Regional assistance was provided by Dale Woomert, P.E. Region III Assistant History and Heritage Committee Chairman. Special thanks to Kathy Fisher, Executive Director, Furnace Town Foundation, Inc., and the Board of Directors for their dedicated support in keeping the engineering past alive.

The American Society of Mechanical Engineers

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Furnace Town Foundation, Inc,

The ASME DelMarVa Group

For additional information contact:

Furnace Town Foundation, Inc. • P.O. Box 207 • Snow Hill, MD 21863 • 301-632-2032
ASME DelMarVa Group • 108 N. Church Street • Snow Hill, MD 21863 • 301-632-0300

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