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FIELD REPORT ON THE ARCHAEOLOGICAL SITUATION AT THE CATOCTIN FURNACE STACK 2 CASTING SHED SITE, FREDERICK COUNTY, MARYLAND

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Thanks are given to Assistant Superintendent Marty Kelly who, as Acting Superintendent, kindly extended the facilities of the Cunningham Falls State Park to us during our five-day dig.

We are especially grateful to the Restoration Crew of Manna Bros. Construction Co., Inc. - Tom Lear, David Jaeger, and David Hawkins, for patiently and enthusiastically undertaking to excavate the site under our direction, and to their supervisor James Fitze for his many kindnesses and considerations during the work.

We feel most fortunate in being visited by William G. Renner, long time expert on the history of the Catoctin Furnace area, and are most grateful for securing an interview from him on the site, as well as a sketch map of the area.

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Introduction

The following field report was prepared following five days of excavation at the Casting Shed site, Stack 2, Catoctin Furnace, Frederick County, Maryland. It attempts to define the main outlines of the archaeological situation of the site as indicated in the features, stratigraphy, and artifacts encountered in the two test pits and four test trenches which sampled the site. Laboratory analysis of the artifacts and comparisons of the finds with the literature, as required in a complete report, remain to be undertaken in the future.

Basic Plan: The principal investigator was requested by the Department of General Services and the Maryland Geological Survey, State of Maryland to conduct a five day archaeological excavation at the Casting Shed site located directly east of Stack 2 at Catoctin Furnace. The dig was carried out August 25-29, 1975 with the assistance of James Fitze and David Jaeger of Marriottsville, Tom Lear of Gather, and David Hawkins of Sykesville, Maryland, who were to do the digging under the direction of Dr. Kenneth G. Orr, and Ronald G. Orr, consulting archaeologists. The diggers were construction workers of Manna Brothers, Inc., a firm which had contracted to restore the casting shed for the State of Maryland. Plans for the restoration of the shed were designed by Col. Laurence P. Sangston, Principal Architect, Office of Design and Construction, Department of General Services. Tyler Bastian, State Archaeologist, Maryland Geological Survey, provided the objectives of the dig, and shared research data on Catoctin Furnace with the archaeologists. The artifacts and other pertinent materials found in the excavation were deposited with Acting-Supervisor of Cunningham Falls State Park, Marty Kelly, Assistant Superintendent, pending determination of appropriate storage by the State Archaeologist.

Purposes of the Excavation: The basic purpose of the excavation was to record and preserve the archaeological features and artifacts

which might be affected by the restoration of the casting shed. The location and nature of the original floor of the shed were to be determined so that its significant features might be carefully recorded and preserved by sealing them under the restoration's new floor of clay and shale, and to establish with greater certainty the levels of remaining construction in the area. An examination of footings for the restoration was also to be undertaken to reveal details for authentic reconstruction as well as possible artifacts for use in archaeological interpretation and dating. It was visualized that features would be discovered on the floor of the casting shed which could be noted, covered-up, and re-excavated at some future time for purposes of public exhibit.

The basic objectives of archaeological excavation is to open "the book of the past" (the site) in such a way as to observe, preserve, and record its contents with accuracy and without waste. The manner in which this objective was approached is described in the following section.

Procedures: Devices for locating archaeological materials in three dimensional space were established at the onset of the dig. These consisted of a grid to locate materials horizontally and a datum plane to locate them vertically.

Horizontal Grid: A grid of 5 foot squares was placed over the casting shed site with stake 0:0 located 2 inches north of the southeast corner of the furnace stack (Fig. 1). This grid consisted of a series of adjacent rows starting with row 0 aligned with the east front of the stack. The rows were numbered 0, 5, 10, 15, etc. While the rows were aligned roughly north-south, a series of alleys at right angles to the rows and coinciding with them were aligned roughly east-west. The alleys were numbered R5, R10, R15 etc. when they were to the right of the 0 row, L5, L10, etc. when left of the 0 row. It remains to mention that the grid system to the south of the 0 row was designated with a minus sign (-5:R5, etc.). The lower left hand corner stake of the square (roughly southwest) gave the designation to the square. Materials could be located within the square by measuring from any of its stakes giving the two directions with measurement necessary to pinpoint the object (i.e. N10",E2" Sq. 10R5), or

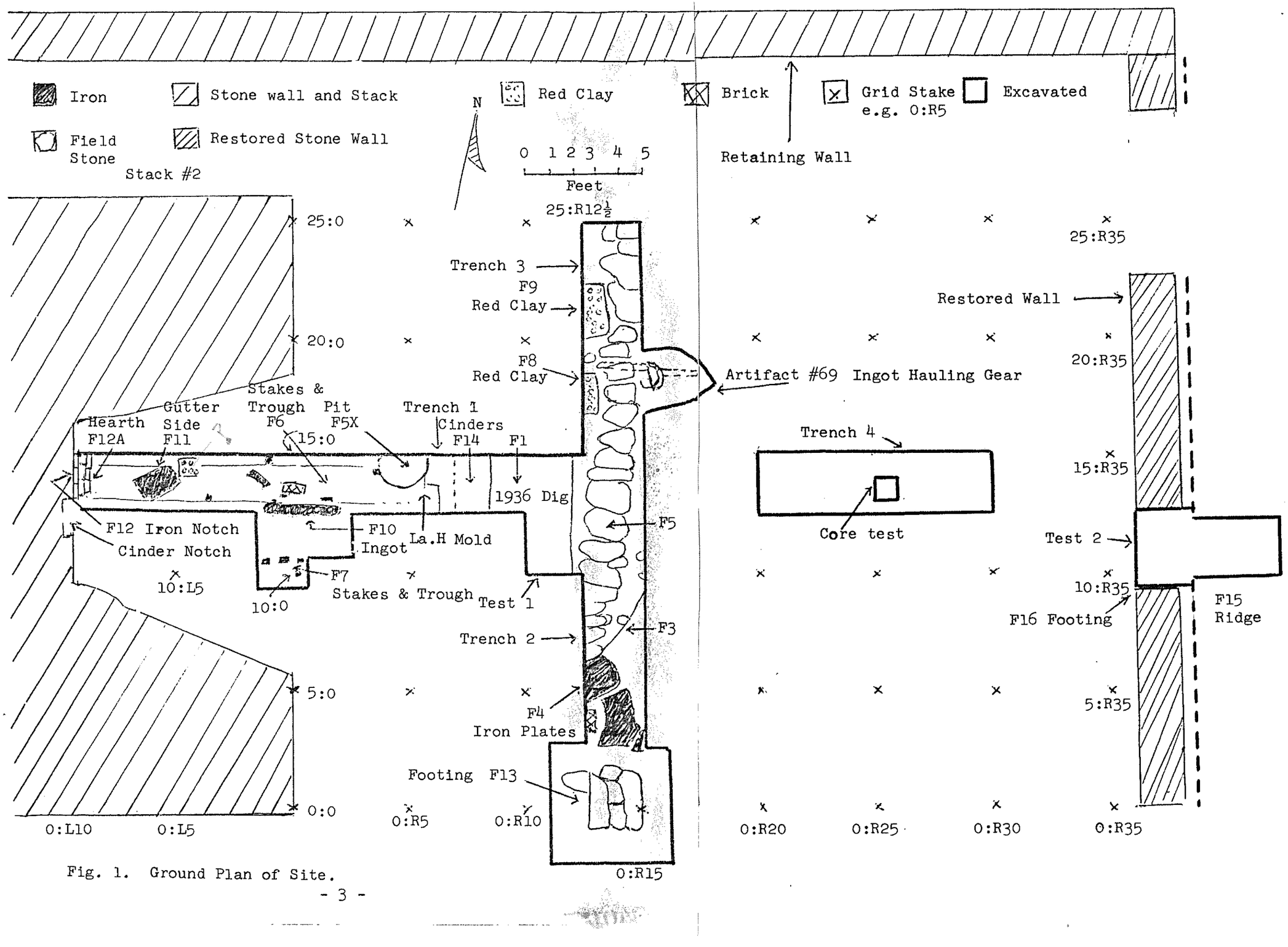

Fig. 1. Ground Plan of Site.

a fractional row and alley point established such as 12½R6".

Datum Plane: If the surface of the site were flat the surface could be considered as a datum plane and vertical measurements made in terms of this. At this site, however, the surface was not flat and an artificial plane had to be established. Fortunately such a plane was setup in the restoration plans for the shed in the Grade 0'-0" point giving the floor plane of the restored shed (Sangston, 1974). This point was located 14 feet below an existing beam seat (niche) in the southeast corner edge of the stack.

The surface elevations of the stakes of the grid system and other key points were "shot" in reference to the datum plane with the use of a transit and stadia rod. Three stations were arbitrarily selected (A,B,C) for this purpose in convenient position for sighting south of the grid. The transit readings allowed measurements to now be taken from surface points, resulting in a conversion of readings on profiles, ground plans, and artifacts into b.d. (below datum) vertical locations.

Every archaeological site requires a strategy of excavation adapted to its special objectives. The casting shed dig contracts called for a sampling of the site on as comprehensive a basis as possible - within a five day period. The strategy required called for as little digging as possible to achieve as great a return of data as possible. Consequently, intensive testing techniques were applied.

Strategy of Excavation: A 5 foot test pit (Test 1) was dug to the yellow clay subsoil at 10R10. Since the stratigraphy of this area was at this point unknown the test was dug in arbitrary levels of 6 or 8 inches. At each level the pit floor was smoothed off ("slicked-down"),studied and recorded. Soil color and/or context differences were noted and when considered significant (showing sharp lines of contrast),feature numbers (e.g. F.1, F.2,etc.) or layer letters (e.g. L.A, L.B., L.C., etc.) were assigned. Artifacts and materials found within the features and layers were sacked in waterproof bags containing a field catalogue number (from

1 to 70). The field catalogue described the 3 dimensional provenience of the finds.

On completion of Test 1, the sides or profiles of the test were slicked-down to reveal the vertical aspects of the layers and features - the stratigraphy. This was studied and recorded with graphs. Trenches 1, 2 and 3, $2\frac{1}{2}$ feet wide were then extended to the West, South, and North respectively. The excavators could now dig by peeling off the strata identified in the profiles of Test 1. Strata containing artifacts were screened with $\frac{1}{2}$ inch mesh to ensure a fuller recovery of artifacts.

Test 2 located in the first door opening in the east wall (which had been partially restored prior to the beginning of the dig) was now dug to subsoil - revealing the footing of the wall and the strata comprising the mound along the east side of the shed.

Finally, Trench 4 was excavated to extend partially an exploratory test trench to the east of Test 1. By this time our time had run out and further testing was not possible. It was believed, however, that the testing gave a comprehensive view of the site.

During the excavations photographs in color and black and white were taken by Ron Orr showing all aspects of the excavation.

It should be mentioned that none of the construction crew diggers had experienced archaeological work before. It was necessary to train them as they proceeded with the work. Being excellent shovel-men to start with, each proved capable and interested excavators. It was amusing to see them wield their large brick-laying trowels quite as expertly as the archaeologists use their much smaller trowels for uncovering artifacts and features. The materials found within any one feature or layer were placed by the diggers on boards to be sacked and notations made by the archaeologists.

Between training the diggers and recording the findings the dig was an extremely busy one. We all found time, however, to answer the questions of a number of visitors who were cordoned off at a safe distance. At night the excavations were covered with boards.

Background

The Catoctin Furnace area has attracted increasing historical and archaeological attention since the 1930's when it was acquired by the National Park Service (1937). An archaeological excavation took place here in 1936 and another in 1971. In addition, a body of historical data has been collected over the years. We were able, in a preliminary way, to draw on these data to provide a setting for the findings of our dig. We were also privileged to interview a local resident William G. Renner who was foreman of the 1936 W.P.A. dig. Mr. Renner has been a lifelong researcher of Catoctin Furnace history, having actually visited the Casting Shed site in 1899 at the age of three, and again in 1907.

Chronology of the Furnaces: The existing stack at Catoctin Furnace is generally believed to be "Isabella", the second stack to be constructed in 1858. Stack 2, measuring 33 feet high with a 9 foot diameter inside stack, was a charcoal furnace with an annual capacity of 3300 tons of pig iron in 1892. The stack was "practically dismantled" by 1904. Stack 1, 33 X 9 feet, is believed to be located about 50 feet to the southwest of stack 2, along with its casting shed. It is also a charcoal blast furnace, constructed by Maryland Governor's James Johnson's company in 1774. It was enlarged in 1831 to an annual capacity of 1700 tons of pig iron and dismantled in 1888. Stack 3, "Deborah" by name, was an anthracite coke furnace 50 x 11½ when constructed in the 1870's with a capacity of 9000 tons of pig iron. It was enlarged to 60 x 13 feet in 1900 with an annual capacity of 15000 tons of pig iron, and finally dismantled by 1908. Stack 3 with its casting shed is thought to be a covered ruin some 175 feet south, southwest of Stack 2 (American Iron and Steel Directories for 1888, 1892, 1908 in Contract Archaeology, Inc., 1971, "Chronological

Chart of the Catoctin Iron Furnace").

Mr. Renner kindly made available to us a map of the Catoctin Furnace area which he had put together as a result of years of research. The map is now in the archives of the Division of Archaeology, Maryland Geological Survey (Renner, 1975). This map shows an earlier iron forge, dating 1760, located about 3/4th mile south of the furnaces - presumably the earliest iron working site in the area. Shown also on the map are a panopoly of unexplored ruins including: the Mansion House, dwelling houses of the iron workers, 2 mill dams with separate raceways for waterwheels providing the power for the blast air bellows), a railroad, the large shop building, the stock house, 2 foundaries, an engine house, a saw mill, grist mill, slave cemetery, and other sites of historical importance. The iron-working area is recognized as probably representing the longest continuously operating iron manufacturing plant in the United States (Mentzer, 1974).

J. Frank Mentzer, a former superintendent of Catoctin Mountain Park (1968), became interested in historical research on the Catoctin Furnace ruins. Among his writings on the subject is a report submitted to the Division of Archaeology, Maryland Geological Survey, on the administrative history of the 1936 W.P.A. archaeological dig (Mentzer, c. 1972) - the only known written account concerning this excavation.

The 1936 Excavations at Catoctin Furnace: According to Mentzer in 1935 attention was called to the Catoctin Furnace ruins, then privately owned, by reports of potential recreational demonstration area teams of the National Park Service. Exploratory digs were carried out in the Stack 2 area by a non-archaeological team of W.P.A. laborers under Foreman W.G. Renner. The explorations were soon stopped because of the need for a professionally trained archaeologist to supervise. W.H. Enslow, a student archaeologist was hired to conduct a dig during August and September, 1936. Enslow's work concerned looking for the 1774 furnace, examining the retaining wall, and explorations around Stack 2. The weekly reports give the following brief

references:

On receiving funds August 8, 1936, four men, two of whom had worked at the furnace in its last year, began digging a trench next to Stack 2 furnace. The trench was "four feet wide, extending southwest parallel to the breast of the furnace and exactly 12 feet from the furnace at its eastern edge". The trench was continued to the wall of a structure which Enslow presumed had been the old molding house (casting shed). Before completing his final report on September 12, Enslow reported finding the four corners of the casting shed and "the brick hoist-platform" (Mentzer, c. 1972).

Mr. Renner indicated to us that much of the 1936 dig in the vicinity of the casting house was concerned with uncovering a stone foundation wall some 20 feet south of the southern wall of Stack 2. This is designated as a foundry on Renner's map. He also recalled digging within the casting house floor - in the eastern area, and finding there an iron "pig".

In the Maryland Room of the Pratt Library, Baltimore, two photographs taken of the Stack 2 and the casting shed floor area were studied. The first accompanied an American history class report submitted by Norman E. Waesche at Johns Hopkins University on 20 May 1936. It had apparently been taken in the spring of 1936 showing the recent (January-February, 1936) excavations of the W.P.A. non-archaeological crew. The area to the south of the casting shed floor had been extensively cleared off to a depth of about a foot below the level of the surface of the site. Part of the bit taken out of the eastern part of the floor area was also shown. In the same collection at the library is another photograph, taken apparently well before the 1936 dig judging by the costume of the man standing inside the Stack 2 east mouth (early 1900's). We noted that the man stood on the site surface at the same elevation (approximately) as today - as seen by marking the height of his head along the furnace stones.

In conclusion - the 1936 dig appeared to have spared at least part of the casting shed site, and its level is apparently the same as that when the floor was in operation or at least not appreciably lowered for the greater part of the site.

We noted also that the 1971 Contract Archaeology, Inc. excavations were conducted to the west of the retaining wall and did not

involve the furnace areas. The generally negative information about the archaeological background of the Catoctin Furnace area emphasizes the importance of our dig as the first scientifically recorded excavations. In order to do full justice to this responsibility it remains to inquire into the state of knowledge concerning charcoal blast furnaces so that we can interpret our findings to the fullest. We again rely on the excellent historical research of J. Frank Mentzer (Mentzer, 1974), whose observations form a basic part of the following analysis on pig iron production technology such as that undoubtedly applied at Stack 2.

Charcoal Blast Furnace Technology: Iron casting technology had been developed in Belgium and Rhenish Prussia nearly 300 years earlier than its first use at Catoctin Furnace. Before this, all iron was made by heating and hammering it in a forge. Stack 2, a charcoal blast furnace, is a truncated pyramid made of mortarless stone around an inner fire brick structure which is shaped like an egg with its widest diameter or bosh 9 feet in diameter. This chamber was always open at the top and had openings at the bottom or hearth that were usually kept plugged with clay. The stack was filled from the top from a ramp (called bridge) leading to a platform (called bridge house) built around the top. The extensive stone walls around the stack, called the furnace bank, here built to retain the hillside where the materials for the charge to load the furnace - charcoal, limestone and iron ore - - were located.

Iron workers, called fillers, would charge the stack by filling the hearth with a layer of cordwood to fire the charcoal. Then followed layers of charcoal, limestone and finally iron ore loaded to the top of the stack. Just above the bosh were located iron nozzles called tuyeres (usually two in number) through which passed currents of air required to raise the heat of the furnace to 2800 degrees F. needed to melt the iron. Charcoal with the oxygen provided by the air burns very much hotter than wood. The tuyeres were attached by an iron pipe to a large bellows operated by a large overshot waterwheel. At Stack 2 the air pipe, some 8 inches in diameter, is seen extending vertically into the furnace at its south mouth. Renner's map shows the Stack 2 bellows along with a waterwheel a few feet west of the furnace mouth on a

narrow raceway. The water was provided by a mill dam (labeled "1770's) located 1000 feet or so to the north which, after powering the waterwheel, proceeds in a southeasternly direction. These features are not in evidence on the surface today.

The amount of material placed in a charge was determined by a keeper. A ton of iron required about 1 3/4 tons of ore, 3/4 ton of charcoal, $\frac{1}{4}$ ton of limestone and 4 tons of air. In addition to providing the necessary heat, charcoal gave carbon monoxide (CO) which combined with the oxygen in iron oxide (FeO) to free the iron (Fe) which trickled down into the hearth. Many of the impurities in the iron which would not melt combined with limestone to form slag which conveniently floated to the top of the melted iron.

> "At regular intervals, the Founder would open a hole near the top of the hearth to permit the slag, floating on the molten iron to run off. This hole was known as the cinder notch. When the hearth was filled with molten iron, the Founder opened the iron notch, located near the bottom of the hearth almost on a level with the floor. White hot iron gushed out with a shower of sparks into trough or gutters made in the sand floor. Guttermen controlled the flow through the main trough called sow, into smaller troughs, called pigs, each weighing about a hundred pounds.
>
> "Sometimes the molten iron was caught in ladles and poured into molds to make hollow ware (pots and kettles), stoves, sash weights, firebacks and other necessary cast iron articles." (Mentzer, 1974, p.7).

When a furnace was fired the blast was kept going continuously for months - its duration depending on many factors. Mentzer tells us that at the Hopewell furnace in Pennsylvania, the average blast before 1840 was $11\frac{1}{2}$ months and after 1840 was $10\frac{1}{2}$ months with the largest blast extending for 15 months and one week (Mentzer, 1974, p.6).

Pictures of the interior of casting houses which accompanied Mentzer's original articles in the Frederick, Maryland News are helpful in visualizing the possible features to be encountered at the Stack 2 Casting Shed site. An illustration shows the interior of a casting house in 1763 wherein: (1) a pouring trough is being cut through the sand floor of the casting house with a

triangular-bladed hoe, (2) a hole placed high above the hearth below which a cinder pile extended parallel to the gutter (presumably the cinder notch), (3) men removing a large sow on rollers, and (4) bellows,and probably part of the waterwheel, seen through the opening in the front of the casting house. A second picture depicts objects being cast in small molds in the sand floor and boxes. The iron is shown as being ladled directly from the iron notch above the hearth. Beside it is a cinder ridge probably extending from the cinder notch. (Mentzer, 1972, P. B-1).

Two photographs of blast furnaces were kindly called to my attention by David L. Yaeger, one of our excavators who brought the books containing them to the dig: (1) a blast furnace with bellows attached as indicated above (Aitchison, 1960, Fig. 179) and (2) a casting house interior with a gutter shown extending from the hearth and flowing at right angles into two sow troughs from which pig troughs dangled,again at right angles. The gutter and trough branches occupy the right half of the casting house floor.

Mr. Renner describing the Stack 2 casting shed floor as he understood it from his observations, and from experience in other casting houses:

> "The molten iron ran down a wrought iron trough lined with fire clay out of the furnace mouth into runners cut in the sand floor. The main channel of the sand runner, called 'sow' ran into shorter 'pigs' 4 inches apart. 'Ruffles' or rises in the sand of the mold occured at intervals in the sow and at the entrance of the pig molds to facilitate breaking the pieces into sections after cooling"

Mr. Renner also described a picture taken of the interior of the casting shed by his father. This picture showed the casting shed gang sitting on a table-like bench at the north wall of the shed "waiting for the iron to run". (Renner interview August 26, 1975).

With the above understandings concerning charcoal furnace technology, chronological position of Stack 2, and previous investigations of the area in mind, we are now in a position to consider the archaeological evidence.

The Finds

Although only an estimated 15% of the site was excavated in our dig ($7\frac{1}{2}$ out of 50 five-foot squares) the following finds were made: 18 features, 28 major strata, and 70 bags of,(and individually tagged)artifacts,and cultural materials. These data and materials may best be discussed within the four areas in which they were found - the stack east mouth area, the casting shed floor, the footings, and the areas outside the casting shed.

The Stack East Mouth Area: The East Mouth area, including the furnace mouth opening and a ten foot zone in front of it, was explored by Test 1 and Trench 1 with its extension. Test 1 was excavated to the subsoil, then Trench 1 and its extension were excavated to the bottom of the trough features found in them, to preserve these forms for possible reconstruction. (Fig. 1).

Test 1. Feature 1 was a north-south oriented trench of unknown length, measuring $3\frac{1}{2}$-4' in width and 30 inches in depth with a rectangular cross-section. It had been cut into the site strata from top to subsoil at a later period. The bottom part of the trench was filled with fine black cinder ash and the top part with a brown soil fill containing bricks and nails as well as parts of machines. Feature 1 fits the description of the Enslow 1936 Dig trench in location and dimmensions (see above), and is typically "Archaeological" The black cinder strata found in Feature 1 continues as La. S, a "blanket" just under the humus and over the trough features of Trench 1 and its extension. (Fig. 1, 2; Pl. III-B).

Trench 1: The west wall of Feature 1 was uncovered in the beginning of Trench 1 showing the feature to be intrusive into a cinder-ashes trench with gradual sloping sides marked by silt lines. The contents of Feature 14, refuse trench included rock slag and light cinder ash which contrasted in color and texture with the black (coal) ash of Layer S. Under Feature 14 trench was a light-colored sand (Layer D) which rested on the yellow clay subsoil. The light sand

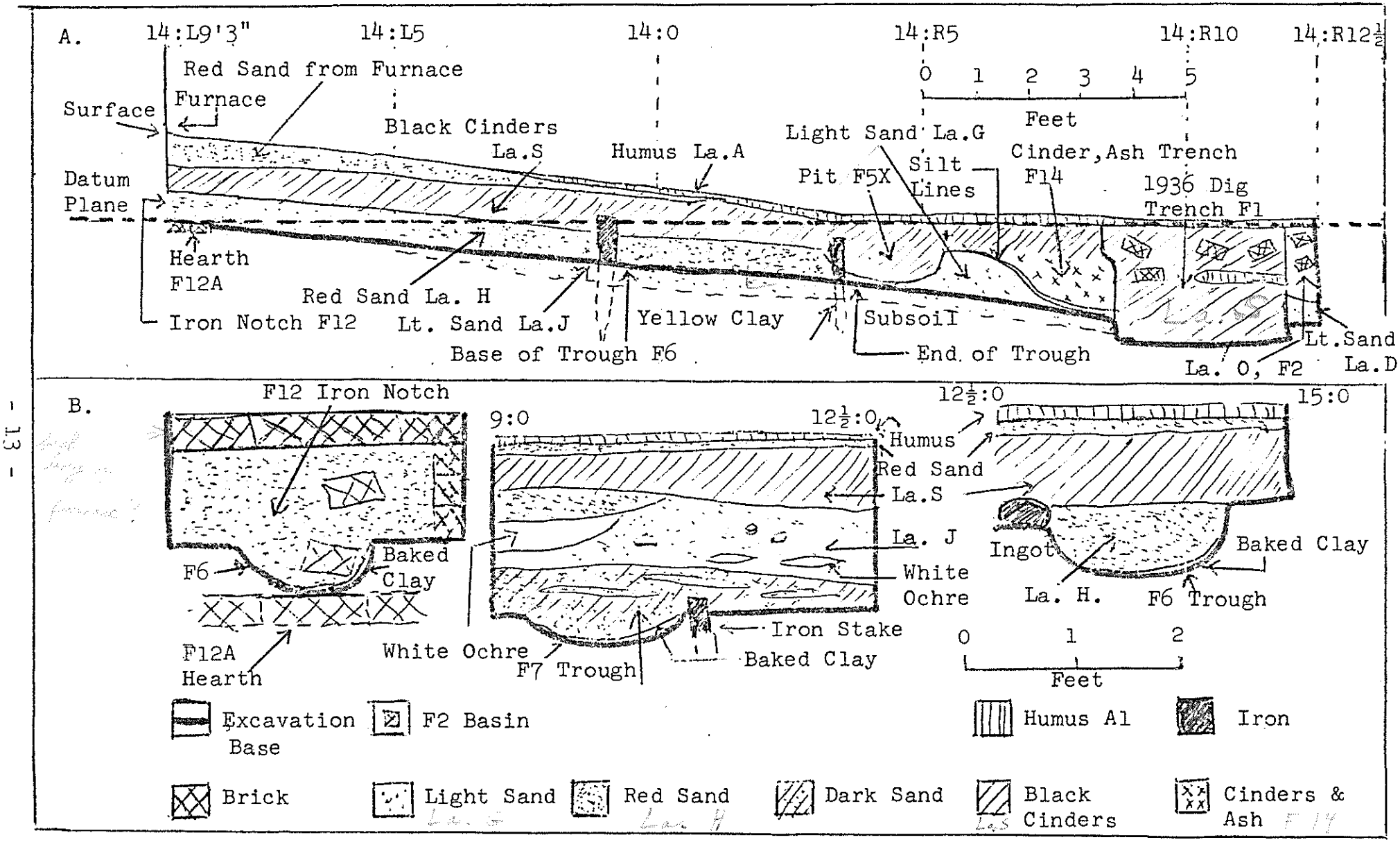

Fig. 2. Profiles of the East Mouth Area: A. East-West Profile on Row 14; B. North-South Profiles on Troughs F6 and F7.

is the basic strata of the East Mouth area until about 7 feet from the furnace where it runs out. (Fig. 2).

The light sand strata, about 10 inches in thickness at this point (beginning of Trench 1) is intruded into by a red (oxidized) sand stratum, Layer H, in an angular "h"-like form (box-like). As we proceed westward the unknown box-like form containing the red sand gives way to a readily identifiable trough some 1½ feet in width and 6-8 inches deep filled with red sand (Layer H). The trough is covered with black cinder stratum (Layer S). The trough which extends to the furnace opening is labeled Feature 6.

At the beginning of Feature 6 trough is a hemispherical pit (F.5X) some 3 by 2 feet filled with black cinder ash. The sides of the trough, Feature 6, are studded with large iron stakes driven deeply into the subsoil - 6 in all, these line the sides of the trough. several extend above the Grade 0'-0" level of the restored shed floor, and the restoration contractor supervisor was advised of this. The stakes were left in situ along with the trough for restoration purposes. Two of the stakes flanking the trough supported the sides of a pig iron ingot measuring 42" by 5 " with a semi-circular cross-section. This artifact was probably a "pig", weighing some 35-40 pounds and not a "sow" which was "much larger, weighing up to 150 pounds" according to Mr. Renner. The pig was labeled #61 in the artifact catalogue and removed.

A large iron slab 1" thick and rectangular in shape with sides measuring 1 and 1½' was found in F6 trough (Fig. 1). Under the slab was a fire brick, and nearby on the floor of the trough was a rectangular patch of red clay, about the same size and shape as the iron plate. The iron plate and brick, along with 3 fragments of iron were removed after being labeled Bag 62 in the artifact catelogue.

Trench 1 Extension: An irregular extension of Trench 1 measuring 4 by 3 feet (Fig. 1) was undertaken on the south side of the trough Feature 6 at the 0:0 line (PL. II-A). A short section of another trough, Feature 7, was found. The trough base, in the subsoil, also contained a baked clay veneer indicating high temperatures. The trough also contained red sand like Feature 6 trough. The sides of the trough were in light sand stratum (Layer D) and overlain by black cinder stratum. A lens of greasy white-yellow ochre was found in Layer D (Fig. 2). Similar ochre grease was found in the light sand west of Feature 14 (meaning?). Four deeply imbedded stakes were found in the trough. Both troughs were covered by a thick stratum of red brick dust and brick fragments from holes in the furnace above the mouth.

The Furnace Openings: Feature 6 trough extended to a rectangular opening in the furnace, filled with brick dust and brick fragments. It was not excavated. The trough at this point rested on a 3 coursed fire brick floor. The opening was designated Feature 12, and the brick floor Feature 12A. (Fig. 2)

An opening centered in a niche in the furnace wall, and clearly visible, though at "ground level" at the beginning of the excavation, appeared 3 feet to the south and 3 feet higher than the opening Feature 12. (Fig. 1, Pl. IA,B)

Slope of the Furnace Mouth Area: The slope of the subsoil underlying the furnace mouth area from the furnace wall at 15L9'3" to 15R8 (where it levels off) is approximately 12 inches in 17'3". The slope of the base of the trough (including sand stratum, Layer D, from about 15L6 to 15 R8) is approximately 8" in 17'3".

Interpretations: Following is a tabulation of a functional interpretation of the finds in the East Mouth Area suggested by historic data.

Table 1. Functional Interpretation of Features, Strata, and Artifacts from Stack 2 East Mouth Area

Item	Historical Feature	Notes
Feature 12	Iron notch.	Opening, originally plugged.
Feature 12A	Fire brick hearth.	3-coursed edge found.
Feature 6	Molten iron gutter or trough.	Baked clay lining and red (oxidized) sand fill.
Iron slab #62	Side of trough.	Held up by iron stakes
Red clay slab	Lining of iron side of trough.	Adjacent to Artifact #62. F.11
Iron stakes (10)	Hold iron sides of trough upright.	Set in c. 2" from trough earthen side.
Layer H	Sand oxidized by molten iron in trough & molds	Red sand stratum.
Layer H "h"-form	Section sow & pig mold?	See below.
Feature 5X	Cinder basin.	To catch slag.
Feature 14	Cinder wharf	Temporary storage for slag.
Feature 1	WPA 1936 Dig	Enslow's trench.
Furnace opening	Cinder notch.	For run off of slag.
Feature 7	Cinder trough or gutter.	Cinder notch connected?
Ingot #61	A pig used on trough.	To strengthen trough? (F10)

The Casting Shed Floor: A T-shaped cross-section of the site was gained by Test 1, and Trenches 2,3, and 4 which revealed the basic stratigraphy (Fig. 3). The strata and features may be discussed in three categories: (1) the Central Basin Feature 2, (2) the casting floor strata, and (3) pre-site strata.

Central Basin Feature 2: All excavations of the floor area show sections of a shallow basin occupying the central area of the shed. The measurements of 15' north-south by 12' plus east-west, and a depth of 2', are indicated by the stratigraphy (Fig. 3). The feature was open at the collapse of the shed and was filled with Layer 0 brown soil and debris including: bricks, square and round section nails, modern type brown, white and green glass, machine parts, iron artifacts including spikes, hooks, straps, etc. recovered by sifting and catalogued in Bags 2,3,4,5,19,31,35,36,59, 59, and others.

Central Basin Feature 2 cuts through all strata with the exception of a thin humus zone, much of which was removed prior to excavation by planing operations of the restoration crew. The feature is lined with a 4-6" black soil stratum on which are artifacts and split rocks in what appears to be a paving layer in some areas, and debris piles in others. The black soil layer, called Layer B1a,is seen extending over the "rim" of the basin to the south (see 10R15 to 5R15, Fig.3), under a foot or so of light-colored sand and humus. At the top of the dark stratum B1a in trench area 15R12½,a 5" long iron object,consisting of an extension (for a wooden tongue?) and a trapeze-like rig with 2 thin plates attached, was found (Pl. V-A).

It is believed that Feature 2 central basin was part of the original shed floor and not a late excavation - such as the 1936 WPA excavation. This interpetation is substantiated not only by the above discussion of the feature's lining Layer B1a but also by the photograph taken of the site "before 20 May 1936". This photograph taken by Norman E. Waesche, Johns Hopkins history student, shows excavations of the WPA diggers from January and February 1936. The basin area is not shown to be disturbed. The August 1936 excavation under the direction of Enslow utilized regulation archaeological trench form with rectangular sides, not seen in the Central Basin Feature 2. Also possibly earlier basins are seen underlying Feature 2 (Fig. 3).

The Casting Floor Strata: We note that the subsoil for the entire site is a natural yellow clay. The subsoil is 12" to 15" deeper inside the shed than outside. This sunken floor made in

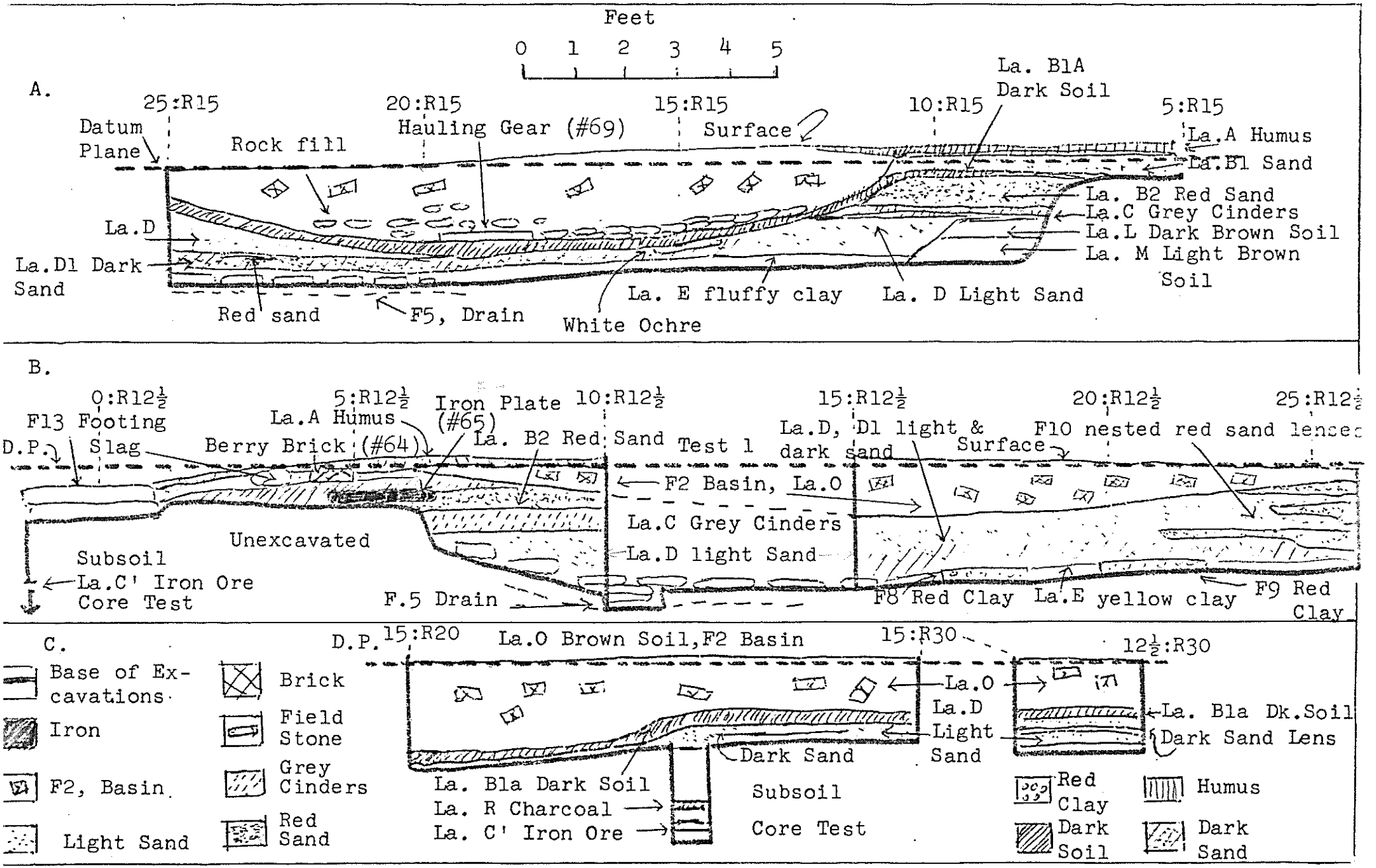

Fig. 3. Profiles of Casting Floor Area: A. North-south Alley R15 Profile (Trench 2,3); B. North-south Alley R12½ profile (Trench 2,3); C. North and East Profile Trench 4.

the original construction, sloped toward the iron notch opening of the Furnace as described above. A drain (Feature 5) was also dug into the subsoil across the width of the shed floor in a north-south direction. The drain, measuring 9" by 9" was formed with sides consisting of two flat field stones, and was capped by 1 - 1½' irregular field stone slabs, some 23 of which were uncovered. The last 2 slabs uncovered at the south end rise in elevation - like steps. The drain was about half full of light-colored sand. A stratum of broken-up ("fluffy" and porous) yellow clay covered the drain field stones from 2 to 4" in depth (Layer E). The feature was uncovered, photographed, sketched, and measured, and left in situ for possible future restoration (Fig. 1, Pls.II-B, IV-A,B).

Two square plugs of red clay about 2' on a side and 4½" thick rested in the top of the yellow clay in Trench 3 (Fig. 1,3, Pls. IV-A,B). These features (8,9) were left in situ.

Superimposed on the features described above and on the subsoil in all excavations was a light-colored sand stratum (Layer D), from a few inches to 9 inches in thickness (Fig. 3). Layer D is found also under the Central Basin Feature 2 in all trenches and tests. Screened sand samples of Layer D yielded quantities of charcoal fragments, a square cross-section spike of iron, iron fragments, slag, coke (few pieces), iron ore, and one sherd of white ironware pottery (Bags 15, 38). This layer is one of several which were added one on top of the other as the need for fresh sand occurred. Interspersed with the sand are lenses of red oxidized sand, such as Layer B1 in Trench 2. Three superimposed red sand "frying pan" shapes occur at the north end of Trench 3 in the west profile (Fig.3, Feature 10). There are also lenses of white greasy ochre often with red clay underneath.

The stratigraphy in Trench 2 at the south of the north-south profile is most definite. Here the strata above Layer D included a zone of compacted grey ash (Layer C) which filled an arc cut into the sand layer (Feature 3). Above this was a red sand layer B2, then B1a, the dark lining of the central basin Feature 2, another light sand layer B1, and the humus layer A. Other layers, K. L, M, appear to be various admixtures in sand layers. The top layer of Trench 2, under the humus, contained 3 slabs of iron (Feature 4) similar in kind to the slab found in the Feature 6 trough. Found here, and elsewhere in the top strata was a hard yellow-brown brick with the cut in inscription "Berry's Premium Fire Proof". The iron slab of F4 under 5R12½ stake in B1 layer was removed (Artifact 65 , but the remainder of the iron was left in situ. Further Excavation is required. Feature 3 Arc may be the south end of a trench to install F5 Drain cutting through what may be early floors (La. L,M).

Interpretation: Following is a tabulation of functional interpretations suggested by historical data.

Table 2. Functional Interpretation of Features, Strata, and Artifacts from Stack 2 Casting Shed Floor Area

Item	Historical Feature	Notes
Sand Floors Layer D, B1 etc.).	Floors for setting molds, runners, gutters, troughs.	Continually being remade for molten iron.
Red Sand Lenses (F.10 "frying pans" La. B2, etc.)	Molds for Sow and Pig runners.	Most are disturbed parts of molds; molten iron oxidizes sand.
F3, Arc Trench	Unknown.	Need more excavation.
F5, Stone Drain	Carries away cooling water	Water for cast ingots.
Red Clay Slabs F8,9	Clay lining for gutters	Why here? Storage. prior to use.
Central Basin F2	Hauling area.	Mules remove ingots.
"Tongue and Trapeze" Artifact 69	Ingot hauling gear	Wooden tongue hitched to mules; 2 plates on "trapeze" to ingots.
Iron Plate, Artifact 63.	Dismantled gutter side slab.	Debris following dismantling of shed.
La. B1A	Ingot hauling floor	Stone paved in part.

Areas outside the Casting Shed, Footing, and Pre-Site Strata: These subjects come into focus in Test 2, whose stratigraphy now claims our attention. Test 2 was placed in the first doorway along the east wall which was erected by the restoration crew just before the beginning of our dig. The T-shaped test, 4' by 4' by 2'3" wide, was excavated to subsoil and below, revealing wall footing and a cross-section of the low ridge flanking the east wall (Fig.4).

Pre-site Strata: Test 2 west profile showed a 9" dark stratum, Layer A' which was undoubtedly excavated by the WPA January-

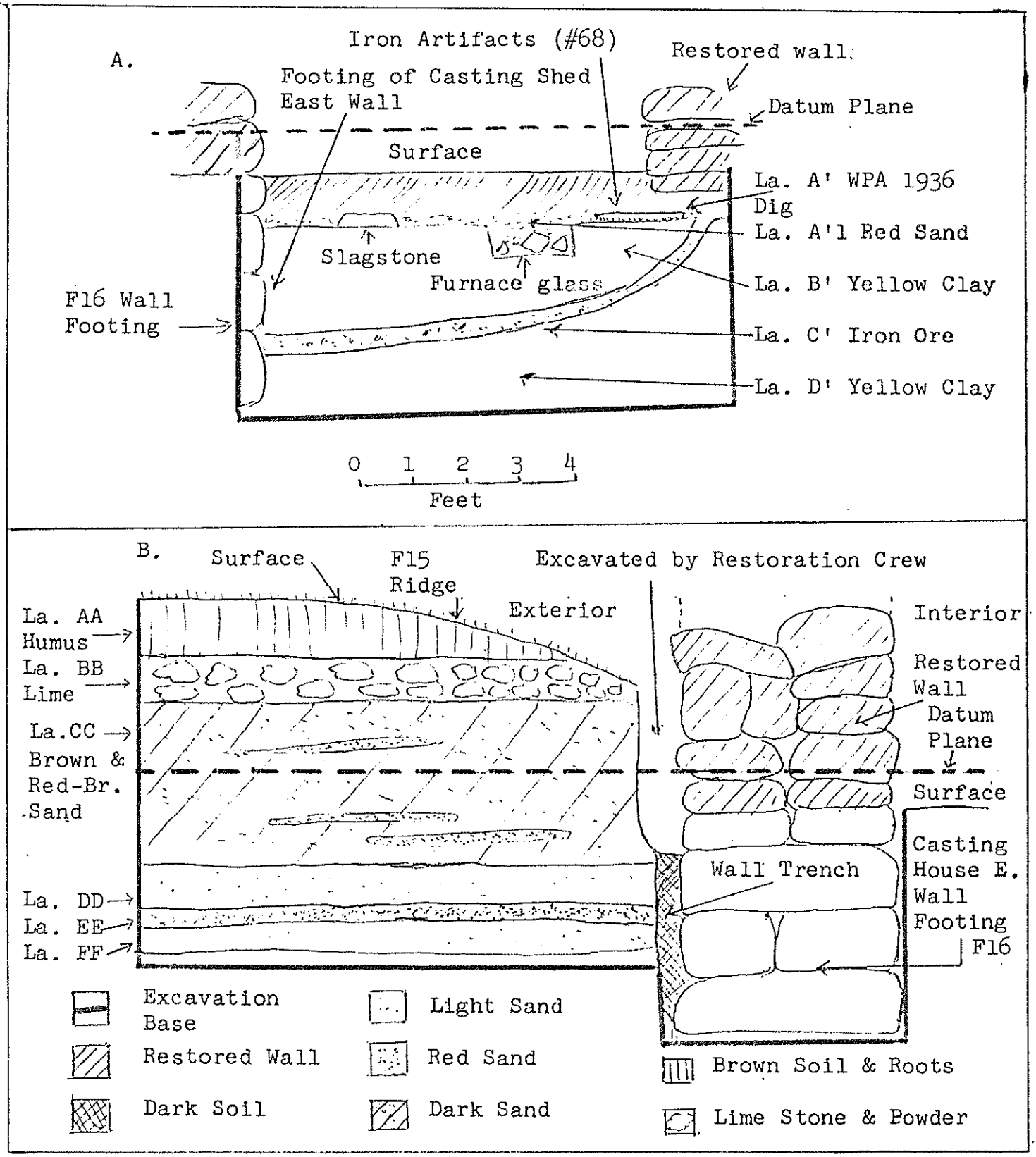

Fig. 4. Test 2 Profiles: A. West Profile: B. South Profile.

February 1936 dig. At the base of the strata were iron artifacts, dark furnace glass and slagstone and a box-shaped depression which could have been a feature such as a drain (Fig. 4-A). A foot and 3 inches below the top of the subsoil, and slanting upward from the south end of the profile to the top of the subsoil, we found La. C', a 2 inch thick stratum of red iron oxide. Similar strata were found below the roof pole footing at -5R10, and Trench 4 - both better than a foot below the top of the subsoil. In Trench 4 a charcoal stratum, La. R, 2 inches thick was found 3" above the iron oxide strata. Each stratum is probably natural but should be checked in future excavations. The fact that the subsoil in the shed is 1'3" above the same level outside the east wall of the shed (Fig. 4 -B) suggests that the floor level inside the shed had been built up by subsoil. On the other hand the subsoil outside the shed might have been cut down to the present level.

Footings: The first section of the restored east wall had a wall trench or footing of roughly squared stones fitted without mortar into each other. This extended 1½ feet into the subsoil from the top of the subsoil within the building. The second wall (restored) section lacked any apparent footing (Fig. 4-A). The restoration crew had, before the archaeological excavation, cut a 6" wide, 9" deep trench along the east side of the wall (Fig. 4-B). In this process 21 iron artifacts were found, which were added to the artifact collection (Bag #6).

The roof rafter upright pole footing at the south end of Trench 2 was excavated in situ, revealing a two course patchwork of field stones roughly 1½' square and 6-8" deep. It was surrounded on the side and inside area by Layer B1, a light sand strata and capped by a thin humus layer. The area in front of the shed (south side) had been cleared off by the WPA digs down to a thin (1 inch) layer of red slag which covered the subsoil (Fig. 6). Two other pole pedestals were located at the southeast corner of the stack and midway from Feature 13 pedestal to the east stone wall of the shed. These were not excavated. (Pl. III-B).

Test 2, Outside Midden: A low ridge, 10-12 feet wide and 3½' above the subsoil was tested by the shank of the "T" of Test 2 (Fig. 7-B). The cut revealed 6 strata. Layer AA consisted of brown soil and humus 7" thick; Layer BB was a white lime layer, 6" thick; Layer CC consisted of lenses of brown and red brown sand 1½' thick; Layer DD was a 4" thick layer of light-colored sand; Layer EE consisted of red sand 2" thick; and Layer FF was another layer of light sand 3" thick resting on the subsoil (Fig. 4-B).

Plate V-B shows Test 2 with three 3-4' long iron rod artifacts of unknown use, one still in situ in Layer BB where they were found. Two of the iron shafts which would be readily unearthed were removed (Artifact No. 63). The other strata were devoid of artifacts.

Interpretation: We recognize the layers of the Test 2 outside midden as similar to those found inside the shed. Layers DD and FF were similar to Layers D, B1, etc., the light-colored sand (floors); Layer EE was red sand similar to that found in lenses which represented gutters and molds in the shed floor; Layer BB was a limestone layer such as was used to cleanse the molten iron in the furnace by uniting with impurities to form slag - pieces of limestone were found in the shed strata; Layer CC contained lenses of "dirty" floor such as found in Trench 2 and elsewhere. The ridge feature (F15) is therefore recognized as a midden composed of material either left over from the shed floors in their building (the clean light-colored sand), or debris thrown out from the shed floor. The limestone layer (BB) was probably a supply for the furnace which wasn't used at the period of dismantling - with which the artifacts (#63) were probably associated. Layer AA accumulated after the stack fell into disuse.

An interesting question: why was the midden ridge built up in front of the two east doors since this would seem to block their use? An alternative interpretation - that the ridge F15 was thrown up by the WPA excavators in the January-February 1936 dig - is difficult to substantiate. For one thing, the layers are too homogeneous and regular, unlike the potpourrir which usually fills the archaeological trench or debris pile. Also it is doubtful if an archaeological debris pile would have artifacts in it as did Feature 15 ridge.

Summary and Conclusions

The August 1975 dig at the Catoctin Furnace Stack #2 casting shed floor was carried out for the Maryland Department of General Services and the Geological Survey. Three excavators under the direction of two archaeologists excavated approximately 375 square feet of a site estimated to contain 2500 square feet of cultural strata. The results revealed major factors in the archaeological situation of the site as seen in the finds consisting of 18 features, 28 strata, and 71 listed artifact bags and individual pieces. The artifacts and cultural material are temporarily stored in the Cunningham Falls State Park Superintendent's garage pending permanent storage by the Maryland State Archaeologist.

The finds were recognized as associated with iron manufacturing processes of the 19th century. These included: the furnace hearth; the cinder notch (opening for slag); the iron notch for releasing the molten metal; two parallel troughs or gutters running down a slope in the mouth of the furnace to the casting floor; upright stakes and gutter plates and clay lining; and a pig iron ingot. At the turning point of the iron notch trough a cinder basin and wharf were found for storing slag. This area was trenched by Enslow in 1936. The troughs were filled with red sand, oxidized by the hot iron, and covered by a layer of black (coal) cinders. The

latter indicates a change in function from pig iron manufacturing in the late period - perhaps to foundry work in which the molten iron would be ladled from the cinder notch rather than run through the troughs.

The casting house floor revealed a number of sand floors superimposed one on the other and interlarded with red sand lenses, dark sand, and cinders. These were interpreted as the casting floor with the pig iron molds and runners seen in the red and darker colored sand. While charcoal fragments were plentiful in the lower floors, coke and coal cinders came from later levels - suggesting a change in fuel for greater efficiency.

The center of the casting house floor was occupied by a large basin which was interpreted as a hauling area for the removal of the pig iron ingots. A "trapeze and tongue" iron artifact was conveniently found on the basin floor and interpreted as "hauling gear". Under the basin, and the sand floors was a fieldstone covered drain, believed to be for draining off the water used to cool the newly molded pig iron ingots prior to removal. Evidence of a curved trench cutting through two sandy soil strata at the base of the excavation might have been made to install or repair the drain. In this case further excavation may reveal earlier strata under the south end of the casting floor.

The Central Basin was open at the dismantling of the shed and

contains bricks, glass, machine parts, and iron artifacts used as fill in leveling the site in the early 20th century.

One of the three rafter pole footings at the south side of the shed was excavated, revealing a square patch-work pedestal of field stones. The footing of the first east wall section was also excavated. The south end of the second east wall section (restored) was lacking footing. Since the restoration of this second section of the east wall seems to agree with a late photograph of the shed, the east wall may have had several phases in its construction - or a footing was considered unnecessary. Evidence of a WPA dig in 1936 is seen in the east section of the site interior with the southeast corner of the shed possibly excavated. This is probably part of the January-February 1936 dig.

A low ridge at the outside of the east wall was sectioned to show six superimposed strata of sand, red and brown sand, lime, and humus. This was interpreted as a midden for refuse from the shed floor, or supplies (white sand) probably used in the latter part of the site's history when the east door (blocked by this debris) were not in use.

Time allowed only the briefest evaluation of the artifacts and other cultural material (cinders, etc.). Many were recognized as associated with the iron manufacturing technology - such as gutter plates and clay, ingot, slag, red sand filled pig iron molds,

furnace slag, hauling gear and the like. A few pieces of pottery including red ware with brown glass, and white ironware suggested a general 19th century chronological position. Square nails intermixed with drawn and cut nails further supported this alignment which is generally held for Stack #2 (1858-1903). However, further comparative analysis of the finds will refine this general picture, and the earlier strata (La. L.M.) not excavated at the south end of the site may hold additional information.

In conclusion:

1. The planned restoration floor to be installed at at Grade 0'-0", 14' below the notch in the southeast corner of Stack #2 was seen to be either above the cultural material of the site or barely in the humus or late fill layers. However, the area at the east mouth of the furnace slopes upward and the iron stakes and features there above Grade 0'-0". The Restoration Crew was so advised.

2. Additional excavation should take place in the future to further explore the site and to allow restoration of features for the edification of the public. The possibility of dramatic presentation of the interior of a 19th century casting shed are exciting indeed.

3. Similar excavations in the casting shed floor undoubtedly associated with the other Catoctin Furnace sites should be undertaken for comparative purposes. The possibilities of gaining thereby an archaeological record of American iron-making technology as well as other socio-cultural interpretations of this important institution presents a distinct opportunity for industrial archaeology.

To sum up: The dramatic impact of site was conveyed to us by William G. Renner, 79 year old, former iron worker, who visited this furnace as a very small child:

"When they lined the troughs (with fire clay) and got it all set, they'd knock that pin out - pish! - out she'd come - pish!" he exclaimed, making the sound of the hissing, rushing molten iron. "When she hit here (a number of feet from the furnace mouth), she was level, perfectly level. As it would run down, it would keep a goin' out and out and out, 'til it would run full (all the runners - sows and pigs) ..... Good Lord! there was fire flyin' everywhere, I just thought we was goin' to be burned up." (Orr, 1975).

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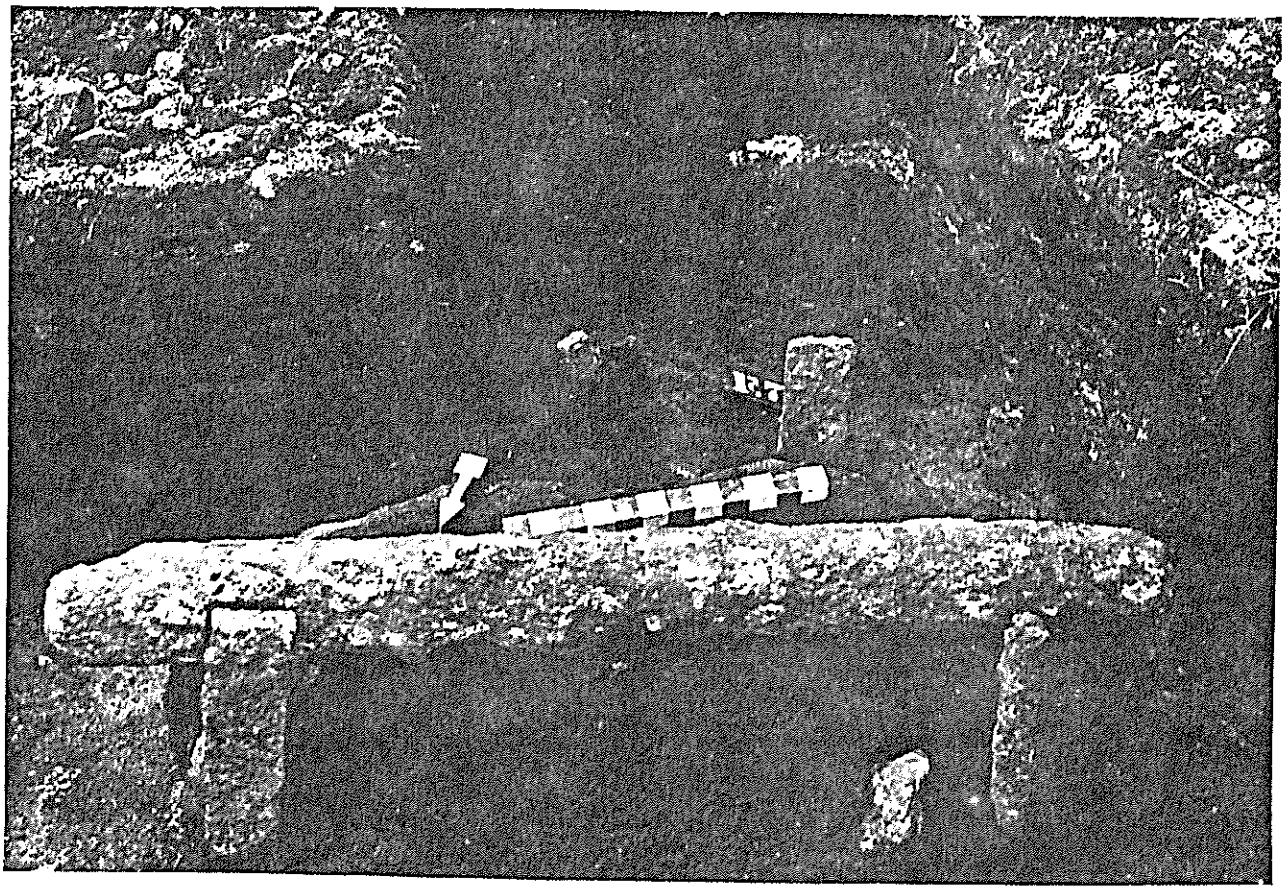
PLATE I

A. East Mouth, Stack 2, Trenches 1,2,3.

B. Trench 1 and Extension, East Mouth.

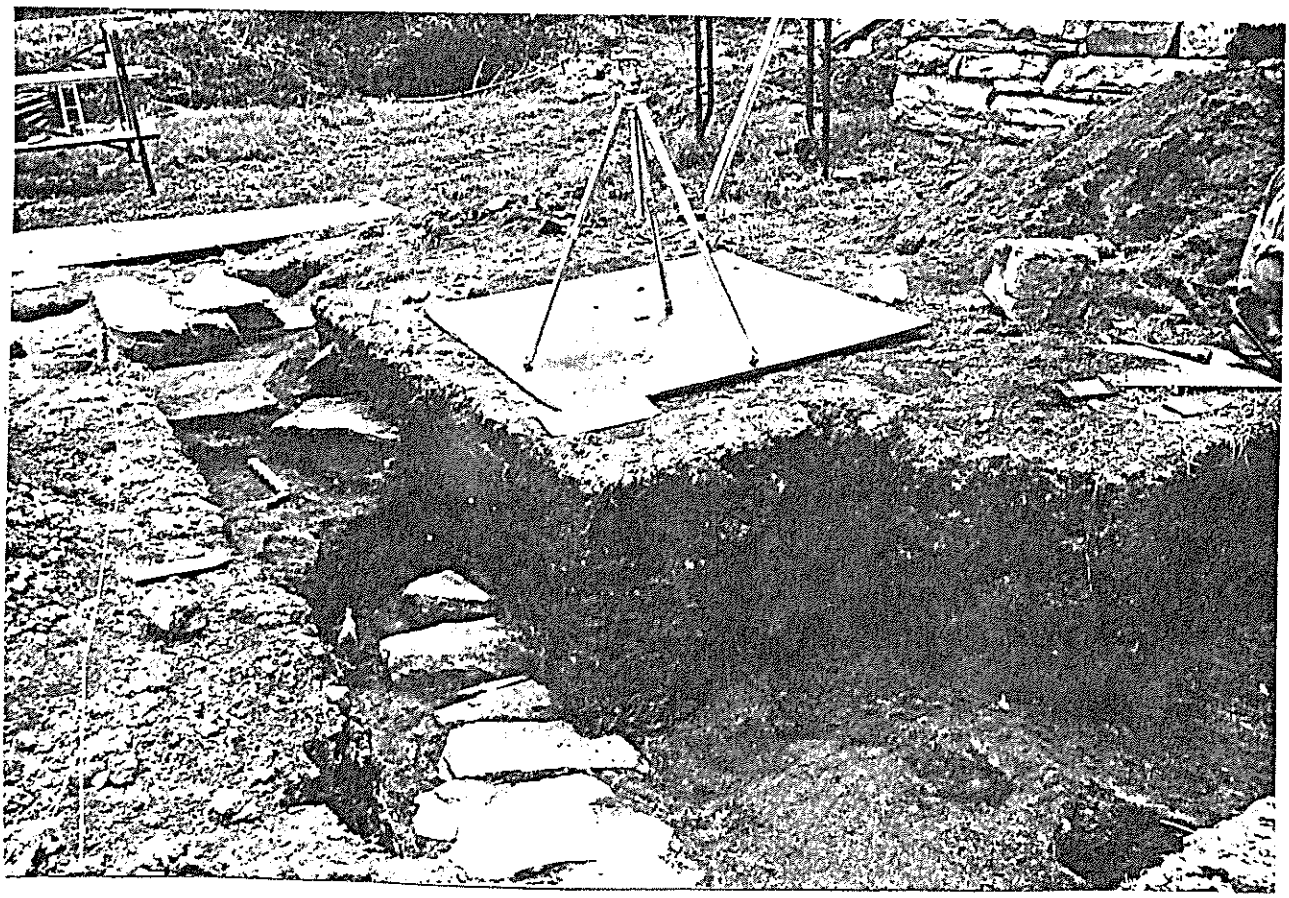
A. Tom Lear excavating Trench 1 Extension.



B. Pig Iron Ingot (#61), Trench 1; Feature 6 Trough.

PLATE II

A. Stack 2, Trench 2,3,4; Dr. Orr in Trench 1



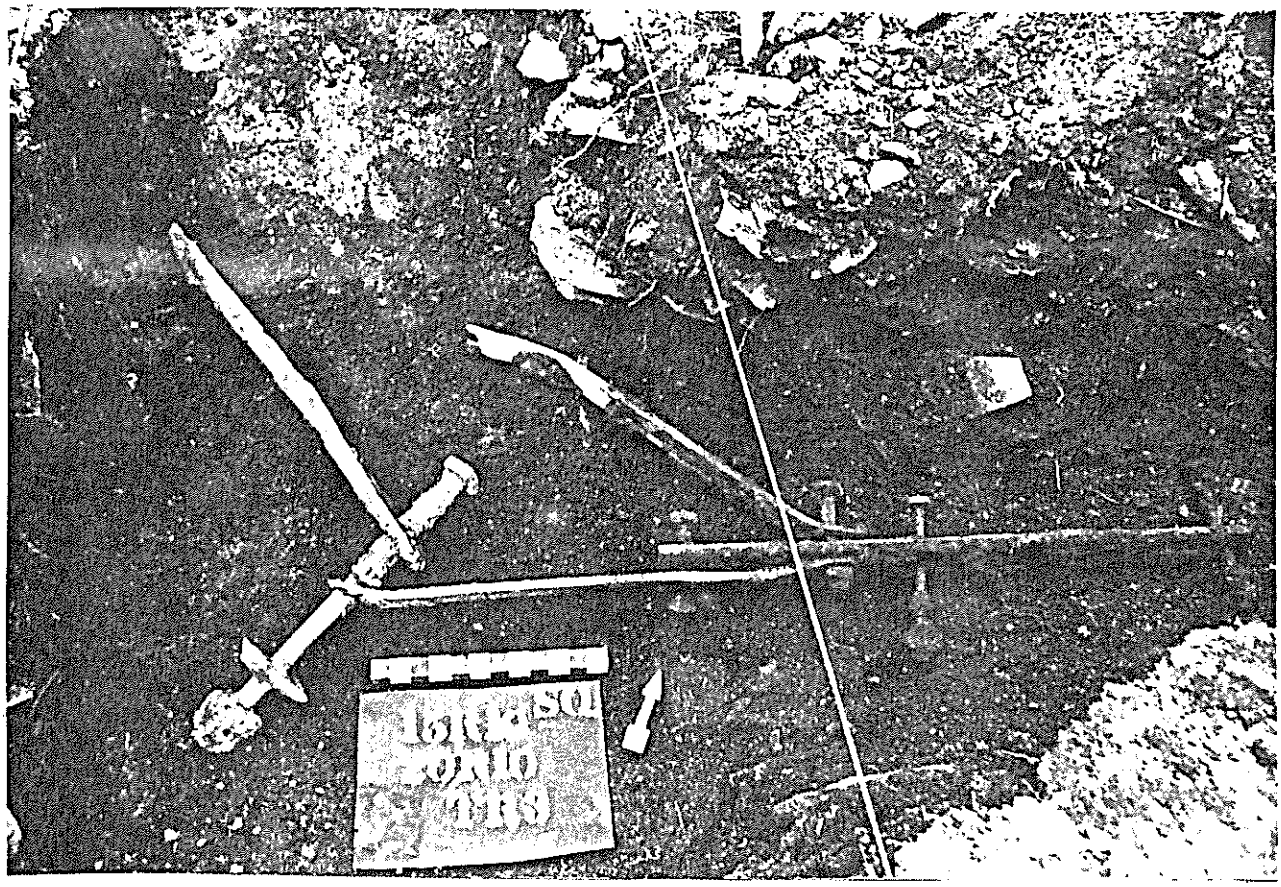
B. Test 1, Trench 2: F5 Drain; F13 Stone, F4 Iron, F3 Arc.

PLATE III

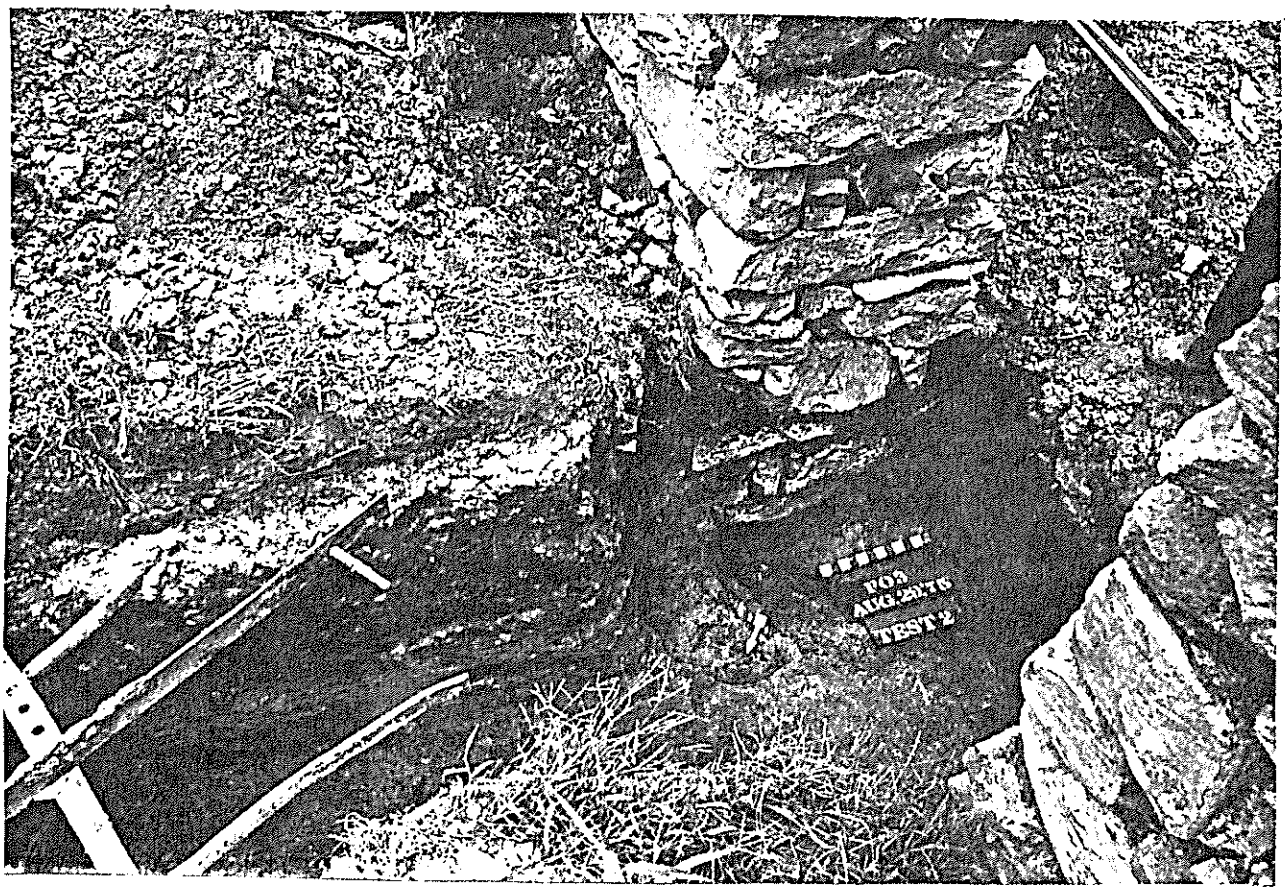
PLATE IV.

A. Trench 2,3, Test 1: F5 Drain; F8,9, Clay

B. Trench 3,2: F5 Drain; F8,9, Clay



A. Trench 2, Possible Ingot Hauling Gear (#69)



B. Test 2: F15 Ridge, Artifacts #63, Restored Wall, Footing.

PLATE V.