

Furnaces and Mines of York County, Pennsylvania

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9:00 am	Depart from Penn State – York
9:20 am	STOP 1. Rudy Ore Bank – Accomac Road
9:40 am	Depart
9:55 am	STOP 2. Codorus Furnace – Codorus Furnace Road
10:20 am	Depart
11:00 am	STOP 3. Boyer Bank – Iron Ridge Road
11:20 am	Depart
11:30 am	STOP 4 – Glatco Lake – Haldeman Bank - Glatco Lake Road
11:50 am	Depart
12:00 pm	Lunch Stop at Bethel UCC – Smith Station
12:45 pm	Depart
1:00 pm	STOP 5. Mary Ann Furnace – Codorus State Park
1:30 pm	Depart
2:00 pm	STOP 6. York Iron Company Mine – P. Joseph Raab County Park
3:10 pm	Depart
3:20 pm	STOP 7. Mt. Prospect Cemetery, Seven Valleys

Jeri Jones, a native of York attended Catawba College in North Carolina and earned his degree in Geoarchaeology. He returned back to York and became employed with York County Parks, now serving as the Program Coordinator. Jeri also owns Jones Geological Services where he studies the geology of southeastern Pennsylvania. In his 30 years of research Jeri leads groups on field trips and acts as a consultant to several area quarries. He conducts classes on a regular basis for Harrisburg Area Community College and OLLI program at Penn State-York. His interests include the mining history, geologic history, groundwater resources and southeastern Pennsylvania earthquakes. He also authored four books, narrated a geologic education video series and written numerous articles. Jeri writes a blog for the York Dispatch titled "Rocks Under Your Feet." He is married to Lou Ann, a United Church of Christ minister and resides in the Spring Grove, PA area.

HISTORY OF IRON MINING IN YORK COUNTY

There is no evidence that the Indians utilized the iron ore that is found in the bedrock of York County. According to historic records, the earliest mines operated in the 1770's. These mines were located in the Hanover area and in Dunkard Valley, west of Dallastown. Through 1900, some 154 mines operated in York County. One note realized during the research conducted by the writer in the 1980's involves the correlation between the furnaces and mines. The furnaces reached their peak around 1845 while the mines reached their peak around 1870. A conclusion can then be reached that the ore being used in the furnaces, for the most part, was not coming from York County mines, but being imported from surrounding counties. With the discovery of the richer ore deposits in the mid-west around 1890, the workers moved west to take advantage of the higher wages.

The location of these mines can be grouped into six different districts based on their location and geology (Fig. 3). They are: 1) South Mountain; 2) Dillsburg-Wellsville-Grantham; 3) Pigeon Hills; 4) Hellam Hills; 5) Margaretta Furnace-East Prospect; and 6) Seven Valleys-Jefferson. Because this guide is examining the history, only a brief discussion of the geology will be discussed here.

DISTRICT	ORE TYPE	NOTES ON GEOLOGY
South Mountain	Limonite	The ore is found along the geologic contact between the Tomstown Dolomite and Antietam Formation. Faulting is involved in the origin of the deposits. Some of the mines were later used for mining the white clay. Weathering has played a major role in the development of the ore, found in the overlying soil.
Dillsburg-Wellsville-Rossville	Magnetite	The deposits formed as a result of magma (rock now known as diabase) intruding into older sedimentary rocks of the Gettysburg Formation. These deposits are similar as those at Cornwall, Lebanon County, Pennsylvania.

Pigeon Hills

Limonite

Most of the mines are found along the boundary between the Antietam Formation and the Vintage Formation. Some faulting is involved in some of the mines. Weathering has played a major role in the development of the ore, found in the overlying soil.

Hellam Hills

SEE PIGEON HILLS ABOVE

Margaretta Furnace-

Limonite

Very similar to the Pigeon Hills and Hellam Hills above but the rock types involved here are the Antietam Formation and the Conestoga Limestone. Weathering has formed the ore in the overlying soil.

Seven Valleys - Jefferson

Limonite

Formed along the boundary between the Conestoga Limestone and Antietam Formation. No faulting appears to be associated with these mines. Weathering has formed the ore in the overlying soil.

Magnetite

Occurs within the Harpers Formation associated with quartz veins. The deposit appears to be controlled by faulting.

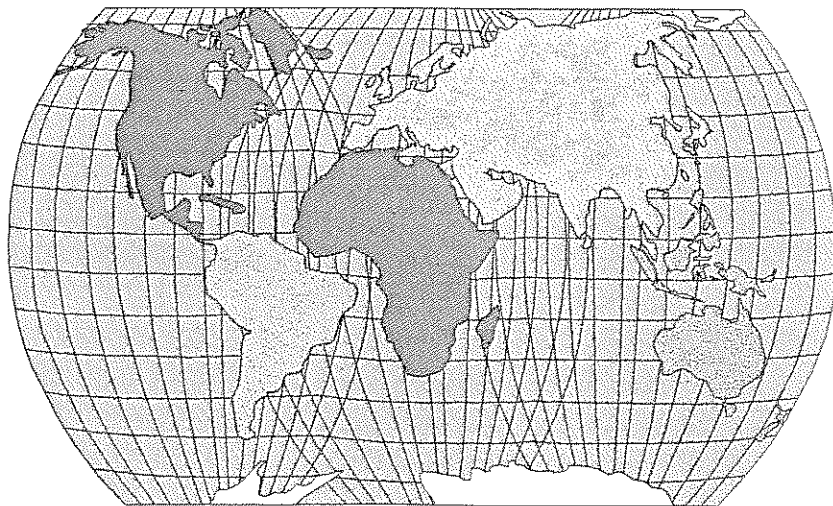
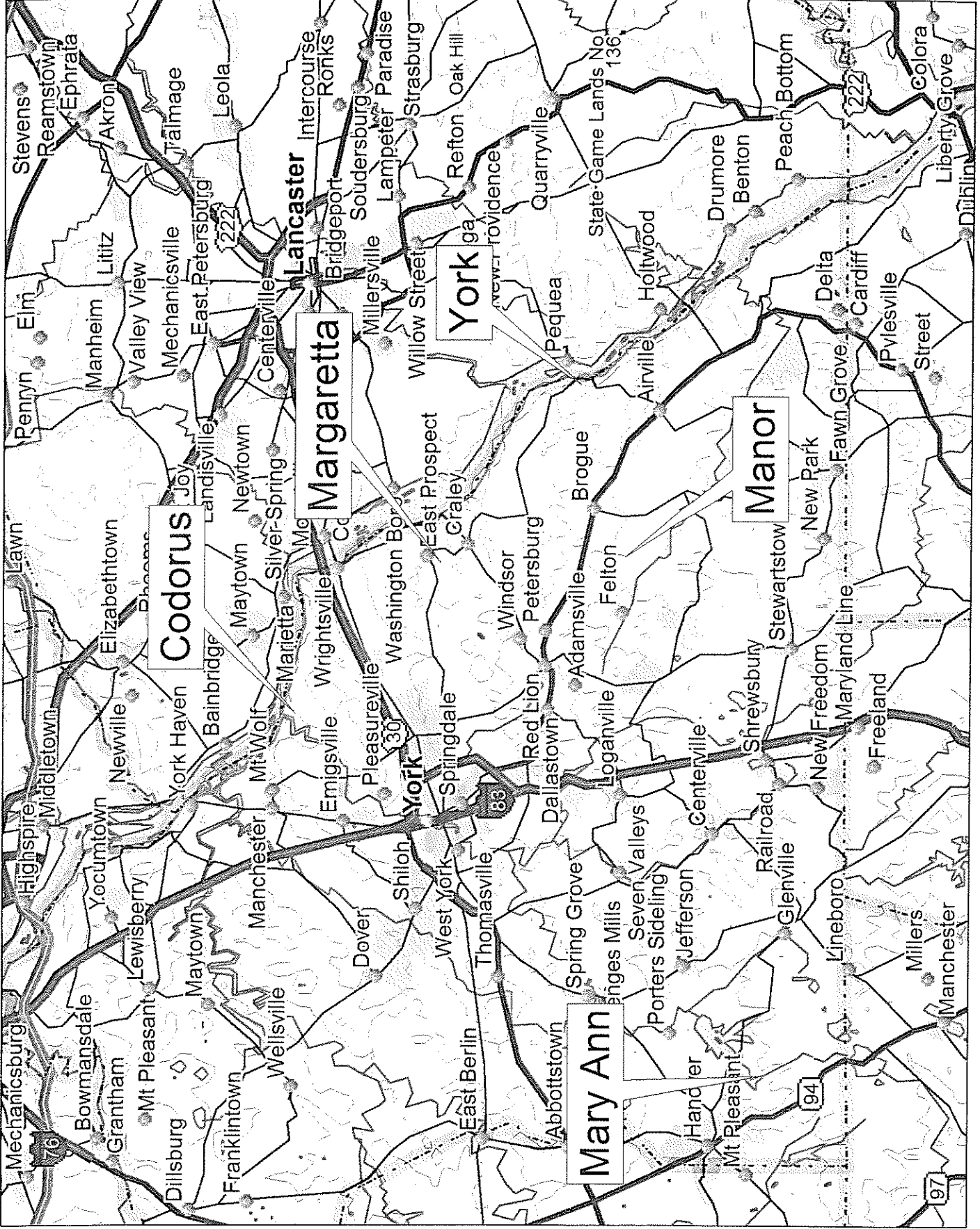


Fig. 4. Furnaces and Foundries of York County





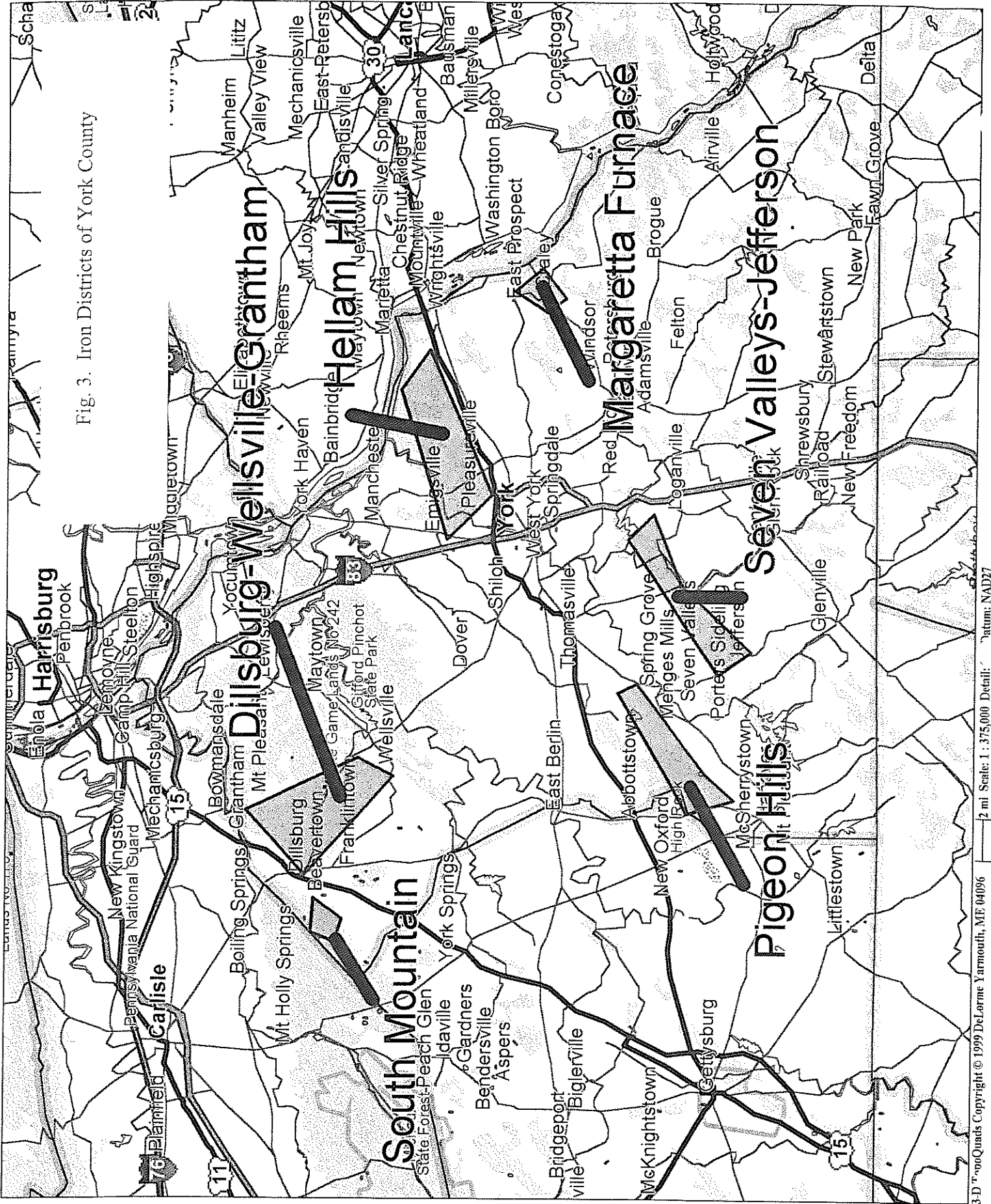


Fig. 3. Iron Districts of York County

OUTLINE OF IRON FURNACES AND FORGES IN YORK COUNTY (see Fig. 4)

Spring Forge Bloomery (Dick's Bloomery): Located on the site of the P.H. Glatfelter Paper Company in Spring Grove. Originally built by Peter Dicks, who has been credited for discovering the iron ore in the Pigeon Hills (Gibson, 1886).

1756-1770	Bloomery operated
1770	Forge erected
1775	Purchased by Daniel Shireman
1800	Purchased by John Brien, Esq. of Philadelphia
1807	Hon. David Eaton of Philadelphia purchased property
1815	Purchased by Robert Coleman
1817-1850	Forge operated by Thomas Burd Coleman
1851	Forge closed and paper mill started

Uses: Blacksmiths and other machines

Notes: Peter Dick was one of the original iron investors in the state. Peter started working as a clerk at Crum Creek Furnace in Delaware County. He eventually saved enough money to purchase the furnace in 1740 and then moved his interests to the west into York County. Ranked as the 51st ironwork in Pennsylvania (Bining, 1979).

Mary Ann Furnace: Located near Black Rock Road, now under Lake Marburg at Codorus State Park in West Manheim Township.

1762	George Ross, Esq. of Lancaster and Mark Bird of Philadelphia start construction
1790	Purchased by John Steinmetz and John Brinton, Esq., both of Philadelphia
1804	Last year of operation

Notes: This furnace is recognized as the first furnace erected in Pennsylvania west of the Susquehanna River (Gibson, 1886), but Eggert mentions the first furnace in operation west of the Susquehanna River was at Boiling Springs, Cumberland County (1750). Ore used here came from the Pigeon Hills deposit. Small cannon balls can still be found in surrounding fields. Ranked as the 57th ironwork in Pennsylvania (Bining, 1979).

Hellam Iron Works: Located at the junction of the Codorus Creek and Susquehanna River in Hellam Township. **See Stop 1 for details.**

Castle Fin Forge: Located along Muddy Creek in Lower Chanceford Township, just east of the Pa. Route 74 bridge.

- 1810 Opened by Joseph Webb as the Palmyra Forge
- 1812 Joseph Withers and Company managed the operation
- 1815 Property sold by John Kauffelt, sheriff of York County, to Joseph Webb
- 1816 Property was sold to Thomas Burd Coleman of Cornwall Furnace, Lebanon County and named it Castle Fin, after his home province in Castle Finn, Ireland
- 1850(?) Joseph Longnecker purchased the property.

Notes: Mansion, out buildings and furnace still visible. The Coleman family had many iron interests across southeastern Pennsylvania, the largest being the Cornwall Furnace in Lebanon County.

York Foundry, Furnace and Forge: Located on the corner of South Newberry and West King Streets in the City of York.

- 1820 Started by Phineas Davis and Israel Gardner and shortly joined afterwards by James Webb.
- 1831(?) Property sold to Judge Durkee and Samuel Slaymaker

Notes: This was the location where the first steam locomotive "The York" was built, as well as the first steamboat "Codorus."

Margaretta Furnace and Woodstock Forge: Located in Lower Windsor Township at Margaretta Furnace (see Fig. 5).

- 1823 Built by Samuel Slaymaker of Lancaster
- 1825 First year of operation
- 1826 Land purchased by Henry and S. Slaymaker
- 1828 Woodstock Forge constructed about 1.5 miles east of here
- 1843 Henry Slaymaker ceased operation
- 1844 Opened by Slaymaker's leading employees
- 1847 Furnace quit functioning

Notes: The furnace is still visible but heavily overgrown.

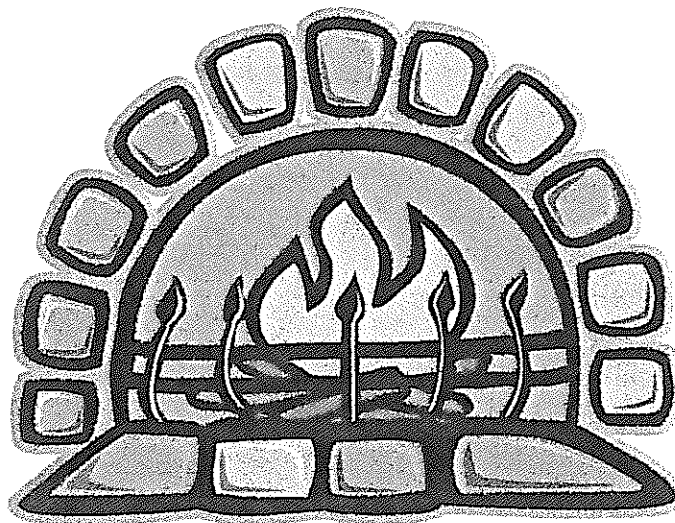
Manor Furnace (Sarah Ann Furnace): Located in Chanceford Township at the intersection of Fulton School Road and Glessick School Road.

- 1830 Started by William G. Cornwell
- 1835 John Herr of Hellam Township purchases land and manufactures iron.
- circa. 1850 Furnace ceased operation on a full-time basis. Several attempts after this date proved to be unsuccessful.

York Furnace: Located along Otter Creek on the property of Pennsylvania Power and Light's Otter Creek Recreational Area.

- 1830 Charcoal furnace constructed by James Hopkins, Esq. of Lancaster.
Henry and S. Slaymaker rented the furnace during this time
- 1850 Property purchased by John Dair
- 1886 Reports state that the furnace was still in operation
- Notes: Ore used here came from Margareta Furnace, Moser's Bank near York and from Lancaster County. Products included car wheels and Civil War cannon balls.

Codorus Furnace: Located along Codorus Furnace Road near the Codorus Creek in Hellam Township. **See Stop #1 for details.**



STOP 2. D. RUDY'S ORE BANK

Along the southern flank of the Hellam Hills, from near U. S. Route 30 and Interstate 83 eastward to the Susquehanna River, approximately 15 iron mines operated during the 19th century. Today, many of these mines can be identified as "small wooded areas" on the north side of U. S. Route 30. Geologically, these deposits of limonite are found along the contact of the Antietam Formation (sandstone) and Vintage Formation (dolomite). It is believed that ground waters weathered the sandstone along the contact and precipitated the formation of the limonite (iron oxide mineral) into the soil (Sots and Jones, 1939).

The D. Rudy Bank was one of the most notable operations in Hellam Township. Many area residents know this location as the "pond by the road." This oval-shaped bank, currently water-filled, covers 1.25 acres and is reportedly about 35 feet deep. The bank was opened in 1862 by Musselman & Watts. A total of 9,872 tons of ore was mined until the mine ceased operation in 1870. An analyses of the ore for its metallic iron was 41.160%, a fairly good grade of ore for its day and a typical composition for the Hellam Hills deposits. As the case with most of the Hellam Township mines, the ore was hauled to the Susquehanna River by wagon to Accomac Point, where it was placed on flat-bottom boats and transported across the river. On the Lancaster side, the ore was again loaded into wagons and pulled to St. Charles Furnace, just north of Columbia. The furnace is now part of Chickies Rock County Park.

STOP 1 - CODORUS FURNACE (AND HELLAM IRON WORKS)

HELLAM IRON WORKS: Located at the junction of the Codorus Creek and the Susquehanna River was The Hellam Iron Works. George Ross and Company built the furnace in 1761-62. George Ross, the principal owner, was born in New Castle, Delaware in 1730. He moved to Lancaster and was later admitted to the Bar in 1750. From 1768 to 1770, he was member of the Colonial Assembly of Pennsylvania. From 1775 to 1777, he was a member of the Continental Congress and became a signer of the Declaration of Independence. In 1779, he was appointed Judge of the Court of Admiralty in Philadelphia, but died suddenly of gout a few months later. Cannon balls for the Revolutionary War were manufactured for the American Army at this furnace. Into the 1900's, samples of cannon balls ranging in size from a mini ball to the four-inch ball were still found in the surrounding fields. This furnace operated for only 40 years. Most of the ore used here during this time span came from the Dunkard Valley area in southern York County, as well as, from Chestnut Hill in Lancaster County. Many iron stoves were also manufactured at this site.

CODORUS FURNACE: At this site is one of the most famous furnaces in York County. Today, referred to as Codorus Furnace, it was also referred to as "Hellam Forge", and "Codorus Forge." The forge and furnace were erected in 1765 by William Bennett, who continued the business until May 21, 1771. Unfortunately, the property fell into the hands of the York County Sheriff, Samuel Edie, who sold the land to Charles Hamilton, and he soon sold the property to the Hon. James Smith of York, a signer of the Declaration of Independence, who managed the business poorly and lost money. He sold the furnace and forge on April 16, 1780 to Thomas Nei, a York merchant. These works were used during the Revolutionary War for casting canons and cannon balls for the Continental Army. In 1800, Thomas Nei began a bloomery in connection with the forge and owned 3,275 acres of land, valued at \$15,875. About this time, Amel Iago became the owner. The entire property was purchased in 1810 by Henry Grubb who enlarged the works and called it "Codorus Forge." He paid \$17,810 for the property. The Grubb family was instrumental in the development of a number of iron furnaces and mines in southeastern Pennsylvania. The Grubb family was a large factor in making the Cornwall Iron Mines in Lebanon County a national-known operation (Oblinger, 1984). Between 1818 and 1850, numerous persons managed the business. The old furnace was replaced with a new one in 1837. Most of the ore during this generation was delivered from the Chestnut Hill mines in West Hempfield Township, Lancaster County, part of which was owned by the Grubb family until the late 1800's. The ore was towed across the river in flat-boats. Ore from the Grubb Bank in Hellam Township was also used, located several miles east of here. "Wood-rights" to large tracts of timber lands was purchased by the Grubbs in Hellam, Conewago and Newberry townships.

The forge and furnace ceased operation in 1850 after an existence of 85 years. For much of this time, sixty men were employed. Large amounts of pig iron was

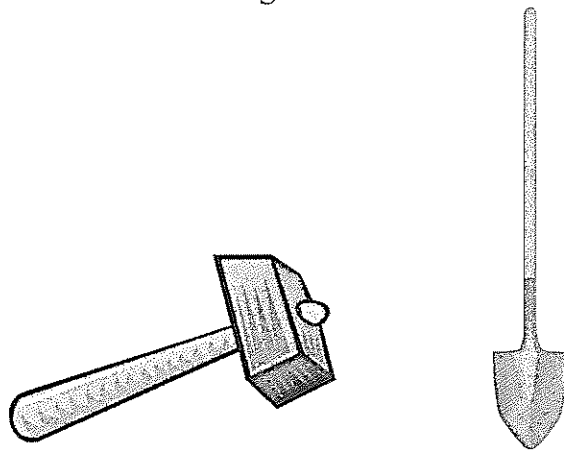
manufactured at the furnace and was made into bar iron and blooms at the forge. Much of the manufactured iron was loaded in shalops and floated down the Susquehanna River and then to Philadelphia and Baltimore. Clement Grubb of Lancaster and Edward Grubb of New Jersey owned the property at its closing.

A "flint mill" was started on the site of the iron works in 1884. The abundant quartz found within the Hellam Hills was used as the "ground rock."

IRON PROCESSING: The process of manufacturing wrought iron was to burn the ore and then pulverize it (Fig. 6). The ore was then placed in an open fire, about eighteen inches square and fifteen inches deep. A tray, made of stone and one inch in diameter, was located five inches below the top of the fire. The blast was supplied by tubes, driven by a water wheel, making a half pound to the inch. Work started by filling the open fire with charcoal made from the plentiful timber lands in the area. The blast was applied by the tuyere and pulverized ore was placed in from above with a shovel.

As the ore melted, the iron ran down below the blast, the cinder and slag being drawn off of the top and the space below the blast was filled to the tuyere. Being in a solid mass, the ore was raised out by a bar of one-hundred pounds in weight, and taken to a hammer weighing five-hundred pounds driven by a water wheel at the rate of twenty to fifty strokes per minute. The mass was then hammered into a bloom. One end of the bloom would then be heated in the fire to a welding heat and formed into what was known as anchony. When some twenty or thirty of these were made, workmen then enlarged the fire to twenty inches square and twenty inches deep. The bloom was then hammered into bars of various lengths from five to ten feet long with various diameters, ready for the market.

When the furnaces were under way and pig iron was being produced, old fashioned Dutch fires were used to work the pig metal into anchonies and drew it out into bars. This was the main function of the forge. The numerous furnaces and forges in York



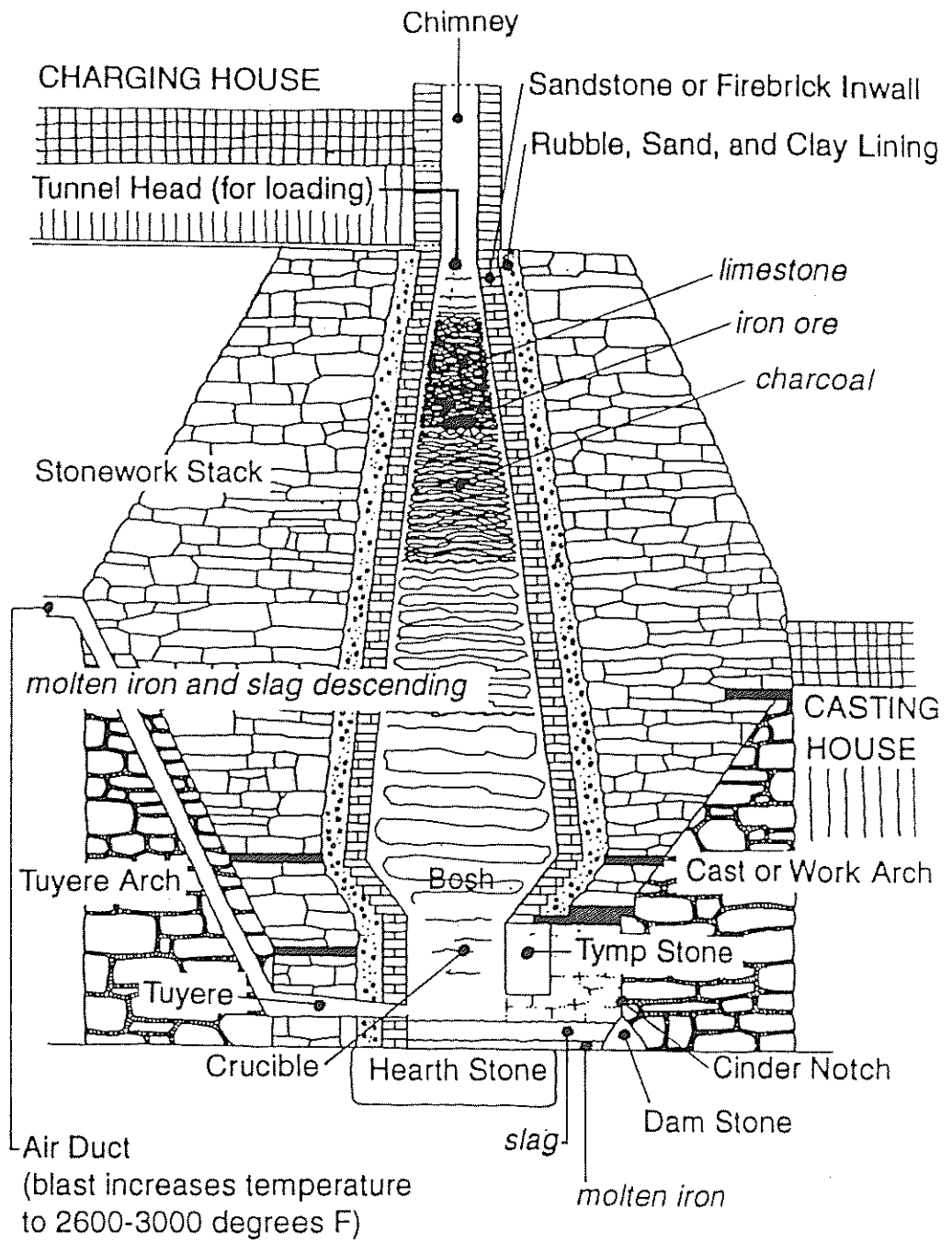


Fig. 6. Coal - blast charcoal - fueled iron furnace

STOP 5. THE ASHLAND IRON COMPANY MINE (ALSO KNOWN AS THE BOYER BANK)

Most property owners who have an abandoned mine or quarry on their land immediately fill-in the excavation to eliminate the possibility of an “accident” occurring and to “beautify” the area. Destroying evidence for past mining is like tearing a page out of a book, never to be replaced exactly like it was. A part of the area’s history has been destroyed, although to the landowner it is only a small fraction of history. The build up of too many fractions creates a large percentage. Approximately 37 of the 154 mines in York County have been destroyed, either by urban development or covered.

Here at the Ashland Iron Company Mine, the property owners have done a reverse. They have turned the mine (now water-filled) into a peaceful lake complete with recreational opportunities. Their house is even built on one of the mine dumps and the area south of the driveway, which was also mostly used for dumps, has been graded and landscaped to please the eye.

The below description is an excerpt of a report written for the Wojciechowski’s as they were interested in learning more about the history of their property (Jones, 1999).

As mentioned in the geology portion of the report, the southern flank of the Pigeon Hills contained some good quality iron deposits for the 19th century (Fig. 10). All of the deposits appeared to be associated close to the Antietam Formation-Vintage Formation contact or in some cases as this example, a fault also played in the role of this particular deposit.

Peter Dicks is credited for the discovery of the Pigeon Hills deposits. Mr. Dicks started the Spring Forge, located near the present P. H. Glatfelter Paper Company in 1756 (Gibson, 1886). Most of the ore, through at least 1800, was shipped to Mary Ann Furnace. The remnants of this furnace, which was constructed in 1761, are now found beneath Lake Marburg in Codorus State Park, near Black Rock Road, Manheim Township. According to historic records of the American Iron and Steel Association, this was the first furnace constructed in Pennsylvania, west of the Susquehanna River. The furnace was built by George Ross, a prominent lawyer from Lancaster, Pennsylvania. The location of the furnace was chosen not only for the rich nearby iron deposits, but also for the good stands of chestnut, which was burned into charcoal and used in the smelting of the ore. The furnace ceased operation around 1804 (Gibson, 1886). Even today, canon balls ranging in size from pea size up to four inches in diameter can be found near the mouth of Furnace Run, products of what was once produced here at the furnace.

Upon inspection of Presser Frazer’s iron map of York and Adams Counties (1876), twenty mines existed in the Pigeon Hills from Pa. Route 194 eastward to

Nashville. Another twelve mines were situated south of the Pigeon Hills near Iron Ridge and Smith Station. The earlier ore mined (1760's until about 1850) was hauled by wagon to either Mary Ann Furnace or to the nearest transportation center for shipment. As was the case in all of York County, the presence of the iron mines greatly influenced the development of the railroad, in this case the Hanover Branch Railroad and the Baltimore and Hanover Railroad, both constructed in the mid 1800's. As the railroad gained business in ore shipping, various sidlings were constructed to Iron Ridge, Porter's, Smith Station and Jabob's Mill to ease the transportation.

As far as the Wojciechowski property is concerned, it was mentioned that the property was obtained by the Boyer family from the Commonwealth of Pennsylvania. Indeed, once the Boyer's had learned of Peter Dick's discovery of iron ore in the Pigeon Hills, all of the land owners saw a potential for making money on the "land." Although it is unknown if Christian Boyer attempted to find any ore, it is known that Samuel Boyer did indeed open a mine on the farm. According to Frazer (1876), Samuel opened a bank (19th century name for a mine) around 1855. Frazer referred to the operation as the Boyer Bank. Samuel leased the bank to Hess & Denny in 1874, who worked it until Samuel's death in 1879. Hess & Denny was one of several companies who worked the larger Pigeon Hills deposits through a lease agreement with the owner. The other companies seen in historic records include the Chickies Iron Works, Watts & Musselman, Leesport Iron Company, Ashland Iron Company and Ex-Governor Porter.

Frazer (1876) reports the following:

"The bank is of oval shape, covering about half an acre, and has an engine house and inclined plane. North of this is a more irregular bank covering perhaps one and a half acres. Each of these is about 15 feet deep. The ore lies in irregular segregated masses in clays. There are no unaltered slates in the banks. The character of the ore is shelly, friable and ochreous, mixed with much clay."

Note in Frazer's description that two mines were mentioned. It is believed that the southern bank which covered about half an acre was located near or under the mobile home on the Steven Rebert property, south of the Wojciechowski property. We know that the "pond" does occupy about two and a half acres, allowing for the working of the bank after the 1875 report of Frazer.

Although the investigator did not walk the Steven Rebert property, it does appear from a distance (looking south and west) that the Rebert property has been filled in, as covering an abandoned bank. Irregular land surfaces to the southeast of the mobile home also appear to be dump piles from a mine. According to the Frazer, 1875 map, this oval pit was longer in a east-to-west direction.

The "pond" is irregular in outline and is larger in diameter in a northwest-to-southeast direction as shown on the historic map. Depth of the pond is said to be approximately 50 feet at the deepest. The P. H. Glatfelter Company pumped the

“pond” dry in the early 1960’s, when a severe drought took place. In the past, the company either owned or had the water rights to several of the larger mines in the Pigeon Hills for use at the paper mill in Spring Grove. It was reported by Menges Mill resident, Raymond Hoover, that a water pump from the mining days was found in the bottom of the pit after the pumping. Former Spring Grove resident, Clair Martin, who was employed by the paper company during this period, retrieved a copper and brass pump head from this mine. The pump head was sold at a public sale in the spring of 1999 after the death of Mr. Martin for \$85.00. Also, following the pumping, a mass of twisted railroad track was found in the bottom (Chester Hoke, personal communications). This track was probably the incline that was used to haul the ore out of the mine.

Also in the above description, Mr. Frazer refers to an engine house. Due to the lack of documentation, it is not known if the engine house stood between the two banks or elsewhere. However, it is known that the 25 foot x 50 foot wooden building sitting on the hill to the north of the “pond” was used by the Ashland Iron Company as an engine house (see Plate 5). The building is constructed of chestnut, although the floor and foundation have been “modernized” with concrete. The engine house was equipped with the mechanical working that operated the incline and the pumps that kept the ground water level down below the working level.

Both of these banks apparently utilized the incline to extract the ore to the surface. The incline was a popular method used during the 19th century. Pictured within this report was the incline used at what is known as Glatco Lake, previously the E. Haldeman & Company Bank. The photograph is believed to have been taken around 1880. The incline consisted of two sets of a narrow gauge railroad which allowed two cars to maneuver up and down at one time. Each car measuring about 4 feet x 6 feet x 2 feet could haul up to 500 pounds of iron ore up the incline. At the top of the incline the ore was transferred into a wagon and hauled to the selected transportation center for export. At the Boyer Bank, the incline ran up the northern slope of the bank near the existing engine house. During the initial inspection of the property, Paul Wojciechowski showed the investigator a “hole” in the side of the northern slope of the bank. At first, I originally thought it might have been an old shaft. After further research and inspection of the “hole,” the investigator now feels that this was the location of one of the support timbers for the framing of the incline. A similar “hole” is located on top of the hill west of the existing engine house, which would represent the top of the incline support timbers. These timbers were buried in the ground and served to support the tracks and cross-ties of the structure. Mr. Chester Hoke reported finding railroad spikes near the top of the bank in this area. Transportation of the Boyer Bank ore was by wagon on the road to Iron Ridge, where there was a double sidling for the Hanover & York Railroad.

The largest dump on the property is located to the northwest of the house and west of the “pond.” These dumps serve as the boundary of the “pond” and is approximately 30 feet higher in elevation compared to the water surface. A terraced area about half-way up on the dump from the pond appears to have been a cart path during the mining period. A deep ravine, measuring up to 20 feet deep cuts through this dump. A

stream flows through this ravine, originating from a spring near the northwestern corner of the property and has provided an erosional effect. As discovered during the residential interviews, the greatest amount of downcutting of the ravine occurred during Hurricane Agnes in 1972, when a small footbridge crossing the ravine was destroyed.

Destination of the ore during the early years of operation is not clearly identified, although a furnace in Maryland, as described below is likely. It is known that after the Ashland Iron Company took the mine over in 1879, the ore was shipped to Ashland, Maryland and used in the Ashland Furnace. According to Frazer (1876), much of the ore mined in the Pigeon Hills was used in the Ashland Furnace. If this is the case, the ore was transported to Hanover, then transferred to the Hanover Branch Railroad. From here the ore was taken to Hanover Junction, then placed on the Northern Central Railroad for its final leg into Maryland.

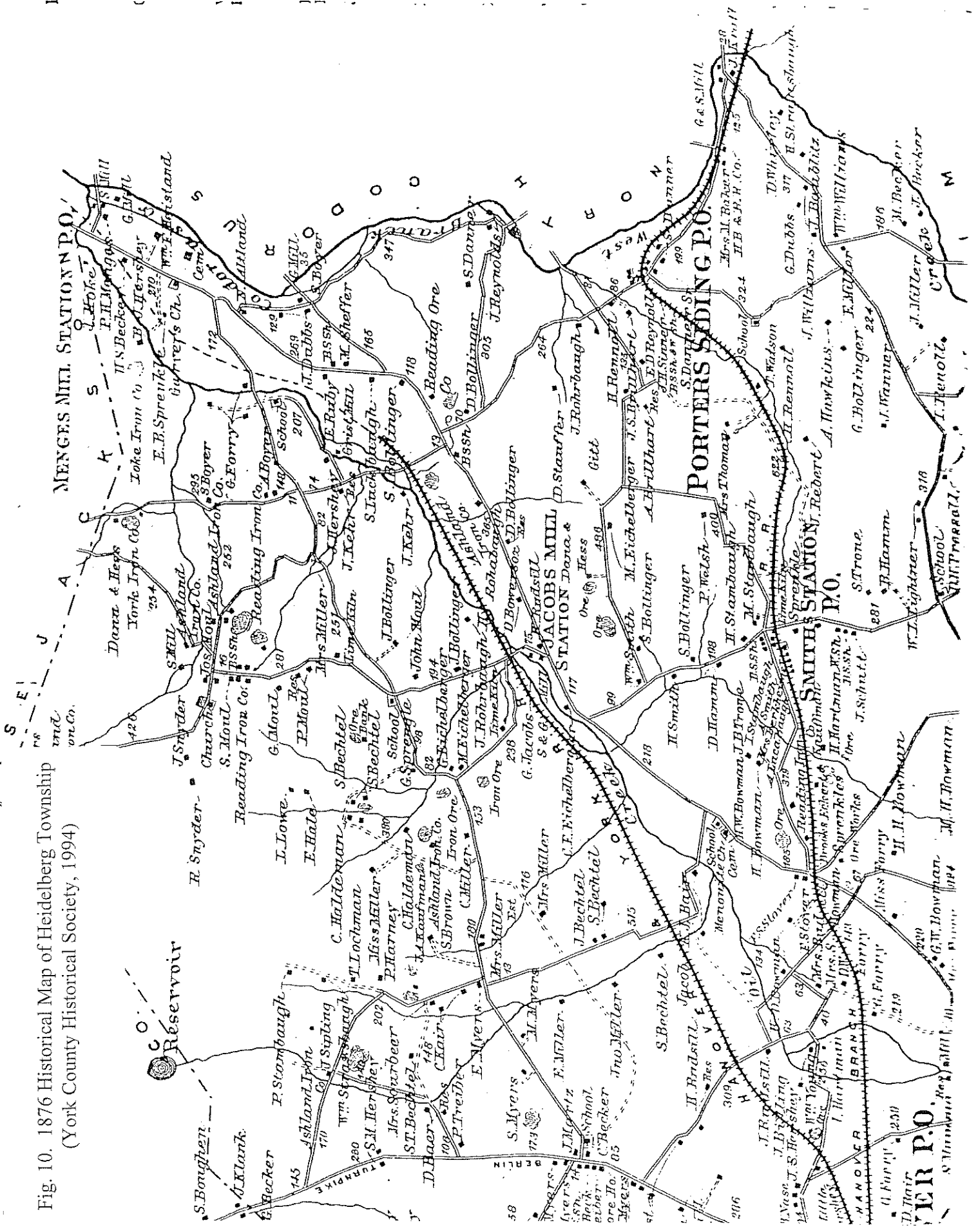
Christian Geiger built the first Ashland Furnace in 1837. Deeds of 1844, show that the furnace company consisted of Geiger and wife of Harford County, Maryland, plus Philip A. Samuel Small of York County. The Small's also founded Sarah Furnace in Harford County in 1842. In December of 1844, they sold 40% of the Ashland interest to Joseph W. Patterson, Edward Patterson and Charles Gilmor of Baltimore for \$5982. Geiger in 1850 sold out to Joseph Patterson and the Small's sold their rights to Ashland Furnace for \$20,000 and conveyed "All the horses, wagons, carts, oxen, tools, implements..... and ore bank agreements." The works continued as Patterson, Small and Company. Ashland Iron Company was chartered by the Maryland General Assembly, Acts of 1844, Chapter 206 (Singerwald, 1911).

The second Ashland Furnace measured 32 feet high and 12 feet in diameter. Total capacity was 25,000 tons of foundry iron per year. The furnace operated until 1889, when all the usable equipment was transported to Sparrow's Point, Maryland (Singerwald, 1911).

During research for this project, the investigator located daily work books for the Ashland Iron Company from 1851 to 1858. These books recorded where ores were arriving from, where finished ore was being shipped to, costs and amounts. According to the records, Oregon Furnace in Cockeysville, Maryland was incorporated with (or into) the Ashland Iron Company. The records were written by Thomas Kurtz, manager of the Oregon Bank. These records are registered in the Maryland Historical Society, Library of Maryland History as document number MS. 629. Internet access for more information on the library can be found at <http://mdhs.org/library/pedley0.html>.

The Heritage Collection Illustrated Atlas of York County from 1876 (York County Historical Society, 1994) shows the Boyer Bank as the Dana and Hess (Dana is probably supposed to be Denny as described above) but also the York Iron Company is listed. It is possible that "York Iron Company" should have been "Ashland Iron Company" since no other records mention the former name.

Fig. 10. 1876 Historical Map of Heidelberg Township
 (York County Historical Society, 1994)



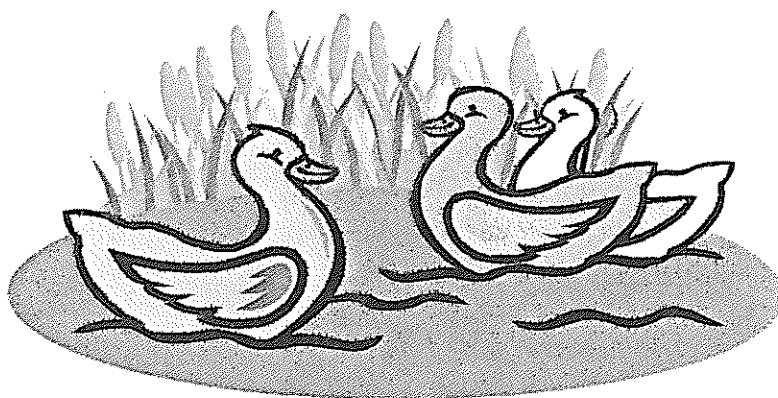
The word “ore “ has been mentioned throughout this manuscript. What exactly was the ore at the Boyer Bank? According to Parker (1994), an ore is defined as “The naturally occurring material from which economically valuable minerals can be extracted, specifically, a natural mineral compound of the elements, of which one element at least is a metal.” The mineral discovered here is that of limonite, a iron oxide mineral of variable composition. Limonite can be either brown or yellowish-brown and has been called brown iron ore. Hall (1878), who cataloged collections collected by Frazer lists the following specimen from the Boyer Bank:

#238 - limonite, with stalactites of the same ore, and goethite. Bank XCVI. Boyer’s Bank, flank of Pigeon Hills.

Although there are no chemical analyses available from the Boyer Bank, several Pigeon Hills banks have been recorded (McCreath, 1879). The Bollinger Bank, which was located to the east of the schoolhouse at the intersection of Porter’s Road and Pa. Route 116 and the Mickley Bank, which was located on the north side of Ore Field Road north of Smith Station, shows the following:

	Bollinger	Mickley
Metallic Iron	45.500%	52.000%
Metallic manganese	1.192	2.716
Sulfur	.042	.084
Phosphorus	1.439	.414

The metallic iron is the important figure which determines the purity of the ore. For the 19th century, these percentages were considered good, but with today’s standards, these percentages cannot be considered for the market. The discovery of the larger, richer iron deposits in the Midwest around 1880, is what eventually closed these area mines.



List of the Typical 18th Century Iron Furnace Industrial Complex

Staging Road – is the road to the top of the bank to the blast furnace stack where horses pull wagons of hematite or magnetite (iron ore), charcoal and crushed limestone to begin the process of making wrought iron.

Blast Furnace Stack – low banks and short stacks (Smelting Furnace)

Upper Level – Charging Deck House

Lower Level – Blast Equipment

Casting Shed – is where the hot liquid molten pig iron flowed out of the furnace and was cast into Pig Iron or Cast Iron Products

Stacking and Loading Area

Roasting Oven –

Wash House -

Connecting Shed – The Connecting Shed protected the charcoal from inclement weather. Carts were used to transport the charcoal to the furnace.

Forge/Black Smith Shop (For Refining the Pig Iron Blooms and Bars) into tools and building and house hold implements.

Wagon Shop

Horse Stable

Ore Bank or Open Pit Mine

Manager's House

Minersville – Industrial Village – Iron Worker Homes and Company Store

Iron Master's Mansion

Raw Materials: hematite or magnetite (iron ore), charcoal and limestone (source of calcium carbonate). *flux*: a substance that helps fuse together or separate metals; in an *iron furnace* limestone is used as *flux* to separate pure iron from impurities in iron .

Finish Products: Molten Iron (Pig Iron, Bars, Blooms) and Slag Material (Stone and other Non-Iron Waste Product)

Sample of wrought iron products:

Iron kettles, pots

Door hinges, Door locks, Keys

Barrel hoops

Railroad spikes and iron rails for railroad tracks

Rifles, guns and knives

Wrought iron nails and spikes

Horse shoes

Wagon wheel rims

Iron toys

Suggestions to Begin an Archaeological Survey and Interpretive Program
for Mary Ann Furnace
Codorus State Park
Hanover, PA

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Introduction

A site inspection, soil probe and magnetometer survey were conducted by the author and Rose-Anna Behr, Geologic Scientist for the Pennsylvania Geologic and Topographic Survey during the winter of 2007/2008. Their results have been recorded in an earlier report. As indicated in that report, further geophysical tests and archaeology will only confirm their findings. This report summarizes the potential to how an archaeological survey should be conducted, the areas involved and also resolve several stories that surfaced during this study. In other words, this is Part 2 of the report to the park administration on the future of preserving and interpreting Mary Ann Furnace.

What Has Been Learned about the Site

- What was believed to have been the Iron Master's House found today adjacent to the Black Rock Road boat launch is in its original position. Looking at the architecture of the building and learning more about the grist mill that sat near the junction of Furnace Creek and the West Branch of the Codorus Creek (West Branch), this house was associated with the mill and probably not the furnace.
- The race for this mill can still be seen in sections today during the winter months along the west bank of Lake Marburg from the parking area of the Mary Ann Furnace trail to the house.
- The foundation of the dam seen in the West Branch at the Mary Ann Furnace trail parking area is associated with the millrace.
- Cannonballs and assorted grape shot (known hereafter as iron shot) was reported from several areas within the West Branch.
- Iron shot was also reported from the field south of the Rummel farmhouse, in the small tributary at the southern border of the Rummel driveway and at the base of the hillside containing charcoal dust, limestone fragments and limonite (site of the proposed Mary Ann Furnace).

- Iron shot was also reported by a former property owner on top of the hill to the west of the Rummel farm, now occupied by Valley View Road.
- Old bricks were found near the surface in a small wooded grove near the southern boundary of the Rummel farm and on top of the hill overlooking the proposed location of Mary Ann Furnace.
- A large area of slag is found on the west side of Black Rock Road adjacent to the location of a former trailer and existing metal garage.
- In the northern portion of the Rummel property, it appears that the 1800's surface is now buried by 28-32-inches of pond-type sediment. A roadbed may exist here.
- With the presence of yucca and holly plants near a conspicuous terrace along the hillside, there appears to be some archaeological features in this area.
- Charcoal terraces exist in the upper field, but cultivation has covered up the dark soil and pieces of charcoal.

Areas of Interest

The property can be divided into four areas: 1) Village Site, 2) Charcoal Terraces, 3) Furnace Area, and 4) South Area. Below is evidence or suggestions composing each area:

1. Village Site – There is documentation that a small village (2 houses or more) existed on site. This is what I believe we see in the northern section of the property. A possible roadbed, yucca and holly plants, a good-flowing spring and a conspicuous terrace are found here. Excavating in the lower meadow introduces the problem of a high water table.
2. Charcoal Terraces: Very noticeable on the 1937 and 1971 aerial photographs, these terraces can very easily be located. Black soil and pieces of charcoal would be expected to be seen.
3. Furnace Area – With the strong signature with the magnetometer, this could very possible be the iron salamander. All of the ingredients for a furnace exist within a short distance: limonite, charcoal, limestone fragments, bricks and slag. IT is believed that Black Rock Road now covers some of the furnace area.
4. South Area – Although only a brick fragment was found in this area at the eastern wooded grove, the area between these wooded groves and the location of the now torn-down outbuildings may contain evidence of associated furnace features.

Comments

- Being an early cold-blast furnace, the structure probably measuring 20-25 feet square. Structure was 20-25 feet in height. The bank behind the proposed site is about 25 feet higher than Black Rock Road.
- What has not been fully identified is the race. A race bringing water to and from the waterwheel had to be present. Source had to be the West Branch and probably ran across the floodplain to the west. It is possible the drainage ditch found to the south of the metal garage may be the return race.
- According to documentation, the slag was about seven feet thick when excavated in the later 1800's and a cart load of iron shot was found at the base of the race.
- The iron ore (limonite) was mined in the Pigeon Hills and from several ore banks in the southern end of Hanover.
- The source of the limestone was from Hanover.
- Historic documents are valuable as background information. It would be helpful to find a sketch of what the Mary Ann Furnace layout really looked like (residences and furnace).
- Research should be done to see what the correlation is with the Consumer's Water Company of Hanover with the Rummel Farm. It is reported in historical documents that the company had proposed that a section of land in this area be made into a reservoir in the late 1800's.

Where Should Archaeology Be Done First?

From first to last priority, I would do the following:

- Furnace site
- Charcoal Terrace(s)
- Village Area (on hillside at conspicuous terrace and yucca)
- South Area

Questions to be Answered in Each Area

Furnace Area:

- Find the salamander (if it exists)
- Find evidence of the foundation to establish location and dimensions
- Determine the depth and extent of the charcoal, limestone and limonite pile
- Remaining foundation of waterwheel or any other structures
- A trace of the race
- Thickness and extent of the slag
- Why was there iron shot found on top of the hill to the west of the furnace?
- Bricks making up the spring house are old. To determine if the bricks were originally a part of the furnace, a test to determine if the bricks were in a furnace environment can be determined by specialists. Both fire bricks and regular bricks were used in furnaces.

Charcoal Terrace(s):

- Determine the exact location of a terrace or terraces
- Determine the diameter of a terrace. Most were 30-40 feet in diameter

Village Area:

- Determine the extent of the village, i.e. number of foundations
- Identify locations of foundations and size
- Determine if the northeast trending magnetic high is a roadway and if so, the extent
- Is the yucca and holly plants related to a garden, gravesite or decorative

South Area:

- Is there any evidence of associated furnace features in this area, i.e. material storage, forge, additional slag, etc.

Steps to Take to Begin an Excavation

- Through Pennsylvania Museum and Historical Commission, apply for an official site number. Application to be completed listing importance of the site.
- Conduct a surface survey of one or more of the areas of interest as outlined above.
- Any artifact collected should be labeled with the site number, artifact number and a form stating what it is, date found, who found it and where.
- Before any test squares are laid down, construct a grid map dividing the site into grids the same size as what your square will be, i.e. 2 meters or 8-foot squares are common.
- Decide where to lay down some test squares. These are put down to get a feel of the areas soil profile or find a particular feature.
- It is fun to excavate, collect data and find artifacts. Proper cleaning of artifacts, labeling and identifying is the time-consuming part.
- Careful note taking is critical. Proper notes taken in the field helps the laboratory section of identification and labeling. There can never be enough notes written by participants.

Props to be Used in an On-Site Interpretive Program

- Piece of limonite – iron source
- Piece of limestone – acts as flux
- Piece of charcoal – creates the heat
- Piece of slag – end product of waste material
- Line drawing of what the furnace complex may have looked like
- Cannonball and/or grape shot
- Site map of proposed layout as outlined in this report
- Either take the group up to the upper field to see a excavated charcoal hearth or build a 30-40 foot diameter ring closer to the farmstead
- Have a picture of another similar furnace complex (Pine Grove Furnace, Greenwood, etc.)

- Have a bushel of charcoal (or something filling the basket). It took ~800 of charcoal every 24 hours to operate a furnace.
- How much wood did it take to make the charcoal? A typical 30-40 foot diameter charcoal hearth contained 20-30 cords of wood (have at least 1 cord of wood on display).
- Throughout the program, have participants imagine seeing the molten iron running out of the base of the furnace into the sand casts on the dirt floor in the casting house, smell the charcoal hearths burning and the soot coming off of the furnace. The valley was probably covered with smoke during cool days or nights, including the smoke from the houses.
- Listen to the pounding of the hammerheads in the forge, weighing several hundred pounds each moved by huge waterwheels. Listen to the pounding of metal as forgers produce an anvil.
- Imagine watching a person charge the furnace from the top as he fuels the furnace among the smoke and soot coming out of the top.
- Include the history of the furnace with notable names and dates operated
- Show any artifacts that can be shown.
- Mary Ann Furnace was the first furnace west of the Susquehanna River.

STOP 4. YORK IRON COMPANY MINE P. JOSEPH RAAB COUNTY PARK

Situated on a predominate northeast-southwest trending ridge approximately 2.5 miles west-southwest of Seven Valleys, is one of the most preserved mines in York County. Unfortunately, due to time restraints, we are not able to walk into the site. The York County Parks does conduct periodic historic hikes into what is called P. Joseph Raab County Park.

Located within the wooded area, and primarily in what is locally known as “Strickhouser’s Ravine” is what remains of the York Iron Company Mine (Fig. 8). This mine was one of about five located on the ridge and another dozen that worked in the valley we are situated. As one walks through the brush on primitive trails, numerous pits, trenches, shafts and dump piles can be seen, suggesting that industry played a part here at one time (Fig. 9). The deepest horizontal shaft, known as an adit, goes back into the hillside 170 feet (see Plate 4). One vertical shaft, apparently one of the last to be dug on the property, was reportedly about 100-feet deep. In this shaft, because the level of the tunnel was below water level, a coal-burning pump was believed to be used in this shaft. Five different shafts were used at this mine according to records gathered. The largest trench measures nearly 350-feet in length, 100-feet wide and over 70-feet deep. The ore was specular hematite occurring in quartz veins. All of the mining features run parallel to the ridge following the quartz veins.

This operation was opened in 1854 by John Musselman, but later bought by the York Iron Company, which worked it from 1861 until about 1880. Several attempts to restart the mine occurred with little success up through about 1890. The ore consisted of a hard compact slate, highly charged with micaeous and come magnetic ore. An average of 10-20 tons were mined per day, depending upon the demand. A total of more than 100,000 tons was produced. Twelve to fifteen men were employed, again varying with demand. The ore was transported by narrow gauge railroad (36-inches wide) down grade 0.75 mile to the Hanover Branch Railroad. The rail dropped 75-feet in elevation from the mine area to the Hanover Branch Railroad. It cost about \$0.50 to transport an eight-wheel car back to the mine with local cattle. The ore was known to mine and furnace owners as “Codus Ore.” The hematitic ore contained 33.4% metallic iron. The ore was shipped to Hanover Junction and then into Maryland and used at several furnaces in Ashland and Baltimore (Frazer, 1876; Jones, 1980).

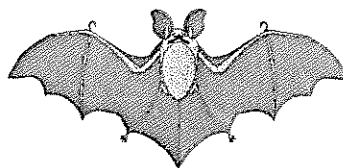
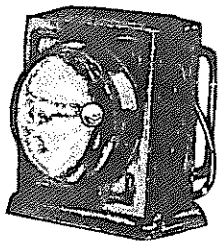
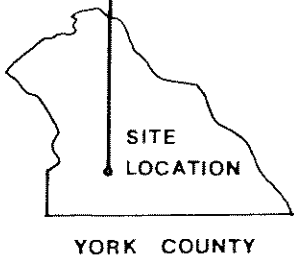
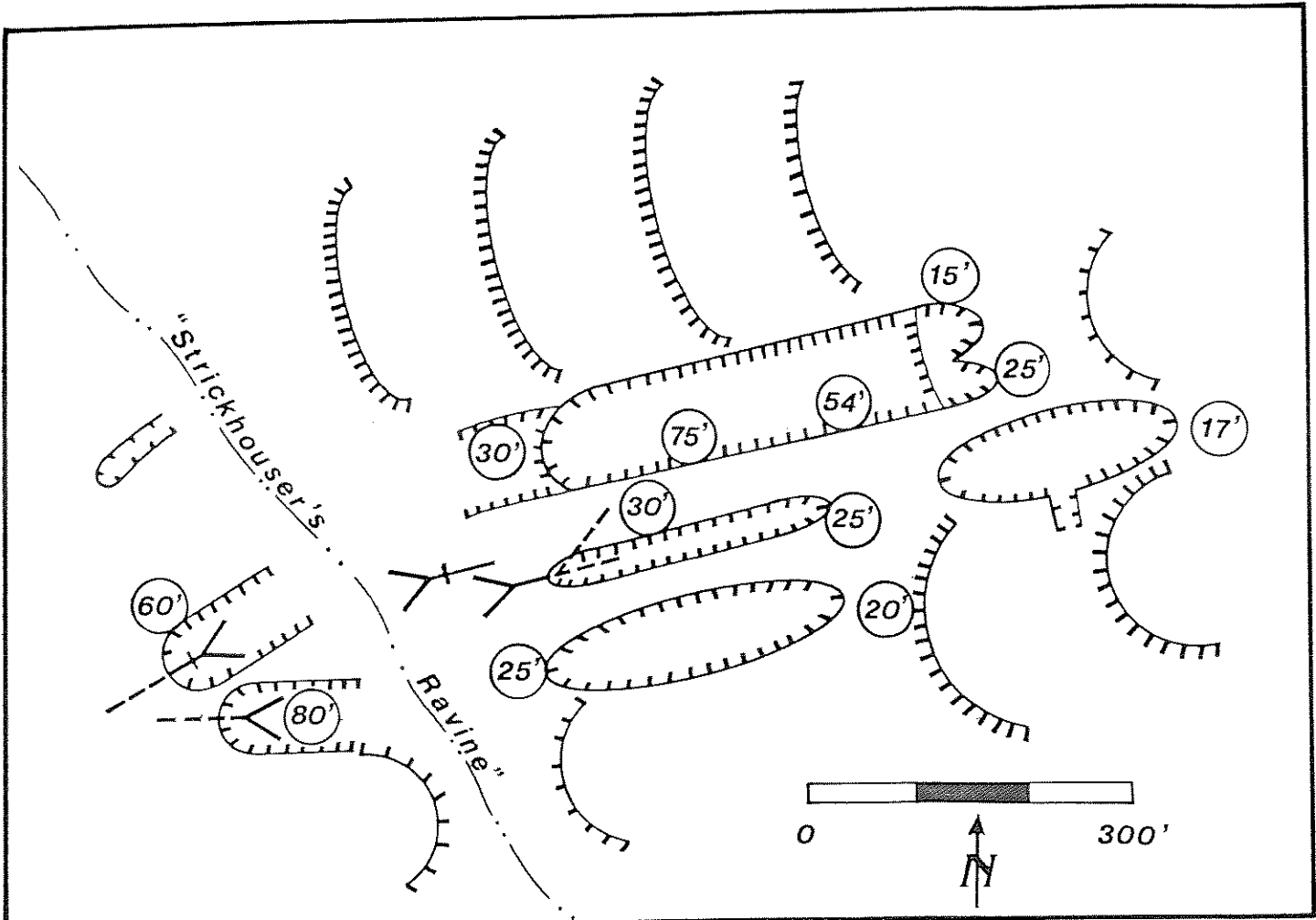


Fig. 9. Mining features at the York Iron Company Mine

A.



- DUMP
- OPEN ADIT
- CLOSED ADIT
- DEPTH OF DEPRESSION

STOP 6 - LOGAN-LONGNECKER MINE

With this stop, we have entered one of the most productive iron ore regions in York County. Known as the Dillsburg magnetite mines, a collection of 12 mines removed an estimated 1.5 million tons of ore from here between 1847 and 1900 (Fig. 11; Spencer, 1908). Refer to Tables 1, 2, and 3, mines #7-18 for historic reference.

HISTORY OF MINING: Abraham Mumper discovered the ore on his farm, followed by brother John Mumper (Fig. 12). This was the first magnetite deposit west of the famous Cornwall mine in Lebanon County. One benefit for this deposit was that the ore was lying close to the surface, as a matter of fact, some of the richest ore came from less than twelve feet down. In the early years, the ore was hauled by wagon to Mechanicsburg, a distance of eight miles, which was the closest rail line. From there the ore was hauled further into Harrisburg and Newport, Perry County.

The Mumpers enjoyed success and wealth for many years. Since the near-surface deposit was becoming depleted and the cost of hauling the ore was too expensive, the Mumpers leased the workings to McCormick & Company of Harrisburg. In 1867, Alexander Underwood, Esq., a son-in-law to Abraham Mumper bought the Mumper farm. Mr. Underwood conducted a survey and sunk a shaft through the bedrock and found ore in 1872.

With the refining of the Dillsburg deposit, the Dillsburg-Mechanicsburg Railroad was built in 1873 and greatly assisted in exporting the ore at a cheaper cost. While the Underwood mine began to produce, John H. Logan, Esq. had inherited his family farm from Col. Henry Logan. Not thinking that the property was worth anything with iron ore, Mr. Logan sold the land to a Mr. Hafner at an ordinary fee. As soon as word came out about the find at the Underwood mine, Mr. Logan came to the conclusion that the old farm was one of the richest properties in the region and purchased the land back from Mr. Hafner at a ridiculously high price. Mr. Logan became the "laughing stock" for paying back the land.

Mr. Logan sank a shaft of thirty feet and found the same vein of iron ore as the Underwood was mining. However, with the opening of the Logan mine, came a financial panic across the country, as the price of iron decreased and the demand dropped off. Progress was slowed. Two years later, the financial scare came to a conclusion and mining took off again at Dillsburg. Mr. G. F. Longnecker took over the mines of Mr. Underwood. Mr. Longnecker proceeded to bore down through the bedrock on the property adjoining Mr. Underwood's. He found at a depth of 1,000 feet, evidence of an "immense deposit." (see Plates 6, 7 and 8).

For the mineral collector, this region is very rich for a diversity of minerals. With its geologic origin involving magma intruding through the sedimentary rocks, sandstone and limestone conglomerate, a suite of minerals based on their origin of temperature have been formed. Jones and Goodman (1980) identified the following: andradite garnet,

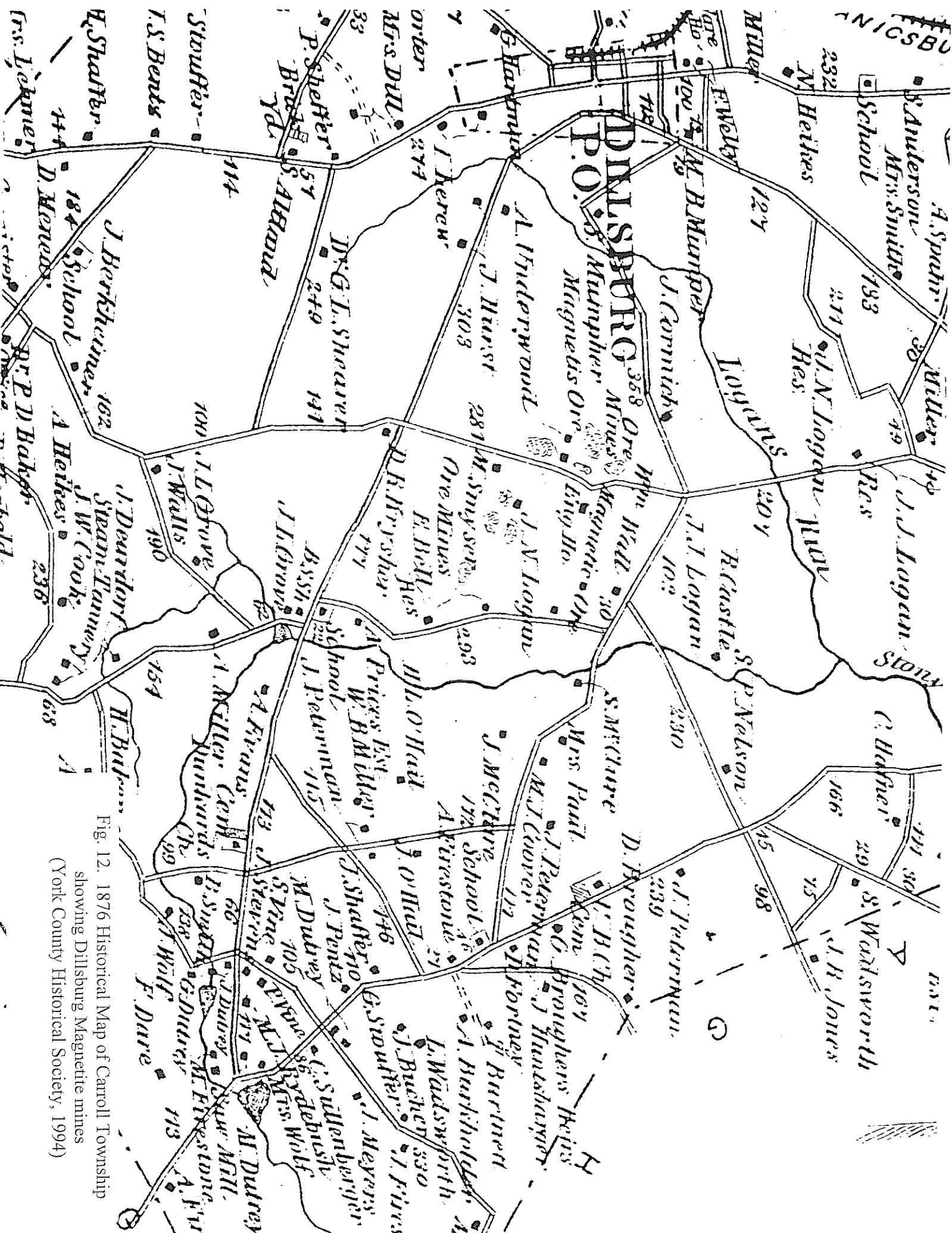


Fig. 12. 1876 Historical Map of Carroll Township showing Dillsburg Magnetics mines (York County Historical Society, 1994)

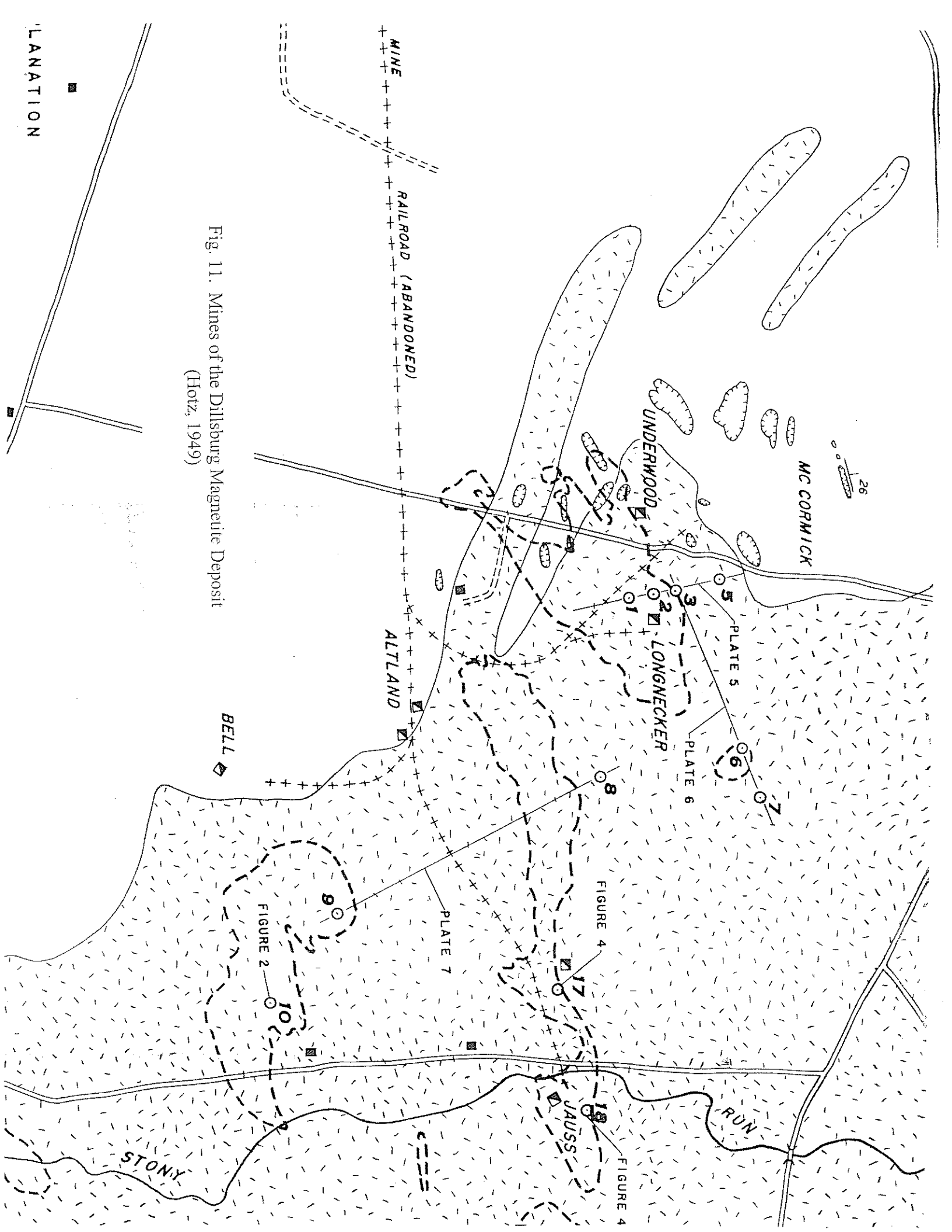


Fig. 11. Mines of the Dillsburg Magnetite Deposit
(Hotz, 1949)

EXPLANATION

calcite, chalcopyrite, chlorite, datolite, diopside, epidote, fluorapatite, goethite, gypsum, hematite, magnetite, malachite, muscovite, orthoclase, pyrite, quartz, sphalerite and titanite. Of these, datolite has only been found at approximately four other locations in Pennsylvania, while six other sites of fluorapatite was studied by Smith (1978) from Pennsylvania. To read more information concerning the formation of these minerals, refer to Jones (1980).

Between 1874 and 1886 were the peak years for these mines as about 120,000 tons of magnetite was removed. The amount of labor paid during this time was about \$250,000.

In an attempt to rejuvenate the Dillsburg magnetite mines around the early 1900's, prominent leaders were invited to visit the mines in hopes that further investments would reopen the deposit. One of the visitors was Thomas Edison, who resided in New Jersey, and founder of electricity. Mr. Edison visited the Jauss Mine, which was believed to have been the last working mine within this district.

Analyses of the magnetite ore are listed below for several of these mines showing the metallic ore content (McCreath, 1879):

Longnecker Mine -	43.000%
Underwood Mine -	40.200%
Bell Mine -	42.550%
King and Jauss Mine	45.000%
Mumper Mine -	38.100%
McCormik Mine -	45.880%

Logan-Longnecker Mine: The Logan-Longnecker Mine is the best preserved mine within the district. This mine was opened in 1874 by John N. Logan. The shaft was located by dip-needle indications, but 27-feet of diabase was encountered before striking ore. The host rock for the ore appears to be limestone conglomerate from the evidence of the dumps. The ore bed was about 20-feet thick at the shaft and to have averaged 10-feet in the mine. From the bottom the shaft, 51-feet deep, a slope toward the north starts at 28 degrees, but flattens as depth is attained (Fig. 13). Mr. Logan reported that the workings extended about 300 feet north of this shaft and that the east drift of the lowest level is 190 feet long (Spencer, 1908). Mr. Logan worked the mine in 1874 and 1875. McCormick & Company and a Mr. Longnecker worked the mine from 1875 until 1887.

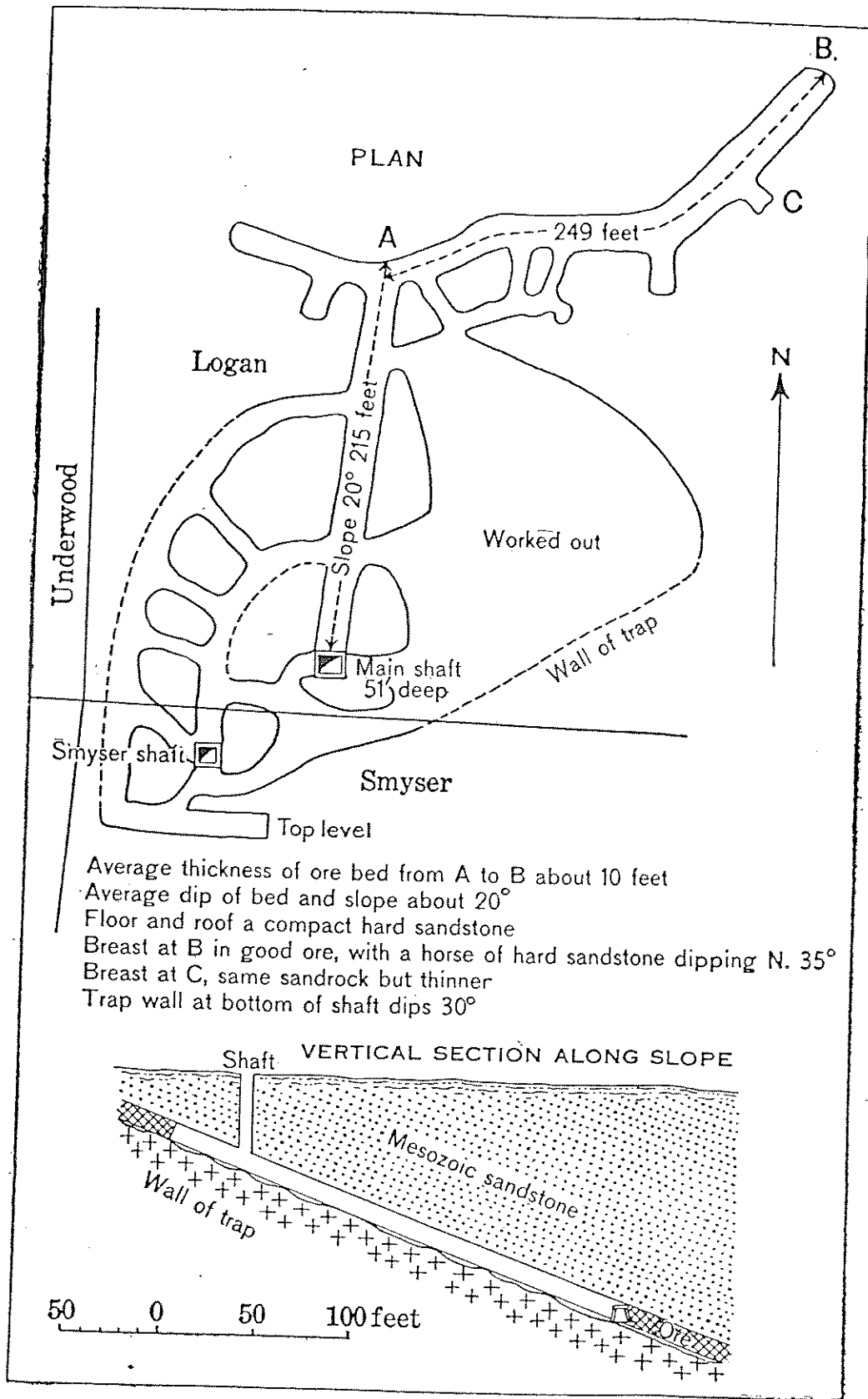


Fig. 13. Profile of the Logan Longnecker Mine
(Spencer, 1908)

