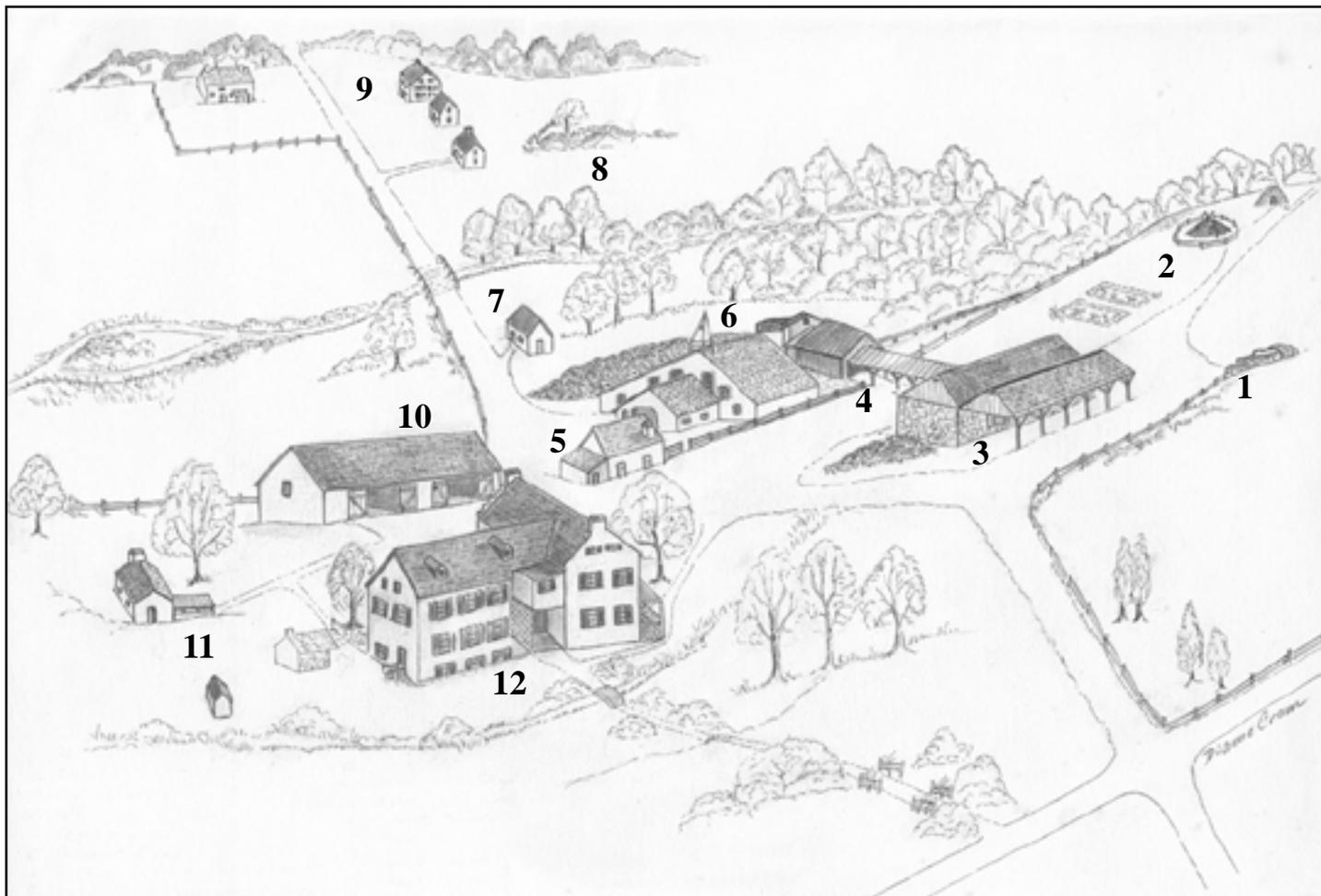




Map of Hopewell Furnace National Historic Site

Numbers correspond to those in "A Walk Back Into History"



- 1) Anthracite Furnace
- 2) Charcoal Hearth, Collier Hut and Charcoal Kilns
- 3) Charcoal House and Shed
- 4) Connecting Shed and Bridge House
- 5) Office — Store
- 6) Cast House and Furnace Stack
- 7) Blacksmith Shop
- 8) School House Ruins
- 9) Tenant Houses and Boarding House
- 10) The Barn
- 11) Springhouse and Smokehouse
- 12) Ironmaster's Mansion

A Walk Back Into History



Use the map in the Hopewell Furnace National Historic Site brochure as a guide to this exercise. The different buildings and areas are numbered on the map. Find the text that describes each place.

Valley Forge — Reading Road

The roadway overlooking the furnace was built in 1757. During the early years of Hopewell's history, the iron made at the furnace was sent east by wagon along this road on a three-day journey to Philadelphia. After 1825 it also connected the furnace with the Schuylkill Canal. With the opening of the canal — and later, the building of the Reading Railroad — wagon trips were much shorter.

Take a left down the old Warwick-Birdsboro road into the historic site. If you walked this road two hundred years ago, how many people and wagons do you imagine would pass you going to and from Hopewell?



Valley Forge — Reading Road Sign

Anthracite Furnace (1)

This is the owners' attempt to modernize Hopewell's ironmaking operations. This hot-blast furnace employed a more modern method for ironmaking, using anthracite coal and a blast of pre-heated air. This process produced more iron and would eventually drive cold-blast furnaces like Hopewell out of business. The ironmaster at Hopewell hoped this new furnace would make better iron and increase profits. Unfortunately, it actually lost money for the furnace. Anthracite coal was expensive to ship by canals from distant mines to Hopewell Furnace. Transportation costs, plus the poor quality of the ore, and possibly structural defects contributed to its failure around 1855.



Anthracite Furnace Ruins

Charcoal Hearth, Collier Hut and Charcoal Kilns (2)

The cleared out, circular area (now covered with pieces of charcoal and ashes) is called a charcoal hearth. In the woods — on hearths like this — colliers (charcoal makers) produced the charcoal needed to fuel the furnace. Wood was piled in large mounds and covered with leaves and dirt so the wood burned slowly. It took about one acre of hardwood to operate the furnace for a day.

The small hut behind the hearth is the type built by colliers to live in while tending several hearths. This one is a replica of an earlier hut.

Next to the charcoal hearth are ruins of the charcoal kilns which were another effort to modernize production and reduce the number of workers needed at the furnace. They operated like an oven for making charcoal and could have been used year-round, but it was soon discovered that bringing the wood to the kilns was more expensive than taking the charcoal out of the woods. The ironmaster then converted the kilns into houses for the workers.

Charcoal House and Shed (3)

For charcoal to burn properly, it was important to keep it dry. Charcoal was hauled by teamsters into this shed and dumped by pulling out the bottom boards of the wagons. After the charcoal had a chance to cool down completely, it was shoveled through the big windows into the charcoal house. When the house was filled to the roof, there was enough charcoal to fuel the furnace for six months.

At one end of the charcoal house is the ore pile. Miners dug the iron ore used at Hopewell from at least three different mines. Miners used simple tools like picks and shovels to remove the ore from open pits. Sometimes black powder was used for blasting the harder rock.

At the other end of the charcoal house (toward the charcoal hearth) is a pile of limestone. Limestone was the



Charcoal Hearth



Charcoal House

purifying agent, also called the flux. Limestone, when heated at 3000 degrees Fahrenheit, combined with the impurities in the iron ore and formed “slag,” a waste product. Iron, in a nearly pure form, separated from the slag and sank to the bottom of the furnace, while the slag floated on a layer above the iron.

Connecting Shed and Bridge House (4)

The covered passageway going from the charcoal house to the bridge house is called the connecting shed. This is where men called fillers worked. Their job was to fill the furnace with the “charge.” A charge was made up of iron ore, charcoal and limestone. The limestone, also called “flux,” combined with the impurities in iron ore and formed “slag,” a waste product. Like most Hopewell workers, fillers worked twelve hours a day, on either a day or a night shift. Using wheelbarrows and carts, every half hour the fillers would dump approximately 300-400 pounds of iron ore, 30-40 pounds of limestone, and 15 bushels of charcoal into the top of the furnace, called the “tunnel head.” Temperatures inside the furnace reached 3000 degrees Fahrenheit and high flames with clouds of smoke and gases would shoot up from the furnace stack, making the filler’s job one of the most dangerous ones at the furnace.



Connecting Shed and Bridge House

Office — Store (5)

Workers were not required to buy at the store, but it was convenient and prices were similar to other stores. The company clerk worked here, keeping account of the orders, production, and transportation of the products made at Hopewell. He kept written accounts of all transactions in large books called “ledgers” and “journals.”

The clerk was also the paymaster, but workers were not paid with cash. Instead, the clerk recorded in the ledgers the amount of money each worker earned. When an employee needed cash or store goods, he would go to the clerk and draw



Office-Store

on his account. Earnings by women and children were credited to the account of their husbands or fathers.

The people in the community at Hopewell had little time, opportunity or transportation to travel to other towns to shop. For this reason, the furnace ran a company store stocked with many of the things the workers needed, including the latest goods from Philadelphia and other cities.

Cast House and Furnace Stack (6)

The cast house was built around the furnace — the large stone chimney. When the furnace’s bottom part, or “crucible,” was filled with molten iron, the furnace workers would empty it. This was done two times a day and was called “tapping.” The iron that came out of the furnace was molded into pig iron bars or into the many iron products cast at the furnace.

When the founder decided the furnace was ready to tap, a gutterman punched out a clay plug in the taphole of the dam stone at the base of the furnace. Red-hot iron ran out into a trench dug into the soft sand floor. From this main trench branched smaller channels. The cooled iron from these floor castings are called pigs — because the iron bars resemble a sow (a female pig) with piglets feeding beside her. Most of the pig iron from Hopewell was sold to forges where it was processed into bars and rods of wrought iron.

Up to the 1840s, much of Hopewell’s iron was cast directly into stove plates, pots, skillets, anvils, and waffle irons. These products were cast in sand molds contained in wooden frames called flasks into which the molten iron was poured. The flask was placed on a bench by a moulder and a wooden pattern of the iron casting to be made was placed in the flask. Next the moulder covered the pattern with sand and turned the flask over. A second flask was placed on the first and filled with sand. The sand was packed in with a rammer. The moulder then would skillfully separate the two flasks and remove the pattern. One mistake and the mold would be ruined.



Cast House

After the pattern was removed, the flask was put back together. When the furnace was tapped, the moulder would fill ladles with the molten iron and pour it into the flask through the “gate,” a hole in the sand. Once the iron was cool, the flasks were taken apart and the casting removed. If the moulder had done a good job, the casting would look exactly like the pattern. When Hopewell was at its peak, there were fourteen to sixteen moulders working each day.

Cleaning Shed

The cleaning shed was where the new castings were sent after cooling. Rough edges were filed off and all the sand that was burned onto the iron was removed. Moulders cleaned their own castings or paid others, including women and children, to do the work. The pay in 1836 was seventy-five cents a long ton (2,200 pounds) for cleaning castings. A ton was often as many as 1100 stove plates.

When the castings were finished, the company clerk inspected them, noted the number of perfect castings each moulder had made, and recorded these in the company ledgers. In 1835 the most successful moulder earned \$352.24.

Slag Pile

Before the furnace was tapped, the guttermen would remove the slag. Some was used to pave roads, but excess slag was piled in mounds outside the cast house and in the barnyard. Large amounts of unused slag, became a problem, since there was no other place to store it.

West Headrace and Waterwheel

Early ironworks used water power to operate the huge bellows which blew air into the furnace. For this reason Hopewell is called a “blast furnace” because blasts of air were pumped into the fire to speed up the smelting process. At Hopewell a dam built on French Creek created a small lake.



Inside of Cleaning Shed



Overgrown Slag Pile between Cast House and Blacksmith Shop



West Headrace

From this, a ditch or race carried the water which turned a large waterwheel. The water turned the wheel by filling each of its buckets. The race which brought the water to the waterwheel is called the headrace, while the one that carried the water back to the creek is called the tailrace. Rods attached to the axle of the wheel moved the bellows inside the wooden blowing tubs. Air was compressed inside these tubs and pushed through a pipe into the square box called the receiving box. From there, the air traveled down the long tube into a nozzle sticking into the furnace. This nozzle is called by a French name, “tuyere.” The blast of cold air fanned the fire in the furnace.



Blacksmith Shop

Blacksmith Shop (7)

The blacksmith not only shod the horses which carried the iron products to the market, but he also made various tools and hardware for the furnace and its workers.

School House Ruins (8)

The furnace school was built in 1836 by the furnace company, which was reimbursed by the school district. The furnace paid the school taxes for its employees, but the parents had to buy books, paper, and pencils for their children. Boys and girls were kept at separate sides of the school room and a disciplinary bench was placed near the teacher’s desk in the center of the room.



School House Ruins

Tenant Houses and Boarding House (9)

The tenant houses across the bridge were built by the furnace to house workers. Rent for the smaller houses was about \$12 to \$25 a year. At one time the furnace owned fourteen tenant houses, but not all of them were in the immediate vicinity of the furnace. Many of the Hopewell workers owned homes and farms nearby. Many of the tenants owned a milk cow, raised chickens, and grew vegetables in small gardens. The boarding house may date to 1807. The



Tenant House

boarders were mainly single men who ate their meals at the moulder's kitchen in the basement of the ironmaster's mansion.

The Barn (10)

The animals sheltered in the barn were crucial to Hopewell's operation. The lower barn contained stalls for 36 horses. Sheep, poultry, hogs, and cattle were also raised to help feed the Hopewell community. Above the stalls were three hay mows which held enough hay to feed the animals for a year. Feed grain was stored in bins at opposite ends of the barn. Today the upper level of the barn houses a variety of horse-drawn wagons, carriages and sleighs. The horses, cows, sheep, and chickens you see today represent the large number of animals that were maintained by the furnace during its operation.



Barn

Springhouse and Smokehouse (11)

The cool spring waters supplied the ironmaster's family with drinking water. The trough in the middle room was like a refrigerator for the Big House. Crocks of food, milk, and butter lasted longer when placed in the cold spring water. The fireplace was used for melting fat to make soap and heating water for washing clothes.

Another way of preserving food was by smoking it. This method dried the meat, preventing spoilage. A smoky fire fueled by green wood or corncobs was built on the dirt floor after the meat was hung inside the smokehouse.



Springhouse

Ironmaster's Mansion (12)

The "Big House" served as the home of the ironmaster and his family. Several servants and the company clerk lived here too. Since there were no hotels near Hopewell, travelers and merchants often spent the night here. The Big House at Hopewell had nineteen rooms on four floors.

Around the back of the ironmaster's mansion is the moulder's kitchen, dining area, and the bake ovens. Because the moulders had to stay near the cast house during their shift, the company hired women to prepare and serve meals to them in the basement dining room of the Big House. The moulders paid about six dollars a month for three meals a day. The food for the ironmaster's family, however, was prepared in a kitchen upstairs.

Fresh bread was baked in the outdoor ovens. Wood fires heated the bake ovens. When the ovens reached baking temperature, the coals were raked out and the bread was inserted.

The East Headrace and the Ironmaster's Garden

Walk up the steps towards the Visitor Center. The small bridge near the Big House crosses the east headrace. Like the west headrace, this earlier ditch brought water to the waterwheel by diverting nearby streams. It is over a mile long. This headrace was likely constructed by slave laborers who were owned by Hopewell's first ironmaster, Mark Bird. Beyond the headrace are the remains of the ironmaster's garden.

On three terraces, and in the old greenhouse whose ruined wall can be seen to the right, the family grew vegetables, herbs, and flowers. Ice was cut from the lake in the winter and stored in an underground pit beneath the ice house that has long since gone to ruin.



Ironmaster's Mansion



Ironmaster's Garden