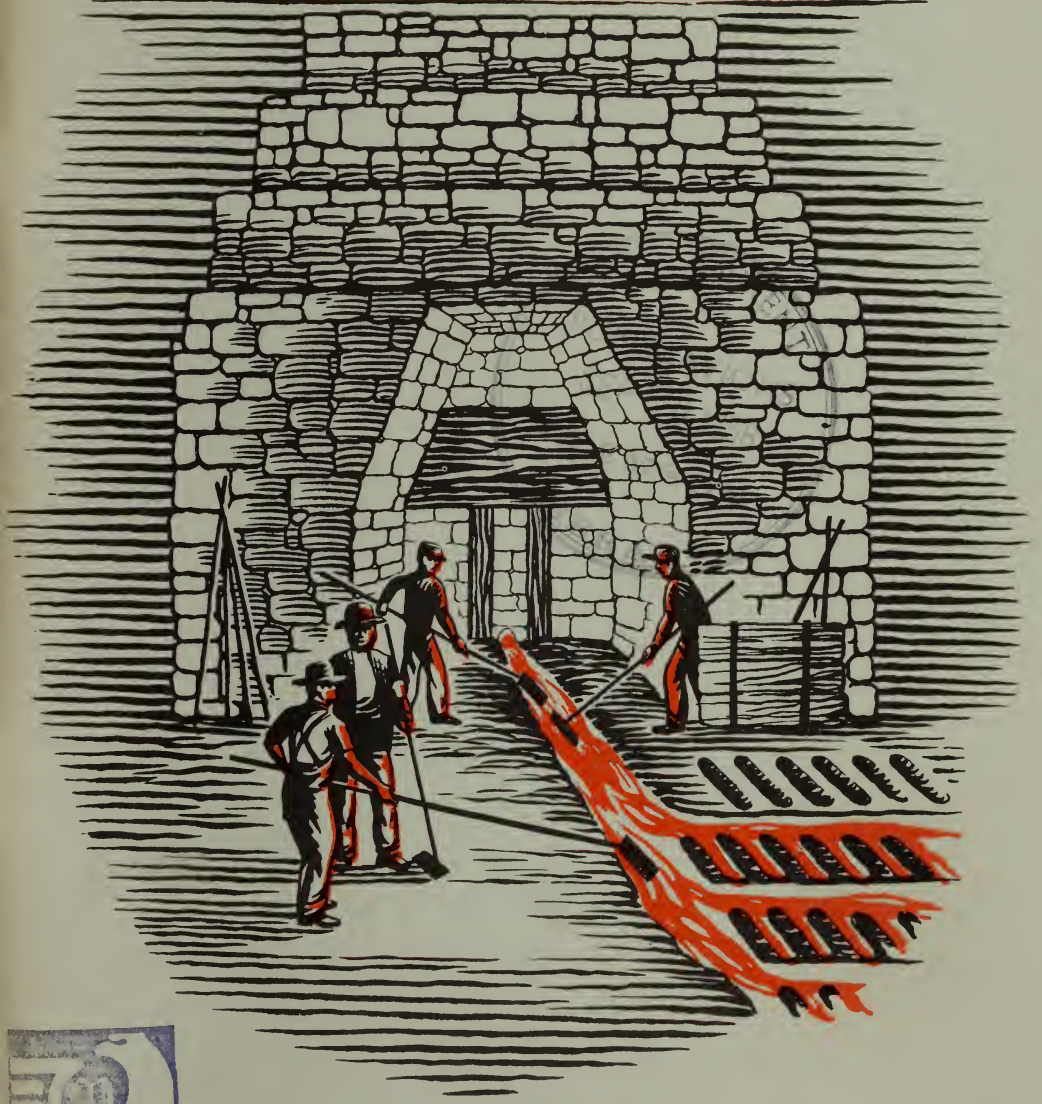
HOPEWELL VILLAGE



UNITED STATES DEPARTMENT OF THE INTERIOR

Fred A. Seaton, *Secretary*

NATIONAL PARK SERVICE

Conrad L. Wirth, *Director*

HISTORICAL HANDBOOK NUMBER EIGHT

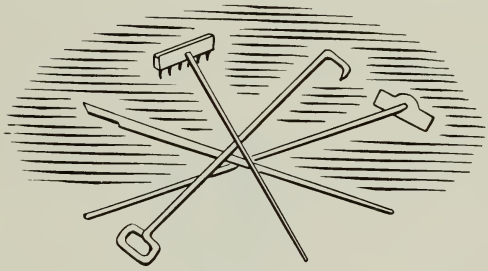
This publication is one of a series of handbooks describing the historical and archeological areas in the National Park System, administered by the National Park Service of the United States Department of the Interior. It is printed by the Government Printing Office and may be purchased from the Superintendent of Documents, Washington 25, D. C. Price 25 cents

Hopewell Village

NATIONAL HISTORIC SITE

PENNSYLVANIA

by Dennis C. Kurjack



NATIONAL PARK SERVICE HISTORICAL HANDBOOK SERIES NO. 8

Washington, D. C., 1954

(Revised 1958)

The National Park System, of which Hopewell Village National Historic Site is a unit, is dedicated to conserving the scenic, scientific, and historic heritage of the United States for the benefit and enjoyment of its people.

Contents

Hopewell Furnace, 1887, four years after the last blast.

HOPEWELL VILLAGE, in colonial times, was built around a cold-blast, charcoal-burning iron furnace and associated structures. The community life was in some respects similar to that of the small feudal manors of medieval Europe and was largely self-sustaining. This condition prevailed at Hopewell, little changed, beyond the colonial period, through most of the nineteenth century. The furnace was closed down permanently in 1883, after 113 years of activity. The quiet of abandonment gradually settled over the place, and it became a ghost community of another era. Even though abandoned, except for limited farm purposes, the quaint little group of early industrial structures and the surrounding picturesque houses were preserved because of the isolated nature of the site in the hills back of the Schuylkill River. The restless hand of modern progress scarcely reached this little vale in the lovely forest-covered hills.

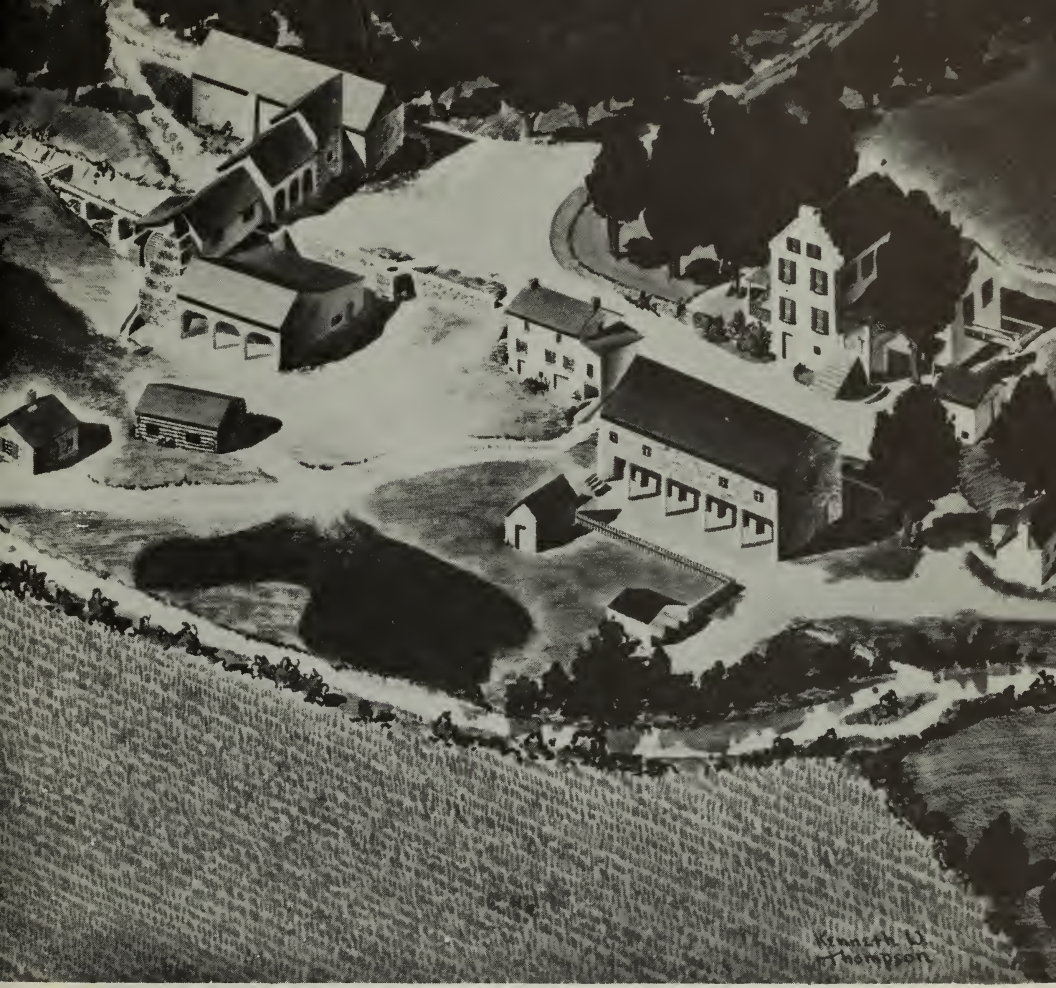
Hopewell Village tells the story not of a single historical event, but rather of a broad sweep of American growth and productive effort. This story—from the first attempt at iron making in the New World, through the days of '76 when an already thriving industry was able to play its part for independence, down to recent times—is an inseparable part of the American saga.

Here is an authentic display of social, cultural, industrial, and economic environment of life in an iron-making community of colonial and early America. Hopewell Village will afford for the present and future generations a picture of the humble but ingenious beginnings in our country of this basic industrial enterprise and will provide a striking contrast for measuring the growth and magnitude of the modern American iron and steel industry.

Establishment of the Early American Iron Industry

Columbus, seeking wealth in precious metals, as well as a route or passage to Asia, found that none of the natives he met was acquainted with the use of "iron, steel or firearms." There was a good reason for this. Gold, silver, copper, and lead often occurred in a "free" state, almost pure, and in sufficient quantity for satisfying the practical needs of even such highly developed Indian civilizations as those of the Aztecs and Incas. Iron ore, on the other hand, was hardly ever obtainable, except in combination with oxygen, sulfur, phosphorous, or silica; and its isolation from these "impurities" for the purpose of making iron objects involved a comparatively difficult process. Hence, it remained for the white man to develop iron manufacturing in the Western Hemisphere.

During the first attempts of the English to establish American colonies, an expedition sent out by Sir Walter Raleigh, in 1585, found iron ore in North Carolina. The news, together with the fact that an "infinite store of wood" for charcoal was available, prompted Thomas Hariot,



Artist's conception of Hopewell Village during its active days.
Drawing by Kenneth W. Thompson.

historian of the expedition, to suggest the establishment of ironworks in the new colony. For England's dwindling forests and the increasing cost of wood, coupled with the needs of the Navy, posed a serious problem to English ironmasters. But the first attempt at iron making in America was not made until 1621, at Falling Creek, Va., 66 miles north of Jamestown. It was an ill-fated attempt, for in the following year Indians swooped down on the tiny settlement, killing the ironmaster and his men and destroying the works.

Not until the 1640's were any successful ironworks established. These were in the Massachusetts Bay settlements, where under the leadership of John Winthrop, Jr., son of the Governor, a "Company of Undertakers for the Iron Works" was formed. This company, incorporated by the General Court in 1644, obtained a monopoly to make iron in the colony for 21 years. Capital was secured, skilled workmen were brought from England, and furnaces and forges were built at Lynn, on the Saugus

Ruins of Hopewell Furnace and its blast machinery about 1925.

River, and at Braintree, about 10 miles south of Boston. Quantities of excellent iron were smelted, cast, and forged from the bog ores of Massachusetts at both of these works during the next half century

From Massachusetts, the infant industry spread into the neighboring colonies of Plymouth, Connecticut, and Rhode Island. In 1654, Roger Williams attempted to promote an enterprise at Providence. Soon afterwards, Joseph Jenks, who made the dies for the famous pine tree shillings, built a bloomery at Pawtucket. It operated successfully until 1675 when the Narragansett Indians destroyed it during the Wampanoag War. By the beginning of the eighteenth century the iron industry in New England had taken firm root, so much so that already English manufacturers were complaining to Parliament of competition from the New World.

Other ironworks were soon afterwards established in New Jersey and Maryland. Principio, the first ironworks in the latter colony (1715), was owned in part by Augustine Washington, the father of George Washington. But it was in Pennsylvania that colonial iron manufacture was destined for its most striking expansion. Scattered over the southern portion of the State—especially in the Schuylkill Valley, in the wide Susquehanna Valley, along the beautiful blue Juniata, and across the wooded Alleghenies—may still be found the ruins of old furnaces. Each ruin—a pile of stones intertwined with leaves and the wild growth of bramble—was once the scene of great activity, the center of a community where the ironmaster and his dependents lived and labored.

Although the majority of such "iron plantations" had their origins in the eighteenth century, many remained until the nineteenth, and even later. With the development of large-scale capitalistic enterprise and consolidation after the Civil War, however, they gradually disappeared and became mere memories.

Not a single ironworks was built in Pennsylvania until long after the English Quakers settled there, although William Penn knew of the presence of iron ore in his colony and was himself connected with iron manufacture in England. The first colonists, mostly Dutch and Swedes, were concerned primarily with fighting for a foothold in the New World, and they made their livelihood by farming, shad fishing, and trade with the Indians. Other nationalities came in after 1681, bringing many families whose names were to become famous in the early American iron industry. There were Englishmen like Thomas Rutter, William Bird, and John Ross; men of Welsh origin like James Morgan, Thomas Potts, and James Old; and Germans like John Lesher and Henry William Stiegel, the latter perhaps better known for his great work in the field of glass manufacture. Other pioneer ironmasters claimed Ireland, Scotland, and France as their place of birth. Many of the sons of these men also learned the iron business, so that by 1800 most of the important industrial leaders of Pennsylvania were native-born.

The first bloomery forge in Pennsylvania was built in 1716 by Thomas Rutter, near what is now Pottstown. Three or four years later, aided by his friend Thomas Potts, Rutter also built the colony's first furnace, Colebrookedale. Further south, at Coventry, Samuel Nutt, Sr., built a bloomery forge which in time became the famous Coventry Iron Works, boasting refinery forges, a blast furnace, and even a steel furnace. It was the first in the province, built in 1732. Mordecai Lincoln, great-great grandfather of President Abraham Lincoln, was one of the partners. After this, progress was rapid. By 1771, there were more than 50 iron forges and furnaces in the province, and at the close of the eighteenth century, iron plantations had been established as far as the western borders of Pennsylvania, and even beyond. Reading (Redding), Warwick, Coventry, Cornwall, Hopewell, Mount Hope, Durham, and Eliza-

467241 O–58–2

A scene in Hopewell Village showing the Big House, or ironmaster's residence, in the right background and the office and store in the foreground. Photo by Hallman.

beth were but a few among these many early works, the ruins of which stand today as monuments to a race of fearless ironmasters who faced tremendous difficulties in obtaining capital, securing skilled workmen, and dealing with metallurgical problems in an age of experimentation.

The Iron Plantations

The feudallike colonial iron plantations of Pennsylvania often comprised several thousand acres of land. This was mostly woodland, because charcoal, the fuel used at early ironworks, required enormous quantities of cordwood. Besides the main works, each had its shops, its dwelling houses and gardens, its orchards and grain fields, and sometimes its gristmills and sawmills. The people literally lived at their jobs, in a compact community which was more or less self-sufficient.

The furnace itself was a truncated pyramid of stone, built near the side of a small hill or bank. Across the opening between was a covered bridge, or "bridge house," over which the "fillers" carried iron ore, charcoal, and limestone to the furnace top, where this "charge" was dumped into the stack. When in blast, the furnace was an impressive sight. Its brilliant flames lit up the night sky for miles around, accompanied by the intermittent roar of the blast. At the other end of the bridge house stood one or more large buildings for storing charcoal. Blast to operate the furnace was furnished by a simple system of machinery geared to a large water wheel. Long ditches, called "races," brought water to the

A section of the East Head Race and retaining wall, partially reconstructed by the National Park Service. About a mile long, it originates in the Baptism Creek area (to right above). *Hopewell Furnace is a quarter of a mile to the west.* Photo by Finch.

wheel from the surrounding hills or the furnace pond and then conveyed it off again when its power had been spent. Within the casting house, adjoining the furnace on one side, the molten iron was run out into waiting molds of scorched and blackened sand. From the furnace structure, the impure "slag" was drawn off through a "cinder hole" above the hearth, later to be dumped outside. Iron lost in the slag was salvaged by means of a crusher, or "stamping mill," which some furnaces installed near the wheel. Both the ore and slag piles were close to the stack.

Some of these early works consisted only of a furnace or forge, while others had both. The forge, where cast "pig iron" was refined and hammered into blooms, or bars of wrought iron, was generally not far from the village center. This, too, was operated by water power. Within the forge, half-naked men of strong physique swung the white-hot, pasty metal from the hearths to great hammers by means of wide-jawed tongs. Under the steady strokes of these hammers, and amid a shower of sparks, they drew the bars to given sizes. Bar iron from the forges was used by blacksmiths to make tools, implements, and ironware of different kinds.

On a low hill, overlooking the furnace or forge, stood the Big House, or ironmaster's residence, surrounded by a garden in which bloomed pinks, lilies, hollyhocks, and other old-fashioned flowers. This building had large rooms, with wide, open fireplaces, and fine furnishings often imported from Europe. Together with the immediately adjacent grounds and outbuildings, it represented all there was of elegance in such a community.

The Big House stood on a low hill overlooking the furnace. Photo by Hallman.

The blacksmith shop at Hopewell Village before restoration. Here horses and mules were shod, woodchopper's axes steeled, and metal posts and fixtures for wagons and equipment made.

Far less commodious were the workmen's homes, sometimes called tenant houses. They were usually small stone structures, or were built of logs and plaster with stone chimneys. All were poorly furnished, without rugs or carpets. Cooking was done at the kitchen fireplace, which also provided heat in winter. Pewter dishes and spoons, iron knives and forks, and wooden bowls and trenchers were the utensils used at mealtime. The bedrooms were bare and rarely contained mirrors, tables, drawers, wardrobes, or even chairs.

There were also subsidiary work buildings. Among these were the blacksmith shop, where draft animals were shod and where necessary tools and other hardware were produced; the wheelwright shop, where the several types of wagons used for hauling were constructed or repaired; and the barns and sheds, where horses, oxen, mules, and other domestic animals were housed.

In the midst of the community was the ironmaster's office and store. Here the business records were kept, and food, clothing, and other

supplies sold to the workers. Such stores were necessities because of the long distance from settled boroughs and the money scarcity. The ironmaster credited his workers with their daily earnings on one side of his ledger, and on the other he entered the merchandise they purchased. The latter often included rum, shoes, and other manufactured articles which he received in exchange for iron sent to Philadelphia.

Nearly all the Pennsylvania furnaces, Hopewell included, cast stoves and hollow ware, such as pots and kettles, in addition to manufacturing pig iron, which was usually their chief product. The first stove castings were flat pieces of iron with tulips, hearts, Biblical figures, and mottoes for decoration. One old stove plate marked "Hopewell Furnace," together with several later (flask cast) Hopewell stoves, can still be seen at Hopewell Village National Historic Site, while other representative castings are in the collections of the Historical Society of Berks County, in Reading, and of the Bucks County Historical Society, at Doylestown, Pa. The early stoves were "open sand" cast; that is, the pattern of the individual plates, carved in relief on mahogany or other hardwood, was impressed directly into the open sand and molten metal poured over it to the desired thickness. "Flask" casting, a more intricate process, came into general practice after the Revolution, especially in the nineteenth century. Coupled with the air furnace and cupola, which resmelted pig iron, it made for better grade and finer detail in the finished product.

Iron making was only a part of the work on these plantations. All the cereals were grown, and even flax and hemp were produced. Sometimes

Hopewell stove plate bearing the date 1772.

Ironmasters possessed fine carriages. This nineteenth-century tallyho is from the Edward Brooke collection at Hopewell.

a flock of sheep provided wool for the making of warm winter garments. In haytime and harvest the village women and children turned out to work long hours in the fields, gathering most of the crop; and during the winter months they spun thread and wove cloth in their homes. Thus, everyone contributed something to the general economic sustenance.

Social life was a closely knit affair. Although the workers generally led an existence of hard labor, they found some amusement in occasional barn dances, corn huskings, and country parties. Once or twice a year the more fortunate among them traveled to the nearest borough fair. Strong drink dulled the steady grind of toil, for there was much use of rum, whisky, gin, cider, and beer. Many ironmasters found drunkenness a real problem.

Ironmasters generally lived elegantly, often imitating the life of the English gentry. Many kept a pack of hounds and loved to hunt the fox. Brilliant social gatherings and frequent travels in elegant "pleasure carriages" did much to enliven plantation life. The story of the fabulous "Baron" Henry William Stiegel is well known.

Churches were few in eighteenth century Pennsylvania, so itinerant preachers, traveling the silent forests on horseback, provided what little there was of religious instruction. Education was limited to the children of the ironmaster, and perhaps of the better-paid workmen, and was often supplied by the plantation clerk.

Picturesque roads led from the ironworks to the world outside, with quaint signboards here and there adding to the attractiveness of nature. Along these roads, long before the middle of the eighteenth century, heavy freight wagons, or Conestogas as they later became known, transported merchandise, goods, and produce to and from Philadelphia, and between the boroughs and towns. Pig iron, castings, and bar iron were hauled in open carts over tortuous roads to the main highways. The cost of carriage under these conditions was exceedingly high. One ton of pig iron which sold for £5 at Colebrookdale Furnace cost from £1 to £2 to carry to Philadelphia, only 40 miles away.

Plantations close to rivers, especially those along the Schuylkill, sometimes used them to transport their products to market. But it was not until the early part of the nineteenth century, with the coming of the canals, that waterways came into extensive use.

Few travelers in the eighteenth century visited the iron plantations because of their remoteness from settled areas. Among the few were Peter Kalm, the naturalist, Israel Acrelius, pastor of Christina parish in Delaware, and S. G. Hermelin, metallurgist—all Swedes—as well as Dr. Johann Schoepf, surgeon to Hessian troops during the Revolution, to whom we owe much for details and descriptions. Many stories and legends came out of these early plantations, particularly concerning the ironmasters. Most famous perhaps is the legend of the hounds, associated in slightly different variations with a number of furnaces.

One version concerns a despotic, violent-tempered ironmaster much addicted to drink and the hunt. He returned from the hunt one day, according to the story, enraged because his hounds had played him false. Leading his entire pack up the furnace bridge to the blazing tunnelhead, with whip in hand, he drove them one by one into the inferno below. Only his favorite dog remained, quivering with fear. But after a moment's hesitation, he picked her up and cast her bodily into the furnace. A low, fearful moan, and it was all over! The ironmaster never hunted again. Losing all interest in life, he sat day after day before his fireplace, dulling his senses with drink. Then one morning, when he failed to appear, his servants found him dead in bed, whip in hand and eyes set in terror. Many a worker, in the years that followed, swore that on lonely winter nights he had actually heard the baying of the hounds and seen the terribly frightened ironmaster flee before them.

But ironmasters generally were men of good character. They were kindly and took genuine interest in the welfare of their men. The Colemans, Mayburys, Olds, Grubbs, William and Mark Bird, Thomas Potts and his sons and descendents, Stiegel, Rutter, and Nutt—all treated their men sympathetically.

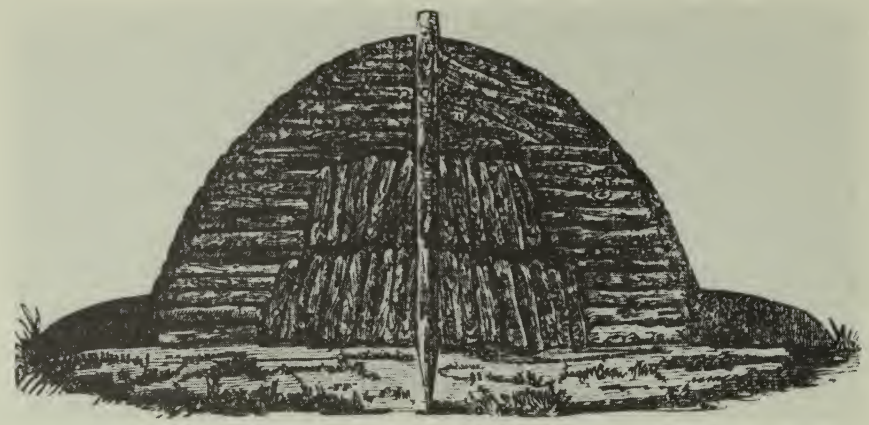
Washing ore at the Hopewell mines. Practically all the iron ores mined in the eighteenth century were bog or surface deposits. Washing the ore freed it of clay or earth. Courtesy Chester County Historical Society.

The Technique of Colonial Iron Manufacture

It was natural that men were attracted early to the manufacture of iron in Colonial America, for ore was plentiful. Acrelius, the Swedish pastor at Christina during the middle of the eighteenth century, wrote that there was more ore in Pennsylvania than the people could ever use. Iron deposits were found even among the loose stones on farm lands. The first ores used were those on the surface or just below; little technical knowledge and but a few simple tools were required to mine them. Trenches were dug, rarely more than 40 feet deep. When this depth was reached, new "mine holes" were started. Most of the Hopewell Furnace ores came from the Jones', St. Mary's, and Hopewell Mines, not far from the Village. Only a very few attempts were made at shaft mining before the Revolutionary War. Three or four good miners could generally supply all the ore needed for a single furnace.

Charcoal was the fuel used to smelt iron ore in America throughout the eighteenth century and the first three decades of the nineteenth. It

467241 O–58–3



Making charcoal. This cross section of a pile of cordwood illustrates the manner of stacking the wood preparatory to starting the "coaling" process. The fire is started in the pocket made by the withdrawal of the center pole. Illustration from Frederick Overman, *The Manufacture of Iron in All Its Branches,* 1850.

made an ideal furnace fuel, being almost free of sulfur, and its ash, consisting largely of lime and alkalis, supplied part of the necessary flux. The charring was done in open piles, mostly during the winter months. Generally it was done in the woods adjacent to a furnace or forge, but sometimes within the limits of settled boroughs. The charcoal "pit," or "hearth," was simply a circular clearing, dry and level, about 30 to 50 feet in diameter. Workers, known as colliers, were required to "coal" the wood, which was cut into given lengths for this purpose by the wood choppers and piled in the shape of a cone. As many as 10 or 12 colliers might be needed to keep a furnace going.

When the piles were in process of charring, they had to be watched day and night. Thus the bleak and lonely colliers' huts were built in the silent forests, far from the plantation center where the other ironworkers lived. Hickory was the best wood for making charcoal, but black oak and chestnut, being more abundant, were generally used. The wood was not charred immediately after being cut, but only a short time before it was needed. Large as most of the strong-walled charcoal houses were, they could not hold enough fuel to feed the furnace for any great length of time, and to have left the charcoal outside would have made it unfit for use. An average furnace would consume perhaps 800 bushels of charcoal every 24 hours, and this required about 50 cords of wood of 20- to 25-year growth. Some furnaces consumed almost the yield of an acre of woodland each day. Perhaps the one disadvantage of charcoal as a fuel was its lightness, which made it easy to crush. This was the factor which limited the height of colonial furnaces to a maximum of about 35 feet.

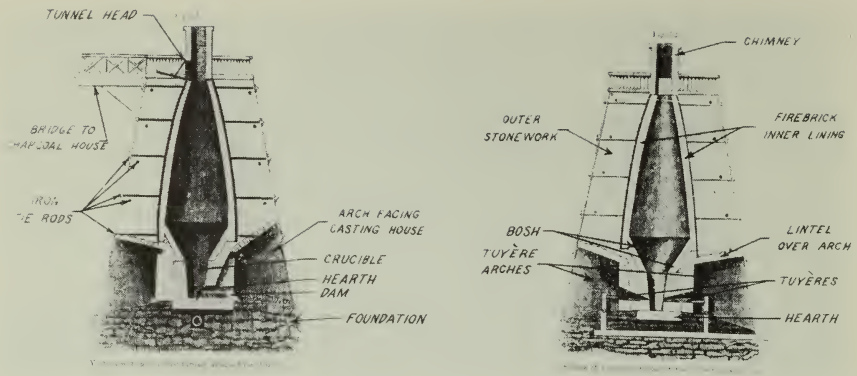
The outside portion of an eighteenth-century furnace stack was usually built of large blocks of limestone or other local stone. Between this and the inwalls came a few heat-insulating layers of clay, coarse mortar,

brickbats, and sand. The widest part of the inner chamber, the bosh, was usually 9 feet in diameter, or slightly less. Hopewell Furnace had a bosh of 6½ feet. This bosh, flaring inward and downward, supported the weight of the charge, relieved the central portion from pressure, and thus permitted the free passage of the blast. The crucible, a cylindrical reservoir at the bottom of the furnace into which the molten metal ran down and out over the hearth, was relatively small (only a few feet in diameter) because of the necessity of concentrating the molten iron to prevent it from solidifying.

Blast for the furnace or forge in the eighteenth century was supplied by bellows, similar to blacksmith's bellows but much larger, motivated by a huge water wheel. Long before the beginning of the nineteenth century, however, blowing cylinders or tubs, invented in England, were introduced. At first these were crude affairs, hardly more than two casks fitting into one another and moving up and down between four wooden posts. The air, passing first into a leather bag, was piped into the furnace through metal pipes. The blast in both cases was intermittent. They were soon followed by the so-called double cylinders—consisting of cylinders, pistons, connecting rods, together with a third cylinder or box to receive the air—which provided a more constant blast. At Hopewell Furnace the latter type was used at least as early as 1822, and possibly as early as the 1790's. On one side of the furnace was an arched recess, the "tuyère arch," in which a small opening allowed for the insertion of the "tue-iron" (tuyère), and also the iron pipe connected with the receiving box through which the blast was fed.

To distinguish between furnace and forge, which were not the same, the blast furnace represented the first step in the production of iron—the reduction of iron ore by smelting into ingots of cast iron or "pig iron." High in carbon content and impurities, and therefore brittle, pig iron

Charcoal wagon at the charcoal house on the furnace bank. Charcoal was hauled in huge metal-lined wagons from the "hearths" deep in the forest to the furnace bank where it was dumped.

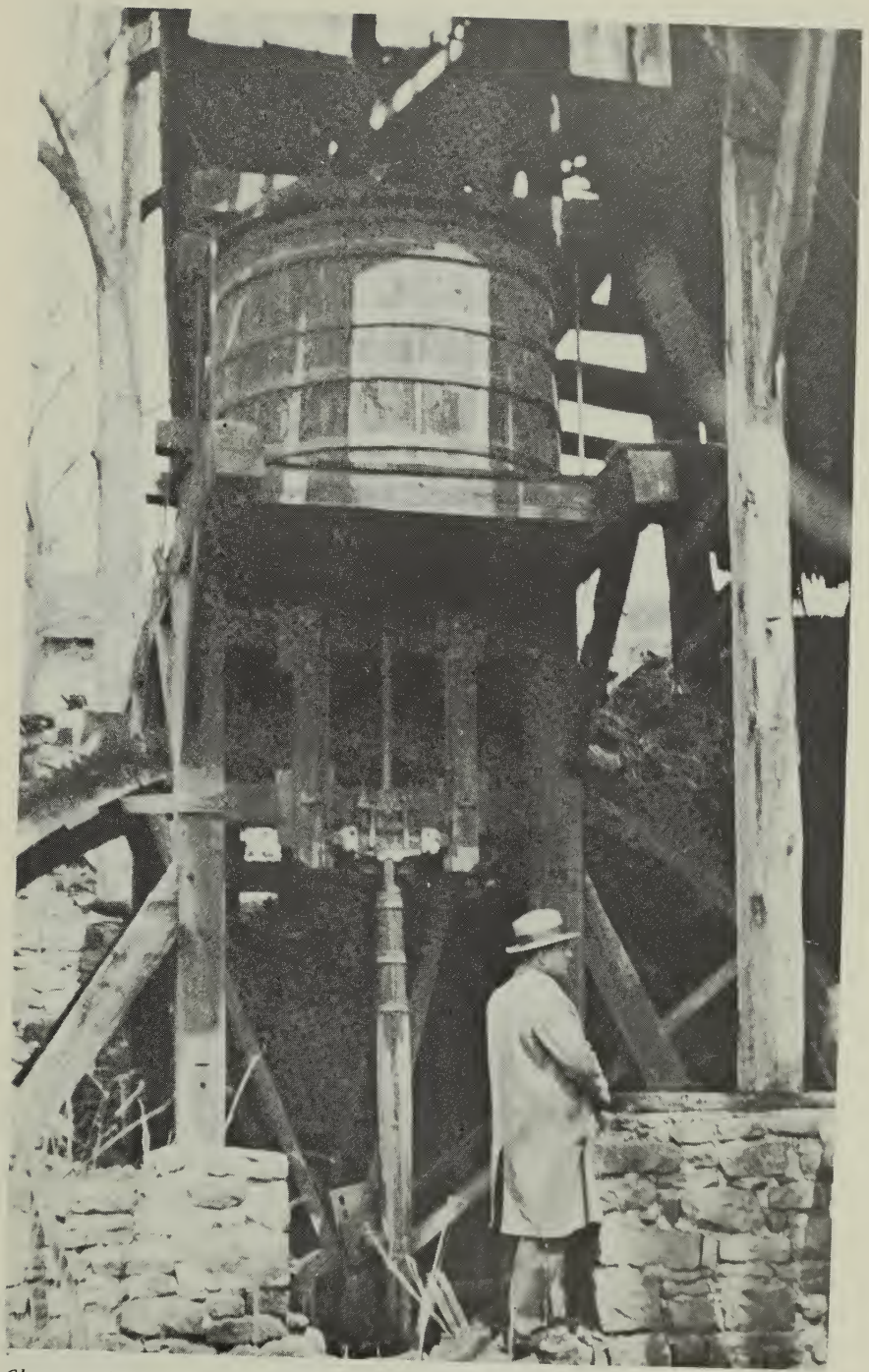


Cross-section plans of an early blast furnace. In the Hopewell Furnace the outer stonework is built up in steps or tiers. There are only one tuyère and two arches. This illustration is adapted from one which appears in Frederick Overman, *The Manufacture of Iron in All Its Branches,* 1850.

was limited in use to such things as stoves and hollow ware. For many products such as nails, horseshoes, tools, and wheel tires, malleable or wrought iron was required. The function of the forge was to change pig iron into this form by reheating in the forge fire and by subjecting the hot, pasty metal to repeated blows of the heavy forge hammer, driving off the excess carbon and impurities. This process was called "refining" and the product "bar iron."

The operation of a cold-blast, charcoal furnace was simple, though it required careful management. Iron ore, charcoal, and limestone were carried across the wooden bridge which led from the bank to the tunnelhead, or opening, of the stack, into which they were dumped in alternate layers. At the tuyère the blast was turned in, burning the charcoal at white heat and melting the iron, which then dropped down to the hearth below. The cinder or slag formed by the chemical fusion of the limestone with the impurities in the ore floated on top and was drawn off from time to time. About twice a day, sometimes oftener, the molten iron was run into the casting bed of sand, which was prepared for its reception by molds made from wood patterns. Some imaginative early ironmaster once compared this casting bed to a sow and her litter of suckling pigs. Thus the main stream, or feeder, from the furnace was called the sow, while the side gutters were called pigs. Before the iron became cold, the pigs were separated from the sow and the latter broken up into smaller pieces. It required about 2 tons of ore, 1 to 2 tons of charcoal, and a few shovelfuls of limestone to make 1 ton of pig iron. The average furnace produced some 500 tons of such iron a year.

Only a few workmen were needed to operate the furnace. Two founders, two keepers, two fillers, two guttermen, a potter, and a few laborers included them all. The founder, the most skilled workman at a furnace,



Close-up of Hopewell's last water-wheel and blast machinery taken about 1925.

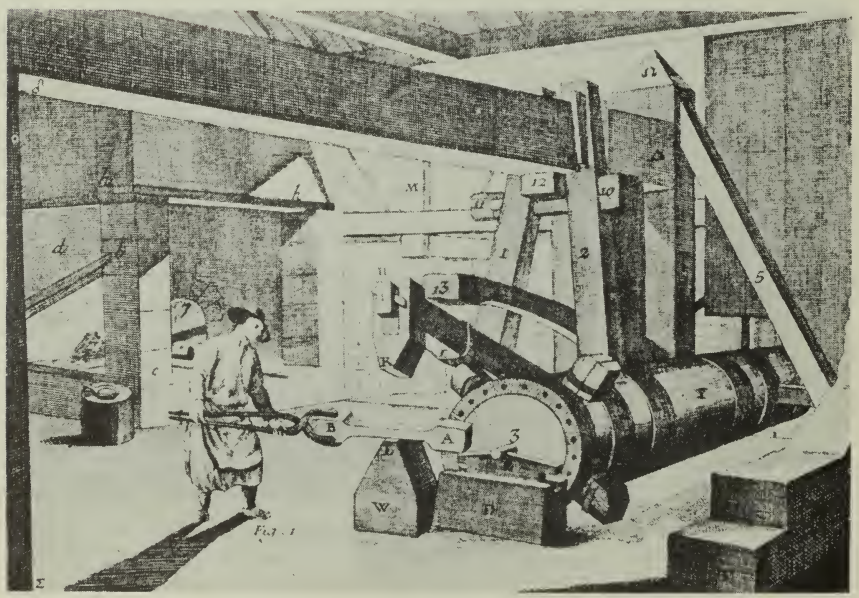
regulated the furnace, made the sand molds, and cast the iron. The keeper was the founder's right-hand man and was particularly responsible for the proper functioning of the blast equipment. The filler, as the name implies, "filled" the furnace at the top with the charge from the bridge house. The gutterman had charge of the sand molds in the cast house, while the potter (later called "Moulder"), a highly skilled artisan, made the small finished castings.

This was the main process. From the furnaces the pig iron went to refinery and ancony forges, or perhaps to another type of furnace for transformation into blister steel. Rolling, plate, and slitting mills produced wrought iron in bars or rods for use of the blacksmiths. Thus, iron products were manufactured for every need.

William and Mark Bird and the Founding of Hopewell Furnace

Among those far-seeing men whose imaginations became fired with the dream of building an American iron industry was William Bird, believed of Dutch ancestry and born in Raritan, N. J., in 1703. He went to work

Forging an ancony at a refinery forge. The refinery forge used pig iron from the furnaces. The finished product, an ancony, was a flat, thick bar of wrought iron, with a knob on each end. This illustration is from Diderot and Alembert, *Recueil de Planches sur les Sciences, les Arts Liberaux, et les Arts Mechaniques,* 1765.



Hopewell water wheel and blast machinery restored in 1952.

for Thomas Rutter, the pioneer ironmaster, at Pine Forge, where in 1733 he earned a woodchopper's wages of 2 shillings and 9 pence per cord.

Before very long, however, young Bird went into business for himself. He acquired extensive lands west of the Schuylkill in the vicinity of Hay Creek, where he built the New Pine Forges in 1744. At this time also he began the construction of Hopewell Forge, believed to have been located at, or near, the present Hopewell Furnace site. Later still, in 1755, he built Roxborough (Berkshire) Furnace. By 1756, he had taken up 12 tracts of land containing about 3,000 acres. The estate upon which his forges stood was alone valued at £13,000 in 1764; and long before his death, in 1761, he had become an important figure in the life of eastern Pennsylvania. His residence, built in 1751, can still be seen in Birdsboro, where it is now used by the Y. M. C. A. It serves as a good example of domestic architecture in that time and place.

Mark Bird, the enterprising son of William Bird, took charge of the family business upon his father's death in 1761, and soon expanded it. The next year, he went into partnership with George Ross, a prominent Lancaster lawyer, and together they built Mary Ann Furnace. This was the first blast furnace west of the Susquehanna River. Eight or nine years later, apparently abandoning or dismantling his father's earlier Hopewell Forge, Mark Bird erected Hopewell Furnace on French Creek, 5 miles from Birdsboro. The date 1770–71 is cut into a huge block of stone at one of the corners near the base of the Hopewell Furnace stack. At the same time, he built Gibraltar (Seyfert) Forge, also in Berks County. All the Birdsboro forges eventually came under his control, and to these works he added a slitting mill before 1779. An inventory of his properties lists for that year: 10,883 acres of land, 1 furnace, 2 forges and two-thirds interest in Spring Forge, 1 slitting mill, 1 saw mill, 2 pleasure carriages, 28 horses, 30 working oxen, 18 horned cattle, 12 negroes, 1 servant, and £3,767 cash. Bird also seems to have built a nailery about this time, although the tax lists do not mention it. Even after the Revolutionary War, when mounting debts fastened themselves on his investments, he continued to expand, building a forge and slitting mill in 1783 at the Falls of the Delaware River, opposite Trenton, in partnership with his brother-in-law, James Wilson.

Few details are available regarding the Hopewell of these years, for most of the original records are gone. In appearance, no doubt, it was not too different from the village of later years, with the furnace and adjoining structures as its center, and the office, Big House, barn, and tenant houses clustered about it. The inhabitants were mostly of Anglo-Saxon stock, in part original settlers and in part recent arrivals from the Old World. Very few of the early names reflect the German element, which predominated in this section. Most numerous perhaps were the Welsh (with names like Williams, Lewes, Davis, and Welsh), followed by the English. Among the English was Joseph Whitaker, a wood

The Boarding House, so named because many of the workers obtained their meals there. Photo by Hallman.

chopper who came to America with the British Army during the Revolution and settled near the furnace about 1782. Three of his many children who worked for the furnace in time became wealthy ironmasters, establishing ironworks in several States; and one of his great-grandsons—Samuel Whitaker Pennypacker—became Governor of Pennsylvania in 1903. These early workmen labored hard for Mark Bird, with whom they got along quite well.

That Mark Bird was prosperous, we may judge from the fact that in 1772 he became the highest taxpayer in the county, supplanting John Lesher, of Oley Furnace, and in 1774 the county increased the assessment on Hopewell Furnace sixfold. This expansion continued through the early years of the war.

By 1778, members of Bird's family were living in the Big House at Hopewell, which was enlarged, probably, in 1774. There is some doubt as to the years when Bird lived at Hopewell, but available evidence would seem to indicate from 1778, at least, to 1788.

The furnace had a production capacity of 700 tons per year before 1789, according to one contemporary authority, making it second only to Warwick Furnace with 1,200 tons. This estimate is probably correct, for in the blast of 1783, for which there is record, Hopewell produced 749½ tons of pig iron and finished castings. Pig iron was its principal product, of course, with pots and kettles, stoves, hammers and anvils, and forge castings following in that order. The number of men employed is not known, but it was probably less than 50, including wood choppers and colliers. The workmen were both freemen and indentured servants. An interesting entry in a surviving daybook for 1784 gives the names of five indentured workmen, two English and three Irish, and states that they were paid 14 pounds 8 shillings each—"as per Indenture"—upon the expiration of their terms of servitude. Negroes were also employed at Hopewell throughout its history, mostly as carters, but there is no indication that any of them were slaves. Bird did possess slaves and three of the four extant county assessment returns show that among his properties assessed for tax purposes there were 12 Negroes in 1779, 12 in 1781, and 2 in 1786, but it is not known whether any of them were employed at Hopewell or at one of Bird's forges.

Mark Bird's Services in the Revolutionary War

Many of these ironworks figured prominently in the Revolutionary War, for Mark Bird, like many other Pennsylvania ironmasters, was an ardent patriot. In 1775, when the war finally came, he served as lieutenant colonel of the Second Battalion, Berks County militia. Later, in August 1776, as Colonel Bird, he fitted out 300 men of the battalion with uniforms, tents, and provisions—all at his own expense. This force marched

The oldest of the tenant houses still standing at Hopewell.
Photo by Hallman.

East wing of the Big House. This is the oldest wing, built probably before 1770. In the lower right-hand corner are the bake ovens. Photo by Finch.

under his command to Washington's relief after the Battle of Brandywine in late 1777. He was a member of the Provincial Conference of 1776, and was elected to the Provincial Assembly.

Mark Bird's chief services to the American cause, however, were those of a patriotic philanthropist and munitions-maker, rather than of a soldier. Many of his ironworks, gristmills, and sawmills supplied the Continental Congress with the sinews of war. A report to the executive council of the Continental Congress, dated February 19, 1778, shows that he sent 1,000 barrels of flour to Philadelphia. The minutes of the Continental Congress for June 24, 1777, March 11, 1778, April 8, 1780, and September 10, 1783, refer to large quantities of iron supplies received from him. An interesting order of 1777 discharged 11 men from the militia so that they might be continued in employment "By Colonel Mark Bird, in the cannon foundry and nail works in Berks County in Pennsylvania, carried on by him for the use of the United States." Orders of $50,000 and $125,691 were issued, or recommended to be issued, in 1778 and 1780, respectively, in Bird's favor by the Continental Congress.

It seems very doubtful, however, that the ironmaster ever collected on the large amounts owed to him by the United States. On September

15, 1783, he addressed a memorial to the Continental Congress, requesting that the Great Chain which had been stretched across the Hudson River at West Point to obstruct British navigation be delivered to him in part payment on his account. This plea was denied "on the ground that he was a creditor of the United States along with the others, and no particular order should be given in his behalf."

The Postwar Years

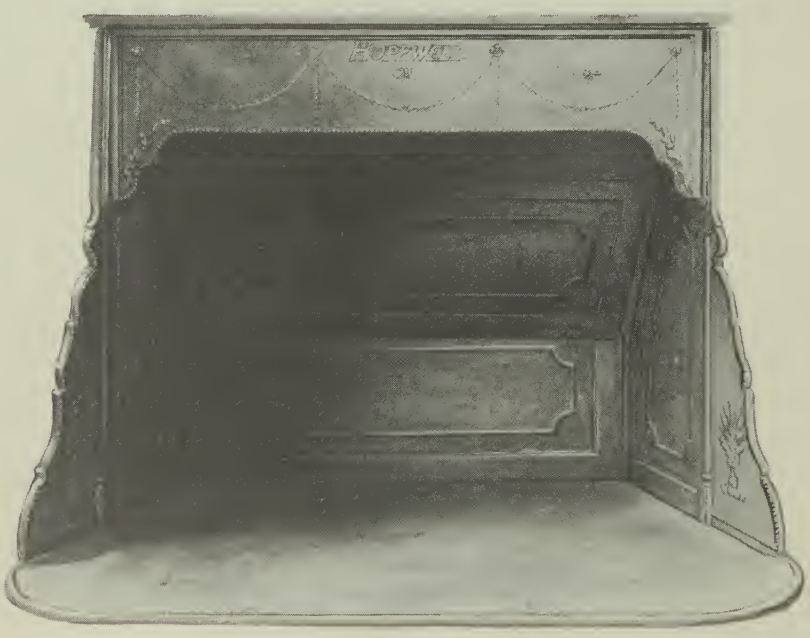
The fortunes of Mark Bird slid rapidly downhill after that. There was a flood on Hay Creek which ruined much of his property, and then came those postwar depression days when two or three Continental dollars would hardly buy a crust of bread. The furnace seems to have been out of operation in 1780 or 1781, for in the latter year Bird complained to the county that his "tax is too high, part of his iron work having not gone a long time;" and the tax records show that from 1782 through 1784, he paid only about one-fourth as much in taxes on his Hopewell properties as during the years immediately preceding and following. While 1783 appears to have been a good year from the standpoint of production, the years following were not. Between April 8 and September 14, 1784, only 196 tons of pig iron and 14½ tons of finished castings were produced, and in 1785 there is record of only 134 tons of pig iron and 30½ tons of finished castings.

In 1784, making a desperate effort to avoid the shoals of complete financial shipwreck, he borrowed 200,000 Spanish milled silver dollars from John Nixon, a wealthy Philadelphia merchant. The following year, through his brother-in-law, James Wilson, he tried to obtain from a group of financiers in Holland a long-term loan of 500,000 florin, indicating the value of his vast properties at 750,000 florin. Unsuccessful, his fate was sealed. Two years later, obliged to satisfy his debt, he assigned all his interests to Nixon. The Hopewell and Birdsboro properties were advertised for sheriff's sale in April 1788, and Bird moved to North Carolina. A letter written by him from there in 1807 to the celebrated Dr. Benjamin Rush, of Philadelphia, asking for financial assistance of friends (and medical advice from Dr. Rush for his rheumatism and sciatica) shows to what pathetic straits the once-powerful ironmaster was reduced. "There is no doubt my principle ruin was by the Warr & Depretiation," he wrote, and "I promise myself, they [i. e., his friends] will not let me suffer, when they come to know of my Situation." Dr. Rush noted on the back of the letter: "Declined Soliciting relief for him as all his friends of 1776 were dead or reduced." Mark Bird died in comparative poverty. Thus he joined the long list of other once-powerful Pennsylvania ironmasters who went bankrupt, a list which, besides his own, included such names as Matthias Slough, Frederick Delaplank, John Truckenmiller, and Henry William Stiegel.

Following the failure of Mark Bird, Hopewell passed into the hands of James Old and Cadwalader Morris, who acquired two-thirds and one-third interest, respectively. Both were famous ironmasters. Old was the father-in-law of Robert Coleman, the ironmaster of Cornwall; and his son, William, married Elizabeth, the daughter of Henry William Stiegel. In 1790, Cadwalader Morris transferred his interest to his brother, Benjamin Morris, and in 1791 James Old did likewise. In 1793, however, deed to the entire property reverted to James Old, with Benjamin Morris holding the mortgage. The amount of the mortgage was 8,857 pounds, 14 shillings, and 5 pence, to be paid off in five annual installments.

For the next few years the furnace operated under the firm name of James Old & Co. With the youthful Matthew Brooke, who was appointed manager in 1794, in direct charge, attempts were made to put it back on a paying basis. Castings, especially stoves and hollow ware, were in great demand and prices were improving. But despite some recovery, Old was unable to meet his annual installments. In consequence, in 1800, he was forced to yield his title through the law to his creditor, Benjamin Morris, who promptly bought it at a sheriff's sale. That same year, in August, Morris sold the property for £10,000 to a partnership composed of Matthew Brooke and his brother, Thomas Brooke, and their brother-in-law, Daniel Buckley.

Hopewell "Franklin stove," or fireplace, of the post-Revolutionary period.



Hopewell in the Early Nineteenth Century

It was under the Brookes that Hopewell reached its greatest prosperity. In 1800 and the years following, extensive repairs were made to the furnace and structures and improvements added to operating equipment both at the furnace and the mine holes. A stamping mill was constructed in 1805 to salvage iron from the slag, formerly a total loss, and in 1817 a cupola, or resmelting furnace, was added to increase the output of small castings. By the 1820's the furnace was operating at its peak, generally in excess of 300 days out of the year as compared with 235 days or less in former years. In the blast of 1800 Hopewell produced only 252 tons of pig iron and 59 tons of finished castings, while in the blast of 1824 the tonnage was 533 and 324, respectively. In those far-off days this was considered excellent, especially for an essentially eighteenth-century furnace.

While blast furnaces were designed primarily to produce pig iron for nearby forges, the growing need for finished castings for household, agricultural, and industrial uses made it profitable to concentrate more and more on the latter. This was particularly true during the "Canal Era" when distant markets could be reached cheaply by boat. With the completion of the Schuylkill and Union Canals, Hopewell found a ready market for all the finished castings it could produce, in Philadelphia, New York, Wilmington, Baltimore, and even more distant points. Thus, during the 15-year period from 1825 to 1840, more finished castings than pig iron were made here.

A large portion of these castings supplied the Philadelphia market, most of it in the form of stoves and fireplaces. In 1830, for instance, 777

A ten-plate (flask cast) stove made at Hopewell during the early part of the nineteenth century. Progress in the technique of stove-casting was rapid following the Revolutionary War.

stoves were purchased by 11 firms of that city. Hopewell produced a large assortment of cooking and heating stoves—at one time as many as 23 types and sizes. They were of fine quality, as surviving examples testify. There were "circular," "square," "stone coal," and "cannon" stoves. Most of them bore the name, "Hopewell," or that of the furnace owners, "Brooke and Buckley"; others were labeled: "Heiss," "Wm Penn," "Perry's Victory," "Wilmington," and so on.

But stoves were by no means the only castings made. Pots, pans, kettles, bake plates, mortars, and waffle irons for the household; mold boards, "corn-shelling machines," and windmill irons for the farmer; and "machinery castings" for industrial use were among the important products of the furnace in this era. Even unusual orders were sometimes filled. Thus, in 1817, a special "steam" stove was made for Dr. Joseph Shippen of Philadelphia. While in 1825–26, Hopewell supplied much of the cast-iron installations used in the cell blocks of historic Eastern State Penitentiary at Philadelphia. This penitentiary, begun in 1823 and completed in 1829, was revolutionary in design and for many years considered the finest in the world.

The visitor gazing upon the silent remains of the furnace group today can hardly realize that this quiet spot once surged with great activity; that in 1824, for instance, not less than 2,995 stoves were cast, in addition to other castings and pig iron; and that in the busy 1830's well over 160 men and boys were actively employed.

The climax in Hopewell's industrial career came in 1836, following extensive improvements and repairs in the preceding years and the rebuilding of the furnace in 1828. In the blast of that year, the furnace was in operation for 445 days, from January 3, 1836, to April 10, 1837, the longest in the entire history of Hopewell. A total of 1,169 tons of mixed castings was produced, exceeded only by the blast of 1853, with its record 1,205 tons of pig iron. Considering that more than half, or 720 tons, of the 1836 figure represented finished castings, which is a time-consuming process, that year's record is actually more impressive than the one for 1853. The daily average of 2.6 tons, also, was the highest for any year between 1770 and 1845, the period during which mixed castings were produced. Hopewell products were so much in demand in 1836 that the furnace was often forced to turn down orders from new customers, as scores of business letters of this period reveal.

Hopewell's Decline

The depression of 1837, coupled with the successful introduction of the hot-blast method in the smelting of iron in the following year, making possible the substitution of coke for charcoal, spelt the doom of the charcoal-burning furnace. Thus, of the more than 100 ironworks built in Pennsylvania during the eighteenth century, most of which survived

into the beginning of the nineteenth, only 12 were left by 1850. The number of anthracite furnaces in that year was 286. Hopewell managed to survive, but its days were numbered. By 1845, finished castings on a commercial scale were discontinued, as competition was too one-sided. Thereafter, the furnace concentrated on pig iron for which there was still a ready market. Some improvements were effected in the late 1840's which raised the average daily output to 3 tons by 1853. It was in that year, in fact, that Hopewell achieved its best record of pig iron produced, 1,205 tons. That the old furnace could not survive long, however, was clear to the owners, for in 1849 they erected nearby an experimental anthracite furnace. It was hoped that this new furnace would replace the old one. But the cost of bringing in anthracite coal was too great, and after a few years the experiment was given up as a bad investment.

The old charcoal burner continued operating, however, and in 1857 even produced 1,094 tons, the third highest record. This was the fourth and last time it made over 1,000 tons in any one blast. From then on the story is one of decline, or, at best, of just hanging on. Even the war years, contrary to local tradition, with pig iron selling at as high as $99

Hopewell "mine hole" near Warwick. Practically all early mines were open pits, the rich veins of ore lying near the surface. Shaft mining did not become general until well into the nineteenth century. Courtesy Chester County Historical Society.

Winter scene in Hopewell Village in the early nineties. After 1883, when the furnace closed down, the woodland surrounding Hopewell continued to make good returns from charcoal production for several years. Courtesy Chester County Historical Society.

per ton, did not make much difference. The best Hopewell could produce was 933½ tons in 1861. An important reason for this, no doubt, was the fact that by that time the best ore deposits in the vicinity had been used up, and the remaining ore, high in sulfur and other impurities, did not yield as much per ton.

From 1870 to 1883, almost the entire furnace output went to A. Whitney & Sons, the big car wheel manufacturers of Philadelphia, and it is not improbable that Hopewell iron has rolled over several of America's transcontinental railroads. But the postwar picture was generally drab, for it was evident that Hopewell had outlived its era. Cold statistics plainly reveal that industrially it could not even match its own prewar record, let alone compete with newer processes. In social aspects, plantation life had lost much of its earlier character, its quaintness, simplicity, and even charm.

One last effort was made to keep the furnace going by making improvements. A steam boiler was installed in 1880 to provide auxiliary power for the water wheel (fueled by gas from the furnace, it was the one modernization "suffered" by the furnace); and an ore roaster, in 1882, was added to calcine ore. The water wheel was substantially re-

built, and the old receiver of the blast equipment was replaced by a larger one. All this was to little avail, however, for in 1883 the furnace was blown out for the last time.

Hopewell was one of the last of the old cold-blast, charcoal-burning furnaces. Owing to many favorable circumstances, it continued in operation long after most of its kind had been supplanted by more modern methods and plants.

The Brookes and the Buckleys

This account would not be complete without more than passing reference to the Hopewell ironmasters of the ninteenth century, the Brookes and the Buckleys, under whom the furnace enjoyed so much growth and prosperity. Members of these two closely related families owned and operated the furnace continuously from 1800 to 1883, and the property remained in the hands of the Brookes until 1935 when it was transferred to the Federal Government.

The chain of title began, as mentioned earlier, with the equal partnership of the two brothers, Matthew and Thomas Brooke, and their brother-in-law, Daniel Buckley, all ironmasters experienced in the early iron business. Following Matthew Brooke's death in 1821, it continued in the hands of the remaining partners, who in 1824 effected a settlement with the children of the deceased partner for the one-third share of the undivided estate. In 1827 and 1830, respectively, Daniel Buckley and Thomas Brooke willed their individual one-half shares to their respective children. Two sons of Daniel Buckley later assigned their interest to a third son, Matthew Brooke Buckley. The sons of Thomas Brooke, Clement and Charles, elected to continue as partners. In 1852, Clement Brooke bought out his brother through court action, thereby obtaining one-half interest in the property. In 1861, Clement, in turn, willed this one-half interest to his daughter, Maria T. Clingan, wife of Dr. Charles M. Clingan, the manager. A few years earlier (in 1856) Edward S. Buckley, son of Matthew Brooke Buckley, had succeeded to his father's share.

All of these successive owners of Hopewell were practical iron men, active both at Hopewell and at other ironworks. The degree of their actual control and direction of affairs at Hopewell is reflected through the years by the changing firm name: "Thomas Brooke & Co.," "Buckley & Brooke," "Daniel Buckley & Co.," "Clement Brooke & Co.," and "Clingan and Buckley." But one of them, Clement Brooke, stands out far above the others, second only to Mark Bird among Hopewell ironmasters. Clement Brooke was more intimately connected with Hopewell, over a longer period of time, and left a more lasting impression on it, than any other. His name appears more often in the furnace records than even Mark Bird's.

Clement Brooke started work at Hopewell in 1804, when quite a young man, as assistant to his father. By 1816, he was actively managing the furnace. For the next 33 years, until 1849, he directed virtually every phase of Hopewell activity. These were the years of Hopewell's greatest prosperity. Recognizing that efficiency was the key to profitable operation of the furnace in a period when the tempo of business was increasing, he introduced many changes and undertook new construction. There was more construction activity during those 33 years than during the preceding 46 years or the 34 years that followed. In addition to extensive repairs to existing structures and buildings, he built new ones. In 1817, the cupola was built to make more and better finished castings. In the years following, several improvements were added to the blast machinery. The furnace was completely rebuilt in 1828, with increased capacity. Shaft mining was expanded at Hopewell and Jones' Mines and the latest hydraulic equipment installed.

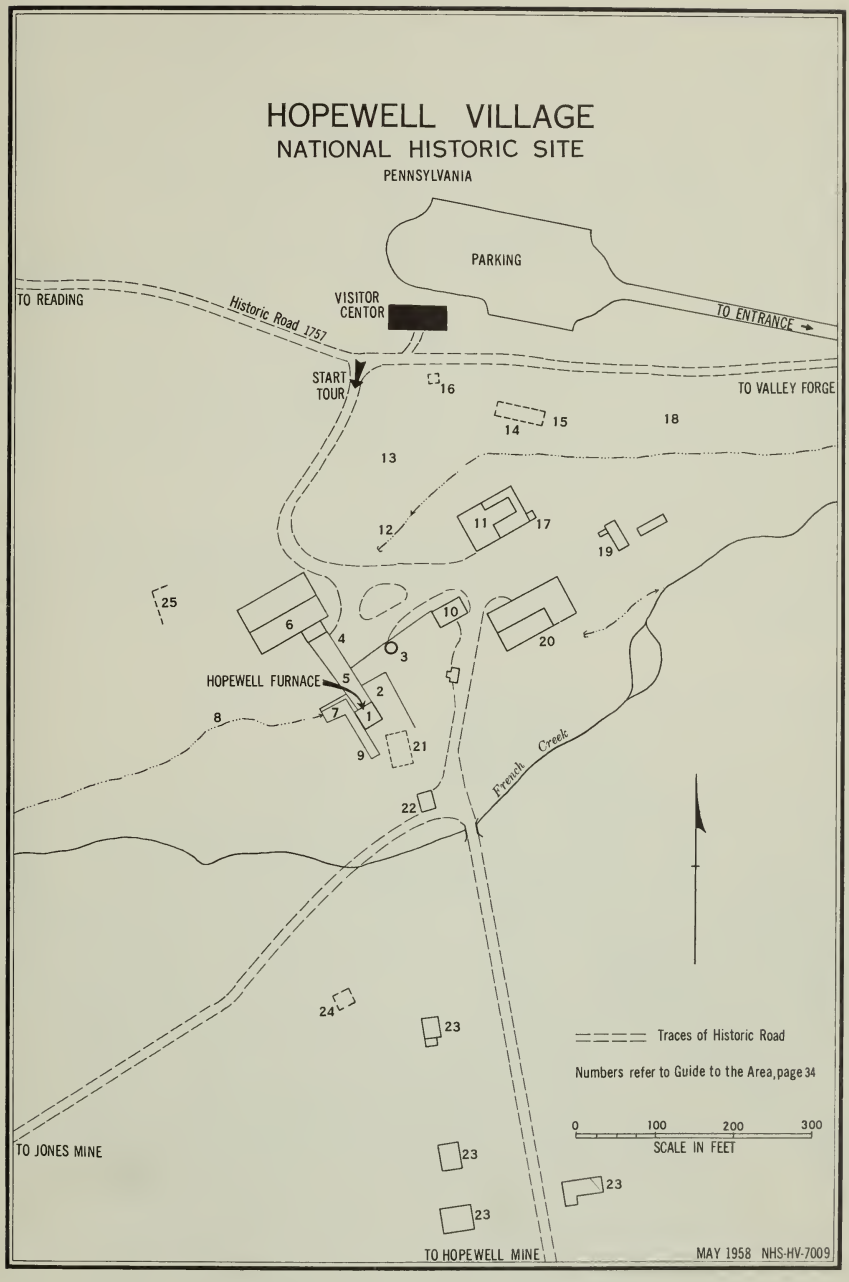
Clement Brooke believed in promoting the efficiency of the workers by improving their conditions. He increased their wages and rewarded them for "perseverance"—sometimes with silver watches, as entries in the account books show. For his miners, who had been living in log cabins at the mine holes, he built stone houses. He promoted one of them, John Benson, to furnace clerk, noting that he was neat of hand, alert, and dependable. The exquisitely fine penmanship in the furnace books of this period, one of which is on display in the temporary museum, came from his hand. John Benson later became an ironmaster in his own right at another furnace.

Drunkenness among the workers, a great problem at early ironworks, was radically reduced. Clement Brooke made his skilled workmen at least subscribe to the *Temperance Advocate*, probably paying for the subscription himself. For education of the children, he built a schoolhouse in 1836. (It stood just back of the tenant house which is nearest to Joanna Road, and was used until 1870.)

Indicative of Clement Brooke's wide interests is the number of newspapers and periodicals he subscribed to (as many as 14 in the 1840's), dealing with technology, farming, politics, religion, and temperance.

In 1849, he turned over active management of the furnace to his son-in-law, Dr. Charles M. Clingan. A few years later he retired to his farm, but he continued his keen interest in its affairs, as well as part-ownership, until his death in 1861. His connection with Hopewell Furnace spanned more than half a century, about one-half of its entire active history.

Dr. Clingan, who married Maria T. Brooke in 1843, began his association with the furnace shortly thereafter. The son of an ironmaster, he studied medicine in Philadelphia. But business was his main interest and he engaged in various enterprises in Philadelphia and Reading. Dr.


HOPEWELL VILLAGE
NATIONAL HISTORIC SITE
PENNSYLVANIA
PARKING
TO READING
Historic Road 1757
VISITOR CENTOR
TO ENTRANCE
START TOUR
TO VALLEY FORGE
HOPEWELL FURNACE
French Creek
Traces of Historic Road
Numbers refer to Guide to the Area, page 34
0 100 200 300
SCALE IN FEET
TO JONES MINE
TO HOPEWELL MINE
MAY 1958 NHS-HV-7009

Clingan managed Hopewell Furnace actively for about two decades, becoming co-owner with Edward S. Buckley following the death of Clement Brooke in 1861. He was an energetic man, handsome in appearance, and well-liked by the workmen. He died in 1875, in Philadelphia, last of the Hopewell ironmasters. The remaining partner, Buckley, carried on at Hopewell through his resident manager, Harker A. Long, until the furnace closed down permanently in 1883.

After 1883, the woodland adjoining Hopewell Village continued to make good returns for several years, but the active days of cold-blast, charcoal-iron manufacture were over. Important technological changes in the industry had already begun to take place about 30 years before. The small, stone furnaces of Pennsylvania have given way to huge smelters towering 100 feet or more, with giant heating stoves, blowing engines delivering thousands of cubic feet of hot blast per minute, and a vast array of dust arresters, gas washers, and automatic ore- and coke-handling machinery. Water power has been superseded by steam and electric power; while coke as fuel has taken the place of charcoal, and also of anthracite, which was used to some extent after 1830. Hopewell Village is thus but a memory of a long and picturesque era in the iron industry.

Guide to the Area

This guide is arranged to enable you to make your own tour of the area by following the numbers appearing on the sketch map on the preceding page. These numbers correspond with the numbers below, preceding descriptions of the most important physical remains, terrain features, and historic buildings on the site. Buildings and physical remains are indicated on the map in solid lines; sites of structures that no longer exist are shown in broken lines. While the tour suggested is the most convenient for covering all the points of interest, it need not be strictly followed, and you may select any other approach.

1. HOPEWELL FURNACE. The furnace was first built in 1770–71, rebuilt in 1828, and operated in all for 113 years, until 1883 when it was blown out for the last time. It was a typical charcoal-burning, cold-blast furnace of the eighteenth and early nineteenth centuries. Its outer dimensions are 32 feet high and 22 feet square at the base and the bosh (largest dimension of the inner core) is 6½ feet. With an average annual capacity of 700 tons, it was one of the largest furnaces of its time. Furnaces cast ingots of iron, called "pig iron" (which forges later refined into malleable iron for hardware, nails, etc.), stoves, hollow ware, and other products. The *charge*—iron ore, charcoal for fuel, and limestone for flux—was introduced in alternate layers through the *tunnel head* at the top; and the molten metal was "tapped" or run out through a hole in the damstone

which was located directly under the casting arch. Like most eighteenth-century furnaces, this one had but one *tuyère* (opening) for conveying the blast into the furnace. It is located directly under the tuyère arch, which faces the furnace bank. A blast pipe conducted the air from the bellows to the tuyère pipe, which was inserted into the tuyère. Generally, about 2½ tons of ore and 180 bushels of charcoal were required to make 1 ton of iron. Hopewell Furnace operated throughout its history as a primitive eighteenth-century blast furnace, although in 1828 it was rebuilt and its top capacity, because of improved blast equipment, increased to 1,000 tons or more.

2. CAST HOUSE. The cast house, which is no longer in evidence, was a large frame structure situated directly in front of the casting arch and extended eastward from the furnace. Inside were the casting beds of sand—a pattern of gutters called "sows" and "pigs"—into which the

The Hopewell Furnace group as it appeared in 1896. In the background from left to right are the furnace, bridge house, and open-sided shed on furnace bank. In the foreground is the shell of the cast house, the boarded portion to the right being the moulding room. Courtesy Chester County Historical Society.

molten metal flowed from the main gutter or runner. Finished castings such as stoves and hollow ware were made in the northern part of the building, called the "moulding room."

3. ORE ROASTER. Built in 1882, or a year before the furnace closed down, the ore roaster was a cylindrical structure of boiler plate about 12 feet high. The masonry base of the roaster may be seen just south of the wall which extends from the furnace bank to the office. Ore was dumped into the top along with anthracite coal, charcoal, or wood (for fuel), and after roasting, came out the bottom. The masonry mound served to spread the roasted ore onto the flat stones on the ground. Roasting, or calcination, of some types of ore was necessary to rid the ore of impurities and to loosen its texture for better smelting.

4. FURNACE BANK. This was perhaps the most conspicuous and important terrain feature of a typical eighteenth-century iron-making community. Before the days of steam and electricity, furnaces were usually built close to a bank to provide a practical means of access to the furnace top, over a connecting bridge. This was the destination for the wagons hauling ore, charcoal, and limestone to the furnace. Here stood the char-

Furnace bank, Hopewell Furnace, and portion of charcoal house as they appeared in 1949. Photo by Finch.

Hand-carved mantelpiece and "Franklin stove" in the dining room of the Big House. Photo by Finch.

coal house, and it was here that boys employed by the furnace riddled the ore. Prices for furnace products were often quoted in terms of "at the Bank" or "on the Bank." Along with the cast house below, the furnace bank was the scene of greatest activity.

5. BRIDGE HOUSE. A solid frame structure, the bridge house consisted of two parts: an open-sided shed leading from the entrance to the charcoal house to the end of the bank, and a covered bridge spanning the space between the bank and the furnace. Charcoal wagons pulled into the shed as they arrived from the "pits" with their charcoal, ready for unloading. Over the bridge, "fillers" carried or carted in baskets the charge to the tunnel head. In the bridge house, too, were kept the ore and limestone bins, filled and ready for instant use, as well as the scales for measuring the charge.

6. CHARCOAL HOUSE. The "Coal House," as the name implies, was for the storage of charcoal. Charcoal was originally called "coal" and what we now know as coal was called "stone coal." Substantially rebuilt in 1880 with a capacity of 55,000 bushels, it held enough charcoal to operate the furnace for about 3 months. Charcoal was stored inside to keep it from deteriorating in the weather.

7. WATERWHEEL-BLAST MACHINERY. The wheel, 22 feet in diameter, is turned by water from Hopewell Lake brought by the West Head Race. The wheel operates the blast machinery above it. The two tubs are double acting cylinders, with pistons which compress air. The compressed air is transferred by a system of valves into the rectangular receiving box between the tubs. From the box, the air enters the bottom of the furnace through the copper pipe. Air pressure was needed both to make a hotter fire and to supply additional oxygen. The machinery produces about three-quarters of a pound of air per square inch. The wheel and blast machinery were restored by the National Park Service in 1952.

8. WEST HEAD RACE. Water to drive the wheel is obtained from nearby streams by means of ditches or races. The West Head Race, one-quarter of a mile long, extends from Hopewell Lake (formerly the smaller furnace pond) to the wheel pit. It was restored in 1952.

9. TAIL RACE. The stone-lined ditch in the rear of the furnace connecting with the wheel pit carries the spent water from the wheel back into French Creek. It goes underground a few feet south of the furnace and emerges again 400 feet to the east, near the southeast corner of the barn, from where it leads into the creek.

Springhouse and lard kitchen, one of several outbuildings associated with the Big House. Photo by Finch.

Ruins of Hopewell wheelwright shop in 1895. To the left is the blacksmith shop and in the foreground, the old section of the Birdsboro-Warwick Road. Courtesy Chester County Historical Society.

10. OFFICE AND STORE. This is one of the best-preserved buildings, as well as one of the oldest. It probably formed a part of the original village at the time the furnace was built, for references to it have been found as far back as 1784. It was used as a combination furnace office and plantation store. The west room on the main floor (containing the built-in safe) served as the office. Here were kept the records of ore and charcoal used, pig iron cast and sold, orders for stoves and other furnace products, wages paid for labor, and all the other bookkeeping details of the iron-making business in the early days. In the east room was the store where drygoods, groceries, and other items were sold to the furnace workers on a credit basis.

11. BIG HOUSE. This large house was the residence of the ironmasters or their managers. It was popularly referred to as the "Big House," in contrast with the small tenant houses in which the workmen lived. Built in the form of a "T," in three stages, it underwent some change in the nineteenth century. The rear section—the stem of the "T"—is the oldest and probably was already standing in 1770 when the furnace was built. The "steps" on the roof, the long front porch and floor-length windows, and the bathroom over the north porch, are mid-nineteenth century and even later additions. Altogether the house contains 14 rooms, bath, hallway, and 2 cellars. Most interesting features of the interior are the main staircase and the mantelpiece in the dining room, both hand-carved. The house is not yet furnished, although a nucleus of its early furnishings is

already on hand. This consists of late Empire and Victorian beds, wardrobes, tables and chairs, a piano, a sideboard, and a few other objects. Practically every ironmaster from Mark Bird to Dr. Charles M. Clingan lived in the Big House at one time or another. Despite long and continuous use, it is still in excellent state of preservation.

12. EAST HEAD RACE. To the north of the Big House, separating it from the larger portion of the gardens, is the East Head Race. About a mile long, beginning in the Baptism Creek area to the east and ending near the Birdsboro-Warwick Road just west of the Big House, this race, as well as the West Head Race, supplied water to the furnace wheel. Considerable portions of this race have been restored.

13. GARDEN. To the north of the mansion, extending up the hillside, was once a semiformal garden, with old-fashioned flowers, boxwood, trelliswork, walks, a combination summerhouse and icehouse, greenhouse, and gardener's toolhouse. The path from the mansion to the parking lot is the site of the historic path. A row of boxwood screened the garden from the road above, and the garden was surrounded by a whitewashed picket fence. There was also a vegetable garden here to supply the mansion with vegetables.

14. GREENHOUSE. The ruins of the greenhouse are clearly visible on the hillside. It was probably built about 1850. It contained two sections—one a grapery and the other a hothouse for flowers.

Restored furnace, bridge house, furnace bank, and walls as they appeared in 1958.

15. GARDENER'S TOOL HOUSE. It once stood just off the southeast corner of the greenhouse.

16. SUMMERHOUSE. A slight depression near the top of the hillside to the right of the path now marks the site of the summerhouse. Underneath was the icehouse. The earliest reference to an icehouse in Hopewell records is for 1833. The ice probably came from the old furnace pond, now the site of Hopewell Lake.

17. BAKE OVENS. Restored in 1955, the two ovens were probably used for community baking. They stand near the southeast corner of the mansion. One was first built in 1824, and the other in 1842. The shingle roof protected the baker standing at the oven door.

18. ORCHARD. East of the gardens and extending along the hillside for a distance was an apple orchard which provided the people with much of their fruit, cider, and apple butter. There were three orchards at Hopewell in the early days (one of them a peach orchard) and this one was probably the oldest.

19. SPRINGHOUSE. The cool water of springs was widely utilized in former times for preserving food. The springhouse was generally a small stone structure with a roof over it, built around a nearby spring which was deepened and widened to form a springbox and trough. Hopewell's springhouse was larger than most, containing three rooms. The northernmost one has the spring box for catching the flow and the center one the cooling troughs where dairy products and other perishables were kept in partially submerged crocks. The southernmost room, the "lard kitchen" with its huge fireplace, is actually not a part of the springhouse but rather a structure added to it in a later period. The heavy accumulation of oil and soot in the fireplace indicates that many kettles of lard, apple butter, and soap must have simmered here through the years. The cement floors probably date from the 1870's.

20. BARN. The barn now in evidence is a new one, built about 1928—before the Federal Government acquired the site. But portions of the historic walls, incorporated into the new one, can be seen from the inside. Below were the stables for draft animals and cattle. The present structure is used to house the fine Edward Brooke collection of late nineteenth-century carriages.

21. WHEELWRIGHT SHOP. Nothing remains of this building, which once stood between the furnace and the blacksmith shop. A frame structure with an attic, it was about 15 feet wide and 20 feet long. In the shop were a workbench fitted with wooden tools, a shaving horse, a pit in the floor for the turning of the wheel as spokes were fitted into the hub which rested on blocks, an old wood stove, the usual reamers for making

hubs, and all the customary tools found in a typical carpenter and wheelwright shop of the early days.

22. BLACKSMITH SHOP. This small stone building standing near the wooden bridge which spans French Creek was built sometime after 1770 and before 1780. Here the work animals were shod and simple hardware and furnace tools made and repaired. The old stone forge, leather handbellows, pole-lever wood drill press, and wooden crane, as well as hand tools, are to be seen within the shop. Not all of these are original, however. The blacksmith was an important artisan in early America, doubly important at furnaces where, in addition to his regular duties, he often had to make mechanical repairs to furnace equipment.

23. TENANT HOUSES. The four stone houses along the Birdsboro-Warwick Road (the one standing by itself was once used as a boarding house) were among the many which ironmasters provided for their workmen. Others stood along this and other roads leading into the village, as well as scattered about in the surrounding wooded area and at the mine holes. Most of them were rude log cabins, however. All of them were of simple construction and furnished with the barest essentials. The largest of the four (the duplex) is obviously the newest, probably built near the middle of the nineteenth century.

24. SCHOOLHOUSE. The site of Hopewell's old schoolhouse is marked by a slight depression ringed with an irregular heap of rocks now grown over with trees, on the south side of Joanna Road and to the rear of the first tenant house. It was a typically old-fashioned stone schoolhouse, one and a half stories high and approximately 30 feet square, accommodating 35 to 40 pupils. Built in 1836 by the ironmaster, at the height of Hopewell's prosperity, it was last used in 1870.

25. ANTHRACITE FURNACE. By wandering into the woods for a short distance, near the northwest corner of the charcoal house, you will find the ruins of an experimental anthracite furnace—the first and only attempt at Hopewell to convert from the use of charcoal to anthracite in the smelting of iron. Built in 1849 by Clement Brooke, the ironmaster, it proved unprofitable and 3 years later was moved to Monocacy. Large portions of the sandstone inner-lining are exposed to view, revealing the glazing effects of intense heat.

How To Reach the Site

Hopewell Village National Historic Site is 5 miles southeast of Birdsboro, Pa., and is reached from the north by U. S. 422, State Route 82, and a hard-surfaced county road. From the south it is reached over State

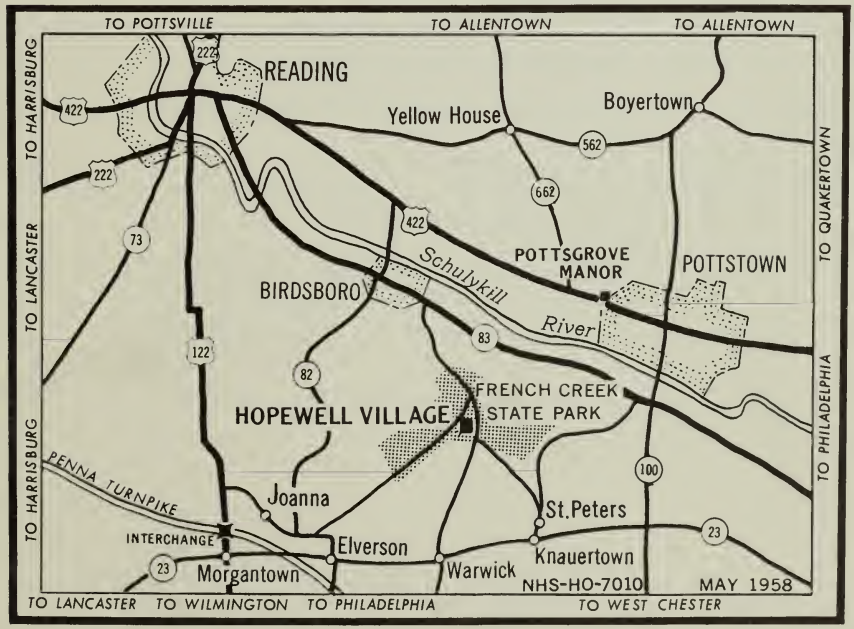
Route 23 to Warwick. Hopewell is 3 miles north of Warwick. The Morgantown Interchange of the Pennsylvania Turnpike is 6 miles west of Warwick.

About Your Visit

Hopewell Village is open daily from 9:30 a. m. to 5:30 p. m., and until 7:30 p. m. on Saturdays, Sundays, and holidays from July 4 through September. Exhibits telling the Hopewell story, illustrated by castings produced at Hopewell and objects and tools associated with the furnace and the village, are in the visitor center. Free literature regarding the site is obtainable, and services of historians and other personnel are available. Organizations and groups are given special tours if arrangements are made in advance with the superintendent.

Administration

Hopewell Village National Historic Site is administered by the National Park Service of the United States Department of the Interior. Communications should be addressed to the Superintendent, Hopewell Village National Historic Site, R. D. 1, Elverson, Pa.



Associated Areas

Hopewell Village represents one phase of the highly interesting story of the ironmaking industry in America.

The Saugus Ironworks Restoration, Saugus, Mass., sponsored by the iron and steel industry and the First Iron Works Association, Inc., commemorates the "birth" of the industry in this country.

Cornwall Furnace, located on State Route 322 southeast of Lebanon, Pa., depicts some of the improved methods of ironmaking that were not incorporated in the operation at Hopewell Furnace. Significant of the 1857 period, Cornwall Furnace is administered by the Pennsylvania Historical and Museum Commission.

Pretentious though it was by comparison with the homes of the workers, the Big House was often modest beside the townhouses maintained by many of the ironmasters. A splendid example of the magnificence in which these artisans indulged is Pottsgrove Manor, the townhouse of John Potts, located on State Route 422 at the west end of Pottstown, Pa., also administered by the Pennsylvania Historical and Museum Commission.

Suggested Readings

BINING, ARTHUR CECIL. *Pennsylvania Iron Manufacture in the Eighteenth Century, Harrisburg, Pa.* Publications of the Pennsylvania Historical Commission. Vol. IV. 1938.

MONTGOMERY, MORTON L. *Historical and Bibliographical Annals of Berks County, Pennsylvania.* Chicago. 1909.

LONG, HARKER A. *A Short History of the Hopewell Furnace Estate.* Reading, Pa. 1930.

PETERS, RICHARD. *Two Centuries of Iron Smelting in Pennsylvania,* Pulaski Iron Works. Philadelphia. 1921.

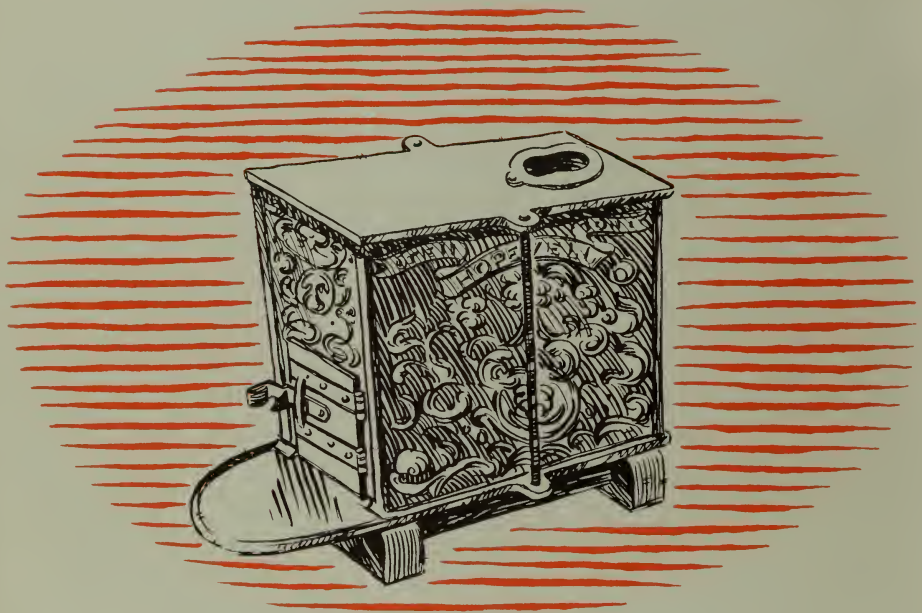
PEARSE, JOHN BERNARD. *A Concise History of the Iron Manufactures of the American Colonies Up to the Revolution, and of Pennsylvania Until the Present Time.* Allen Lane & Scott. Philadelphia. 1876.

U. S. GOVERNMENT PRINTING OFFICE : 1958 O—467241

HISTORICAL HANDBOOK SERIES

FOR SALE BY THE SUPERINTENDENT OF DOCUMENTS, U. S. GOVERNMENT PRINTING OFFICE, WASHINGTON 25, D. C.

Bandelier (No. 23), 25 cents
Chickamauga and Chattanooga Battlefields (No. 25), 25 cents
Custer Battlefield (No. 1), 20 cents
Custis-Lee Mansion (No. 6), 25 cents
Fort Laramie (No. 20), 25 cents
Fort McHenry (No. 5), 25 cents
Fort Necessity (No. 19), 25 cents
Fort Pulaski (No. 18), 25 cents
Fort Raleigh (No. 16), 25 cents
Fort Sumter (No. 12), 25 cents
George Washington Birthplace (No. 26), 25 cents
Gettysburg (No. 9), 25 cents
Hopewell Village (No. 8), 25 cents
Independence (No. 17), 25 cents
Jamestown, Virginia (No. 2), 25 cents
Kings Mountain (No. 22), 25 cents
The Lincoln Museum and the House Where Lincoln Died (No. 3), 20 cents
Manassas (Bull Run) (No. 15), 25 cents
Montezuma Castle (No. 27), 25 cents
Morristown, A Military Capital of the Revolution (No. 7), 25 cents
Ocmulgee (No. 24), 25 cents
Petersburg Battlefields (No. 13), 25 cents
Saratoga (No. 4), 20 cents
Shiloh (No. 10), 25 cents
Statue of Liberty (No. 11), 25 cents
Vicksburg (No. 21), 25 cents
Yorktown (No. 14), 25 cents



A six-plate Hopewell stove