

**sauagus**  
**iron works**

## **Ironworks on the Saugus**

The economic crisis in the Massachusetts Bay Colony caused by the end of the great migration from England of the 1630s spurred local interest in manufactures. As fewer ships came to New England, iron products became scarcer and more expensive. Thus, the government became increasingly concerned with the development of the region's vast resources.

In 1641 the General Court of the colony enacted an ordinance for "encouragement to discovery of mines." By this legislation, anyone discovering mineral deposits in the colony was to possess exclusive rights to them for 21 years. They could purchase land from the Indians and, with the permission of the owners, could prospect for ore and develop mines on lands already held by settlers.

One man deeply interested in the development of the iron industry in Massachusetts was John Winthrop, Jr., son of the colony's governor. Educated at Trinity College in Dublin, he had studied law and read widely in the sciences, and experimented in alchemy, metallurgy, and medicine. Winthrop recognized that capital to exploit the iron resources of the Bay Colony could not be raised among his fellow colonists; English investment would be necessary to undertake such a venture. In the summer of 1641 he sailed for England, probably carrying samples of iron ore and copies of the General Court's offer. Over the next year and a half he succeeded in forming a "Company of Undertakers of the Iron Works in New England," in which some two dozen men purchased an interest.

Nearly all the investors sympathized with the Puritan cause, and several later emigrated to Massachusetts. However, they did not share in the project primarily to aid in the economic and political development of the colony. Though they hoped to meet the needs of the colonial market for iron, they wanted to export products to England, where iron prices had been rising steadily, because of increased demand at home, and in Europe where the industry had been severely crippled by the Thirty Years War.

The English industry, however, faced a growing shortage of timber reserves for charcoal, and sought such forest areas abroad. The nearest were in Ireland. By 1635 English ironmasters had established an extensive iron industry there. The Irish regarded the ironworks as a form of exploitation because of the felling of their forests for charcoal. During the rebellion of 1641 they destroyed nearly all of the ironworks. Thus, the promise of an area in New England with adequate resources and a public desire for ironworks must have held great appeal to the Englishmen whom Winthrop contacted.

The lands of Massachusetts Bay Colony had certain attributes conducive to setting up an ironworks: streams and iron ore near the coast and an abundance of forests to provide the all-important charcoal. The forests also provided lumber for buildings and for machinery in an age when only their most basic parts were made of iron. The main obstacle to launching the ironworks was the lack of skilled workmen in the colonies. Unskilled, manual workers could be found, though even these were not numerous.

Enthusiasm at home helped Winthrop obtain from the General Court for the organizers and investors, a generous grant to the rights within the colony of iron ore deposits, to certain lands, and to the use of waterpower. And, perhaps of most importance, the grant gave the company a 21-year monopoly for the manufacture of iron.

Winthrop arrived in England in the autumn of 1641 after an 8-week trip. He was abroad more than a year, returned home for a brief time, and early in 1643 went back to England to again recruit shareholders and skilled workmen for the planned ironworks. He succeeded in rounding up the necessary team of ironworkers except for a bloomer. Three of his men had second thoughts and "deserted"—perhaps fearful of the ocean voyage and life in the New World.

Those who remained with Winthrop may have come to regret their contract. They were detained for 6 weeks at Gravesend by customs officers and by unfavorable winds, and then endured 14 weeks of torturous sailing across the turbulent ocean, arriving in New England in the late autumn of 1643. The 1640s were troubled times in England. The Thirty Years' War in Central Europe had disrupted England's textile trade upon which so many people depended for their wages. And 1642 saw the start of the long Civil War between Englishmen loyal to their King and those who supported Parliament and the ancient liberties of the people.

Nevertheless, it required great courage for skilled men, either married or single, to pull up roots and journey across the great sea to an English colony that had endured for only one generation on the fringe of an almost unknown continent.

### **Men of Iron**

These men of iron knew the white-heat of the blast furnace, the clanging heavy noise of the great hammer, the hard muscle work, and the need for constant alertness in the application of their skills. No doubt they were not only young, but also in good health. Most could neither read nor write, and it is for that reason that we know very little about them as individuals or of their life at Hammersmith, as the ironworks community was called. Few, if any of them, adhered to the Puritan interpretation of Christianity—religious and secular. This nonconformism caused them some problems with their neighbors.

Colonists from the nearby communities and farms were hired for unskilled musclework in the building of the ironworks and its operations. In 1651, one shareholder, John Becx of London, bought a number of Scotsmen who had been captured by Cromwell at the Battle of Dunbar in the the autumn of 1650. They were mostly young men who must have considered their lot as enforced indentured servants in New England a better one than life in English prisons. Of the 62 in the original group, 35 were on the rolls of the company's books in the autumn of 1653. Quarters were built in Hammersmith for some of them; the rest were farmed out to board with the English workmen employed by the company.

None of the workmen or their wives left letters or diaries that would have given us a personal account of their lives among the established colonists. However, the high number of marriages of ironworkers and their sons and daughters into local families suggests social acceptance and friendship with their Puritan neighbors.

True, the local court records show a fairly high incidence of ironworkers, and a few of their women, appearing before justices for infractions of Puritan moral strictures. These arraignments were most frequent for nonattendance at church, drunkenness, wife-beating, foul speech, and the like. Even so, this record is no worse than that of the local Puritan families nor of similar groups in England.

Some of the boys learned from their fathers the skills of working iron ore into merchantable iron bars. We have records that show these young men moved about New England and were employed at other factories in Massachusetts Bay, Plymouth, Rhode Island, and Connecticut colonies. Some rose high in the iron business and in social standing.

Having in mind their acceptance by the local society and the urgency of this handful of English and Scots people (there were only 14,000 in the whole of New England in 1640) to live together in friendship, we may safely assume that the ironworkers and their families lived much as did their neighbors.

## A Walk Through the Ironmaking Process

As you tour Saugus Iron Works, use this guide to learn how iron was made and forged here.

The direct process of producing iron in a “bloomery” was a tried and proven method. In this process, the iron never became liquid but passed from iron ore into wrought iron in one direct step. At Saugus, however, the more modern indirect process was chosen.

By this indirect process, the high heat of the furnace produced a liquid iron which was cast into long bars. In a forge, the brittle cast iron was then converted into more malleable wrought iron bars. This indirect process was more complicated and more expensive than the direct process, but the yield was much higher. Even more up-to-date at Saugus was the slitting mill which flattened and slit some of the wrought iron bars into “flats” and “rod” stock for nails. In 1650 there were only about a dozen such mills in the world.

### Blacksmith Shop

Much of the work at Hammer-smith required only the power of men's muscles. Repair and maintenance work on tools and machinery was done in a building in the vicinity of the Ironhouse, equipped with a hand or foot-driven blast forge. Much of the same type of work is done today in the shop which stands on the east bank of the Saugus River.

### The Furnace

The raw materials for making iron were gathered near the furnace. Colliers had converted acres of trees into charcoal for fuel. Miners had collected bog iron ore from swampy areas and ponds. Flux, a dark gabbro rock containing calcium carbonate that helps separate the iron from the earthy parts of the ore, had been shipped in from Nahant, several miles away. These three materials, charcoal, bog ore, and flux, were dumped into the top of the furnace.

The furnace was fired up, or “blown in” as the ironworkers called it. Within three days, the molten iron began to collect in the crucible. The ironworker had to continually remove slag from the liquid metal. The heavier iron dripped into the crucible and the refuse was skimmed off the top. The furnace operated day and night for as long as possible. Once or twice in every 24 hours the furnace was tapped, and the molten iron ran into a

furrow dug in the sand. Once hardened, the long cast iron bars, or “sows,” were ready to be taken to the forge for further refinement. Slag was dumped into the nearby river.

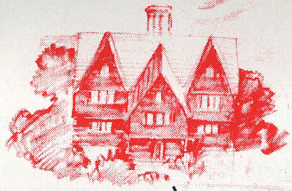
Not all metal was cast into sows. Potters had been busy nearby making molds for pots, kettles, firebacks, and replacement parts for the ironworks itself. Liquid iron was ladled into these molds and finished products were created right at the furnace. Still, the basic product of the furnace was the heavy sow bar of cast iron. This iron was brittle and its use was quite limited. The colonists needed iron that could be hammered into hard tools or nails. For this use, the sow bar was taken to the forge building for refining.

### The Forge

With three fires in use, four waterwheels turning, and the great hammer pounding on its anvil, the forge was the busiest of the three ironworks buildings. It took skill and a great deal of muscle to transform the cast iron sows into malleable wrought iron bars. A sow was first melted and refined in one of the two “finery” fires (to the right). A rocklike “loop” was formed. It was then drawn across metal plates to the hammer and “chafery” fire. After repeated hammering and heating, many impurities were pounded from the iron. The final product was a long wrought iron merchant bar which could be made into tools and building materials.

The workers were constantly exposed to suffocating heat, flying streams of hot metal shooting out from under the blows of the hammer, deafening noise, and exhaustion from the back-breaking work. In an era when industrial safety programs were not even thought of, injuries were common.





**VISITOR  
ENTRANCE**

**The Iron Works House**

Many of the nails made at the ironworks were used in the construction of the community of Hammersmith, an early forerunner of a company town. The community was owned and run by the ironworks for its employees. Here was probably America's first company housing and company store where provisions were usually bought on credit.

The individual workers' houses were one- or two-room structures, comfortable for those

times, but small. The Iron Works House, by far the finest home in Hammersmith, was the social and business center of the community. Built about 1646 for Richard Leader, the agent who built Saugus Iron Works, the house was used as the family living quarters, as the company office, and as a place to entertain business guests. The agent directed the day-to-day operations and made plans for the coming year. The success or failure of the project was largely in his hands.

Hammersmith was a place where people lived and where iron was produced. It was also a school for ironworkers. With skills learned at Saugus, these men and their sons carried the skills of iron manufacturing to other colonies and laid the foundation for the American iron industry.

**The Ironhouse**

The Saugus River was used for transportation. At high tide, one of the three small boats owned by the ironworks could bring in a load of iron ore or other supplies. At the next high tide a load of iron products, which had been stored in the ironhouse, could be shipped to nearby markets such as Lynn or Boston.

**The Slitting Mill**

About one of every twelve merchant bars made in the forge was carried over to the slitting mill. This building was not busy 24 hours a day but only when flats or rods were needed. The merchant bars were brought to a red heat in the oven. While hot, the bar was passed through the set of rollers (on the right) and flattened to the desired thickness. The product was called a flat. Many flats were used in the construction and repair of the ironworks. Some were sold to customers. The rest were reheated and passed through the cutting discs (on the left) to produce rods. Then the rods could be made into nails or sold in bundles of 50 to 60 pounds. Thus, readily available and relatively inexpensive nails were provided to a colony which previously relied on iron materials shipped from England at extra cost.

The Saugus River provided the power to operate the machinery used in ironmaking. A canal fed water from a dam upstream into the sluiceways at each building. By adjusting the sluice gates at the end of each sluiceway, the workers could regulate the speed of the waterwheels.

What you see today at Saugus are reconstructed buildings except for the Iron Works House. The work was done in the 1950s by the American Iron and Steel Institute. In 1969 the area became a unit of the National Park System.

## Life in the Puritan Colonies

We do have some records from which to draw a picture of the lifestyle and experiences of the first-generation colonists of Massachusetts Bay and Plymouth. We have Winthrop's *Journal*, Bradford's *Diary*, letters, and countless notations in town records. By 1650 the first considerable immigration ceased. Of the 25,000 settlers then living in the Massachusetts Bay Colony, probably 95 percent were small farmers or workmen engaged in manual trades. The remaining 5 percent was composed of ministers, lawyers, and some merchants.

All of these people quickly overcame the hardships and inconveniences experienced in every new settlement. In a few years the rawness disappeared, and the lifestyle they brought with them was duplicated in their 17th-century homes.

Most of New England then was miles and miles of hardwood forest. These woodlands nurtured the many lakes and streams that fed the rivers that flowed to the sea. The English had cleared large acreages and sown corn and other crops, and they had converted many more acres to pasture for cattle and sheep.

New England held some surprises for the settlers. John Josselyn, a traveler who wrote about the natural history of the region, said the scent of one creature was so strong that if it "light upon anything, there is no abiding it." He was talking about the skunk. One day in 1638 while walking in Maine, he "chanc't to spye a fruit as I thought like a pine Apple" but of ash color. Although it was an odd looking fruit, Josselyn had seen many strange things so he was not greatly surprised. When he tried to pick it, however, he was stung severely by a swarm of furious hornets.

Pastor Higginson of Salem wrote enthusiastically of the natural abundance of grass that "growth verie wildly with great stalke. Our turnips, parsnips and carrots are here both bigger and sweeter than is ordinary to be found in England. Here are stores of pumpions, cucumbers and other things of that natural I know not. Plentie of strawberries in their time, and pennyroyall, winter saviour, carmel and water-cresses, also leeks and onions are ordinary."



Of the hardships, however, Higginson makes small mention, for his aim in writing was to induce emigration. There was much sickness and many deaths. Governor Dudley wrote "that there is not an house where is not one dead, and in some houses many. . . ."

Most of the colonists lived in very simple thatched roofed cottages of unpainted clapboard. These were of one or two rooms with a shed in the back, such as the Company's shareholders provided for the ironworkers in the small village of Hammersmith. Each family had a small garden plot for vegetables.

The ironworkers found themselves in a society where the life expectancy at birth was 46; only one in ten lived to middle age.

Massachusetts Bay was the great Puritan experiment. Their "city upon a hill" was meant to show the world what they considered a better way of life. Religion was the most powerful private and public social force. Adherence to the Puritan ethic was expected. Church services was the principal event for many families, particularly for the women. Their men were employed in one trade or another that brought them into almost daily contact with people. And even the men and boys on the farm now and again went by wagon to other settlements or, with great excitement, to Boston to sell their foodstuffs and to buy town-made goods and supplies.

Most towns had public taverns where beer and spirits were freely sold. Furthermore, the New England colonists drank beer and ale at home, an entrenched custom they had brought from England, where the drinking of water was considered unhealthy. For all classes, readings from the Bible helped pass the leisure hours on Sundays. Small children could play the age-old games that children have always played, but not



John Winthrop, Jr., (1606-1676) was the guiding light behind Saugus. The force of his personality and his determination kept the iron works going in its early years.

Massachusetts Historical Society

on the Sabbath. Records show that the Saugus ironworkers were frequent breakers of the Sabbath regulations.

Early Americans had that kind of great courage that springs from unawareness and from fatalism about the vagaries of the natural forces ("Acts of God," to them) that affected all their days and nights. They worked hard from sunrise to sundown. This 10- to 12-hour workday was their lot 6 days a week, year-round, and made these 17th-century Americans thrifty about everything—for the sake of their God, for their children, and for the accumulation of wealth.

New England colonies officially recognized the existence of differences in social classes. Some people were of a higher or better class than others. This betterness took two forms: one, wealth—the greater a man's means (property in any form), the better he was; and two, adherence to the Puritan doctrine.

The Better Class was composed of the clergy and their church assistants and those of the laity who were most strict in the observance of the many rules of right conduct. And also of the Better Class were prosperous men—merchants, artisans, landowners—even though they might be of somewhat questionable religious standing. Only the manager of the ironworks rated as one of this class. The workers were of the lower class.

The harshness of religious and secular law was ameliorated by the social mobility of the Puritan colonial society. A large proportion of men moved upward in their short lifetime, or fathers accumulated enough property to enable their sons to make the upward step. Women were accorded the same social standing as their father, or husband. A son or a brother could raise the social position of the women of his family, and of course the treatment of women varied according to their social position.

Life was much less hard for those of the Better Class, especially in the matter of work, because all dirty, difficult, and hard work was done by servants. The ladies were shielded from those diseases and dangers that were the constant companions of less fortunate women. Even so, in the matter of pregnancy and childbirth, women of leisure suffered almost as badly as their poor sisters, because of the primitive state of medicine in those days. A pregnancy every 10 or 12 months was usual for most wives, and the death rates of both mother and baby were very high. A woman who survived the primitive, superstitious, and unsanitary mid-wifery and lived to nurse as many as a dozen babies into childhood might live to see only two or three reach adolescence, live to see a daughter marry and embark upon the same dangerous cycle of conceiving life and witnessing death.

Young women were usually educated, sometimes as well or better than their husbands and brothers. Though it is true that only the boys of upper



The *New England Primer* was just about the first schoolbook used. It was first printed in the late 17th century. Strongly Protestant, the values. The two pages above taught the alphabet with allusions to

class families went to college, the stay-at-home girls often had time to read. New Englanders wanted their daughters to read the Bible, frequently and at length as a means of salvation. They were not, however, always taught to write any more than the simplest of communications. In 1647, Massachusetts Bay passed a law requiring every town of 50 families or more to choose a teacher from among the residents and pay him wages. The children of the ironworkers must have attended such a school. Towns of 100 families or more were to build a Latin grammar school to prepare boys for college.



Boston dominated the commerce of New England, largely because it was a fine seaport. Most of the Bay Colony's growing wealth came from the sea—fish from the deeps and ships on the waves. It was not unusual for some of the more wealthy colonists, men such as John Winthrop II, to make trips back to England, usually on business. There was a brisk commerce by sea of raw materials in exchange for English goods, but only the wealthy could afford to import fine clothes and armchairs and books.

This fireback was one of the products made at Saugus. Set at the rear of the fireplace, it reflected heat back into the room thus reducing the amount that escaped up the chimney.

Under the economic system of private capitalism and personal effort, with a minimum of interference by the Commonwealth and a maximum of natural resources, an increase in wealth was created by the internal trade between those who produced foodstuffs and other necessities and those who provided needed services. Thus the prosperity of the wealthy merchant and religious class was shared by those who sold them goods and services in exchange for money. Even during the short lifetime of Saugus Iron Works, there was a rise in the number of families that could count themselves as belonging to the Better Class through an accumulation of wealth.

Records show that some craftsmen at Saugus managed to bequeath modest estates and taught their valuable skills to their sons. Many of these second-generation ironworkers went to other ironworks in New England. James Leonard was a forgeworker at Hammersmith and became a freeman (landowner) in 1688. In 1671 he was manager of Bromingum Forge. Joseph Jenks

G



As runs the *Glass*  
Mans life doth pass.

H



My *Book* and *Heart*  
Shall never part.

J



*Job* feels the *Rod*  
Yet blesses *GOD*.

K



Our *KING* the  
good  
No man of blood.

L



The *Lion* bold  
The *Lamb* doth hold.

M



The *Moon* gives light  
In time of night.

N



*Nightingales* sing  
In Time of Spring!

O



The *Royal Oak*  
it was the *Tree*  
That sav'd His  
*Royal Majestie*;

P



*Peter* denies  
His Lord and cries.

Q



Queen *Esther* comes  
in *Royal State*  
To Save the *JEWS*  
from dismal Fate.

R



*Rachel* doth mourn  
For her first born.

S



*Samuel* anoints  
Whom God appoints

The *New England Primer* was just about the first schoolbook used in the New England colonies. It was first printed in the late 17th century. Strongly Protestant, the emphasis was on religion and Puritan values. The two pages above taught the alphabet with allusions to Biblical characters.

was a skilled craftsman at Saugus. His son, Joseph Jr., also worked at Hammersmith at the age of 16 in 1649. In 1672 he erected his own forge at Pawtucket, R.I. His son, Joseph Jenks III, was Governor of Rhode Island (1727-32) when in his seventies.

### **Failure of the Iron Works**

Saugus' failure cannot be ascribed to any one factor. Clearly mismanagement played a part, along with high production costs, the fixed price (£20 per ton) for its products, and competition from imported iron. Although the works produced respectable quantities of bar iron, it could not return a profit to the shareholders. After a while they felt that their interests were being subverted, and they refused to advance more capital for the failing enterprise.

The company's debts became so great that creditors brought suits to recover their loans. As a consequence, courts made decisions that caused production to decline and skilled workers to leave because they were not being paid at Saugus. As a direct consequence, production at Saugus Iron Works was further reduced.

Thus the skills and technology first brought to America at Saugus were spread throughout the northeast. The men of Saugus not only worked in new plants themselves, but also trained their sons and other men in the skills of iron manufacturing. Thereby, they greatly helped to build a colonial iron industry. Descendants of the Saugus workers also became leaders in other fields, contributing to the growth and welfare of the colonies.

Thus it can be said that although Saugus Iron Works ultimately failed as an individual enterprise, it helped to lay the foundations for the iron and steel industry in the United States.

## FOR YOUR SAFETY

The ironworks in 1650 was an industrial factory with many inherent dangers. By maintaining the authenticity of the factory setting, some of these dangers remain. Please be careful around the waterwheel pits and do not climb on the waterwheels or other historic structures. The slag can cause severe cuts.

## ADMINISTRATION

Saugus Iron Works National Historic Site is administered by the National Park Service, U. S. Department of the Interior. A superintendent, whose address is 244 Central Street, Saugus, MA 01906, is in immediate charge

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.