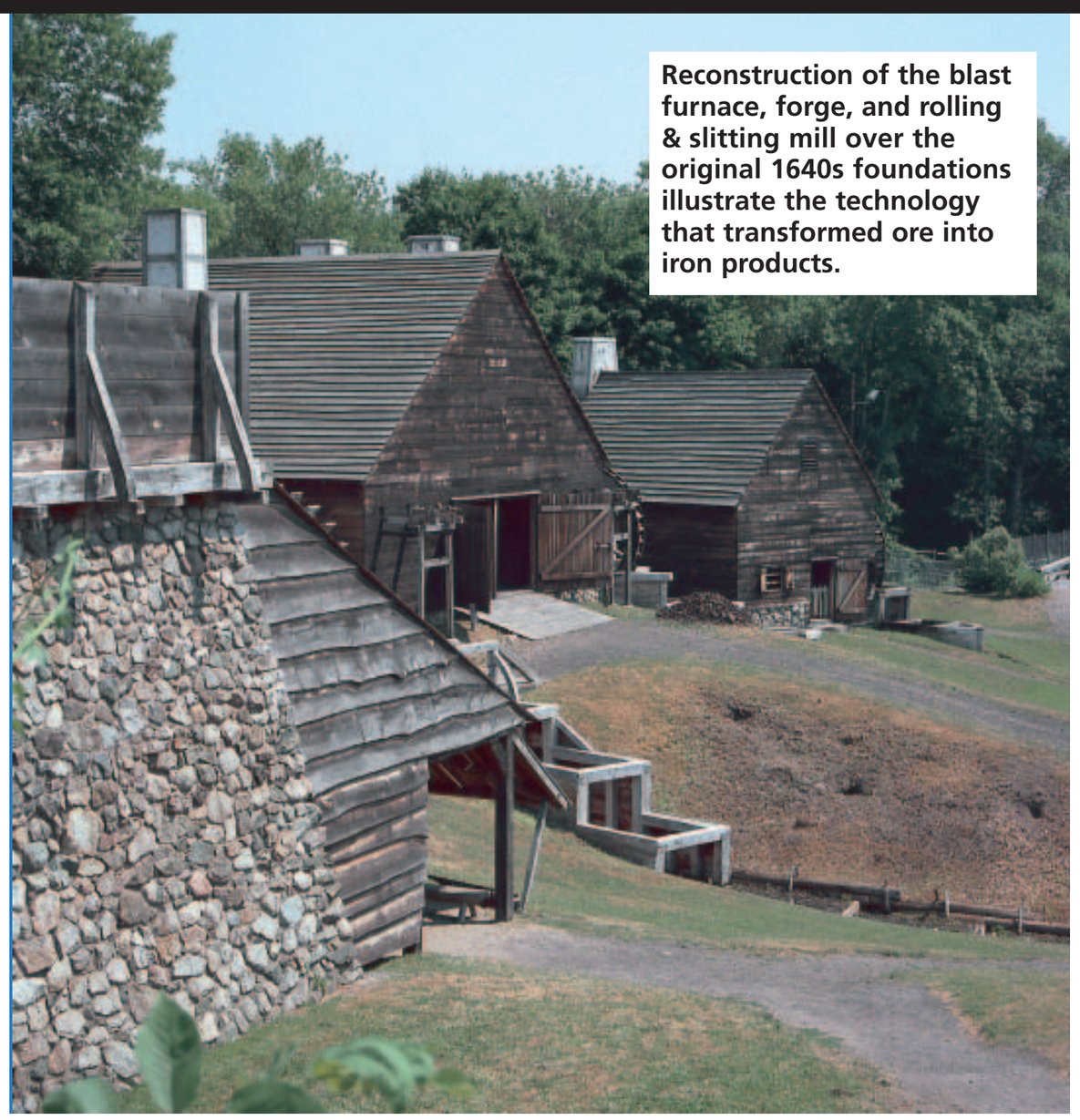
Saugus Iron Works

Official Map and Guide - Large Print

Saugus Iron Works National Historic Site
Massachusetts

National Park Service
U.S. Department of the Interior



Reconstruction of the blast furnace, forge, and rolling & slitting mill over the original 1640s foundations illustrate the technology that transformed ore into iron products.

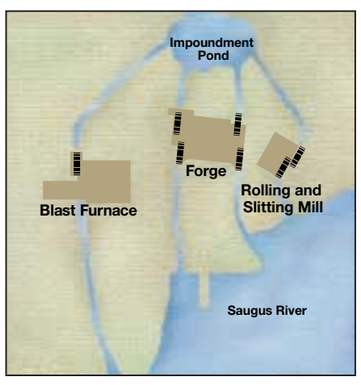
The Saugus Iron Works

In the early 17th century, when Europeans began to settle in Massachusetts, the colony's leaders recognized the potential of New England's fish and timber resources. Processing and trading these products was a way to achieve the financial stability of the new Puritan colony. They also brought with them a two-thousand-year tradition of iron tool use, a vital part of their daily lives and developing economy.

Massachusetts's leaders understood the importance of iron and offered incentives to encourage investment in minerals extraction. In 1641, John Winthrop, Jr., son of the governor of the Massachusetts Bay Colony and a self-taught metallurgist, returned to England to gather investors for a colonial iron works. After forming the Company of Undertakers of the Iron Works in New England, he traveled to iron-making regions of Europe to collect relevant information. Skilled workers were recruited, and in 1643 they made the journey with Winthrop to New England. Arriving late in the fall, Winthrop's experts explored New England for an appropriate site, which needed extensive forests, ore, water power, transportation routes, and labor. With winter closing in, construction began on the company's first furnace, in Braintree, Massachusetts, south of Boston.

Progress through 1644 was slow, and by 1645 the investors were disappointed by Winthrop's lack of progress. Winthrop was replaced by Richard Leader, a man "with skill in mynes and tryall of metalls." The colony gave the Company of Undertakers exclusive rights to iron manufacture in Massachusetts for twenty-one years. Leader set out to find a site that was more conducive to iron making than was Braintree.

The location he chose, on the banks of the Saugus River, where fresh water met salt water, was an ideal place to locate an iron works. Raw materials could be shipped in and finished iron could be shipped out at high tide in shallow-bottomed boats. In addition, the steep contour of land surrounding the tidal basin would provide a place to nestle waterwheels to take advantage of falling water.



Above: The water power system at Saugus

Operating an iron works demanded a steady source of water. About three-eighths of a mile to the north of the iron works, a dam was built which stored 230 acres of water. A waterway was cut along the hillside, channeling water to a small holding pond just behind the ironworks complex. From there the water flowed at controlled rates down four wooden troughs called races: one for the blast furnace; two for the forge (each driving two wheels); and one for the rolling and slitting mill.

An integrated iron works, with a blast furnace and forge, required labor from numerous sources. Workers with specialized metallurgical knowledge could not be found in Puritan New England. They were recruited in England for their skills, rather than their religious affiliation, and came to Massachusetts for financial reasons. The core of indentured iron makers at Saugus consisted of little more than three dozen millwrights, hammermen, finers, founders, mould makers, and colliers. Since many of them did not share the religious enthusiasm of the predominant Puritan society, they were often called before the magistrates for such offenses as drunkenness, physical assault, and swearing. Not surprisingly, few of this first generation of workers were assimilated into Puritan society.

Many of the other vital, unskilled jobs that supported the iron works, such as woodcutting, farming, carting wood, washing and mending clothes, and, with some training, mining, were done by the local inhabitants of Lynn.

In late 1650, the local work force was augmented by a group of 61 Scottish prisoners of war, who arrived in Lynn as forced indentured workers. This created new tensions between the iron works and the local community. These men had been captured at the Battle of Dunbar, Scotland, marched to New Castle, and then shipped across the Atlantic to ease the chronic shortage and high price of labor at the iron works. Many Scottish prisoners were trained at Saugus, and they soon replaced local workers as carpenters, farmers, woodcutters, and miners, with some becoming iron-workers and blacksmiths.

Despite successful iron production, the iron works was beset by financial difficulties beginning in the 1650s. This caused a dispersal of ironworkers throughout southern New England and as far south as New Jersey, helping to spread iron-making technology throughout the colonies.

The Iron Works House

The building called the Iron Works House is the sole remaining 17th-century structure on the site, though it is probably unrelated to the iron works. The first known occupant, Samuel Appleton, lived in the house from 1681 to 1688, after the industrial site had closed.

By the early 20th century the house had been greatly altered from its original state. It was rescued and restored by antiquarian Wallace Nutting, who became famous for his reproduction colonial furniture, books on colonial homes, and photographs. Nutting bought the house in 1915 and restored it to its original appearance. Today, the house features 17th-century period rooms and exhibits.

Above: The Iron Works House today

Iron Works Reconstruction

Wallace Nutting's restoration of the Iron Works House inspired efforts to restore the iron works site. Local citizens formed the First Iron Works Association in 1943. With funds from the American Iron and Steel Institute, archeologist Roland Wells Robbins began digging in 1948. Over the next few years, he and his team unearthed the outlines of the principal structures and the remains of the blast furnace, a 500-pound hammer head, a large section of a waterwheel, and thousands of other artifacts.

By 1951, a reconstruction project was underway. Workers, from civil engineers to leather craftsmen, relied on Robbins's archeological finds, colonial documents, and 17th-century English descriptions of iron works to recreate the Saugus works. The site was opened to the public in 1954 and transferred to the National Park Service in 1968.

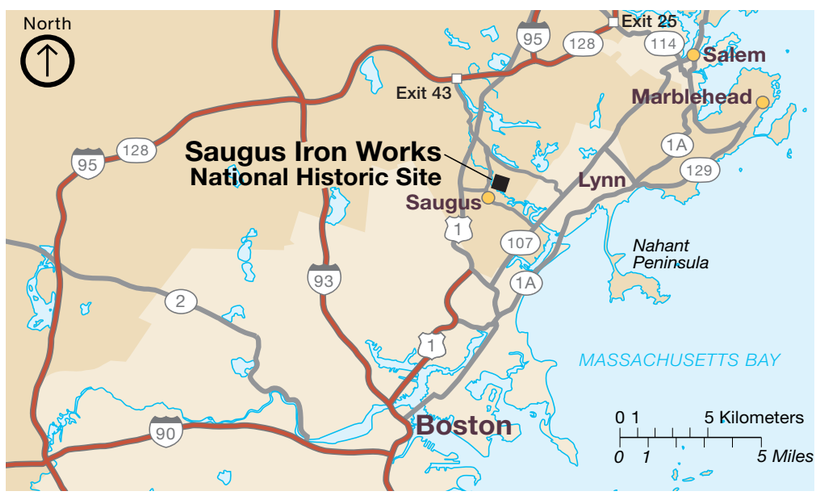
Above: The Iron Works during reconstruction

About Your Visit

The Saugus Iron Works is open every day except Thanksgiving, Christmas, and New Year's Day. The museum offers a film and exhibits displaying hundreds of artifacts found at the iron works. A half-mile nature trail winds along the banks of the Saugus River. Picnic tables are available. The museum and restrooms are accessible to those in a wheelchair. Some historic areas are accessible via a special route.

Do not climb on the waterwheels, other machinery, or stone walls. Please do not remove slag, pieces of iron, or other materials. Be careful to avoid poison ivy and bees.

For more information, contact Superintendent, Saugus Iron Works NHS, 244 Central St., Saugus, MA 01906; 781-233-0050; www.nps.gov/sair.

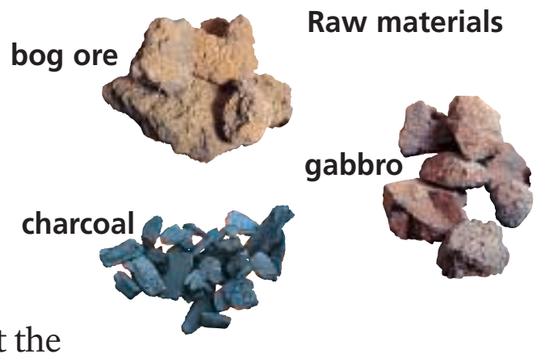


The Saugus Iron Works is a gateway to the Essex National Heritage Area. The area encompasses historic, cultural, and natural resources related to early settlement, maritime trade, and industrial development.

The Transformation of Iron

Raw Materials

The raw materials–bog ore, charcoal, and gabbro–used to make iron were gathered from nearby marshes, woods, and coastal areas. Colliers slow-burned an earth-covered mound of freshly-cut wood to produce vast quantities of charcoal. Bog ore, or limonite, was dug up from marshy areas or pond bottoms. It ranged in consistency from rocky to earthy and contained variable amounts of iron. A calcium-rich flux, usually limestone or seashells, was needed to drive impurities out of the iron. At Saugus, it was determined that gabbro rock, found on the shoreline of the nearby Nahant peninsula, could be used as a flux. The iron-making operation began with fillers dumping basketful after basketful of the raw materials into the furnace's deep charging hole. The initial charging operation, which included drying out the furnace, could take as long as a week to be completed.



The Blast Furnace

A bridge led to the charge hole at the top of the blast furnace, a large stone structure that processed raw materials into cast iron. A sixteen-foot waterwheel drove a massive pair of wood-framed bellows covered with heavy leather. This machinery blew air into the furnace to create an intense charcoal fire. Founders carefully managed proportions of charcoal, bog ore, gabbro, and air to separate the iron from its impurities. As molten iron and "slag" were tapped separately from the base of the furnace, more material was fed into the charge hole at the top. While in blast, the furnace was tended around the clock for 30 to 40 weeks until maintenance was needed.

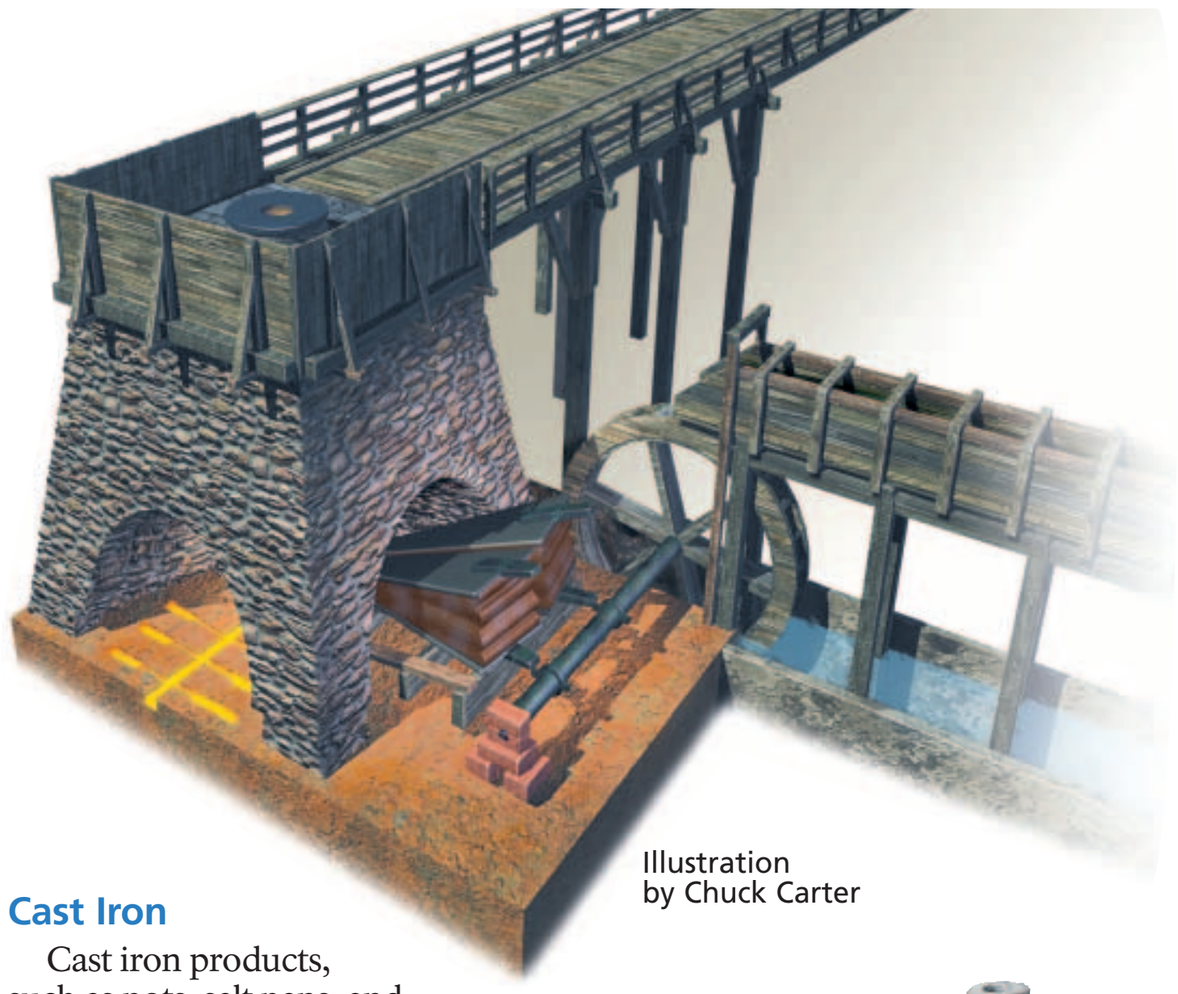


Illustration by Chuck Carter

Cast Iron

Cast iron products, such as pots, salt pans, and anvils, were in great demand by the inhabitants of the new Massachusetts colony. To fill the need, potters were employed to produce clay moulds, which were buried beneath the sand floor of the casting shed located alongside the furnace. A clay plug was knocked out of a dam at the bottom of the furnace, allowing molten iron to flow into a large ladle. It was then poured through a "gate," or long hollow tube, into the buried mould. When making firebacks, wooden patterns were pressed into the surface of the sand floor. This left an impression into which iron was poured to form the piece.

Above: Clay mould in which some cast products were formed.

Below: The ladle was used to pour molten iron into moulds.

Below: Fragments of pot cast at Saugus

Right: Archeologist Roland Robbins in 1950 with original 500-pound forge hammer found at the site

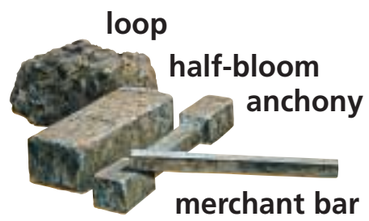


Illustration by L. Kenneth Townsend

The Forge

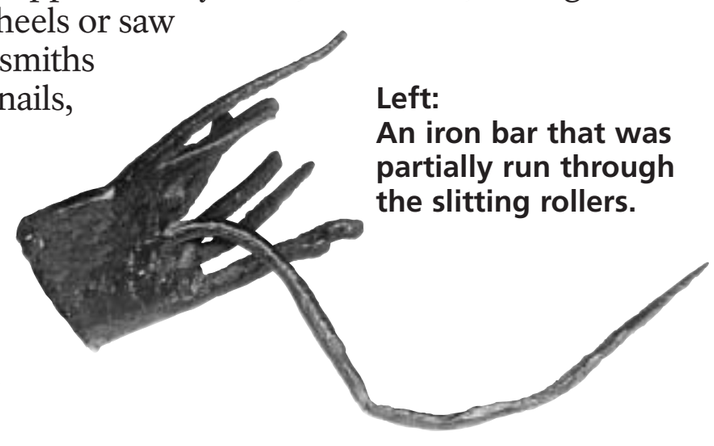
Sow bars, made at the furnace by filling a long, shallow trench in the sand floor with molten iron, were dragged by oxen to the forge for conversion from brittle cast iron into malleable wrought iron. To begin the process, sows were melted by finers to lower carbon content and form a "loop." Then, using the 500 pound hammer, the hammermen squeezed excess slag from the loop and forged the iron into merchant bars, the major product of the Saugus works.

Wrought Iron

Wrought iron merchant bars were the primary products of the iron works. The long internal fibers of the bar made it less brittle than cast iron, making it ideal for horseshoes, shovels, and other tools. Imported steel could be welded onto wrought iron axes and chisels to add a more durable cutting edge. Merchant bars were also the basic stock for the rolling and slitting mill.

Rolling and Slitting Mill

In the rolling and slitting mill, merchant bars were heated, passed through rollers to flatten them, and then sent through cutters to produce thin rods. Some of the rolled pieces were shipped as they were, to be used, among other things, as iron tires for wagon wheels or saw blades. The rods provided blacksmiths and farmers the means to make nails, which were in great demand.



Left: An iron bar that was partially run through the slitting rollers.

Below: The rolling mill machinery produced flat bar and slit rod.