

A BRIEF HISTORY OF THE OREGON IRON INDUSTRY

Susanna Campbell Kuo © 2008



Earliest known photo of the Oswego Furnace taken while it was under construction in 1866.

Courtesy of the Lake Oswego Public Library

productive. In 1878 it was sold at a sheriff's auction to investors from Ohio's Hanging Rock Iron Region who were experienced furnace managers. Ernest Crichton and L. B. Seeley modeled their operation

on the plantation system of eastern iron furnaces and wasted no time in purchasing the town site, large tracts of timber, and water rights to the lake. They remodeled the furnace and tripled its output. But they went into debt to finance these improvements. Just five years after buying the furnace, they sold it to their financial backers, Simeon Gannet Reed and railroad baron Henry Villard. However, they retained an interest in the company.

The next chapter in Oregon's iron story is one of big dreams and bitter power struggles. Reed borrowed heavily from Villard to build a modern iron works, which opened in 1888 half a mile north of the old furnace. A pipe foundry was also built and there were plans for a rolling mill. But bad blood between Reed and the Ohio investors, whose steamboat company had been squeezed out of the market by Reed and Villard, poisoned the relationship. They sued Reed relentlessly for mismanaging the company.

At its peak in 1890, the Oregon Iron & Steel Company produced 12,305 tons of pig iron and owned more

The Oregon Iron Company was established in 1865 by a group of Portland financiers who decided to capitalize on the discovery of iron in the hills surrounding Sucker Lake (now Oswego Lake). These investors, headed by William Sargent Ladd, were among Portland's leading businessmen. Their investments in the Oregon Steam Navigation Company, the Oregon Central Railway, and Portland gas and water systems were tied to the availability and price of imported iron. Controlling the source and means of iron production would be a major advantage.

They recruited George Wilbur, a furnace expert from Sharon, Connecticut to oversee construction of the blast furnace, which he modeled on furnaces in New England's Salisbury Iron District. Construction began in 1865 and the furnace was blown in on August 24, 1867. Newspapers hailed the event as "a cause for sincere rejoicing." Foundries dependent on pig iron shipped around the Horn now had a source of iron on the West Coast.

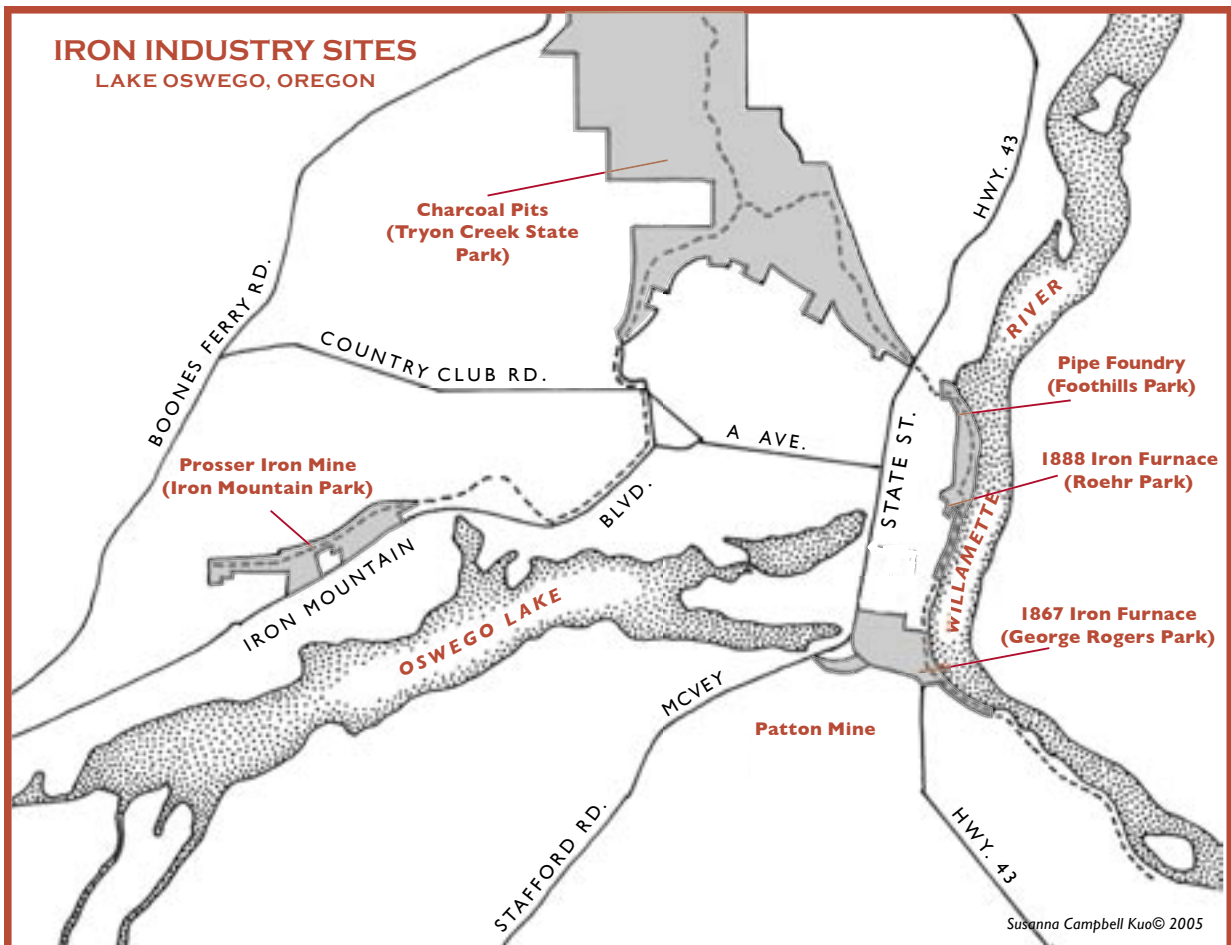
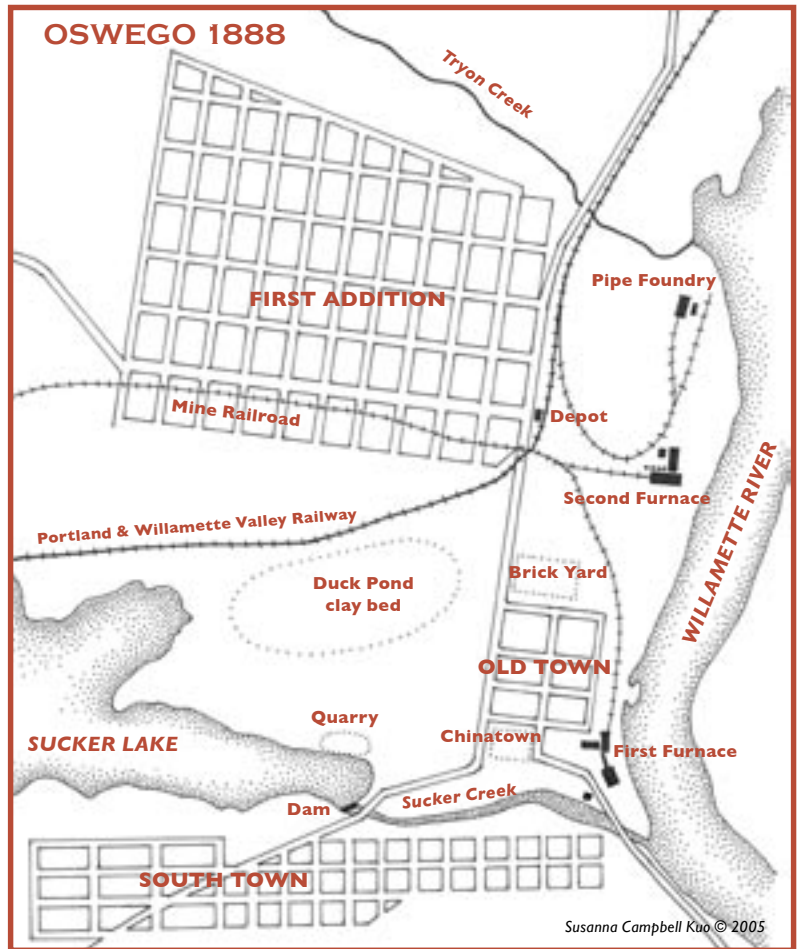
During its twenty-seven years of operation, the Oswego iron works had many ups and downs. Due to the inexperience of its first owners, the furnace operated sporadically and was not very

IRON COMPANY OFFICERS

- 1865 - 1878 Oregon Iron Company
Company officers: William Sargent Ladd, President;
Herman C. Leonard, Vice President;
John Green, Secretary
- 1878 - 1882 Oswego Iron Company
Company officers: Ernest W. Crichton,
Lamar B. Seeley,
Samuel H. Brown, Jr.
- 1882 - 1894 Oregon Iron & Steel Company
Original company officers:
Simeon Gannet Reed, President;
William M. Ladd, Vice President;
Martin Winch, Secretary
-

than twenty-three thousand acres in Oregon, Washington, and British Columbia. It was Oregon's biggest manufacturing enterprise, supplying iron to thirty-three foundries in Portland and employing 325 workers. One hundred and fifty of these were Chinese laborers who lived in a makeshift Chinatown near the east end of Sucker Lake. Workers were recruited from all over America and the company platted a "First Addition" to the town to accommodate the growing population. But just six years after the new furnace opened, a series of economic calamities forced it to close.

Charcoal production was the company's biggest expense, consuming the labor of more than half its workforce. Oregon's charcoal pig iron was consistently undersold by imported pig iron made with coke (baked coal). To make matters worse, railroad expansion declined sharply after 1887 reducing the demand for iron. The final blow was the Panic of 1893, one of America's worst depressions, which dried up credit and devastated the iron industry. By 1900 the majority of charcoal iron furnaces had closed. The increasing demand for

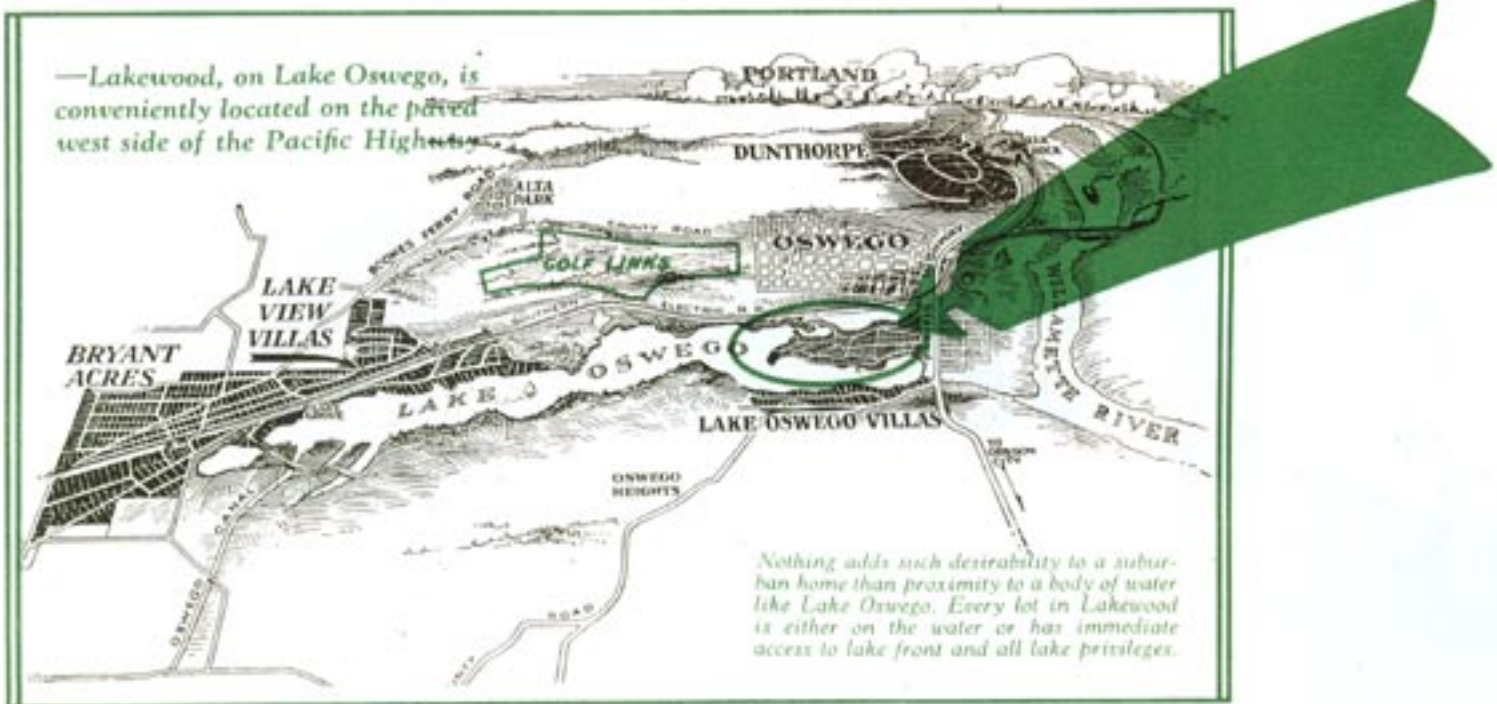


steel and the efficiency of giant coke-fired steel mills brought an end to the era of cast iron.

Viewed from this perspective, the Oregon iron industry did fairly well given its late start, lack of coal deposits, and remote location. Of the four furnaces west of the Rocky Mountains, Oregon's was the most successful. In spite of its difficulties, it survived 18 years longer and produced nearly four times as much iron as its closest competitor, the Puget Sound Iron Company at Port Townsend, Washington.²

Oregon Iron & Steel continued to operate the pipe foundry until 1928, producing cast iron water pipe for Portland's Bull Run water system. But the company's most enduring impact on Oswego had nothing to do with iron making. Land rich and cash poor, O. I. & S. went into the real estate business, mining the aesthetic and recreational potential of the geographic features that once supported the furnace.

The Ladd & Tilton Bank was the principal creditor of the iron company. William M. Ladd, who succeeded his father as president of the bank, also succeeded Reed as president of Oregon Iron & Steel. In partnership with three gifted developers, George F. Cotterill, Paul C. Murphy and Frederick H. Strong, Ladd began an ambitious plan to develop Oswego's recreational and residential potential.



Advertisement for waterfront property in the Lakewood neighborhood. Courtesy of the Lake Oswego Public Library

Between 1910 and 1941 the Ladd Estate Company and its successor, the Murphy Real Estate Company, transformed Oswego from a depressed iron town into a prestigious lakeside retreat. Distinguished architects were engaged to design model homes. A country club and golf course were built on the former site of the Ladd dairy farm. Sucker Lake was enlarged and renamed "Oswego Lake." A polo field and giant indoor riding arena were built at the foot of Iron Mountain. New boulevards and park-like neighborhoods were laid out and marketed under the slogan, "Live where you play."

In 1940 the Paul Murphy Company replaced the Ladd Estate Company as developer and manager of Oregon Iron & Steel's property. In 1941, O. I. & S., now headed by Paul F. Murphy, created the Lake Oswego Corporation, a private corporation of lake front property owners who agreed to assume management of the lake. In 1960, in one of its final acts, Oregon Iron & Steel deeded the powerhouse and dams to the Lake Corporation.

¹ *The Daily Oregonian*, August 27, 1867.

² Joseph Daniels, *Iron and Steel Manufacture in Washington, Oregon, California and Utah*. Engineering Experiment Station Series, Report No. 2. Seattle, WA: University of Washington, Dec. 15, 1929, p. 10.

INVENTORY OF PROPERTY³

Oswego Iron Company

(April 1882)



Furnace, sheds, engine, shops and plant	130,000.00
600 acres of land lying in a body from 1 to 3 miles from the furnace containing an estimated 3 million tons of 40% ore. The vein was worked by 2 tunnels above a railroad. 200 tons per day could be mined without further outlay	210,000.00
Narrow gauge railroad 2 5/8 miles long & equipment	45,000.00
21,884 acres of timber lands	220,000.00
Water power from Sucker Lake. Canal 1 1/2 miles long furnishing 2100 effective horsepower under 80 feet head	120,000.00
Oswego townsite. 150 acres of land, 21 houses, 6 barns	50,000.00
Stock of ore, limestone, charcoal, etc.	75,000.00
Total:	\$850,000.00

Oregon Iron & Steel Company

(April 1890)



Timber and ore lands:	
9,408 acres in Clackamas County	
4,196 acres in Washington County	
216 acres in Multnomah County	
5,087 acres in Cowlitz County	
4,362 acres in Wahkiakum County	
120 acres on Texada Island, British Columbia	
Total: 23,389 acres	
Oswego Town Property and Buildings, valuation	60,000.00
New Townsite, valuation	40,000.00
Water Power and Canal	200,000.00
Railroad & Equipment 2 3/4 miles	40,000.00
Amount forward	340,000.00
Furnace plant, Ore bunkers, Rock crusher, Engines, Etc.	281,842.48
42 Charcoal Kilns, cost	41,145.72
Machine Shop and Tools	10,177.66
Pipe Foundry, cost	84,852.03
Patterns	2,807.94
Laboratory	829.34
Fire-brick	23,316.93
Pipe Line from Dam	11,288.77
Mine Equipment and Dump	23,337.07
New Davis & Colby Ore Roaster, capacity 125 tons/day	5,122.87
Oswego Water Works	1,174.11

FURNACE CONSTRUCTION

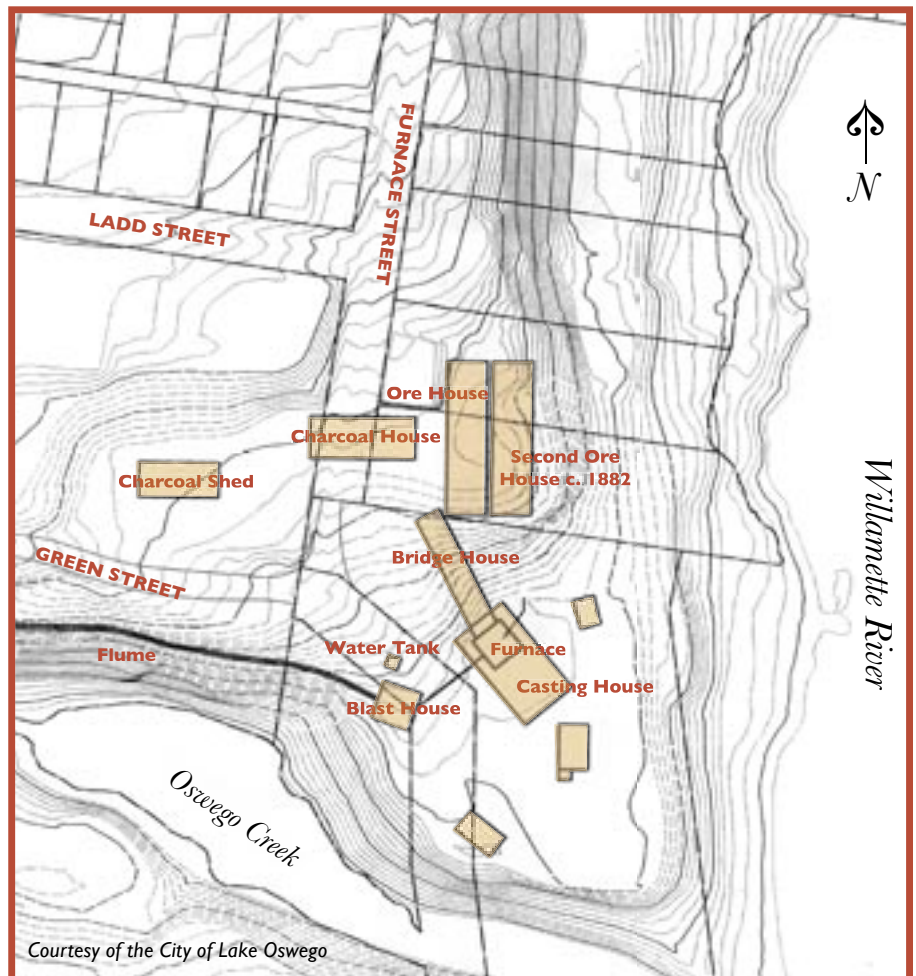
Susanna Campbell Kuo © 2008



The Oregon Iron Company c. 1870 Collection of the Oswego Heritage Council

The Oswego Furnace was built at the confluence of Oswego Creek and the Willamette River, a spot that provided both waterpower from the nearby lake and transportation by river. Like all furnaces of this period, it was built next to a hill. Raw materials were stored on top of the hill so they could be easily moved across a bridge to the top of the furnace. From the casting house it was a short distance to the river landing where the pig iron was loaded on ships.

By the 1880s the furnace had become outdated so a new furnace was built half a mile north. The second furnace was modeled on the larger “hard driving” furnaces of Andrew Carnegie. The new plant also included a pipe foundry, 42 brick kilns for charcoal making, and extensive rail lines for moving materials.



Courtesy of the City of Lake Oswego

First Furnace

Years of operation: 1867-1885

Built in 1866-67 by the Oregon Iron Company

Ten-ton stack, 32 feet square and 34 feet high

Modeled on the Lime Rock Furnace in Lime Rock, Connecticut

Construction foreman: George D. Wilbur of Sharon, Connecticut

Mason: Richard Martin

Masonry style: Ashlar (basalt blocks quarried on the north side of Sucker Lake) Gothic arches of red brick

Blast system: water-powered hot blast; Leffle double turbine water wheel with two wooden blowing tubs. Heat exchanger with cast iron pipes in brick oven on top of the stack; paired downcomers and bustle pipe placed inside the stack.

Three tuyeres (blast pipes)

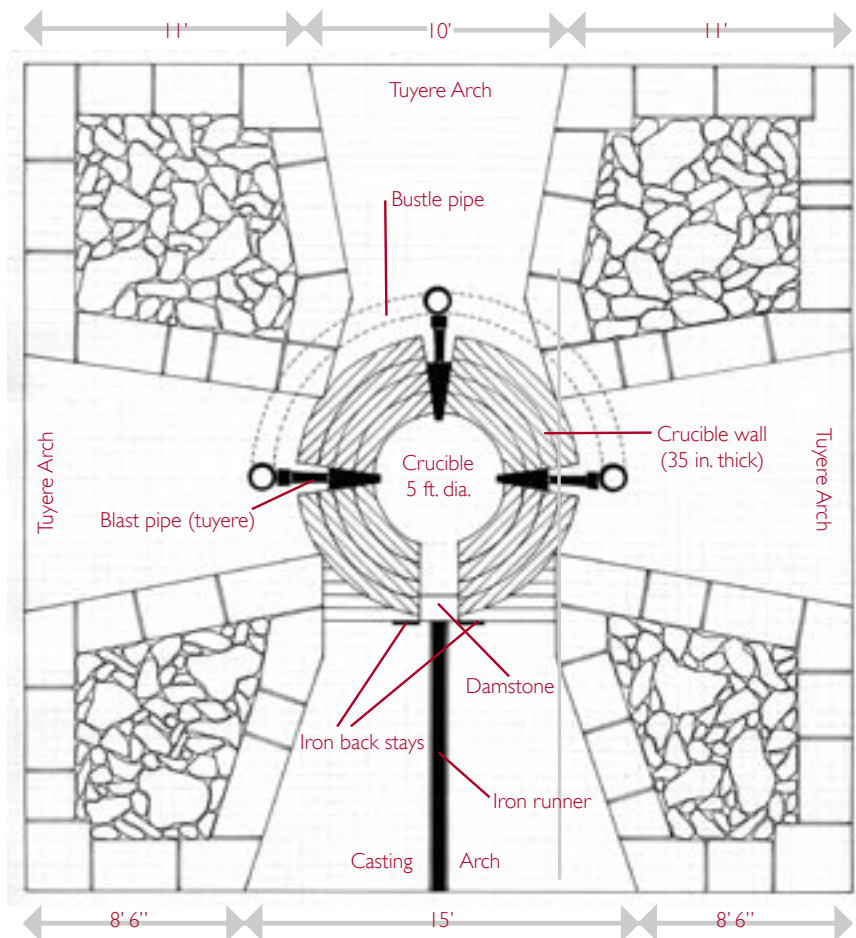
Remodeled in 1879 by the Oswego Iron Company

Stack height increased by 10 feet.

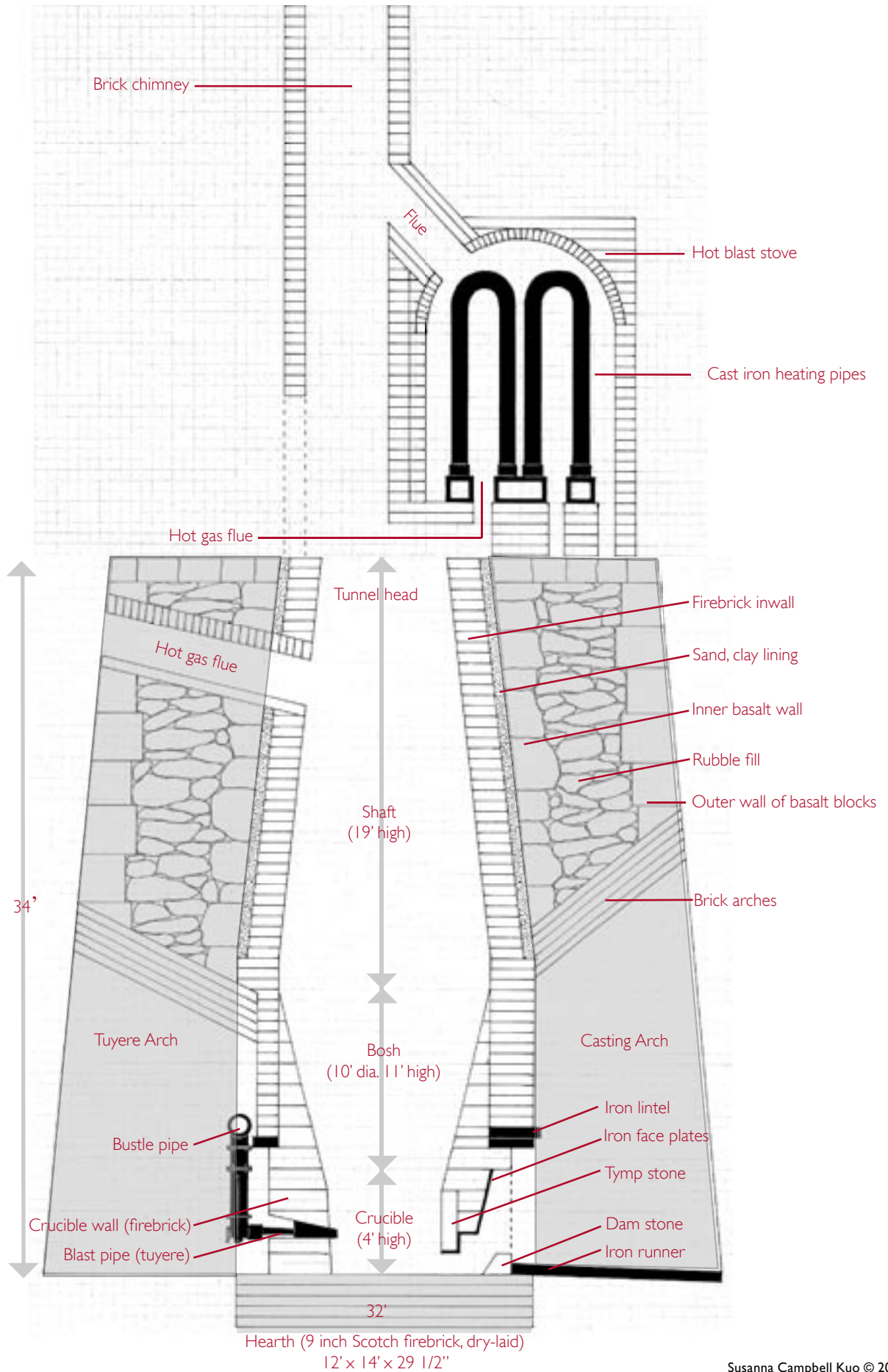
New blowing engine from Smith Bros. & Watson, Portland

Downcomer and bustle pipe moved to the outside of the stack

CROSS SECTION OF HEARTH



CROSS SECTION THROUGH CASTING ARCH



Second Furnace

Years of operation: 1888-1894

Built in 1887-88 by the Oregon Iron & Steel Company

Fifty-ton furnace, 60 feet high

Modeled on the hard-driving furnaces developed by Andrew Carnegie

Iron clad cupola

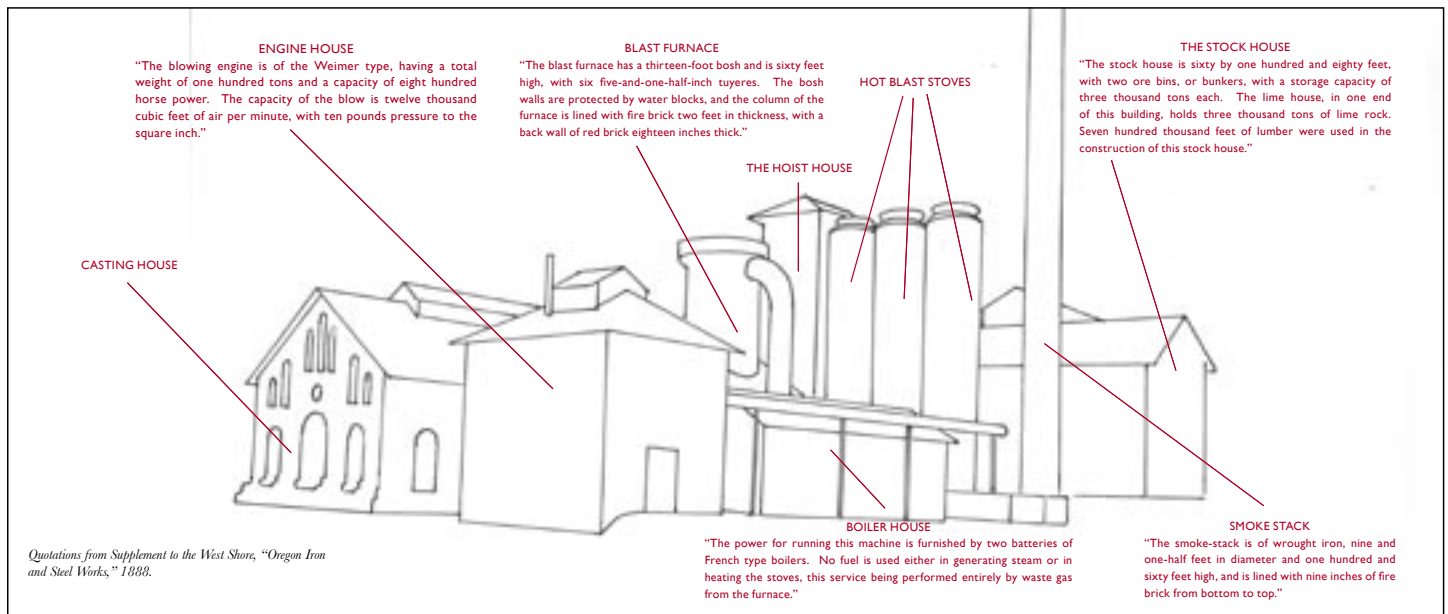
Blast system: steam-powered hot blast; two batteries of French boilers;

a Weimar blowing engine; three Siemens regenerative stoves for

heating the blast; six tuyeres (blast pipes)



Oregon Iron & Steel Company, second furnace, c. 1890 *Courtesy of the Lake Oswego Public Library*

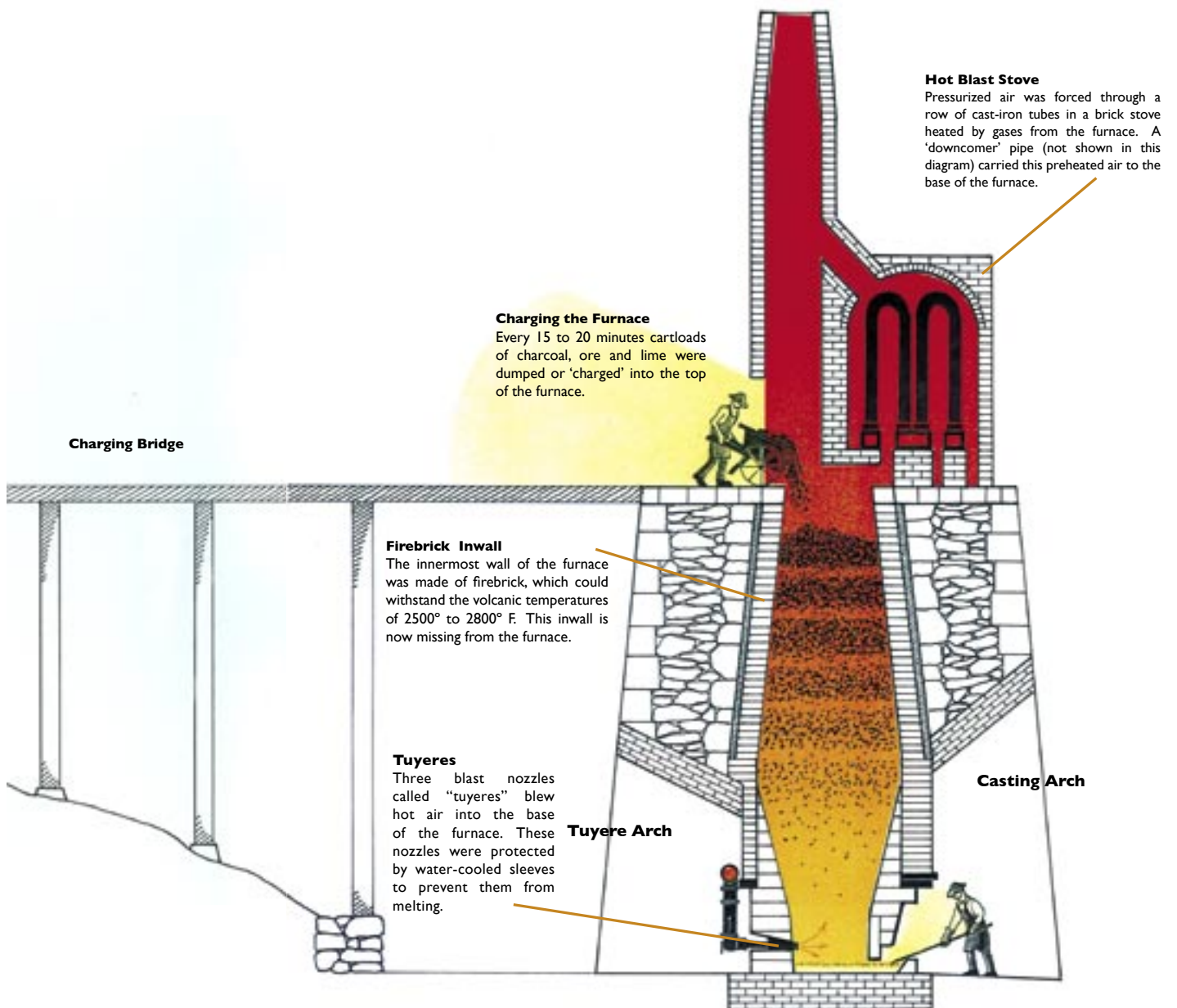


MAKING IRON

Susanna Campbell Kuo © 2008

Smelting Iron Ore

Extracting iron from ore is the first step in making any iron or steel product. The smelting process works as follows: charcoal, ore and limestone are fed into the top of the furnace and air is blown into the bottom. During combustion, a chemical reaction takes place. Charcoal acts as a reducing agent to remove oxygen from the ore (iron oxide), leaving metallic iron. The oxygen combines with carbon to form carbon dioxide and carbon monoxide, which escape up the chimney. With the aid of a flux (limestone), impurities in the ore separate into a glassy material called slag. Once the furnace is "in blast," it operates night and day without stopping for as long as a year and a half. It is only shut down when repairs are necessary or business is slow.



This cross-section does not show the buildings that enclosed the furnace.

Susanna Kuo © 2006

Raw Materials

Iron Ore

Ore for the Oswego Furnace was obtained from two mines: the Patton Mine in South Oswego and the Prosser Mine on Iron Mountain. The ore was a hydrated form of hematite variously known as brown hematite, limonite or bog ore. An 1888 account in a supplement to the *West Shore* magazine described the Prosser Mine: "It is a fissure vein of brown hematite, averaging ten feet in thickness, the ore yielding forty percent metallic iron. The old mine penetrated the hill in which the ore is found for a distance of about a thousand feet. The ore is first shoveled into cars in the mine, hauled out and dumped into bunkers, from which cars of the Oregon Iron & Steel Company's narrow gauge railway are loaded and drawn to the furnace stock house."

Charcoal

Fuel for the furnace was charcoal, which was superior to mineral coal because it did not contaminate the iron with sulfur. Chinese woodcutters felled Douglas fir trees and cut them into billets, which were then burned by colliers in charcoal "pits" in the forest. The billets were actually stacked on level ground in two tiers. The finished stack was



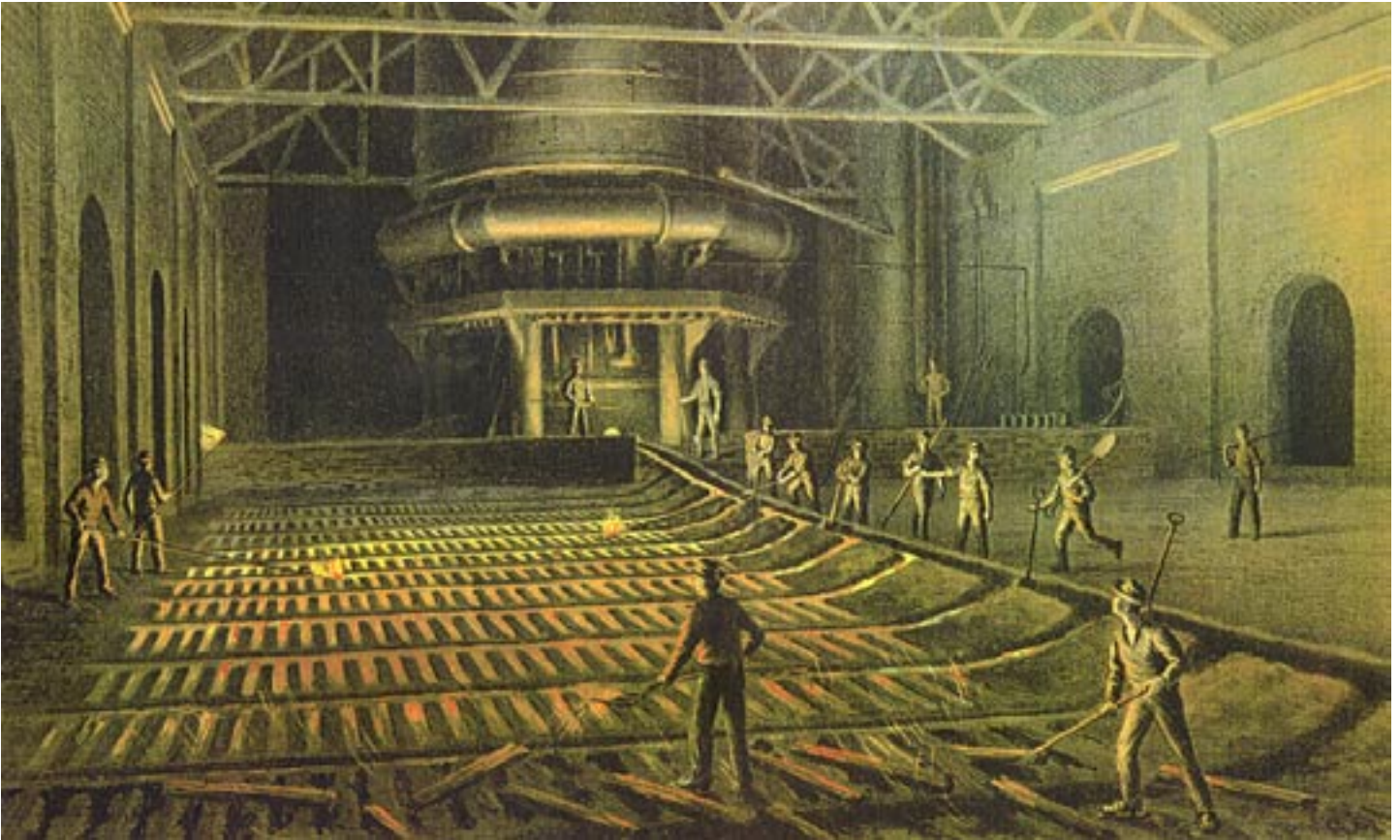
Engravings from a Supplement to the *West Shore*, 1888. A narrow gauge railroad carried ore from the mine on Iron Mountain down to the furnace.

Collection of the Oswego Heritage Council

about thirty feet in diameter and twelve feet high. It was covered with leaves and soil to cut off oxygen. The slow process of smoldering took about two weeks. During this time the charcoal burner or "collier" tended the mound night and day to ensure it didn't catch fire. Charcoal was made by this method until 1885. Thereafter, it was made in brick kilns near the new furnace.

Limestone

Limestone for the Oswego Furnace came from Puget Sound since there was no source nearby. Limestone serves as a flux during the smelting process, reacting with impurities in the ore and causing them to separate from the metal. These impurities collect in a glassy waste material called slag that floats on top of the molten iron.



Color engraving from the *West Shore*, November 2, 1889 Courtesy of the Lake Oswego Public Library

Casting Pig Iron

This night scene shows ironworkers tapping Oswego's second iron furnace in 1889. The method of casting pig iron in a sand floor was identical at both furnaces. Every twelve hours the furnace keeper broke a clay plug in the dam stone and the molten iron ran down a channel in the casting house floor. The stream of white-hot iron was diverted into branching channels called 'sows.' Each sow fed a row of molds called 'pigs' because of their resemblance to nursing piglets. Before the pigs cooled, they were broken off the sows with sledgehammers. Oregon iron was sold to foundries and forges in Portland and San Francisco where it was re-melted and made into a variety of cast iron, steel and wrought iron products. The two Oswego furnaces produced 93,404 net tons of pig iron between 1867 and 1894.



A bar of pig iron discovered near Oswego's second iron furnace. *Photo/Susanna Kuo*

Some Notable Uses of Oregon Iron



Cast Iron Architecture

The cast iron facades of Portland's Ladd & Tilton Bank and Salem's Ladd & Bush Bank were identical. William S. Ladd, the founder of both banks, was also president of the Oregon Iron Company. The majority of cast iron building fronts in Portland were made of Oregon iron.

Photo/Susanna Kuo



Pipe for Portland's Bull Run Water System

The Oswego Pipe Foundry was the only pipe foundry west of Saint Louis. It manufactured water pipe for Portland and other towns in the Pacific Northwest.

Collection of the Oswego Heritage Council



1879 San Francisco City Hall

Iron from Oswego was used in San Francisco's first City Hall, which was destroyed in the earthquake of 1906.

Photo courtesy of Alex Blendl, phone: 503-657-0970.

THE FURNACE RESTORATION PROJECT

Susanna Campbell Kuo © 2008



Photo/Susanna Kuo

The Oswego Iron Furnace was the first furnace on the West Coast and is the only surviving charcoal iron furnace west of the Rocky Mountains. Since 2003 the Oswego Heritage Council has worked closely with the City of Lake Oswego to create a restoration plan for the 1866 structure, which stands in a city park on the banks of the Willamette River. Although the buildings that originally surrounded the furnace are gone, the riverside site and the creek that provided waterpower are largely unchanged. The furnace, which is listed on the National Register of Historic Places, was Oregon's largest manufacturing enterprise in the 19th century and produced pig iron for foundries in Portland and San Francisco.

The 44-foot tall stack is modeled on the Lime Rock Furnace in Connecticut. The massive walls of locally quarried basalt are pierced with Gothic arches of red brick. Although the exterior is in relatively good condition, the interior stonework is seriously deteriorated. In 2005 the City of Lake Oswego appointed an eight-member citizen task force to develop a restoration plan. In 2007 Miller Consulting Engineers finalized a plan for stabilizing and repairing the monumental stone stack, which was hailed as a model of the mason's art when it was completed in 1866.

Preservation Plans

The basalt walls and brick arches will be repaired and stabilized. The firebrick lining will not be replaced due to the impossibility of replicating the historic bricks, which were manufactured in a variety of sizes and shapes for specific zones inside the furnace. Preservation work includes the following steps:

1. Rebuild missing stonework with matching basalt.
2. Grout the masonry with natural hydraulic lime mortar approved for historic preservation.
3. Rebuild the brick arches.
4. Inject grout into the rubble fill between the inner and outer walls.
5. Anchor the stack to its foundation with four vertical steel rods.
6. Install a low profile soldered seam lead roof for weather protection.
7. Install recessed iron gates in the four arches.

Interpretive Kiosk

When restoration work is complete, the chain link fence surrounding the furnace will be removed and an interpretive kiosk will be built on the lawn east of the stack. Diagrams and historic photos will illustrate the original iron works and will explain the process of smelting and casting iron.

The Casting Arch has suffered the most damage to its brickwork.

Photo/Frank and Susanna Kuo



Panoramic view of the interior shows where large blocks have fallen and exposed the rubble fill between the inner and outer walls. *Photo/Frank and Susanna Kuo*