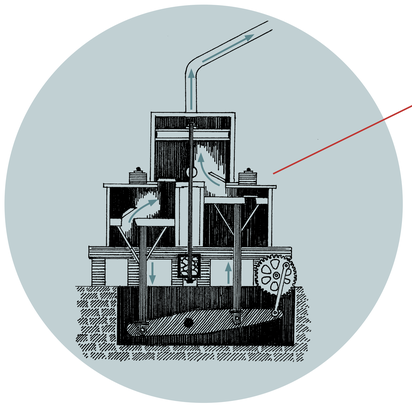
The Blast Furnace: *A Man-made Volcano*

The Blast Engine
The wooden blast engine and the water turbine that drove it were located in the blast house. Two five-foot diameter blowing tubs, with pistons driven by a huge walking beam, produced the blast. Air from the tubs was forced into a receiver with a weighted piston that kept the air pressure constant.



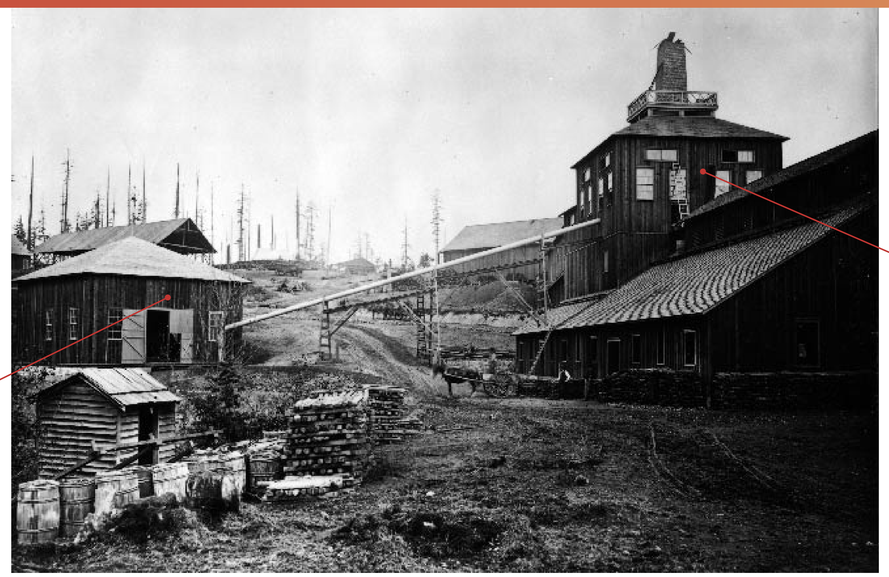
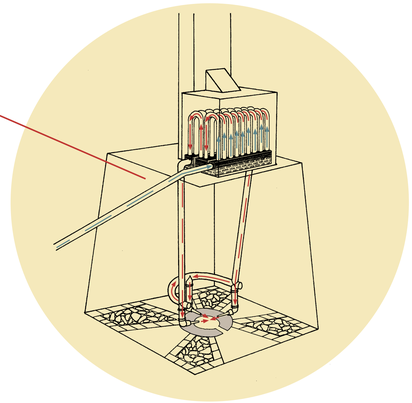


Photo by Carleton E. Watkins, 1867. *Courtesy of the Oregon Historical Society, #OrHi 21593.*



The Hot Blast Stove
Preheating the blast reduced fuel consumption. Cold air from the blast engine was piped through a row of giant cast iron tubes in a stove heated by furnace gas. Two "downcomers" carried the air to a bustle pipe that fed three nozzles, which injected it into the furnace. Water-cooled sleeves prevented the nozzles, or tuyeres, from melting in the inferno.

What is a Blast Furnace?

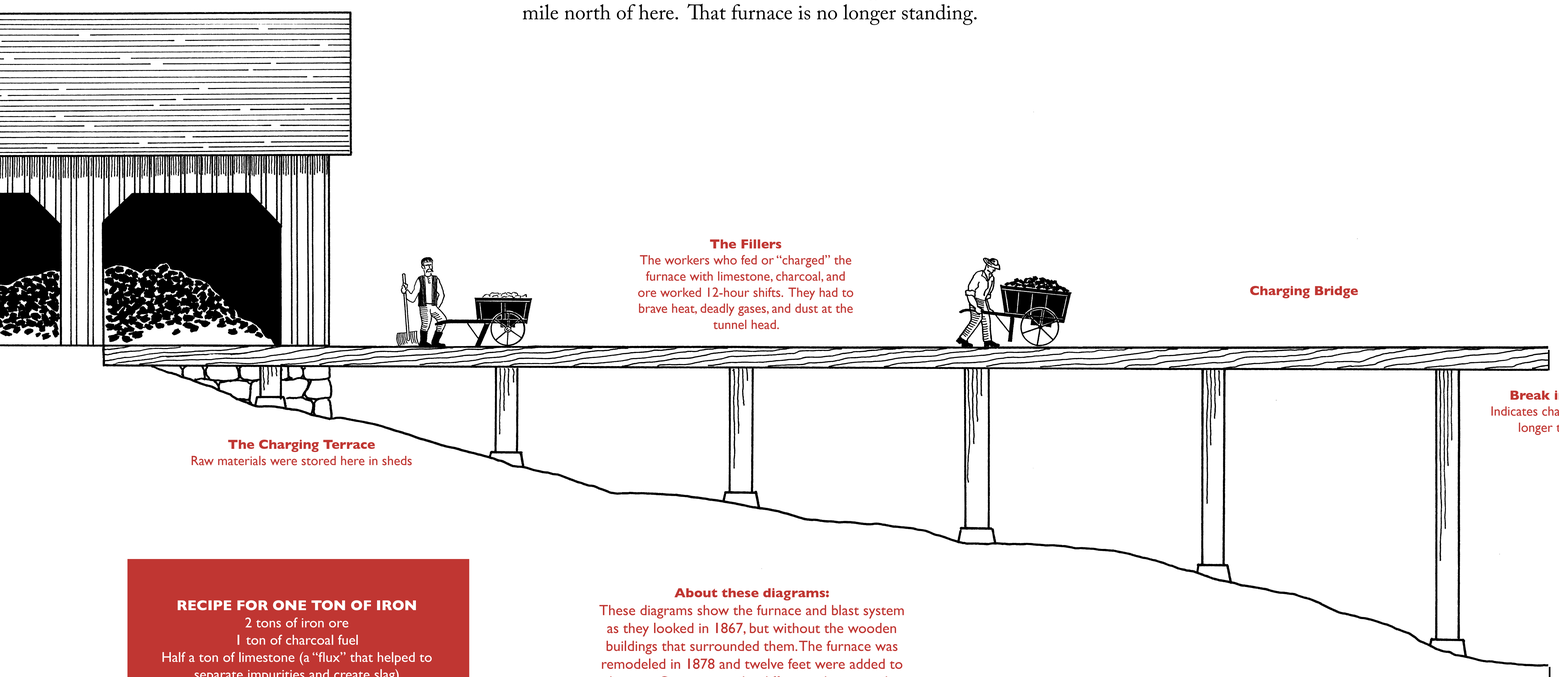
Iron, the world's most useful metal, makes up more than five percent of earth's crust and most of its core. However, elemental iron is rarely found in nature. In order to obtain pure iron, iron oxide ore must be "smelted" to remove the oxygen. The most efficient way of doing this is in a blast furnace.

Early blast furnaces were square stone towers with a vertical shaft. Ore, fuel, and limestone were fed into the top and air was blown into the bottom. As the solid materials descended in the shaft, a chemical reaction "reduced" or removed oxygen from the iron. Molten metal collected in the bottom of the furnace and slag, containing the impurities, floated on top of the heavier iron.

The conditions in a blast furnace were so similar to a volcano that some furnaces were named Etna and Vesuvius. In addition to enduring the heat and constant roar of the blast, workers were at risk from deadly gases, molten metal, and steam explosions.

Question: What is missing from the furnace today?

Answer: All the firebrick structures are missing: smelting shaft, hot blast stove, and chimney. Firebrick was the most expensive material in the furnace. It was the only material that could resist the corrosive effects of burning gas and molten metal. Most of Oswego's firebrick was imported from England and Scotland. Because of its value, the missing brick may have been reused in the second furnace built half a mile north of here. That furnace is no longer standing.



RECIPE FOR ONE TON OF IRON
2 tons of iron ore
1 ton of charcoal fuel
Half a ton of limestone (a "flux" that helped to separate impurities and create slag)
5 tons of air

About these diagrams:
These diagrams show the furnace and blast system as they looked in 1867, but without the wooden buildings that surrounded them. The furnace was remodeled in 1878 and twelve feet were added to the top. Can you see the difference between the old and new stonework?