



Reverberatory Furnace

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Introduction



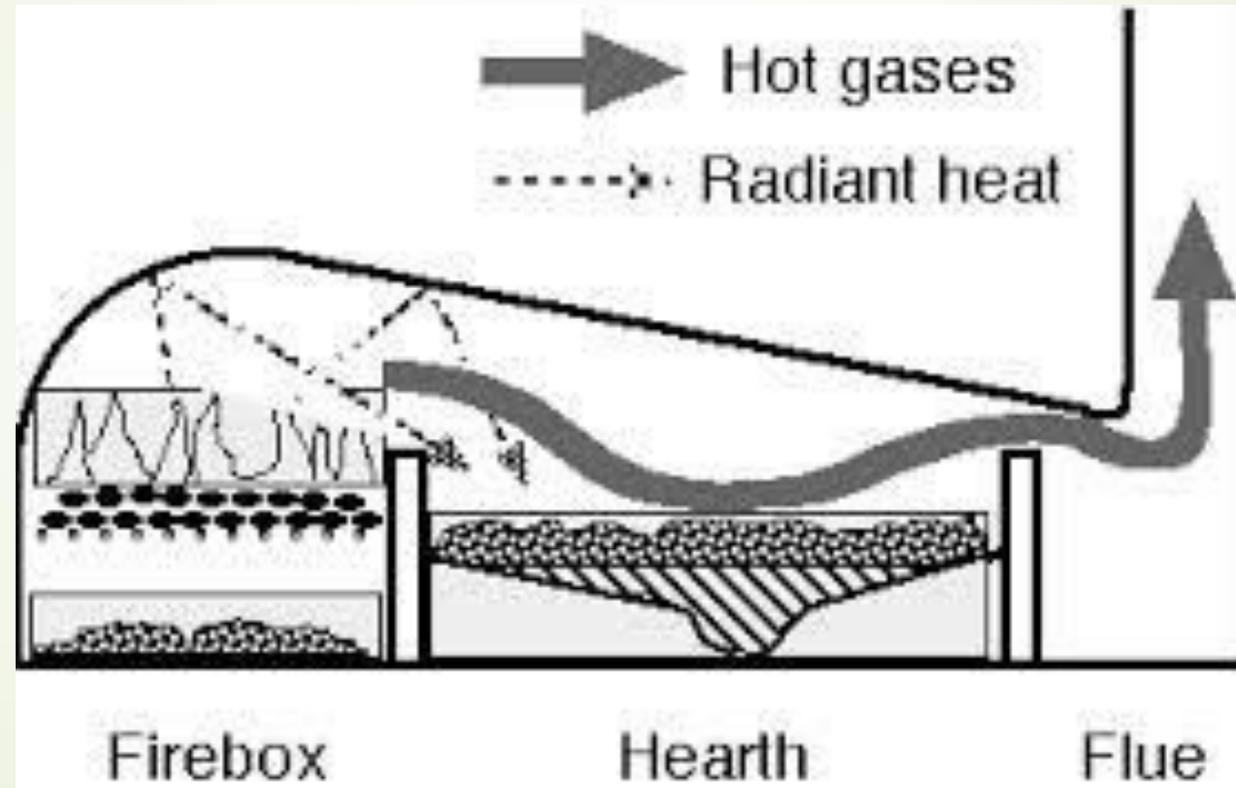
- Reverberatory furnace, a furnace used for smelting or refining in which the fuel is not in direct contact with the ore but heats it by a flame blown over it from another chamber.
- The term reverberation is used here in a generic sense of rebounding or reflecting, not in the acoustic sense of echoing.
- Such furnace is used in COPPER, TIN, and NICKEL production, in the production of certain CONCRETES and CEMENTS, and in ALUMINUM recycling.



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- In steelmaking, this process, now largely obsolete, is called the open-hearth process.
- Today, reverberatory furnaces are widely used to melt secondary aluminium scrap for eventual use by die-casting industries.
- Reverberatory smelting has recently been giving way to such newer processes as continuous smelting and the use of electric or flash furnaces.

Schematic Diagram





History



- The first reverberatory furnaces were perhaps in the medieval period, and were used for melting bronze for casting bells.
- They were first applied to smelting metals in the late 17th century.
- Sir Clement Clerke and his son Talbot built cupolas or reverberatory furnaces in the Avon Gorge below Bristol in about 1678.
- In 1687, while obstructed from smelting lead (by litigation), they moved on to copper.
- In the following decades, reverberatory furnaces were widely adopted for smelting these metals and also tin.



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- They had the advantage over older methods that the fuel was mineral coal, not charcoal or 'white coal' (chopped dried wood).
- In the 1690s, they (or associates) applied the reverberatory furnace (in this case known as an air furnace) to melting pig iron for foundry purposes.
- The puddling furnace, introduced by Henry Cort in the 1780s to replace the older finery process, was also a variety of reverberatory furnace.



Construction



- Numerous technical innovations have improved the production capacity of this furnace, although its basic construction has remained the same.
- The simplest reverberatory is nothing more than a steel box lined with alumina refractory brick with a flue at one end and a vertically lifting door at the other.
- Conventional oil or gas burners are placed usually on either side of the furnace to heat the brick and the eventual bath of molten metal is then poured into a casting machine to produce ingots.
- Roofs are made of refractory brick rather than the ordinary brick used earlier, and this has permitted higher temperatures and thus faster refining.



Operation

- The heat passes over the hearth, in which the ore is placed, and then reverberates back.
- The roof is arched, with the highest point over the firebox.
- It slopes downward toward a bridge of flues that deflect the flame so that it reverberates.
- The hearth is made dense and impervious so that the heavy matte, or molten impure metal, cannot penetrate into and through it, and the walls are made of a material that resists chemical attack by the slag.



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- The process is continuous in the reverberatory furnace: ore concentrate is charged through openings in the roof;
- Slag, which rises to the top, overflows continuously at one end;
- The matte is tapped at intervals from the deepest part of the ore bath for transfer to a converter, where it is further refined.