Reverberatory Furnace

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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.
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.
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.
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.
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.
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.