Shafts of Mechanical Kilns with Superposed Floors

For Roasting of Ores and Similar Purposes

Filed Oct. 26, 1960

INVENTOR
Miroslav Nejedly

By
Richard Kord
A94
The shafts of mechanical kilns with superposed floors for roasting ores and for similar purposes are at present cooled with steam, compressed air, or water. In some cases no cooling is used at all.

The present arrangements have the drawbacks of consuming large amounts of compressed air, steam, or water as cooling medium, and requiring means for conveying, propelling and frequently also cooling the cooling medium. The arrangements are frequently subject to failures and required proper attention.

In case of changes of the temperature in the kiln, the temperature of the shaft changes as well. The shaft thus changed its length due to thermal dilatation, which had an unfavorable effect upon the thickness of the layer of the roasted material on the floor. When sintering material is treated, new difficulties arise with the breaking off of the material sintered on the floor.

Additional difficulties were caused due to lack of tightness of the connections of the shaft since the cooling medium enters sometimes the kiln and unfavorably influences the technological process in the kiln, for instance, by distorting the reducing medium in the kiln with steam or other coolants.

These drawbacks have been overcome by cooling the shafts of mechanical kilns of greater height and having superposed floors by an air stream caused by the draft as it develops in a hollow shaft. In lower kilns, cooling has been accomplished by an air stream generated by the draft in the hollow shaft, helped by the suction effect of a stack placed on top of the hollow shaft, the shaft being provided at the bottom with ports for sucking in cooling atmospheric air. The shaft has been provided on its inside with cooling ribs for more intensive cooling.

To the accomplishment of the objects of my invention, which will appear from the following description, my invention provides for reduction roasting an annular ring to surround the shaft so that emergency steam can be admitted into the shaft to suppress any air draft within the shaft.

A practical embodiment of the object of this invention is shown by way of example in the accompanying drawing, wherein:

FIG. 1 is a schematic elevational view of a roasting kiln having superposed floors, and showing a shaft and stack;

FIG. 2 is a cross section of the shaft provided with a lining; and

FIG. 3 is a vertical cross section of the shaft at the place of admission of steam.

Referring to the drawing, there is seen in FIG. 1 a roasting furnace of the known type having a plurality of superposed hearths and rabbles arranged on each hearth for causing movement of a material being roasted. Since furnaces of this type are conventional, only the shell 9 of the furnace is shown together with the legs 10 which support the furnace shell 9 at a distance above the ground. The shaft 1 which actuates movement of the rabbles in a known manner passes vertically through the center of the shell 9. As also seen in FIG. 3 on an enlarged scale, the hollow shaft 1 is provided below the kiln proper with suction ports 2 which are sucking cooling air from the surrounding space. The air passes through the shaft 1 which is shown in the embodiment selected for illustration to be provided on the outside with a lining 5. The air is heated by the inner wall of the shaft 1 and thus cools the shaft. In order to achieve a more intensive heat transmission, the shaft is provided on the inside with cooling ribs 6. The stack 8 which is of a height similar to that of the shell 9, and is superposed on the shaft 1 removes the hot air and simultaneously increases the suction effect, causing a more intensive stream of the cooling air for lower kilns. The shaft 1 can be provided on the inside with a ladder 7 to enable checking of the shaft 1. Since the gaseous atmosphere within reduction kilns has a strongly reducing character there is case of air escaping from the cooled shaft 1 a danger of explosion. The arrangement according to this invention acts as a safeguard by automatically admitting steam into the shaft 1 in case a danger state is signaled. Entrance of air into the shaft is thus prevented. The steam of air is supplied to the annular ring 3 from which it enters the shaft 1 through the pipes 4. These parts are spaced upwardly from the ports 2 or the passage open to the atmosphere.

It will be appreciated that the cooling medium is atmospheric air. No conveying, moving, and cooling means for the cooling medium are required. Cooling is spontaneous, automatic, and foolproof. In case of a change toward a higher temperature within the kiln, passage of air is automatically adjusted so that the stream of air is more intensive for higher than for lower temperatures. This causes equilization of the temperatures of the shaft and thus its uniform thermal dilatation. No cooling air can enter the kiln, due to some lack of tightness of shaft joints, under normal pressure conditions of a reduction roasting.

It will be apparent that while I have shown and described my invention in a single form only, many changes and modifications may be made without departing from the spirit of the invention defined in the following claim.

I claim:

In a mechanical kiln for roasting a material, in combination, a kiln shell; a hollow rotatable shaft passing through said shell and having upper and lower terminal portions projecting from said shell, said shaft defining a substantially closed cavity therein, said lower terminal portion being formed with a passage therein communicating with said cavity and open to the atmosphere; an elongated stack communicating with said upper terminal portion and extending upwardly therefrom, a portion of said stack spaced from said upper terminal portion being open to the atmosphere; and means for admitting steam under pressure to a portion of said cavity adjacent said lower terminal portion and spaced upwardly from said passage.

References Cited in the file of this patent

UNITED STATES PATENTS

828,095 Dewey  Aug. 7, 1906
1,685,745 Holt  Sept. 25, 1928
1,828,293 Powell  Oct. 20, 1931
2,302,841 Connolly  Nov. 24, 1942