Feb. 16, 1965 J. E. O'REILLY 3,169,754

REHEAT FURNACE

Filed March 7, 1963

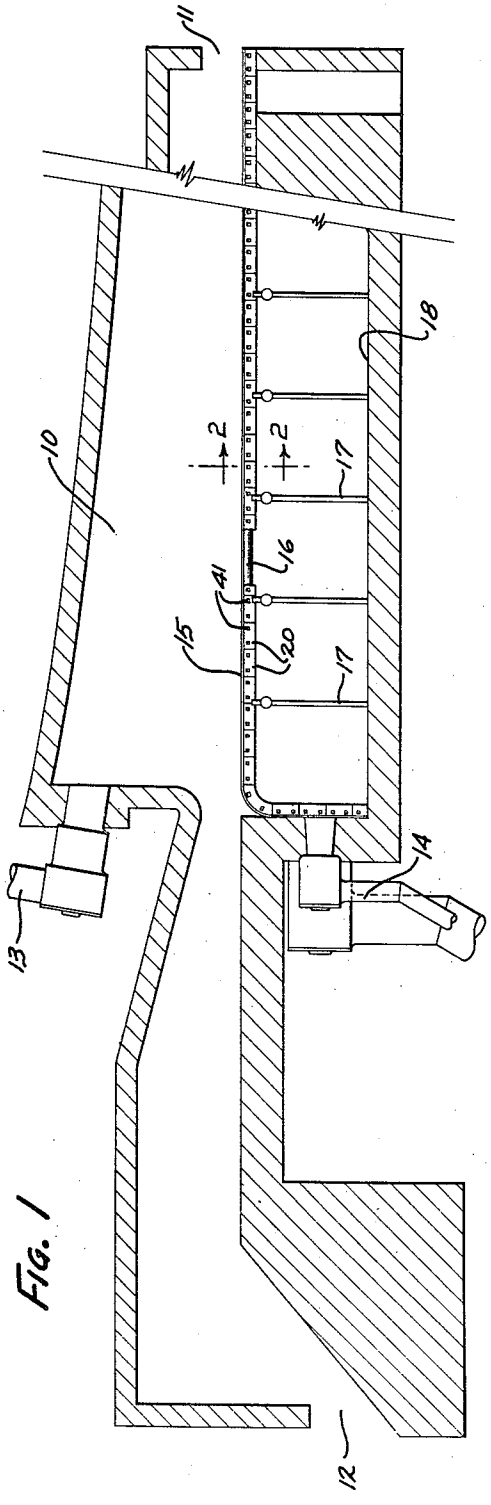


FIG. 1

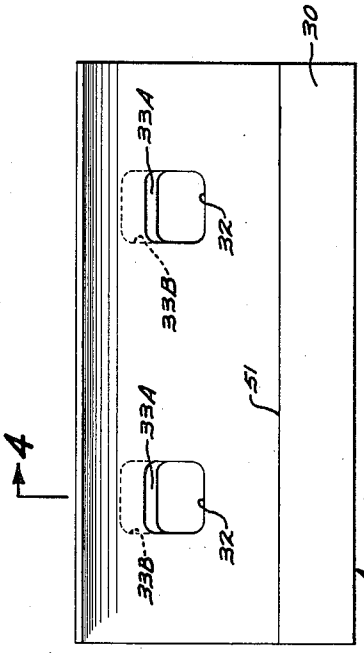


FIG. 3

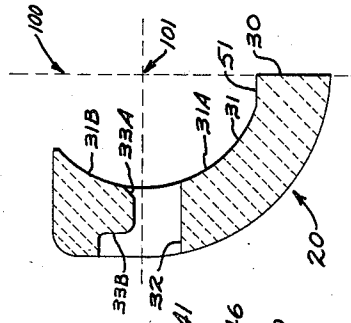


FIG. 4

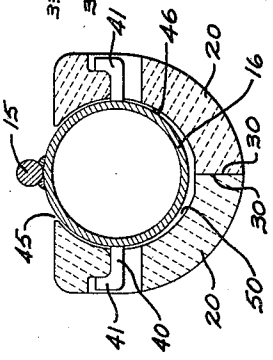


FIG. 2

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3,169,754

REHEAT FURNACE

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2 Claims. (Cl. 263—6)

This invention relates to reheat furnaces of the type which use cooled skid rails. In a particular embodiment, the invention relates to refractory insulating skid cooling pipe tile.

Reheating furnaces are used to heat steel ingots, billets, slabs, and the like, to minimize internal stresses which have occurred during working, and to prepare them for subsequent additional working. These furnaces may be, generally, divided into two classes; namely, a batch type in which shapes to be treated remain in a fixed position on the furnace hearth while being reheated to working temperature, and the continuous types in which a line of billets, ingots, slabs, etc., are moved in a continuous line through the furnace. In this type of continuous operation, the shapes are moved through the furnace by pushing the last piece charged which, in turn, moves the entire line of shapes, and discharges the first of the line through a discharge door at the other end of the furnace.

One type of continuous reheat furnace uses water-cooled skid rails. Heat is applied above and below the ware being pushed through the furnace on the skid rails. These skid rails must be maintained at a relatively cool temperature, to prevent deformation under load. Conventionally, the skid rail is fixed, as by welding, to the top of a cooling fluid conduit or pipe, whereby the skid rail is maintained at a relatively low temperature. The cooling fluid is usually water. An appreciable amount of furnace heat is lost through this manner of cooling. Many attempts have been made to use some type of insulation around the cooling fluid pipe, but, as far as I know, none have proved satisfactory.

Accordingly, it is an object of this invention to furnish improved reheating furnaces of the type using cooled skid rails. It is another object of the invention to provide improved refractory insulating skid cooling pipe tile.

Briefly, according to one embodiment of the invention, I provide generally C shaped refractory insulating tile, adapted to be mounted in pairs about reheating furnace skid rail cooling pipe. The lower lip of the respective members of a par of these C shaped tile are arranged to seat against each other. A dished face above such a lower lip opposes a similar dished face of the other of the pair of tile, to define an open topped, open ended slot. The upper mouth of this open topped slot extends its entire length, and is narrower than its middle or waist portion. Such a pair of tile peripherally encompass—in loose fitting relation—all but the top portion of the cooling conduit, where it is in contiguous heat-conducting relation with the skid rail. Means are provided to releasably hold the pair of tile about the cooling conduit.

Other object and further features and advantages of the invention will be readily apparent to those skilled in the art from a study of the following detailed description with reference to the appended drawings. In these drawings:

FIG. 1 is a schematic side elevation in partial section of a reheat furnace having water-cooled skid rails in combination with refractory insulating tile, according to the invention;

FIG. 2 is a sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a side elevation of one of the tile of the arrangement of FIG. 2; and

FIG. 4 is a sectional view of the tile of FIG. 3, taken along the line 4—4 thereof.

In FIG. 1, a countercurrent fired, continuous, reheat furnace is schematically indicated to include a furnace chamber 10 having an intake door 11 and a discharge door 12. A plurality of burners 13 and 14 heat the interior of the furnace. Skid rails 15 extend a substantial portion of the distance between the intake door 11 and the discharge door 12. Mounted along at least a portion of the bottom of the skid rail 15 is a fluid conduit or pipe 16. A plurality of vertical support members 17 hold the fluid conduit and skid rail a substantial distance above the furnace hearth 18. Suspended along the fluid conduit 16 are a plurality of pairs of refractory insulating skid cooling pipe tile 20.

Each of the skid pipe tile 20 may be characterized as generally C shaped. It has a lower lip portion 30 which is arranged to abut against a similar lip portion 30 of the other of a pair of tile, as is clearly shown in FIG. 2. The face of the tile immediately above this lip 30 is dished. The dimensions and cross-sectional configuration of such a dished face 31 will, of course, vary, depending on the diameter or cross-sectional configuraton of the fluid conduit it is used to insulate. However, for purposes of explanation, with a 4½" outside diameter cooling pipe, the following dimensions can be typical: Considering the vertical plane 100 and a point 101 approximately 4" above the bottom of the lip 30 (total height, about 6"), the portion 31A of the face 31 has about a 2½" radius and the portion 31B has a radius of about 2 5/16". Such a configuration provides for the lip ridge 51 and the necessary spacing 50 between the bottom of the conduit and the lips 30, so the tile may rotate about their points of suspension, as discussed below. This loose fitting relation also appears to compensate for thermal expansion differences.

Passages 32 are formed at spaced intervals lengthwise of each tile. The inner edge 33A of the upper wall, which defines passage 32, is sloped at about a 45° angle. This is in order to allow placement of the tile over such as legs 40, as will be described in detail below. A toe hole or indentation 33B is formed through the outer edge of the upper wall, defining the outer mouth of passage 32. This is to provide a space in which the toe 41 of leg 40 may be positioned. The legs preferably fall along the same horizontal axis. The dimensions of the legs, toes, passages and toe holes are such as to promote frictional engagement between adjacent surfaces of the toes and toe holes. Since FIG. 2 is approximately to scale, exemplary dimensions are provided. As can be appreciated from the drawings, most of the mass of each of the tile 20 is below the passage 32 and towards the sidewardly extending lip 30. Thus, when the tile are suspended or hung on the legs 40, the mass of the tile tends to rotate it towards the lip and, thus, towards the center of a pipe about which they are mounted. When a pair of identical tile 20 are suspended on legs attached to opposite sides of the cooling pipe, their lips 30 are pressed against each other and held in this position—due to the mass and centers of gravity of the tile relative to their points of suspension, and they thereby form an elongate open topped and open ended slot having a relatively narrow upper mouth 45. In any event, the mouth 45 is considerably smaller than the middle or waist 46 of the slot formed by the pair of tile. The cross-sectional configuration, thus resulting, peripherally encompasses all but the top portion of the cooling pipe, where it is in contiguous heat-conducting relation with the skid rail.

I prefer that the lips 30 of the tile be flat for economy of manufacture, although it is, of course, possible to code such a lip to interlock with an opposed lip of complementary coding on a second of a pair of the tile.

Having thus described the invention in detail, and with sufficient particularity as to enable those skilled in the art

to practice it, what is desired to have protected by Letters Patent is set forth in the following claims.

I claim:

1. In combination with a reheating furnace consisting of a furnace chamber having an intake and discharge end, a skid rail extending at least a portion of the distance between said ends, means for supporting the skid rail, and a cooling conduit in contiguous heat conducting relation below at least a portion of said rail, said conduit having rigid hooks means in the external part thereof; a plurality of pairs of generally C shaped elongated refractory insulating tile disposed about the cooling conduit, each of said tile having a lower lip in contact with a similar lip of the other tile in said pair, and a dished face above said lower lip opposing a similar dished face of the other tile to define an open topped, open ended slot, the open topped slot having an upper mouth which extends its length and which is narrower than the diameter thereof, the curvature of the dished face being such that whereby a pair of tile peripherally encompass in spaced relation all but the top portion of the cooling conduit where it is in contiguous heat-conducting relation with the skid rail, each of said tile also having a plurality of longitudinally spaced passages opening through the dished face for releasably mounting and frictionally engaging with the hook means carried by the cooling conduit, the central axis of the passages being above the center of gravity of the tile, and most of the mass of the tile being below the opening of the passages.

2. Generally C shaped refractory insulating tiles for mounting in pairs about a cooling conduit having a skid rail disposed there above and in contiguous contact therewith, and in which said cooling conduit contains external

rigid hook means, each of said tile having a lower lip arranged to contact a similar lip of the other tile in said pair and a dished face above said lower lip constructed and arranged to oppose a similar dished face of the other tile to define an open topped, open ended slot, the open topped slot having an upper mouth which extends its length and which is narrower than the diameter thereof, the curvature of the dished face being such that a pair of tile will be adapted to peripherally encompass in spaced relation all but the top portion of a cooling conduit where it is adapted to be in contiguous heat-conducting relation with the skid rail, and means adapted to releasably mount and frictionally engage said tiles in place about the cooling conduit, said means including a plurality of longitudinally spaced passages opening through the dished face arranged for hanging on the hook means carried by the cooling conduit, said passages being above the center of gravity of the tile.

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CHARLES SUKALO, *Primary Examiner.*

JOHN J. CAMBY, *Examiner.*

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,169,754 February 16, 1965

Jack E. O'Reilly

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 48, for "par" read -- pair --; line 58, for "object" read -- objects --; column 3, line 10, for "hooks" read -- hook --.

Signed and sealed this 12th day of October 1965.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents