

[54] REFRACTORY LINING FOR THE FLOOR OF METALLURGICAL VESSELS

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[57] ABSTRACT

A refractory lining for the floor of a metallurgical vessel wherein the floor slopes down to a central or eccentrically offset outlet. The floor is divided into a plurality of sectors radiating from the center of the outlet orifice. Each sector has a plurality of courses having the same angular size. The left and right hand edges of each sector are formed by straight courses of bricks and a brick is aligned across the width of each sector adjacent the outlet. Each straight course of bricks comprises at least a pair of wedge shaped bricks defining the left and right hand sides of each sector and the faces of the wedge-shaped bricks which face inwardly are parallel to each other. The outside faces of the wedge-shaped bricks defining the sides of the sectors are inclined at an angle determined by the number and slope of the sectors so that the outside faces of adjoining sectors are in contact with each other.

9 Claims, 3 Drawing Figures

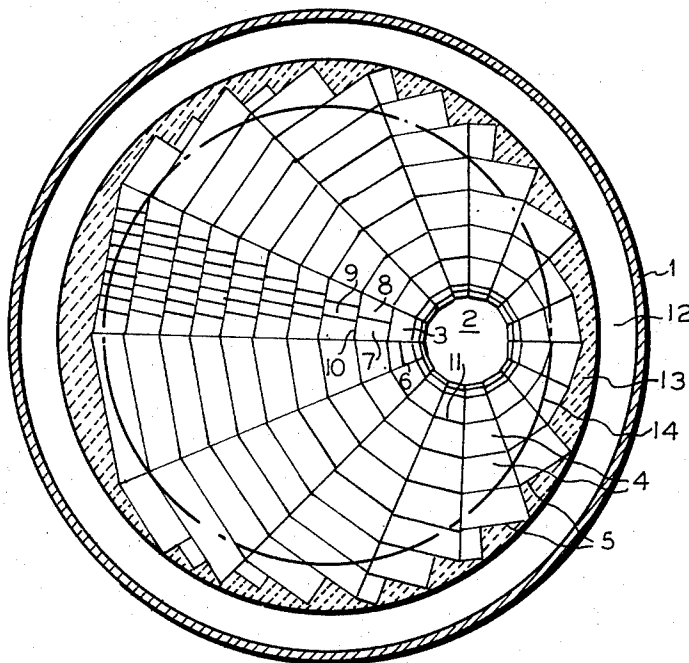


FIG. 1

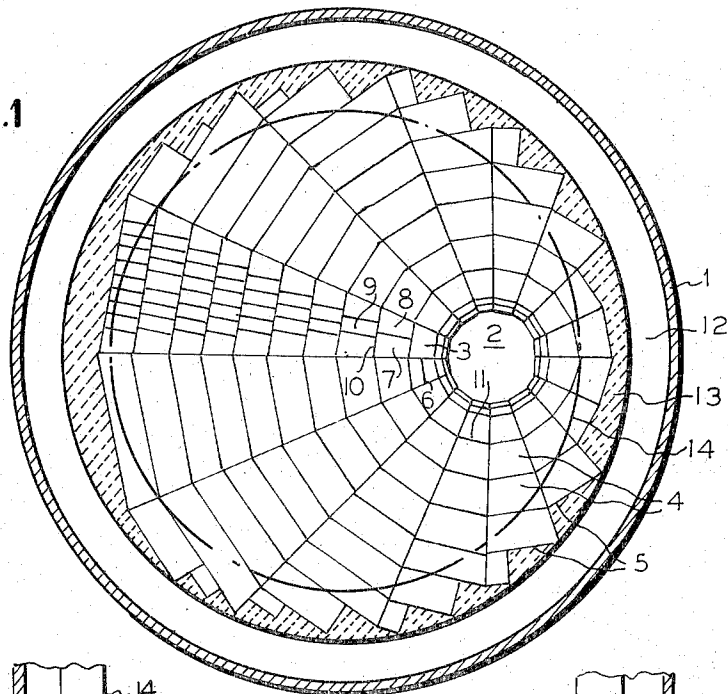


FIG. 2

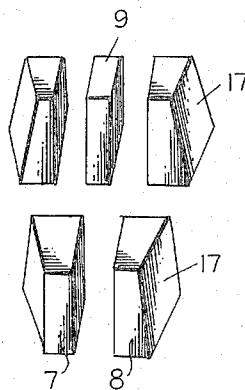
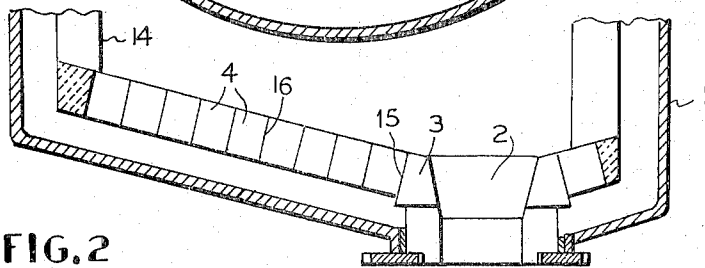


FIG. 3

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## REFRACTORY LINING FOR THE FLOOR OF METALLURGICAL VESSELS

The invention relates to a lining for the floor of metallurgical vessels, particularly of vessels used for degassing steel melts, in which the floor slopes towards a central or eccentrically offset outlet orifice surrounded by edging bricks backed by further brick courses.

The floors of metallurgical vessels frequently slope down towards an outlet orifice so that the melt can easily flow out. Usually the vessel floors, particularly in vessels for degassing steel, have a spherical or conical surface. Around the orifice the surface is formed by consecutive concentric courses of bricks. The construction of the several courses of a conical bottom requires bricks that are wedge-shaped in two different directions, namely tangentially and vertically to the surface of the floor (so-called wedge shapes). Moreover, bricks must be used which also have arcuate ends (so-called radial bricks). The inner courses are formed exclusively from radial bricks, whereas the outer courses that are laid on a larger diameter are increasingly constructed of wedge-shaped bricks.

The refractory material of the bricks for the wearing lining of the floor of vessels for degassing steel is generally a high grade sinter magnesia and fused magnesia.

This generally conventional method of lining the floors of steel degassing vessels calls for the provision of a large number of bricks of different shapes in addition to the edging bricks for forming the orifice. Moreover, the necessary radial bricks can be produced only in the form of rammed bricks, a circumstance which adversely affects their specific gravity. Apart from the laborious process of making the bricks the lining of the floor is itself a difficult and protracted operation. It involves keeping the joints in the individual brick arches as well as between them as tight as possible. The wear resistance and density of the bricks as well as the tightness of the joints in the vessel floor are important factors in determining the life and availability of steel degassing vessels. These requirements are difficult to fulfil and cannot be really satisfactorily met by hitherto conventional methods of lining.

It is therefore an object of the present invention to simplify the lining and improve the durability of the floor lining of metallurgical vessels.

For achieving these objects the invention proposes to divide the lining of the floor into sectors of equal angular size converging and forming planes descending towards the center of the outlet orifice, said sectors consisting of an edging brick and wedge-shaped bricks that define the left and right hand sides of each sector, whereas the space between the latter is filled with square bricks, the edging bricks having sides conforming with the divergence angle of the sectors and the side faces of the wedge-shaped bricks forming the sector sides being inclined at an angle determined by the number and slope of the sectors. A floor lining of this form of construction requires a minimum number of shapes which can be laid to a simple pattern. Moreover, it is possible to use exclusively pressed shapes and, after a possible regrinding of the bricks, high demands can be easily satisfied both with regard to wear resistance and to tightness of the brickwork. In operation a floor

lining according to the invention also exhibits more satisfactory properties with regard to expansion than conventional arrangements consisting of concentric brick rings. This is due to the fact that under the influence of thermal expansion entire blocks of bricks can slide along linear joints, the risk of joints opening by arching between consecutive courses being minimized.

The floor lining should preferably be so designed that the face of the edging brick (rear face) which is backed by the associated sector is perpendicular to the surface of the sector and that the faces of the joints between consecutive courses of a sector are parallel to said rear face. This arrangement assists in stabilizing the brickwork besides ensuring tightness of the joints.

At the floor surface the short edges facing the outlet orifice of the wedge-shaped bricks according to the invention are equal in length to half the length of the upper edge of the rear face of the edging brick. Moreover, it is preferred that the square bricks between the wedge-shaped bricks should all be of the same dimensions, and increase in number by one brick from course to course from the inside outwards. This arrangement permits the number of joints in the particularly critical region of the edging bricks to be limited and the total number of different shapes to be small.

For the sake of economy it may also be desirable in conjunction with the proposed floor lining so to construct the metal bottom that it conforms with the shape of the lining.

There are preferably at least four sectors e.g. 8, 10, 12, 16 or 20 or more sectors, 16 being a very satisfactory number.

Each straight course of bricks preferably consists of at least a pair of wedge shaped bricks defining the left and right hand sides of the sector, the faces of the wedge shaped bricks which face inwardly being parallel to each other.

The outside faces of the wedge shaped bricks defining the sides of the sectors are also preferably inclined at an angle determined by the number and slope of the sectors so that the outside faces of adjoining sectors are in contact with each other. The outlet orifice is preferably surrounded by edging bricks each of which conform to the sector with which they are in contact, the sides of the edging bricks conforming with the divergence angle of the sector.

The invention may be put into practice in various ways and one specific embodiment will be described by way of example with reference to the accompanying drawings in which:

FIG. 1 is part of the floor of a vacuum vessel in plan; FIG. 2 is a cross section of the same part of the floor and

FIG. 3 is an exploded view of bricks in two consecutive courses.

In FIGS. 1 and 2 a vessel having a sheet metal shell 1 is provided with a refractory lining forming its floor which contains an eccentrically offset outlet orifice 2. This orifice is surrounded by edging bricks 3 which are backed by further brick courses 4. The lining of the floor is divided into sectors 5 of equal angular size radiating from the center of the outlet orifice 2. The side face 6 of the edging bricks 3 conform with the

angle of divergence of the sectors 5. The brick courses 4 each comprise a left and right hand wedge-shaped brick 7 and 8 and parallel sided bricks 9. In each sector the number of bricks 9 increases by one from course to course 4 from the inside outwards. In the wedge-shaped bricks 7 and 8 the length of the short edge 10 facing the orifice at the floor surface is equal to half the length of the upper edge of the rear face 11 of the edging brick 3. The space which remains between the sheet metal shell 1, the insulating and permanent lining 12 and the portion of the refractory floor lining formed by the brick sectors 5 is filled with a refractory composition 13. The side wall of the vessel is built up on the floor and extends inwards to the circle 14 indicated by a dot-dash line in FIG. 1.

As will be understood more particularly from FIG. 2 the vessel floor slopes at a constant angle downwards to the outlet orifice 2 and each sector 5 is flat. The edging bricks 3 surrounding the eccentrically located orifice 2 have a rear face 15 which is perpendicular to the surface of the floor. Moreover, the joints 16 between the several brick courses 4 are all parallel to the rear face 15.

FIG. 3 illustrates the disposition of a left-hand wedge-shaped brick 7 and a right-hand wedge-shaped brick 8 in a course 4 lacking a brick 9 as well as the disposition of the two wedge-shaped bricks in the next course flanking an interposed brick 9. The side faces 17 of the wedge-shaped bricks defining the sector edges are inclined at an angle determined by the number of sectors 5 and their angle of slope.

The lining of the floor of the vessel begins at the completed annulus of edging bricks 3 around which consecutive courses 4 of the sectors 5 are laid in rings. The bricks 7 to 9 which represent the wearing lining of the floor are laid on the permanent lining and any difference in height is made good in conventional manner by inserting a basic composition under the floor thus packing up the floor.

The number of sectors 5 is in principle arbitrary. However, their number should be chosen in accordance with the desired shape of floor and the size of the shapes that are to be used. It would thus be advisable to divide the floor into 16 sectors 5 if the diameter of the outlet orifice is of the order of say 300 mm.

For the construction of the floor the preferred refractory materials are pressed and fired bricks of high-grade sinter magnesia and fused magnesia which may be ground to an exact fit after they have been fired.

We claim:

1. A refractory lining for the floor of a metallurgical vessel wherein the floor slopes down to a central or eccentrically offset outlet comprising a floor divided into a plurality of sectors radiating from the center of the

outlet orifice, each sector having a plurality of courses having the same angular size, the left and right hand edges of each sector being formed by straight courses of bricks and a brick aligned across the width of each sector adjacent said outlet.

2. A refractory floor lining as claimed in claim 1 in which each sector is flat.

3. A refractory floor lining as claimed in claim 1 in which each straight course of bricks comprises at least a pair of wedge shaped bricks defining the left and right hand sides of each sector and the faces of the wedge-shaped bricks which face inwardly being parallel to each other.

4. A refractory floor lining as claimed in claim 3 in which the outside faces of the wedge-shaped bricks defining the sides of the sectors are inclined at an angle determined by the number and slope of the sectors so that the outside faces of adjoining sectors are in contact with each other.

5. A refractory floor lining as claimed in claim 1 in which said outlet orifice is surrounded by edging bricks each of which conform to the sector with which they are in contact, the sides of the edging bricks conforming with the divergence angle of the sector.

6. A refractory lining for the floor of metallurgical vessels, wherein the floor slopes down towards a central or eccentrically offset outlet orifice comprising edging bricks forming said orifice, courses of bricks backing said edging bricks, said lining being divided into sectors of equal angular size converging and forming planes descending towards said outlet orifice, an edging brick and wedge-shaped bricks defining the left and right hand sides of each sector, square bricks between said wedge-shaped bricks, said edging brick having sides conforming with the divergence angle of the sector and the side faces of the wedge-shaped bricks forming the sector sides being inclined at an angle determined by the number and slope of the sectors.

7. A refractory floor lining as claimed in claim 6 in which the rear of said edging brick is perpendicular to the surface of the sector and the faces of the joints between consecutive courses in a sector are parallel to said rear face of said edging brick.

8. A refractory lining as claimed in claim 6 in which the short edge of said wedge-shaped bricks facing said outlet orifice at the floor surface is equal in length to half the length of the upper edge of the rear face of said edging brick.

9. A refractory floor lining as claimed in claim 6 in which the square bricks between the wedge-shaped bricks are all of the same dimensions and increase in number by one brick from course to course from the inside outwards.

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