March 22, 1960 L. HÜTTER 2,929,343

BASIC ARCH FOR REVERBERATORY FURNACE

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Fig. 1

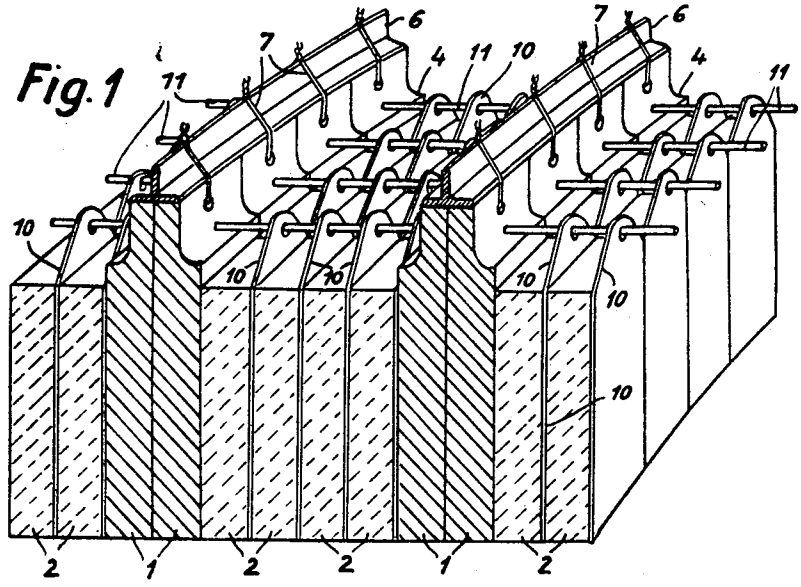
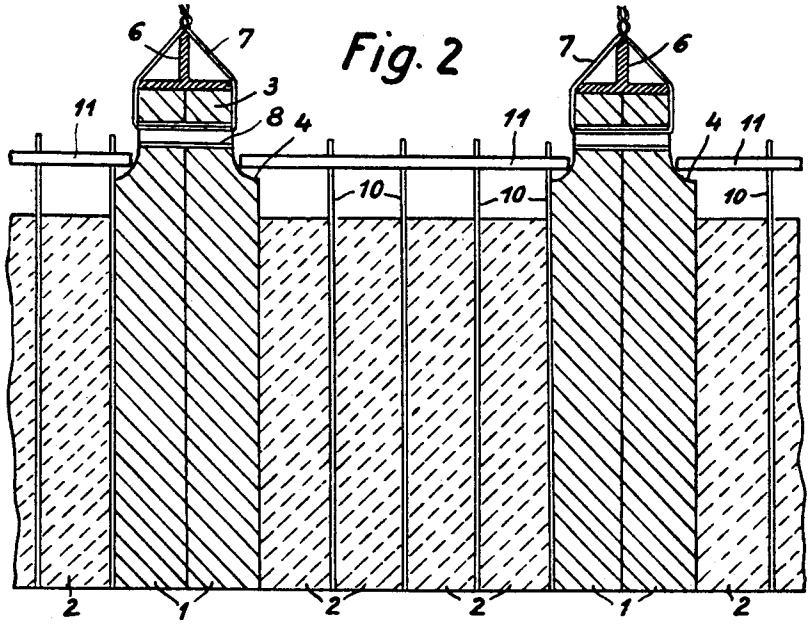


Fig. 2



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Fig. 3

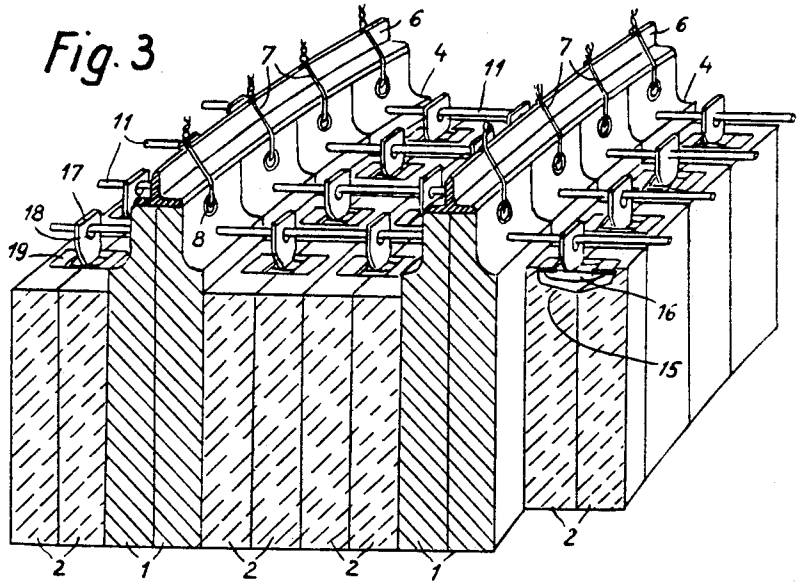
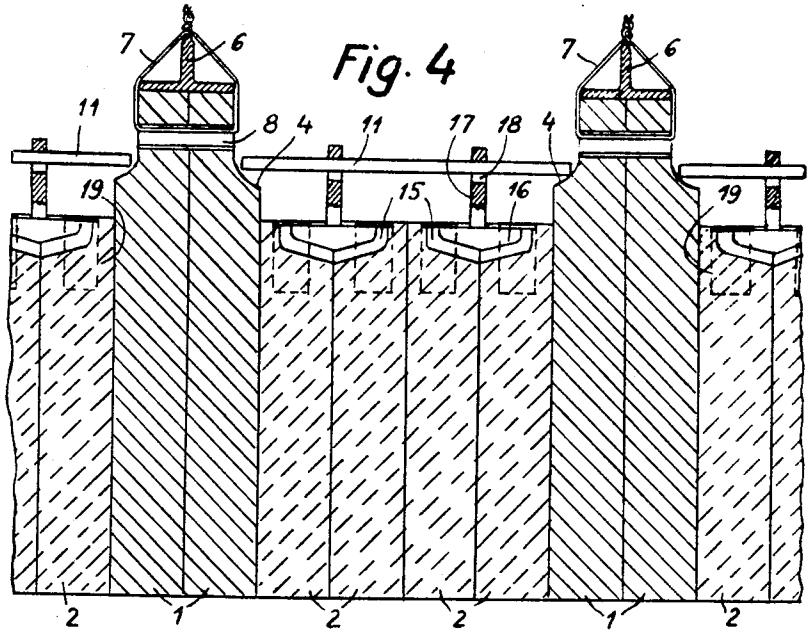


Fig. 4



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BASIC ARCH FOR REVERBERATORY FURNACE

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Application October 28, 1954, Serial No. 465,402

Claims priority, application Austria October 30, 1953

2 Claims. (Cl. 110—99)

The present invention relates to basic arches or roofs for reverberatory furnaces especially open hearth steel furnaces.

The invention aims at reducing to a minimum the stress in the arch which arises from the properties of basic brick, and especially from their great tendency to expand during operation.

According to the invention this advantage is achieved by producing an arch composed of rib-forming brick and groove-forming brick between the rib-forming brick, with the rib-forming brick both suspended and supported and with the groove-forming brick suspended, suitably from the rib-forming brick. Thus the groove-forming brick are indirectly suspended by means of the rib-forming brick, since the groove-forming or intermediate brick are suspended by the rib-forming brick or by their suspension.

There are numerous ways in which the suspension of the groove-forming brick may be accomplished. In a preferred embodiment the suspension devices, suitably suspension sheets, are arranged on the lateral faces of the brick and extend beyond the cold front end. In another advantageous form the suspension of the groove-forming or intermediate brick consists of anchors intruding into recesses in the cold front ends of the groove-forming brick. In this case the groove-forming or intermediate brick are suitably anchored to girders or supporting bars which extend in the longitudinal direction of the arch and are supported by the rib-forming brick.

In an arch in accordance with the invention, especially where the rib-forming brick have to support the groove-forming or intermediate brick, the rib-forming brick require a greater mechanical strength. It is therefore advisable to use for the rib-forming brick chrome-magnesia brick containing more than 55 percent of chrome by weight, since these have a high refractoriness-under-load and a great resistance to temperature changes. These brick are preferably used fired.

For the groove-forming or intermediate brick, magnesia-chrome brick are suitably used, desirably containing more than 55 percent magnesia by weight, and these are preferably laid in the form of unfired brick and subjected to firing temperature in the furnace during use.

In accordance with technical usage, the term chrome-magnesia brick is intended to refer to brick produced from mixtures of chrome ore and sintered or fused magnesia containing chrome ore in a predominant proportion by weight. The term magnesia-chrome brick is intended to denote brick produced from mixtures of the same raw materials containing magnesia in the predominant proportion by weight. For the groove-forming or intermediatte brick metal encased brick commonly referred to as steel clad brick are advantageously used.

The ribs in the rib arch serve to strengthen and reenforce the arch. If the groove-forming brick are not suspended, there is often a tendency for large parts of the groove-like sections of the arch to cave in before the back brick come into use, where an extra layer of back

brick is applied on the cold ends of the groove brick. Although in the case of the suspended groove brick, backing of the brick is not possible, nevertheless by suspending the groove-forming brick it is possible to extend the service life of the rib arches considerably without even needing backing brick on the groove brick. It has been found that there is no danger of premature destruction of the suspension. Thus the arch in accordance with the invention combines the advantages of the roof reinforced by ribs and those of suspension to all of the brick.

In order to enable the invention to be more readily understood, reference is made to the accompanying drawings which illustrate diagrammatically and by way of example two embodiments of the invention.

Figure 1 is a perspective view of the roof of the invention partly in longitudinal vertical section.

Figure 2 is an enlarged longitudinal vertical section of Figure 1.

Figure 3 is a perspective view of a further embodiment partly in longitudinal vertical section.

Figure 4 is an enlarged longitudinal vertical section of Figure 3.

The arch shown in Figures 1 and 2 consists of pairs of rib-forming brick 1 of greater length and pairs of groove-forming or intermediate brick 2 of shorter length. The rib-forming brick have smaller cold ends 3 which enlarge at a shoulder or step 4 to the full width on each side. On top of the row of rib-forming brick extend supports 6 from which the rib-forming brick are suspended by wire loops 7 which pass through transverse holes 8 arranged in the smaller ends 3 of the rib-forming brick. These holes if desired are lined with short sections of metallic pipe.

The groove-forming or intermediate brick are suspended by means of suspension sheets 10 suitably of steel which have openings through which the supporting bars 11 pass. The bars extend in the longitudinal direction of the arch and rest on the shoulders 4 of the rib-forming brick and are thus supported from the rib-forming brick. The suspension sheets are inserted into the joints between the rows of groove-forming brick and extend beyond the cold end of the groove-forming brick to provide ears which carry the holes through which the supporting bars 11 extend.

The rib-forming brick 1 which not only form the supporting and strengthening ribs of the arch but which also support the groove-forming or intermediate brick 2 preferably are fired chrome-magnesia brick.

The groove-forming or intermediate brick 2 are preferably magnesia-chrome brick which are desirably laid in the unfired state with the insertion of sheets or wire gauze of oxidizable metal such as steel along the lateral surface. These spacer plates may be the sheets 10 of Figures 1 and 2, in which case they are desirably joined to the bricks by co-molding. The spacer plates melt at the hot end when the furnace is heated up for the first time to operating temperature and oxidize to cause the brick to be fritted together. The principles of the invention are applicable whether or not the groove-forming brick 2 are metal encased brick.

The arch shown in Figures 3 and 4 differs from that described in reference to Figures 1 and 2 only in regard to the means for suspension of the groove forming brick 2. At the cold end the groove-forming brick are provided with insertion pockets 15 which serve for anchoring heads 16 of T-shaped suspension irons or hangers 17. The legs of these suspension arms have holes 18 through which the supporting bars 11 extend. In the embodiment shown, the insertion pockets 15 are formed by U-shaped metal insertions 19, which have the legs of the U embodied in the brick material by co-molding.

One of the advantages of the arch of the present invention is that it has a relatively long service life. The chrome-magnesia rib-forming brick impart to the arch great refractoriness-under-load and resistance to temperature change while the magnesia-chrome groove-forming brick impart increased resistance especially to chemical attack such as infiltration of iron oxides and bursting. By arranging the ribs at longer or shorter distances from each other, and therefore by using a greater or smaller number of groove-forming or intermediate brick, it is possible to adapt the above described arch to the most diverse plant conditions.

In view of my invention and disclosure, variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A basic arch roof for reverberatory furnaces, such as open hearth furnaces, comprising two kinds of basic refractory bricks of different sizes, which kind of bricks on the one hand are rib-forming chrome-magnesia bricks consisting of at least 55% chrome refractory arranged in transverse rows spaced longitudinally of the roof, and on the other hand are groove-forming magnesia-chrome bricks consisting of at least 55% magnesia arranged in transverse rows spaced longitudinally of the roof and disposed in alternating relation to said rows of rib-forming bricks, said transverse rows having an arch configuration in the roof, the groove-forming bricks further being in rows extending longitudinally of the roof between a corresponding pair of said transverse rows of the rib-forming bricks with at least two groove-forming bricks in each longitudinal row, said rib-forming bricks being longer than said groove-forming bricks and extending upward beyond said groove-forming bricks on the cold side of the roof, and affording shoulders above said groove-forming bricks, support means extending along the transverse rows of rib-forming bricks on the cold side of the roof and suspension means interconnecting said support means and rib-forming bricks, and said longitudinal rows of groove-forming bricks being in separately hung assemblies including supporting bars over said longitudinal rows on the cold side of the roof and hangers for the individual bricks in said longitudinal rows suspending the bricks from the supporting bars, said bars extending between the adjacent transverse rows of rib-forming bricks longitudinally of the roof and having opposite ends resting directly on the shoulders of said rib-forming bricks, whereby the groove-forming bricks are partially supported by the rib-forming bricks and partially by each other.

2. A basic roof of claim 1, wherein said chrome-magnesia bricks are burned bricks and said magnesia-chrome bricks are unburned bricks.

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