Nov. 17, 1953

F. HÖNIG

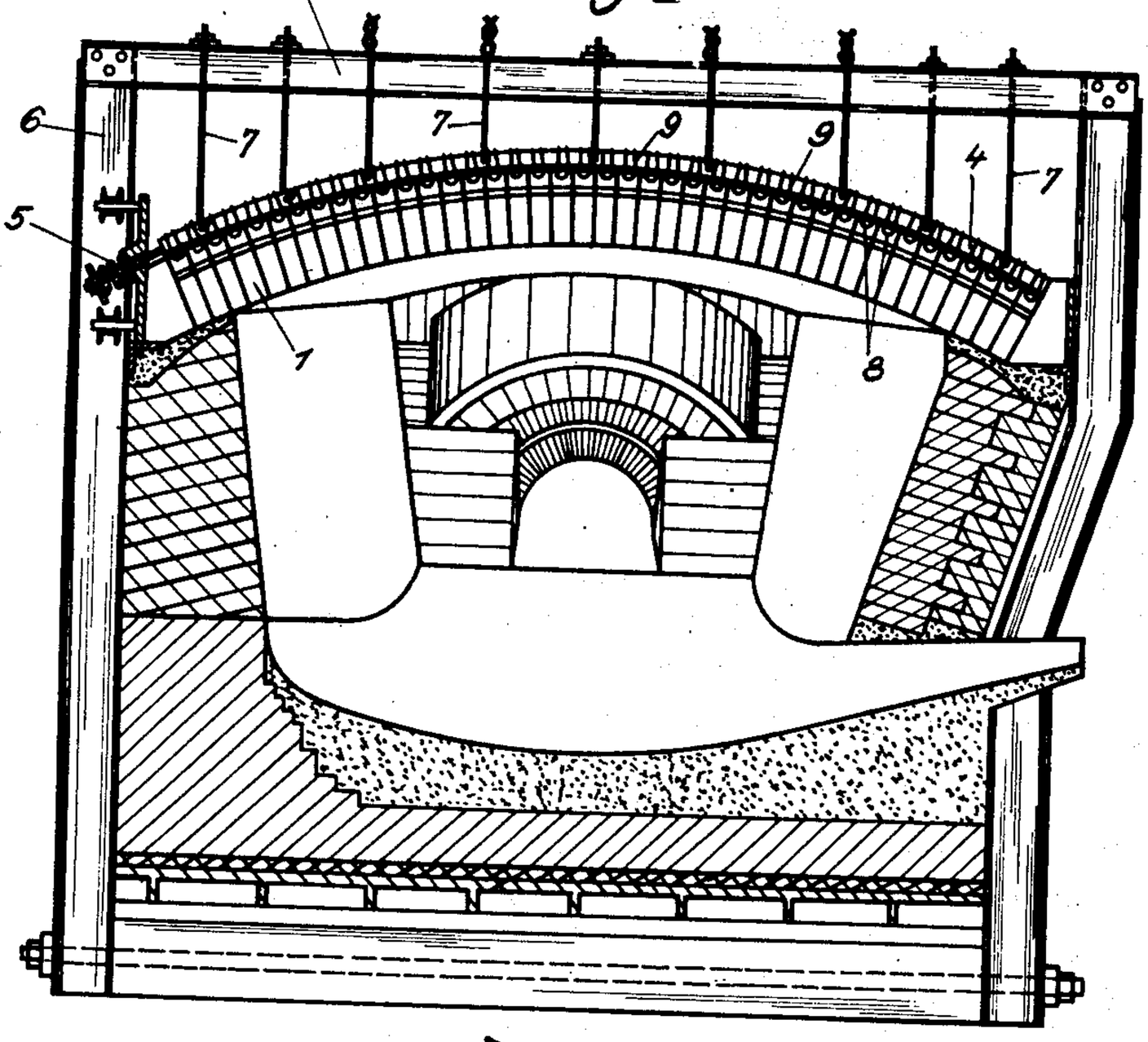
2,659,326

ROOF FOR TILTING FURNACES

Filed July 23, 1947

2 Sheets-Sheet 1

Fig. 1



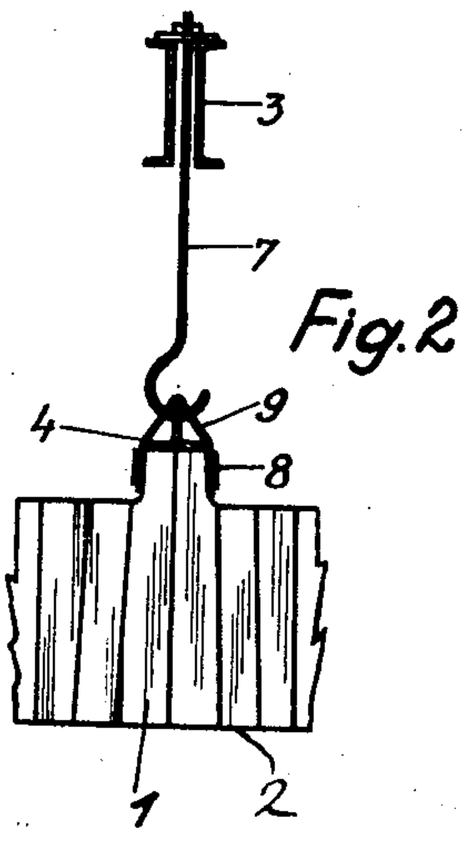


Fig. 2

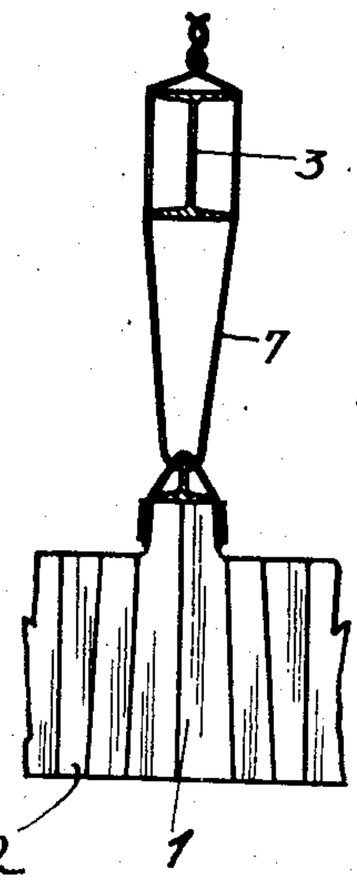


Fig. 2a

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Fig. 3

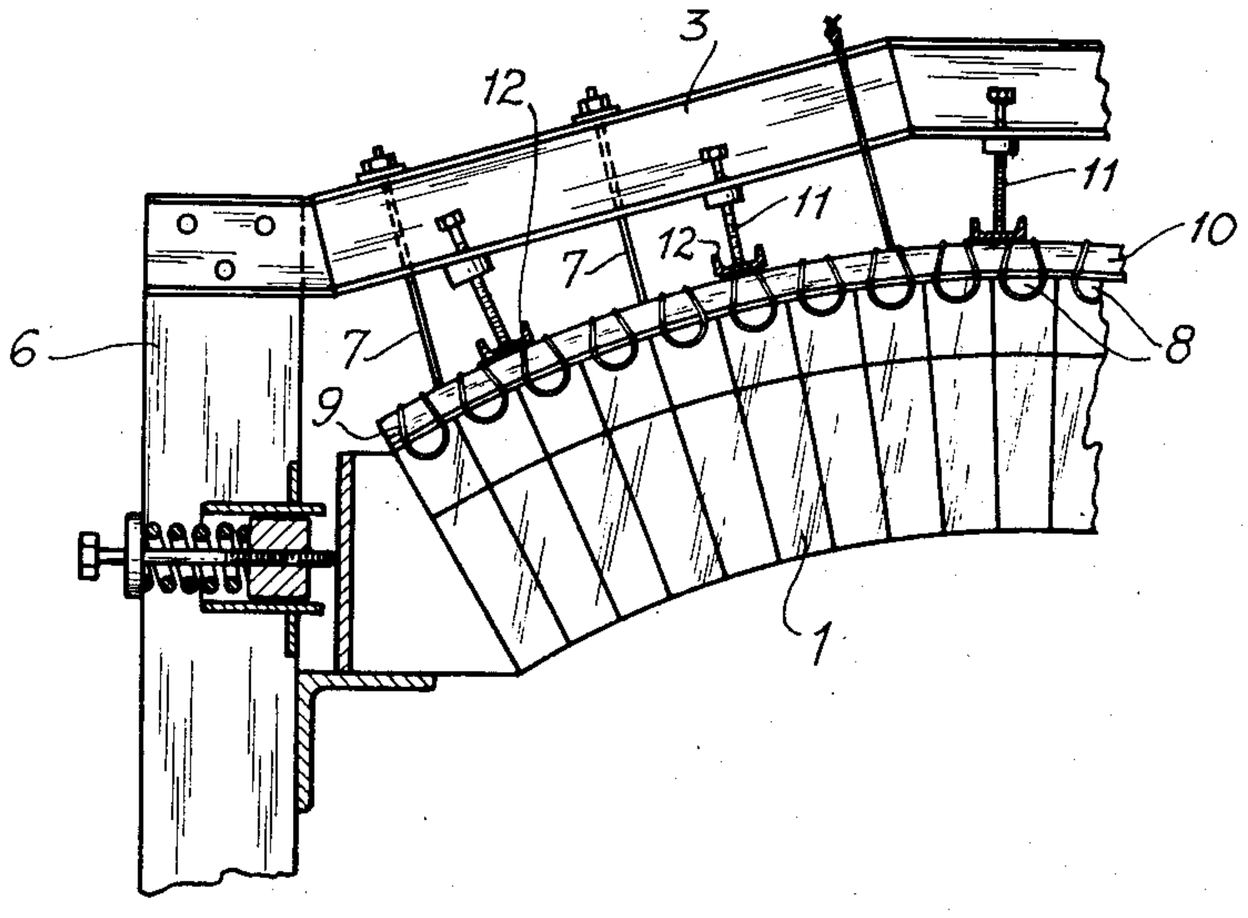


Fig. 4

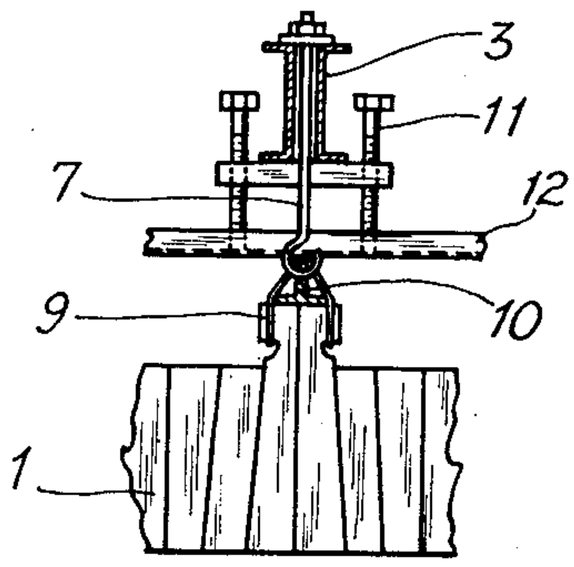


Fig. 4a

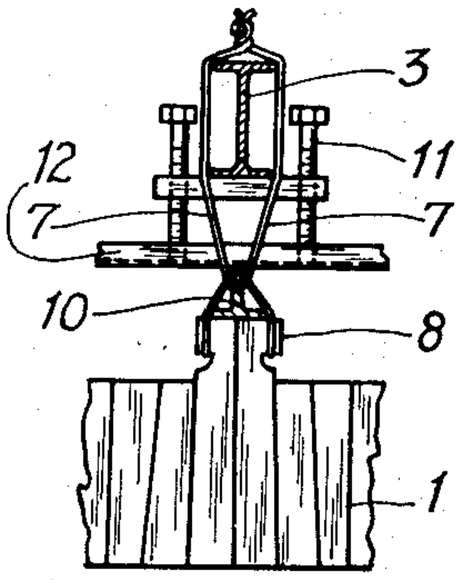
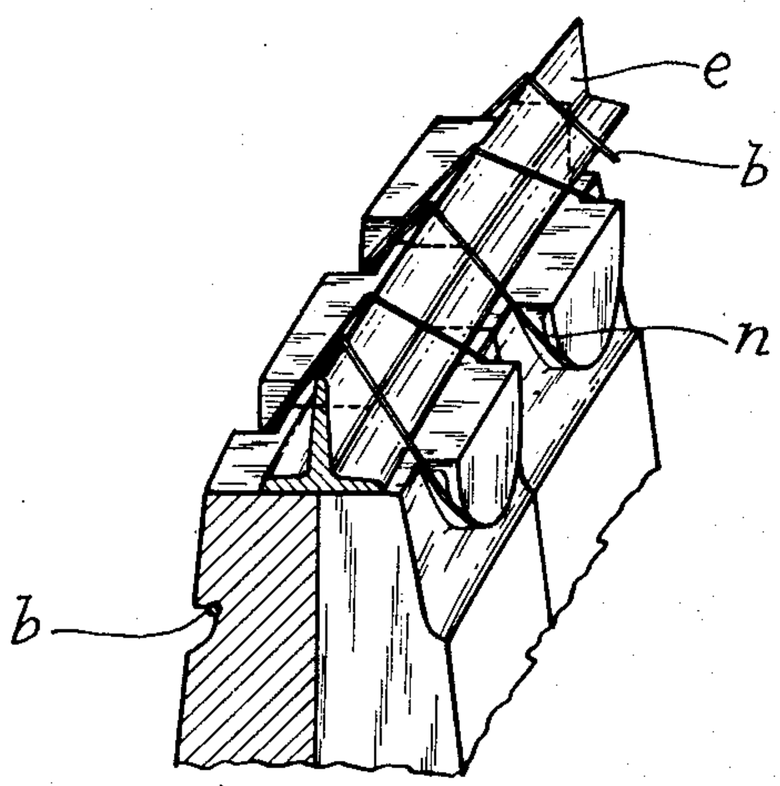


Fig. 5



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Patented Nov. 17, 1953

2,659,326

UNITED STATES PATENT OFFICE

2,659,326

ROOF FOR TILTING FURNACES

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Application July 23, 1947, Serial No. 763,016
In Germany August 23, 1940

Section 1, Public Law 690, August 8, 1946
Patent expires August 23, 1960

7 Claims. (Cl. 110—99)

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This invention relates to roofs of furnaces, and more particularly to roofs of tilting smelting furnaces. With furnaces of this kind that part of the roof carrying the weight of the roof crown is exposed to danger of being buckled out. In order to prevent such an occurrence it is customary to press down this part of the roof from above.

Now when using bricks of relatively high specific weight which are not capable of being solidly cemented together (such as bricks made of chrome magnesite) for building up such a roof in order to utilize their excellent properties (high refractoriness and prolonged durability), there arise great difficulties since in default of a fast cementation a certain arch-pressure must always exist. At first glance it may seem possible to attain the desired compactness by placing the roof as a whole under pressure from above, whereby the rise of individual parts of the roof, especially of parts which have become infirm, may be prevented. A construction of this kind, however, would be disadvantageous, in particular with roofs of great span as used with furnaces of today's open-hearth type, because those parts of the roof which have become infirm are exposed to the danger of being pressed through. The next thought of solving this problem might be to increase the height of the vault in order to secure the prevention of the tumbling-down of parts of the roof that might be caused by the pressure from above. But this solution too would not be a favorable one because it might facilitate the buckling-out of the roof during the tilting of the furnace. Therefore a solution was to be found which was to be compatible with a minimum height of the vault.

It is the principal object of the invention to overcome these difficulties by providing an arrangement according to which the roof is placed, on the one hand, under pressure from above, and, on the other hand, is suspended in addition thereto.

To build up a roof according to the invention any suitable way of construction may be put into practice; for example, pressure straps may be used, known per se, put under tension by any spring device, suspended on rigid beams, on the one hand, and connected fast to the row of bricks supporting them, on the other hand. Or

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the pressure on the suspended roof may be exerted by means of thrust members abutting on rigid beams. Advantageously the suspended bricks are connected fast to intermediate girders which are suspended on their part too, and capable of being deformed in common with the roof as a whole, and wholly or partly placed under pressure. It is of particular advantage to suspend the supporting bricks in groups or as a whole by means of loops formed of a single continuous length of wire.

In the accompanying drawings illustrating two embodiments of the invention:

Fig. 1 is a fragmentary side elevation of a suspended roof held under pressure from above by means of pressure straps;

Fig. 2 is a sectional view taken on a plane extending at right angles to the plane of Fig. 1;

Fig. 2*a* is a view similar to Fig. 2, showing a modification of a detail;

Fig. 3 is a fragmentary side elevation similar to Fig. 1 but illustrating a modified pressure-exerting structure;

Fig. 4 is a sectional view taken on a plane extending at right angles to the plane of Fig. 3;

Fig. 4*a* is a view similar to Fig. 4, showing a modification of a detail; and

Fig. 5 is a perspective view of a detail.

Generally, a roof for tilting furnaces according to the invention is built up of supporting ribs or stringers **1** combined with intermediate sections **2** and of rigid beams **3** supported by the iron structure **6** of the furnace, this structure being tiltable together with the vault **1**, **2** secured thereto.

Referring more particularly to Figures 1, 2 and 2*a*, pressure straps **4** are used which may be flat-iron bars or T-girders with wide flanges and which, whilst being under tension produced by spring devices **5**, exert a downward pressure on the ribs **1** supporting them. This pressure on the roof applied from above prevents a buckling-out of the roof in the tilted position of the furnace. Generally, such an arrangement of pressure straps prevents an uneven deformation of the roof. These pressure straps are connected with the iron structure **6** of the furnace by spring device **5** and are suspended on the rigid beams by means of suspension members (tie-rods, Fig. 2, or wire loops, Fig. 2*a*) **7**.

The bricks of the ribs 1 are shaped in such a fashion, for example provided with lateral projections 8, that they can be connected easily with the pressure straps by wire loops 9. Each suspended brick may be connected with the pressure strap singly or in pairs, respectively, (Figs. 2, 2*a*); or a plurality of bricks, forming a group, may be suspended by a single common wire loop. This latter arrangement is shown in detail in Fig. 5 where the single wire loop is shown at *b* and passes around the projections 8, formed with noses *n* to prevent slipping off of the wire, and over a member *e* which may be part of either the pressure strap 4 or the girder 10 (subsequently referred to in connection with Figs. 3, 4, 4*a*). It is of particular advantage to suspend all bricks of a supporting rib or at least a plurality of them forming a group by means of a single common wire loop, in the manner just described. An arrangement of this kind results in an extremely simple and—as to the making of such a connection—inexpensive suspension.

A pressure strap according to the invention combining the exertion of pressure on the roof, due to its tension produced by a spring device provided at its end, with the suspension of the roof (which suspension produces an upward directed pull on the strap) will, on the one hand, prevent a buckling-out of the roof in the tilted position and, on the other hand, make possible the use of heavy bricks, for example of bricks made of chrome-magnesite which are not apt to be cemented together fast, so that the excellent properties of these bricks (insensitiveness to variations of temperature and refractoriness) may be utilized for building tilting furnaces.

The wire loops lie immediately and freely on the arched supporting members constituted either by pressure straps 4 (see Figs. 1 and 2, 2*a*) or by intermediate girders 10 (see Figs. 3 and 4, 4*a*), hence the loops are not wound around projections or drawn through holes; thus the roof is capable of longitudinal expansion under the influence of heat in conformity with the different expansion of the roof and of the pressure straps or the intermediate girders, respectively.

A modified embodiment of my invention is represented by Figures 3 and 4, 4*a*. With a structure of this kind intermediate iron girders 10 capable of deformation are used, resting on the supporting ribs 1 and pressed on said ribs by thrust members 11 and thrust transmitting members 12 abutting on rigid beams 3 as well as carrying the suspended bricks by means of the loops 9. These latter may be formed, as already described in connection with Fig. 5, of a single continuous length of wire for each supporting rib.

In the tilted position of the furnace the thrust members 11 in combination with the arched girders 10 will prevent a buckling-out of the roof and will take up the great strain arising in the lower part of the roof during tilting of the furnace. The intermediate girders 10 are dimensioned in such a way that they become capable of being deformed during the rise of the whole roof whereby the strains in the roof coming into existence thereby may be equalized along the tension areas of each supporting rib, which results in a continuity of the tension curves of said ribs.

The measure of the rise of the roof may be controlled by adjusting the springs of the abutments. The thrust members 11 too are adjusted

according to said rise in order to secure a proper pressure effect from above in the tilted position. By these means the strains in the roof are properly balanced. A supplementary regulation can be attained in a simple way by an additional adjustment of the thrust members and of the springs of the abutments.

The wire loops engaging the girder 10 and the projections 8 are applied in such a way that the tops of the bricks lie close to intermediate girders so that the transmission of the pressure on the roof from above is effected immediately from the intermediate girders to the roof so that no slackening of the suspension may occur. By that means no use of inflexible suspension members is necessary because the suspension members according to the invention do not serve as a means for transmitting pressure but serve only as a means for suspension. Therefore the use of plain wire loops is possible in this preferred embodiment of my invention.

Although two embodiments of the invention have been shown and described for the purpose of illustration, modifications occurring to those skilled in the art may be made without departing from the scope of the invention as defined in the appended claims.

I claim as new:

1. In a furnace, in combination, a tiltable frame, a vault supported on said frame, a plurality of arched members bearing upon said vault from above, and pressure means anchored to said frame and imparting a downward pressure to said vault through the intermediary of said arched members, each of said arched members comprising a pressure strap, said pressure means including spring means maintaining said strap under tension.

2. In a furnace, the combination according to claim 1 wherein said frame is provided with a plurality of substantially horizontal beams extending above said vault, further comprising suspension means supporting said pressure straps from said beams.

3. In a furnace, in combination, a tiltable frame, a vault supported on said frame, a plurality of arched members bearing upon said vault from above, and pressure means anchored to said frame and imparting downward pressure upon said vault through the intermediary of said arched members, each of said arched members comprising a girder, said frame being provided with a plurality of substantially horizontal beams extending above said girders, said pressure means including a plurality of thrust members inserted between said girders and said beams.

4. In a furnace, the combination according to claim 3, further comprising suspension means supporting said girders from said beams.

5. In a furnace, in combination, a tiltable frame, a brick vault supported on said frame, said vault including a plurality of rows of bricks each forming an arched rib, a plurality of arched members respectively overlying said ribs, pressure means anchored to said frame and imparting a downward pressure to said ribs through the intermediary of said arched members, and supporting means individually securing each brick of a rib to the adjacent arched member in a manner substantially preventing radial movement between said bricks and said member.

6. In a furnace, the combination according to claim 5 wherein said bricks are provided with projections and said supporting means include

wire means looped around a respective arched member and engaging said projection in a manner suspending said bricks from the arched member while maintaining said bricks and said member in close contact with each other.

7. In a furnace, the combination according to claim 6 wherein said wire means includes a continuous length of wire engaging a plurality of bricks having the said projections thereof facing in the same direction.

FRITZ HÖNIG.

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