March 8, 1932. P. W. MATTHEWS 1,848,737

FURNACE ARCH

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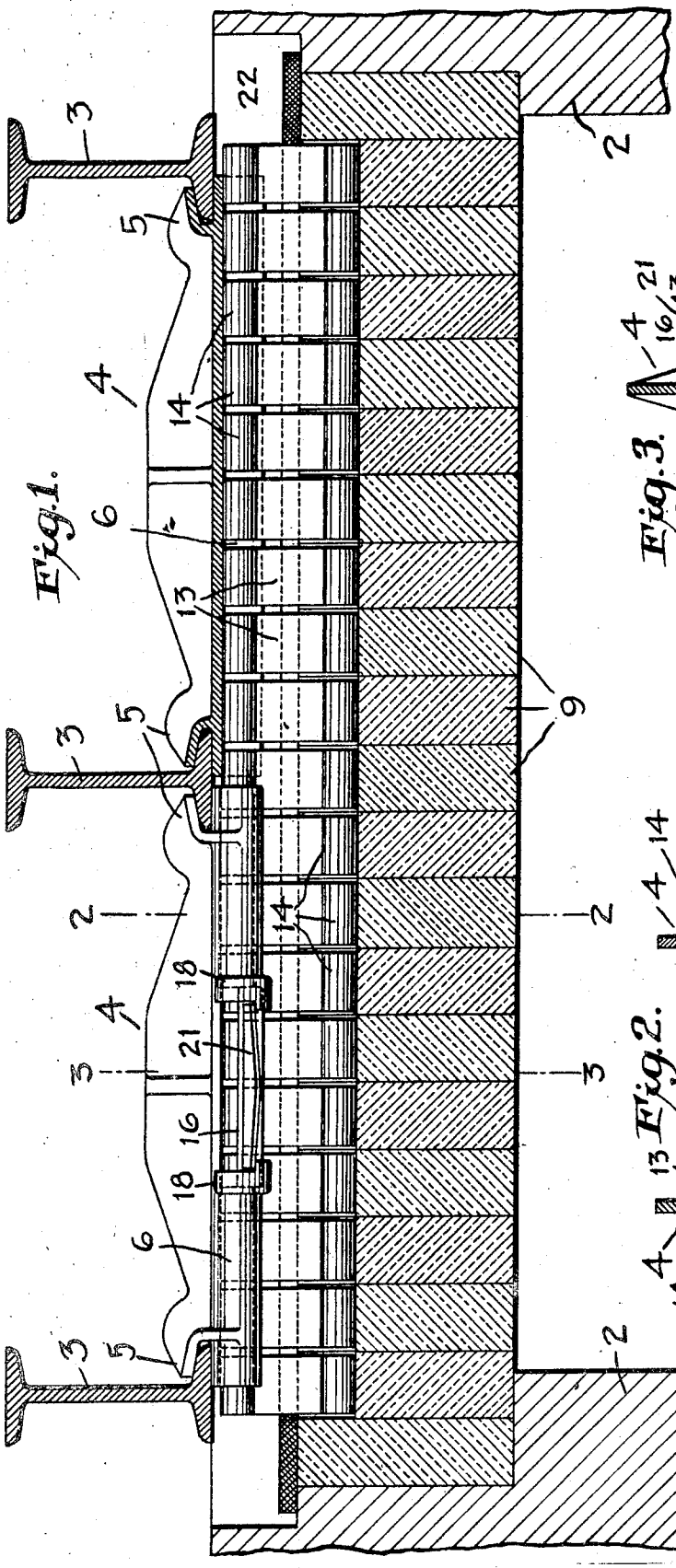


Fig. 1.

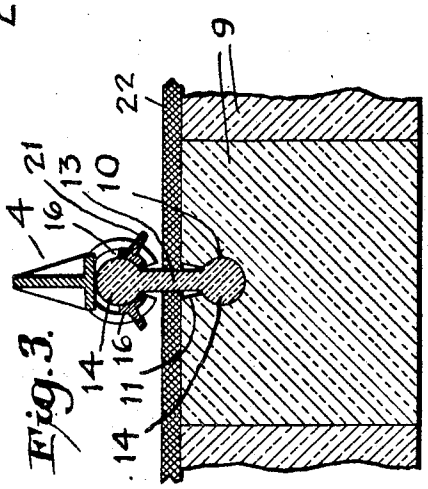


Fig. 3.

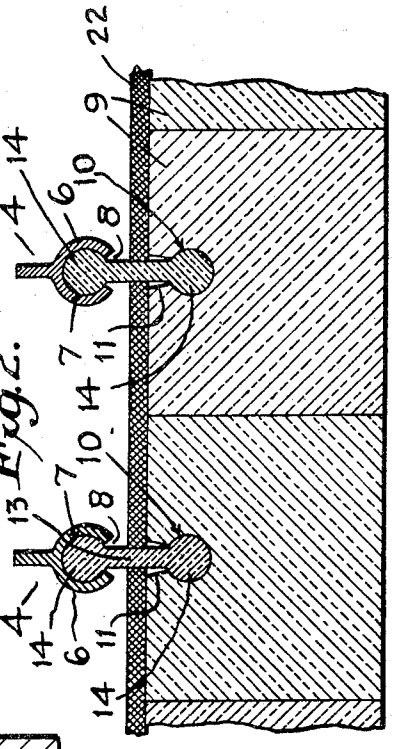


Fig. 2.

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FURNACE ARCH

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Fig. 4.

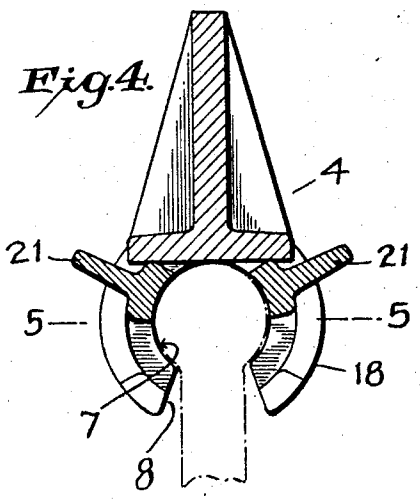


Fig. 5.

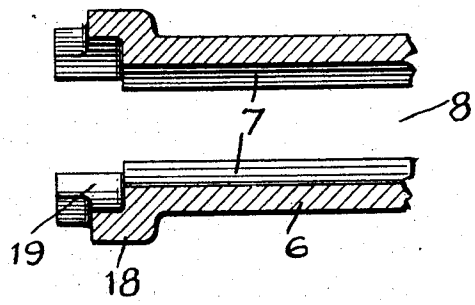


Fig. 6.

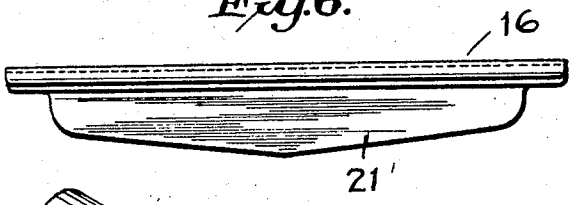


Fig. 7.

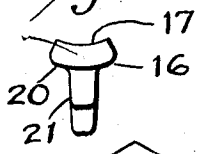


Fig. 8.

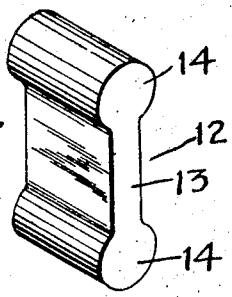


Fig. 9.

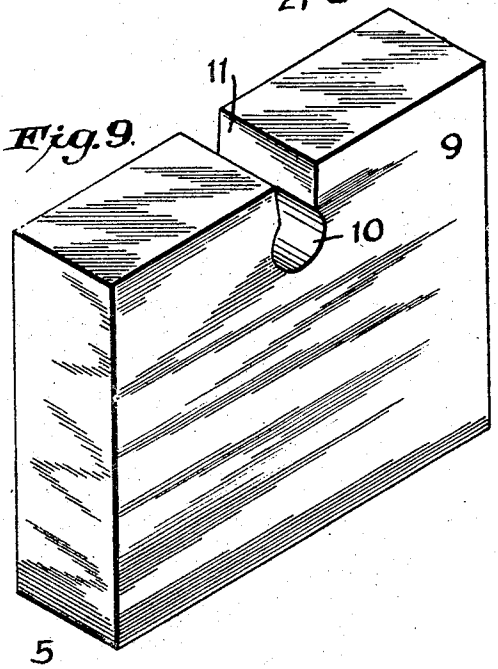
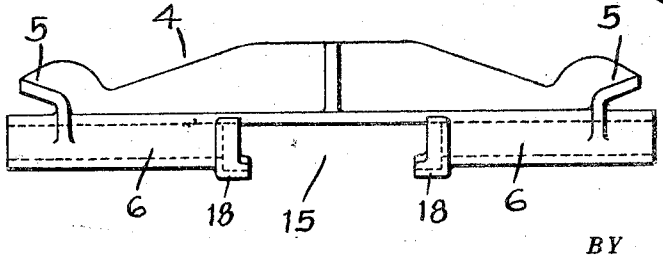


Fig. 10.



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UNITED STATES PATENT OFFICE

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FURNACE ARCH

Application filed July 27, 1928. Serial No. 295,697.

The invention relates to a furnace arch construction comprising refractory blocks provided with sockets, hanger beams or supports likewise provided with sockets, and refractory hangers formed at their opposite ends with enlargements to work in said sockets whereby each block is allowed to move in any direction under expansion or contraction and whereby proper bearing between the hangers, hanger supports and arch blocks is insured under all conditions. The invention also includes the provision of heat insulation covering the blocks at the outer sides between the same and the hanger supports, this being made possible by the use of refractory hangers extending through the insulation. In this way radiation losses are greatly reduced and the hangers permit the placing of cast iron hanger beams above the insulation and entirely out of the heat zone. This in turn affords longer life for the furnace arch, since the arch blocks may be cut down very much more than would otherwise be permissible before being replaced.

In the accompanying drawings forming a part hereof:

Fig. 1 is a vertical section through an arch embodying the invention and a portion of the furnace walls;

Figs. 2 and 3 are vertical sections taken on the lines 2—2 and 3—3, respectively, of Fig. 1;

Fig. 4 is a section on a larger scale, taken in the same plane as Fig. 3, showing the keys shifted to a position which permits removal or insertion of the hangers and arch blocks;

Fig. 5 is a fragmentary horizontal section taken on the line 5—5 of Fig. 4;

Fig. 6 is a side elevation of one of the keys;

Fig. 7 is an end view of the same;

Fig. 8 is a perspective view of one of the refractory hangers;

Fig. 9 is a perspective view of one of the arch blocks; and

Fig. 10 is an elevation of one of the hanger beams.

Reference will now be had to Figs. 1 to 10 illustrating a flat suspended arch construction embodying the invention.

Portions of the furnace walls are marked 2. On these are placed I-beams or the like 3, by which hanger beams 4 are supported, these hanger beams having suitable lugs 5 to engage over the bottom flanges of beams 3.

Each of the hanger beams comprises a generally tubular part 6, the interior of which affords a socket channel 7. The lugs 5 are above this tubular part, so that the latter is disposed below the bottoms of the primary beams 3.

The bottom of each of the channel parts 6 is slotted longitudinally from end to end, the slots being marked 8. The socket channel of each beam is substantially circular in cross-section, though it is not necessary that the wall of the channel be circularly curved all the way around from edge to edge of the slot 8.

The arch proper is composed of refractory blocks 9, each of which is provided in its upper portion with a substantially circularly curved or cylindrical socket 10 extending transversely in the direction of the narrow dimension of the block. Leading from this socket to the upper edge of the block there is a slot 11, the sides of which are divergent like the sides of the slots 8 of the hanger beams. A number of the blocks are suspended from each of the hanger beams by hangers 12 of refractory material, there being one of these hangers for each of the blocks. Each hanger is preferably of substantially dumb-bell section, comprising a flat web 13 and two substantially circularly curved or cylindrical end enlargements 14. One of these enlargements is adapted to be slipped endwise into the socket channel 7 of the hanger beam and the other into the socket 10 of the block, the enlargements 14 being freely turnable in the sockets. The webs 13 pass through slots 8 and 11 and are of such length as to space the blocks a substantial distance below the metal hanger beams.

The ball and socket type connections between the blocks, hangers and hanger beams leave the individual arch blocks free to move during heating up of the arch when the furnace is being placed in operation, and the action is also such as to give proper bearing between the refractory hangers, hanger beams

and arch blocks when any movement takes place due to expansion of the arch blocks. When the arch blocks expand or contract there is some bodily lateral movement of the blocks, varying in amount in different portions of the arch. The hangers, swinging more or less on their fixed pivots in the hanger beams and turning at their lower ends in the sockets of the blocks, allow for this movement. The end faces of the blocks remain in true bearing relation to each other and move somewhat vertically in relation to each other. When the arch cools down, the blocks return to their original positions, subject, of course, to any permanent volumetric changes in the blocks.

The barrel part 6 of each of the hanger beams is interrupted at an intermediate region so as to provide a recess 15 which permits of insertion and removal of the refractory hangers for the purpose of replacing arch blocks. A key member or members 16, preferably two in number, bridge the recess 15 in each hanger beam, so as to afford support for the refractory hangers at this region. Each of these keys is narrow so as to contact with only the lower portion of the curvature of the upper enlargements 14 of the hangers, the inner faces 17 of the keys being curved to conform approximately with the curvature of the enlargements. The ends of these keys are engaged with the portions of the barrel 6 at the opposite ends of the recess in such manner as to permit the keys to be moved to upper positions as shown in Fig. 4, in which positions they do not support the hangers, and the blocks with the hangers can therefore be removed downwardly. The portions 18 of the barrel 6 of the hanger beam with which the ends of the keys engage are preferably enlarged so as to provide curved cavities 19 larger than the channel 7. The ends of the keys rest in these cavities and are free to be turned therein upwardly about the upper enlargements 14, the outer surfaces 20 of the keys being preferably curved to correspond generally with the curvature of the cavities. Ribs 21 on the backs of the keys project outwardly, strengthening the keys and affording convenient means for shifting them.

The top of the arch is covered by a thickness of insulation 22, lying on the tops of the blocks and intervening between them and the iron hanger beams 4. The webs 12 of the refractory hangers pass through this insulation, which does not in any way interfere with the freedom of movement. The insulation of the entire top of the arch which is thus permitted by the construction effects a great saving in loss of heat, and the use of the refractory hangers in connection with the insulation enables the hanger beams to be kept entirely out of the heat zone. The life of the arch is thereby prolonged as the arch blocks may cut down to about two inches below the hangers before it becomes necessary to replace them.

The preferred embodiment of the invention has been illustrated and described, but it will be understood that there may be various changes in form, proportions and details without departing from essentials. For example, the substantially circular curvature of the sockets 7 and 10 and of the enlargements 14 may be less complete than is shown.

I claim:

1. In a furnace arch construction comprising hanger beams having channel sockets, socketed arch-blocks, and refractory hangers having enlargements at their opposite ends to work in the socket channels of said beams and in the sockets of said arch-blocks, the combination of a hanger beam formed with a recess interrupting its socket channel to permit introduction and removal of hangers, and key means bridging said recess to support the hangers at such region, the opposite ends of said key means being engaged with the portions of the hanger beam at opposite sides of said recess and being movable upwardly to allow the removal and insertion of the keys.

2. A furnace arch construction comprising blocks free to move laterally and vertically and each provided with a central socket, the end faces of said blocks being capable of moving vertically relatively to each other, hanger supports likewise provided with sockets, and freely movable hangers formed of non-metallic refractory material with enlargements at their opposite ends pivotally occupying the sockets of said supports and blocks, said construction insuring the blocks holding predetermined positions in the construction when cold and enabling each block to move relatively to other blocks under conditions of heat, while preserving proper bearing relation between the blocks, and also between the blocks, their hangers and hanger supports, said construction also causing each block to assume its original position in the furnace construction when heating ceases.

3. A furnace arch construction comprising blocks free to move laterally and vertically and each provided with a central socket, the end faces of said blocks being capable of moving vertically relatively to each other, hanger supports likewise provided with sockets, and freely movable hangers individual to the respective blocks, said hangers formed of non-metallic refractory material with enlargements at their opposite ends pivotally occupying the sockets of said supports and blocks, said construction insuring the blocks holding predetermined positions in the construction when cold and enabling each block to move relatively to other blocks under conditions of heat, while preserving proper bearing relation between the blocks, and also between the blocks, their hangers and hanger

supports, said construction also causing each block to assume its original position in the furnace construction when heating ceases.

4. A furnace arch construction comprising blocks free to move laterally and vertically and each provided with a central socket, the end faces of said blocks being capable of moving vertically relatively to each other, hanger supports likewise provided with sockets, and freely movable hangers formed of non-metallic refractory material with enlargements at their opposite ends pivotally occupying the sockets of said supports and blocks, said construction insuring the blocks holding predetermined positions in the construction when cold and enabling each block to move relatively to other blocks under conditions of heat, while preserving proper bearing relation between the blocks, and also between the blocks, their hangers and hanger supports, said construction also causing each block to assume its original position in the furnace construction when heating ceases, together with heat insulation at the outer sides of said blocks between the same and said supports.

5. A furnace arch construction comprising blocks free to move laterally and vertically and each provided with a central socket, the end faces of said blocks being capable of moving vertically relatively to each other, hanger supports likewise provided with sockets, and freely movable hangers formed with enlargements at their opposite ends pivotally occupying the sockets of said supports and blocks, said construction insuring the blocks holding predetermined positions in the construction when cold and enabling each block to move relatively to other blocks under conditions of heat, while preserving proper bearing relation between the blocks, and also between the blocks, their hangers and hanger supports, said construction also causing each block to assume its original position in the furnace construction when heating ceases.

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