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METAL CASED REFRACTORY BRICK

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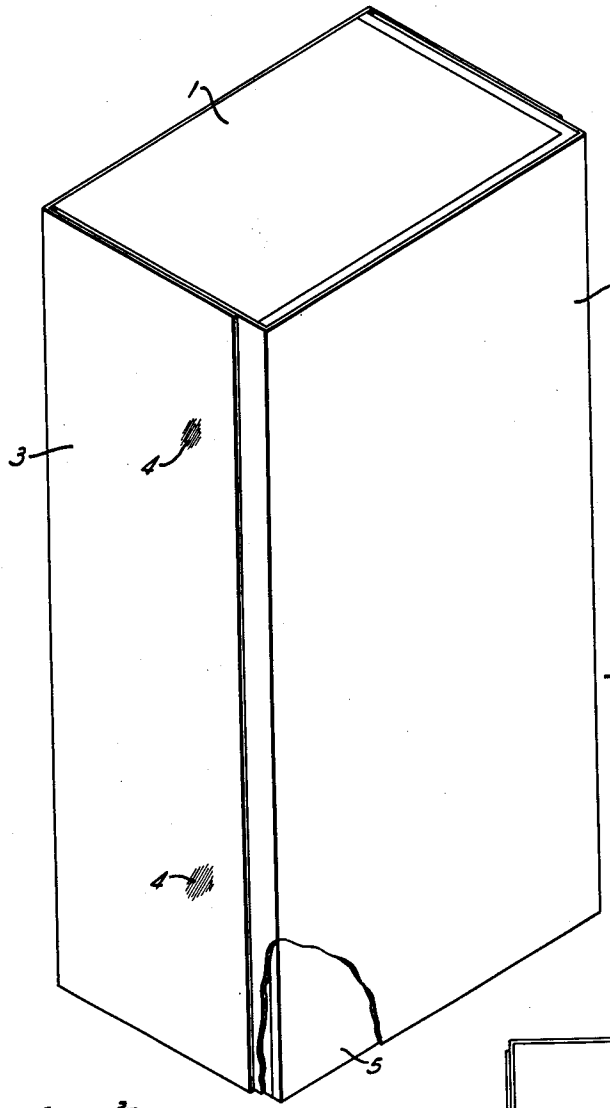


Fig. 1

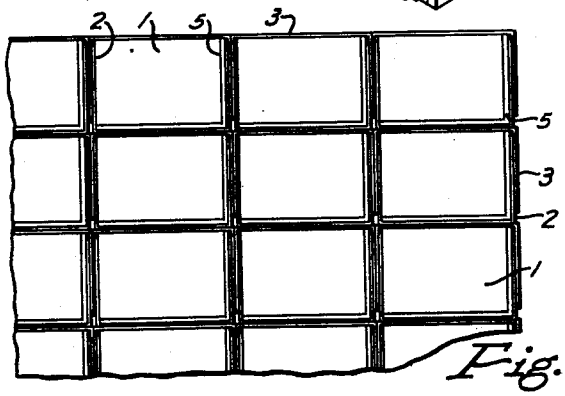


Fig. 2

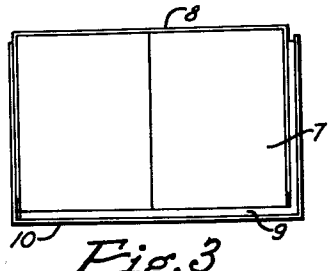


Fig. 3

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METAL CASED REFRACTORY BRICK

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This invention relates to refractory bricks, and more particularly to those surrounded by a metal case.

A basic or nonacid refractory brick has a longer life in an industrial furnace wall or roof when the brick is encased by steel sheets. It is therefore common practice to enclose the sides of such a brick in a metal casing. Such casings serve to bond a brick wall or roof into a monolithic unit as the steel oxidizes upon heating of the furnace. The resulting iron oxide reacts with the adjoining brick surfaces to give a well-bonded structure. However, this reaction also causes the brick to grow or expand permanently. In investigating the causes of brick failure in open hearth furnace roofs and walls formed from metal cased bricks, it has been found that such expansion definitely shortens the life of the bricks. Due to the expansion, great pressure forces are built up which can only be relieved through brick failure, and, frequently, roof failure. Even if complete failure does not result, harmful distortion of the furnace roof or walls occurs.

In an attempt to overcome this difficulty, it has become common practice to insert sheets of cardboard between the blocks. These sheets burn out in service and thus leave room for expansion of the bricks. The use of such cardboard spacers depends entirely upon the whims of the men laying up the blocks and they may insert only a small fraction of the number required or they may even fail to use any at all. In still other cases an uncontrolled excess of cardboard spacers has been used resulting in wide open joints through which dust and fumes from the furnace penetrate and damage the brick. Furthermore, in a roof, it is difficult to hold the spacers in place while the blocks are being assembled. Although it might be thought that these difficulties could be overcome by cementing these spacers to the metal cases before the blocks are laid up, that presents other problems, because many of the spacers would be partly or completely torn loose in the shipping and handling of the blocks, for the spacers would be fully exposed.

It is among the objects of this invention to provide a composite block, in the form of a refractory brick in a metal case, which has built-in means to compensate for expansion of the brick, which has no exposed spacing members, and which does not require the use of separate spacers when the blocks are laid up.

In accordance with this invention, a layer of consumable material is sandwiched between a side of a refractory brick and the surrounding metal case. When the block is heated in use, the consumable layer either burns or melts away, depending on the material used. The consumable layer preferably is in the form of a sheet extending across only two adjoining sides of the brick.

The invention is illustrated in the accompanying drawing, in which

FIG. 1 is a perspective view of my block, with a corner of the case broken away to show the expansion sheet more clearly;

FIG. 2 is a reduced fragmentary end view of a number of the bricks as they appear when they are first laid and before the expansion members have been consumed by heating; and

FIG. 3 is an end view of a modified block.

Referring to FIG. 1 of the drawings, a conventional basic or nonacid brick 1, such as used in industrial furnaces, is surrounded by a sheet metal case. The case may be made in different ways, but the preferred form is one made from two channels 2 and 3 which oppose each other and have their side flanges telescoped together. The overlapping side flanges at each side of the brick are then spot welded together as at 4. This is a well known type of furnace block which is now in wide use.

It is a feature of this invention that the block is provided with built-in means that will allow for expansion of the brick when it is heated up in use and the metal case oxidizes. Accordingly, a layer 5 of consumable material is located or sandwiched between the case and at least one side of the brick. The material is clamped tightly between them when the case is formed around the brick, so that the brick will be tight in the case. The expansion layer may be of any desired thickness, but preferably between 1/16 and 1/4 inch, with 1/8 inch generally the most satisfactory. The choice of thickness of this layer can be based upon knowledge of the expansions exhibited by the cased refractory acquired in laboratory tests and furnace trials. The expansion strip may be solid or it can be a mesh or a plurality of narrow members. All that is necessary, in addition to being consumable, is that it fill the space between the brick and the case well enough to insure the case fitting tightly around the brick. The most benefit is obtained from this invention by using two strips of consumable material, one against each of two adjoining sides of the brick. More than two strips are unnecessary. When two strips are used, it is most convenient to form them by folding a sheet of the material round a side edge of the brick so that only one piece of material has to be handled. When the blocks are first laid up as shown in FIG. 2, it will be seen that expansion strips extend along all four sides of each block. Two of the strips form a part of each block while the other two form parts of two adjoining blocks.

When the furnace is heated up for the first time, the expansion strips will be consumed and leave open spaces or voids between each brick and two sides of its case, whereby the brick will have adequate space into which it can expand or grow as the metal case oxidizes. The expansion strips can be consumed by burning or by melting, depending on the material used. If a suitable low melting point metal is used as the consumable material, it will melt and either runaway or be absorbed by the brick material. However, it is preferred to use a combustible material, such as cardboard, wood or asbestos paper. The heat of the furnace will burn out this material and leave voids for expansion of the brick.

If desired when a brick is formed by pressing brick mix into a sheet metal channel resting within the mold cavity of a brick press, the expansion sheet can be dropped into the channel just before the refractory mix is charged. Or, an expansion layer can be sandwiched between a flat steel plate and the brick, the assembly being held together by adhesives. Such an arrangement has its limitations, however, particularly for overhead arch constructions, because the destruction of the expansion layer may allow the steel plate to drop. That will not occur in furnace side walls, and even in the arch of a furnace roof it may be prevented by such means as hooking the plates over the tops of the bricks.

If it is felt that there is any danger of the brick shown in FIG. 1 dropping out of the case as soon as the expansion layer has been consumed, the arrangement of FIG. 3 can be used. There the brick 7 is clamped tightly between the flanges of a case channel 8. The expansion strip 9 then is laid against the exposed side of the brick and against the outside of one of the channel flanges. Finally, the other case channel 10 is fitted over the expansion layer and channel 8 to complete the case. The two flanges that are in contact with each other can be

welded together to hold the various elements together. This embodiment of the invention also shows that the brick does not have to be a one-piece brick, but can be made from two half bricks in contact with each other or spaced apart sligthly by a metal plate or other spacer. If desired, the brick can be formed from several parts, but in any case it is referred to herein as a brick.

It will be seen that with this invention, preferably every block has an expansion member built into it, so there is no danger of not enough expansion members being used in a wall or roof. The expansion members are incorporated in the block by the manufacturere. As they are completely enclosed by the case, they are fully protected and will not become separated from the bricks during transportation and handling.

It should also be observed that the temperature gradient in service from the hot to the cold face of the block may be such that the consumable filler will not be wholly consumed near the cooler face. This fact may be considered to have a self-compensating aspect because it is at the hot face, where expansion of the brick is greatest, that there is most need for provision of space by consumption of the filler.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desired to have it understood that, within the scope of the appended claim, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

A composite block comprising a basic refractory furnace brick, a pair of steel channels having webs at two opposite sides of the brick and having overlapping side flanges covering the other two sides of the brick, a preformed layer of consumable material spacing two of said overlapping flanges apart and also spacing the brick from the web joined to the outer flange, and a weld joining the other two overlapping flanges together to form a case.

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