

May 14, 1963

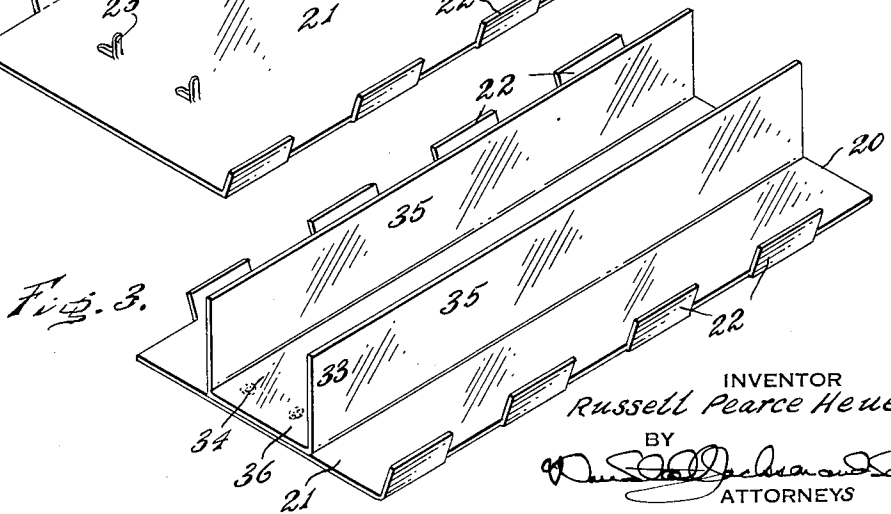
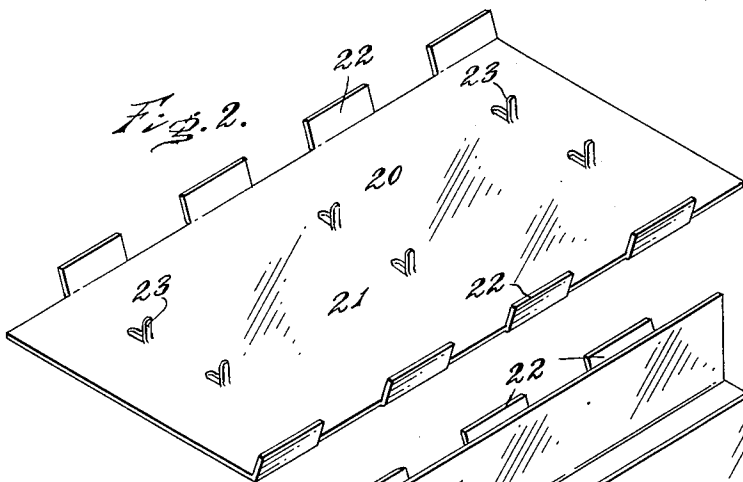
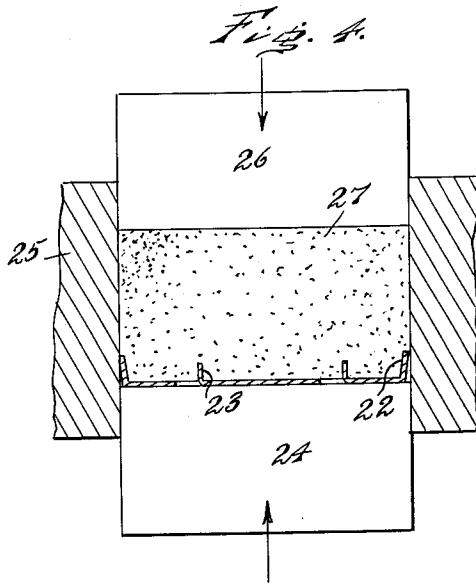
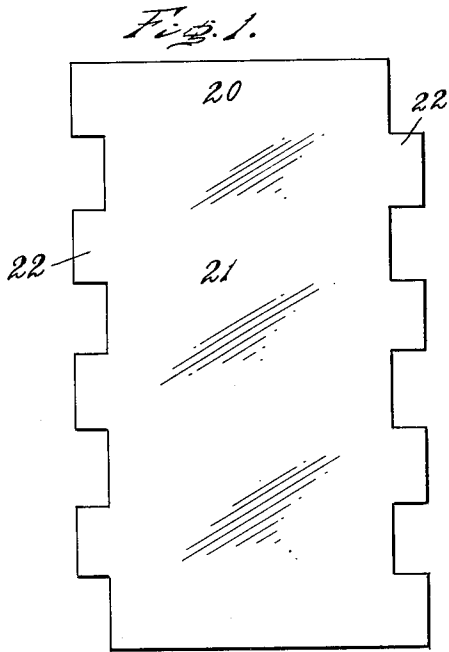
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3,089,284

BASIC REFRACTORY BRICK AND METHOD

Filed Feb. 19, 1959

2 Sheets-Sheet 1



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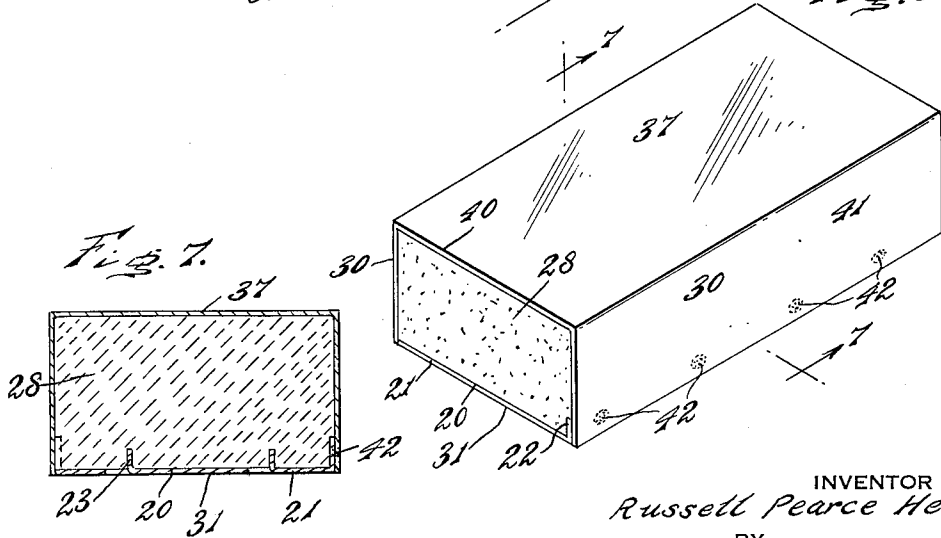
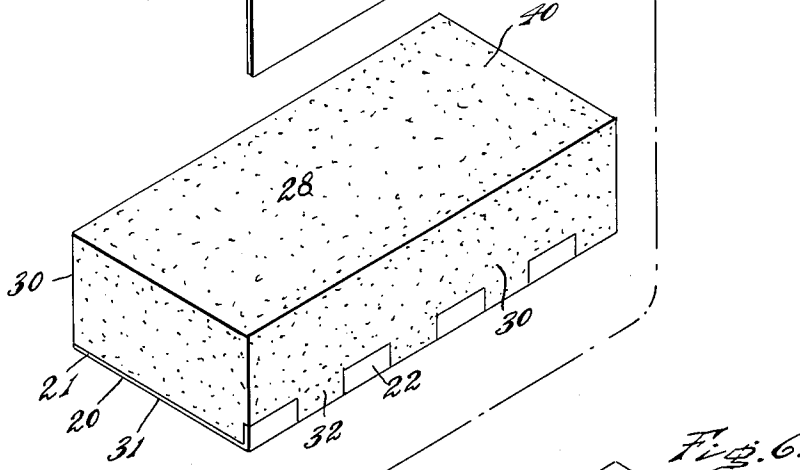
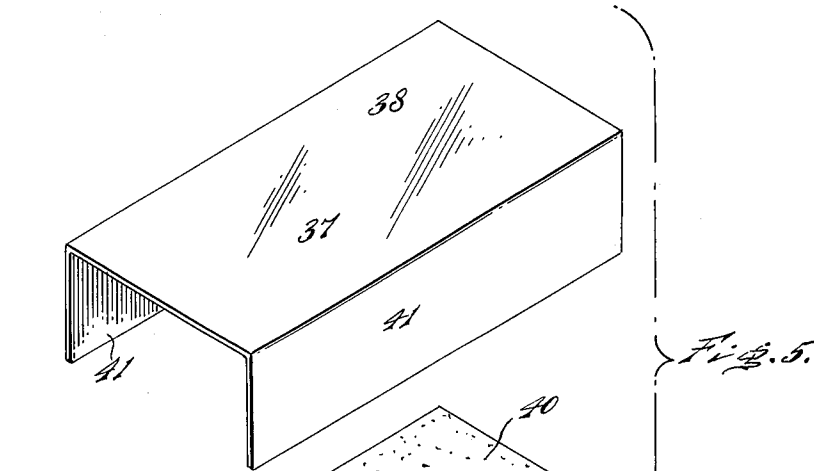
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BASIC REFRACTORY BRICK AND METHOD

Filed Feb. 19, 1959

2 Sheets-Sheet 2



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3,089,284

BASIC REFRACTORY BRICK AND METHOD

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3 Claims. (Cl. 50-416)

The present invention relates to the manufacture of brick which have external metallic plates.

A purpose of the invention is to minimize the use of double thicknesses of metallic plates on the outsides of basic refractory bricks.

A further purpose is to obtain firm attachment of oxidizable metallic plates to a basic refractory brick without the necessity of comolding more than one plate, and at the same time cover all four lateral faces of the brick to at least a major extent.

Further purposes appear in the specification and in the claims.

In the drawings I have chosen to illustrate a few only of the numerous embodiments in which the invention may appear, selecting the forms shown from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

FIGURE 1 is a plan view of a blank from which the comolded plate is formed.

FIGURE 2 is a perspective of one form of comolded plate.

FIGURE 3 is a perspective of a variant form of comolded plate.

FIGURE 4 is a diagrammatic vertical section showing the comolding of the refractory and the plate.

FIGURE 5 is an exploded perspective showing the application of a second plate to the brick.

FIGURE 6 is a perspective of the finished brick of the invention.

FIGURE 7 is a section of the finished brick of the invention on the line 7-7 of FIGURE 6.

Describing in illustration but not in limitation and referring to the drawings:

Extensive use is being made in refractory roofs and other constructions of basic refractory brick provided with oxidizable metallic plates on the outside, and in some cases also on the inside of the bricks.

The plates are usually of steel, preferably plain carbon steel such as AISI 1010 or 1035 or suitably low alloy steel. The plates are normally in the range of thickness between $\frac{1}{2}$ " and $\frac{1}{4}$ ", and are suitably affixed to the refractory of the brick. In furnace use the plates oxidize and react with the refractory, improving the behavior of the refractory roof as a whole.

One method of making such brick includes molding the brick and then affixing to the outside of the brick two opposed U-shaped plates each of which covers one of the two parallel major lateral faces and two parallel minor lateral faces. On the minor lateral faces the arms of the U's overlap and the plates are welded together and prevented from slipping off the brick by punching holes in the brick and lancing tongues of metal from the plates which fit into such holes.

This procedure is cumbersome, and produces a brick in which the plates are not always tightly held to the refractory. It furthermore is subject to the serious disadvantage that on the minor lateral surfaces of each brick there are two layers or thicknesses of metal of the plate.

By the present invention it is possible to greatly reduce the use of double thicknesses of metal plate, thus avoiding the likelihood that metal may melt and leave the joint rather than oxidize and react with the refractory.

At the same time the present invention makes it pos-

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sible to secure the plates very much more firmly to the brick than by the technique just described above.

I illustrate in FIGURES 1 and 2 a plate 20 which in FIGURE 1 is in the form of a blank having a body portion 21 which is intended to extend along the major portion of one lateral surface of the brick, and having projecting portions or arms 22 which are adapted to be bent up suitably to an angle somewhat greater than a right angle as shown in FIGURE 2.

There are also tabs 23 lanced out from the base portion of the U of the oxidizable metallic plate, and capable of being embedded into the refractory by comolding.

The plate 20 is placed in a mold as shown in FIGURE 4 resting on the bottom die 24 with the projecting portions or arms 22 of the U extending upward and the tabs 23 extending upward. The base of the U is narrower than the mold and the upper ends of the projecting portions or arms 22 spring engage the side walls 25 of the mold. The mold has an upper die 26 which in molding moves relatively toward the lower die.

A mass of basic refractory mixture 27 is placed in the mold of FIGURE 4.

The refractory mixture may be any suitable basic refractory such as chrome-magnesia or magnesia-chrome, many such refractory mixtures having been described in my prior patents.

The upper and lower dies 26 and 24 move relatively together, applying a molding pressure which should exceed 3000 p.s.i. and preferably should exceed 10,000 p.s.i. or 15,000 p.s.i. The effect is to produce a brick 28 as shown in FIGURES 5, 6 and 7, which has a refractory body and a comolded plate 20, with the projecting portions or arms 22 at the outside extending only a short distance over the lateral faces 30, suitably not more than one-fourth of the lateral faces. The base of the U 21 covers the major portion and in the actual brick substantially all of the major lateral face 31. It will also be noted that the projecting portions or arms 22 are separated in the preferred embodiment by refractory areas 32 where no projecting portions are present at each one of the faces 30.

While the angle of the projecting portions to the base of the U exceeded 90° in FIGURE 4 prior to molding, and the width of the base of the U is smaller than the intended corresponding side of the formed brick, after molding the projecting portions are formed at right angles to the base 21 of the U in the formed brick as a result of the molding pressure. The tabs 23 of course are firmly anchored in the interior of the brick by comolding.

In some cases it is desirable to use an internal plate comolded with the brick in accordance with my U.S. Patent 2,791,116. In FIGURE 3 I illustrate an internal oxidizable metallic plate 33 of U-shaped form having a base 34 which is united to the base 21 of the U and having arms 35 of the U which are embedded in the interior of the brick. In the plate of FIGURE 3 the base 34 of the U of the internal plate is desirably united to the base 21 of the U of the external plate as by spot welding as shown at 36.

A second external oxidizable metallic plate 37 of suitable U-shape is united in opposed relation to the exterior of the brick. The plate 37 has a base 38 of the U which covers the lateral face 40 of the brick which is opposite to the lateral surface 31 and also has arms 41 of the U which cover the lateral faces 30 suitably in their entirety. In any case when the plate 37 is applied to the brick the base 38 of the U covers the major portion of the face 40 of the brick and the arms 41 of the U cover the major portions of the faces 30 of the brick.

The arms 41 of the U extend on the outside of the projecting portions 22 and are united to the projecting portions as by spot welding at 42.

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As a result the second plate 37 is firmly united to the comolded plate without the necessity of cutting holes in the brick or punching portions of the plate to fit in such holes.

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 refractory brick comprising an integral body of basic refractory having a plurality of lateral longitudinal faces each in a corresponding plane of said body, an oxidizable metallic plate having a base on one of said faces of the refractory body, said plate having projecting arms on opposed edges of the base and supporting projecting tabs between said opposed edges of the base, said projecting tabs and projecting arms being securely embedded in the refractory body of the brick and said projecting arms having outside faces flush with a second and third of said plurality of lateral longitudinal faces of the refractory body, said arms of said plate having a length which is less than one-quarter of the transverse dimension of the corresponding face of the refractory body, said second and third faces being opposed to each other, and a separate external oxidizable metallic U-shaped plate having arms of the U directly abutting substantially the entirety of the respective facial areas of said opposed faces of the refractory body and base of the U directly abutting substantially the entirety of the facial area of a fourth of said plurality of faces of the refractory body opposite said one of said faces, said plate second mentioned extending over the outside faces of said projecting arms of the oxidizable metallic plate first mentioned and being anchored to the body of the brick by said first mentioned plate, and said second mentioned plate being bonded to said projecting arms so that said plates encase said plurality of lateral longitudinal faces of the refractory body and are retained as a casing to the body by said projecting arms and projecting tabs.

2. A basic refractory brick comprising an integral body of basic refractory having a plurality of lateral longitudinal faces each in a corresponding plane of said body, an oxidizable metallic plate having a base on one of said faces of the refractory body of the brick and said plate having a plurality of spaced projecting arms on each of opposed edges of the base, said projecting arms being securely embedded in the refractory body of the brick and having outside faces flush with a second and third of said plurality of lateral longitudinal faces of the refractory body, said arms of said plate having a length which is less than one-quarter of the transverse dimension of the corresponding face of the refractory body, said second

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and third faces being opposed to each other, and a separate external oxidizable metallic U-shaped plate having arms of the U directly abutting substantially the entirety of the respective facial areas of said opposed faces of the refractory body and substantially the entirety of the facial area of another of said plurality of faces of the refractory body opposite said one of said faces, said plate second mentioned extending over the outside faces of said projecting arms of the oxidizable metallic plate first mentioned and being anchored to the body of the brick by said first mentioned plate, and said second mentioned plate being bonded to a projecting arm of each said plurality of projecting arms so that said plates encase said plurality of lateral longitudinal faces of the refractory body and are retained as a casing to the body by said projecting arms.

3. A basic refractory brick comprising an integral body of basic refractory having a plurality of lateral longitudinal faces each in a corresponding plane of said body, an oxidizable metallic plate having a base on one of said lateral longitudinal faces of the refractory body of the brick, said plate having projecting arms on opposed edges of the base, said projecting arms terminating at their outer ends short of a second face of said plurality of faces of the refractory body opposite said one of said faces of the body and having opposed side edges securely embedded in the refractory body of the brick, said projecting arms having outside faces flush with a third and fourth of said plurality of faces of the refractory body, said arms of said plate having a length which is less than one-quarter of the transverse dimension of the corresponding face of the refractory body, said third and fourth faces being opposed to each other, and a separate external oxidizable metallic U-shaped plate having a base of the U directly abutting substantially the entirety of the facial area of said second face of the refractory body and arms of the U directly abutting substantially the entirety of the facial areas of said opposed third and fourth faces respectively of the refractory body, said plate second mentioned extending over said projecting arms of the oxidizable metallic plates first mentioned and being anchored to the body of the brick by said first mentioned plate, and said second mentioned plate being bonded to said projecting arms so that said plates encase said plurality of lateral longitudinal faces of the refractory body and are retained as a casing to the body by said projecting means.

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