April 12, 1960 R. P. HEUER 2,932,265

REFRACTORY BRICK

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Fig. 1

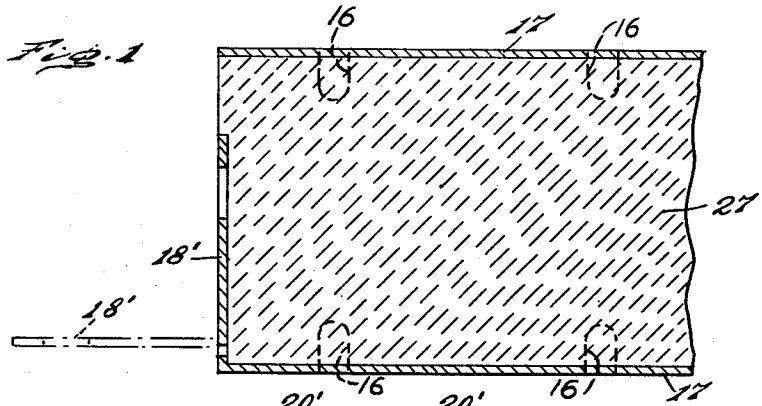


Fig. 2

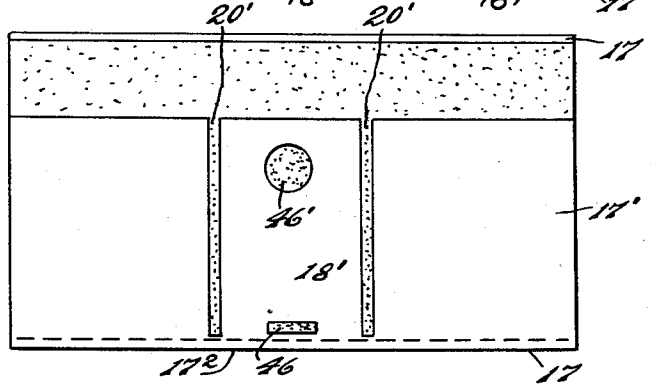
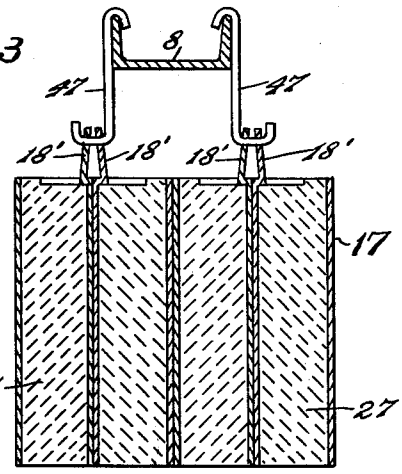


Fig. 3



INVENTOR
Russell Pearce Heuer
BY
ATTORNEYS

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Fig. 4

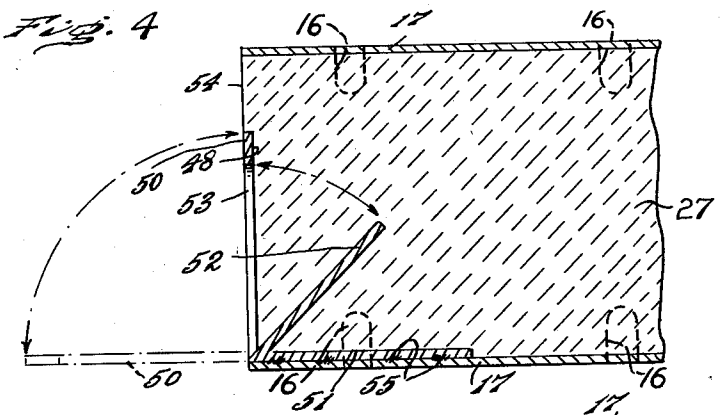
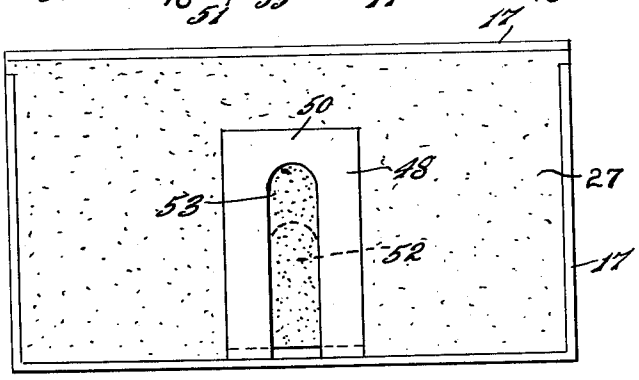


Fig. 5



INVENTOR.
Russell Pearce Heuer.

BY

ATTORNEYS.

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2,932,265

REFRACTORY BRICK

Russell Pearce Heuer, Villanova, Pa., assignor to General Refractories Company, a corporation of Pennsylvania

Application April 27, 1954, Serial No. 425,860

3 Claims. (Cl. 110—99)

The present invention relates to refractory structures employing basic refractory brick with comolded metallic surface plates and with mechanical means of support, and to methods of making the same.

The present application is a continuation in part of U.S. application Serial No. 308,749, filed September 10, 1952, for Refractory Wall and Roof Making, now Patent 2,781,006, granted February 12, 1957.

A purpose of the invention is to provide a basic refractory brick with a comolded metallic surface plate having supporting means secured to and preferably integral with the surface plate, preferably in the form of a supporting tab.

A further purpose is to support the brick by uniting the supporting means on the surface plate to a structural support by a hanger, which will desirably be formed of wire.

A further purpose is to provide the integral supporting means on the surface plate initially at a location within the confines of the brick, and then to bend or otherwise deform it to a position at which it is accessible to the means of support.

A further purpose is to locate the supporting means so that during manufacture and shipment the supporting means does not extend beyond the confines of the brick and so is protected.

A further purpose is to secure integral supporting means on surface plates of basic refractory brick extending beyond the end of the brick most distant from the heated face.

A further purpose is to mold the supporting tabs into the brick by forming them on the surface plates before molding, applying pressure to the basic refractory through the surface of one plate or two opposite plates and imbedding projections in the refractory by comolding as the brick is formed.

A further purpose is to secure to an oxidizable metallic external spacer plate on a basic refractory brick a tab element which extends along the surface of the brick within the confines of the brick adjacent the end, and is deformed from the confines of the brick to produce a tab to hang or secure the brick, and preferably also to imbed the projection from the tab element in the refractory of the brick by comolding.

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 my 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 fragmentary longitudinal section of a supported brick of the character employed in the invention.

Figure 2 is an end view of the brick shown in Figure 1.

Figure 3 is a supported roof structure employing the brick shown in Figure 2.

Figure 4 is a central longitudinal fragmentary section showing a modification of the refractory brick in respect to the tab element.

Figure 5 is an elevation of the refractory brick of Figure 4 from the cold end.

In the prior art considerable use has been made of basic refractory brick and mechanical means of support in the construction of furnaces such as open hearth steel furnaces. This use includes construction of suspended roofs, walls and so-called suspended ends and slag pockets. This construction is typically shown in my U.S. Patents 2,154,813, 2,155,165 and 2,547,322.

The brick **27** in accordance with the present invention are made from basic refractory material, such as chromite, or magnesia or mixtures thereof well known in the art. A typical refractory composition is disclosed in my U.S. Patent No. 2,087,107.

The refractory brick are preferably formed by comolding the oxidizable metallic plates **17** with the refractory mix and applying the molding pressure through the plates.

The metal preferably used is steel or iron, including plain carbon steel and stainless steel. The plate is of sheet material, desirably having a thickness between approximately $\frac{1}{32}$ inch and $\frac{1}{4}$ inch depending on the installation.

At intervals over the surface of the plate and protruding in the direction of the refractory there are interlock projections **16** which are conveniently formed by lancing from the plate, and are comolded and united in the refractory.

The internal plates preferably extend in a radial direction in the curved arch.

In Figures 1 and 2 the tab is provided on one of the minor, or end faces of the brick. The metallic plate used for providing the tabs is formed into a U shaped section which covers all or part of the minor face of the brick. The U shaped section is cut out to form the tab **18'**, which is separated from the rest of the plate **17'** at the cold end of the brick by a separation line **20'**. A hole **46'** may be provided to engage a supporting means. The tab is further weakened by a hole **46** near the intended line of bending, so that when the tab is bent into its opposition extending away from the brick, the bending will occur at a predetermined place near the corner 17^2 of the brick.

The bricks of Figures 1 and 2 may be assembled in groups of two or four as shown in Figure 3. In this case, the supporting means **8** is provided with suitably formed wires or hooks **47** which connect with the supporting means and engage the brick at the tabs **18'**.

In some cases it is desirable to have a metallic tab of different thickness and preferably of greater thickness than that of the oxidizable metallic spacer plate which is placed on the outside surface of the brick. The tab element may be of any metal suitable for the spacer plate, but will preferably be of steel. For this purpose it is preferable to us a separate tab construction which is secured to the spacer plate.

Figures 4 and 5 illustrate a support **48** which consists of an angle having a tab element **50** and a flange **51**. From the tab element **50** a tongue **52** is lanced out and bent to a position intermediate between the angular positions of the flanges **50** and **51**. The lancing leaves a hanger opening **53** in the tab element **50**.

In the preferred embodiment, the tab element **50** extends along the end **54** of the refractory brick which is to be the cold end in service within the confines of the generally rectangular or other standard shape of the brick. The flange **51** is secured as by spot welding at **55** to the interior of the oxidizable metallic spacer plate **17** near the end of the brick, and the tongue **52** extends

diagonally into the brick. The tongue is imbedded in the refractory of the brick by comolding. When it is desired to use the tab element **50** as a tab to hang up or support the brick, the tab element **50** is bent out into a position shown in dot-and-dash lines in Figure 4, so that the opening **53** is available to engage a hanger or pin as previously described.

It will be noted that in the construction of Figures 4 and 5 the thickness of the tab element can be made appreciably greater than that of the oxidizable metallic spacer plate **17** to increase the strength of the tab.

In addition to the use of supported brick for constructing regularly formed (arch type) roofs, the supported brick may be used also to form sloping walls, nose construction and other parts of suspended end construction as revealed in my other patents.

The principles of the invention are applicable not only for the suspended roofs but also for vertical and other types of walls, used for example in furnace ends and slag pocket sections. When used in vertical walls the major axis of the brick lies horizontal as compared to the vertical or radial position of the major axis of the brick in a roof.

Wherever reference is made to supporting the brickwork it is understood that the brickwork so supported need not necessarily be supported from above. Supporting means can be either directly above, or angularly above the brick, or disposed in a horizontal direction. It is the intention that the word "supporting" signifies maintaining the brick in a desired position by mechanical means attached to any part of the furnace.

I am familiar with the fact that it has been proposed to use mechanically supported brick with a metal sheath, the sheath being provided with parts external to the brick itself and intended to be used as supporting means. Such brick were made by placing premolded brick in the sheath or by molding loose refractory into a preformed sheath. This presents difficulties in molding, however, and is unsatisfactory because the sheath is already in its intended form before pressing begins and no pressure can be exerted from a moving pressing die on the contained refractory through the external casing. I have found that it is an improvement to comold the brick with metallic plates which are adaptable to a pressing operation which applies the pressure from a moving die through the metallic plates, the plates relatively moving in achieving their final intended form or relative position with respect to their position when introduced into the mold. The present invention permits the use of this desirable pressing operation and incorporates the support means integral with the comolded plates. Thus the final brick has desirable properties from proper pressing, and at the same time the comolded plate is intimately associated with and integrated to the brick by the comolded union of the projections with the refractory.

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 apparatus 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 of generally rectangular shape having side faces, a hot face and a cold face, comprising a body of basic refractory making up the bulk of the brick, a support, said support including a tab in inactive position having an inside surface comolded into said cold face by comolding said support and refractory, an outside surface of the tab being at most flush with the cold face of the brick in the inactive position of the tab, and an oxidizable metallic plate extending transversely of said inside and outside surfaces of the tab in said inactive position of the tab and along a side face of the brick, said plate having projections which extend into the body of basic refractory of the brick and which are united thereto by comolding, said support being supported by said plate and said tab being of bendable metal and capable of being bent relative to said plate to an active position beyond and transverse to the cold face of the brick.

2. A basic refractory brick according to claim 1, in which said support includes a flange integral with the tab and said flange extends inward into the refractory of the brick and along the inside surface of the oxidizable metallic plate and is secured to said oxidizable metallic plate.

3. A basic refractory brick of generally rectangular shape having side faces, a hot face and a cold face, comprising a body of basic refractory making up the bulk of the brick, a support, said support including a tab in inactive position having an inside surface comolded into said cold face by comolding said support and refractory, an outside surface of the tab being at most flush with the cold face of the brick in the inactive position of the tab, and an oxidizable metallic plate extending transversely of said inside and outside surfaces of the tab in said inactive position of the tab and along a side face of the brick, said plate and the body of basic refractory of the brick being united by comolding, said support being supported by said plate and said tab being of bendable metal and capable of being bent relative to said plate to an active position beyond and transverse to the cold face of the brick.

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