Aug. 28, 1962 R. P. HEUER 3,051,101

REFRACTORY BRICK AND METHOD OF MOLDING

Filed Nov. 12, 1958

2 Sheets-Sheet 1

Fig. 1.

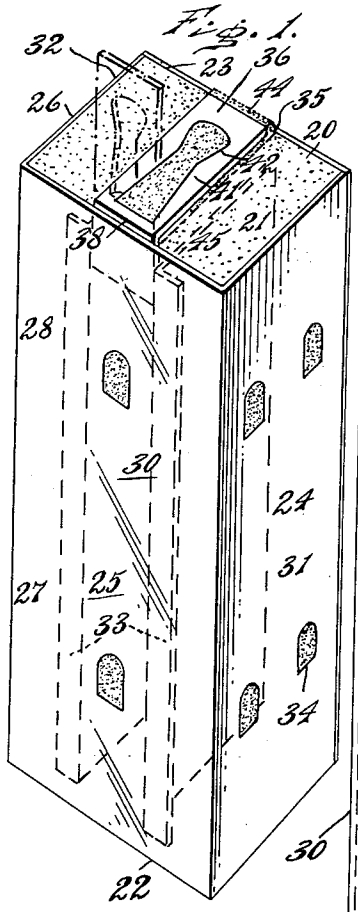


Fig. 2.

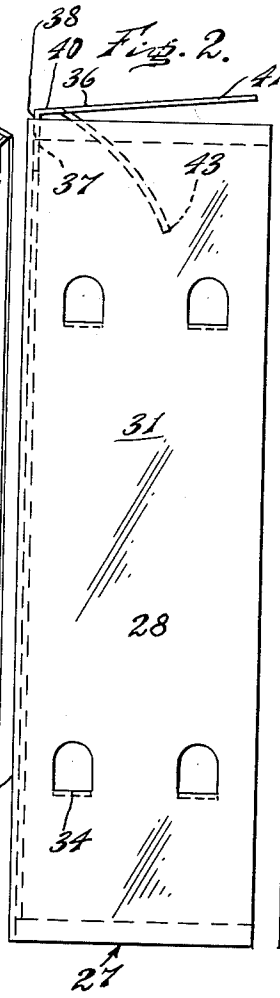


Fig. 3.

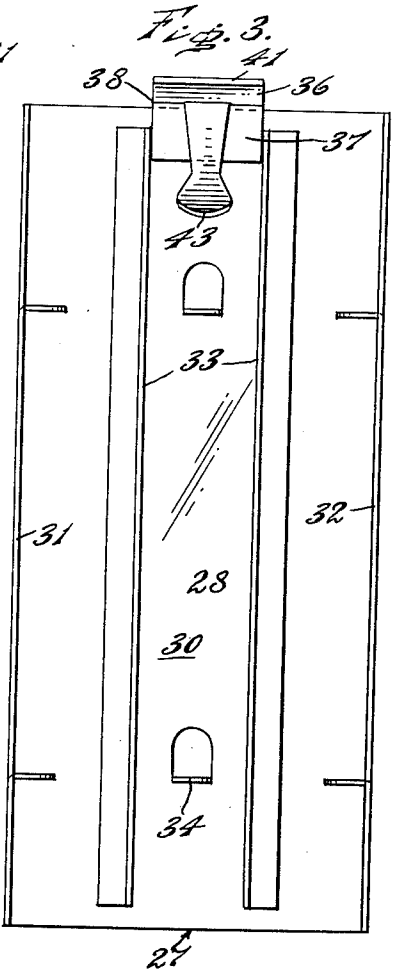


Fig. 1a.

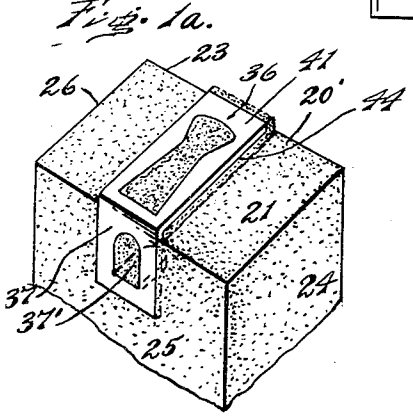
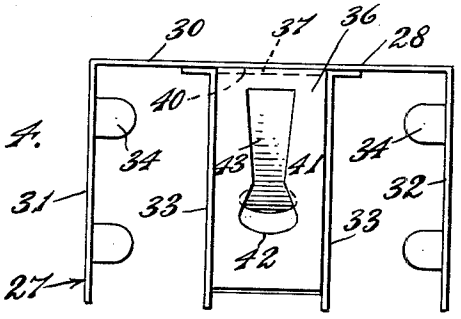


Fig. 4.



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Fig. 5.

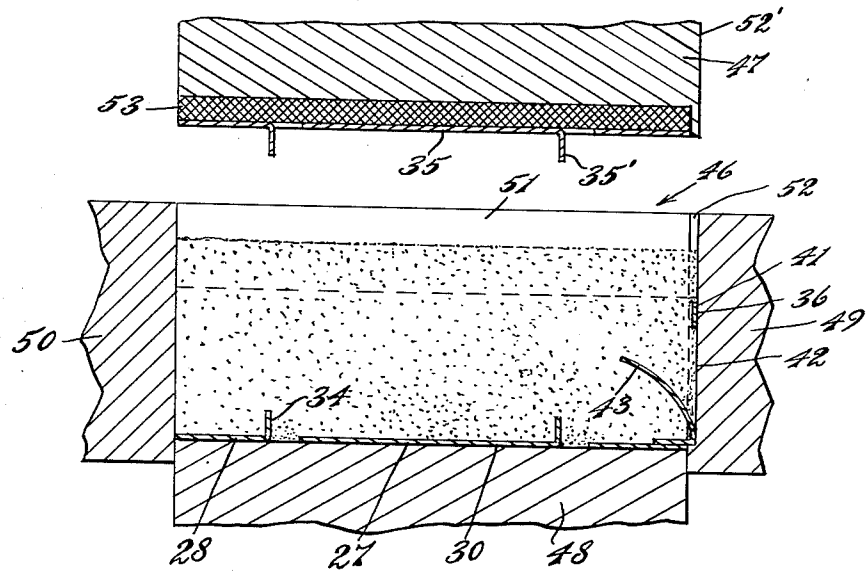
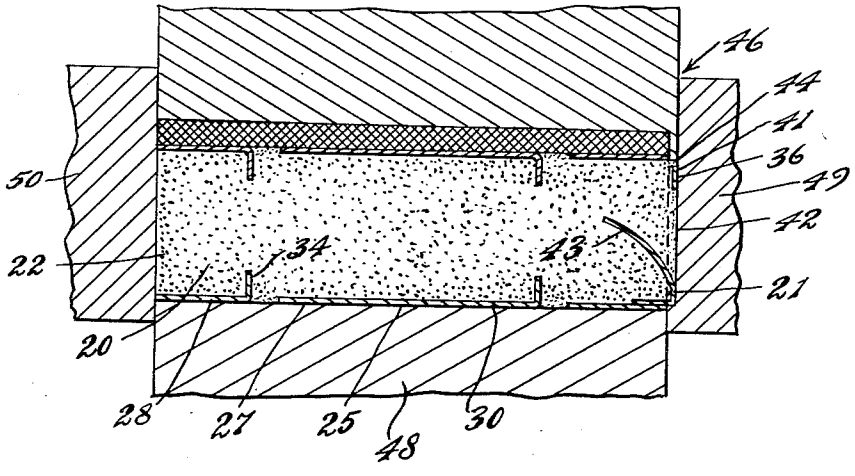


Fig. 6.



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REFRACTORY BRICK AND METHOD OF MOLDING

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Filed Nov. 12, 1958, Ser. No. 773,308
2 Claims. (Cl. 110—99)

The present invention relates to basic refractory bricks particularly intended for refractory furnace roofs, noses, and the like, and methods of molding the same.

A purpose of the invention is to make it more convenient to raise the hanger tab on a basic refractory brick.

A further purpose is to support the hanger tab effectively during shipment, while permitting ready access to the hanger tab to bend it up during assembly.

A further purpose is to assure that the hanger tab is correctly placed during molding by securing the hanger tab to a plate assembly and bending the hanger tab initially at an angle greater than 90 degrees, so that the hanger tab will effectively engage the end of the mold under spring action, tending to hold its position during molding and prevent loose refractory from entering the space between the hanger tab and the end of the mold.

Further purposes appear in the specification and in the claims.

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

FIGURE 1 is a perspective of a basic refractory roof brick constructed in accordance with the present invention.

FIGURE 1*a* is a fragment of FIGURE 1 showing a variation.

FIGURE 2 is a side elevation of a metallic plate assembly useful in forming the brick of FIGURE 1.

FIGURE 3 is a front elevation of FIGURE 2.

FIGURE 4 is an end elevation of FIGURE 2.

FIGURE 5 is a diagrammatic central longitudinal section of a mold for forming the brick of the invention in open position.

FIGURE 6 is a view corresponding to FIGURE 5 showing the mold in closed position.

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

Extensive use is being made of basic refractory roof and nose brick for open hearth steel making furnaces and the like, in which the refractory is of the character which can react with external and preferably internal ferrous metal plates. The refractory employed may be magnesia, according to my previous patents such as Patent No. 1,992,482 or a mixture of chromite and magnesia containing at least 10 percent of magnesia by weight, as defined in my previous patents, illustratively Patent No. 2,087,107.

The brick in the preferred form in addition to the refractory includes an oxidizable ferrous metal plate assembly, with a hanger tab secured to this plate assembly. The preferred completed brick according to the invention is shown at **20** in FIGURE 1, and its major plate assembly is shown in FIGURES 2, 3 and 4. The brick has a cold end **21**, a hot end **22**, and side faces **23**, **24**, **25** and **26**, being suitably of elongated rectangular form as shown.

The major plate assembly **27** suitably comprises a U-shaped plate **28** having a base of the U at **30** which conforms with the outside face **25** of the brick, an arm of the U at **31** which conforms with the outside face **24** of the brick over most of its surface and an arm of the U at **32** which conforms to the outside face **26** of the brick over most of its surface.

There are also in the preferred form in spaced relation through the interior of the brick parallel to the arms of the U internal oxidizable ferrous metal plates **33** united to the base of the U by welding. The arms of the U are suitably provided with lanced out tongues **34** buried in the refractory. The U-shaped plate is united to the refractory of the brick by comolding.

The other face **23** of the brick is suitably covered by an oxidizable ferrous metal plate **35** comolded to the plate and having suitable tongues **35'** which extend into the brick and this plate also is united by comolding.

Adjoining the cold end at the base of the U, the plate assembly **27** has a sheet metal hanger tab **36** secured thereto by spot welding at **37**, preferably on the inside of the base of the U. The hanger tab has a short extension **38** beyond the end of the plate and then it is bent abruptly at **40** to form a tab portion **41** which lies along the cold end. The tab portion **41** has a hanger opening **42** suitably of keyhole shape lanced out, and the material lanced therefrom forms a tongue **43** (see FIGURES 2, 3 and 4) which extends into and is buried in the refractory and united thereto by comolding. The angle **40** of the tab is initially greater than a right angle and the hanger tab is of sheet gauge material which has spring properties, to assist in obtaining proper engagement between the hanger tab and the side of the mold in molding as later explained.

The brick has a rib **44** extending across the cold end under the hanger tab and protruding beyond the surface **45** of the rest of the cold end by a distance which may be conveniently of the order of 1/32 to 1/4 inch or somewhat more, preferably about 1/16 inch. The sides of the rib are in the preferred form as shown coextensive with the sides of the hanger tab.

Accordingly it is now much easier to raise the hanger tab, since access can be obtained to its sides, which are suitably located at the sides of the offset or rib **44**. Furthermore, the raising of the hanger tab position with respect to the rest of the cold end makes it easier to grasp and raise the hanger tab to the position shown in phantom in FIGURE 1, where it can be gripped by the supporting structure.

In some cases the hanger tab will be comolded with the basic refractory and placed on the brick **20'** without affixing metallic plates, as shown in FIGURE 1*a*. In this case the bricks may be used without metallic plates, or oxidizable metallic external plates will be placed around the sides of the bricks after molding. In FIGURE 1*a*, the portion **37** of the tab, which rests on the bottom of the mold in molding, preferably has an ear **37'** lanced out and united in the brick by comolding. The tongue **43** is comolded in the brick. The tab portion **41** rests on a rib of refractory **44** as already described, formed in the manner to be described.

In molding the brick of the invention, the mold **46** has an upper die **47**, and a lower die **48** which move relatively toward and away from one another, a mold end **49** for molding the cold end, a mold end **50** for molding the hot end, and mold lateral faces **51**. There is in the mold end for molding the cold end a lateral offset or recess **52** and a cooperating rib **52'** on the upper die. When the plate assembly **27** is placed in the mold the base of the U rests on the lower die, the sides of the U rest against the sides of the mold and are sprung inwardly at the outer ends to make them fit within the sides of the mold, and the hanger tab fits in the mold recess **52** and is sprung inwardly until the angle **40** is approximately a right angle, under which condition the hanger tab is held close against the end of the mold, by spring action, and loose refractory is prevented from getting between the hanger tab and the end of the mold during filling of the mold.

I then place in the mold within the U-shaped ferrous metal plate and around and between the internal plates

if any a basic refractory mix as already described. The plate **35** is held on the upper die by a magnetic clutch **53**.

When the dies move together the refractory is molded and comolded to the plates and around the tongues protruding inwardly from the plates and around the internal plates. The hanger tab **41** is molded at the cold end and immediately beneath the hanger tab is formed a rib **44**. The tongue **43** extending from the hanger tab is comolded into the refractory.

In the preferred embodiment of the invention, the hanger tab is made of heat resisting alloy, preferably heat resisting ferrous alloy, such as stainless steel containing 18 percent chromium and 8 percent nickel, or stainless steel containing 14 percent chromium, or one of the higher chromium or higher chromium and nickel iron alloys. This protects against having the hanger tab oxidize away and fail to support the brick. The external plates and internal plates are suitably made of plain carbon steel, although if desired they may be made of corrosion resistant alloys such as corrosion resistant steels. The external and internal plates are suitably of sheet having a thickness between 1/64 and 1/4 inch, preferably about 20 gauge. The hanger tab may be of similar thickness.

In view of my invention and disclosure, variations and modifications to meet desire 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 specifically adopting the process and brick shown, and I, therefore, reserve 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 composed of basic refractory of the class consisting of magnesia and mixtures of chromite and magnesia containing at least 10 percent of magnesia, having a hot end, a cold end, and side faces, the refractory at the cold end having a rib protruding across the cold end beyond the rest of the cold end, having a metallic hanger tab adjacent the cold end, said tab including two arms in L formation, one of said arms extending along a side face of the refractory brick adjoining the cold end, said tab having a metallic anchorage portion protruding into and comolded within the refractory adjacent the cold end and securing the hanger tab to the refractory, the other arm of the hanger tab extending across the rib at the cold end in face to face relation with the refractory of the rib, said other arm in extending across the rib being coextensive with the width of the rib, and the rib by reason of its thickness placing said other arm of the hanger tab in accessible position to be pried away from the cold end and erected in upstanding relation to the cold end.

2. The basic refractory brick of claim 1, in combination with an oxidizable ferrous metal plate extending along the side face of the brick at which said one arm of the L is located, said plate being united to the brick by comolding and secured to the hanger tab, said hanger tab being of corrosion resistant alloy.

References Cited in the file of this patent

UNITED STATES PATENTS

2,247,376	Heuer	July 1, 1941
2,303,544	Goss	Dec. 1, 1942
2,527,063	Heuer	Oct. 24, 1950
2,725,833	Reintjes	Dec. 6, 1955
2,781,006	Heuer	Feb. 12, 1957
2,932,265	Heuer	Apr. 12, 1960