Nov. 19, 1940. O. C. SCHAUBLE 2,222,576

PANEL WALL CONSTRUCTION

Filed May 27, 1939

Fig. 1.

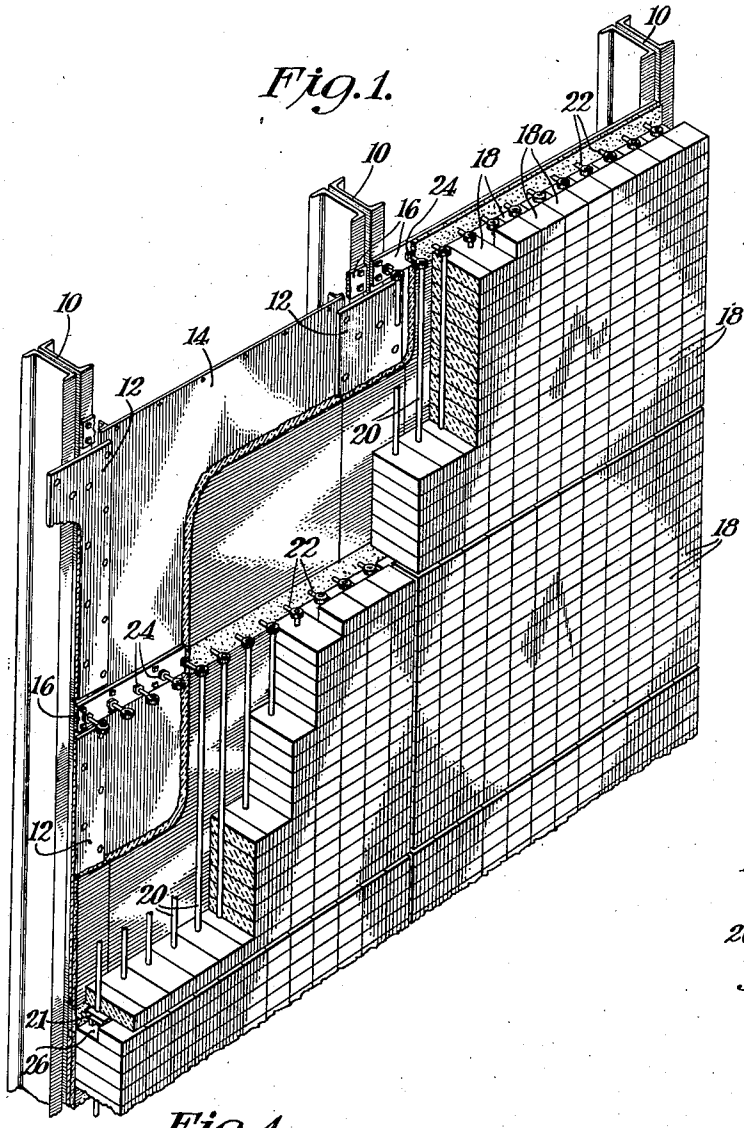


Fig. 2.

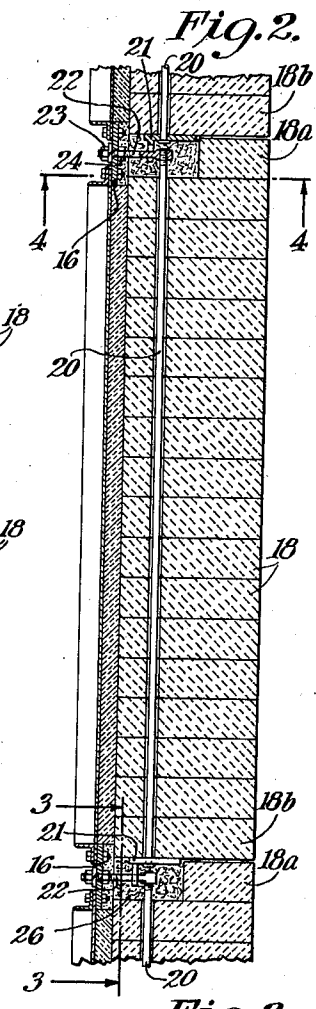


Fig. 3.

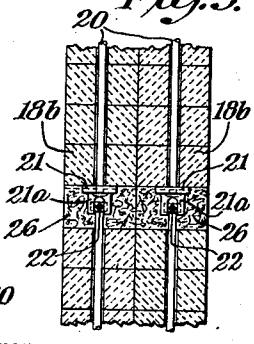


Fig. 4.

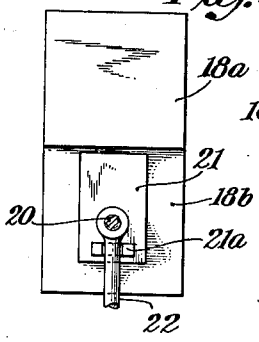


Fig. 5.

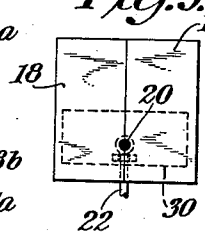
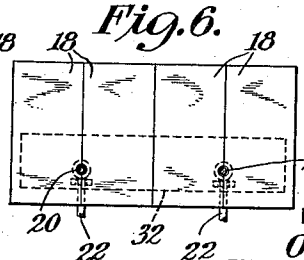


Fig. 6.



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PANEL WALL CONSTRUCTION

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Application May 27, 1939, Serial No. 276,187

3 Claims. (Cl. 110—1)

This invention relates to improvements in furnaces and other refractory faced constructions exposed to high temperatures. It is exemplified herein as a thin, lightweight, air tight encasement for furnace walls as in steam boilers and oil heaters and is more particularly an improvement of the type described in Brinckerhoff et al. Patent 2,144,598 of January 17, 1939.

One of the principal objects of this invention is to provide a sectional refractory faced encasement including independently replaceable tiers of refractory of exceptionally low co-efficient of thermal conductivity such encasement being free of objectional expansion and contraction changes under thermal changes to which it is subject.

A more specific feature of the invention is to provide a suspended as distinguished from a supported, refractory liner for a furnace wall composed of a plurality of tiers of lightweight and porous brick.

Another and more specific object of the invention is to provide a suspending structure for a detachable furnace wall construction in which the wall structure is protected from furnace heat and in which the supporting elements subject to high temperatures are relatively small and economically made of heat resisting material.

A still further object of the invention is to provide a rectangular detachable refractory wall construction for furnaces and the like, said wall structure being provided with a series of suspended sections which are readily adjusted for initial tightness both laterally and linearly, such construction being simple in assembly, inexpensive, and of relatively long life.

Further advantages of the invention will appear from the following description of a preferred form of embodiment thereof taken in connection with the attached drawing which is illustrative of the invention and in which:

Figure 1 is a perspective view showing a section of a furnace wall with parts broken away to show the internal construction.

Figure 2 is a vertical transverse section through the furnace wall.

Figure 3 is a vertical longitudinal section through the furnace wall and taken substantially along the line 3—3 of Figure 2.

Figure 4 is a horizontal section taken substantially along the line 4—4 of Figure 2.

Figures 5 and 6 are detailed plan views with parts in section showing alternative arrangements of the foot pieces.

In large sized furnaces such as steam boilers, oil heaters for refineries and other constructions, very extensive wall coverings are provided, a large part of which is subject to high temperatures. Much of the surface is exposed to radiant heat and all of it is subject to considerable thermal expansion. Furthermore such furnace walls must be made in a detachable manner not only for the convenience in assembling, but for the purpose of facilitating repairs should they be necessary. It is also important that the furnace wall be relatively air tight and it has been found that dry walls are preferable to mortar walls.

In the prior patent to Brinckerhoff heretofore mentioned, it is pointed out that furnace walls of this type are frequently located from 75 to 100 ft. above the station floors and it is therefore important that separate sections be made so that there is not a gross expansion which would be difficult to compensate for. In the present case, although arrangements are made to compensate for the expansion of the refractory by using the sectional construction, the invention is characterized by a differential support by which an increasing tightness of furnace can be obtained.

In accordance with a preferred form of embodiment of my invention, I have shown a plurality of vertical columns 10 which are placed at suitable intervals as may be found desirable and on which the wall structure is to be formed. Each vertical column is normally provided with a bolting flange 12 and separate sectional backing plates 14 are bolted to these bolting flanges and cover such area as may be found desirable.

Marginal transverse supporting beams 16 are also used, such beams extending between the vertical columns and being provided for the support of the refractory 18 which are of any suitable form of ceramic tile but are preferably of a lightweight type. As pointed out in the Brinckerhoff patent, a particular type of porous tile which is found most suitable is characterized by a thermal conductivity of such low order that there may be a differential in temperature in excess of 2,000° F. between the respective ends of the tile when the furnace ends are exposed to radiant heat, if the bricks are set the long way.

The heat conductivity of such bricks is of the order of 25-40% that of standard heavy refractories and their weight varies from ½ to ⅙ the weight of standard heavy ceramic firebrick.

The refractories 18 are preferably aligned in vertical tiers for a suitable height corresponding approximately to the height of panels 14 and as shown in Figure 2, they may be confined by

a rod 20 which is preferably provided with a flanged head which will support the foot piece 21.

The restraining rods 20 are suspended from the top by an eye bolt 22 which passes through the frame work and is bolted thereto by the nuts and lock nuts generally indicated at 23 and 24. Such eyebolt not only adjusts the lateral spacing of the restraining rods 20 at the top but also fixes the lateral spacing of the subjacent rod at the bottom.

As will be seen in Figures 4 and 2, the foot piece 21 is provided with a bifurcated leg portion 21*a* which projects downwardly and engages over the next lowermost eye bolt 22 and is retained from lateral movement thereby. As the head of the eyebolt limits the outward movement, considerable accuracy of adjustment is possible.

The restraining bolts 20 also can be adjusted along their length to allow a proper clearance between the topmost refractory 18*a* of one row and the lowermost refractory 18*b* of the next higher row. Such clearance when the bricks are set up cold will be a very minimum as will be pointed out hereinafter. The topmost brick 18*a* may be only a partial brick leaving a recess 26 which is filled with a suitable asbestos or other insulating material.

Inasmuch as each tier of refractory is suspended from an uppermost point, any tendency of the rods 20 to become heated will cause a vertical downward movement of the foot piece 21. This will tend to decrease the marginal opening between the vertical tiers. At the same time, however, the refractory tends to slightly expand under the high temperatures to which it is subjected causing a vertical upward movement of the column which will tend to close the marginal opening between the tiers. It will be apparent that if the metal for the restraining rods 20 has substantially the same co-efficient of expansion as the refractory tile 18, there will be no substantial movement between the top of one tier and the bottom of another, and the wall will always be substantially air tight regardless of the temperature changes.

There is another important advantage in a suspended wall construction in that there are no parts which are secured to the frame work which may be subjected to the high temperatures within the furnace. The foot piece is not connected to the panel wall except indirectly and is a relatively small member which could be made of a suitable heat resisting material. At the other end the rod is supported by an eye bolt which is relatively inexpensive and may be conveniently made of heat resisting material, but in any event is spaced from the radiant heat not only by a part of a tile, but also by the insulating material which may be placed in the pocket 26. The construction eliminates the usual transverse angle brackets which serve as footings for the tier of brick and is considerably cheaper not only in initial construction but in repair and upkeep and in the reduction of heat losses.

The foot pieces may be of various types including one such as shown at 21 in Figure 4, which fits directly under the lowermost brick 18*b* in which case the tier of bricks is centrally perforated such as shown in Fig. 1.

It is also possible to use a single foot piece to accommodate two tiers of bricks as shown in Fig. 5. In this construction the restraining rod passes down between notched wall portions of adjacent bricks and the foot piece 30 extends substantially across the bottom portion of both bricks.

A still further modification is shown in Fig. 6 in which the foot piece 32 is adapted to extend across four tiers and be supported by two restraining rods 20. This is merely a matter of convenience depending upon the size and weight and other characteristics of the brick.

In the present construction, it will be noted that the eye bolts 22 which serve as tier supports, are projected through the horizontal transverse beams 16 and are thereby directly supported from the framework of the furnace. It will be obvious, however, that if it is desired to provide a detachable casing plate and brick construction as shown in the Brinckerhoff, et al. patent mentioned, it would be possible to project the bolts 22 through the casing plates 14 which, in turn, are secured to the furnace framework. Reenforcements on the top line of the casing plates if desired, could be provided without difficulty. The advantage of top suspended brickwork would similarly be obtained.

While I have shown and described a preferred form of embodiment of my invention, I am aware that modifications may be made thereto, and I, therefore, desire a broad interpretation of my invention within the scope and spirit of the description herein and of the claims appended hereinafter.

I claim:

1. In a panel wall construction for furnaces, in combination with a supporting framework, casing plates, tiers of refractory brick, thermal insulating material between the casing plates and refractory brick, restraining rods extending along the tiers of refractory brick and maintaining them in alignment, top supports for said restraining rods, said top supports being secured to said framework and laterally adjustable therewith, and means on the bottom of said restraining rods to cooperate in supporting a tier of refractory brick, said tier carrying means being a plate extending substantially across a tier of refractory brick, said tier carrying means being out of thermal contact with the casing plates and having downwardly opening projections which engage the next lower top support to prevent movement of the tier away from the casement.

2. In a panel wall construction for furnaces, in combination with a supporting framework, casing plates, tiers of refractory brick, thermal insulating material between the casing plates and refractory brick, restraining rods extending along the tiers of refractory brick and maintaining them in alignment, top supports for said restraining rods, said restraining rods being screw threaded in said top supports, said top supports being secured to said framework and laterally adjustable therewith, and means on the bottom of said restraining rods to cooperate in supporting a tier of refractory brick, said tier carrying means being bifurcated, and engaging the top of the support of the next lower restraining rod to prevent relative lateral displacement of the lower end of the refractory brick tier.

3. In a panel wall construction for furnaces, a framework consisting of horizontal and vertical members as a supporting framework, casing plates secured to said framework and substantially closing the spaces therebetween, tiers of refractory brick adjacent said casing plates, thermal insulating material between the re-

fractory brick and the plates, restraining rods extending transversely along the tiers of refractory brick and maintaining them in alignment, horizontal adjustable eye bolts secured to the horizontal portions of the framework and adapted for relative lateral adjustment with respect thereto, said restraining rods being screw threaded and supported by said eye bolts in vertically adjustable relation and bottom supports supported by said restraining rods, said bottom supports being adapted to serve as a footing for the tiers of refractory brick, said bottom supports having integral downwardly projecting elements which overlap the next lower eye bolt, said projections being spaced apart to vertically move over the eye bolt and to be laterally restrained by the head thereof, said bottom supports being spaced from the casing plates and out of thermal contact therewith.

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