May 22, 1928. 1,670,490

J. E. BIGELOW

FURNACE WALL CONSTRUCTION

Filed May 3, 1926 2 Sheets-Sheet 1

Fig. 1.

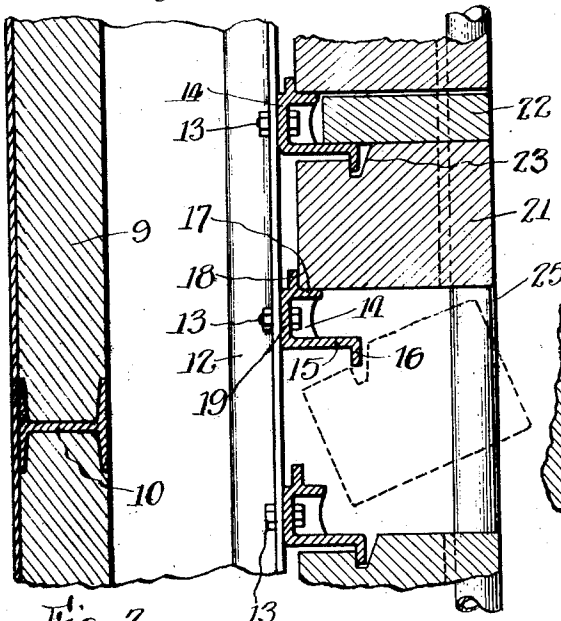


Fig. 4.

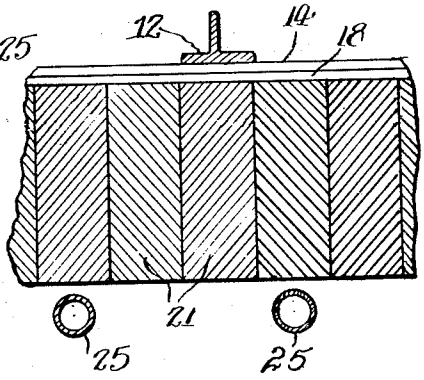


Fig. 2.

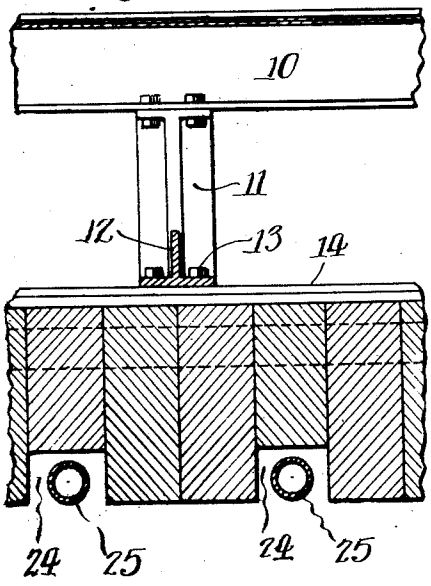
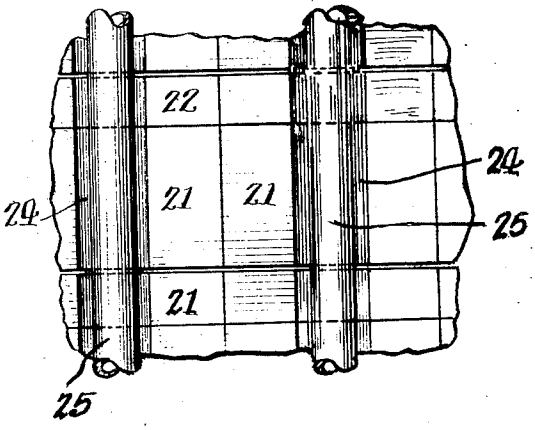


Fig. 3.



Witness:
C. J. Sauser.

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Fig. 5.

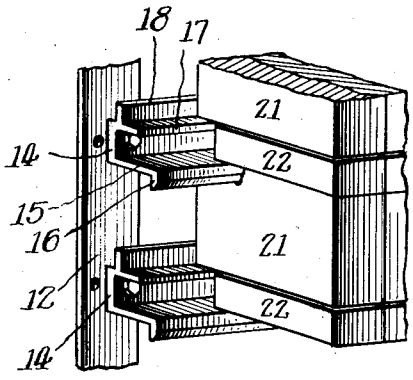


Fig. 6.

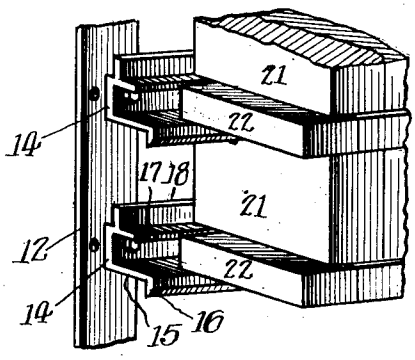


Fig. 7.

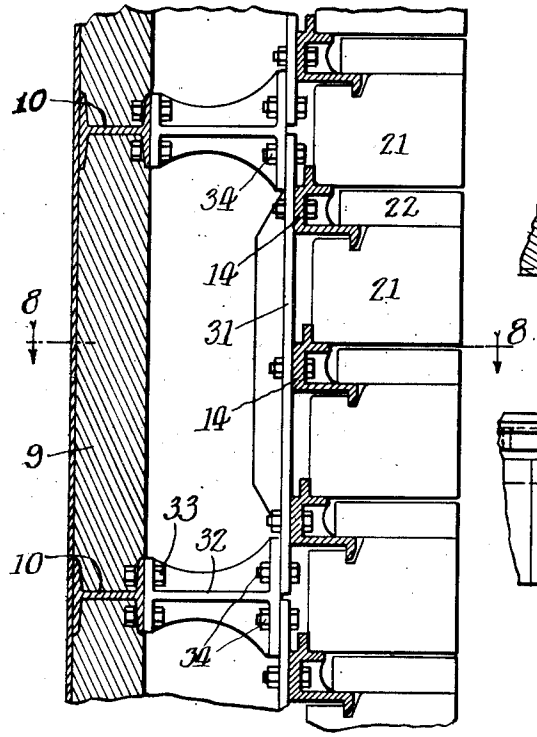
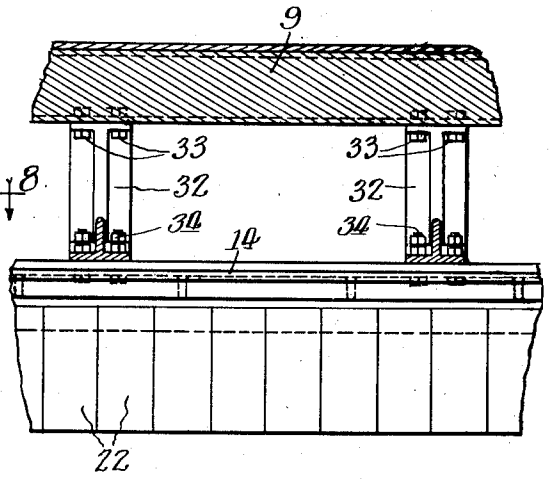


Fig. 8.



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Patented May 22, 1928. 1,670,490

UNITED STATES PATENT OFFICE.

JACK E. BIGELOW, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO BIGELOW ARCH COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

FURNACE-WALL CONSTRUCTION.

Application filed May 3, 1926. Serial No. 106,245.

This invention concerns furnace-wall structures wherein the fire bricks or refractory elements are more or less independently supported in such a manner that the expansion strains and stresses and the deformation of the bricks caused by the combination of the heat imposed on them and the weight or pressure of other bricks bearing on them have been eliminated in large or substantial measure.

The new and improved construction incorporating the present invention permits the repair of local deterioration of the brick work or wall without interference with the adjoining structure, and any of the refractory units can be readily removed and easily replaced.

A prime and leading object of the invention is the provision of a furnace-wall of this type which is simple in structure and comparatively economical to produce.

The invention also concerns certain novel features of construction in furnace and similar walls, and relates more particularly, but not necessarily restrictedly, to walls of this character which are protected or cooled by water pipes, tubes or the like, the invention dealing particularly with the means for demountably supporting the bricks or refractories of the wall so that they may be readily replaced or renewed without interference with the cooling water-pipes referred to.

In a preferred embodiment of the invention, the refractory lining or brick wall is supported wholly independently of the associated or correlated water-tube protecting means for shielding the wall from undue heat, but the arrangement is such that the refractories or bricks may be renewed from the inside of the furnace and without interference with such tubular or pipe construction.

To enable those skilled in this art to have a full and complete understanding of the invention and its several structural and functional advantages, in the accompanying drawings, forming a part of this specification, and throughout the several views of which like reference characters have been employed to designate the same parts, I have illustrated present desirable and preferred embodiments of the invention.

In these drawings:

Figure 1 is a fragmentary, vertical section through a furnace-wall incorporating the new improvements and illustrating in dotted lines how one of the bricks or refractories may be removed after those immediately below and above it have been taken out;

Figure 2 is a fragmentary, horizontal section through the structure shown in Figure 1, with the outer or back wall omitted;

Figure 3 is a fragmentary elevation of the inner front face of such furnace-wall showing the cooling water-pipes which are also indicated in Figures 1 and 2;

Figure 4 is a partial horizontal section through a slightly modified construction wherein the water-pipes, instead of occupying grooves or channels in the brick wall, are spaced slightly away in front of the wall;

Figure 5 is a small broken perspective view of the wall structure with the bricks arranged in vertical rows, such wall being usable by itself or also in association with cooling water-pipes;

Figure 6 is a similar perspective view which shows the bricks in staggered relation;

Figure 7 is a fragmentary vertical section through a modified embodiment of the invention; and

Figure 8 is a horizontal section on line 8—8 of Figure 7.

Referring first to the form or style of structure or species illustrated in Figures 1, 2 and 3 of the drawings, it will be perceived that the construction comprises an outer wall 9 composed in part of horizontal I-beams 10, and an inner wall spaced inwardly away therefrom and incorporating the structural features of the present invention.

This inner wall includes a series of upright, spaced T-bars 12 supported in position by means of brackets 11 connected to the bars 10 of the outer wall, although the particular manner of holding these upright posts 12 in position is of no substantial moment.

The T-bars 12, of which only one is shown in the drawings, support and have fastened to them by bolts 13, 13, a number of vertically-separated, horizontal bars 14, 14, each of which has a lower, wider, hori-

zontal, inwardly-projecting ledge or shelf 15 terminating along its inner edge in a depending flange or hook 16, and an upper, narrower, horizontal, inwardly-extending shelf or ledge 17 equipped along its rear portion with an upstanding abutment-rib 18, these two ledges or shelves being connected or joined together by an apertured, vertical web 19 bearing against the inner faces of the posts or standards 12, and through the holes of which the attaching bolts 13 extend to perform their securing and holding function.

The inner brick wall comprises alternating, horizontal series of thicker and thinner bricks or refractories 21 and 22, respectively, each brick 21 resting on the corresponding narrow ledge 17 of one of the bars 14 and bearing against its abutment-rib 18, as is clearly shown, each such brick having a transverse groove 23 in its top face to accommodate or receive the retaining hook or flange 16 of the next higher bar 14, that portion of the brick below the lower ledge of said upper bar being of less depth than that part of the brick inwardly of the furnace beyond such ledge, all as is fully shown in Figure 1, the top surface of such section of the brick being practically on a level with the corresponding face of the adjacent wider ledge or shelf 15.

Each of the thinner bricks 22 rests in part on the associated ledge 15 and also on the next lower brick 21, as has been fully depicted.

Thus the brick or refractory wall is composed of horizontal series of bricks, all supported more or less directly or indirectly on the metal framework provided for that purpose, each brick 21 partially supporting the brick 22 just above it.

To protect the inner face of such internal wall or lining from the destructive effects of the high temperatures prevailing in the furnace, and also incidentally to provide auxiliary means for the production of steam, this wall on its inner face is supplied with vertical or upright grooves or channels 24 formed by using narrower bricks at those points in the structure.

In the present instance, every third brick in each horizontal layer or group is of this narrower or shorter type, for the purpose indicated but, of course, such cavities or channels may be made as near together or as far apart as circumstances dictate may be desirable by the mere proper use of the wider or longer and narrower or shorter bricks.

These surface channels or grooves are occupied by upright water-pipes 25 connected together in any appropriate manner, not necessary here to indicate, and such cooling pipes afford substantial protection to the adjacent bricks from the intense heat in the furnace, these pipes or tubes being supported independently of the inner wall and its framework.

If any brick 22, between the water-pipes or tubes, requires replacement, it can be readily slid out of place inwardly of the furnace between the adjoining pipes, and a new brick can be as readily inserted.

If any brick 21 between the pipes needs to be renewed, it is first necessary to take out the bricks 22 immediately below and above it, and then the brick in question can be tilted upwardly, as shown in dotted lines in Figure 1, to remove it from the ledge 17 and to release it from the hook portion 16, whereupon it can be withdrawn inwardly of the furnace between the pipes or tubes, thus permitting the putting in place of a new brick or refractory, and its companion ones 22, by a mere reversal of the specified operation.

In case either style of brick 21, or 22, behind one of the water tubes or pipes, necessitates renewal or replacement, this operation or result can be accomplished with facility by first taking out, in the manner indicated, the brick 22 or the brick 21 and two bricks 22, as the case may be, next adjacent to or alongside of the injured one or ones, and then, by sliding the latter horizontally on its or their support, until out of register with the pipe, removal can be effected in the way already described.

The manner of inserting the new brick or bricks and then sliding it or them into position behind the water pipe or tube, and the installation of the next brick or bricks to complete the wall will be readily understood from what precedes.

Thus it is possible to remove or place any brick or refractory in the wall with ease and dispatch, regardless of its location, and quite without interference or conflict with the water-pipe structure.

In Figure 4, a slightly modified construction is presented, in which case the water conduits 25, 25, do not occupy channels or grooves provided in the inner face of the brick wall or lining, but they are positioned inwardly away from the wall a small amount, hence eliminating the necessity for the use of the narrower or shorter bricks specified, the inner wall in this case being of substantially uniform thickness throughout.

The way or method of taking out or demounting any of these bricks will be obvious from the description already given.

From the foregoing, it will be understood that no brick of the inner wall is subjected to the weight of others above it except that each horizontal row of bricks partially supports the row of filler bricks over it, but this is of no substantial consequence.

The wall as a whole and its individual elements may expand and contract without danger of damage to the refractory bricks

or to the water-cooling structure, and the bricks are not subjected to the action of the heat and at the same time to any material pressure by reason of sustaining the wall-section above them.

In the forms of the invention illustrated, a slight space is desirably left between the top surface of each brick 22 and the under surface of the brick 21 above it, in order to allow for expansion of the parts involved, and without placing any pressure upon the adjoining construction.

The bricks or refractories of this inner wall, whether the cooling water-tubes are used or not, may be arranged in direct vertical rows as indicated in Figure 5, or, these bricks may be arranged in staggered relation as depicted in Figure 6.

In the embodiment of the invention shown in Figures 7 and 8, which may be used with or without the water conduits, as circumstances dictate, the bricks 21 and 22 and their horizontal supporting bars 14 are the same as already described, but the other parts of the structure are somewhat different.

Instead of employing long upright bars 12, this style of wall has shorter T-beam sections 31 to which the horizontal bars 14 are directly bolted as shown.

To support the members 31, I employ suitably-shaped brackets 32 of the form and style clearly depicted, which at one end are bolted at 33 to the beams 10 and at the other end at 34 to the overlapping, adjacent ends of the corresponding elements 31.

As illustrated, the members 31 extend only from one supporting bracket 32 to the next one, but they may be of greater length if desired.

The embodiment of the invention shown in Figures 7 and 8 relates more particularly to the manner of supporting the horizontal bars carrying the bricks of the inner wall and all other features of the construction are alike those presented hereinbefore.

While I have herein illustrated and described several embodiments of the invention, it is to be borne in mind that the invention is susceptible of other satisfactory embodiments in practical form differing more or less in mechanical structure from those herein set forth, the range or scope of the invention being defined by the appended claims.

This application is in part a continuation of my earlier patent application, Serial No. 51,723, furnace wall constructions, filed August 22, 1925.

I claim:

1. In a furnace-wall construction, the combination of supporting means for a brick including a ledge on which the brick rests and an upper latch engaging in a groove in the top face of the brick, the wall including readily removable bricks immediately above and below said first brick, the removal of the former permitting the demounting of the latter from the ledge and latch.

2. In a furnace-wall construction, the combination of supporting means for a brick including a ledge on which the brick rests and an upper fixed latch engaging in a groove in the top face of the brick, the wall including readily removable bricks immediately above and below said first brick, the removal of the former permitting the demounting of the latter from the ledge and latch.

3. In a furnace-wall construction, the combination of a plurality of vertically-spaced supporting bars each of which has an upper supporting ledge and a lower latch portion, rows of bricks each resting on said ledge of one such bar and held thereon by the latch portion of the next upper adjacent bar engaging in a groove of the brick, and rows of intermediate filler bricks resting at least in part on said rows of supported bricks.

4. In a furnace-wall construction, the combination of a plurality of vertically-spaced supporting bars each of which has an upper supporting ledge and a lower latch portion, rows of bricks each resting on said ledge of one such bar and held thereon by the latch portion of the next upper adjacent bar engaging in a groove of the brick, and rows of intermediate filler bricks resting in part only on the latch portions of said bars.

5. In a furnace-wall construction, the combination of an upright metal framework, an upright wall of bricks supported on said framework, comprising alternate horizontal rows of bricks directly supported on the framework, and filler bricks between said rows of bricks and supported in part directly by the framework and in part directly by the next lower row of bricks.

6. In a furnace-wall construction, the combination of a metal framework, an upright brick wall composed of alternate horizontal rows of bricks supported directly by the metal framework, and other alternate horizontal rows of filler bricks supported in part directly by said framework.

7. In a furnace wall construction, the combination of a plurality of vertically-spaced horizontal supporting bars each of which has an upper supporting ledge and a lower latch portion rigid therewith and rows of bricks each resting on said ledge of one such bar and held thereon by the latch portion of the next bar engaging in a groove of the brick.

8. In a furnace-wall construction, the combination of a substantially-upright metal framework, horizontal vertically-spaced rows of bricks mounted on said framework, each such brick having direct interlocking engagement with said framework and indi-

vidually removable from said wall inwardly of the furnace, and rows of free filler bricks between said rows of supported bricks, the inward removal of said free filler bricks directly above and below any such supported brick being required to permit the latter to be shifted sufficiently to release its interlocking engagement with said framework and permitting its removal from the wall.

9. In a furnace-wall construction, the combination of a substantially-upright metal framework, horizontal vertically-spaced rows of bricks mounted on and overhanging from said framework, each such brick having direct interlocking engagement with said framework and individually removable from said wall inwardly of the furnace, and rows of free filler bricks between said rows of supported bricks, the inward edgewise removal of said free filler bricks directly above and below any such supported brick being required to permit the latter to be rocked vertically sufficiently to release its interlocking engagement with said framework and permitting its removal from the wall.

10. In a furnace-wall construction, the combination of a substantially-upright metal framework, horizontal vertically-spaced rows of bricks mounted on said framework, each such brick having direct interlocking engagement with said framework and individually removable from said wall inwardly of the furnace, and rows of free filler bricks between said rows of supported bricks and resting at least in part on the latter, the inward removal of said free filler bricks directly above and below any such supported brick being required to permit the latter to be shifted sufficiently to release its interlocking engagement with said framework and permitting its removal from the wall.

11. In a furnace-wall construction, the combination of a substantially-upright metal framework, horizontal vertically-spaced rows of bricks mounted on said framework, each such brick having direct interlocking engagement with said framework and individually removable from said wall inwardly of the furnace, and rows of free filler bricks between said rows of supported bricks and resting at least in part directly on said metal framework, the inward removal of said free filler bricks directly above and below any such supported brick being required to permit the latter to be shifted sufficiently to release its interlocking engagement with said framework and permitting its removal from the wall.

12. In a furnace-wall construction, the combination of a substantially-upright metal framework, horizontal vertically-spaced rows of bricks mounted on and overhanging from said framework, each such brick having direct interlocking engagement with said frame-work and individually removable from said wall inwardly of the furnace, and rows of free filler bricks between said rows of supported bricks and resting in part on the latter and in part directly on said metal framework, the inward edgewise removal of said free filler bricks directly above and below any such supported brick being required to permit the latter to be rocked vertically sufficiently to release its interlocking engagement with said framework and permitting its removal from the wall.

13. In a furnace-wall construction of the character described, the combination of supporting means, bricks detachably mounted on said supporting means, and spaced cooling water-tubes inwardly in front of the wall composed of said bricks, the spaces between said tubes permitting the inward removal and reverse renewal of any of the bricks through such spaces, those bricks behind the tubes requiring horizontal shifting on said supporting means to permit such removal and renewal.

14. In a furnace-wall construction of the character described, the combination of supporting means, bricks detachably mounted on said supporting means, certain of the bricks providing upright channels in the inner face of such brick wall, and spaced cooling water-tubes occupying such channels, the spaces between said tubes permitting the inward removal and reverse renewal of any of the bricks through such spaces, those bricks behind the tubes requiring horizontal shifting on said supporting means to permit such removal and renewal.

15. In a furnace-wall construction of the character described, the combination of a plurality of vertically-separated bars, means to support said bars, each of said bars having a lower inwardly-extended ledge and a depending hook flange, and having an upper inwardly-projecting ledge, horizontal rows of bricks having grooves in their top surfaces, each such brick bearing on the corresponding upper flange of one such bar and held in place by the hook flange of the next higher bar fitting in its top groove, horizontal rows of filler bricks between said rows of bricks, and spaced cooling water-tubes inwardly in front of the wall composed of said bricks, the spaces between said tubes permitting the inward removal and reverse renewal of any of the bricks through such spaces, those bricks behind the tubes requiring horizontal shifting on said supporting means to permit such removal and renewal.

16. In a furnace-wall construction of the character described, the combination of a plurality of vertically-separated bars, means to support said bars, each of said bars having a lower inwardly-extended ledge and a depending hook flange, and having an upper inwardly-projecting ledge, horizontal rows

of bricks having grooves in their top faces, each such brick bearing on the corresponding upper flange of one such bar and held in place by the hook flange of the next higher bar fitting in its top groove, horizontal rows of filler bricks between said rows of bricks, said brick wall having upright spaced channels in its inner face, and cooling water-tubes occupying said channels, the spaces between said tubes permitting the inward removal and reverse renewal of any of the bricks through said spaces, those bricks behind the tubes requiring horizontal shifting on said supporting means to permit such removal and renewal.

In witness whereof I have hereunto set my hand.

JACK E. BIGELOW.