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A. C. PACIFIC

1,998,733

RETAINING MEANS FOR FIRE WALLS OF FURNACES

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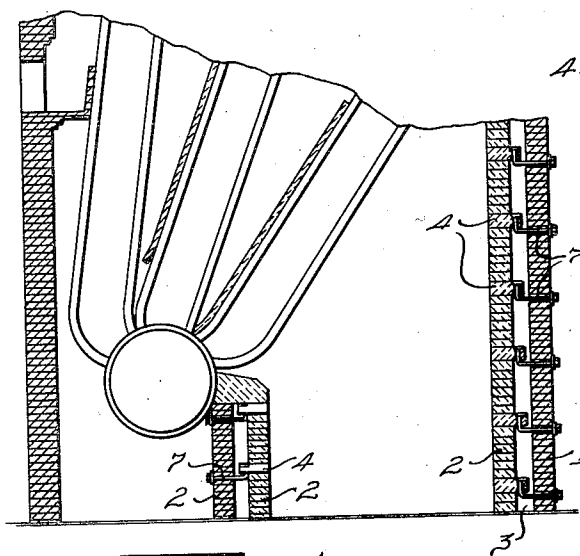


FIG. 1.

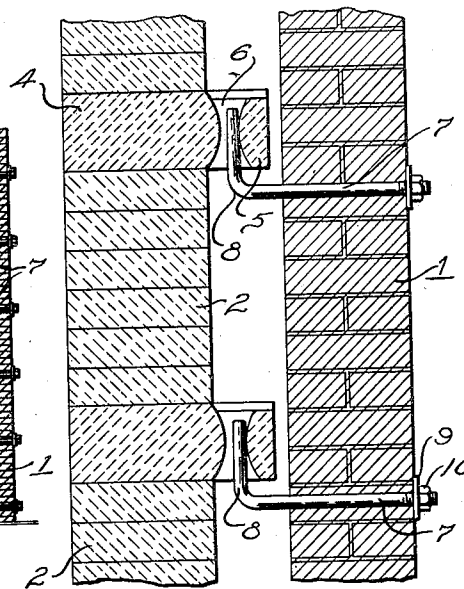


FIG. 2.

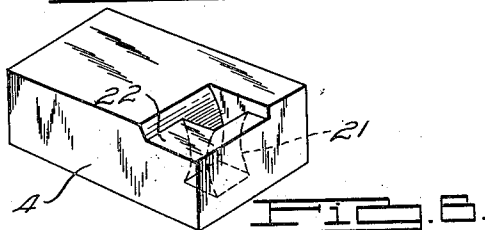


FIG. 3.

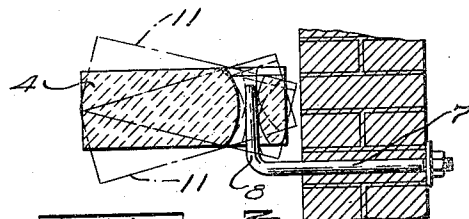


FIG. 4.

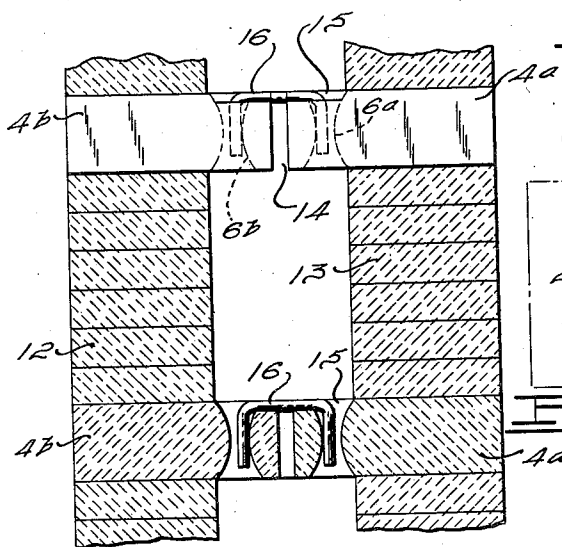


FIG. 5.

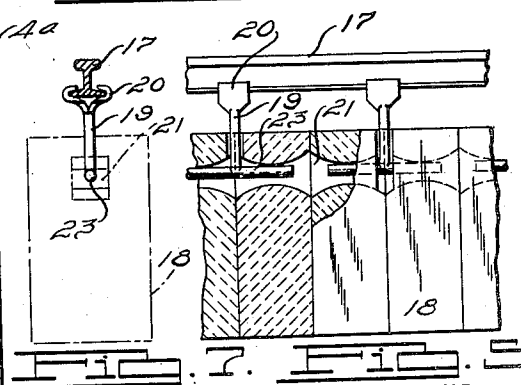


FIG. 6.

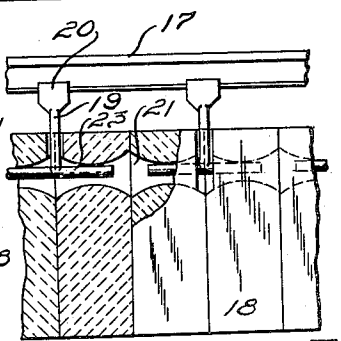


FIG. 7.

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RETAINING MEANS FOR FIRE WALLS
OF FURNACES

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5 Claims. (Cl. 72-101)

This invention relates to retaining means for the fire walls of furnaces, as for instance in boiler settings, forging furnaces and various places where a fire wall is subjected to high temperature and through successive heating and cooling tends to become distorted and displaced.

It has been the practice heretofore to provide a fire wall within an outer supporting wall and to provide a retainer element extending from the outer to the inner fire wall but previous fastening means do not provide for latitude of movement of the fire wall due to expansion and contraction without distortion or displacement of the holding means.

The present invention is directed more specifically to a holding means that permits variation in position of the portion thereof secured in or to the fire wall and relative to a portion thereof secured to the outer supporting wall.

The invention is also directed to holding means for the arch of the firing chamber of a furnace or the arch over the opening to a furnace or wherever an arch is to be positioned and submitted to a high temperature tending through repeated firing and consequent heating and cooling to crack and become displaced and thus cause a shut-down of the furnace for repair.

These and other objects and the several novel features of the invention are hereinafter more fully described and claimed, and the preferred form of construction of a fire wall and non-binding retaining means therefor is hereinafter more fully described and claimed, and the preferred form of construction of such retaining means for fire walls or arches is shown in the accompanying drawing in which—

Fig. 1 is a vertical section of a portion of a boiler setting showing my improved retaining means.

Fig. 2 is a section of a fire wall and an outer supporting wall in spaced relation therewith, it being an enlarged view of similar walls shown in Fig. 1 and showing more fully my retaining means.

Fig. 3 is a detail in section showing the latitude of movement of the parts of the retaining element on an enlarged scale and exaggerated in degree.

Fig. 4 is a view showing adjacent fire walls of a pair of furnaces and an arrangement of my holding means in respect thereto.

Fig. 5 is a sectional view showing a portion of an arch of a furnace and the application of my retaining means to such structure.

Fig. 6 is a perspective view of a holding tile shown in section in Fig. 5.

Fig. 7 is an end view of a tile and supporting element shown in Fig. 5.

In the usual furnaces, especially furnaces which are submitted to comparatively high temperature as for instance the boiler structure shown in Fig. 1, there is usually an outer wall 1 extending around the firing chamber which is formed with the fire brick walls 2. The fire wall is in spaced relation with the outer wall, hereinafter sometimes termed the "cold wall", and in such construction the space between the cold wall 1 and the hot wall 2 is open at the bottom as at 3 to a flow of air from atmosphere to between the walls, the air escaping at the top through an aperture (not shown). In this manner the wall 1 and the portions of the retaining means in said space therebetween are cooled to a considerable degree, at least to such degree as to soften the same.

My improved holding means consists essentially of a tile or fire brick 4 set in the fire wall 2 which, as shown in Fig. 1, is formed of fire brick and which, as indicated in Fig. 2, may be of monolithic fireproof construction, it being immaterial to this invention whether the fire wall be monolithic in character or formed of fire brick or tile. The retaining tile or brick are arranged in vertically spaced relation in the form of the furnace shown in Fig. 1 and are set into the wall and have a projecting portion at 5 formed with an aperture 6 extending vertically therethrough. This aperture is of least diameter midway of the sides of the brick and the openings through the opposite faces of the brick are of greater diameter thus forming an aperture with curved walls. In the outer cold wall 1 is introduced a rod 7 having the inner and upturned end 8 extending upwardly in the aperture 6 to above the narrow point thereof. When originally set, the upturned portion 8 preferably engages the outer face of the opening, that is, the face toward the cold wall. These bolts may be secured in any approved manner in the cold wall and are preferably provided with a washer 9 and nut 10 on the threaded end thereof on the exterior of the wall 1. The wall 1, due to being exposed directly to atmosphere on its outer surface and to a flow of comparatively cold air from atmosphere on the inner surface, does not tend to become distorted through influence of the heat from the firing chamber but the wall 2 of the firing chamber, which is subjected to an excessive heat, tends to raise or lower or twist out of shape. The purpose of this invention is to provide a means to sustain this fire wall from collapse by retaining

it substantially in its original position relative to the cold wall.

As will be understood from Fig. 3 that, if this wall tends to twist as is shown by the dotted lines 11, the brick does not become disengaged with the end 8 of the bolt 7. On the contrary, the bolt continues to function as a secure retaining device irrespective of the variation in position of the retaining tile through the usual distortions of the wall occurring through repeated heating and cooling. This twist of the wall, as indicated by the dotted lines 11 in Fig. 3, is an exaggerated condition and it will be likewise understood that the wall may merely expand in a manner to raise the holding brick 4 somewhat above the position shown in Fig. 2 or it also may lower somewhat from such position. The upturned end 3 is therefore of a length sufficient to permit such variation in position of the brick without release from the end 8.

The projecting end 5 of the brick is spaced from the outer wall 1 a distance slightly greater than the space between the end 8 of the rod 7 and the smaller diameter portion of the opening 6 and therefore the brick or tile 4 may move laterally to an extent permitted by the difference in the size of the diameter of the central portion of the opening 6 and diameter of the end 8 without the end of the brick contacting the external wall 1. Thus there is a secure attachment of the fire wall 2 to the external or cold wall 1 in all of the positions usually assumed by the brick 4 due to expansion or contraction of the wall under the influence of the heating and cooling of the furnace.

Furnaces are often built in multiple in which case a fire wall of one, as for instance 12 of Fig. 4, is adjacent a fire wall 13 of the next furnace of a series and in such multiple structure there is no cold wall between the adjacent fire wall of two furnaces and as one furnace might be in operation and another not in operation and further, due to the fact that even though both are in operation for a period and then out of operation for a period, the fire walls of such furnaces, as for instance the walls 13 and 14 are subject to expansion and contraction and to retain these walls from material relative displacement through such expansion or contraction, I provide a fire brick 4^a similar in all respects to the fire brick 4 of Fig. 2, in the wall 13 and a similar aligned brick 4^b in the wall 12 which project into the space between the walls 12 and 13 and the ends thereof are spaced apart as at 14. The brick has the same character of opening indicated at 6^a as is shown in the section 6 of Fig. 2 and the end of the brick on the upper side is formed with a groove 15. These two bricks 4^a and 4^b are connected by a U rod 16 having its ends extending downwardly from the upper side of the brick into the apertures 6^a and 6^b of the said bricks. The body 16 of the rod lies in the groove 15 but the groove may be dispensed with if desired inasmuch as the ends thereof extending through the apertures will hold the connecting element 16 in place. In this arrangement the bricks 4^a and 4^b may move relatively vertically in position due to influence of the heating and cooling or the heating of one while the other is cold and under any such usual condition of variation in position the connecting element 16 securely holds the walls in position.

My improved holding means for a fire wall may be applied to a furnace arch which may be a flat arch or curved as occasion may require and for

this purpose, I provide the usual eye beam or railroad rail 17 shown in Fig. 5 which extends across the top of the furnace for each course of the brick, one course being shown in Fig. 5 as being formed of a series of brick 18. The metal holding element 19 has a U end portion 20 shown in Fig. 7 that may slide on the lower flanges of the rail 17 as shown in Fig. 7. The tile 18 have the aperture 21 corresponding to the aperture 6 of the brick 4 in Fig. 2 being of the same shape in cross section. The side face of the brick is cut away providing a recess 22 as shown in Fig. 6 and to this recess in the face of the brick the aperture 21 opens. This recess 22 in two adjacent bricks 18, provides space for the body portion of the metal retainer 19 as will be seen in Fig. 5 and the member 19 has a transversely extending portion 23 which extends each way from the body thereof into the aperture 21 of the two adjacent bricks which are thus sustained in position under the distortions occurring in the repeated heating and cooling of the arch. The two brick associated with a single metal retainer may be folded together after the manner of the leaves of a book when assembling the same on this member 19 and when the arch is completed the brick are held together and prevented from opening sufficiently to release the brick from the retaining member 19.

As the retaining elements 19 are slidably mounted on the member 17 there can be some displacement thereof relative to the rails 17 under the pressures imposed thereon in distortion of the arch under heat and thus, in conjunction with the size of the opening 21 of the brick in respect to the diameter of the portions 23 of the member 19 extending thereinto, there is considerable latitude of movement of the brick up or down or laterally without release of the holding means and thus the arch is held in place under the normal conditions of use.

It will be noted that, by providing the apertures in the brick, the entire end of the brick will carry the strain. It has sometimes been the practice to make a T slot in the end of the brick thus providing two lips which in practice have been found to readily break off but with my construction and due to the position of the aperture in the body of the brick there is sufficient stock in integral association with the body of the brick to prevent such breaking out of the end thereof and one of the features of this invention is to provide a brick of this character of construction and association with a retaining member extending into the aperture of a character to permit limited movement of the brick relative to the retainer element. Thus the necessary latitude movement of the wall or the brick 4 is provided for and yet an efficient retaining means is also a result of the construction described.

It would be impossible to hold the fire wall by a solid element extending from the cold wall into the fire wall. Such arrangement would more quickly cause distortion of the furnace wall than if no retainer element were provided of such latter construction. However, by providing for a latitude of movement of the wall through expansion and contraction without rigidly connecting the binding tile to the cold wall, I secure a construction that is highly efficient in use, that is inexpensive in character providing for a comparatively long life of the furnace and secure a construction attaining the various objects of the invention.

Having thus briefly described my invention,

what I claim and desire to secure by Letters Patent of the United States is—

1. A retaining means for connecting a fire wall of a furnace with a spaced exterior wall comprising a series of fire brick secured in the fire wall and in spaced relation vertically and horizontally, said fire brick extending beyond the outer face of the fire wall toward and in spaced relation with the exterior wall, said extending portion of the fire brick having an aperture, and an element secured to the said exterior wall and having a portion thereof extending into the aperture and of less cross sectional area than the aperture, the said brick and said element being unattached thereby permitting a variation in the position of the fire brick through expansion or contraction of the fire wall and restraining the fire wall from deformation.

2. A means for connecting the fire wall of a furnace with a spaced exterior wall comprising a fire brick built into the fire wall and having a portion extending beyond the exterior face of the fire wall toward and in spaced relation with the exterior wall, said extending portion of the brick having an aperture extending therethrough from side to side, the aperture being of smallest diameter approximately midway between the two ends and of greatest diameter at the respective opposite faces of the brick, and a metal element for securing in the outer wall and having a right angle portion extending into the aperture from one side to beyond the portion of smallest diameter and providing a construction permitting the brick to move from a plane at a right angle to the said end of the metal member to a plane at less angle thereto one side or the other of the said right angle position, said arrangement providing a construction permitting variation in position of the brick in respect to the said end portion of the securing element.

3. A retaining means for the fire wall of a furnace comprising a fire brick having the body portion thereof mounted in the fire wall and an ex-

tending portion having an aperture extending vertically therethrough, and a retainer element for association therewith, comprising a metal rod like element for securing in a fixed position, a portion of which extends into the aperture of the brick, the cross sectional area of the aperture at any point being greater than the cross sectional area of the portion of the element extending thereinto and providing for a limited universal movement of the brick both in a horizontal and vertical plane.

4. A retaining means for the fire wall of a furnace subjected to high temperature comprising a fire brick forming a part of the fire wall, the brick each having an opening extending there-through from one side to the other, and an element for limiting movement of the brick through expansion or contraction of the fire wall, comprising a securing means attached to a fixed support exteriorly of the fire wall at one end and extending between adjacent brick at the opposite end, said securing means extending between adjacent brick into the apertures of the adjacent brick, said apertures being of least diameter intermediate the side walls of the brick and of greatest diameter at the said opposite walls providing a construction in which the brick may turn on an axis to a limited degree and may move in its plane or in a direction at an angle to its plane.

5. A retaining means for the spaced fire walls of adjacent furnaces comprising a fire brick secured in each of the said walls in opposed relation, said brick extending into the space between the said fire walls and terminating in spaced relation, the extending portions of each of the said brick having apertures extending therethrough, the apertures of the two bricks being in parallel relation, and a U shaped retaining element of metal having the legs thereof extending into the apertures and the body thereof being positioned on the upper faces of the contiguous ends of the brick.

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