Nov. 19, 1929. S. C. GILBERT 1,736,704

FLEXIBLE TIE FOR PLASTIC FURNACE LININGS

Filed May 2, 1928 2 Sheets-Sheet 1

FIG. 1.

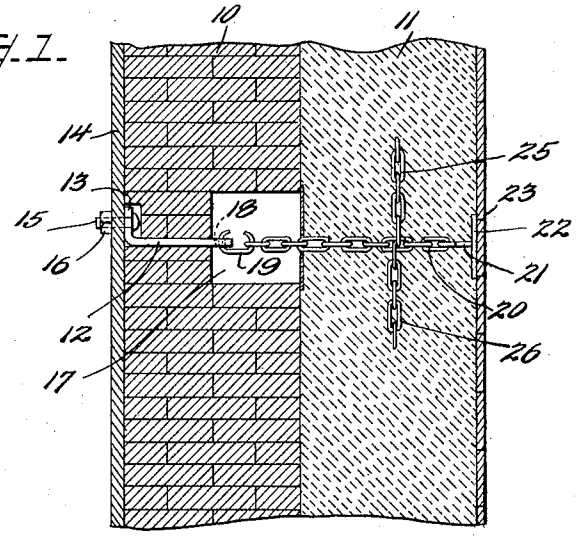


FIG. 2.

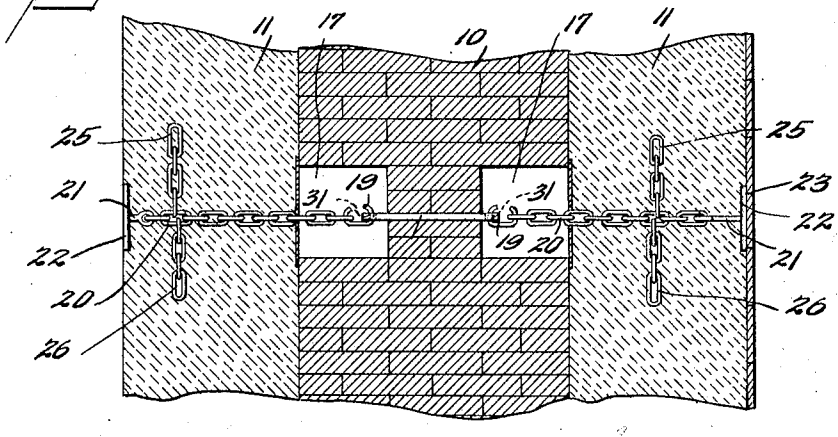
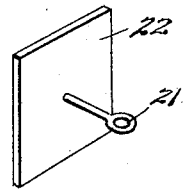


FIG. 3.



Inventor

Samuel C. Gilbert

By Watson, Cole, Morse & Grindle

Attorneys

Nov. 19, 1929. S. C. GILBERT 1,736,704

FLEXIBLE TIE FOR PLASTIC FURNACE LININGS

Filed May 2, 1928 2 Sheets-Sheet 2

FIG. 4.

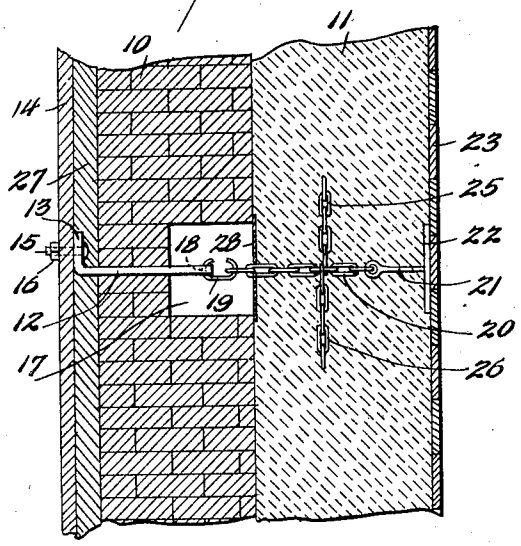


FIG. 6.

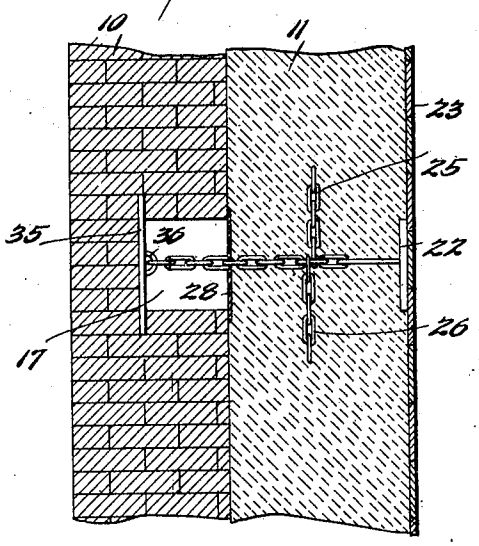


FIG. 5.

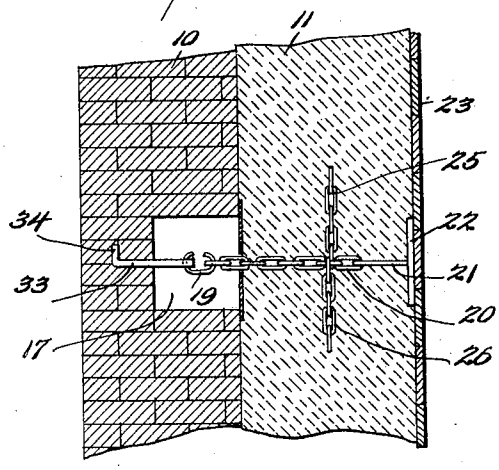
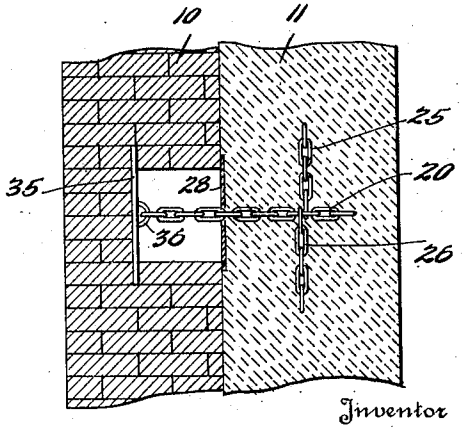


FIG. 7.



Inventor

Samuel C. Gilbert

By Watson, Cole, Morse & Grindle

Attorneys

Patented Nov. 19, 1929 1,736,704

UNITED STATES PATENT OFFICE

SAMUEL C. GILBERT, OF HARTSVILLE, SOUTH CAROLINA

FLEXIBLE TIE FOR PLASTIC FURNACE LININGS

Application filed May 2, 1928. Serial No. 274,654.

This invention relates to means for anchoring plastic linings to furnace walls, and more particularly to devices of this character adapted to allow for expansion and contraction of the lining, and prevent bulging of said lining when installed.

Furnace walls are ordinarily constructed of brick, stone or other masonry, sometimes encased within steel shells, which materials, of themselves are heat resisting to a certain extent, but not sufficient to withstand the intense heat of the furnace, and to protect them from such heat a lining of refractory material is generally provided. While the lining is sometimes precast and installed in blocks, it is of considerable advantage to install the refractory lining in a plastic state so as to provide a monolithic lining. In either case the refractory material is preferably anchored to the furnace wall by bolts or ties which support it and hold it in position.

While refractory materials often have low coefficients of expansion, the temperatures reached in furnaces are very high, and in operation the temperature range is so great that the resulting linear expansion and contraction results in powerful forces. These forces have in many installations caused rapid deterioration of the refractory lining, as they tend to either crack the lining or to break the bond between the lining and any tying devices of types heretofore designed or suggested for the purpose of attaching the linings to the permanent walls of the furnace.

It is therefore the principal object of this invention to provide means for anchoring refractory linings to furnace walls in such manner as will permit expansion and contraction of the lining without cracking or bulging the lining or destroying the grip of the anchoring devices.

Another object of the invention is to simplify and improve devices of this character.

Another object of the invention is to provide a tie with not more than one and one-half inches (1½″) of metallic substance that is not flexible.

Other objects and features of novelty will be apparent as the following description proceeds when taken in connection with the accompanying drawings, in which:

Fig. 1 is a vertical cross section of a furnace setting wall, composed of a steel shell, brick and refractory lining in the order named, showing one embodiment of the invention as installed therein;

Fig. 2 is a cross section showing the invention as modified in order to anchor refractory linings on both sides of the furnace setting wall;

Fig. 3 is a detail of the end plate used to assist in securing the new lining;

Fig. 4 is a view similar to Fig. 1 showing the invention modified as to anchor plate in order to anchor refractory lining to furnace setting wall of brick, originally lined with fire brick or a similar refractory;

Fig. 5 is a cross section of a furnace setting wall of brick showing embodiment of the invention as installed in wall newly constructed or under construction;

Fig. 6 is a cross section of a furnace setting wall showing another modification; and

Fig. 7 is a cross section of a furnace setting wall and its lining, similar to Fig. 6, but showing the arrangement after the end plate has been burned off after extensive use.

Referring more particularly to the drawings, the furnace settting wall is indicated at 10 and may be of sheet metal, stone, concrete, masonry, a combination of the materials mentioned, or other similar construction, but for the purposes of illustration the wall is shown as being built of brick, with and without the steel shell and insulating material. The refractory lining is shown at 11 as of monolithic structure, being applied while plastic, although it is with the purview of my invention to build up the refractory lining of precast blocks.

The wall 10 is provided with an anchor plate 12 which may be built into the wall 10 as it is constructed, or fitted into walls which have already been built. The outer end of the plate 12 is provided with a flange 13 which forms an abutment against the wall 10, to give the plate greater bearing in addition to its bond with the masonry. In the form shown in Fig. 4, the furnace is pro-

vided with an outer steel shell 14, with insulating material 27 between the brick 10 and the steel shell 14, and the flange 13 is bolted to the shell by means of bolts 15 secured by nuts 16, which arrangement gives the plate 12 a very firm foundation in the structure.

The wall 10 is also provided with a recess 17 preferably located centrally with respect to the plate 12, which projects slightly into the recess and is provided with an aperture 18. An open link 19 in the aperture 18 secures a chain 20 to the anchor plate 12. In the form shown, an eye-bolt 21 is secured to the outer end link of the chain 20 and to a face plate 22 which is flush with the edge of lining and rests against the inner surface of a wooden form 23 used in connection with installation of the lining. The intermediate links of the chain 20 may have secured thereto links forming short lateral chains 25 and 26.

To apply the refractory lining 11 to the furnace wall, the plate 12 is mounted as described. When the lining 11 has been brought up to the level of the bottom of the recess 17, the chain 20 is placed in the position shown and attached to plate 12 by means of the open link 19 through the aperture 18. The lining 11 is applied therearound, so that the chain 20, as well as the laterals 25 and 26, are firmly embedded in the material. In applying the material 11, it is necessary to prevent the material from filling the recess 17, and for this purpose a piece of any sheet material 28 is fitted over the recess, with the flexible member projecting therethrough, before the lining 11 is applied. After the lining has set, form 23 may be burned, or removed if so desired to permit construction of other units, which is sometimes necessary in several types of furnaces. It should be noted that the plate 22 is not essential to the anchoring device, and if it should be burned off, the chain 20 and the laterals 25 and 26 are not weakened in any way, but give the lining 11 adequate support of themselves. This is illustrated by Fig. 7.

The link 19 as well as the other links within the recess 17, permit very free pivotal movement, so that the lining 11 may move bodily in any lateral direction as it expands or contracts, without any tendency to crack or bulge the lining, or to break the grip of the anchoring device. At the same time, the anchor will hold the lining 11 snugly against the wall 10. The clearance provided by the recess 17 also contributes to the freedom of movement provided by the free pivoting of the links.

A slightly modified form of the invention which is shown in Fig. 2, is adapted to anchor refractory linings 11 on each side of a central furnace wall 10. In this form the links 19, the recesses 17, the form 23, the laterals 25 and 26, as well as the sheet material 27 over the recesses, are identical with those described for Fig. 1, as they are duplicated for each side of the furnace wall. In the place of the bent plate 12 however, a flat anchor plate 30 is used, and apertures 31 are provided in each end thereof where the plate projects into the recess 17 on each side of the wall. It is obvious that various forms of the plates 30 and 12 may be substituted without departing from the spirit of the invention, as shown in Figs. 5 and 6 or 7, showing plate similar to 22 and 12 embedded in a brick wall having no outer shell.

In Fig. 5, the plate 33 is quite similar to the plate 12 of Figs. 1 and 4, but is shorter, and does not extend to the outer surface of the wall, but instead it is embedded in the brickwork, and the flange 34 gives it additional bearing.

In the form shown in Figs. 6 and 7, a flat plate 35 is embedded vertically in the brickwork, and is provided with an eye 36 to receive the end link of the chain.

While various embodiments of my invention have been shown and described in comparative detail for the purposes of disclosure, the invention is not limited to any of the details shown or described, but includes such embodiments of the broad idea as come within the scope of the appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. Means for anchoring plastic linings to furnace walls, comprising in combination, a member adapted to be secured to a furnace wall, a chain one end of which is adapted to be embedded in a plastic lining for said wall and means for connecting said member to the other end of said chain whereby the plastic lining is maintained in close proximity to the furnace wall but is permitted to move in expanding and contracting through short distances in directions parallel to the wall without cracking or bulging.

2. Means for anchoring plastic linings to furnace walls, comprising in combination, a member adapted to be secured to a furnace wall, a chain part of which is adapted to be embedded in a plastic lining for said wall and means for connecting said member to the free end of said chain whereby the plastic lining is maintained in close proximity to the furnace wall but is permitted to move in expanding and contracting through short distances in directions parallel to the wall without cracking or bulging, said chain having branch links secured thereto and also embedded in the lining.

3. Means for anchoring plastic linings to furnace walls having steel shells and insulating material between the shell and masonry, comprising in combination, a member adapted to be secured to a furnace wall, a second member adapted to be embedded in a

plastic lining for said wall and means for connecting said members together whereby the plastic lining is maintained in close proximity to the furnace wall but is permitted to move in expanding and contracting through short distances in directions parallel to the wall without cracking or bulging, said anchored member having a flange adapted to be bolted to the steel shell of the furnace wall.

4. Means for anchoring plastic linings to furnace walls having steel shells, comprising in combination, a member adapted to be secured to a furnace wall, a second member adapted to be embedded in a plastic lining for said wall and means for connecting said members together whereby the plastic lining is maintained in close proximity to the furnace walls but is permitted to move in expanding and contracting through short distances in directions parallel to the wall without cracking or bulging, said anchored member having a flange adapted to be bolted to the steel shell of the furnace wall.

5. Means for anchoring plastic linings to furnace walls constructed wholly of masonry, and originally lined with fire brick or a similar refractory, comprising in combination, a member adapted to be secured to a furnace wall, a second member adapted to be embedded in a plastic lining for said wall and means for connecting said members together whereby the plastic lining is maintained in close proximity to the furnace walls but is permitted to move in expanding and contracting through short distances in directions parallel to the wall without cracking or bulging, said anchored member being a plate adapted for easy embedding in the masonry.

6. Means for anchoring linings to furnace walls constructed wholly of masonry, comprising in combination, a member adapted to be secured to a furnace wall, a second member adapted to be embedded in a plastic lining for said wall and means for connecting said members together whereby the plastic lining is maintained in close proximity to the furnace walls but is permitted to move in expanding and contracting through short distances in directions parallel to the wall without cracking or bulging, said anchored member being a plate adapted for easy embedding in the masonry during or after construction of wall.

7. In a furnace, a furnace wall and a lining therefor defining between them a pocket and sheet material covering the pocket and provided with an aperture, a flexible member extending through the pocket and the aperture of the sheet material and having its ends respectively attached to the wall and lining.

8. In a furnace, the combination of a furnace wall and a plastic lining, and means for securing the lining to the wall and permitting lateral movement to allow for expansion and contraction of the lining without cracking or bulging said lining, said means comprising a member anchored in the furnace wall, a second member at the furnace surface of the lining designed to hold said lining in place should it be desired to remove forms, and a third member embedded in the plastic lining and extending therefrom to connect with the first and second member, said wall being provided with a recess, and said members being pivotally connected within said recess to allow free pivotal movement of the parts.

9. In a furnace, a furnace wall having a pair of aligned recesses in its sides and an anchor member mounted in the wall between said recesses, a refractory lining for each side of the wall, and means embedded in each lining and secured to said anchor member within said recesses for holding said linings in place without cracking or bulging.

10. In a furnace, a furnace wall having a pair of aligned recesses in its sides and an anchor member mounted in the wall between said recesses, a refractory lining for each side of the wall, and means embedded in each lining and secured to said anchor member within said recesses for holding said linings in place without cracking or bulging, said means being pivoted to said member within the recesses to permit movement of the linings with respect to the wall to permit expansion and contraction of the linings.

11. In a furnace, a furnace wall having an anchor member embedded therein and provided with a recess located centrally with respect to said anchor member which projects into the recess, a monolithic lining of refractory material for said wall, and a chain embedded in said lining and secured to said member within said recess, with nothing of metallic substance over one and one-half inches ($1\frac{1}{2}''$) that is not flexible projecting into the recess.

In testimony whereof I hereunto affix my signature.

SAMUEL C. GILBERT.