July 7, 1931. H. W. WILDISH 1,813,790

FURNACE LINING

Filed April 26, 1928

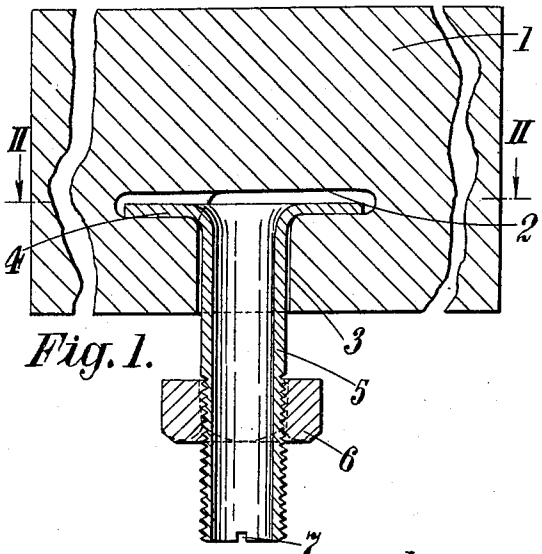


Fig. 1.

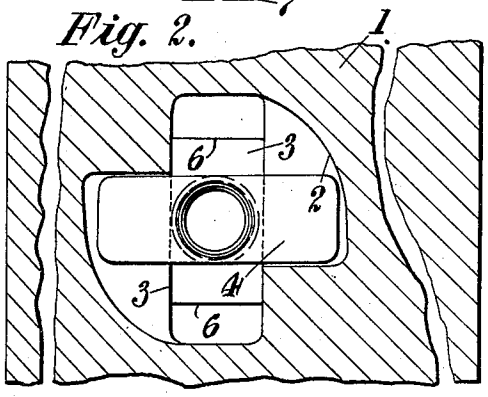


Fig. 2.

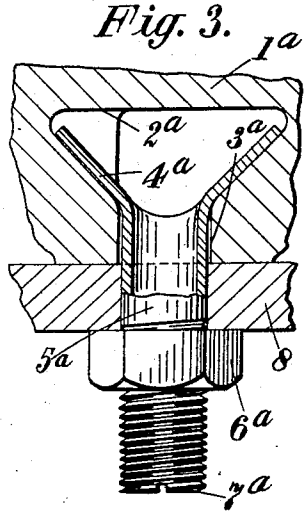


Fig. 3.

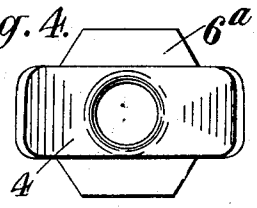


Fig. 4.

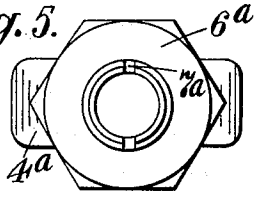


Fig. 5.

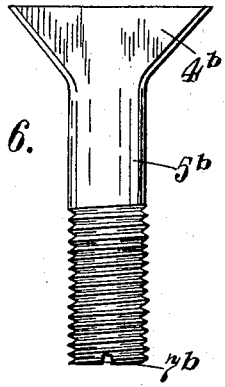


Fig. 6.



Fig. 7.

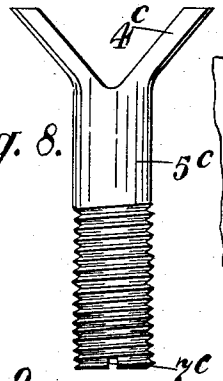


Fig. 8.



Fig. 9.

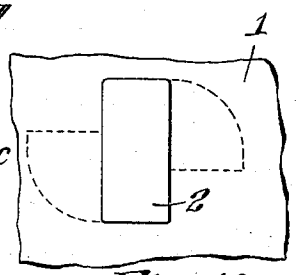


Fig. 10.

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UNITED STATES PATENT OFFICE

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FURNACE LINING

Application filed April 26, 1928, Serial No. 273,028, and in Great Britain July 2, 1927.

This invention relates to furnace linings, and it is particularly concerned with the method of securing the refractory fire bricks employed in such linings to the outer casing. The usual method of securing the bricks to the casing consists in forming a conical hole in the middle of each brick, and in passing a conical bolt through this hole and through the casing, and tightening it up by means of a nut on the outside of the casing. In order to protect the bolt head from the heat of the furnace, which would rapidly melt the bolt, the hole in the face of the brick is then filled up with bolt stopping. It is found in practice, however, that this stopping always shrinks when it is heated, that the heat passes through and around the stopping, and that the stopping becomes hotter than the surrounding brick. Again, another method consists in providing bolts at the junction of two bricks so that their heads project partly into each of the two bricks. However, in such a case, in order to renew one brick it is necessary to take down several others, and also it is found that the heat passes down the crack between the two bricks so that the risk of the bolts melting still remains considerable.

It is a principal object of the present invention to provide an improved method of securing the bricks to the casing in which there shall be no danger of the bolts being damaged, and the necessity for the employment of bolt stopping shall be eliminated. Another object of the present invention is to provide an improved method of securing the brick in position so that any brick can be removed and replaced without disturbing adjacent bricks. A further object of the invention is to form the bolts and bricks with interlocking heads and cavities so that by passing the bolt into the cavity, upon rotation it will be firmly secured within the brick. Yet another object of the invention is so to shape the internal cavity in the brick that the bolts can only be turned in one direction, and through a limited angle, thus ensuring ease of assembly.

According to the invention, a brick is secured to the casing of a furnace lining by means of a bolt anchored in a cavity formed in the back of the brick but not extending to the surface of said brick directly exposed to the furnace heat. The bolts may conveniently be formed with laterally elongated heads, and the cavities in the bricks so shaped that the bolt head can be pushed down a passage in the cavity and then rotated through an angle when the laterally projecting parts of the head will engage with the walls of the cavity so that the bolt and brick will be firmly locked and the bolt cannot be withdrawn from the brick without being again rotated. Very conveniently the bolt heads may be Y shaped and the cavity formed, of course, to correspond, since in this the stresses set up when the nut is tightened on the bolt will be taken substantially equally over the bolt head.

In order to allow of cooling of the bolts they may be made hollow so that the air can enter right into the cavity, but in many cases this will result in such rapid cooling that the brick will be unequally contracted and may crack. It is preferred, therefore, to make the bolts solid and then cooling takes place more gradually.

In order that the invention may be clearly understood and readily carried into effect, some forms of bricks with corresponding bolts will now be described by way of example with reference to the accompanying drawings, in which

Figure 1 is a cross-section through the brick with the bolt in position;

Figure 2 is a section on the line II—II of Figure 1;

Figure 3 is an elevation, partly in section, of a modified form of bolt and brick;

Figure 4 is a plan of the bolt shown in Figure 3, and

Figure 5 is an inverse plan of the bolt shown in Figure 3.

Figure 6 is an elevation and Figure 7 a plan of another modified form of bolt, while

Figure 8 is an elevation and Figure 9 a plan of yet a further modified form of bolt.

Figure 10 shows the elongated slot in the face of the brick.

Referring first to Figures 1 and 2, a fire

brick 1 is formed with a cavity 2 having the shape shown in Figure 2, and communicating with the back of the brick by means of a passage 3. This passage is made, as shown, of elongated shape on the outer face of the brick (Fig. 10) so as to receive a T-shaped head 4 of a bolt 5. This bolt 5 passes through the casing to which the brick 1 has to be secured, and the head is then pushed through the passage 3 and the bolt is rotated through 90° so that it takes up the position shown in the drawings. The peculiar shape of the slot 2 prevents the bolt being rotated in a counter-clockwise direction at all, and only allows it to be turned through 90° in a clockwise direction. A nut 6 is then screwed over the threaded end of the bolt 5 so as to cause the brick 1 to be firmly secured to the casing, and it will be realized that the brick and bolt cannot come out of engagement with one another unless the bolt 5 is rotated back through 90°.

The bolt 5 is made hollow so as to allow air to pass through it to cool the head 4, and it may conveniently be slotted as shown at 7. This slot 7 then serves both as an indicator of the degree of rotation of the bolt and also as a means by which the bolt can be rotated if it is desired to be withdrawn.

The form of bolt 5^a and cavity 2^a shown in Figure 3 differs from that shown in Figure 2 only in that the bolt 5^a has a Y-shaped head 4^a and the cavity is correspondingly shaped. The arms of the Y are set at an angle of 90° to one another so as to equalize as far as possible the stresses in the head 4^a and the brick 1^a when the nut 6^a is tightened up. This figure shows the bolt 5^a actually clamping the brick 1^a to a casing 8.

Figures 6 and 7 show a solid bolt 5^b, the head 4^b being wedge-shaped and flat on the top as shown in Figure 7. The end of this bolt is provided with a slot 7^b which is cut right across the end.

The bolt shown in Figures 8 and 9 is also solid, but in this case the head 4^c is Y-shaped.

It will be realized that in the construction according to the present invention, the bolt is completely insulated from the heat of the furnace by means of the brick. Furthermore the improved construction allows a greater degree of elasticity of the bolt head than has been the case with previous constructions, so that there is less tendency for the bolt to cause cracking of the brick, either on account of expansion or of careless tightening up of the nut.

Having thus described my invention what I claim as new, and desire to secure by Letters Patent, is:—

1. In a furnace, a furnace casing, a substantially rectangular lining brick formed with an undercut cavity, communicating with the face of the brick, adjacent said casing by a passage of reduced cross-section, but internally closed to the remaining faces of said brick, and a bolt passing through said casing and said passage and anchored within said cavity to clamp said brick to said casing whereby said bolt is insulated from the heat of the furnace.

2. In a furnace, a furnace casing, a substantially rectangular lining brick formed with an undercut cavity, communicating with the face of the brick adjacent said casing by a passage of reduced cross-section but closed to the remaining faces of said brick, and a bolt having a Y-shaped head, passing through said casing and said passage and locking by means of said head when turned within said cavity to fix said brick to said casing.

3. In a furnace, a furnace casing, a lining brick formed with an undercut cavity, communicating with the face of the brick adjacent said casing by a passage of reduced cross-section but closed to the remaining faces of said brick, a bolt having a head formed with elongated lateral projections passing through said casing and said passage and locking within said cavity when turned to fix said brick to said casing and means in said cavity permitting a turning of the bolt in one direction only.

4. In a furnace, a furnace casing, a lining brick formed with an undercut cavity communicating with the face of the brick adjacent said casing by a passage of reduced cross-section but closed to the remaining faces of said brick, and a bolt having a head formed with elongated lateral projections passing through said casing and said passage and locking within said cavity when turned to fix said brick to said casing and means in said cavity preventing rotation in a counter-clockwise direction and only permitting rotation through 90° in a clockwise direction.

5. A substantially rectangular lining brick for furnace wall constructions having an undercut cavity communicating with one face only of the brick by a passage of reduced cross section, thereby to receive a bolt having an enlarged head which may be turned when entering said cavity to clamp said brick to the furnace casing, and means in said cavity permitting turning of the bolt in one direction only.

6. A substantially rectangular lining brick for furnace wall constructions having an undercut cavity communicating with one face only of the brick by a passage of reduced cross section, thereby to receive a bolt having an enlarged head which may be turned when entering said cavity to clamp said brick to the furnace casing, and means within said cavity to prevent rotation of the bolt in a counter-clockwise direction and to permit rotation of the bolt thru substantially only ninety degrees in a clockwise direction.

7. A substantially rectangular lining brick

for furnace wall constructions having an undercut cavity communicating with one face only of the brick by a passage of reduced cross section, thereby to receive a bolt having an enlarged head which may be turned when entering said cavity to clamp said brick to the furnace casing, and means in said cavity permitting turning of the bolt in one direction only, whereby said brick may be secured to or removed from the wall casing without disturbing the remaining bricks.

In witness whereof I hereunto subscribe my name this 14th day of April, A. D., 1928.

HENRY WILLIAM WILDISH.