April 16, 1929. T. E. MURRAY 1,709,088

BOILER WALL

Filed March 23, 1927

Fig. 1.

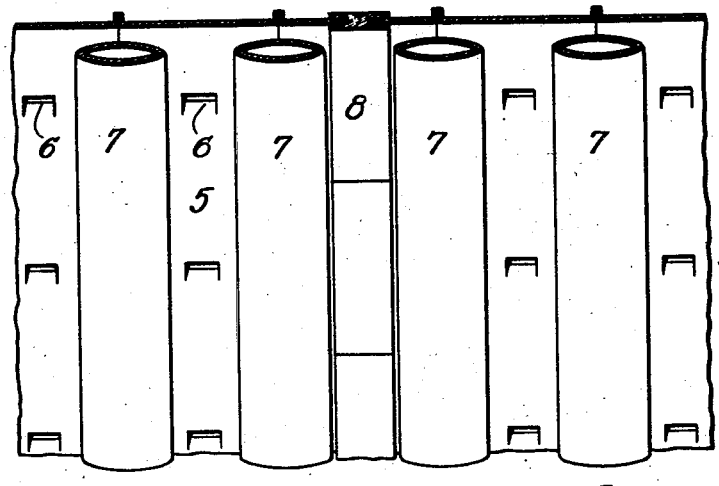


Fig. 4.

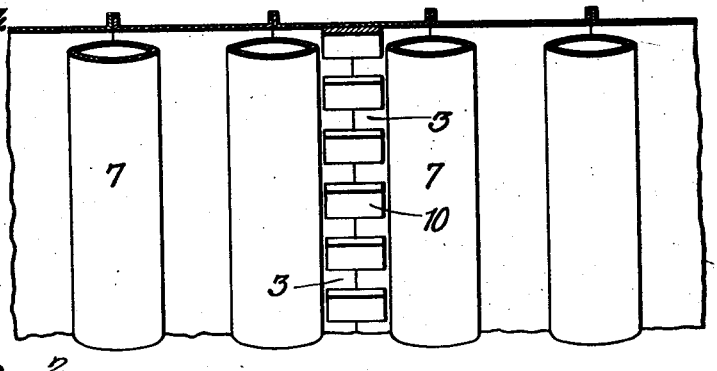


Fig. 2.

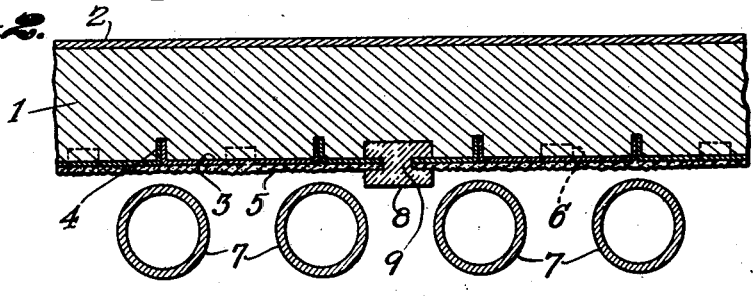
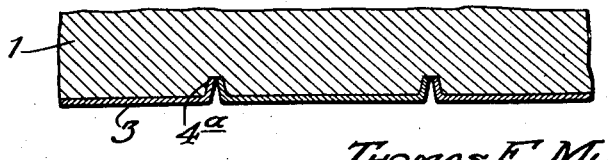


Fig. 3.



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UNITED STATES PATENT OFFICE.

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BOILER WALL.

Application filed March 23, 1927. Serial No. 177,533.

My invention aims to provide an improved wall structure for boiler furnaces operating at very high temperatures, and particularly for furnaces fired with powdered coal or the like.

Fig. 1 is an inside face elevation of a wall;

Fig. 2 is a cross-section of the same;

Fig. 3 is a cross-section in detail showing the wall as originally built;

Fig. 4 is a view similar to Fig. 1 illustrating a modification.

Referring to the construction illustrated, the principal part of the structure is a wall 1 of brick-work or similar refractory material commonly used for this class of work, having any usual or suitable hard finish layer 2 on the outer face. On the inner face of the brick-work it is faced with metal plates 3 which are preferably highly resistant to oxidation at high temperatures. The plates are fastened to each other and to the brick-work by flanges 4 on their vertical edges embedded in the brick-work. On the inner face of the plates 3 is a coating 5 of powdery or granular material of mineral or similar composition which saves the plates from excessive heat. The plates 3 may be further tied to the brick-work by tongues 6 bent back from the plates and embedded in the brick-work.

In front of the structure thus described, and which may be referred to as a whole as a refractory wall, is a row of vertical tubes 7 carrying water which is circulated upward at a high rate of speed; these tubes being connected into a boiler circulation of any suitable type.

The burning fuel produces an intense heat which is radiated directly against the tubes 7 and, between these tubes, against the refractory wall. The tubes, with the water in them, create a comparatively cool zone adjacent to the plates 3. This, and the mineral coating 5 protect the plates so that they will be durable even under extreme conditions.

Further protection for the plates may be provided by means of tiles 8, each plate 3 being divided along a central line to engage a portion 9 of reduced cross-section, to hold the tiles in place. These tiles are located in register with the spaces between the tubes, where the direct effect of the radiant heat is greatest.

The same arrangement of tiles 8 may be made in line with the spaces between each pair of tubes 7. The furnace is designed particularly for operating at high temperatures, such as are obtainable by use of powdered coal or other fuel introduced through jet nozzles. The high temperature will produce a certain expansion of the plates 3 and of the brick-work 1 behind them. The expansion will be approximately the same in the vertical direction, or so nearly so as not to present any difficulty.

To allow for lateral expansion, the flanges of the plates 3, when they are built up cold, should be of the converging shape shown at 4^a Fig. 3, leaving a slight space so that when the furnace is heated, the plates may come together in the manner indicated in Fig. 2. Such expansion joints are not claimed in the present application, being covered, with certain arrangements of the tubes, and more fully illustrated it my co-pending application No. 261,493 filed March 14, 1928.

Instead of the tiles 8 covering joints in the metal plates 3, in line with spaces between the tubes, covering plates 10 may be used of the style indicated in Fig. 4 overlapping the joint in the plates 3. The overlapping plates 10 are all of material resistant to high temperature, such as Stellite or similar grades of steel. They may be spaced apart as in Fig. 4 so as to secure only partial protection, or they may extend continuously from top to bottom of the joint so as to entirely cover the latter. They can be fastened to the plates 3 by welding or otherwise.

In the operation of furnaces of this class, particularly with coal dust firing, the cold metal plates 3 are found to accumulate a deposit of powdery or granular mineral matter, which adheres very lightly so that it can be knocked off or brushed off with ease. This incidental deposit serves two very useful functions. It protects the steel plates from burning. It is also heated to incandescence or similar high temperature so as to present a highly heated surface to the gases. This is important, particularly with low grades of coal, to protect the gases from the excessive cooling effect such as might be provided by the metal plates and thus to better the combustion and diminish the smoke.

Such a coating will build up only to a slight thickness, sufficient to maintain a certain balance of heat abstracted from the flame.

The building of the wall in the manner described will ensure the existence of such a coating in a brief period after the furnace is put in service. I may, however, provide what I call a permanent coating to distinguish it

from the incidental or automatic coating described. This can be done by painting or spraying the steel plates with a sticky carbonaceous material which will be further coated with the mineral deposit in actual use; or by applying at once a coating of the full thickness desired which will not build up to any substantial extent.

The greatest heat reaches the portions of the wall which are in line with the spaces between the tubes, and the metal lining may be made to cover only these portions of the brick-work or similar refractory material, leaving the latter bare immediately behind the several tubes.

The wall described, of brick work or the like is the usual type of boiler wall, which is generally self supporting and often carries part of the weight of the overhead structure. It is to be distinguished from a mere layer or sheathing of insulating material such as is shown for example in my British Patent No. 227,156 of 1924 which is held in place by embedded woven wire secured to and supported from the plates and tubes, the latter constituting the primary support.

Various modifications may be made by those skilled in the art without departing from the invention as defined in the following claims.

What I claim is:

1. A boiler furnace wall comprising a backing of refractory material with metal plates on its inner face in combination with a line of vertical water tubes spaced apart from each other and adjacent to but spaced apart from the face of the wall on the furnace side thereof and serving to protect it partially from the radiant heat of the burning fuel.

2. A boiler furnace wall comprising a backing of refractory material with metal plates on its inner face and a mineral coating on the faces of said metal plates in combination with a line of vertical water tubes spaced apart from each other and adjacent to but spaced apart from the face of the wall on the furnace side thereof and serving to protect it partially from the radiant heat of the burning fuel.

3. A boiler furnace wall having a backing of refractory material in combination with a line of vertical water tubes spaced apart from each other and adjacent to but spaced apart from said wall and high temperature resistant protective means on the face of the wall on the furnace side thereof in line with the spaces between the tubes.

4. A boiler furnace wall comprising a backing of refractory material with a metal inner face in combination with water tubes spaced apart from each other, the metal face of the wall being composed of plates extending continuously behind the tubes and being partially protected by said tubes from the radiant heat of the burning fuel.

5. A boiler furnace wall comprising a backing of refractory material with a metal inner face in combination with water tubes spaced apart from each other, the metal face of the wall being composed of plates extending continuously behind the tubes and being partially protected by said tubes from the radiant heat of the burning fuel and high temperature resistant protective means on the face of the wall in line with the space between the tubes.

6. A boiler furnace wall comprising a backing of refractory material with a metal inner face having a mineral coating, in combination with water tubes located adjacent to and on the furnace side of said metal face and protecting it from the direct radiant heat of the burning fuel.

In witness whereof, I have hereunto signed my name.

THOMAS E. MURRAY.