March 17, 1931. C. H. DAVY 1,796,284

FURNACE

Filed March 9, 1927

Fig. 1

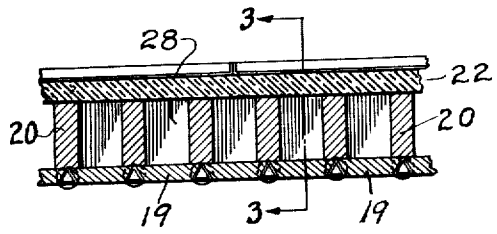


Fig. 4

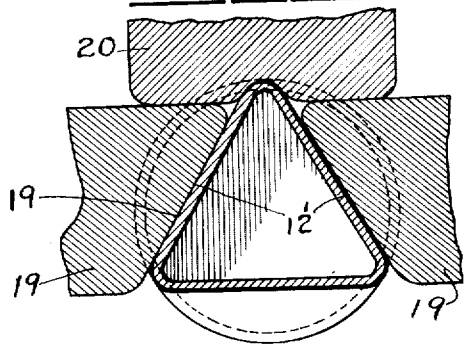


Fig. 2

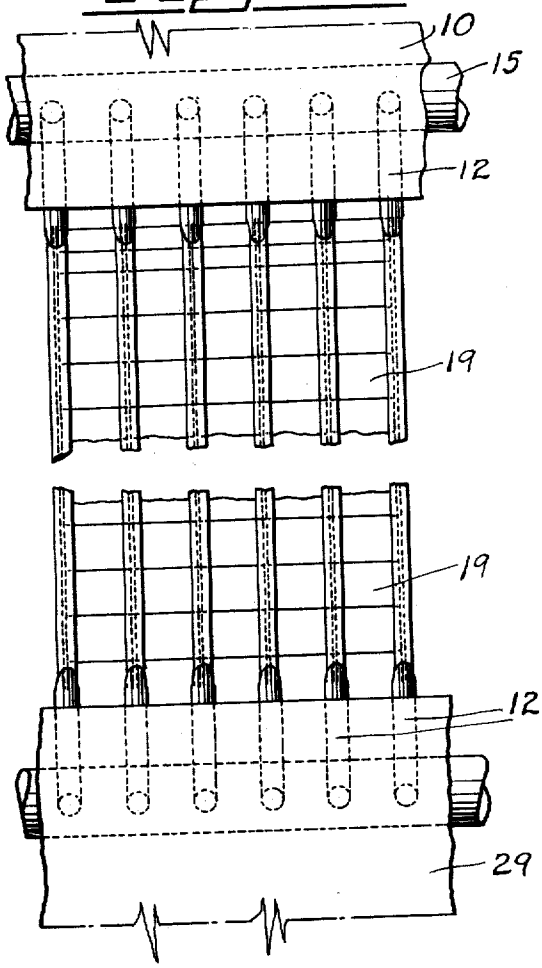
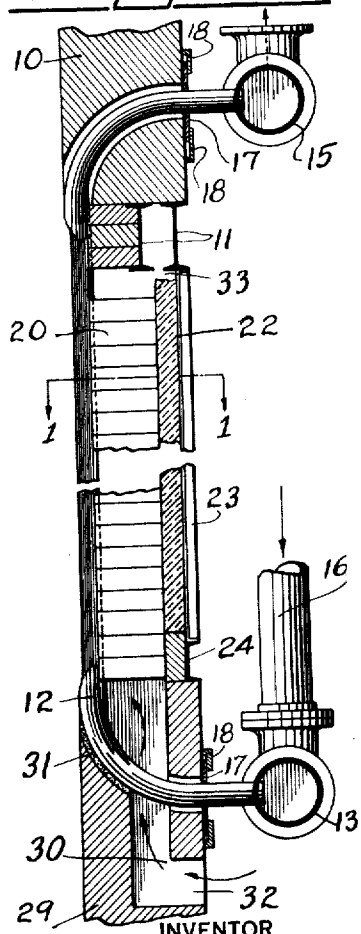


Fig. 3



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Patented Mar. 17, 1931

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UNITED STATES PATENT OFFICE

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FURNACE

Application filed March 9, 1927, Serial No. 173,913, and in Great Britain June 18, 1926.

My invention relates to fluid cooled walls for furnaces, and more particularly to the kind wherein the wall tile is retained in place by a special tube construction.

My invention will be best understood from the following description of an embodiment thereof taken in connection with the accompanying drawings in which Fig. 1 is a cross section on the line 1—1 of Fig. 3 through a furnace wall built according to my invention; Fig. 2 is an elevation of a portion of such a wall; Fig. 3 is a section on the line 3—3 of Fig. 1, and Fig. 4 is an enlarged section through one of the tubes showing how it is deformed from the circular form shown in dotted lines.

Like reference characters indicate like parts throughout the drawings.

In the embodiment of my invention as shown, a furnace wall 10 is carried on a girder 11 above a cooled section of furnace wall. An air cooled furnace wall is retained in place below the wall 10 with the aid of water tubes 12 partly exposed to radiant heat. The tubes 12 connect into a header 13 by passing through the lower portion of the cooled section of the wall on a curve of large radius. The tubes 12 pass through the upper wall 10 on a curve of relatively large radius and are connected to an upper header 15. The water to be circulated through these tubes enters the header 13 through a pipe 16 and returns from the header 15 to the steam and water spaces of the boiler through any suitable connections.

Each wall section is constructed in such a manner that ample provision is made for movement of the tubes to accommodate changes in length of the tubes. Plates 17 are perforated for the passage of a tube and are slidably held against the wall by angle guides 18 to seal the space in the walls around the tubes.

I deform the walls of the tubes 12, as shown, to simplify the construction of the refractory tile which line the furnace chamber. As shown, the tubes are deformed in cross section to the form of an equilateral triangle having rounded apexes. This deformation of the tubes is in the nature of an upsetting process which tends to thicken the walls of the tube as thus changed in shape. This results in an advantage by strengthening the tubes where they are exposed to the full heat of the furnace. The outstanding or exposed wall of the tube 12 may be rounded or slightly rounded, as desired.

Blocks 19, preferably of refractory material, bridge the spaces between adjacent water tubes 12 to form the inner furnace lining. The tile or metallic blocks 19 are formed with plane beveled faces 19′, fitting against the flattened faces 12′ of the water tubes 12. These tile may be of any thickness. They are held in place against the water tubes 12 by tile blocks 20 extending from the layer 22 of insulating material to contact with the inner lining tile and a tube and forming a backing for the lining and tubes. Each tile 20 has a vertical groove 21 fitting the outer apex of a deformed tube 12 to retain the tile against lateral displacement. The tile 20 rest upon one another to form vertical partitions, spaced horizontally to provide vertical air passageways. Steel framing pieces 23 and 24 cooperate with the tubes 12 to keep the layer 22 and the tile in place. This retains the structure of the air passageways and walls in rigid assembly on rigid steel construction while permitting slight expansive movements.

The tiles 19 and 20 and the outer wall 22 inclose air passageways 28 connected to a source of air under pressure to cool the furnace walls in their hottest portions by the passage of circulating air. The lower furnace wall 29 contains air ducts 30 communicating with these air passageways 28 and serving as the entrance for air under pressure. A packing 31 of such material as asbestos wool surrounds the tube in the passageway leading from the air duct 30 to the furnace chamber and prevents the passage of air into the furnace at this point. The air enters a port 32 at the lower ends of the passageways 30 and rises, cooling the wall, and leaves the wall through ports 33 adjacent the upper part of the steel frame 23 and the girder 11.

It will be apparent that my invention affords a water and air cooled furnace wall of

great simplicity and durability, and one in which the individual parts may be of a simple outline and of a durable form. It will be obvious that various changes may be made without departing from the spirit of this invention. The tubes need not be vertical but may be inclined or horizontal, as desired, to obtain the desired circulation.

I claim:

1. A furnace wall including an outer portion and an inner spaced portion of tile, means extending from said outer wall portion to said inner wall portion and spaced to form air passageways between said outer and inner walls and said means, and boiler tubes having at least two faces flattened to bear against the tile of the inner wall and retain them against said spacing means.

2. A furnace wall including an outer portion and an inner spaced portion of tile, partitions formed of tile blocks and spaced from one another and extending between said outer and said inner portions of said wall to form air passageways in said wall, and boiler tubes engaging the tile in the inner portion and holding them in contact with said tile blocks in the partitions.

3. A furnace wall including an outer portion and an inner refractory lining, tile spacing blocks forming partitions spaced from one another and extending between said outer wall and said inner lining to form vertical air passageways in said wall, and boiler tubes having at least two faces flattened to contact against the inner wall to retain it against said spacing blocks.

4. A furnace wall including an outer portion and an inner refractory lining, tile spacing blocks forming partitions spaced from one another and extending between said outer wall and said inner lining to form vertical air passageways in said wall, and boiler tubes having a portion approximately triangular in cross section with flattened faces contacting the tile of the inner wall to retain them against said spacing blocks.

5. A furnace wall including an outer portion and an inner refractory lining, tile spacing blocks forming partitions spaced from one another and extending between said outer wall and said inner wall to form vertical air passageways in said wall, and boiler tubes having a portion approximately triangular in cross section with flattened faces contacting the tile of the inner wall to retain them against said spacing blocks, said spacing blocks having surfaces notched to fit the tubes at the intersection of two of the flattened faces of said tubes.

6. A furnace wall including an outer wall portion, an inner refractory lining, boiler tubes, approximately plane sided in cross section, for retaining said refractory lining, and spacing blocks forming partitions extending from said outer wall to said inner lining wall, at least a portion of said spacing blocks having a face notched to grip a tube at the intersection of two of its flattened faces.

7. A furnace wall including an outer wall portion, a framework supporting said outer portion, an inner refractory wall lining said furnace, boiler tubes having portions approximately plane sided in cross section retaining said inner lining, and spacing blocks extending between said outer and inner wall portions, at least a portion of said blocks having a face notched to grip a tube at the intersection of two of its flattened faces.

8. A furnace wall including an outer wall portion, an inner refractory lining, boiler tubes approximately plane sided in cross section for retaining said refractory lining, spacing blocks forming partitions extending from said outer wall to said inner lining wall, at least a portion of said spacing blocks having a face notched to grip a tube at the intersection of two of its flattened faces, said spacing blocks being arranged to provide passageways in said wall, and means for circulating cooling fluid in said passageways.

9. A furnace wall including an outer wall portion, a framework supporting said outer portion, an inner refractory wall lining said furnace, boiler tubes having portions approximately plane sided in cross section retaining said inner lining, spacing blocks extending between said outer and inner wall portions, at least a portion of said blocks having a face notched to grip a tube at the intersection of two of its flattened faces, said spacing blocks being arranged to provide passageways in said wall, and means for circulating cooling fluid in said passageways.

10. A furnace wall comprising a row of spaced tubes, each tube having a portion thereof substantially triangular in cross-section with one side exposed to the radiant heat of the furnace, and tile contacting with the other sides.

11. A furnace wall comprising inner and outer portions spaced apart, substantially parallel partitions extending between said portions, and a tube disposed inwardly of each of said partitions and extending substantially parallel thereto, said inner portion consisting of tile having parts disposed between the tubes and partitions and held in place against said partitions by said tubes.

12. A furnace wall comprising inner and outer portions spaced apart, substantially parallel partitions extending between said portions and perpendicular thereto, and a tube substantially triangular in cross section disposed inwardly of each of said partitions and extending parallel thereto, said tube

having a corner thereof disposed in proximity to said inner portion consisting of tile having parts disposed between said partition and the sides of the triangular tube on opposite sides of said corner, whereby the tubes hold said tile in place against said partitions.

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having a corner thereof disposed in proximity to said inner portion consisting of tile having parts disposed between said partition and the sides of the triangular tube on opposite sides of said corner, whereby the tubes hold said tile in place against said partitions.

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CERTIFICATE OF CORRECTION.

Patent No. 1,796,284. Granted March 17, 1931, to

CHRISTOPHER HUMPHREY DAVY.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 2, claim 12, after the word "said" insert the words partition and said; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 7th day of April, A. D. 1931.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.

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