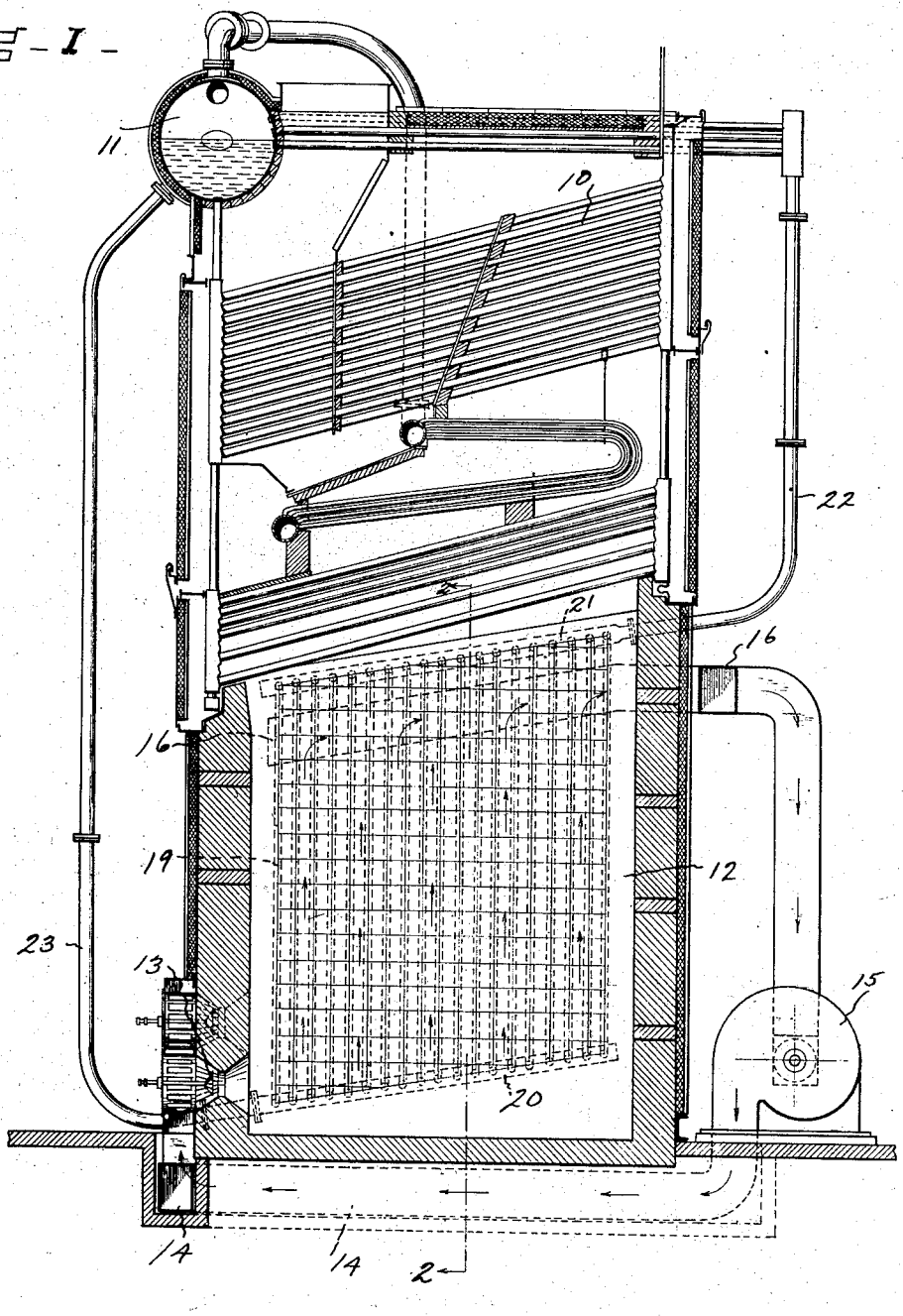
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FURNACE WALL

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Fig. 1.



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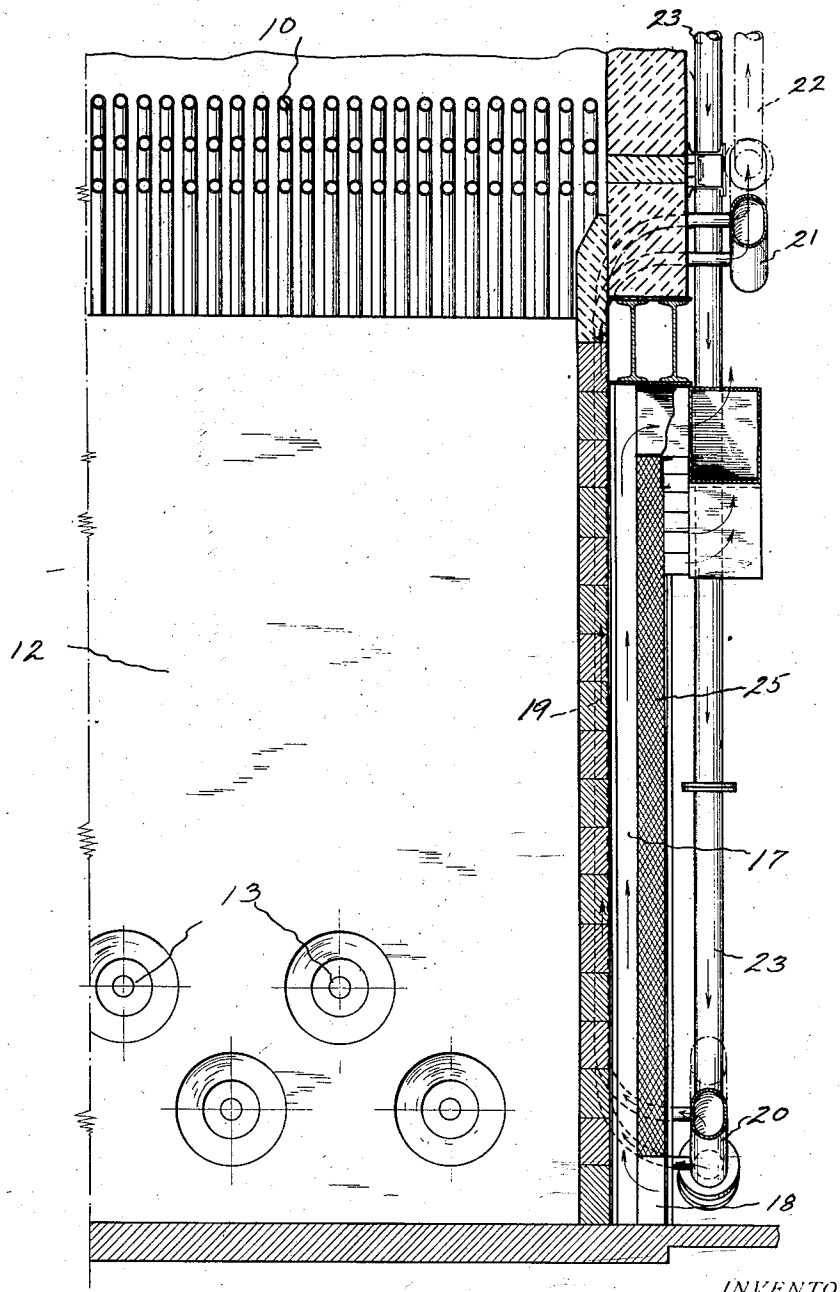
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Fig. 2.



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Fig-4

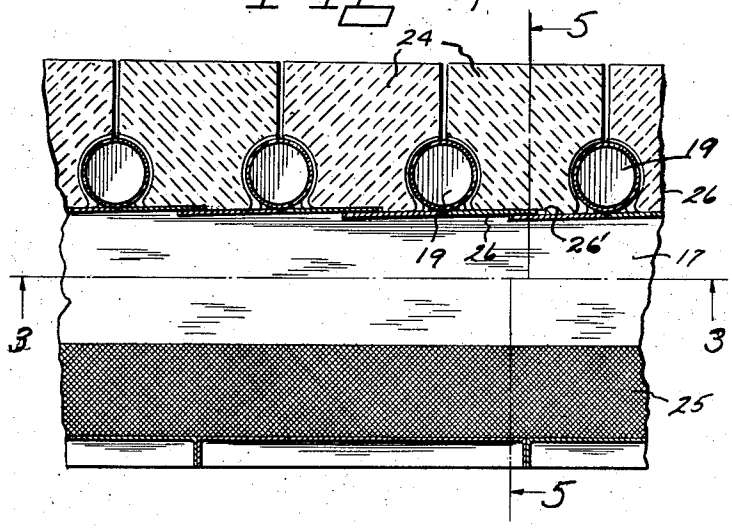


Fig-3

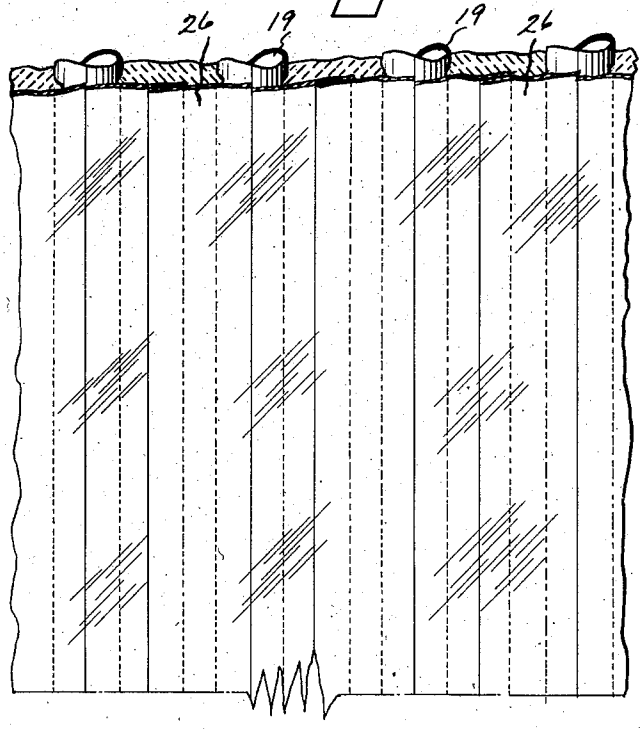
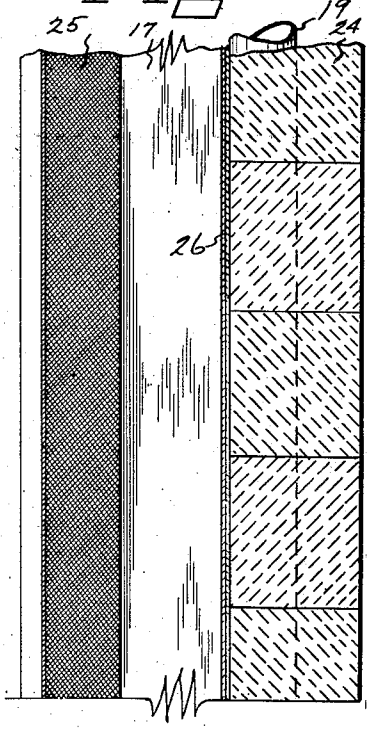


Fig-5



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Fig. 7

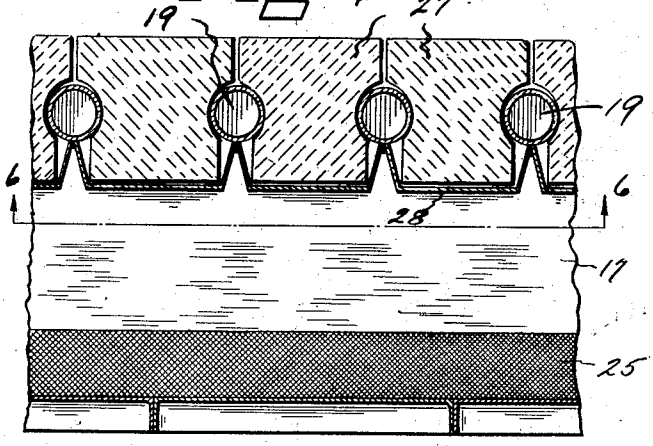


Fig. 6

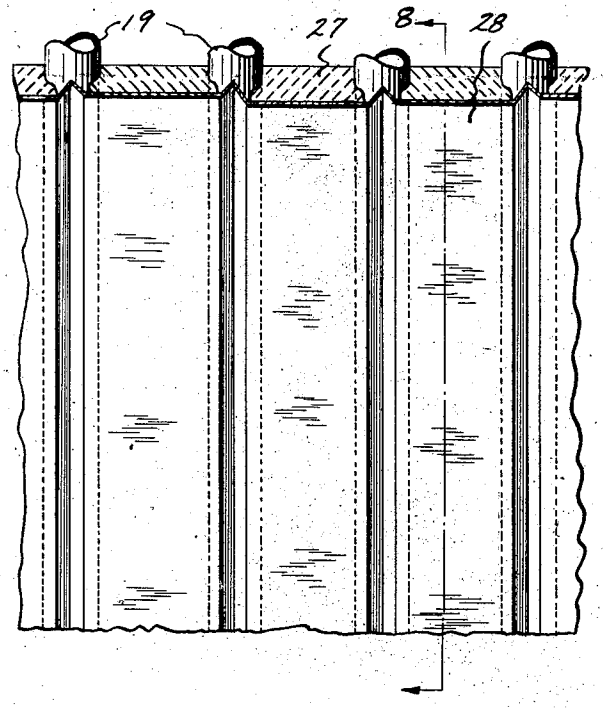
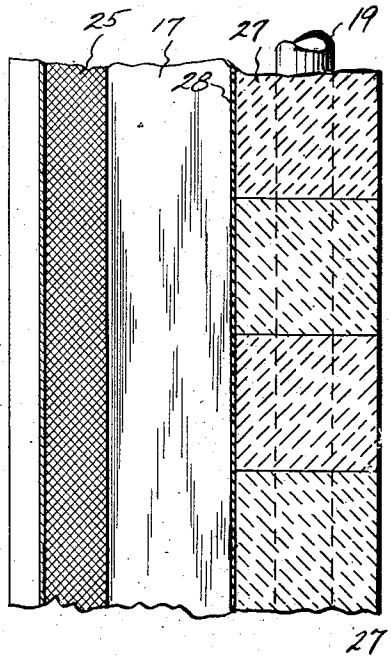


Fig. 8



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Fig-10

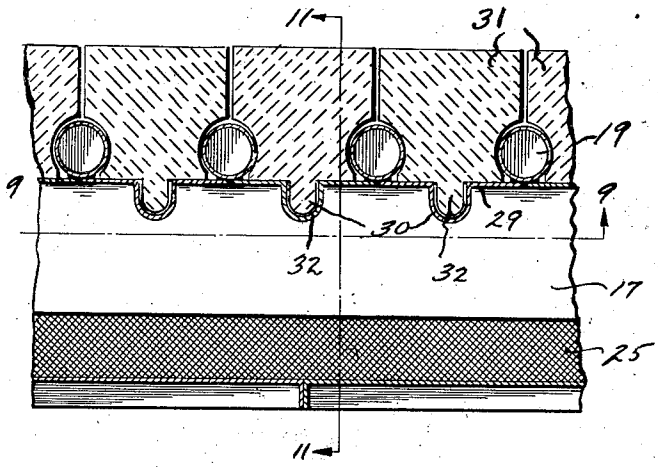


Fig-9

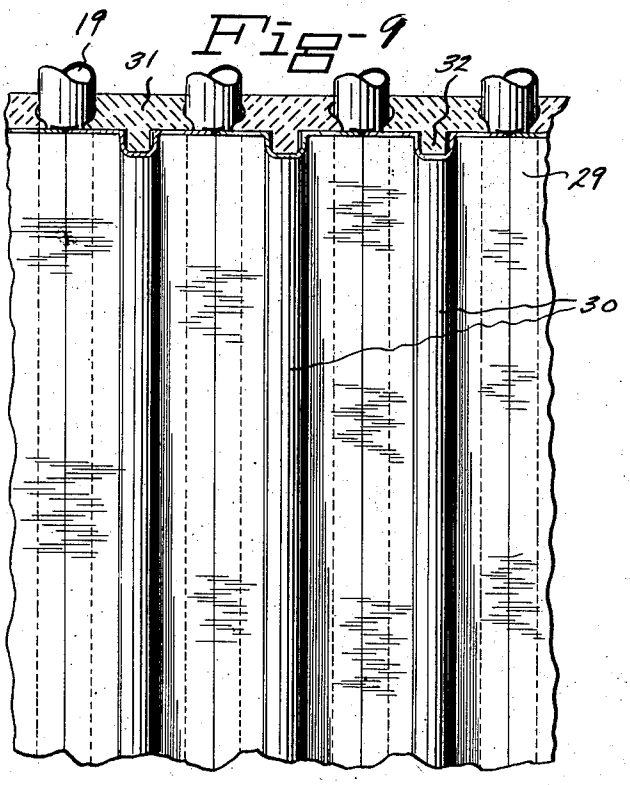
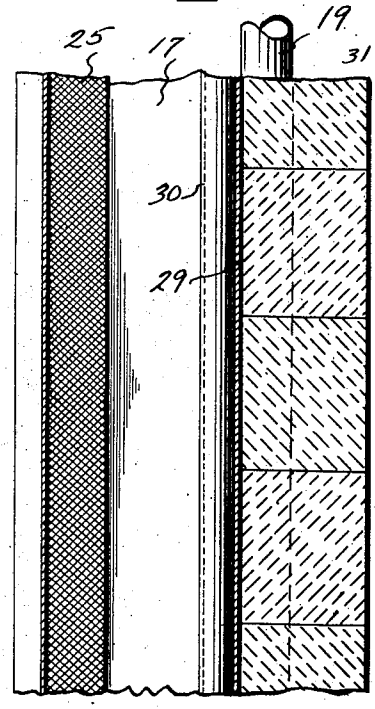


Fig-11



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Fig- 13

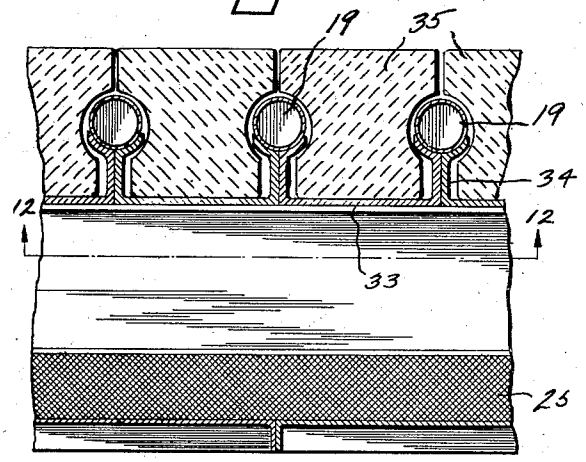


Fig- 12

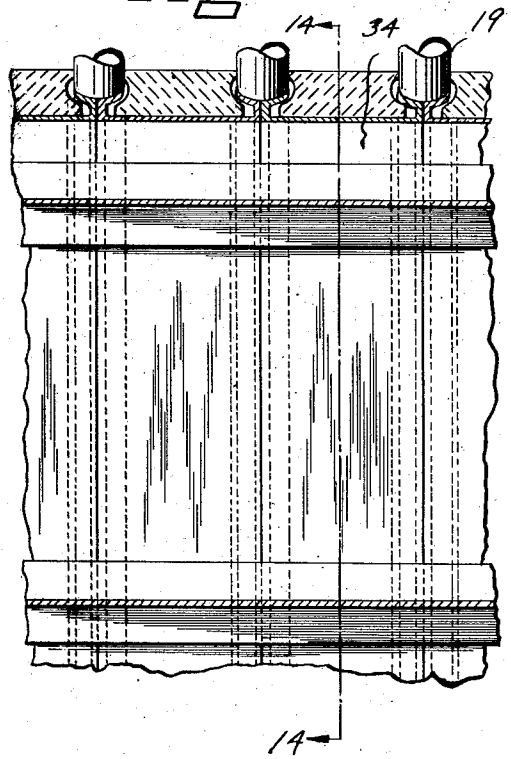
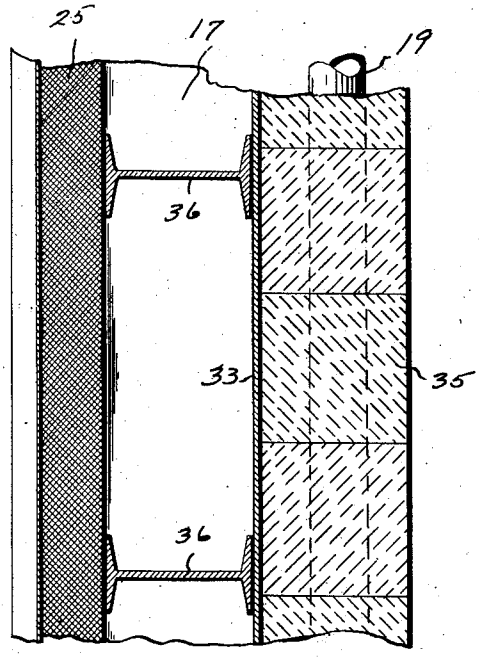


Fig-14



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Patented June 3, 1930

1,761,567

UNITED STATES PATENT OFFICE

HOWARD J. KERR, OF WESTFIELD, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO FULLER LEHIGH COMPANY, A CORPORATION OF DELAWARE

FURNACE WALL

Application filed March 4, 1926. Serial No. 92,134.

My present invention relates to furnace walls, and particularly to walls of this character which are adapted for use in furnaces operating at high temperatures, and in which it is necessary to cool the refractories in order to maintain them. My invention will be best understood from the following description and the annexed drawings, in which Fig. 1 is a longitudinal section of a typical form of water tube boiler and its furnace in which I have embodied my invention; Fig. 2 is a section on the line 2—2 of Fig. 1 on a larger scale; Figs. 3, 4 and 5 are views of a portion of the wall shown in Fig. 2 on a still larger scale, Fig. 3 being a view on the line 3—3 of Fig. 4, Fig. 4 being a cross-section in plan of Fig. 3, Fig. 5 being a section on the line 5—5 of Fig. 4; Figs. 6, 7 and 8 are views similar to Figs. 3, 4 and 5, but showing a modification, Fig. 6 being a section on the line 6—6 of Fig. 7, Fig. 7 being a section in plan of Fig. 6, and Fig. 8 being a section on the line 8—8 of Fig. 6; Figs. 9, 10 and 11 are views similar to Figs. 3, 4 and 5, but showing a modification, Fig. 9 being a section on the line 9—9 of Fig. 10, Fig. 10 being a section in plan of Fig. 9 and Fig. 11 being a section on the line 11—11 of Fig. 10; Figs. 12, 13 and 14 are views similar to Figs. 3, 4 and 5, but showing still another modification, Fig. 12 being a section on the line 12—12 of Fig. 13, Fig. 13 being a section in plan of Fig. 12 and Fig. 14 being a section on the line 14—14 of Fig. 12.

Like reference characters indicate like parts in the several views.

In the illustrative embodiment, the steam boiler has water tubes 10, an upper steam and water drum 11 and a furnace chamber 12. The oil burners 13 are supplied with combustion air through ducts 14 from a fan 15, this air being drawn through ducts 16 upwardly through channels 17 formed between the inner and outer side walls of the furnace chamber, the air entering at the bottom of the wall through the opening 18.

While I have shown my wall arrangement and the cooling connections therefor as applied to the side walls only, it will be understood that, if desired, it may be applied to the front and rear walls also. The arrangement in each side wall is the same as in the other side wall, so that a description of the construction of one will suffice for both.

In the side wall is a row of vertical tubes 19 having their ends bent outwardly but connected respectively with a lower header 20 and an upper header 21 preferably inclined as shown in Fig. 1. The upper header 21 is connected to the drum 11 through a pipe 22 in a well-known manner and the header 20 is similarly connected to the water space of the drum 11 by a pipe 23, also in a well-known manner. With the arrangement described, boiler water is circulated through the tubes 19 to cool the same.

As is usual, the tubes 19 are protected by refractory tile and because of changes in operating conditions, it is desirable that these tile shall be free to move relatively, and to that end, it is desirable to omit the bonding between the several tile, and particularly between the several vertical rows of tile. It is also desirable to make these tile as thin as possible, or at least to provide for the cooling of the tile as closely adjacent the furnace side of the tile as possible, so as to maintain the tile at as nearly a uniform temperature as may be.

In the form illustrated in Figs. 3, 4 and 5, each pair of adjacent tubes 19 has a vertical row of tile 24 between them with the sides of the tile recessed to provide a space between each pair of tile 24 for a tube 19. In this form, the tile 24 are made more than usually thin and, at the same time, are formed so that open joints are provided between each vertical row of tile and also between the tubes 19 and the tile. Hence the tile have a freedom of movement and yet, because the outer portion of the tile is wider than the space between the tubes 19, the tile are held against removal from the wall. Similarly this arrangement permits the tubes 19 to have lateral motion relatively to each other.

In order to close the openings or recesses provided for the tubes 19 and, at the same time, to make a substantially air-tight lin-

ing for the wall, which lining is particularly desirable when air is being forced through the space or channel 17 between this lining and the outer casing 25, I provide a metallic plate lining.

In the arrangement shown in Figs. 3, 4 and 5, this lining is made up of a plurality of metallic plates 26, each connected, as by autogenous welding, to a tube 19 at about the middle portion of the plate and with the plates arranged with overlapping edges so that the plates may move with the tubes 19 parallel to the face of the wall without opening joints between the plates 26. It will be noted that the tile are chipped at 26′ so as to permit the relative motion between the tile and the plates without interference with the overlapping portions of the plates 26. The plates 26 may be made as long vertically as desired, but preferably will be made in a number of lengths placed edge to edge.

In the arrangement shown in Figs. 6, 7 and 8, the tile 27 are made somewhat thicker than the tile 24 of Fig. 4, but otherwise the arrangement is substantially the same, so far as the tile is concerned. The metallic lining is formed of a plate or plates 28 with their edges bent to enter the recesses between the tile 27, these edges being connected to the tubes 19 so as to provide a bent portion, so that, when the tubes 19 move relatively to each other, these bent portions will permit such movement, the metal of the plates 28 being thin and flexible for this purpose. It will be obvious that by this arrangement, the relative motions of the tubes 19 will simply cause the plates 28 to bend without opening up any cracks through which air from the channel 17 might flow.

In the form shown in Figs. 9, 10 and 11, the arrangement is somewhat like that of Figs. 6, 7 and 8 and also like that of Figs. 3, 4 and 5. The lining is formed of a plurality of plates 29 placed edge to edge and with their edges fastened, as by autogenous welding, to the tubes 19. A fold or rib 30 is formed between the vertical edges of each plate and the plates themselves are relatively thin and flexible. Consequently, when the tubes 19 move relatively to each other parallel to the face of the wall, they are not prevented from doing so by the plates 29 because of the possible bending of the fold 30. The tile 31 may be provided with a projection 32 extending into this fold, though, if desired, this projection may be omitted.

In the arrangement shown in Figs. 12, 13 and 14, the metallic lining is formed of a number of plates which, in this case, may be of cast metal, the plates 33 being placed edge to edge and having projecting portions 34 at either end extending into the spaces between the tile 35, these projections 34 being curved at their inner ends to partly surround the tubes 19. Movement of the tubes 19 relatively to each other is permitted by the springing of the projecting portions 34. In this modification, the wall lining plates are not attached to the tubes 19 and they must therefore be held in position. To that end, I have provided a number of I-beams 36 positioned in the channel 17 and extending from the plates 33 to the casing 25. These beams 36 may be divided up into sections so as to permit the air to flow vertically in the channel 17 and, if desired, the beams 36 may be made of skeleton form to permit the passage of air vetrically across them.

I claim:

1. A furnace wall having a row of spaced tubes, connections to supply a cooling medium to said tubes, tile between each pair of adjacent tubes and having recesses for the tubes with the sides of said recesses toward the inner faces of said tile substantially closed, and a metallic lining covering the outer face of said wall, said lining comprising a plurality of plates, each contacting with at least one of said tubes.

2. A furnace wall having a row of spaced tubes, connections to supply a cooling medium to said tubes, tile between each pair of adjacent tubes and having recesses for the tubes with the sides of said recesses toward the inner faces of said tile substantially closed, and a metallic lining covering the outer face of said wall, said lining comprising a plurality of plates, each contacting with at least one of said tubes and the recesses in said tile being large enough to permit small movement of the tile parallel to the face of the wall and closed sufficiently at the front and rear of each tube to prevent the removal of the tile from the wall in a direction at right-angles to the wall.

3. A furnace wall having a row of spaced tubes, connections to supply a cooling medium to said tubes, tile between each pair of adjacent tubes and having recesses for the tubes with the sides of said recesses toward the inner faces of said tile substantially closed, and a metallic lining covering the outer face of said wall, said lining comprising a plurality of plates, each contacting with at least one of said tubes and connected thereto, each of said plates being disconnected from, and free to move horizontally relatively to, the adjacent plates.

4. A furnace wall having a row of spaced tubes, connections to supply a cooling medium to said tubes, tile between each pair of adjacent tubes and having recesses for the tubes with the sides of said recesses toward the inner faces of said tile substantially closed, and a metallic lining covering the outer face of said wall, said lining compris-

ing a plurality of plates, each contacting with and connected to at least one of said tubes.

5. A furnace wall having a row of spaced tubes, connections to supply a cooling medium to said tubes, tile between each pair of adjacent tubes and having recesses for the tubes with the sides of said recesses toward the inner faces of said tile substantially closed, a metallic lining covering the outer face of said wall, said lining comprising a plurality of plates, each contacting with at least one of said tubes, an outer wall spaced from the outer side of said wall, and connections to circulate air through the space between said wall and said outer wall.

6. A furnace wall having a row of spaced tubes, connections to supply a cooling medium to said tubes, tile between each pair of adjacent tubes and having recesses for the tubes with the sides of said recesses toward the inner faces of said tile substantially closed, a metallic lining covering the outer face of said wall, said lining comprising a plurality of plates, each contacting with at least one of said tubes and said plates being constructed and arranged to permit the tubes to move relatively to each other parallel to the face of the wall while maintaining the lining substantially air tight.

7. A furnace wall having a row of spaced tubes, connections to supply a cooling medium to said tubes, tile between each pair of adjacent tubes and having recesses for the tubes with the side of said spaces toward the inner faces of said tile substantially closed, and a metallic lining covering the outer face of said wall, said lining comprising a plurality of plates, each contacting with and connected to at least one of said tubes and said plates being constructed and arranged to permit the tubes to move relatively to each other parallel to the face of the wall while maintaining the lining substantially air tight.

8. A furnace wall having a row of spaced tubes, connections to supply a cooling medium to said tubes, tile between each pair of adjacent tubes and having recesses for the tubes with the sides of said recesses toward the inner faces of said tile substantially closed, and a metallic lining covering the outer face of said wall, said lining comprising a plurality of relatively thin, flexible plates, each connected to at least two of said tubes and having a bent portion between the points of connection to permit the tubes to move relatively to each other parallel to the face of the wall while maintaining the lining substantially air tight.

9. A furnace wall formed of refractory material and having recesses therein opening toward the outer face thereof, tubes disposed in said recesses, and a metallic lining on the outer face of said wall comprising a plurality of plates, each plate being secured to adjacent tubes and bent to permit movement thereof along said wall.

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