April 3, 1934. T. E. MURRAY 1,953,768

BOILER CONSTRUCTION

Original Filed Dec. 4, 1923 3 Sheets-Sheet 1

Fig. 1.

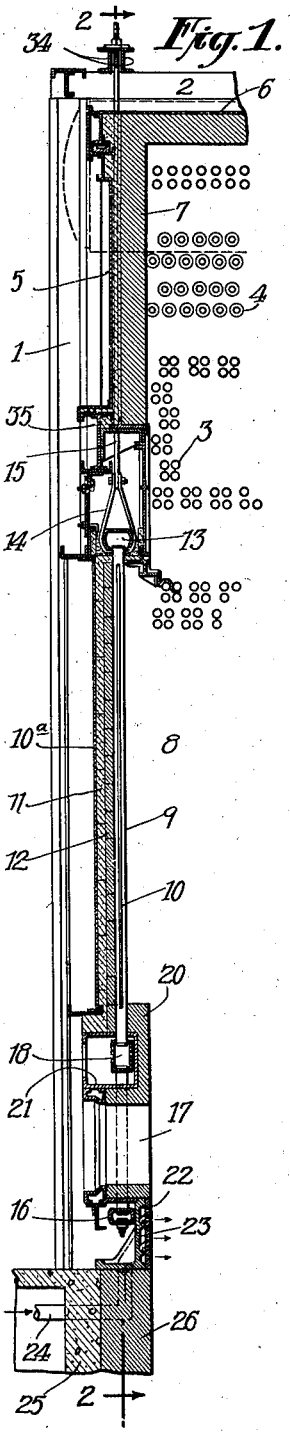


Fig. 2.

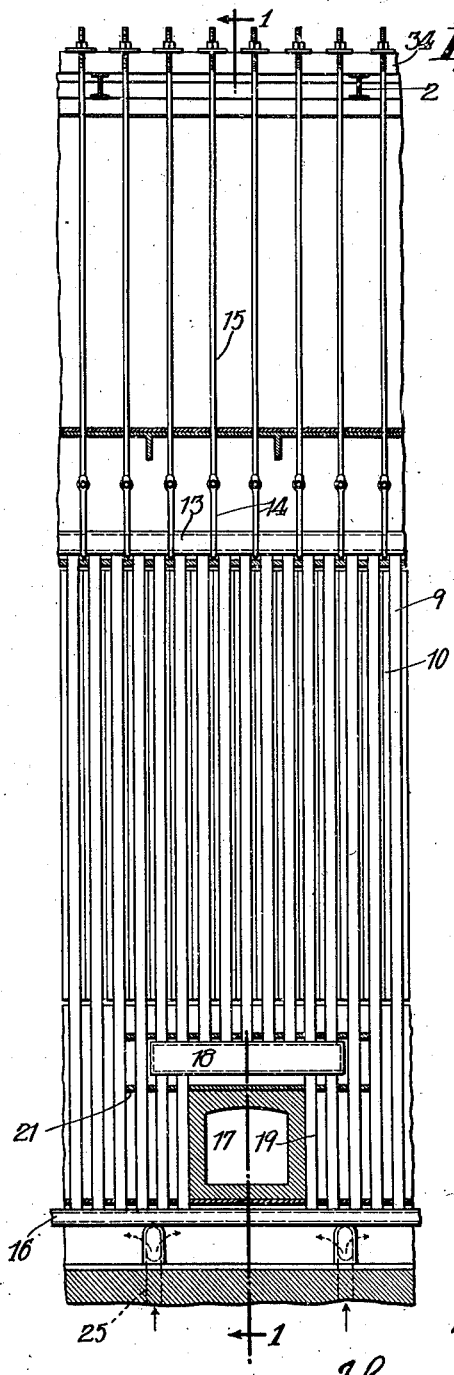
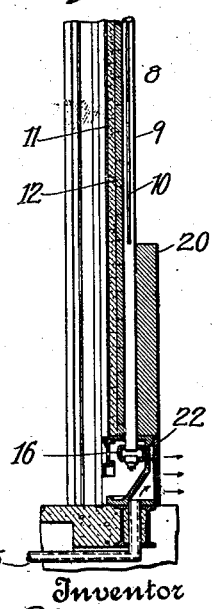


Fig. 3.



Inventor

Thomas E. Murray

By his Attorneys

D. Anthony Usina

April 3, 1934. T. E. MURRAY 1,953,768

BOILER CONSTRUCTION

Original Filed Dec. 4, 1923 3 Sheets-Sheet 2

Fig. 4.

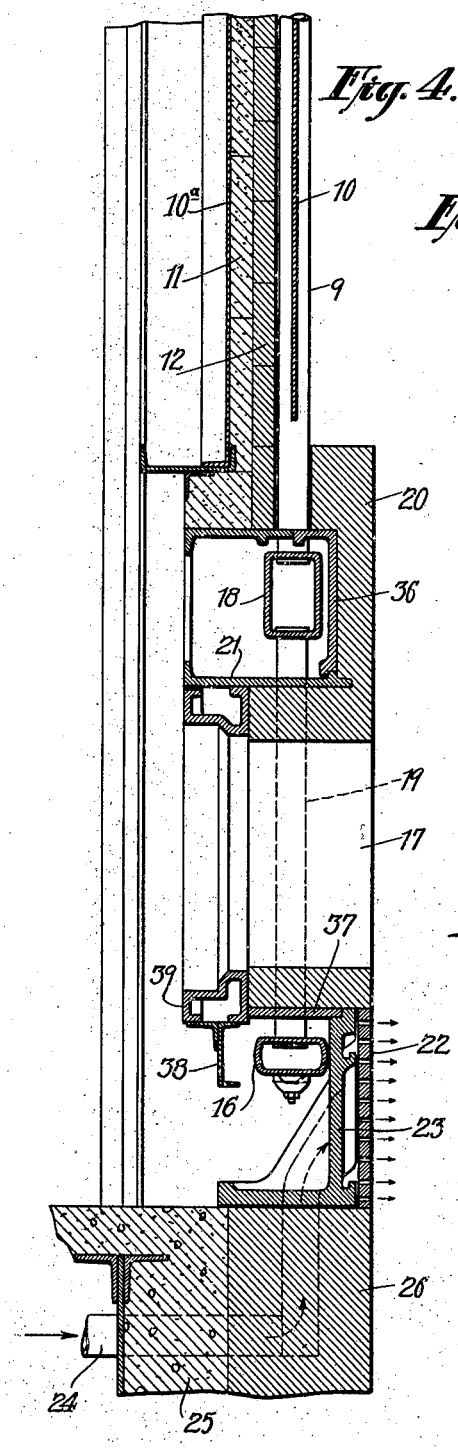


Fig. 5.

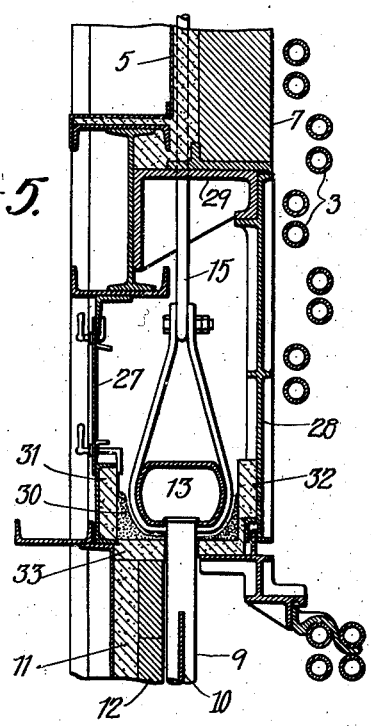
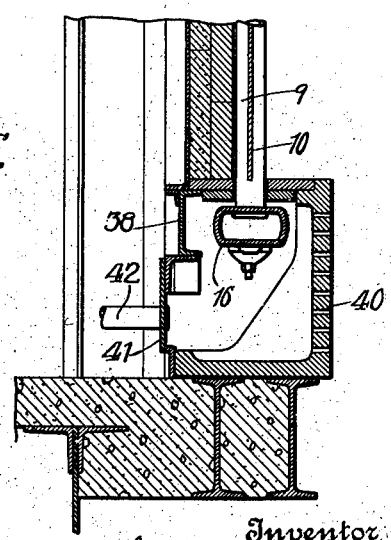


Fig. 6.



Inventor
Thomas E. Murray
By his Attorney
W. Anthony Usina

April 3, 1934. T. E. MURRAY 1,953,768

BOILER CONSTRUCTION

Original Filed Dec. 4, 1923 3 Sheets-Sheet 3

Fig. 7.

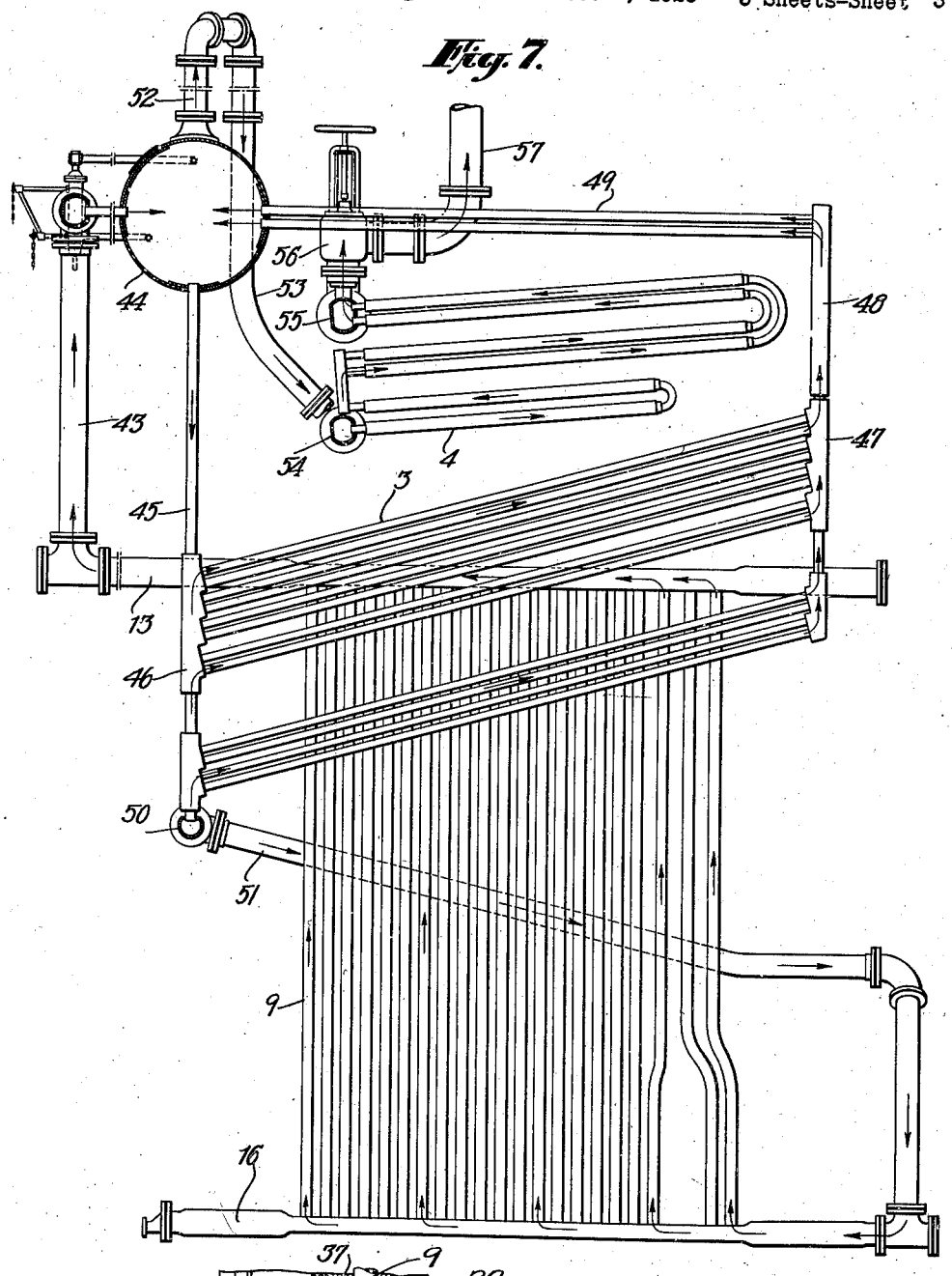
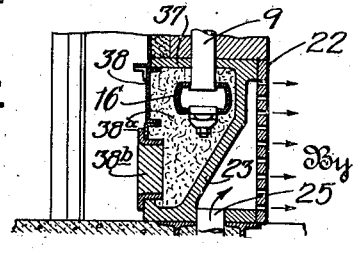


Fig. 8.



Inventor
Thomas E. Murray
By his Attorney
D. Anthony Usina

Patented Apr. 3, 1934 1,953,768

UNITED STATES PATENT OFFICE

1,953,768

BOILER CONSTRUCTION

Thomas E. Murray, Brooklyn, N. Y.; Joseph Bradley Murray, Thomas E. Murray, Jr., and John F. Murray, executors of said Thomas E. Murray, deceased, assignors to Metropolitan Engineering Company, a corporation of New York

Application December 4, 1923, Serial No. 678,443
Renewed November 23, 1932

10 Claims. (Cl. 122—235)

The present invention provides a special construction of boiler wall and arrangement of tubes for use in various installations in which boiler tubing is arranged alongside a wall.

The accompanying drawings illustrate embodiments of the invention.

Fig. 1 is a vertical section of one of the boiler walls;

Fig. 2 is an inside elevation of the same, partly in section approximately on the line 2—2 of Fig. 1;

Fig. 3 is a section similar to Fig. 1 at another point in the wall;

Figs. 4 and 5 are enlarged details of Fig. 1;

Fig. 6 is a section on a larger scale showing a modification of Fig. 3;

Fig. 7 is a side elevation, partly in section showing the connections of the different sets of tubes;

Fig. 8 is a cross-section of an alternative detail.

Referring to the embodiments of the invention illustrated, the structure is supported by side columns 1 carrying at their upper ends cross-beams 2. In the upper part of the boiler, supported and arranged in the usual or any suitable way, are the boiler tubes 3 and superheater tubes 4. These are enclosed within a shell of sheet metal 5, 6, supported from the columns and lined with tile, fire-brick or other insulating material 7. Below the boiler elements described and enclosed by the side and end walls is the space 8 which constitutes the furnace or chamber through which the heating gases rise. Exposed at the sides of this chamber are the supplementary tubes 9. These tubes are provided with flanges 10 between them and overlapping so as to close the spaces between the tubes, such flanged tubes being described in certain previous patent applications of mine. This lower part of the boiler wall is similar to the upper part, comprising plates 10^a of sheet metal on the outside lined with insulating blocks 11 and fire-bricks 12, against which the tubes 9 are located.

The tubes 9 run at their upper ends into a header 13 which is supported at intervals by straps 14 suspended by rods 15 and channels 34 from the overhead cross beams 2. At their lower ends, they enter a lower header 16 or mud drum. The usual connecting tubes for circulation of the water are assumed and they may be arranged and located in any suitable way.

Where the wall is pierced with a door 17 in line with the tubes a cross-box 18 is provided connecting the tubes above with short tubes 19 passing down alongside the door to the lower header 16. The lower portions of the tubes, up to a point some distance above the level of the tops of the doors, is protected by an inward horizontally extending portion of the wall consisting of a layer of insulating material 20 to protect the joints of the tubular structure. The cross-box 18 is set in a casing 21 in this lower part of the wall, the casing being large enough to permit a certain vertical movement of the cross-box. The lower part of the wall, below the level of the doorway, includes a plate 22 backed at intervals by a casting 23 which is channeled and ribbed as shown. The plate 22 is perforated at points which are engaged by the casting 23. Air is supplied through a pipe 24 and passes through the channels of the casting and thence through the plate 22 into the furnace chamber for combustion. The lower header or mud drum 16 is located back of the plate 22 and in such a position as to be capable of vertical motion. The bottom wall 25 and its facing 26 are supported on the foundations of the structure and carry the plate 23 and the lower portion 20 of the wall, with the casing 21; and these parts in turn carry the intermediate portion of the wall composed of the outer plates 10^a and the lining 11 and 12.

The purpose of the lining of insulating material 20 is not only to protect the joints and other parts of the tubular structure, but is also to protect the fuel against such cooling as would retard combustion. This protecting wall 20 is high enough to prevent the tubular structure from absorption of heat so rapidly from the fire-bed as to interfere with efficient combustion. This protecting wall serves the same purpose whether the furnace be used for a boiler or for any other purpose. The back of the tile or other material of which the wall 20 is composed, is cooled by the water circulating through the tubes sufficiently to prevent too rapid burning out of the wall.

The upper header 13 is enclosed in a metal box illustrated in detail in Fig. 5. This box comprises side plates 27 and 28 and a top 29 on which the upper part of the wall is supported. The bottom of the box consists of plastic material 30 which is enclosed between side plates 31 and 32 of tile which rest on tiles 33 supported on the top of the intermediate wall (11 and 12). The bottom of the box thus constituted is adapted to move upward, sliding between the sides of the box, when the wall on which it is supported is moved upward under the expansion produced by the high temperature. Thus the intermediate part of the wall, when subjected to the heat of the gases will expand upward, being solidly supported on its foundation, and such expansion will be taken up within the box which encloses the upper head-

er for these tubes. The intermediate part of the side wall is not fastened to the main supporting columns 1. The upper part of the wall is carried by a beam 35 which is carried on the inner faces of the supporting columns 1. The upper section of the wall is practically fixed, though it can expand slightly. But the greatest heat comes on the lower part of the wall and the actual extent of the expansion will be greatest for this section of the wall.

The arrangement illustrated also permits expansion of the side tubes 9. This expansion will be greater than the expansion of the wall and will be in the opposite direction, that is downward. It is for this purpose that the cross-bar 18 and the lower header or mud drum 16 are supported merely by the tubes themselves and are arranged in recesses or casings of the wall which permit a relative downward movement of the cross-box and the lower header,—relative to the wall.

It has been explained that the joints in the lower portions of the tubes 9 are protected from the heat in the lower part of the furnace chamber by the wall 20 on the inner side of such tubes. To prevent cooling of the cross-box 18 and also the lower header 16 by the outside air, they may be packed in yielding insulating material. As shown in Fig. 4, the box 21 is made up of a casting open at the outer side and with a plate 36 on the inner side protected by the insulating wall 20. The casing for the lower drum is formed of the plate 22, the bottom of the casting 23, a top plate 37 supporting the brickwork of the doorway and a channel 38 depending from the air cooled frame 39 of the door.

According to the design of Fig. 6, the construction is simplified by using a casting 40 which is perforated for admission of air and omitting the covering plate 22 of Fig. 4. The casing in either case may be closed on the outside by a plate such as 41 and air introduced through a pipe 42. Fig. 8 shows an alternative arrangement in which cooling of the header 16 is prevented by a filling of flocculent insulating material 38^a held in place by a block 38^b of masonry.

The bottom constructions described are useful particularly for powdered coal furnaces, or they may be used for stoker-fired furnaces or for oil or gas fired boiler furnaces; and in fact, for many furnaces not necessarily used in connection with boilers.

Fig. 7 illustrates in side elevation the various groups of boiler tubes and shows the manner in which they are connected to each other and in which the water and steam are circulated; the walls and supporting parts of the structure being omitted so that the arrangement of the tubing will be clear.

The vertical tubes 9 which extend alongside of and adjacent to the side walls and shield the latter are connected to a header 16 at their lower end and to header 13 at the upper end. The steam generated therein passes out of one end of the header 13 to a vertical pipe 43 and thence to a main steam drum 44. The water in this drum passes down by pipes 45 to headers 46 at the lower ends of the upper series of boiler tubes, the inclined, approximately horizontal, tubes 3 previously referred to. At their opposite and higher ends, these are connected to headers 47 whence the steam passes by vertical pipes 48 and horizontal pipes 49 to the main drum 44. At the lower ends of the headers 46 they are connected to a cross-header 50 which at its opposite ends connects with downwardly inclined pipes 51 leading to the bottom headers 16 of the first set of tubes 9. Thus the main drum 44 is in the circulating system of both sets of boiler tubes.

The steam from the drum 44 passes out of the top by a pipe 52 and thence downwardly by a pipe 53 to a cross-header 54 at the lower end of the superheater tubes 4, which is the third set of tubes in the complete boiler. The superheated steam passes out to a cross-header 55 and thence by way of a valve 56 to the superheated steam pipe 57.

The invention is applicable to boilers having various other arrangements of tubing and circulating connections.

The combination of the upright tubes with the sheathing and with suspending means located outside of the furnace is illustrated more fully and claimed in pending application Ser. No. 61,387, filed October 9, 1925.

Though I have described with great particularity of detail certain embodiments of my invention, yet it is not to be understood therefrom that the invention is restricted to the particular embodiments illustrated. Various modifications may be made in detail and in the arrangement of the parts without departing from the invention as defined in the following claims.

What I claim is:—

1. A structure of the character described including in combination a boiler wall supported at the bottom and a line of boiler tubes supported independently of said wall and alongside of and closely adjacent to the same so as to shield said wall and exposed to the radiant heat of the burning fuel on their inner side only, said wall having an inward horizontally extending portion through which the ends of the tubes pass said ends being free to move with respect to the wall.

2. A structure of the character described including in combination a boiler wall of masonry and a line of boiler tubes supported independently of said wall and alongside of and closely adjacent to the same so as to shield said wall and exposed to the radiant heat of the burning fuel on their inner side only, said wall having an inward horizontally extending portion through which the lower ends of the tubes pass and said tubes being supported at their upper ends and free at their lower ends to expand downwardly.

3. A structure of the character described including in combination a side wall, vertical boiler tubes alongside of said wall and supporting means for their upper ends leaving them free to expand downward, a lower header suspended from the lower ends of said tubes and a casing extending inwardly from said wall and enclosing said lower header and in which the latter is vertically movable.

4. A structure of the character described including in combination a side wall, vertical boiler tubes alongside of said wall, a header from which said tubes are suspended with freedom to expand downward, a lower header suspended from the lower ends of said tubes, and casings extending inwardly from said wall and in which said headers are enclosed with freedom for vertical movement.

5. A structure of the character described including in combination vertical boiler tubes and supporting means for their upper ends leaving them free to expand downward, a cross-box at an intermediate point in the length of said boiler tubes, and connected above and below with parts of said tubes and free to expand therewith, and a wall carrying a casing enclosing said cross-box with

freedom for vertical movement of the latter in the casing.

6. A boiler having over head water tubes heated by convection from the heating gases and having an upper wall alongside of said over head tubes, and having a furnace with a combustion chamber below said tubes, said combustion chamber having a lower wall and a set of upright water tubes alongside of the same, said lower wall and upright tubes being supported independently of each other and being expansible one with relation to the other and the lower wall being supported independently of the upper wall and being expansible with relation to the upper wall.

7. A structure including in combination an inner wall comprising a line of upright water tubes spaced apart with metallic extensions substantially across the spaces and extending over substantially the full exposed length of the tubes, and an outer wall supported independently of said inner wall, the two being close together to prevent the passage of the heating gases between them and so that the tubes are exposed to the heating gases only on the inner faces thereof.

8. A structure including in combination an inner wall comprising a line of upright water tubes spaced apart with metallic extensions extending substantially across such spaces and an outer wall of masonry spaced away from said flanges and shielded from the heating gases over substantially its entire face by said inner wall, the inner and outer walls being close together so as to prevent access of the heating gases between them and so that the upright tubes are exposed to the heating gases on their inner faces only.

9. A structure including in combination an inner wall comprising a line of upright water tubes spaced apart with metallic extensions extending substantially across such spaces and an outer wall of masonry spaced away from said flanges and shielded from the heating gases over substantially its entire face by said inner wall, the inner and outer walls being close together so as to prevent access of the heating gases between them and so that the upright tubes are exposed to the heating gases on their inner faces only, and a protecting shield on the inner side of the lower portions of said upright tubes.

10. A furnace including an outer wall of refractory material on the inner side of which is a single line of upright water tubes and on the inner side of the lower portion of which is a protecting wall of refractory material, said tubes being spaced apart and metallic members bridging the space between them from the top of the inside refractory wall to about the upper ends of the tubes, said outer wall being spaced from said metallic members.

THOMAS E. MURRAY.