

Feb. 6, 1940.

J. F. DICKSON

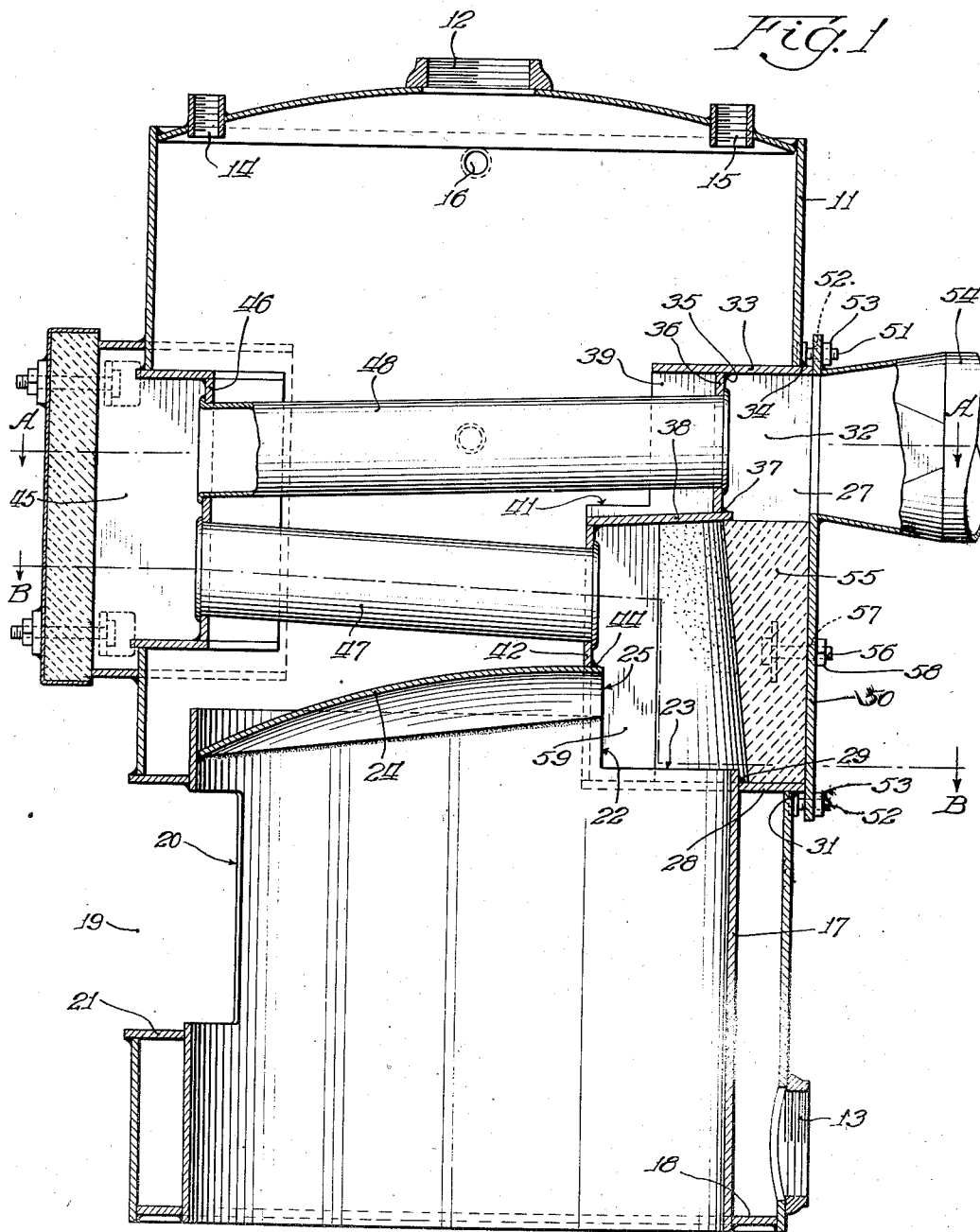
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BOILER

Filed June 30, 1939

2 Sheets-Sheet 1

Fig. 1



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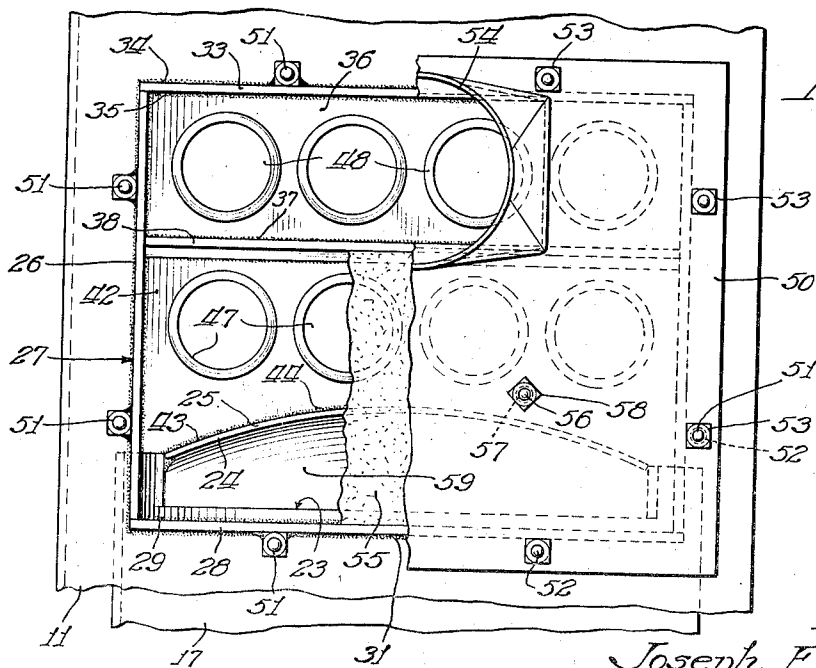
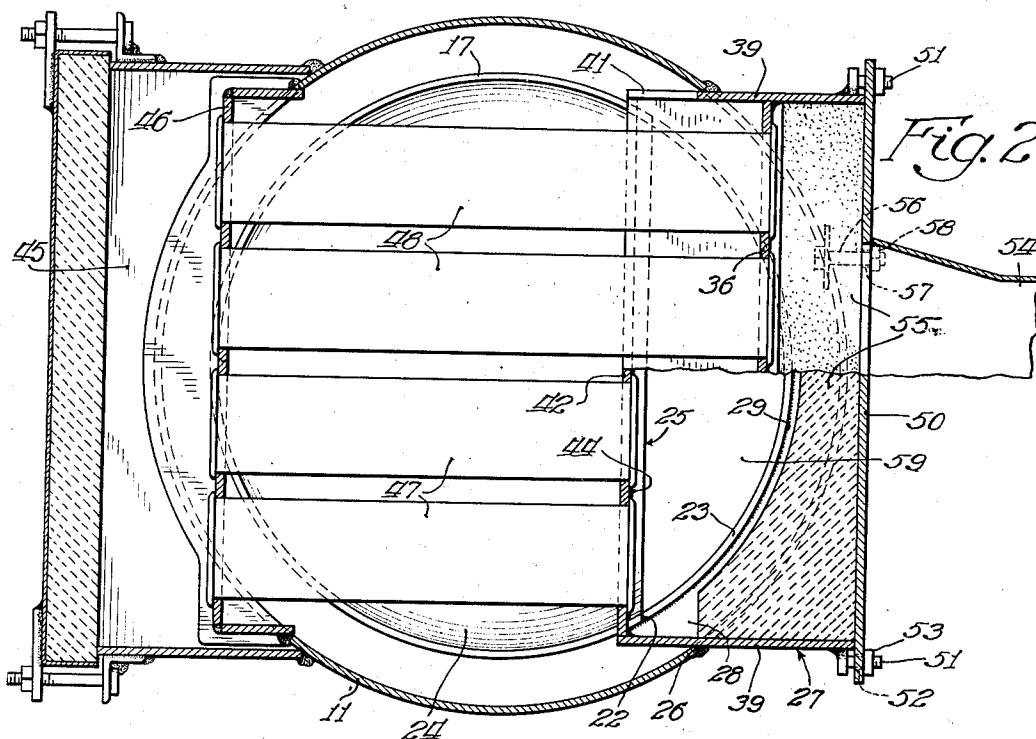
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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BOILER

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Application June 30, 1939; Serial No. 282,010

4 Claims. (Cl. 122-149)

My present invention pertains to certain novel features of structure and advantageous functional properties in boilers, heaters, and the like, and it concerns more particularly, but not necessarily exclusively, elements of betterment in round boilers which facilitate the replacement of damaged or worn-out tubes or flues with new ones, and which effect a more complete and efficient combustion of the gases by reason of the presence in suitable position or location of a heated refractory member with which the gases come into effective contact.

In the accompanying drawings forming a part of this specification, and to which reference should be had in connection with the following detailed description, I have illustrated a present preferred embodiment of the invention, but it is to be borne in mind that the invention, as defined by the appended claims, is capable of incorporation in physical form in other ways.

In these drawings, for simplicity, like structural parts have been supplied with the same reference numerals.

In these drawings:

Figure 1 is a central vertical section through the new boiler;

Figure 2 in its upper half is a horizontal section on line A-A of Figure 1 and in its lower half a similar section on line B-B of Figure 1; and

Figure 3 is a fragmentary elevation of a portion of the back of the boiler with parts broken away to more clearly present the structure.

Referring to the several views of the drawings, it will be observed that the round boiler includes an upright, external, sheet-metal casing or shell 11 having the usual means 12, 13, 14, 15 and 16 for connection of conduits or pipes therewith.

In its lower portion, such enclosing shell houses a sheet-metal, cylindrical, fire-box wall-member 17, of considerably less height than the outer shell and spaced inwardly away from such exterior wall 11 to which it is connected at the bottom of the boiler by a flat ring 18 welded to the two concentric members.

As is clearly illustrated, the outer wall 11 has a door-opening 19 in register with a similar aperture 20 in the inner wall 17, the structure having a frame 21 fitted to such registered openings and welded to the two members around the margins of such doorways, the door proper co-operating with such passage into the fire-box not being shown because it constitutes no part of the present invention.

The rear upper portion of such inner, cylindrical wall-member 17 is cut away on a vertical plane 22 and an intersecting horizontal plane 23.

As is shown, such member 17 has welded to the upper portion of its inner, curved surface, an upwardly, rearwardly, inclined, dome-shaped, sheet-metal top-wall 24, the rear arched edge 25 of which is in the same vertical plane 22.

The back of the round boiler has a rectangular opening 26 in which is fitted a like-shaped, sheet-metal box-member 27, the inner portion of the lower wall 28 (Fig. 1) of which is cut away so that it fits against and is welded at 29 to the corresponding, curved, external surface of the member 17, the outer portion of the same lower wall 28 being welded at 31 to the external shell or casing 11.

The flat, upper wall 33 of the rectangular box-member 27, which is partly inside of the boiler and partly outside thereof, is welded to the outer casing at 34, and it has welded at 35 at an intermediate point of its under surface a flat, vertical, tube-sheet 36, and the bottom edge of the element 36 at 37 is welded to a nearly-horizontal, cross metal-sheet 38; the ends of both sheets 36 and 38 being welded to the upright end-walls 39, 39 of the box-like member 29, such end-walls being recessed at 41.

The innermost end of boxing 27 has fitted in it, and welded in place, another, vertically-disposed tube-sheet 42 whose lower part is cut away in the form of an arch to receive in it the extreme rear part of the dome-plate 24 to which it is welded at 44.

At the front of the boiler, a smoke-box 45 is provided and which has the usual, vertical tube-sheet 46 which accommodates in its apertures a lower series of downwardly, rearwardly, sloping tubes or flues 47 whose rear ends are received in openings in the flue or tube sheet 42, sheet 46 having also an upper group of tubes or flues 48 whose back ends are mounted in the tube-sheet 36, such tubes or flues in each instance being flanged or rolled over at their ends in accordance with common practice.

The rectangular metal-box 27 has welded to the outer surfaces of all of its four walls, outside of the round shell 11, the heads of a plurality of bolts 51 whose screw-threaded shanks extend rearwardly beyond the back margin of the box, and these shanks are provided for demountably securing in position a rear cover-plate 50 for the box, such shanks occupying holes 52 through the cover and being supplied with retaining nuts 53 for removably holding the cover in place.

A smoke or burned-gas outlet-conduit 54 is located on the upper portion of such cover, and, of course, it communicates directly with that chamber 32 of the interior of the box connected to the rear ends of the upper group of tubes 48.

Detachably fastened to the lower portion of the inner face of such cover is a refractory-block 55 fitted with bolts 56 partially imbedded therein and arranged to extend rearwardly through holes 57 through the cover, the protruding ends of the shanks of such bolts being fitted with the usual confining nuts 58.

The surface of such refractory-element 55, which bears against the inner face of the cover-plate 50, is flat or plane, as is also its lower surface just above the top of plate 28 and its upper surface on a level to fit beneath plate 38 in small degree as illustrated in Figure 1.

The inner surface of the refractory-block is curved to conform to the exterior surface of the internal-shell 17 and such block is slightly thicker at its top than at its bottom, all as is clearly presented in the drawings.

From what precedes, it should be apparent that the hot combustion-gases originating in the fire-box shell 17 ascend and are efficiently directed, at least in part, by the arched or domed top-wall 24 into the chamber 59 where they come into direct contact with the hot refractory-block 55 which action aids in developing an effective and complete combustion of the gases which flow forwardly through the lower group of tubes 47 into the front smoke-box 45 from which they pass rearwardly through the upper tubes or flues 48 into the chamber 32 from which they escape through the discharge conduit or flue 54 to the stack or chimney.

By mounting the stated refractory-member in the position indicated, the advantageous recited result occurs, and it is to be noted that such member may be removed with the demountable cover if substitution is required, due to injury or deterioration of the block in service, or, if occasion requires, the cover alone can be detached, leaving the refractory-element in place.

If any of the upper group of tubes or flues necessitate replacement with one or more new ones, the rear ends of the substituted ones are rendered accessible for easy and direct flanging by demounting the cover, either with or without the refractory-block.

In similar manner, if any of the tubes or flues of the lower group require substitution by one or more new ones, then the back ends of the new one or ones can be conveniently flanged or rolled over in place by removal of the cover and the refractory-member.

The ready approach to the rear ends of the two series of flues or tubes may be availed of to remove the damaged or worn-out one or ones from the boiler, as well as to introduce and secure in place the fresh one or ones.

The scope of the present invention, as defined by the following claims, indicates that various structural changes or modifications may be resorted to without departure from the heart and essence of the invention and without the loss or sacrifice of any of its desirable and material benefits and advantages.

It will be observed, that in the particular embodiment of the invention herein pointed out, the cylindrical fire-box shell and the novel rectangular box are both cut away to allow their proper interfitting together to permit the desired passage of the gases from the fire-chamber into the

compartment leading to the first or lower assemblage of tubes, but the invention, in its broader aspects, is not confined to such indicated structural details.

Also it will be noted that the refractory-element 55 is so located that it adequately protects the metal cover or closure 50 from the heat in the boiler, that it overlies and, in some cases, may rest upon the bottom-wall 28 of the boxing 27, and that it acts as a division-wall between the chambers or compartments 59 and 32, thus causing the hot-combustion gases to traverse their passages to best functional advantage.

I claim:

1. In a round boiler, the combination of an outer cylindrical shell having a rectangular opening through its rear portion, a top-wall for said shell, a shorter cylindrical fire-box shell of less diameter than that of said outer shell inside of the lower portion of said outer shell and spaced inwardly therefrom, the upper rear portion of said inner shell being cut away on intersecting vertical and horizontal planes, means connecting together the lower portions of said two shells thereby forming an annular water-leg surrounding said fire-box, an upwardly-rearwardly-inclined domed top-wall for said fire-box at least partially above the top edge of said inner shell, a rectangular-boxing occupying said outer shell opening and extending both inside of the boiler and outside thereof, the lower wall of said boxing conforming to and secured to said inner shell and secured to said outer shell, the inner part of the lower portion of said boxing in the boiler having a first upright apertured tube-sheet arched at its lower portion to receive and secured to the rear part of said fire-box top-wall, an intermediate part of the upper portion of said boxing having a second upright apertured tube-sheet, a cross-wall connecting the top portion of said first tube-sheet and the lower portion of said second tube-sheet, a smoke-box at the front of the outer shell having an apertured tube-sheet, a lower group of tubes occupying apertures in said first tube-sheet and said smoke-box tube-sheet, an upper group of tubes occupying apertures in said smoke-box tube-sheet and said second tube-sheet, a removable cover for the back of said boxing, and a refractory-block demountably secured to said cover and having a curved inner surface adjacent to and conforming to the curvature of said inner shell and of a height substantially equal to the distance between the bottom wall of said boxing and said boxing cross-wall.

2. In a round boiler, the combination of an outer cylindrical shell having an opening through its rear portion, a top-wall for said shell, a shorter cylindrical fire-box shell of less diameter than that of said outer shell inside of the lower portion of said outer shell and spaced inwardly therefrom, means connecting together the lower portions of said two shells thereby forming an annular water-leg surrounding said fire-box, an upwardly-rearwardly-inclined top-wall for said fire-box, a boxing conforming to and occupying said outer shell opening and extending both inside of the boiler and outside thereof, a portion of said boxing wall conforming to and secured to said inner shell and secured to said outer shell, first and second apertured tube-sheets in said boxing, a smoke-box at the front of the outer shell having an apertured tube-sheet, a lower group of tubes occupying apertures in said first tube-sheet and said smoke-box tube-sheet, an

upper group of tubes occupying apertures in said smoke-box tube-sheet and said second tube-sheet, the upper portion of said fire-box communicating with the interior of said boxing to the rear of said lower group of tubes, a removable cover for the back of said boxing, and a refractory-block in front of said cover and having a curved inner surface conforming to the curvature of said inner shell and with which the hot gases from the fire-box contact before they pass forwardly through the lower group of tubes.

3. In a boiler, the combination of an outer shell having an opening through its rear portion and a top-wall, a shorter smaller fire-box shell inside of the lower portion of said outer shell and spaced inwardly therefrom, the upper rear part of said inner shell being cut away, means connecting together the lower portions of said two shells thereby forming a water-leg surrounding said fire-box, an upwardly-rearwardly-inclined domed top-wall for said fire-box and at least partially above the top edge of said inner shell, a boxing occupying and conforming to said outer shell opening and extending inside of the boiler, a lower wall of said boxing conforming to and secured to said inner shell and secured to said outer shell, the inner part of the lower portion of said boxing having a first apertured tube-sheet recessed in its lower portion to receive and secured to the rear part of said fire-box top-wall, the upper portion of said boxing having a second apertured tube-sheet, a cross-wall connecting the top portion of said first tube-sheet with the lower portion of said second tube-sheet, a smoke-box at the front of the outer shell having an apertured tube-sheet, a lower group of tubes occupying the apertures in said first tube-sheet and in said smoke-box tube-sheet, an upper group of tubes occupying apertures in said smoke-box tube-sheet and in said second tube-sheet, a removable-cover for the back of said boxing, and a refractory-block demountably secured to said cover and having an inner surface conforming to the outer surface of said inner

shell and another surface beneath and conforming to said cross-wall preventing the gases from passing from the lower part to the upper part of said boxing without flowing through said groups of tubes.

4. In a boiler, the combination of an outer shell having an opening through its rear portion and a top-wall, a shorter smaller fire-box shell inside of the lower portion of said outer shell and spaced inwardly therefrom, means connecting together the lower portions of said two shells thereby forming a water-leg surrounding said fire-box, an upwardly-rearwardly-inclined top-wall for said fire-box, a boxing occupying and conforming to said outer shell opening and extending inside of the boiler, a lower wall of said boxing conforming to and secured to said inner shell and secured to said outer shell, the lower portion of said boxing in the boiler having a first apertured tube-sheet, the upper portion of said boxing having a second apertured tube-sheet, a cross-wall connecting the top portion of said first tube-sheet with the lower portion of said second tube-sheet, a smoke-box at the front of said outer shell having an apertured tube-sheet, a lower group of tubes occupying the apertures in said first tube-sheet and in said smoke-box tube-sheet, an upper group of tubes occupying apertures in said smoke-box tube-sheet and in said second tube-sheet, a removable-cover for the back of said boxing, and a demountable refractory-block in front of and protecting said cover, said fire-box at its rear upper portion communicating with the interior of said boxing to the rear of said first group of tubes and in front of said refractory-block, said refractory-block having an inner surface conforming to the outer surface of said inner shell and another surface beneath and conforming to said cross-wall preventing the gases from passing from the lower part to the upper part of said boxing without flowing through said groups of tubes.

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