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R. G. FISHER  
STEAM BOILER

2,544,013

Filed Oct. 10, 1949

2 Sheets-Sheet 1

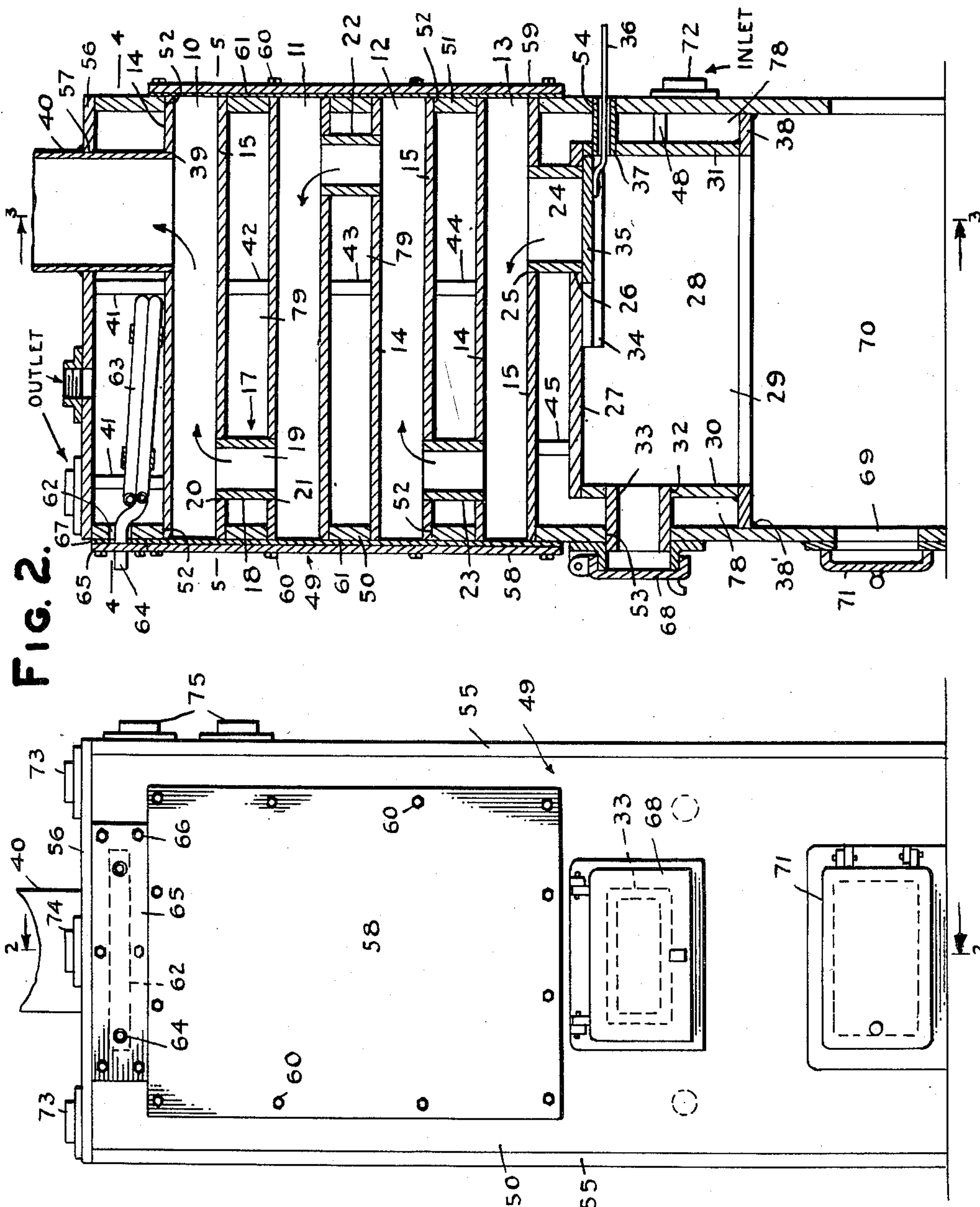


FIG. 1.

Inventor  
ROBERT G. FISHER

By

*Robert G. Fisher*

ATTORNEY

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2 Sheets-Sheet 2

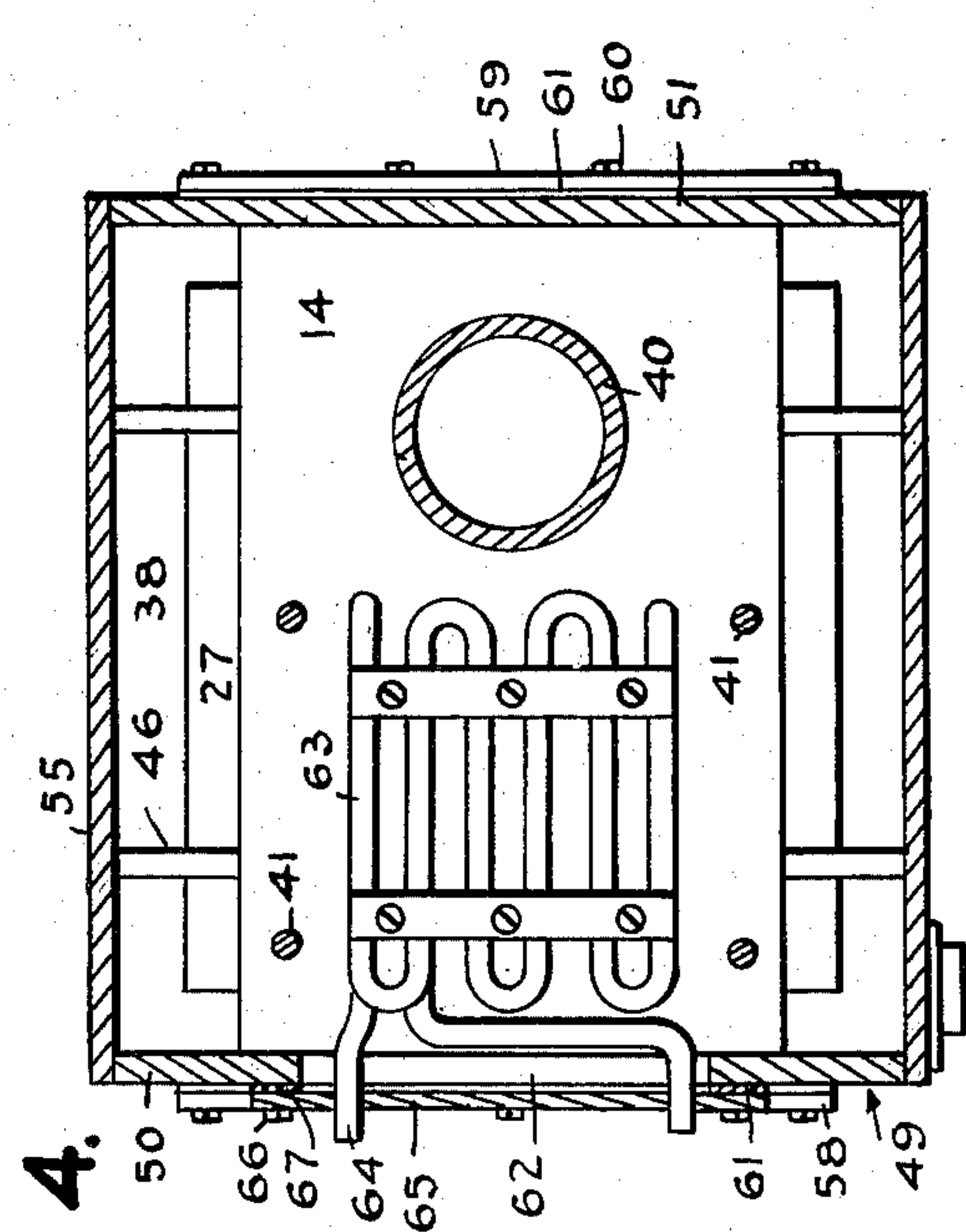


FIG. 4.

FIG. 5.

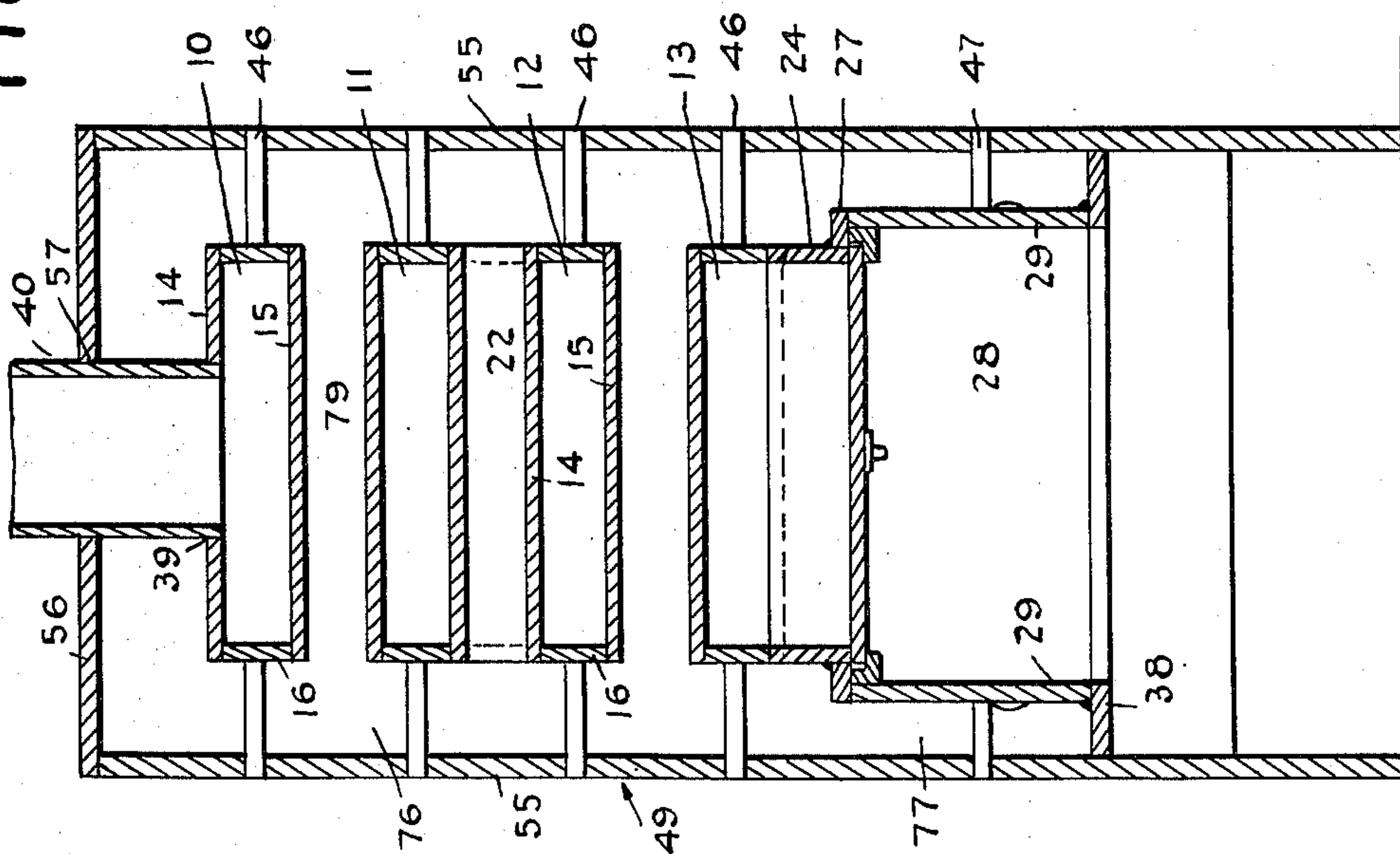
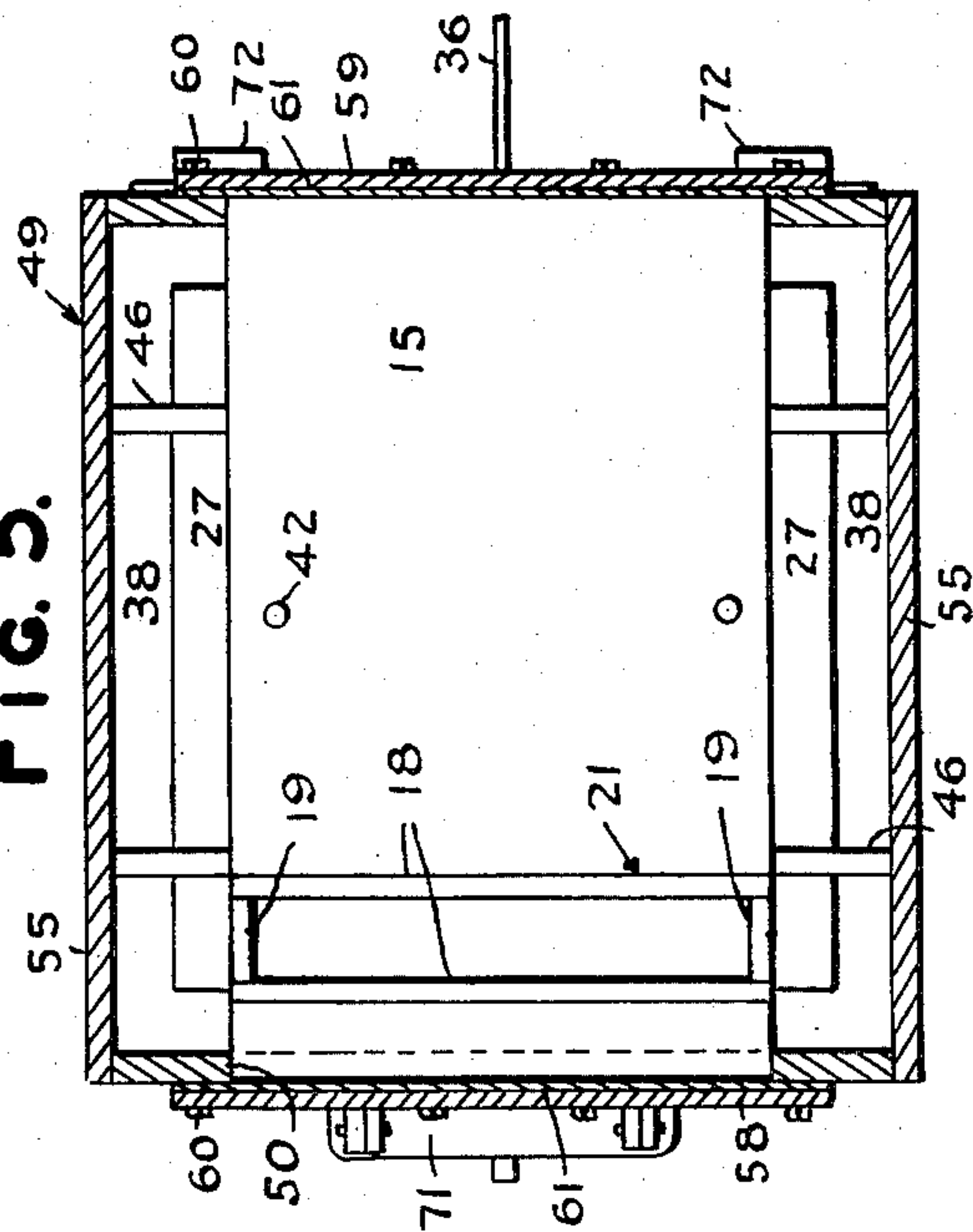


FIG. 3.

Inventor  
ROBERT G. FISHER

By

*Robert G. Fisher*

ATTORNEY



## UNITED STATES PATENT OFFICE

2,544,013

## STEAM BOILER

Robert G. Fisher, Coplay, Pa.

Application October 10, 1949, Serial No. 120,561

2 Claims. (Cl. 122—214)

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My invention relates to steam boilers.

An important object of the invention is to provide a boiler which may be formed of sheet metal plates welded together, in assembled relation, to produce the desired unit.

A further object of the invention is to provide an arrangement of flues, which is highly simplified, and will produce the maximum heat exchange.

A further object of the invention is to provide means whereby free access may be had to the flues for a quick and convenient cleaning of the same.

A further object of the invention is to provide a boiler of the above mentioned character which is well adapted to be used as a relatively small unit, for household purposes or the like.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this application, and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a front elevation of a boiler embodying my invention,

Figure 2 is a vertical section, taken on line 2—2 of Figure 1,

Figure 3 is a vertical section, taken on line 3—3 of Figure 2,

Figure 4 is a horizontal section, taken on line 4—4 of Figure 2, and

Figure 5 is a horizontal section, taken on line 5—5 of Figure 2.

In the drawings, the numerals 10, 11, 12, and 13 designate horizontal flues, which are much wider than tall and are rectangular in transverse vertical section and longitudinal vertical section. Each flue embodies a horizontal top 14 and bottom 15, formed of sheet metal and vertical sides 16, and these parts are secured together by welding to form a gas-tight joint. The top flue 10, near its forward end, is connected with the next lower flue 11, by a vertical riser 17, extending transversely of these flues throughout their entire width. This riser includes sides 18 and ends 19. The riser is open at its top and bottom and the top of the riser is inserted within an opening 20 formed in the bottom 15 of the flue 10. The lower end of the riser is inserted within an opening 21 formed in the top 14 of the flue 11. These parts are welded together to form a gas-tight joint. The numeral 22 designates a vertical riser identical with the riser 17, and connecting the bottom 15 of the flue 11 with the top 14 of the flue 12, and disposed adjacent to the rear ends

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of these flues. The numeral 23 designates a vertical riser which is identical with the riser 17 and connects the bottom 15 of the flue 12 with the top 14 of the flue 13. The numeral 24 designates a vertical riser which is identical with the riser 17, except that it is wider. The riser 24 has its top mounted within an opening 25 formed in the bottom 15 of the flue 13 and the lower end of this riser is mounted in an opening 26, formed in the horizontal crown plate 27 of a firebox 28. This firebox includes the crown plate 27, sides 29, a front plate 30 and rear end plate 31, these parts being welded together to form a gas-tight joint. The bottom of the firebox 28 is open, as shown. All of the risers are welded in place within their openings to form a gas-tight joint. The riser 24 is near the rear end of the flue 13. It is thus seen that the products of combustion will pass from the firebox 28 and pass upwardly into the successive horizontally arranged flues, and travel longitudinally within the successive flues in opposite directions. The front end 30 of the firebox has an opening 32 to receive a tube 33, welded in place to form a gas-tight joint. This tube is rectangular in vertical section and is horizontally elongated. Arranged beneath the crown plate 27 and rigidly secured thereto by welding or the like are horizontal tracks 34, disposed inwardly of the sides 29. These tracks slidably receive an adjustable damper 35 which may be moved to positions for covering the bore of the riser 24, thus regulating the draft from the firebox. This damper may be moved by any suitable means, and I have shown a rod 36 secured to the same, slidable within the tube 37, mounted within an opening formed in the rear end 31. The rod 36 may extend to the exterior of the boiler. A horizontal flange 38 is welded to the bottom of the firebox 28, as shown. The top 14 of the flue 10 has an opening 39 formed therein, near its rear end for receiving an outlet pipe or pipe coupling 40, welded within the opening 39 to form a gas-tight joint. The top 14 of the flue 10 has vertical stay rods 41 welded thereto. Vertical stay rods 42 are arranged between the bottom 15 of the flue 10 and the top 14 of the fire tube 11 and are welded to the same. Vertical stay rods 43 are welded to the bottom 15 of the flue 11 and the top 14 of the fire tube 12; vertical stay rods 44 are welded to the bottom 15 of the flue 12 and the top 14 of the flue 13; and vertical stay rods 45 are welded to the bottom 15 of the flue 13 and the crown plates 27. It is obvious that these stay rods and risers securely and permanently connect the horizontally arranged flues and firebox, which constitutes



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a unit. Horizontal stay rods 46 are welded to the sides of all of the flues, and horizontal stay rods 47 are welded to the sides 29 of the firebox 28. Horizontal stay rods 48 are welded to the end 31 of the firebox, Figure 2.

The numeral 49 designates the main casing or shell of the boiler, which is shown as vertical, and rectangular in vertical and horizontal cross section. This casing comprises a forward sheet metal plate 50 and a rear sheet metal plate 51. These plates 50 and 51 have pairs of oppositely arranged horizontal openings 52, formed therein, for receiving the ends of the flues, 10 to 13 inclusive, which are welded within these openings to form a gas-tight joint. The plate 50 has an opening 53 for receiving the tube 33 which may be welded therein to form a gas-tight joint, and the plate 51 has an opening 54 formed therein to receive the tube 37. In assembling the boiler, the plates 50 and 51 are first applied to the ends of the flues 10 to 13 inclusive, and these parts welded together. The tube 33 and tube 37 extend into their openings and are welded in place. The opposite ends of the flues 10 to 13 inclusive are open and these open ends are substantially flush with the outer faces of the plates 50 and 51. The stay rods 48 are also welded to the plate 51, Figure 2. With the parts thus assembled the side plates 55 may be next applied to the edges of the front and rear plates 50 and 51 and will be welded to the same. A top plate 56 is provided having an opening 57 to receive the pipe 40 and this top plate is welded to the front and rear plates and side plates. All of these plates are formed of sheet metal. The top plate 56 is welded to the stay rods 41 and the side plates 55 are welded to the horizontal stay rods 46 and 47. The flange 38 is welded to the main casing, as shown at 38'.

The numerals 58 and 59 designate front and rear removable sheet metal plates, which are arranged to cover the open ends of the flues 10 to 13 inclusive, and these plates are held in position by removable bolts 60. Arranged between the plates 58 and 59 and the plates 50 and 51, respectively, are sheets of packing material 61, such as asbestos sheets. These sheets are preferably of the same dimensions as the metal plates 58 and 59. When the bolts 60 are screwed up, the packing sheets 61 are pressed against the ends of the flues 10 to 13 inclusive, forming a gas-tight joint between such ends and the removable plates 58 and 59.

The front plate 50 is shown as provided with a horizontal slot 62 for the passage of a hot water coil 63, which may rest upon the top 14 of the flue 10. The ends 64 of this hot water coil pass through openings formed in a plate 65, arranged upon the front plate 50 and detachably secured thereby by bolts 66. A suitable packing sheet 67 is disposed inwardly of the plate 65.

The front plate 50 is equipped with a vertically swinging door 68, to cover the tube 33. The front plate is also equipped with an opening 69 which leads into a compartment 70 which may serve as an ash pit. The opening 69 is covered by a horizontally swinging door 71.

The numeral 72 designates inlet couplings, secured to the rear plate 51 near its lower end. Secured to the top plate 56 are tubular outlet couplings 73, arranged near the front plate 50. A tubular outlet coupling 74 is also mounted upon the top plate 56 near and between the tubular coupling 73 and may be used for connecting a pressure gauge with the main casing. Vertically

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spaced tubular couplings 75 are mounted upon one side plate 55 near its top, for connection with a water gauge. The tubular couplings 72, 73, and 75 are identical with the tubular coupling 74.

As clearly shown in Figure 3, the sides of the flues are spaced from the side plates 55 of the main casing, providing vertical passages 76 for the water, and there are side passages 77, outwardly of and adjacent to the sides 29, and in communication with the passages 76. The ends of the firebox 28 are spaced from the front plate 50 and rear plate 51 providing water passages 78. There are horizontal water passages 79 between the flues which are in free communication with the passages 76.

I contemplate using the boiler in connection with an oil burner, of any well-known or preferred type. The boiler may also employ coal as fuel, in which event a suitable grate, not shown, would be positioned at the bottom of the firebox. Since oil burning units and grates for coal are well-known, the same have not been shown.

The water is introduced into the passages of the main outer casing between it and the flues, by feeding the water through the inlet couplings 72. The steam may be withdrawn from the outlet couplings 73. The flues provide a large heat-exchange area, and the boiler has a high degree of efficiency in operation. The flues may be readily cleaned by removing the plates 58 and 59, and since they are straight and open at both ends, a brush or other implement may be conveniently manipulated in cleaning the flues.

While I have shown the flues horizontally arranged, yet they may be arranged vertically. The boiler is well adapted for use as a small household unit, but may be embodied in any size boiler. The apparatus is of simple construction.

It is to be understood that the form of my invention herewith shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

Having described my invention, I claim:

1. A boiler comprising a main rectangular casing including a pair of opposed side plates having transversely elongated rectangular openings extending for the major portion of the width of the side plates, a plurality of vertically spaced rectangular flues extending between the side plates, each flue being transversely elongated and extending for the major portion of the width of the side plates, the opposite ends of the flues being open and mounted within the rectangular openings of the side plates, a unitary common cover plate mounted upon each side plate and completely covering all of the adjacent open ends of the flues, each common cover plate extending for the major portion of the width of the adjacent side plate, conduit means connecting the flues in series, and a second opposed pair of side plates connected with the first-named side plates and forming therewith a water chamber surrounding the flues.

2. A boiler comprising a main casing including a pair of opposed side plates having transversely elongated openings extending for the major portion of the width of the side plates, a plurality of vertically spaced flues extending between the side plates, each flue being transversely elongated and extending for the major



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portion of the width of the side plates, the opposite ends of the flues being open and mounted within the openings of the side plates, a unitary substantially flat common cover plate mounted upon each side plate adjacent to the open ends of the flues and completely covering all of the open ends, risers connecting the vertically spaced flues in series, a second pair of side plates connected with the first-named side plates and forming therewith a water chamber surrounding the flues, and a fire box arranged within the main casing below the lowermost flues and communicating with such flue, the fire box being spaced from the first and second named side plates of the main

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casing for forming a water chamber surrounding the fire box.

ROBERT G. FISHER.

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