

May 9, 1933.

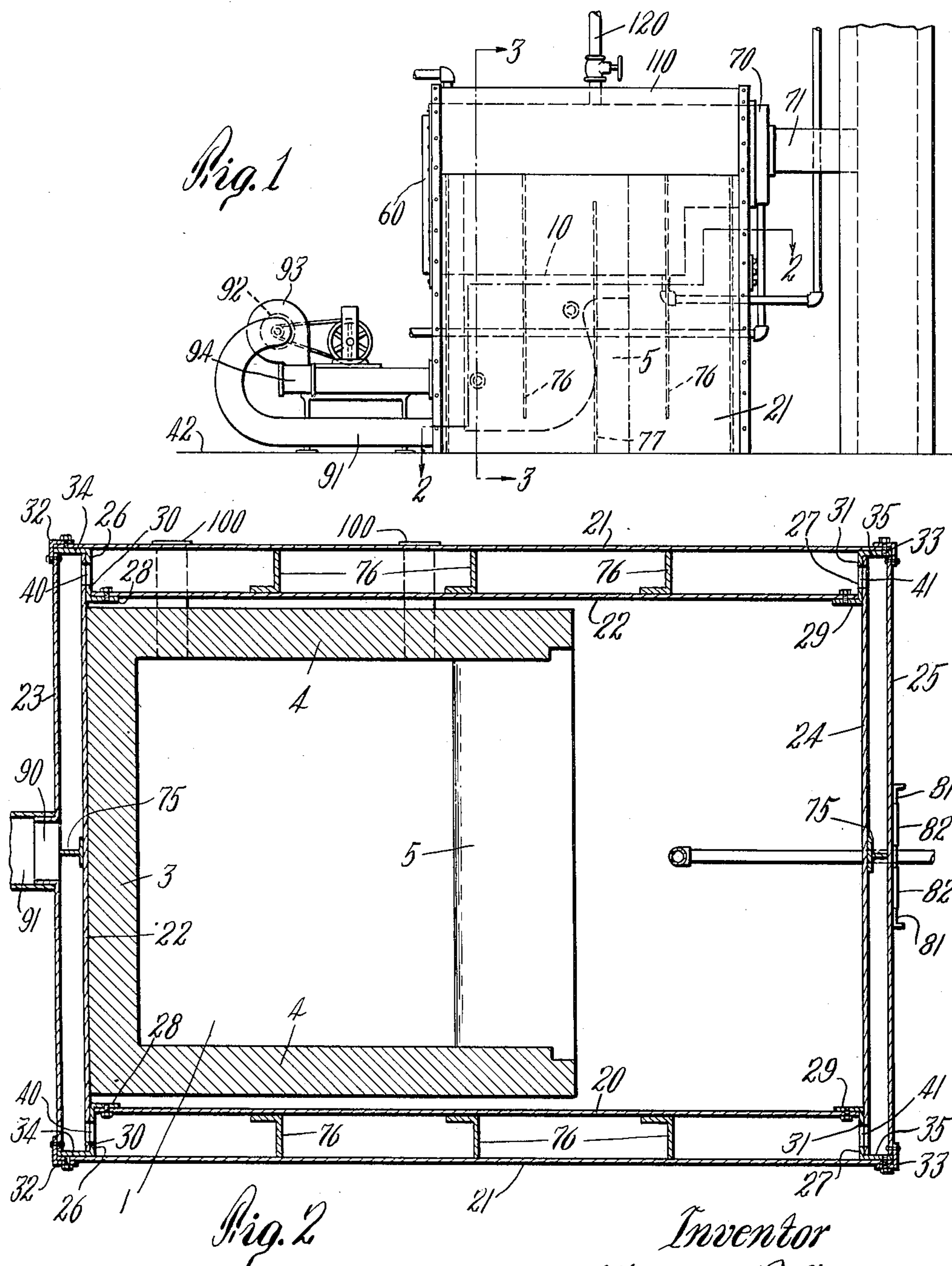
W. B. SIMMONS

1,908,547

BOILER

Filed July 29, 1931

4 Sheets--Sheet 1



May 9, 1933.

W. B. SIMMONS

1,908,547

BOILER

Filed July 29, 1931

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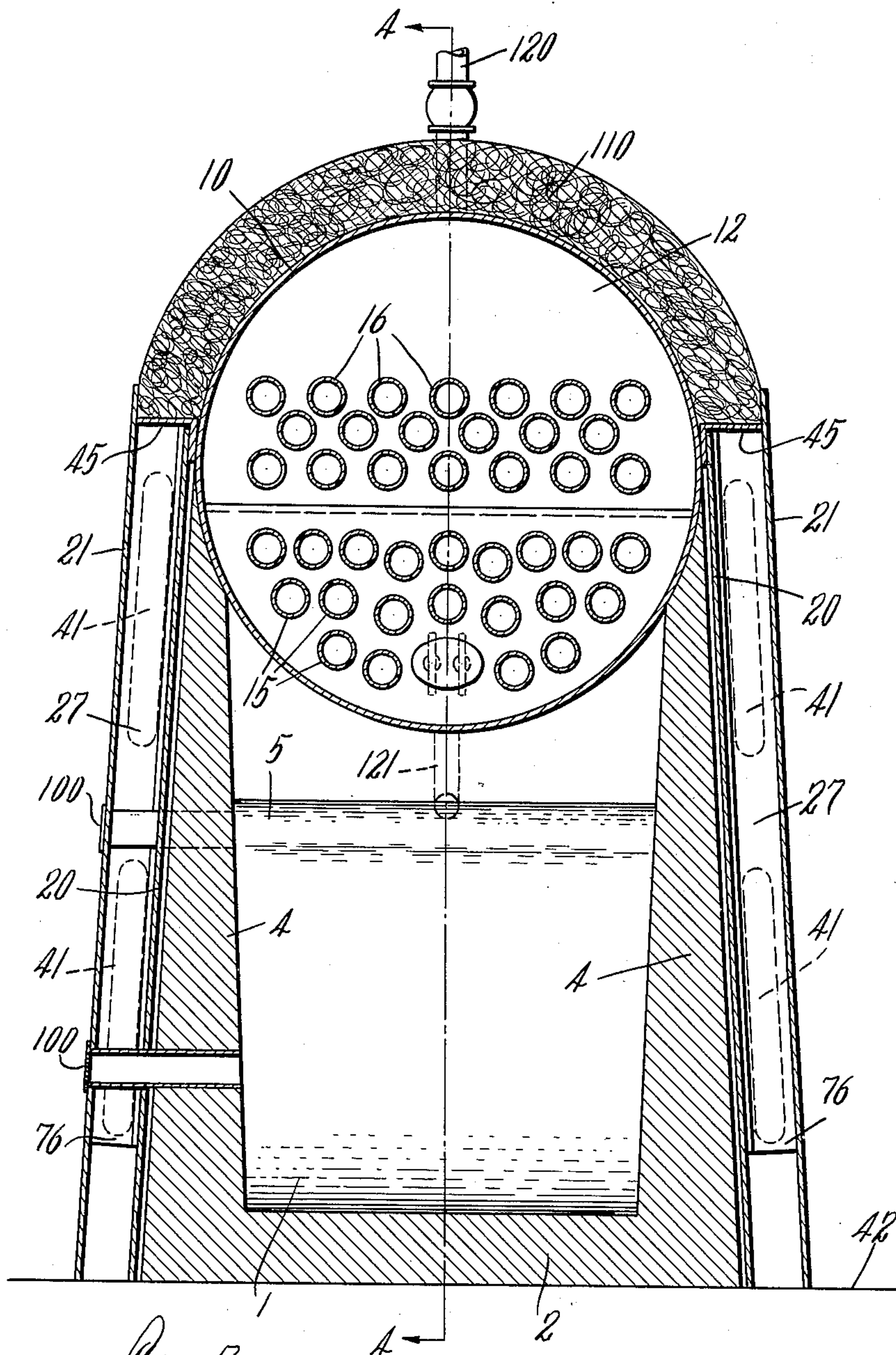


Fig. 3

Inventor
William B. Simmons
by Wright Brown & Company
Attys

May 9, 1933.

W. B. SIMMONS

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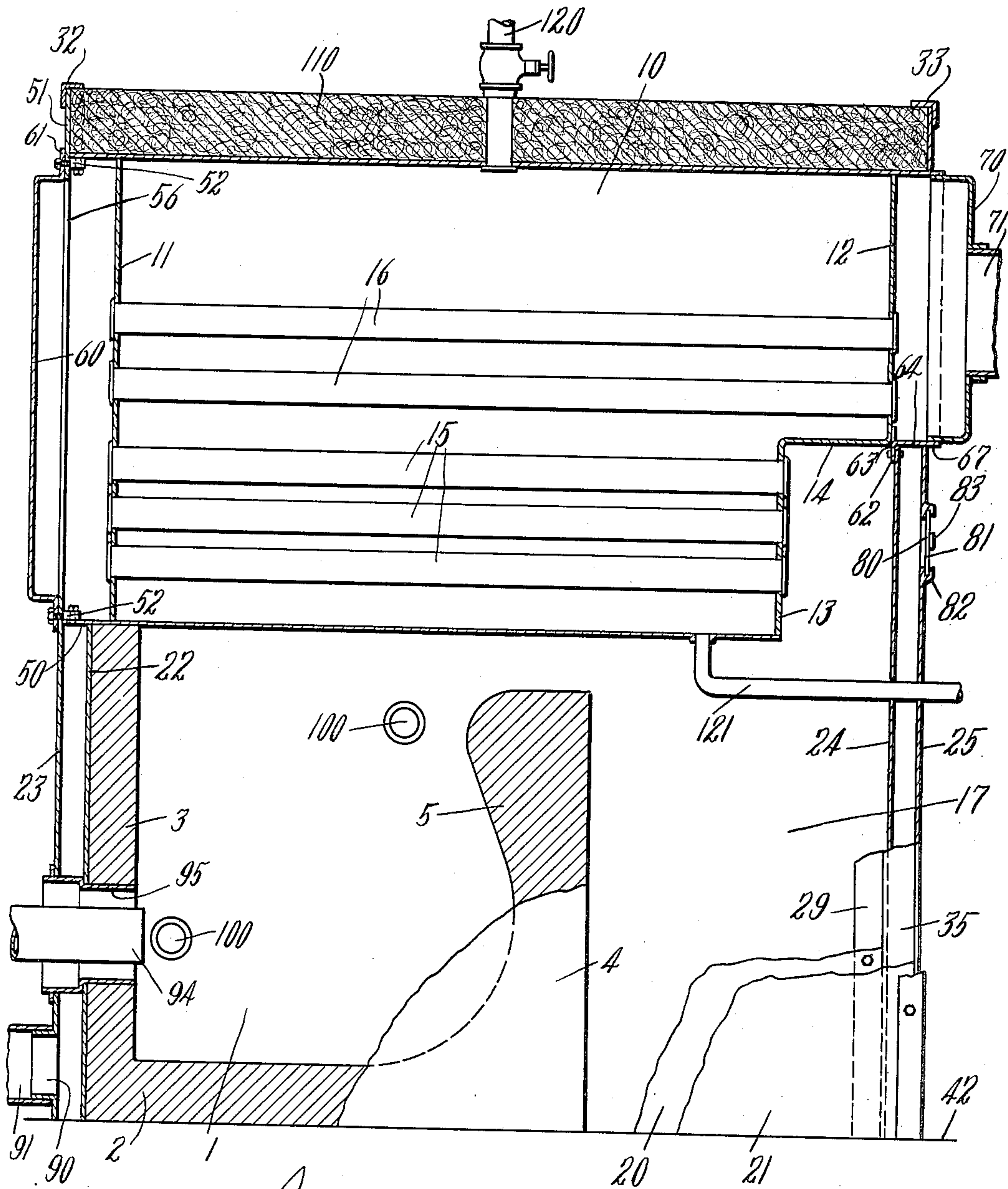


Fig. 4

Inventor
William B. Simmons
by Wright Brown Finley May
Atty's

May 9, 1933.

W. B. SIMMONS

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4 Sheets-Sheet 4

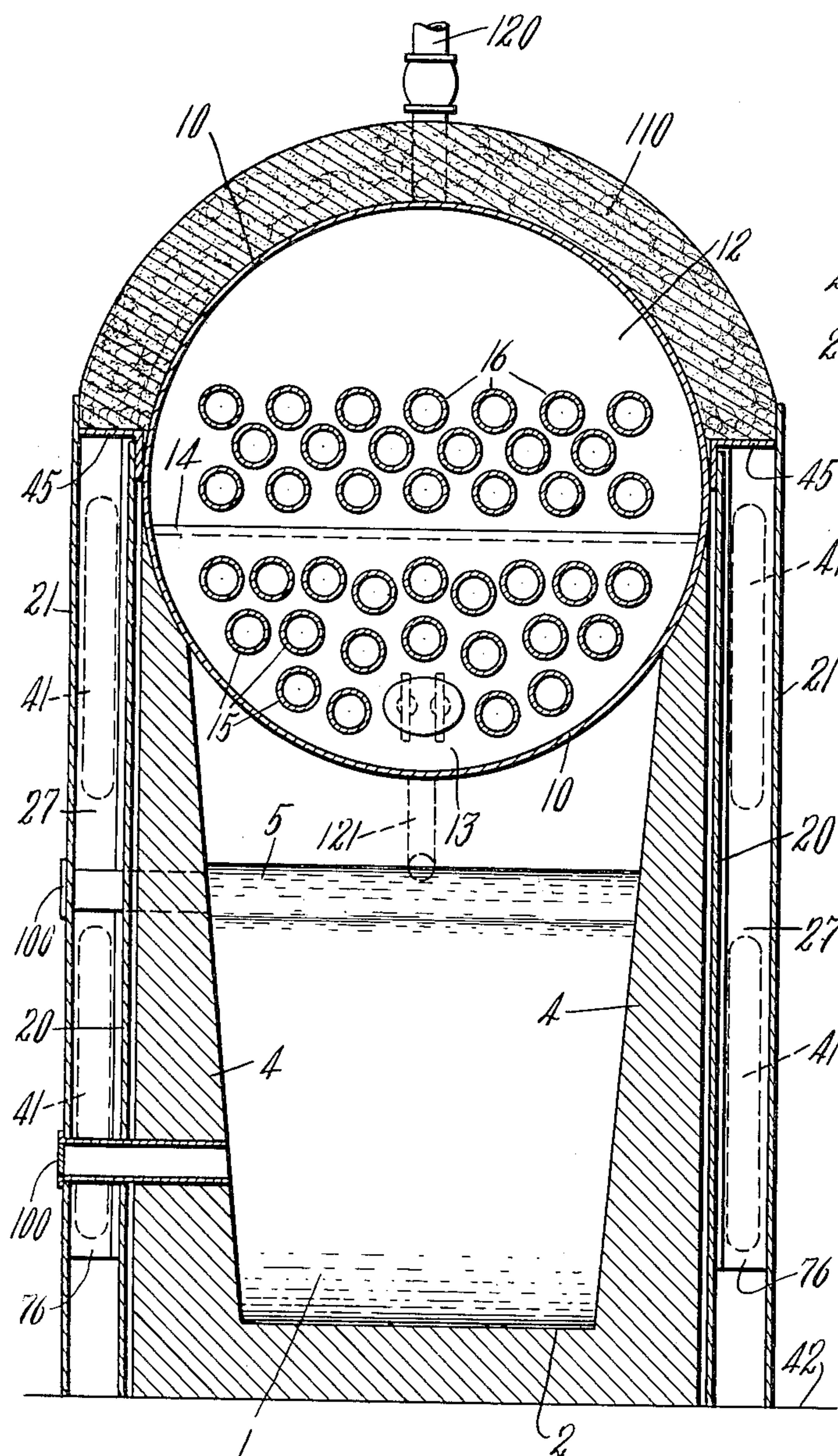


Fig. 5

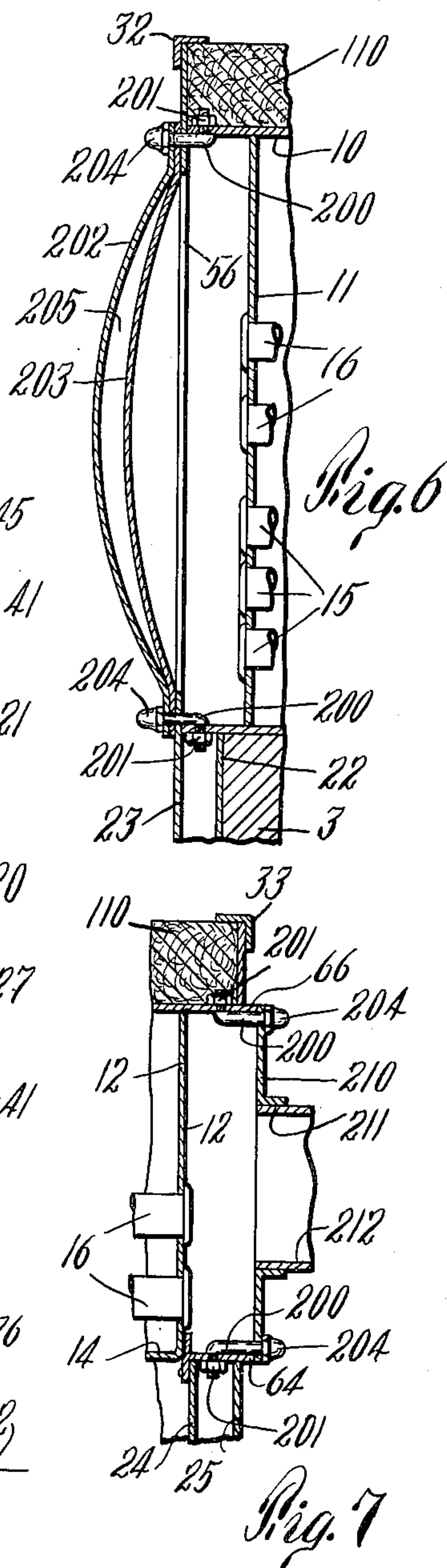


Fig. 7

Inventor
William B. Simmons
by Wright Brown Quincy & May,
Attys

UNITED STATES PATENT OFFICE

WILLIAM B. SIMMONS, OF BENNINGTON, VERMONT, ASSIGNOR TO WILLIAM B. SIMMONS, HERMAN McC. SIMMONS, AND FREDERICK M. SIMMONS, COPARTNERS DOING BUSINESS UNDER THE FIRM NAME OF H. C. SIMMONS' SONS, OF NORTH BENNINGTON, VERMONT

BOILER

Application filed July 29, 1931. Serial No. 553,728.

This invention relates to boilers of a type particularly suitable for house heating and for use with fluid fuel though many features are capable of more general application. One object is to produce a boiler which may utilize such fuel with marked efficiency.

To this end the metal walls through which the heat interchange takes place between the hot gases and the water are made of thin highly conductive sheet material and are so relatively disposed as to properly receive heat from the hot combustion gases and that radiated from the combustion chamber walls. Means are also provided by which pre-heated air in regulatable quantities is supplied to the burner, the heat for such pre-heating being derived from the side walls of the combustion chamber where the heat is not too intense and where it does not decrease the efficiency of heat interchange with the boiler. Moreover, this air during its pre-heating, acts as a heat insulating covering for the side portion of the combustion chamber, so that if desired the usual insulating lagging may be dispensed with at these portions of the heater.

This application is a continuation in part of my application Serial No. 310,299 for Fluid fuel burning heater, filed October 4, 1928.

For a more complete understanding of this invention, reference may be had to the accompanying drawings in which

Figure 1 is a side elevation of a boiler embodying this invention.

Figures 2 and 3 are sections to a larger scale on lines 2—2 and 3—3, respectively, of Figure 1.

Figure 4 is a section on line 4—4 of Figure 3.

Figure 5 is a view similar to Figure 3, but showing a modified construction.

Figures 6 and 7 are detail sections at the front and rear ends of the boiler shell, respectively, showing further modifications.

Referring first to the construction shown in these figures a combustion chamber 1 is formed by means of suitable heat resistant bottom, front and side walls 2, 3, and 4, respectively, and a bridge wall 5. The top

of the combustion chamber is formed by a heating surface of the heat interchange member of the heater shown in these figures as a fire tube boiler drum 10. This drum is provided with a front flat tube sheet 11, and a back tube sheet comprising upper and lower vertical wall portions 12 and 13 and an intermediate horizontal portion 14. These tube sheets may be welded about their edges to the wall of the drum. A lower set of fire tubes 15 extends between the front tube sheet 11 and the lower portion 13 of the rear tube sheet which is inwardly of the portion 12, and an upper set of fire tubes 16 extends from the front tube sheet 11 to the upper portion of the rear tube sheet 12. The portion 14 of the rear tube sheet forms a top wall of the back connection 17 of the boiler, back of the bridge wall 5, and presents a heat interchange surface as a roof for the back connection back of the rear ends of the fire tubes 15, thus to provide heat interchange surfaces for the boiler where the hot gases from the back connections are most effective in transferring heat thereto. Heat transfer surfaces are provided, it will be noted, for the entire top portion of both the combustion chamber and the back connection in the best possible position to receive heat from the hot gases and that radiated from the interior walls of the combustion chamber. The boiler shell itself may be made of relatively thin sheet metal which permits relatively rapid heat transfer to the water in the boiler.

The front and sides of the combustion chamber and the sides and rear of the back connection are formed with double walls which act not only as a heat insulation to prevent loss of heat through the side portions of the heater, but also serve as pre-heating passages for air which may be drawn therethrough, as will later appear, and be delivered into the combustion chamber. As shown, these double walls are formed of inner and outer plate members, the side walls being formed by the inner plate members 20 and the outer plate members 21, the front wall being formed by an inner plate member 22 and an outer plate

member 23, and the rear wall being formed by an inner plate member 24 and an outer plate member 25. These wall members are connected together with these plates in suitably disposed angular relation and as shown this is accomplished by the use of Z bars, one pair of Z bars, as 26, being used for the connections between the side and front plates, and a similar pair of Z bars 27 being used to connect the side and rear plates. The front and rear edges of the inner side plate members 20 are fixed as by means of cap bolts to the inner flanges 28 and 29 of the Z bars 26 and 27. The inner front and back plates 22 and 24 are fixed as by rivets, welding or other permanent fastenings to the webs 30 and 31 of these Z bars. The outer front and back plates 23 and 25 have riveted or otherwise permanently fixed to their side margins, angles 32 and 33 by one flange, the other flange of each of these angles being turned to overlie the outer side plates 21, these overlying flanges and the side plates being fixed to the outer flanges 34 and 35 of the Z bars 26 and 27 as by means of cap bolts. By this construction it will be evident that the parts may be partially fixed together at the factory in condition to be readily assembled when the heater is being erected. In Figure 3 the double side walls are shown as more widely spaced at the lower ends than at their upper ends but if desired they may be arranged in parallel relation as shown in Figure 5.

The webs of the Z bars are perforated as at 40 and 41 to form communicating passages from one space to its adjacent space defined by the spaced wall members. The space between these wall members is closed off at its lower end by any suitable means, as, for example, by the cellar floor 42 on which the heater is placed. The upper edges of the side spaces are closed off as by means of the horizontal legs of angle members 45, the facing substantially vertical legs or flanges of which are secured to the drum 10. The inner front plate 22 extends to and conforms with the outer face of an extension 50 of the boiler drum 10 forwardly of the tube sheet 11. The outer front plate 23 extends across the end face of the drum 10 and extends outwardly to form a margin 51 about the upper portion of the drum of a width substantially equal to the thickness of the double side walls formed by the plates 20 and 21, as shown best in Figure 3. The side walls 4 of the combustion chamber taper, being thickest at their lower ends and thinnest at their upper edges where they are conformed to the contour of the sides of the shell 10. The front outer wall plate 23 is shown as provided with an opening 56 opposite to and concentric with the boiler drum 10 of sufficient size so that access may be had to the front ends

of the fire tubes 15 and 16 therethrough, and this opening is normally covered by a dished plate 60 having a marginal flange 61 which may be fixed as by nuts on suitable studs 52 fixed to the extension 50 of the drum 10 and extending through the front wall plate 23. The inner rear plate 24 as shown terminates at its upper end against and is fixed to a depending flange 62 of a T bar 63, the upper flange of which is fixed to the lower edge of the portion 12 of the end tube sheet as by welding thereto. The web 64 of this T bar extends outwardly and forms the lower wall of a rearward extension of the drum 10 back of the rear tube sheet 12 and it also extends to the outer back plate 25 and acts as a top closure for the space therebetween. The outer plate 25 is of the same peripheral configuration as the front outer wall plate 23 and has an opening therethrough to permit the rear end of the drum to extend therethrough and receive a suitable hood or thimble 70 connecting to the smoke pipe 71. It will thus be seen that the wall members form a jacket about the sides and rear of the heater closed at its upper and lower ends. Preferably this jacket is divided into a pair of air passages by an angle or T bar 75 fixed to the rear wall member 24 and projecting to the wall member 25 and if desired by a similar member fixed to the inner front wall 22 and projecting to the outer front plate 23.

It is preferable to position in the spaces between the inner and outer wall members baffles such as 76 and 77, these being shown as angle members, the baffles 76 terminating at their lower ends somewhat above the lower ends of their spaces and the baffles 77 terminating at their lower ends somewhat below the angles 45 so as to produce a zigzag course for the air through these spaces to prevent the possibility of uneven heating of the air.

The outer wall 25 is provided with suitable openings on either side of the partition 75 through which air may be drawn into the air passages. As shown in Figures 2 and 4 these openings as at 80 may be more or less closed off by dampers 81 so as to control the effective sizes of these openings independently for each of the air passages, thereby to control not only the amount of air which may be drawn therethrough, but the relative amounts which will pass on opposite sides of the combustion chamber. By this means the rate of flow and the amount of heating of the air and the cooling of opposite sides of the heater may be adjusted as desired and equalized. As shown the dampers 81 are mounted between horizontal guideways 82 so that adjustment of the sizes of the openings may be made readily. A stop 83 may be positioned between these slides to limit their movements toward each other.

The front outer wall 23 is provided with a discharge opening 90 which communicates with the space between the front walls 22 and 23 and if a partition is used between these spaced walls this opening communicates with the spaces on opposite sides thereof. This opening 90 is adapted to receive a pipe connection 91 to the intake side 92 of the blower 93 commonly employed as a part of the oil burner and by which the fuel is broken up or vaporized so as to condition it for combustion in the combustion chamber of the heater. The heated air is thus supplied to the burner in advance of conditioning of the oil, uniformly mixing with the oil and its heat aiding materially in the vaporization and conditioning of the oil for combustion. The pressure pipe of this blower is directed through the burner nozzle 94 which extends through a thimble 95 extending entirely through the front wall of the heater including the wall members 23, 22 and the combustion chamber wall 3. The usual sight tubes 100 may be placed through one of the side walls of the heater including the combustion furnace wall 4.

The outer side walls 21 are shown as extending slightly above the top angles 45 and these extensions form retaining means between the outer front and back plates 23 and 25 for the lower edges of a mass of heat insulating material 110 extending over the top of the boiler and between the outer front and back walls 23 and 25. The marginal angles 32 and 33 which form inwardly directed marginal flanges extend continuously about the upper edges of these outer plates 23 and 25, respectively, bridge across any cracks or spaces at the ends of this insulation 110 and present a good finished appearance. Preferably this mass of insulation is pre-formed so as to engage as a single block in proper position. The entire heater is thus enclosed in a non-conducting casing, the side and end portions of which are formed by the air passages between the spaced plate members and the top of which is formed by the insulation 110.

Of course it will be understood that a steam outlet as at 120, a return pipe 121 and the various attachments such as safety valves, gage glass, etc., which have not been here illustrated will be employed, preferably, however, the cover plate 60 being independent of any of these so that it may be removed at will without disturbing them.

Figure 6 shows a modified construction for the front end of the boiler shell. Referring to this figure, it will be noted that the forward extremity of the boiler shell 10 has extended through suitable holes therein angle studs 200 having securing nuts 201 threaded on their outer ends on the outer face of the shell 10. These angle studs have their other legs extended forwardly through

holes in the plate 23 and through domed or dished plate members 202 and 203 forwardly of which they are provided with ornamental cap nuts 204. Thus the plates 202 and 203 are secured in bridging relation over the opening 56 of the front plate 23. These cover plates 202 and 203 are shown as spaced apart at their intermediate portions, providing a dead air space 205 which tends to prevent the escape of heat to the outer air and to prevent the deposit of soot from sudden cooling of the combustion gases on the inner face of the plate 203.

In Figure 7 a modified construction for the rear end of the drum is illustrated. The extension 66 of the drum 10 rearwardly of the upper portion 12 of the rear tube sheet is perforated for the reception of angle studs 200 such as are shown in Figure 6 and likewise the horizontal member 64 which extends rearwardly from the horizontal portion 14 of the rear tube sheet is also provided with holes for similar angle studs 200. These angle studs have nuts 201 threaded on their outer ends outwardly of the drum 10 and the member 64. The horizontal legs of these bolts extend through the segmental shaped end plate 210 and have nuts 204 threaded on their outer ends to secure the plate 210 against the rear extremity of the drum 10 and the member 64. This plate 210 is provided with a flanged hole at 211 to receive the thimble 212 of the smoke pipe.

From the foregoing description of certain embodiments of this invention it should be evident to those skilled in the art that various other changes and modifications might be made without departing from the spirit or scope of this invention as defined by the appended claims.

I claim:

1. A heater comprising a drum for containing water and having fire tubes there-through, means for supporting said drum with its tubes substantially horizontal, said supporting means including a pair of spaced end walls, the inner of said walls having its upper edge terminating at said drum, and the outer of said walls extending across the end face of said drum and having an opening through which access may be had to the ends of said tubes, a cover for said opening spaced from said tube ends and having a marginal flange removably secured to said drum and outer wall around said opening, and insulating material extending over said drum and to the outer of said end walls.

2. A heater comprising a drum for containing water and having fire tubes there-through, means for supporting said drum with its tubes substantially horizontal, said supporting means including a pair of spaced end walls, the inner of said walls having its upper edge terminating at said drum, and the outer of said walls extending across the

- end face of said drum and having an opening through which access may be had to the ends of said tubes, a cover for said opening spaced from said tube ends and comprising
- 5 a pair of plate members secured to said outer wall around said opening and spaced apart inwardly thereof, and insulating material extending over said drum and to the outer of said end walls.
 - 10 3. A heater comprising a drum for containing water and having fire tubes there-through, means for supporting said drum with its tubes substantially horizontal, said supporting means including a pair of spaced
 - 15 end walls, the inner of said walls having its upper edge terminating at said drum, and the outer of said walls extending across the end face of said drum and having an opening through which access may be had to the
 - 20 ends of said tubes, a cover for said opening spaced from said tube ends, angle studs each having one end extending through said drum and the other extending through said outer wall and cover, and nuts on the ends of said
 - 25 studs for fixing said cover, outer end wall and drum together.
 4. A boiler comprising a boiler drum, angle members each having a flange secured to said drum, said angle members extending
 - 30 throughout the length of said drum, pairs of spaced walls between which said drum depends supporting the outer flanges of said angle members which members close the space between said walls, a combustion
 - 35 chamber between said walls, and an insulating covering extending over said drum and supported on said angle members.
 5. A boiler comprising side walls each comprising spaced wall members, an angle
 - 40 having a horizontal flange bridging the space between said wall members of each wall, said angles having their vertical flanges facing each other, a boiler drum extending between said walls and secured to said vertical
 - 45 flanges, said horizontal flanges extending the full length of said drum, and an insulating covering over the top of said drum and resting at its edges on said horizontal flanges.
 - 50 6. A boiler comprising walls including side walls each comprising spaced members forming air spaces therebetween, a combustion chamber between said walls, a boiler
 - 55 drum above said combustion chamber, flange members secured to opposite sides of said drum and supported on said side walls and closing off the upper ends of said spaces, and a heat insulating covering applied to the
 - 60 top of said drum with its lower edges supported on said flange members.
 7. A boiler comprising walls including side walls each comprising spaced members forming air spaces therebetween, a combustion chamber between said walls, a boiler
 - 65 drum above said combustion chamber, flange members secured to opposite sides of said drum supported on said side walls and closing off the upper ends of said spaces, and a heat insulating covering applied to the top of said drum with its lower edge supported on its flange members, the outer of said spaced members extending above said flange members outwardly of said covering.
 8. A heater comprising a double side wall enclosure defining an air jacket, a combustion chamber within said enclosure, a boiler forming the top of said enclosure, and a non-heat conductive covering for the top of said boiler having its lower edges resting on the upper edges of said air jacket, the outer wall of said jacket extending above the lower edge of said covering and engaging the outer face thereof.
 9. A boiler comprising walls including a back wall comprising inner and outer spaced
 - 85 plates, a boiler drum supported between said walls, said drum having front and rear tube sheets, the rear tube sheet having upper and lower vertical wall portions and an intermediate horizontal portion, the inner of said
 - 90 back wall plates being secured at its upper edge to the horizontal portion of said rear tube sheet, the outer of said back wall plates extending upwardly beyond said drum, a smoke connection to the rear end of said
 - 95 drum above said horizontal tube sheet portion and back of said outer wall plate, and a heat insulating covering for the top of said drum forwardly of the upward extension of said outer back wall plate.
 10. A boiler comprising side front and back walls each comprising spaced plate
 - 105 members, elements bridging the space between said side wall plate members, a boiler drum supported on said elements, the inner of said front and back wall plate members terminating at said drum and the outer of
 - 110 said front and back wall plate members extending across and beyond the ends of said drum, a combustion chamber beneath said drum and between said walls, and a heat insulating covering for the top of said drum supported at its side edges on said elements and extending between the extended portions
 - 115 of said outer front and back wall plate members.
 11. A boiler comprising side front and back walls each comprising spaced plate
 - 120 members, elements bridging the space between said side wall plate members, a boiler drum supported on said elements, the inner of said front and back wall plate members terminating at said drum and the outer of
 - 125 said front and back wall plate members extending across and beyond the ends of said drum, a combustion chamber beneath said drum and between said walls, and a heat insulating covering for the top of said drum supported at its side edges on said elements and extending between the extended portions
 - 130

of said outer front and back wall plate members, the outer side wall plate members extending above said elements and outwardly of the side edge portions of said covering.

- 5 12. A heater comprising a double side wall enclosure defining an air jacket, baffles in said side walls defining therewith a tortuous air passage in said jacket from back to front of each side wall, a combustion chamber
10 within said enclosure communicating with said air passages, a boiler forming the top of said enclosure, and a non-heat conducting covering for the top of said boiler having its lower edges resting on the upper edges of
15 said jacket, the outer wall of said jacket extending above the lower edge of said covering and engaging the outer face thereof.

In testimony whereof I have affixed my signature.

20 WILLIAM B. SIMMONS.

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