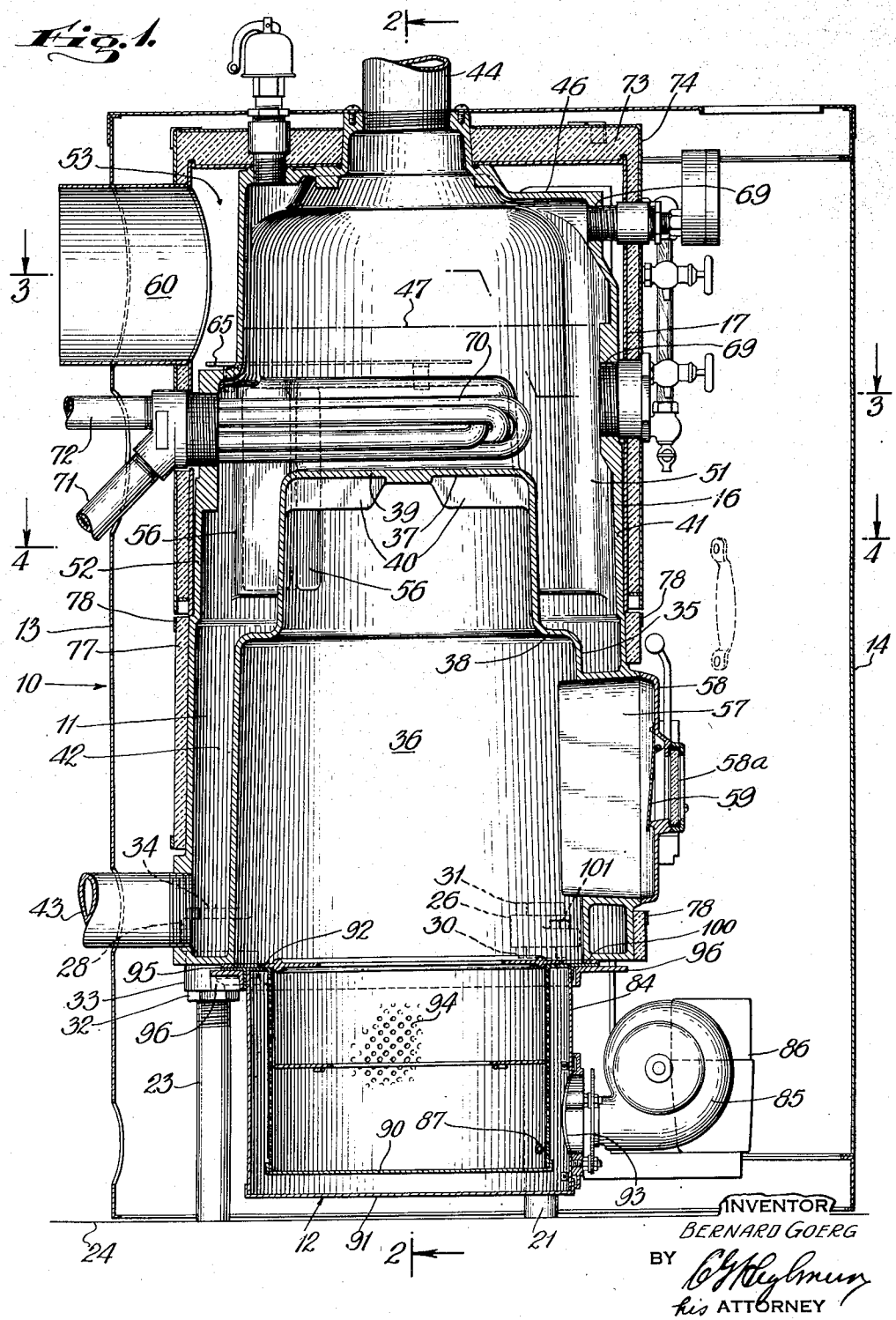
Jan. 9, 1940. B. GOERG 2,186,803

HEATING APPARATUS

Filed June 30, 1938 5 Sheets-Sheet 1

Fig. 1.

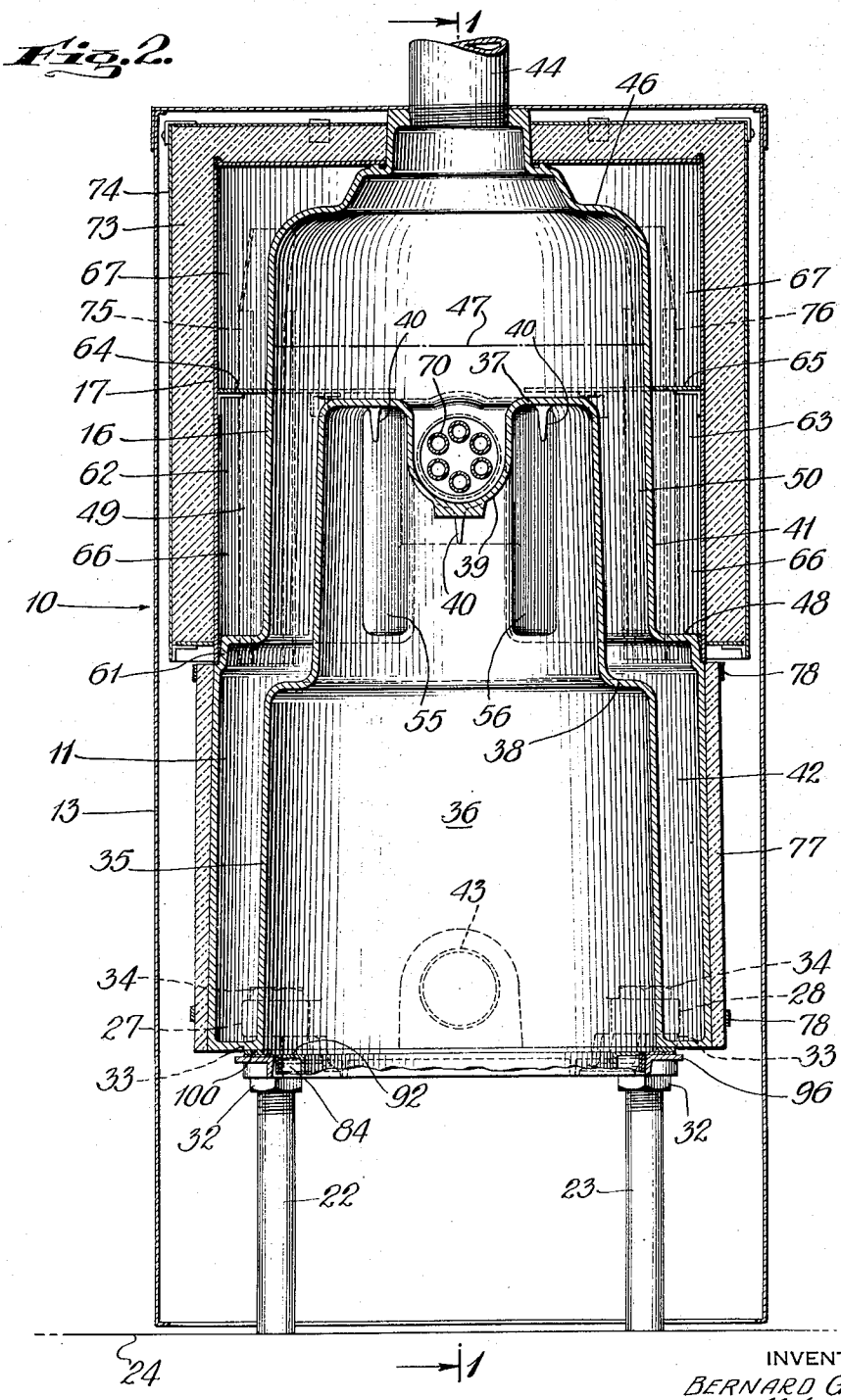


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Fig. 2.



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Fig. 3.

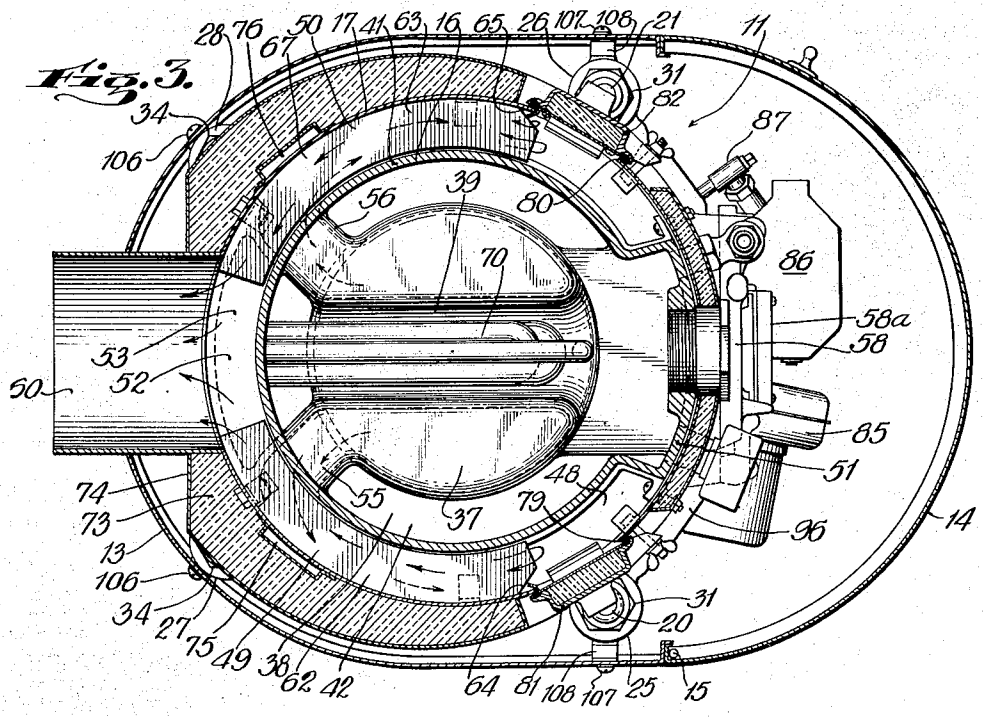
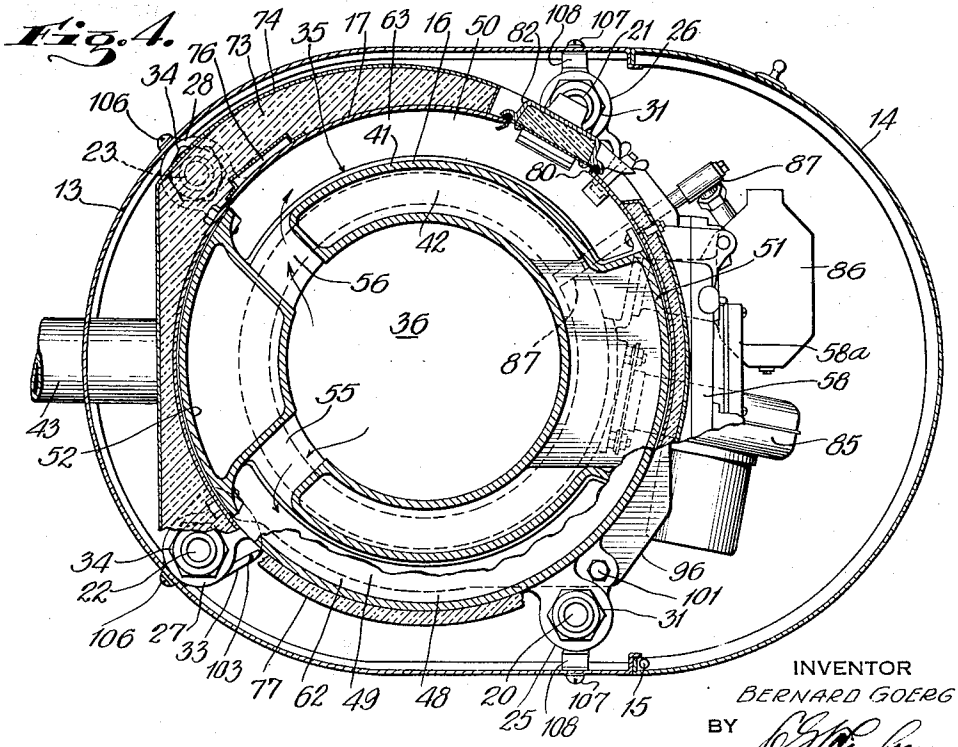


Fig. 4.



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Fig. 5.

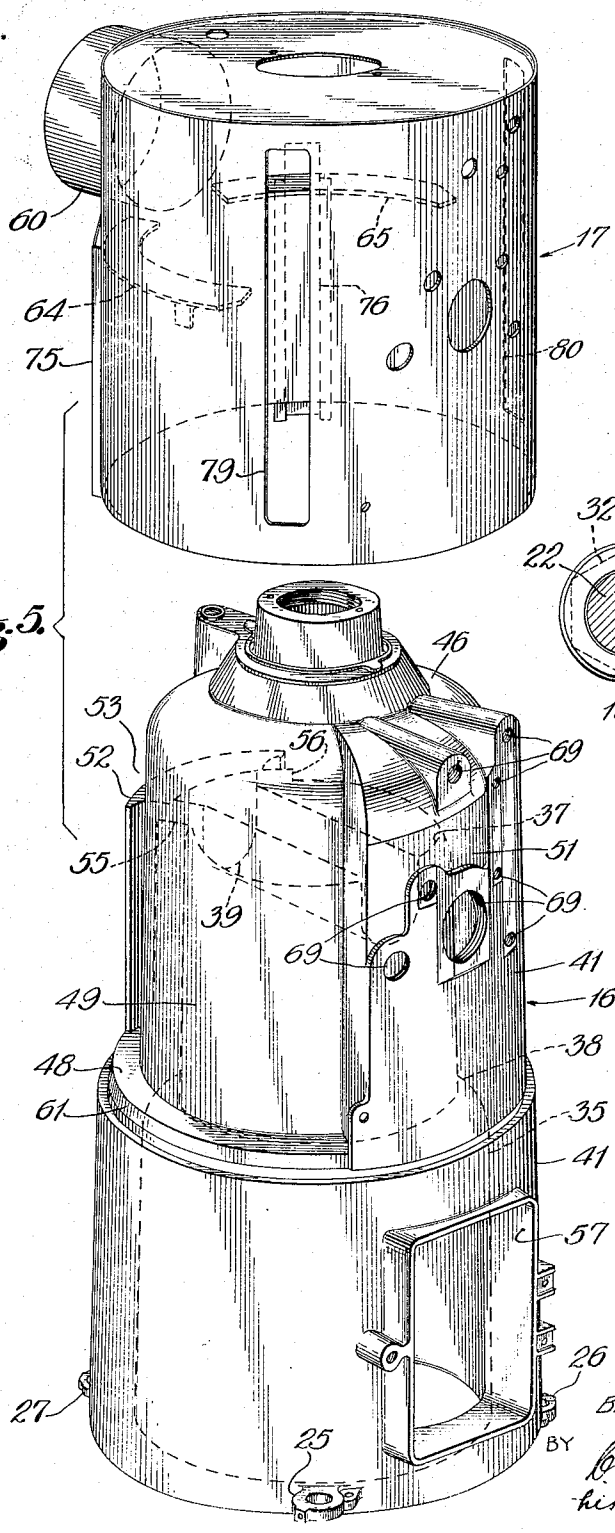
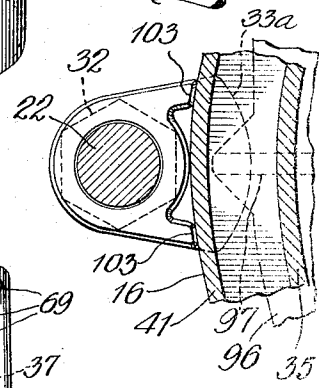


Fig. 9.



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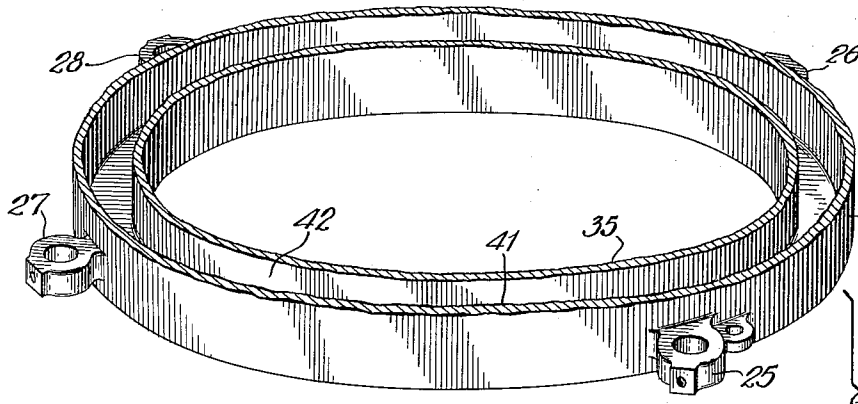


Fig. 6.

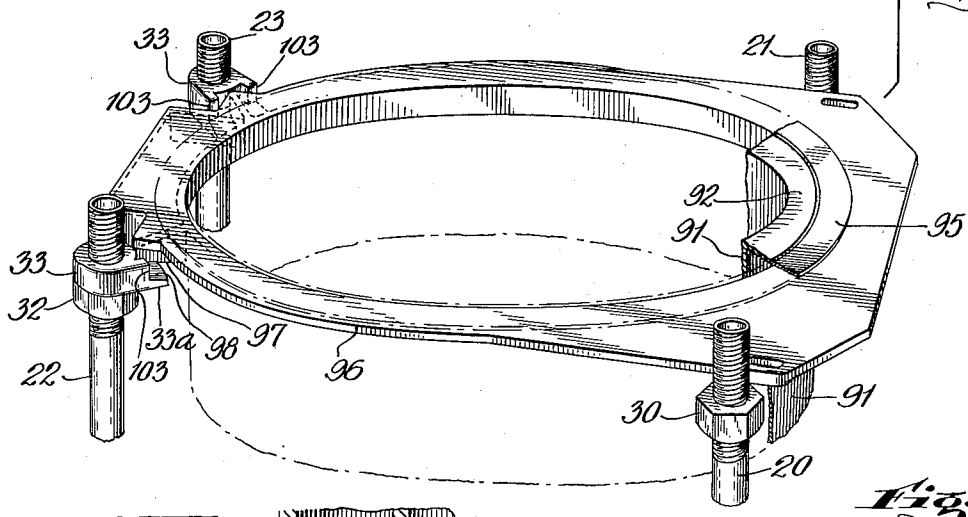


Fig. 8.

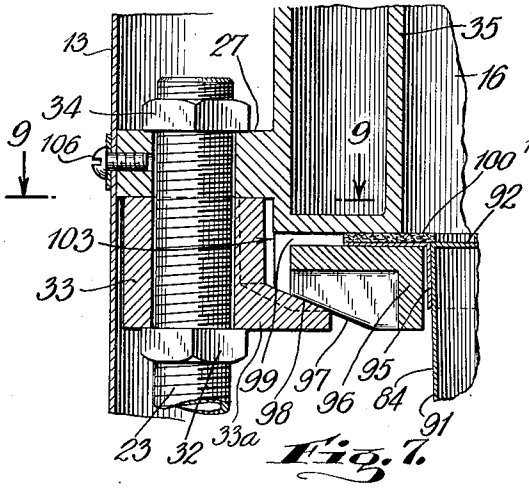
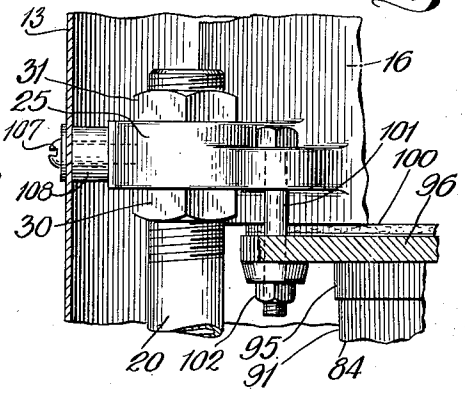


Fig. 7.



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Patented Jan. 9, 1940 2,186,803

UNITED STATES PATENT OFFICE

2,186,803

HEATING APPARATUS

Bernard Goerg, Scarsdale, N. Y., assignor, by mesne assignments, to American Radiator & Standard Sanitary Corporation, New York, N. Y., a corporation of Delaware

Application June 30, 1938, Serial No. 216,733

12 Claims. (Cl. 122—156)

My invention relates to heating apparatus and more particularly to boilers of the type suitable for heating small buildings such as dwelling houses and the like.

An object of my invention is to provide a boiler of the above type, which is simple and relatively inexpensive in construction and one which has a relatively large capacity for its size.

A further object is to provide a boiler-burner unit in which the boiler and burner are arranged and supported in assembled relation in an improved manner.

A still further object is to provide a complete boiler-burner unit compactly arranged within an enclosing jacket of neat and pleasing appearance and so constructed that the working parts thereof are readily accessible for inspection and repair.

The invention consists in the novel construction and combination of parts, to be more fully described hereinafter, and the novelty of whch will be particularly pointed out and distinctly claimed.

In the accompanying drawings, to be taken as a part of this specification, I have fully and clearly illustrated a preferred embodiment of my invention, in which drawings—

Fig. 1 is a vertical transverse sectional view taken through a boiler-burner unit constructed in accordance with one preferred embodiment of my invention, the section being taken on the line 1—1 of Fig. 2;

Fig. 2 is a vertical transverse sectional view taken on the line 2—2 of Fig. 1, and looking towards the rear of the boiler;

Fig. 3 is a horizontal plan section taken on the line 3—3 of Fig. 1;

Fig. 4 is a horizontal plan section taken on the line 4—4 of Fig. 1;

Fig. 5 is an exploded detail view illustrating in perspective the boiler casting with the steel enclosing cap therefor;

Fig. 6 is an exploded detail view illustrating in perspective the improved manner of supporting and assembling the boiler and the firing chamber, parts being broken away for the sake of clarity;

Fig. 7 is a fragmentary vertical section showing the manner in which the boiler, firing chamber, and enclosing jacket are secured together at the rear of the boiler;

Fig 8 is a fragmentary vertical section showing the manner in which the boiler, firing chamber and enclosing jacket are secured together at the front of the boiler; and

Fig. 9 is a fragmentary plan section on the line 9—9 of Fig. 7.

Referring now in detail to the construction illustrated, the reference numeral 10 indicates my improved boiler-burner unit in its entirety. The unit 10 comprises a boiler 11, a fluid-fuel burner apparatus 12, and an enclosing jacket 13. The jacket is preferably formed of sheet metal and includes a separate front section 14 hinged as indicated at 15 to the main body portion thereof so that the section 14 may be readily swung aside when it is desired to inspect, make adjustments or repair the parts of the burner and boiler.

The boiler 11 is here shown as being of the vertical round type and comprises a boiler part 16, a sheet metal cap 17 enclosing the upper part of the boiler part 16, and a supporting means for the boiler part including a plurality of spaced upright supporting posts 20, 21, 22 and 23. The posts rest at their lower ends on a foundation floor indicated at 24, and pass respectively at their upper ends through openings in spaced lugs 25, 26, 27 and 28 which are formed integral with and extend outwardly from the lower outer sides of the boiler part 16.

The posts 22 and 23 and lugs 27 and 28 are arranged at the rear of the boiler and the posts 20 and 21 and lugs 25 and 26 at the front of the boiler. The upper ends of the forward posts 20 and 21 are secured to their respective lugs 25 and 26 by supporting nuts 30 engaging the threaded upper portion of the posts 20 and 21 beneath the lugs 25 and 26 and by clamping nuts 31 engaging the threaded upper ends of the posts 20 and 21 above the lugs 25 and 26. The upper ends of the rear posts 22 and 23 are secured to their respective lugs by supporting nuts 32 threadedly engaging, respectively, the threaded upper ends of the posts 22 and 23 and by collars 33 surrounding respectively the posts 22 and 23 and engaging at their lower sides the nuts 32 and at their upper sides the lugs 27 and 28. Clamping nuts 34 engage the upper end of the posts 22 and 23 above the lugs 27 and 28. The collars 33 are provided respectively, with inwardly and forwardly extending projections 33a for a purpose which will appear more fully hereinafter. By changing the position of the supporting nuts 30 and 32, and the clamping nuts 31 and 34, the height of the boiler may be varied to suit the requirements of the particular installation.

In the interest of simplicity and economy, the boiler part 16 is preferably formed as a one-piece

casting and comprises an inner cylindrical shell 35 defining a cylindrical combustion chamber 36 open at the bottom, and closed at the top by a crown sheet or top wall 37. The upper portion of the inner shell is offset inwardly or reduced as indicated at 38, and the top wall 37 is formed with a depressed portion 39 extending thereacross. The under side of the top wall 37 is provided with integral heat absorbing fins 40. The boiler casting 16 also comprises a cylindrical outer shell 41 spaced from the inner shell to provide a water space 42 surrounding the sides and top of the inner shell. The shells are integrally joined at their lower ends and the lugs 25, 26, 27 and 28 are formed integral with and extend outwardly from the lower end of the outer shell. The usual condensate return pipe 43 connects with the lower part of the water space 42 through the lower end of the outer shell and the steam supply pipe 44 connects with the steam space through the top wall 46 of the outer shell 41. The normal water level is indicated by the dot-and-dash line 47.

As can be seen from an examination of Figs 2, 3, 4 and 5, the upper portion of the outer shell is offset inwardly as indicated at 48 to provide at opposite sides of the casting 16 a pair of arcuate recesses 49 and 50 separated at the front by an extension 51 of the outer shell extending upwardly from the cylindrical lower portion of the outer shell to points adjacent the top wall 46. The recesses 49 and 50 are separated at the rear of the boiler by a shorter extension 52 of the outer shell extending from the lower cylindrical part of the outer shell and terminating at its upper end a substantial distance below the top wall 46 to provide a connection, indicated at 53, between the recesses 49 and 50 at the rear of the boiler and above the extension 52.

A pair of gas-exit tubes 55 and 56 extend across the water space 42 and connect the upper end of the combustion chamber 36 to the ends of the recesses 49 and 50 respectively which are adjacent the extension 52. The tubes 55 and 56 are advantageously formed in part by the outer wall surfaces of the shorter extension 52 (see Fig. 4). The tubes 55 and 56 are of substantially the same height as the shorter extension 52 and the inner ends of the tubes are located respectively at opposite sides of the depressed portion 39 in the top wall 37 of the inner shell 35. Thus, the tubes 55 and 56 provide large exit passages for the flue gases and thereby permit relatively high firing rates.

The lower front of the casting 16 is advantageously provided with a rectangular access opening 57 closed by a hinged door 58. The door 58 is provided with an inspection opening 58a closed with quartz glass and normally shielded to prevent sooting by a pivoted flap 59.

The cap 17 is preferably formed cylindrical and of a suitable sheet metal such, for example, as regular steel. The cap completely encloses the upper end of the outer shell 41 and is provided with a gas outlet opening 60 above the shorter extension 52 and communicating with the connection 53 between the recesses 49 and 50. The lower cylindrical end of the cylindrical cap snugly engages a surface 61 which is slightly conical and is formed on the upper end of the cylindrical lower portion of the outer shell. The cap 17 serves to close the recesses 49 and 50 and provide therewith a pair of gas passages 62 and 63 connecting the outer ends of the gas-exit tubes 55 and 56 with the gas outlet opening 60.

I provide a pair of horizontal partitions or baffle plates 64 and 65 which extend respectively from the opposite sides of the upper end of the shorter extension 52 forwardly around the outer shell and toward the longer extension 51 so as to divide each of the passages 62 and 63 into lower and upper parts 66 and 67. The plates 64 and 65 are shown as being of steel and as being secured to the inner sides of the cap 17. However, the plates may be formed in other ways, if desired. For example, they may be integral extensions of the casting 16. The forward ends of the baffle plates 64 and 65 terminate short of the longer extension 51 so as to provide connections between the upper and lower parts of the passages 62 and 63, adjacent the extension 51. From the above, it will be apparent that the flue gases leave the combustion chamber 36 through the gas-exit tubes 55 and 56 and enter the lower parts 66 of each of the passages 62 and 63 adjacent the extension 52. The gases then flow forwardly toward the extension 51, and then upwardly into the upper parts 67 of each of the passages 62 and 63 and then rearwardly to the connection 53 and gas outlet 60. In flowing rearwardly toward the outlet 60, the flue gases also contact the outer surfaces of the top wall 46 (see Fig. 2). The arrows in Figs. 3 and 4 indicate the direction of flow of the gases.

The arrangement of the gas-exit tubes 55 and 56, the extensions 51 and 52 and baffle plates 64 and 65 provides an unusually long path of relatively large cross-sectional area for the combustion gases after leaving the combustion chamber, which path is continually bounded on at least one side by the outer heat absorbing surfaces of the boiler; thereby permitting relatively high firing rates and providing for the absorption of an unusually large part of the heat in the gases and a substantially low gas-exit temperature. As the flue passages are provided in part by the steel cap 17, complexity in the casting 16 is avoided and the low cost of manufacture is preserved. The longer extension 51 advantageously provides an accessible outer surface for the usual service openings 69 which receive the necessary instruments such as the steam gage, water level glass, low-water cut-out, water temperature control, etc. The shorter extension 52 located at the rear and below the flue gas outlet 60 and in the water space 42 of the boiler, provides an advantageous construction for receiving a hot water heat exchanger 70. The exchanger 70 is here shown as being of the hair-pin type and as extending across the upper part of the extension 52 and within the depressed portion 39 below the water level. The exchanger 70 is provided with the usual connecting pipes 71 and 72 which may be connected to the usual hot water storage tank (not shown).

The outer surface of the steel cap is preferably surrounded by a suitable heat insulating material indicated at 73. An example of such insulation is rock wool. The insulation may be held in place by a relatively thin galvanized iron member 74. In order to protect the steel cap 17 at the relatively hot areas opposite the ends of the gas-exit tubes 55 and 56, I provide a pair of channels 75 and 76 respectively, which are suitably spotwelded to the outer surface of the cap 17 and provide vertical air spaces communicating at their lower ends with the air space within the jacket 13 and outside of the boiler. The channels prevent the rock wool from being packed tight against the cap at these hot points

and assure a slight circulation of air along the outer surfaces of the cap. The slight circulation of air along the channels serves to dissipate the intense heat opposite the ends of the gas-exit tubes and thereby prevents damage to the steel cap. The air from the channels passes upwardly through the open upper ends thereof and is distributed in the minute spaces between the particles of rock wool. The lower part of the outer shell is also surrounded by a suitable heat insulating material indicated at 77. An example of such an insulating material is corrugated asbestos lined with "alfol" which may be wrapped about the lower cylindrical part of the outer shell and held in place by suitable metal bands 78.

The steel cap is also provided with a pair of rectangular openings 79 and 80 at each side of the extension 51 which communicate with the forward ends of the upper and lower parts 66 and 67 of each of the passages 62 and 63. These openings are closed by detachable doors 81 and 82 which provide ready access to the flue passages for cleaning.

The boiler thus far described is admirably suited for oil-firing. In accordance with the present invention, the oil burner apparatus 12 occupies the space beneath the boiler and is suspended from the boiler and its supporting posts, so that it may be readily assembled and detached for inspection and repair. The apparatus 12 is assembled as a unit and comprises an open-top cylindrical firing chamber 84, a motor-driven blower 85 secured to and supported by the side of the firing chamber 84, a flow-control valve 86 also supported by the firing chamber, and an oil feed pipe 87 connecting the valve 86 with the interior of the firing chamber 84.

The firing chamber comprises spaced inner and outer cylindrical shells 90 and 91 respectively, providing an air supply space therebetween and joined together at the top by an annular wall 92. The outer shell 91 is imperforate except for an air inlet opening 93 connected to the outlet of the blower 85 and an opening through which the feed tube 87 extends. The inner shell 90 is perforated as indicated at 94 so as to provide a properly distributed flow of combustion-supporting air into the firing chamber. An annular flange member 95 is suitably spotwelded to the upper outer edge of the shell 91. A detachable clamping and supporting ring 96 loosely encircles the outer shell 91 and engages the under surface of the flange 95 for supporting the firing chamber beneath the boiler part 16.

At the rear of the boiler adjacent the posts 22 and 23, the under surface of the supporting ring 96 is beveled as indicated at 97 (see Figs. 7 and 9) and these beveled surfaces engage upper beveled surfaces 98 formed on the projections 33a of the collars 33 which are clamped respectively against the lugs 27 and 28 by the nuts 32. The surfaces 98 on each of the projections 33a in conjunction with the under surfaces of the boiler part 16 provide spaced notches 99 at the rear of the boiler into which the rear of the clamping ring 96 and flange 95 are readily inserted. As the surfaces 97 and 98 are beveled, a tight fit is assured between the upper surfaces of the flange 95 and the under surfaces of the boiler part 16 when the parts are in place. A suitable gasket 100 is interposed between the flange 95 and the under surfaces of the boiler part 16 to assure a gas-tight joint. At the front of the boiler the ring 96, with the flange 95 and gasket 100, is held tight against the under surfaces of the boiler 16 by bolts 101 extending downward through aligned openings in the forward supporting lugs 25 and 26 and by nuts 102 threaded to the lower ends of the bolts (see Fig. 8).

Thus, the entire burner assembly 12 may be quickly secured in position by placing the ring 96 in the notches 99 at the rear of the boiler and by placing and tightening the nuts 102 on the bolts 101. This arrangement provides a unitary burner assembly which may be quickly attached to and supported in position by the same means as is used for supporting the boiler.

In order to assure that the collars 33 will stay in proper position to maintain the forwardly facing notches 99 for receiving the ring 96, the sides of the collars are provided with spaced projections 103 which will engage the sides of the casting 16 and prevent turning of the collars 33 on the posts 22 and 23 (see Fig. 9).

The supporting lugs 25, 26, 27 and 28 in addition to supporting the boiler and forming a part of the supporting and clamping means for the burner assembly, also serve as a means for securing and properly positioning the enclosing jacket 13 with respect to the boiler 16. The rear lugs 27 and 28 are provided with tapped openings which receive the ends of securing screws 106 passing through the jacket 13. Also the forward lugs 25 and 26 are provided with tapped openings which receive the ends of securing screws 107. Suitable collars 108 surrounding the screws 107 serve to properly space the jacket 13 from the lugs 25 and 26.

From the above description, it will be readily appreciated that I have provided an improved boiler which is admirably suited for oil firing, and which is simple and inexpensive in construction, and one which is capable of operating at relatively high capacities for its size. The simple one-piece casting 16 with the steel cap 17 providing the relatively long flue passages and large cross-sectional area make these advantages possible. Furthermore, the improved burner assembly 12 and the supporting means for the boiler and burner assembly, as well as the enclosing jacket of pleasing design with its hinged front section 14, all coact to provide a boiler-burner unit which is highly compact and which may be readily and easily assembled and installed and which may be readily inspected and parts repaired or replaced with a minimum of trouble and expense.

It is to be understood that the term "boiler" used herein is intended to include a hot water boiler as well as a steam or vapor generator, for the apparatus disclosed is well adapted for use both with a hot water heating system and with steam and vapor heating systems.

What I claim and desire to secure by Letters Patent of the United States is:—

1. A boiler including a one-piece casting comprising a double-walled body portion, the lower portion of which encloses a combustion chamber; the inner wall being closed by a transverse wall forming the crown of the combustion chamber and the outer wall extending above said crown and being closed by a top wall enclosing a water space above said crown: upper portions of the opposite sides of the outer wall being offset inwardly relative to the lower portion of said outer wall to form recesses separated by lateral extensions of said outer wall above said lower portion thereof; gas-exit tubes leading from the

combustion chamber to said recesses; and a wall member enclosing the upper portion of said casting and enclosing said recesses and having a flue outlet.

2. In heating apparatus, the combination of a cast-metal boiler part comprising an inner shell defining a combustion chamber open at the bottom and closed at the top, and an outer shell spaced from the sides and top of the inner shell to define with the latter a water space surrounding the sides and top of the inner shell and the shells being joined together at their lower ends; the upper portion of the outer shell being offset inwardly from the lower portion at opposite sides of the boiler to provide a pair of recesses separated at their front and rear by extending portions of the outer shell; a pair of gas-exit tubes extending through said water space and connecting the upper portion of the combustion chamber with one end of each of said recesses; a sheet-metal wall member closing said recesses to form a pair of gas passages and having a flue outlet connected to said gas passages.

3. In heating apparatus, the combination of a cast-metal boiler part comprising an inner shell having cylindrical side wall surfaces defining a combustion chamber open at the bottom and closed at the top, and an outer shell having a lower cylindrical portion spaced from the lower portion of the inner shell and an upper portion spaced from the upper parts of the inner shell to define with the latter a water space surrounding the sides and top of the inner shell and the shells being joined together at their lower ends; the upper portion of the outer shell being offset inwardly from the lower portion at opposite sides of the boiler to provide a pair of arcuate recesses separated at their front and rear by extending portions of the outer shell; a pair of gas-exit tubes extending through said water space and connecting the upper portion of the combustion chamber with one end of each of said recesses; a sheet-metal wall member closing said recesses to form a pair of gas passages and having a flue outlet connected to said gas passages.

4. In heating apparatus, the combination of a cast-metal boiler part comprising an inner shell defining a combustion chamber open at the bottom and closed at the top, and an outer shell spaced from the sides and top of the inner shell to define with the latter a water space surrounding the sides and top of the inner shell and the shells being joined together at their lower ends; the upper portion of the outer shell being offset inwardly from the lower portion at opposite sides of the boiler to provide a pair of recesses separated at their front and rear by first and second extending portions of the outer shell, said first extending portion terminating at its upper end adjacent the top of the outer shell and said second extending portion terminating short of the top of the shell to provide a connection between the recesses above said second extending portion; a pair of gas-exit tubes extending through said water space and connecting the upper portion of the combustion chamber with each of said recesses; and a wall member closing the recesses to form gas passages and having a flue outlet communicating with the space above said second extending portion.

5. In heating apparatus, the combination of a cast-metal boiler part comprising an inner shell defining a combustion chamber open at the bottom and closed at the top, and an outer shell spaced from the sides and top of the inner shell to define with the latter a water space surrounding the sides and top of the inner shell and the shells being joined together at their lower ends; the upper portion of the outer shell being offset inwardly from the lower portion at opposite sides of the boiler to provide a pair of recesses separated at their front and rear by first and second extending portions of the outer shell, said first extending portion terminating at its upper end adjacent the top of the outer shell and said second extending portion terminating short of the top of the outer shell to provide a connection between the recesses above said second extending portion; a pair of substantially horizontal partitions arranged respectively within the recesses and extending from the upper part of said second extending portion towards said first extending portion and terminating short of the latter so as to divide each recess into upper and lower parts with a connection between the two adjacent said first extending portion; a pair of gas-exit tubes extending through said water space and connecting the upper portion of the combustion chamber with those ends of the lower parts of the recesses which are adjacent said second extending portion; and a sheet-metal wall member surrounding said upper shell and said recesses to form gas passages and having a flue gas outlet therein above said second extending portion.

6. In heating apparatus, the combination of a cast-metal boiler part comprising an inner shell defining a combustion chamber open at the bottom and closed at the top, and an outer shell spaced from the sides and top of the inner shell to define with the latter a water space surrounding the sides and top of the inner shell and the shells being joined together at their lower ends; the upper portion of the outer shell being offset inwardly from the lower portion at opposite sides of the boiler to provide a pair of recesses separated at their front and rear by first and second extending portions of the outer shell, said first extending portion terminating at its upper end adjacent the top of the shell and said second extending portion terminating short of the top of the shell to provide a connection between said recesses above said second extending portion; the outer wall of said second extending portion having an opening therein and a hot water heat exchanger extending through said opening and into the water space above said inner shell; a pair of gas-exit tubes extending through said water space and connecting the upper portion of the combustion chamber with one end of each of said recesses; and a sheet-metal wall member closing said recesses to form a pair of gas passages and having a flue outlet above said second extending portion and connected to said gas passages.

7. In heating apparatus, the combination of a cast-metal boiler part comprising an inner shell defining a combustion chamber open at the bottom and closed at the top, and an outer shell spaced from the sides and top of the inner shell to define with the latter a water space surrounding the sides and top of the inner shell and the shells being joined together at their lower ends; the upper portion of the outer shell being offset inwardly from the lower portion at opposite sides of the boiler to provide a pair of recesses separated at their front and rear by first and second extending portions of the outer shell; said first extending portion terminating at its upper end adjacent the top of the shell and said

second extending portion terminating short of the top of the shell to provide a connection between the recesses above said second extending portion; the top of the inner shell terminating adjacent the top of said second extending portion and the inner shell having a depressed portion therein extending thereacross from said second extending portion; a hot water heat exchanger arranged across the upper part of said second extending portion and within said depressed portion; a pair of gas-exit tubes extending through said water space and connecting the upper portion of the combustion chamber with one end of each of said recesses; and a wall member closing said recesses to form a pair of gas passages and having a flue outlet above said second extending portion and connected to said gas passages.

8. In heating apparatus, the combination of a cast-metal boiler part comprising an inner shell defining a combustion chamber open at the bottom and closed at the top, and an outer shell spaced from the sides and top of the inner shell to define with the latter a water space surrounding the sides and top of the inner shell and the shells being joined together at their lower ends; the upper portion of the outer shell being offset inwardly from the lower portion at opposite sides of the boiler to provide a pair of recesses separated at their front and rear by first and second extending portions of the outer shell, said first extending portion terminating at its upper end adjacent the top of the outer shell and said second extending portion terminating short of the top of the outer shell to provide a connection between the recesses above said second extending portion; a pair of substantially horizontal partitions arranged respectively within the recesses and extending from the upper part of said second extending portion towards said first extending portion and terminating short of the latter so as to divide each recess into upper and lower parts with a connection between the two adjacent said first extending portion; a pair of gas-exit tubes extending respectively through said water space from the combustion chamber to the ends of said recesses which are adjacent said second extending portion, and being defined in part by opposite sides of said second extending portion, and each being of a height equal substantially to that of said second extending portion; and a sheet-metal wall member cap surrounding said upper shell and said recesses to form gas passages and having a flue gas outlet therein above said second extension.

9. In heating apparatus, the combination of a cast-metal boiler part comprising an inner shell defining a combustion chamber open at the bottom and closed at the top, and an outer shell spaced from the sides and top of the inner shell to define with the latter a water space surrounding the sides and top of the inner shell and the shells being joined together at their lower ends; the upper portion of the outer shell being offset inwardly from the lower portion at opposite sides of the boiler to provide a pair of recesses separated at their front and rear by extending portions of the outer shell; the upper portion of the inner shell being offset inwardly adjacent the offset of said outer shell so as to assure circulation of water in the space between shells; a pair of gas-exit tubes extending through said water space and connecting the upper portion of the combustion chamber with one end of each of said recesses; a sheet-metal wall member closing said recesses to form a pair of gas passages and having a flue outlet connected to said gas passages.

10. In heating apparatus, the combination of a cast-metal boiler part including an inner shell open at the bottom and closed at the top, and an outer shell spaced from the sides and top of the inner shell to provide a water space about the sides and top of the inner shell, and the inner and outer shells being joined at the bottom; the inner shell having a depressed portion extending thereacross; a tubular hot water heat exchanger arranged in said depressed portion and including connections for hot water circulating pipes extending through said outer shell; a sheet-metal member enclosing the upper end of said outer shell and defining with portions of the outer surface thereof, a gas passage, and said cap having a flue gas outlet connected to said passage; and a gas-exit tube connecting the upper end of said combustion chamber with said flue gas passage.

11. In heating apparatus, the combination of a one-piece vertical boiler casting including an inner shell having cylindrical lower and upper portions defining a combustion chamber open at the bottom and closed at the top and the upper portion being of reduced diameter, and an outer shell enclosing the inner shell and defining therewith a water space about the sides and over the top of said inner shell, and the shells being joined together at their lower end; said outer shell having a cylindrical lower portion and an upper portion having its opposite sides offset inwardly to define arcuate recesses separated at their front by an extension of the outer shell extending to the top thereof and separated partially at their rear by a shorter extension terminating short of the top to provide a connection between the recesses above the shorter extension; a sheet-metal cap enclosing the outer shell and said recesses to form gas passages and having a flue gas outlet above said shorter extension; gas-exit tubes connecting the passages with said combustion chamber; a plurality of lugs extending outwardly from the lower part of said outer castings; upright supporting posts adapted to rest on a foundation floor and secured at their upper ends respectively to said lugs; an open-top firing chamber secured at its upper end to said lugs; a metal enclosing jacket; and means for detachably securing said jacket to said lugs and for holding the jacket in spaced relation to said boiler casting.

12. In heating apparatus, an upright boiler part including a combustion chamber open at the bottom and a water space surrounding said combustion chamber; means for supporting said boiler part in spaced relation to a foundation floor and including a plurality of lugs extending from the lower part of the boiler and a plurality of upright posts adapted to rest at their lower ends on the floor and secured respectively at their upper ends to the lugs; a firing chamber arranged beneath said boiler part; and means for detachably securing said firing chamber to said boiler part and including means providing notches on said supporting means at one side of said boiler part for slidably receiving the adjacent upper parts of said firing chamber and bolt means on the opposite side of said firing chamber from said notches and secured to said lugs and said firing chamber for drawing said firing chamber upward against said boiler part.

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