July 2, 1940. A. P. GRIMM 2,206,398

BOILER

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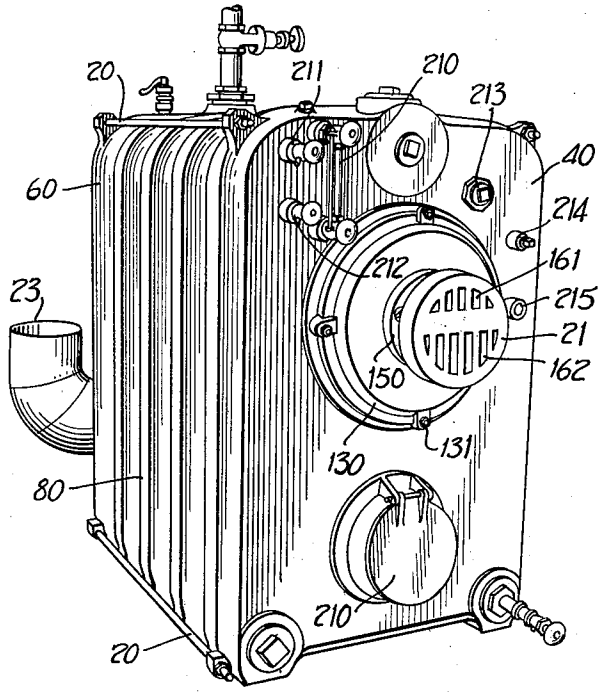


Fig. 1.

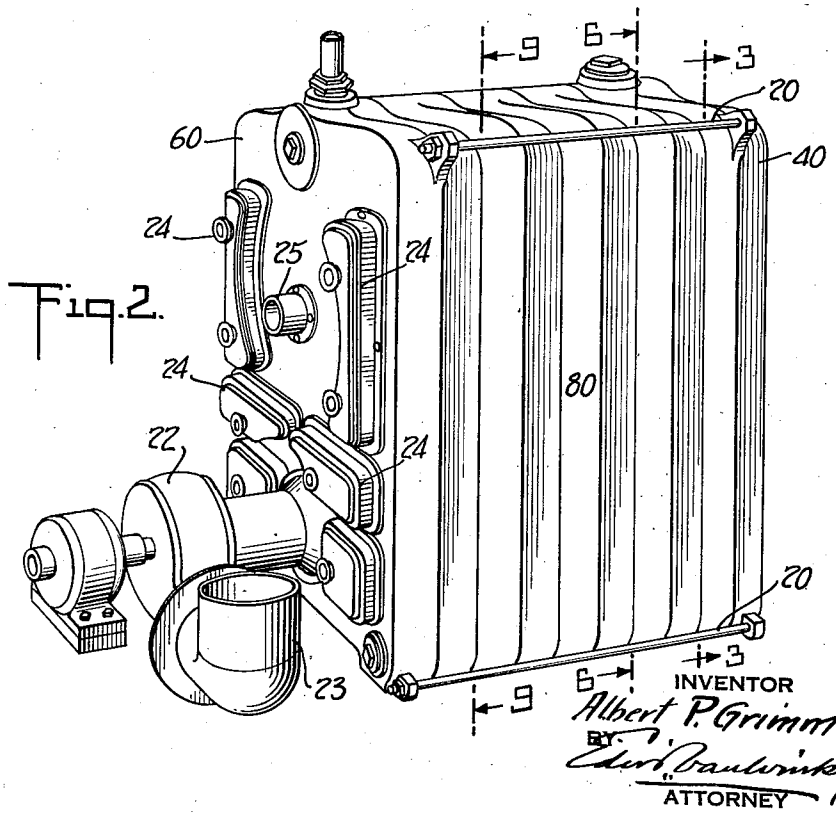


Fig. 2.

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Fig. 3.

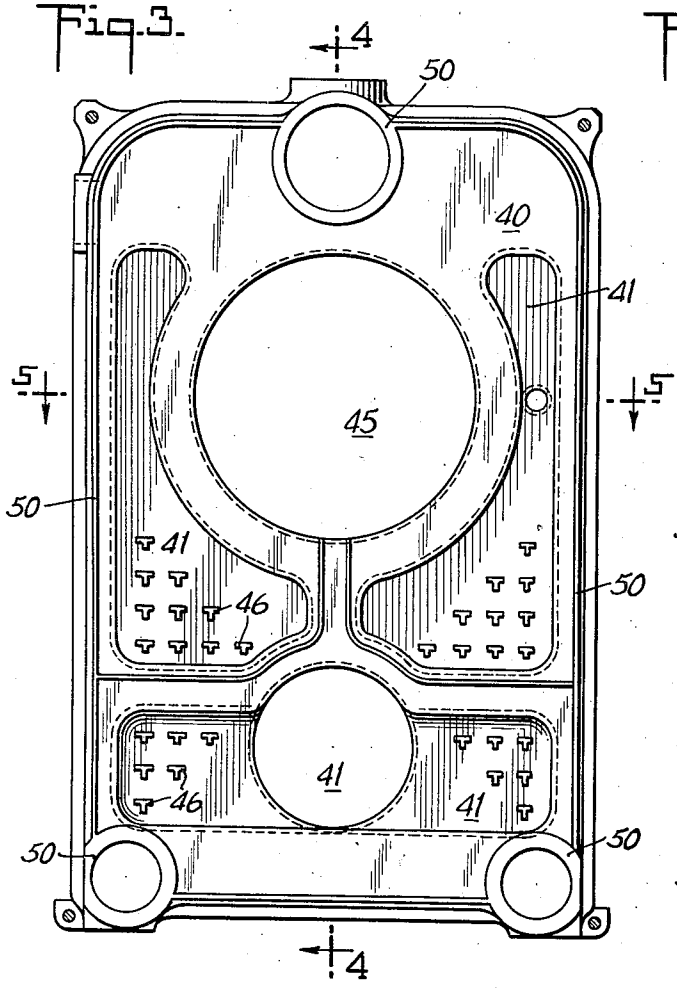


Fig. 4.

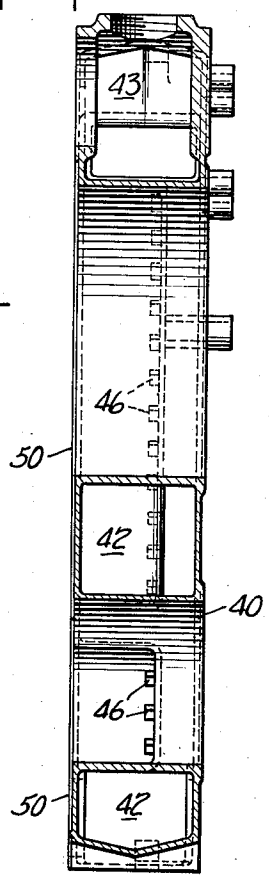
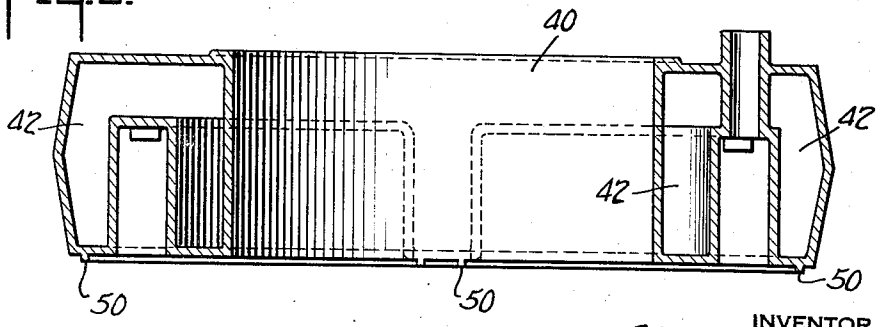


Fig. 5.



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Fig. 6.

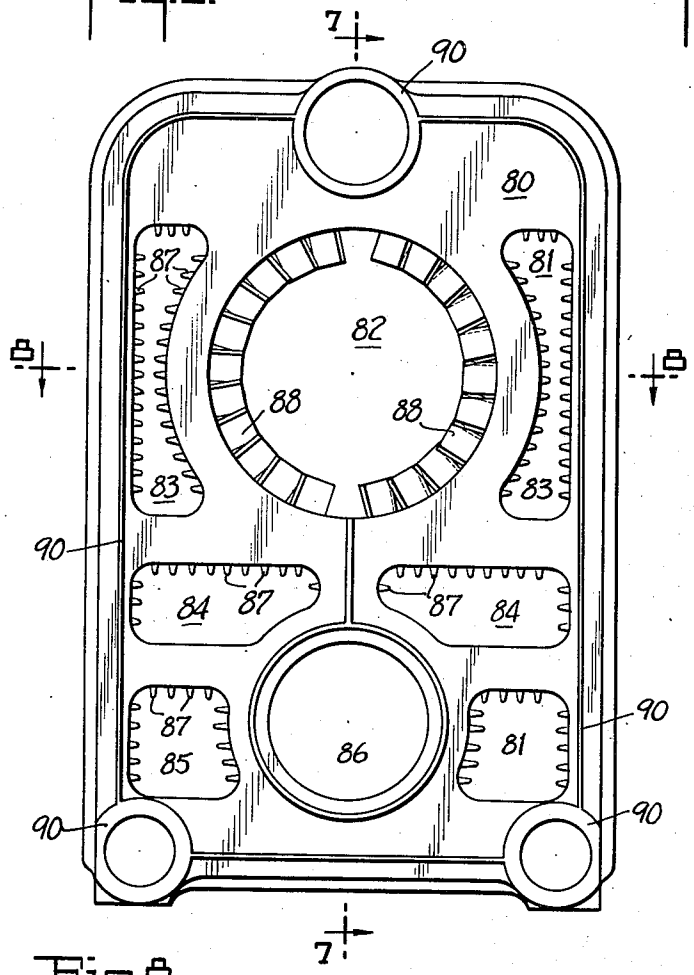


Fig. 7.

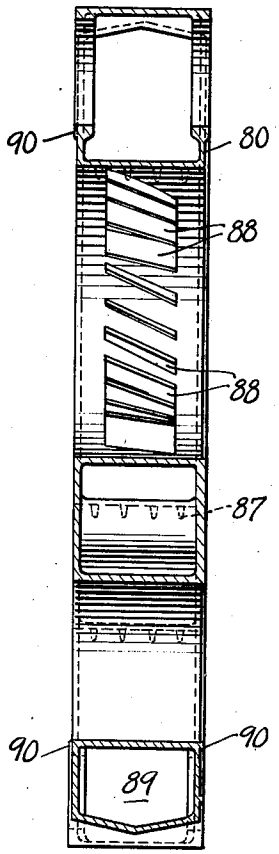
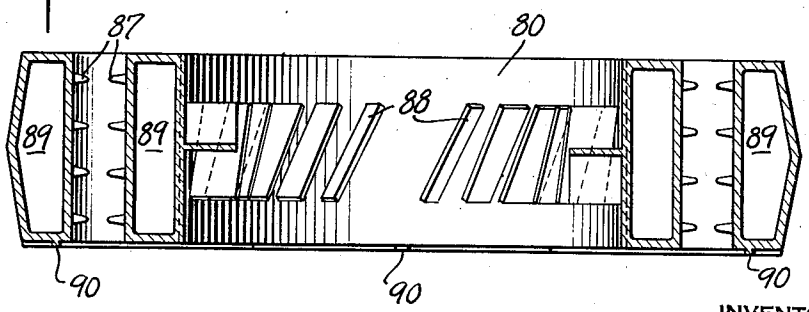


Fig. 8.



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Fig. 9.

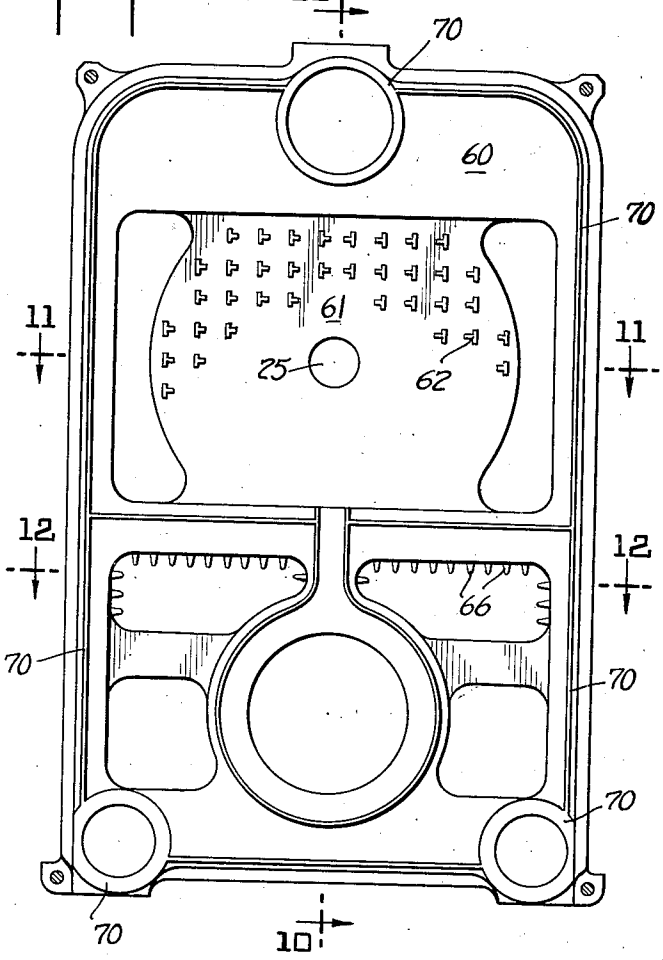


Fig. 10.

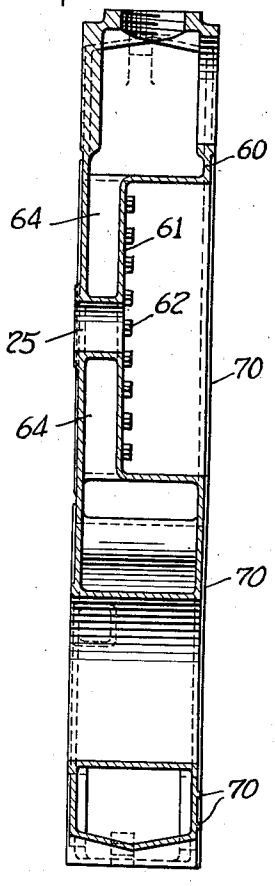


Fig. 11.

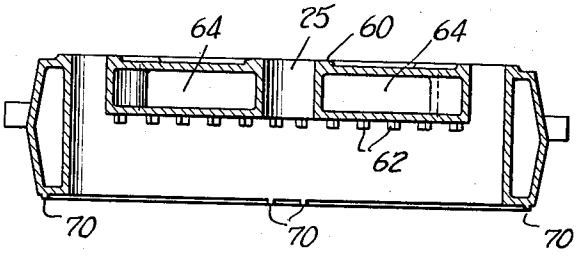
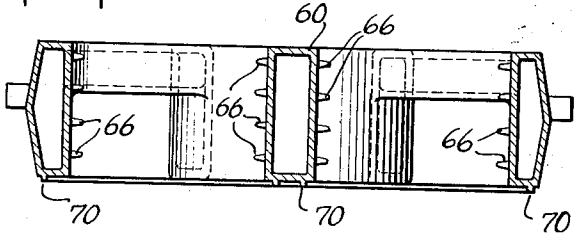


Fig. 12.



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Fig. 13.

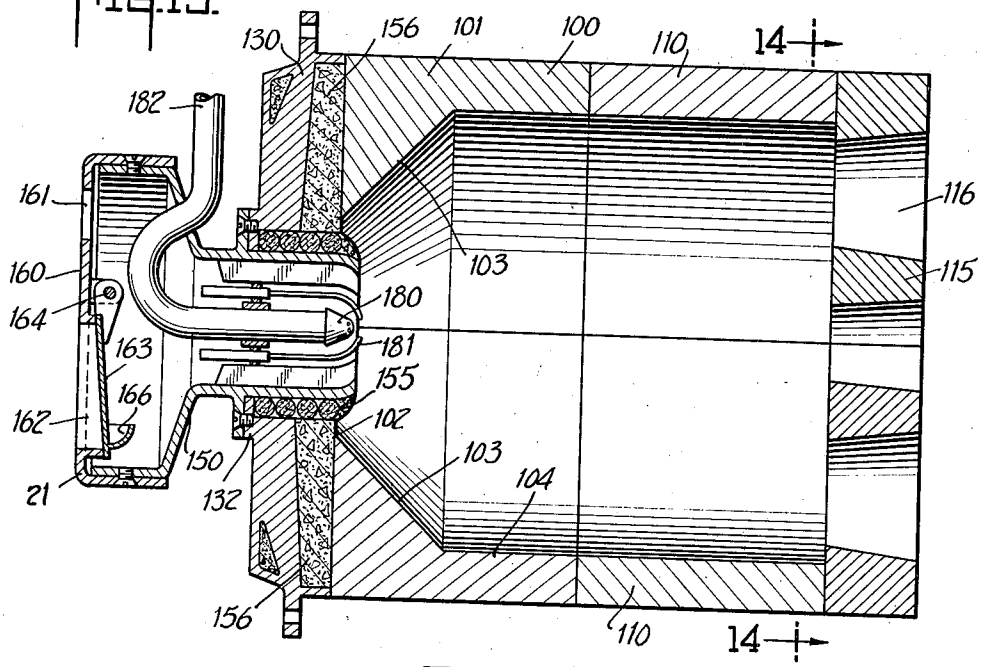


Fig. 14.

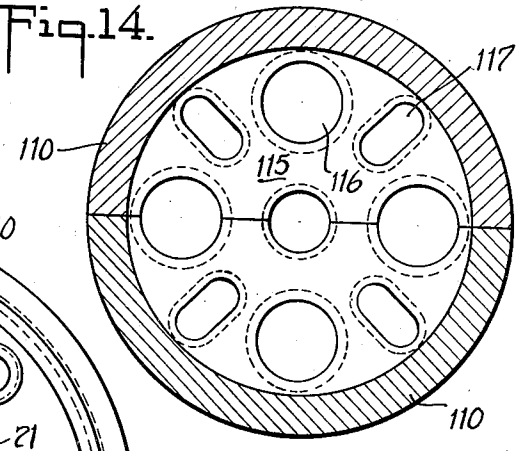
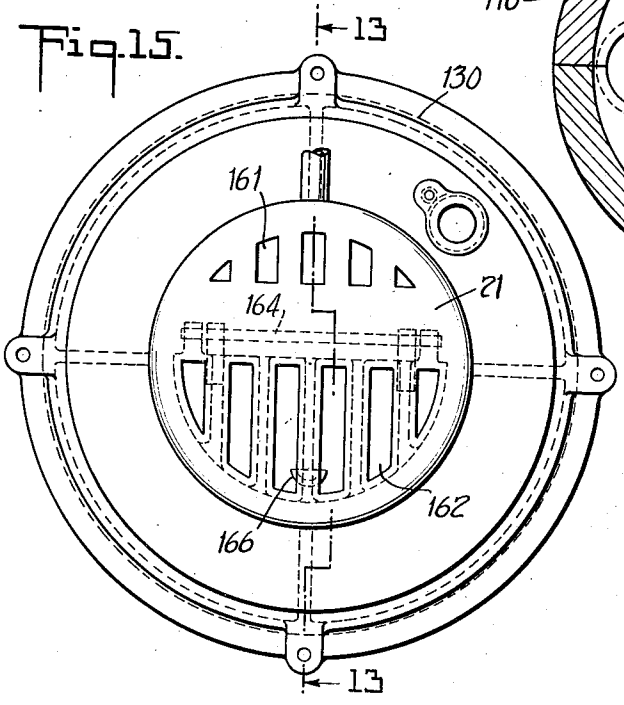


Fig. 15.



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Patented July 2, 1940 2,206,398

UNITED STATES PATENT OFFICE

2,206,398

BOILER

Albert Preston Grimm, Raritan, N. J.

Application July 1, 1938, Serial No. 217,005

7 Claims. (Cl. 122—210)

My invention relates to boilers, more particularly to boilers of the sectional type especially adapted for oil firing, and has for its object the production of a boiler that is more efficient than those now commonly used.

One of the objects of the invention is to produce a boiler that will approach perfect combustion and hold the heat within the boiler and provide a good heat transference structure so that the heat generated will be transferred to the water for the production of steam without unnecessary loss.

A further object is to provide a structure that will have a low flue temperature and a high combustion temperature.

A further object is to provide a structure in which the burner is assembled on the combustion chamber ring prior to mounting the ring on the boiler.

The foregoing and other features of my invention will now be described in connection with the accompanying drawings forming part of this specification in which I have represented my boiler in its preferred form after which I shall point out in the claims those features which I believe to be new and of my own invention.

In the drawings:

Figure 1 is a perspective view of my boiler as viewed from the front or burner end.

Figure 2 is a perspective view of my boiler as viewed from the back or flue end, i. e., opposite to that shown in Fig. 1.

Figure 3 is a front view of a front section of the boiler.

Figure 4 is a vertical section along the line 4—4, Fig. 3.

Figure 5 is a horizontal section along the line 5—5, Fig. 3.

Figure 6 is a front view of one of my mid-sections of the boiler.

Figure 7 is a vertical section along the line 7—7, Fig. 6.

Fig. 8 is a horizontal section along the line 8—8, Fig. 6.

Figure 9 is a front view of a rear section positioned along the line 9—9, Figure 2.

Figure 10 is a vertical section along the line 10—10, Figure 9.

Figure 11 is a horizontal section along the line 11—11, Figure 9.

Figure 12 is a horizontal section along the line 12—12, Figure 9.

Figure 13 is an enlarged vertical section of the combustion chamber showing one type of burner assembled on the front plate of the boiler.

Figure 14 is a section along the line 14—14, Figure 13 showing the outlets for the hot gases upon entering the tortuous path through the boiler to the flue.

Figure 15 is an enlarged detail of the cover in front of the boiler, and burner mounting plate.

In the carrying out of my invention, I find it desirable to construct my boiler in a plurality of sections, comprising a front section 40, a rear section 60 and one or more mid-sections 80. These sections have machine ground surfaces to ensure perfect assembly and prevent short-circuiting of the hot gases and infiltration of the outside air. They are assembled as shown in Figures 1 and 2 and held together by bolts 20.

In the installation illustrated the burner is located behind the ventilating cover 21, the suction blower 22 pulls the hot gases through the boiler and sends them up the flue 23.

Easily removable panels 24 provide ready access to flues for cleaning the carbon, while a special peep-hole 25 is provided for observation of the burner operation without opening the door.

It will be observed that the combustion chamber is located above the middle of the sections directly under the steam dome of the section and that the carefully proportioned flue passages are provided so that the gas travels five times the length of the boiler with each traverse being lower than that of the former. With this construction the hottest gas is directly under the steam dome.

The design of the front section is illustrated in detail by Figures 3, 4 and 5. This section 40 is a typical hollow sectional shape having passages 41 for the hot gases and hollow section 42 for the water with a larger section 43 at the top as a steam dome in which the steam is made to be used for heating purposes.

The central opening 45 is located above the mid-center of the section and is formed approximately one-half inch in diameter larger than the combustion chamber which is inserted therein. It will be observed that with this design the hottest combustion temperature is directly under the steam dome 43. After the combustion is complete the hot gases are drawn through the boiler structure by the suction blower 22. These passages are provided with a plurality of heat extruders 46 so spaced and shaped to give a maximum of heat transference, to convey the generated heat of the hot gases through the metal of the section to the circulating water.

The design of the mid-section is illustrated in

detail in Figures 6, 7 and 8. In Figures 1 and 2 I show three of these mid-sections **80**. I may use only one of these sections or I may use a greater number, depending on the capacity required. The middle section likewise is a hollow sectional structure having passages **81** for the hot gases, designed so that when in assembled relation with the front and rear section the hot gases upon leaving the combustion chamber pass through the entire length of the boiler five times with each traverse lower than the former. In tracing out this passage of the hot gas, after the combustion is complete, the hot gas passes through the section in central passage **82** to the rear, then forward through **83** then rearward through **84**, then forward through **85**, then back again through **86** to the flue **23**.

These passages are also provided with heat extruders **87** to perfect the heat transference and baffles **88** to keep the gases in a swirling motion in its first passage through the boiler. The water is circulated in the section in passages **89** with a steam dome on the upper part of the section. Here again it must be observed that the steam dome is directly over the combustion chamber.

The design of the rear section is illustrated in detail in Figures 9, 10, 11 and 12. The design of this hollow section **60** is such that when the hot gases leave the combustion chamber they strike up against the wall **61** provided with a plurality of heat extruders **62** adapted to transfer a maximum of heat units to the water in the hollow **64**. The flue passages are also provided with heat extruders **66**. It will be observed that these projections on all the passages completely cover all of the vertical surfaces and the upper horizontal surface, and that they are omitted on the lower surface to aid in cleaning the flues. It has been found out that it is impractical to have these projecting points on the lower surfaces because of difficulties presented when the carbon is being removed during cleaning operation.

This section may be machine ground on the raised portion **70** so that it will tightly fit the ground raised portion **90** of a mid-section **80** and the latter when fitted to the raised portion **50** of a front section **40** so that there will be no infiltration of cold air into the boiler or the bypassing of the hot gases in their proper passages through the boiler.

In Figure 13 I show an enlarged detail of my combustion chamber **100** which is cylindrical in shape and may be built up of a plurality of sections. The front section **101** is made of two semi-cylindrical portions formed of high temperature material and when placed together provide a central opening **102** through which the burner extends, and a frustro conical surface **103** extending from the opening **102** to the cylindrical portion **104**.

The mid-section is also made up in semi-cylindrical pieces **110**. I may use two or more of these with this construction. I may make my combustion chamber any desired length as will be readily understood.

The rear section **115** is a flat partition provided with a plurality of openings **116** and **117**. It will be observed that these holes are alternately disposed, every other one around the circle is round and the alternate holes are out of round.

Experience has demonstrated that with this arrangement the life of the rear wall **115** is much longer because the material is the heaviest where the heat is the hottest and therefore not so liable to burn out, and therefore does give a longer life.

With my invention I provide for convenience of assembly of the burner to the boiler a ring **130**. This ring is bolted to the furnace by the bolts **131** and is provided with a flange **132** to which the burner assembly **150** is attached.

The burner assembly **150** is bolted to the ring **103** while it is not attached to the boiler. The space between the burner assembly and the ring is then packed with asbestos rope **155**.

The entire ring is then packed with high temperature cement **156** and allowed to harden before the ring **103** is mounted to the furnace. With this construction the burner assembly is packed to the furnace ring prior to final assembly.

As the packing is inserted from within, there is no possible chance of it being blown out in service.

A draft regulator is provided in the cover of the burner. It will be observed that the cover **21** is provided with two sets of holes; one set **161** above the horizontal diameter and the other set **162** below the horizontal. The lower set has a closing door **163** mounted to swing on hinge **164**. This door is of light material and opens with the start of the vacuum within the combustion chamber caused by the suction of the blower **22** when the burner starts to operate. On the door I provide a cup **166** for holding a plurality of shot so that the weight may be adjustable to suit the requirements of service. The upper set of openings **161** provide sufficient air for ordinary purposes but when a heavy load is on the burner, the suction blower opens the lower set of holes **162** providing free passage for the proper amount of additional air.

It is not necessary to go into detail in reference to the burner **180** which is of the atomizing type electrically ignited by the spark plugs **181**. The oil is delivered through the supply line **182** by a pump (not shown) which may be driven by the blower motor.

As a safeguard against blowing up of the boiler, should anything go wrong in the ignition or gas supply and an unusual explosion occurs within, I provide a relief door **210** located within the structural part of the boiler in the gas passage in front of the blower and stack.

It will be observed that I have presented two new departures in sectional boiler design. The first is a cylindrical combustion chamber entirely enclosed, and second, its location is directly under the steam dome so that the hottest part of the flue gases in their path through the boiler is where the steam is made. With this construction we have in a normal operation of the boiler a relatively higher combustion temperature with a lower flue gas temperature.

My boiler may be supplied with the usual safeguards and I provide the necessary outlets for the purpose. **210** is the water gauge. **211** and **212** are provided for water level inspection should the water gauge become broken for any reason and is out of commission. **213** is the low water cut out plug. **215** is provided for the acquastat. **216** is the plug for the stack switch.

I wish it distinctly understood that my boiler herein illustrated and described is in the form in which I desire to construct it and that changes or variations may be made as desirable or convenient without departing from the salient features of my invention and I therefore intend the

following claims to cover such modifications as naturally fall within the lines of invention.

I claim:

1. In a sectional boiler, comprising a plurality of hollow water circulating sections, a cylindrical combustion chamber having a perforated rear wall located within a space in the assembled sections above the central portion thereof, an enclosed gas expansion chamber adjacent the rear wall of the combustion chamber, a path for the hot gases passing through the assembled sections a plurality of times leading from the gas expansion chamber to exit, each passage for gas being lower than its immediate predecessor in its passage to the exit.

2. The device of claim 1 in which the cylindrical combustion chamber is provided with a central opening in a frustro conical front surface, and a cylindrical mid-section.

3. The device of claim 1 in which the perforations of the perforated rear section of the cylindrical combustion chamber are alternately round and substantially elliptical openings.

4. In a sectional boiler comprising a plurality of hollow water sections, a combustion chamber located in the upper half of the boiler, a path for the hot gases passing a plurality of times through the assembled sections, each passage for gas being lower than the immediate predecessor, said passages being supplied with heat extruders on the vertical and upper surface of the passage, and smooth on the lower surface whereby the heat units of the flue gases are transferred to the water in the water sections.

5. The device of claim 4 with the addition the combustion chamber being cylindrical and provided with a single circular opening in a frustro conical front surface and a rear surface comprising a perforated flat plate.

6. In a steam boiler, having a waterhead, a circulating passage and a flue, a cylindrical combustion chamber located directly under the water head and having a central opening in a frusto conical front surface and a perforated rear surface in front of and leading to the circulating passage conveying the hot gases downward to the flue.

7. The device of claim 6 in which the perforations of the rear section are alternately round and substantially elliptical passages.

ALBERT PRESTON GRIMM.