May 30, 1933. S. J. LONERGAN 1,911,760

CASING STRUCTURE FOR WATER HEATERS AND OTHER HEATING APPLIANCES

Filed Dec. 12, 1930 2 Sheets-Sheet 1

Fig. 1

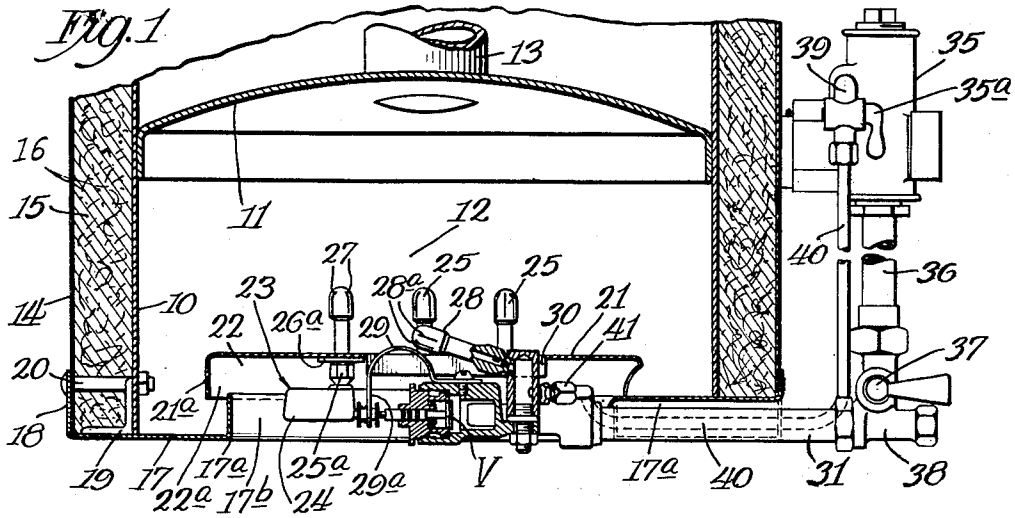


Fig. 2

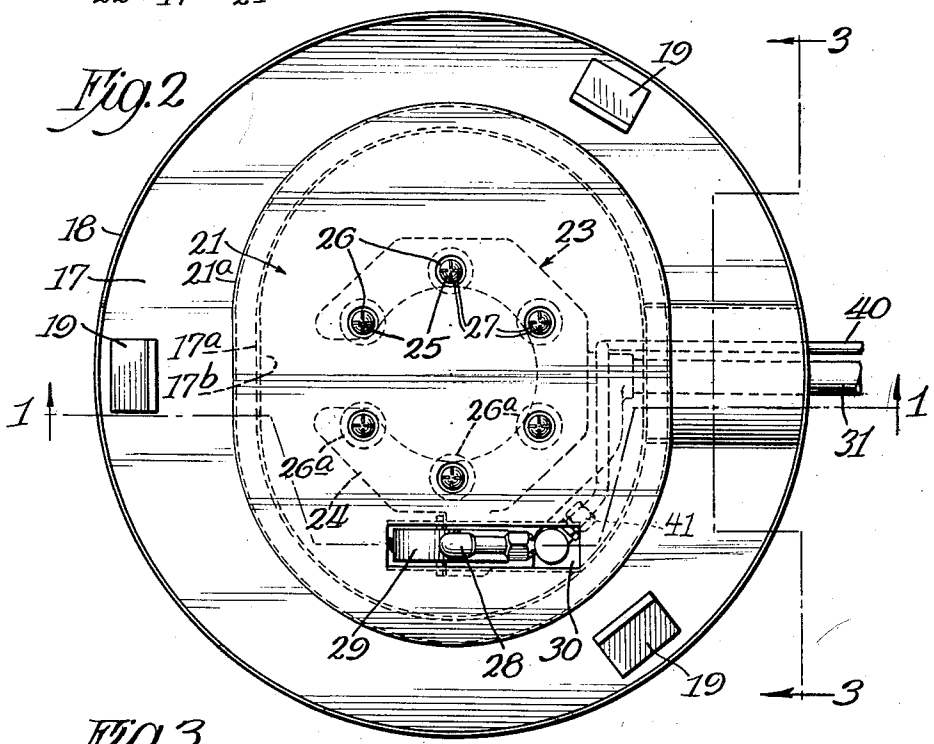
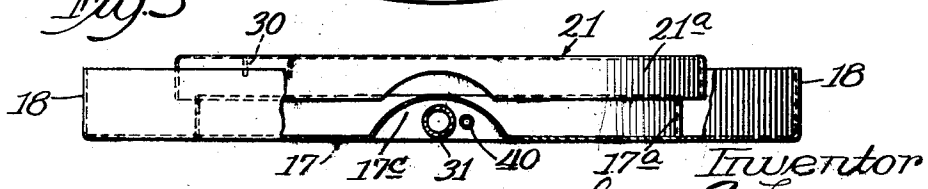


Fig. 3



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CASING STRUCTURE FOR WATER HEATERS AND OTHER HEATING APPLIANCES

Filed Dec. 12, 1930 2 Sheets-Sheet. 2

Fig. 4

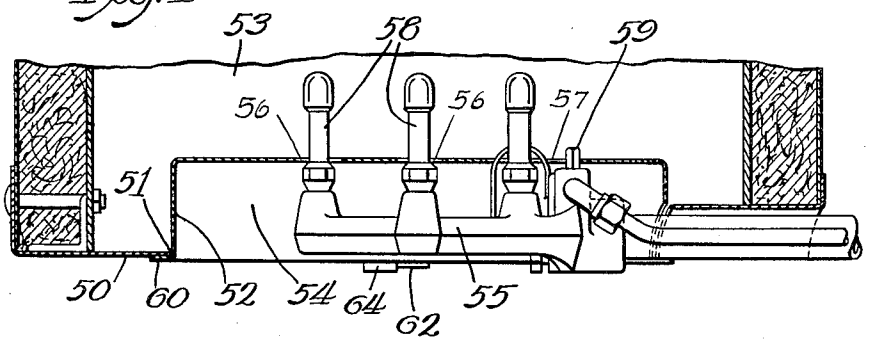


Fig. 5

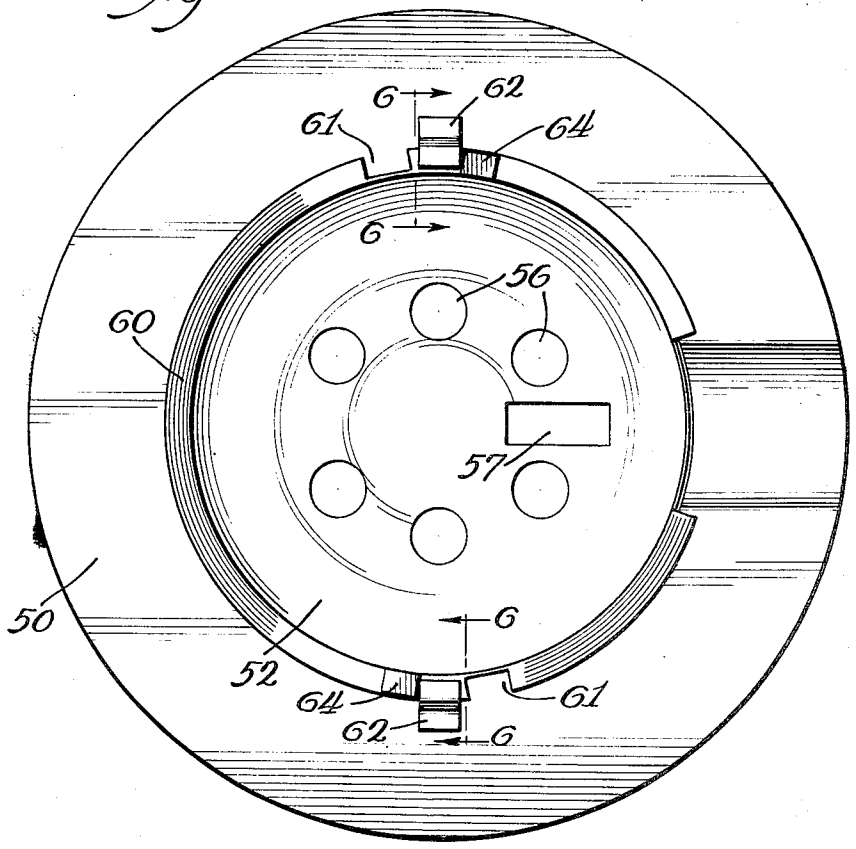
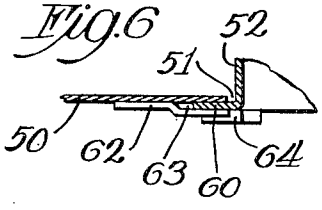


Fig. 6



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Patented May 30, 1933

1,911,760

UNITED STATES PATENT OFFICE

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CASING STRUCTURE FOR WATER HEATERS AND OTHER HEATING APPLIANCES

Application filed December 12, 1930. Serial No. 501,890.

My invention relates generally to casing structure for water heaters and other heating appliances.

In the use of certain forms of gas burners, shallow combustion chambers may be employed in which there is created a zone of intense heat while the burner is in operation. In such structures, if the burner including its body or manifold portion which receives the gas from the supply is mounted within the zone of intense heat in the combustion chamber, such burner may become heated to such an extent that it may not pass its exact rated amount of gas. One of the objects of my invention is to provide against such a condition as that just mentioned by providing an improved form of casing structure forming in part a combustion chamber and adapted for the mounting of the burner within the limits of the casing structure, but the parts are so arranged that the burner, except its flame-discharging part, is mounted outside the combustion chamber in a cool zone, giving positive assurance that the burner will at all times pass its rated amount of gas. In other words, my invention contemplates the use of combustion chamber structure of such a character that the full heating effect of the burner is obtained without subjecting the burner to the influence of the heat in the combustion chamber.

It is also well known that a predetermined volume of secondary air is required to support combustion under each gas-flow or pressure condition and when that amount of secondary air is exceeded, the surplus air tends to cool and dissipate the heated gases of combustion and reduce their effectiveness. Another object of my invention is to provide a combustion chamber structure adapted to automatically regulate the amount of secondary air admitted to the combustion chamber to that required for the particular combustion needs. Another object of my invention is to provide improved casing bottom structure which is adapted for the support of the burner and other associated parts in such a manner that all of such parts are readily accessible and readily removable for service, inspection, etc., purposes without adjustment or detachment of the casing parts.

A further object is to provide a plurality of casing parts forming a bottom and a combustion chamber, all of which may be readily assembled and disassembled, and which are of a character adapted to protect the burner and other related parts against damage during shipment and general handling of the same.

Other objects and advantages will become apparent as this description progresses and by reference to the drawings wherein:

Figure 1 is a vertical sectional view through the lower portion of one form of water heater structure in connection with which one form of my invention is illustrated, said view being taken substantially on line 1—1 of Fig. 2;

Fig. 2 is a top or inside plan view of the bottom of the combustion chamber structure shown in Fig. 1, with the burner parts indicated;

Fig. 3 is a fragmentary section taken substantially on line 3—3 of Fig. 2;

Fig. 4 is a vertical sectional view through the lower portion of a modified form of combustion chamber structure embodying my invention.

Fig. 5 is a bottom plan view of the structure shown in Fig. 4; and

Fig. 6 is a section taken substantially on line 6—6 of Fig. 5.

My invention is well adapted for use in water heater structures and I, therefore, have chosen such form of structure for illustration and description of my invention; however, it is to be understood that my invention also has utility in other devices where similar conditions of use exist and where similar results are sought.

Referring now to Figs. 1, 2 and 3, the water heater includes a storage tank, the wall 10 of which is extended downwardly beneath its bottom 11 to form the sides of a relatively shallow combustion chamber 12 from which suitable flue structure 13 leads through the storage tank to the outside of the heater. The storage tank wall or shell 10 is surrounded by a larger cylindrical shell 14 forming an insulating space 15

filled, preferably, with a suitable form of insulating material 16.

One of the important features of my invention has to do with the structure forming the bottom of the combustion chamber, which structure will now be described. This bottom structure includes a so-called drip pan 17 of cylindrical form with its outer edge flanged upwardly as at 18. This pan serves as a support for the entire heater structure (Fig. 1) and it may be, in turn, carried by any suitable form of stand, legs, and the like, (not shown) so as to support the heater structure with the combustion chamber disposed somewhat above the floor surface. A plurality of angle pieces 19 are secured to the pan 17, by welding or otherwise, at spaced intervals around its circumference, and these angle pieces are so related as to hold the pan 17 accurately centered with respect to the storage tank 10. Pan 17 is fixedly secured to the outer shell 14 and to the storage tank wall 10 by a plurality of bolts-and-nuts 20 which pass through the pan flange 18, the shell 14 and storage tank wall 10 as shown. The nuts of these fastening devices are, preferably, located on the inner part of the structure where they are readily accessible for quick detachment of the pan and related parts when that becomes desirable. This pan is further provided with a central oblong opening 17^b, the edge of which is surrounded by a similarly-shaped upstanding flange 17^a.

The bottom of the combustion chamber 12 is completed by an inverted, cup-shaped pan member 21 of greater dimensions than the flanged pan opening 17^b so that its depending oblong flange 21^a telescopes the flange 17^a of pan 17 in spaced relation thereto. The shape, size and relationship of these pans and their flanges are such as to provide within the vertical and horizontal limits of the combustion chamber a burner-receiving chamber 22 located exteriorly of the combustion chamber 12, and out of the zone of the heat therein.

In the open-bottom chamber 22, I mount the burner 23 which includes a body portion 24 supporting a plurality of burner vertical nozzles or tips 25 which project upwardly through openings 26 in the bottom of pan 21 into the combustion chamber 12. The structure of the burner body and tips 25 may be of a construction such as that disclosed in Letters Patent No. 1,753,962, granted April 8, 1930, for Gas Burner, the tips having a plurality of discharge slots 27 which are adapted to discharge flames of high heating efficiency, creating in the comparatively shallow combustion chamber a zone of intense heat. The burner which I have shown also includes as a part thereof, a pilot flame device including a nozzle or tip 28 similar in construction to the tips 25 except for the position of the discharge slots 28^a thereof. This tip 28 is adapted to discharge through the lower slot 28^a a pilot flame upon an inverted U-shaped thermal element 29 of such construction that, when heated by the pilot flame, its end 29^a moves toward the right (with respect to Fig. 1) to operate valve structure V for maintaining the supply of fuel to the pilot flame through pipe 40. The inverted pan 21 is provided with a rectangularly-shaped opening 30 through which the U-bend of the thermal element 29 projects together with the pilot device 28 into the combustion chamber 12 slightly above the inset bottom formed by the pan 21. In this manner the pilot flame is not affected by outside conditions and the thermal element is subjected to the temperature variations in the combustion chamber whereby a slight "breathing" movement is imparted to its end 29^a. With this arrangement the burner structure, while being located within the limits of the casing, is so arranged that its body is outside the combustion chamber and the zone of heat and the gas received therein through the supply pipe 31 is unaffected by the heat conditions in the combustion chamber and passes into and through the burner tips in its rated amount.

It is highly desirable that the amount of secondary air admitted to the combustion chamber be limited to, as nearly as possible that required for secondary air needs. Otherwise the efficiency of the heating device is materially lowered by the dissipation of the heated gases by the excess secondary air as will be well understood. In accordance with my invention this is accomplished automatically by the burner structure and the trap structure provided by the telescoping pan members 17 and 21. More particularly, in the structure shown in Fig. 1 the pan 21 is supported by the burner. Discs or washers 26^a are passed over each burner tip and they seat upon the beveled tip surface 25^a. The bottom of pan 21 seats flush upon these washers substantially sealing the pan openings 26 and preventing secondary air from passing therethrough. The pilot burner unit practically fills the pan opening 30, permitting only a minimum supply of secondary air to pass through such opening. This leaves the burner chamber 22 and opening 22^a between flanges 17^a and 21^a as the flow path for secondary air supply. However, the telescopic arrangement of the pan flanges 17^a and 21^a forming the opening 22^a which extends laterally from the top of chamber 22 and then downwardly into the combustion chamber, provides a trap which, as will be readily appreciated, functions to retard and limit the flow of secondary air

into the combustion chamber, and, practically speaking, admits secondary air only when the burner is in operation and then only in such quantity as the then-existent combustion condition requires. In other words, this trap structure as controlled by draft conditions in the combustion chamber diminishes the amount of secondary air admitted as the hot gases and draft conditions are diminished, and vice versa as these conditions are reversed.

The flow of fuel through the burner is controlled by the temperature of the water in the storage tank through the medium of a thermostat device 35 which may take any suitable form. This thermostat is adapted to be connected to the gas supply (not shown) and has a pipe connection 36 connected to the gas cock 37 by a union connection 38. The gas cock 37 is, in turn, connected to the burner by the pipe 31. The thermostat 35 may include a bypass cock 55[a] connected by a union connection 39 to bypass pipe 40 which is, in turn, connected by a union connection 41 to the pilot device 28. In order to protect the burner and the pipes 31 and 40 against damage when the casing structure is supported upon the bottom 17 and when the structure is being handled during shipment and otherwise, as well as to permit the burner to be moved fully up into the space 22, I form the pan 17 at one side of the space with a semi-circular inwardly-depressed portion (the shell walls 10 and 14 being similarly shaped) to provide a radially-extending semi-circular, open-bottomed passageway 17[c] for receiving the pipes 31 and 40 within the vertical limits of the casing structure. The arrangement just described also provides for ready and quick detachment of the parts for inspection and servicing of the same and the structure as a whole. More particularly, the heater and its parts may be quickly detached by merely breaking the union connections 38 and 39 and moving the burner and connected parts downwardly to disengage the burner tips 25 from the bottom openings 26 and 30. The casing parts need not be disturbed except for the lowering of the pan 21 down upon the flange 17[a] and U-part 17[c] of the pan 17. The union connection 41 to the pilot device 28 further provides for ready detachment of the parts and facilitates the assembly and disassembly of the same.

It will be understood that while the foregoing feature is well adapted to the trap form of structure above described, it also has utility in various other forms of combustion chambers. For example, the pan 21 may be omitted so that the burner may be projected directly into the combustion chamber, in which case the lateral, connection-receiving space in the bottom wall permits of ready detachment of parts and also provides protection against damage in handling.

The structure shown in Figs. 4, 5, and 6 is substantially the same as that shown in the previously described figures except as follows: The bottom pan 50 is provided with a central opening 51 in which an inverted cup-shaped pan 52 is inserted. The shape of the inverted pan is such as to provide within the limits of the combustion chamber 53 a chamber 54 in which the burner 55 is received in such a way that its main body portion (like in the previous form) is out of the zone of heat in the combustion chamber. The pan 52 is provided with suitably located openings 56, 57 in its bottom through which the burner tips 58 and pilot device 59 project, respectively. The pan openings 56 are slightly larger than the burner tips thereby to restrict the amount of secondary air passing normally therethrough to that required for minimum combustion needs, but adapted to permit the burner in its operation to self-induce through such opening additional secondary air as the secondary air requirements are increased.

It is important that the inverted pan 52 be held rigidly in place, but readily removable. To that end, the vertical side wall of this pan has its outer edge flanged outwardly as at 60 to fit snugly against the underside of the pan 50 around the edge of the opening 51 therein. The pan flange 60 is notched, preferably, at diametrically opposed points, as at 61, to freely pass over lugs 62 secured to the bottom of the pan 50 adjacent its opening 51, which lugs have their free ends offset downwardly to space the same from the bottom of the pan, as at 63 to a distance substantially equal to the thickness of the material forming the pan flange 60. When the pan 52 is inserted in place at a position wherein the free ends of the lugs 62 pass through its notches 61, such pan is then rotated to an extent until the stops 64 carried thereby strike against the ends of the lugs 62. The pan 52 may be removed by reversal of the foregoing movement. In assembling the parts the pan 50 is first fixed to the bottom of the casing and the pan 52 is then adjusted in place. The burner is subsequently adjusted to the position shown and, with the burner in that position, the pan 52 is securely held in place against detachment until the burner is again removed and the pan 52 is rotated to engage its notches 61 and the lugs 62.

I believe that the advantages of my invention will be readily appreciated from the foregoing. A burner adapted to create an intense heat zone in a shallow combustion chamber may be employed without heating up of the burner parts to such an extent as to interfere with the burner passing its rated amount of fuel. The casing structure as a whole is quite simple and is exceedingly

cheap to manufacture, and its parts may be readily and quickly assembled and disassembled. The burner and its associated parts may be readily detached from the structure and it is a material advantage at all times that the connections to the burner may be made outside the heater and without disconnection or removal of heater or casing parts. These advantages are extremely important from service and maintenance standpoints as will be well appreciated by those skilled in this art. Furthermore, devices of this character may be subjected to comparatively rough handling during shipment, and even during ordinary handling of the same, and it is a material advantage that the parts (while being so readily accessible) thereof are securely protected against damage.

While I have shown only two forms of my invention, in its adaptation to only one form of structure, it will be understood that it may be used in other instances and that changes in details and arrangement of parts may be made without departing from the spirit and scope of my invention as defined by the claims which follow.

I claim:

1. In structure of the character described, casing structure including a bottom forming a combustion chamber, said bottom having an opening therein, surrounded by an upstanding flange, an inverted pan of larger dimensions than said opening and having a peripheral depending flange telescoping said first flange in spaced relation thereto, said latter pan having one or more openings in its bottom adapted to receive parts of an exteriorly located burner for discharging gases of combustion into said combustion chamber.

2. In structure of the class described adapted for use in connection with a burner having gas-discharging elements, a casing including a bottom providing a combustion chamber, said bottom having an opening, means disposed over and inwardly of said opening providing a chamber for receiving the burner, said means comprising a pan member having openings in its bottom through which the burner elements are adapted to pass for supporting said pan member.

3. In structure of the class described adapted for use with a burner having gas-discharging elements, means including a bottom member forming a combustion chamber, said bottom member having an opening therein surrounded by an upstanding, inwardly-projecting flange element, said flange element defining a space in which the burner is adapted to be mounted, a pan member having a depending peripheral flange telescoping said flange element in vertical and lateral spaced relation, the bottom of said pan member serving as the top of said burner space and having therein openings through which the burner elements are passed to support said pan member.

4. In structure of the class described adapted for use with a burner having gas-discharging elements, means including a bottom member forming a combustion chamber, said bottom member having an opening therein surrounded by an upstanding, inwardly-projecting flange element, said flange element defining a space in which the burner is adapted to be mounted, a pan member having a depending peripheral flange telescoping said flange element in vertical and lateral spaced relation, the bottom of said pan member serving as the top of said burner space and having therein openings through which the burner elements are passed, support members adapted to be passed over the burner elements in snug-fitting relation thereto and upon which the bottom of said pan member seats, said members being of larger dimensions than said pan member openings to close the latter whereby normal air access to said combustion chamber is through said spacing between said flange element and flange.

5. The combination with a casing side and top walls forming a combustion chamber, and a burner having heating elements projecting into said chamber; of an inverted pan member, the inset part of which constitutes in part the bottom of said chamber, the inwardly inset part of said member and its surrounding depending flange or side wall providing a space within the lateral and vertical limits of said chamber but exteriorly thereof adapted to receive the part of said burner supporting said heating elements in a zone cooler than the combustion chamber, said inset bottom part having openings therein corresponding in number to said heating elements for projection of said elements into said chamber, and said inset bottom part being removable from the other of said bottom parts when said burner is detached for inspection of the interior of said chamber.

6. In structure of the character described, an inner shell, an outer shell spaced therefrom, and means constituting a bottom for said shells comprising a pan having an upstanding peripheral flange embracing said outer shell, a plurality of centering members projecting upwardly from said pan and embracing said inner shell, and fastening means securing said flange, shells and members together.

7. In structure of the character described, an inner cylindrical shell, an outer cylindrical shell spaced therefrom, and means constituting a bottom for covering and supporting said shells comprising a pan having an upstanding peripheral flange embracing the outer wall surface of said outer shell a plu-

rality of angled centering members carried by and projecting upwardly from said pan and embracing said inner shell, in the space between said shells, and fastening means passing through and securing said flange, shells and members together.

8. In casing structure of the character described, shell means forming a chamber, and bottom structure for said chamber comprising a pan secured to the bottom of said shell means and having an opening therein, an inverted cup-shaped member mounted over said opening providing a space exteriorly of said chamber and offset inwardly of said pan, the wall of said pan at one side being shaped to form therein an open-bottomed passageway leading from its outside edge to said opening, and the side wall of said cup-shaped member having an open-bottomed cut-out therein coinciding with the inner end of said passageway.

9. In casing structure of the character described, a pan-like bottom having its central portion offset inwardly providing a receiving-space within the limits of the casing but exteriorly thereof, said bottom at one side of said space being depressed inwardly to form a semi-circular open-bottom passage open at both ends and leading into said space.

10. The combination with shell structure forming a combustion chamber, and a burner device having a plurality of heating elements; of a bottom part carried by and supporting said shell structure, said bottom part being offset inwardly into said combustion chamber providing a space adapted to receive said burner within the limits of said shell structure but exteriorly of said chamber, said offset portion having openings corresponding in number to said elements and through which said elements project into said chamber, and said bottom part, at one side of its offset portion being formed inwardly to provide an open-bottom passage leading from the outer edge of said shell structure into said space and adapted to receive within the vertical limits of said shell structure fuel connections leading to said burner, whereby said burner and parts are protected against injury during handling of the shell structure and the burner structure and its connections may be disconnected and freely moved away from the shell structure without disassembly of the latter and said bottom part.

11. A structure of the character described which includes a bottom part having an inwardly offset central portion providing a burner receiving space, and having a radially disposed offset portion leading from said first offset portion providing an open-bottom passageway leading from said space to the outside of the structure for receiving the fuel connections leading to the burner, by which arrangement the burner and its connected parts are readily removable from the structure without detachment of parts of said structure while at the same time being mounted within the vertical and lateral limits of the structure to protect the same against breakage.

12. In structure of the character described, a casing bottom structure which comprises a pan adapted to be detachably secured to the side walls of the casing, which pan is provided with a central opening therein, another and inverted, cup-shaped pan mounted in said opening, said latter pan having the free edge of its side wall flanged laterally to engage the bottom of the first mentioned pan to limit the movement of said second pan in inverted position through said opening, said second pan providing a space within the limits of the casing structure, but exteriorly thereof for reception of a burner or other device, and means for detachably securing said second pan to said first pan.

13. In structure of the character described, a casing including side and top walls forming a combustion chamber, a bottom for said chamber comprising a pan attached to said side walls and having a central opening therein, another and cup-shaped pan mounted in inverted position in said opening providing, within the limits of said combustion chamber and exteriorly thereof, a burner receiving chamber, the free edge of the side wall of said cup-shaped pan being flanged outwardly to seat against said first pan, and means carried by both said pans for detachably engaging the same.

14. The combination with casing side and top walls forming a combustion chamber, and a burner device having a plurality of heating elements discharging into the combustion chamber; of a bottom for said chamber comprising a pan of a size substantially equal to the outside dimensions of said casing and having an opening therein, means for securing said pan to said casing wall, another pan mounted over said opening in inverted position and having in its bottom openings corresponding in number and position to said heating elements, said second pan having its side wall edge flanged to seat against said first pan to limit its movement through said opening, interlock means carried by both said pans for detachably securing the same together, said inverted pan providing a space within the limits of but exteriorly of the combustion chamber for receiving the body portion of said burner removed from the combustion chamber heat zone.

15. In structure of the character described, a casing including a bottom wall forming a combustion chamber, said bottom having an opening adjacent its center through which

gas discharging means is projected into the combustion chamber, said bottom also having its surface formed to provide a passage leading from said opening to the outer part of said casing exteriorly of but within the vertical limits of said casing providing a space adapted for receiving connections leading to said gas discharging means within the limits of said casing but removable therefrom with said means by merely detaching the same and moving the latter downwardly away from said casing.

16. In casing structure of the character described, a bottom comprising a pan having an opening therein, a cup-shaped member mounted in said opening in inverted position and having a flange extending laterally from its side wall which engages the underside of said pan to limit the inward movement of said member, said member defining a space within the limits of said casing but exteriorly thereof, and means for detachably securing said pan and member together by inserting said member in said opening and rotating it relatively to said pan.

17. In casing structure of the character described, a bottom comprising a pan having an opening therein, a cup-shaped member mounted in said opening in inverted position and having a flange extending laterally from its side wall which engages the underside of said pan to limit the inward movement of said member, said member defining a space within the limits of said casing but exteriorly thereof, a plurality of lugs carried by said pan and having a part projecting from the underside of said pan in spaced relation thereto adjacent said opening, said member flange having openings through which the projecting parts of said lugs are passed for rotation of said member to seat its flange upon said lugs, and stops carried by said member and adapted to engage said lugs to limit said rotational movement of said member.

18. A bottom structure for a casing forming a combustion chamber which comprises a pan having a central opening attached to said casing and upon which said casing rests, a cup-shaped pan mounted in said opening in inverted position, said cup-shaped pan having its side wall flanged outwardly to seat against said supporting pan and to limit the movement of said former pan through said opening, said cup-shaped pan having openings in its bottom wall for the reception of heating elements and also having spaced notches in its said flange, supporting lugs carried by the underside of said first pan in spaced relation thereto and of a size to readily pass through said notches, said pan flange having stop means adapted to strike said lugs and limit movement of said cup-shaped pan when it is inserted in said opening with its notches engaged with said lugs and turned.

19. In casing structure forming a combustion chamber into which hot gases of combustion are discharged by burner means having connections with a suitable fuel source, a bottom wall constituting the bottom of the combustion chamber, said wall having a centrally-disposed opening therein leading into said combustion chamber through which said burner means is projected from beneath the casing into the combustion chamber, said bottom wall being inset from said opening to the outer part of said casing to provide a relatively narrow open-bottom passageway within the vertical limits of the casing structure, said passageway being of sufficient depth to receive within its vertical limits the connections leading to the burner means.

In testimony whereof, I have subscribed my name.

SIMON J. LONERGAN.