122. LIQUID HEATERS
& VAPORIZERS,

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2,245,322

BOILER

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2 Claims. (Cl. 122—156)

My invention relates to improvements in a boiler construction and is directed more particularly to improvements in boilers for hot water systems and the like.

The principal objects of my invention are directed to the provision of a boiler which is characterized by a hot water compartment having disposed therewithin a heating chamber and a flue so as to provide relatively thin vertical water spaces between the outer shell and the enclosure therein consisting of the heating chamber and the flue connected therewith and also to provide a plurality of horizontal water spaces between various sections of the flue. The small water spaces are especially well adapted for quick heating and fast circulation and the extended flue provides long forward and backward flue travel and permits more heat transfer.

The flue is specially constructed so as to take full advantage of the tendency of the gases therein to flow upwardly as it is natural for them to do. The construction is such that the gases pass upwardly from the heating chamber in a zig-zag route from one flue section to another. With the heating chamber and flue being disposed within the outer shell which also contains the water to be heated, and with the heating chamber and flue being entirely surrounded by this water, the gases which pass through the heating chamber and the flue heat the water surrounding these elements.

The parts of my device are preferably made from a thin sheet material so that relatively thin sections are provided and the general construction is such that the heating sections are more or less submerged in water so as to provide alternating layers of water and heating sections or compartments so as to facilitate the most efficient heat transfer and to bring about at a lower cost of operation a greater capability for quick steaming.

The boiler of my invention is adapted for many broad uses but it is especially well adapted for use in connection with an oil burner which delivers its products of combustion into a combustion chamber and which is in operation intermittently according to the demands for heat upon the system in which the boiler is used. According to present day demands, boilers are required in connection with oil burners which are adapted to withstand the intermittent periods of use and non-use. The boiler of my construction is especially well adapted for such irregular use. It is furthermore incumbent upon oil burner and boiler manufacturers today to recognize that a quick steaming apparatus is necessary and the device of my construction is such as to obtain a quicker time for steaming at a lower cost of operation than has ever heretofore been possible.

The boiler has the further advantage of having eliminated all unnecessary tubes which are always susceptible to clogging and to leakage and it has the further advantage of being a complete boiler, having all of the water heating facilities which may be desired in a single complete unit.

A maximum operating efficiency is assured by the balanced design of the boiler and its component oil burner, by the arrangement of baffles which force the hot gases to travel a plurality of times the length of the boiler.

Quiet operation is another outstanding feature of the device of my invention, it having an insulated combustion chamber which completely eliminates objectionable noise on the outside.

Furthermore, the device is especially simple in its construction as compared with the constructions of the prior art.

With the foregoing and various other novel features and advantages and other objects of my invention as will become more apparent as the description proceeds, the invention consists in certain novel features of construction and in the combination and arrangement of parts as will be hereinafter more particularly pointed out in the claims hereunto annexed and more fully described and referred to in connection with the accompanying drawing wherein:

Fig. 1 is a sectional elevational view of the device of my invention;

Fig. 2 is a plan view of the device of the invention along the line 2—2 of Fig. 1;

Fig. 3 is an inverted plan view of the top cover member of the flue section; and

Fig. 4 is a top plan view of the hot water heater of the device of my invention shown in conjunction with a portion of a side wall of the outer shell.

Referring now to the drawing more in detail, wherein similar reference figures refer to like parts, and referring more particularly to the preferred form of my invention which has been selected for illustrative purposes, I have shown an outer shell which is preferably square in its construction and which comprises side walls 10 and 10, end walls 12 and 12, a bottom wall 14 and a top wall 16 so as to form a compartment therewithin into which the water may be disposed.

Also disposed within the outer shell is an inner shell having side walls 22 and 24 which at their lower extremities are disposed vertically and par-

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Fig. 1.

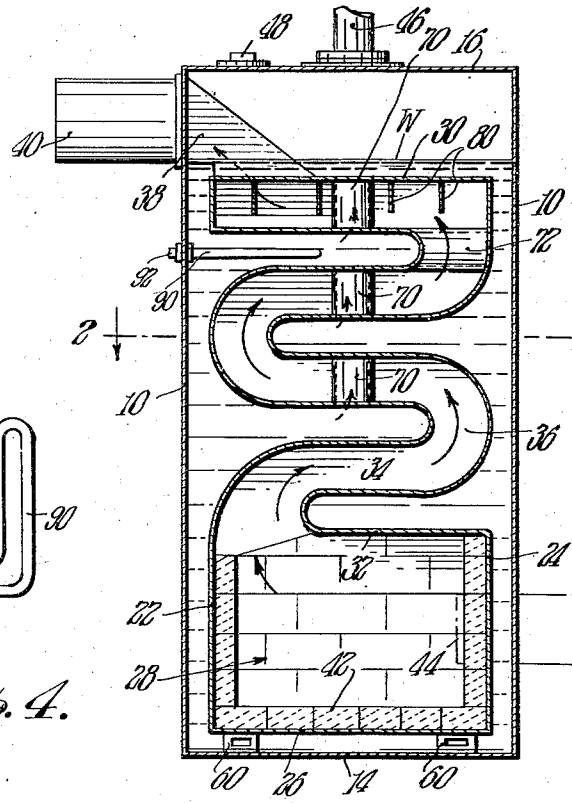
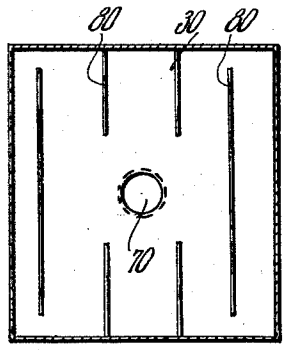


Fig. 3.



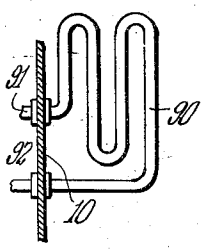
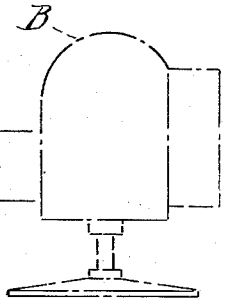


Fig. 4.



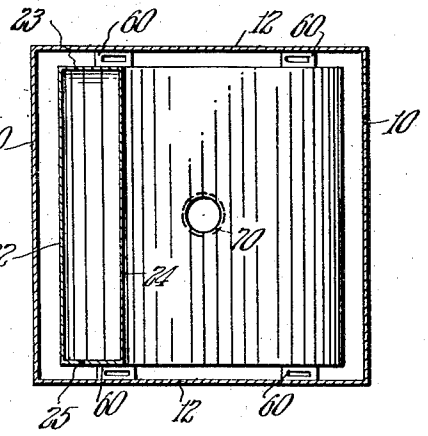


Fig. 2.

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allel and are connected by a pair of end walls **23** and **25** and by a bottom connecting wall **26** so as to provide a box **28** which is later to be more fully described. The upper portions of the side walls **22** and **24** extend in parallelism alternating forwardly and rearwardly relative to the side walls of the outer shell so as to provide horizontal runs which are interconnected and spaced above one another and which extend from the box **28** to the top edges of the side walls **22** and **24**. These top edges are connected by a cover member **30**. All this is to say that a portion of the side wall **24** extends horizontally inwardly at a point above the box **28** so as to provide a portion which is indicated by the character **32** which serves as a cover member for the box **28** substantially as is shown in Fig. 1. The wall **24** then curves upwardly and outwardly again, substantially as is shown in Fig. 1, and the other side wall member **22** is curved similarly in a line parallel thereto and spaced therefrom so as to provide a horizontal run which is indicated by the character **34**. The upper portions of the side walls are further curved in parallel so as to form a series of interconnected horizontally disposed flue sections or runs.

By virtue of these horizontal runs which are separated from each other and above each other in spaced relation by vertically disposed interconnecting sections such as is indicated by the character **36** horizontally disposed water compartments are provided therebetween.

A stack outlet **38** is provided at the top of the uppermost horizontal run which permits the escape of the gaseous fumes therefrom. This outlet passes through a wall of the outer compartment and the gases may be conducted from there by means of a conduit **40** to a chimney (which is not shown) or the like so as to assist the gases in their route from the box **28** through the flue member and the outlet and out the conduit, all as has been indicated by the direction of the arrows in Fig. 1.

A suitable refractory material which is indicated by the character **42** is provided within the box **28** so as to line the side walls **22** and **24** and the bottom wall **26** thereof along these portions which will receive the direct flame from an oil burner indicated by B through the connecting tube **44** which extends into the box **28** which serves as a combustion chamber, although it will be understood that any type of heating unit may be contained therein with equally effective results.

A steam outlet vent **46** or radiator supply is provided at the top of the outer chamber as is also provided a safety valve **48** of one of the well-known types.

Braces **60** are provided along the sides of the inner shell so as to hold the same securely in position relative to the outer shell, all as has been shown in Fig. 2.

As a special feature of my invention, the inner chamber is seated upon legs or standards **62**, substantially as is shown in Fig. 1, so that the water is enabled to circulate freely not only around but also beneath the inner shell. I have called this feature of my invention, the "floating-bed" and it results not only in a more complete circulation of the water within the outer shell but also in a greater area of heating surface, where the heat is most intense and obviously most desirable.

What is more, by virtue of this "floating-bed," a wet base is provided which enables me to locate my device upon a wooden floor or the like, if such may be desired, without the fear of such dangers as are inherent with boilers of the more ordinary types.

Vertical tubular connectors such as **70** are disposed through the horizontal runs so as to provide other means of access by which the heated water and steam may rise to the top of the boiler. Three of these connections are shown in Fig. 1 as being disposed directly above each other, and in Fig. 2, as being disposed centrally of the boiler, although it will be understood that they may be inserted elsewhere so long as the objective of providing means by which the percolation is facilitated.

A horizontally extending tubular connection, such as **72**, may likewise be provided, substantially as has been shown in Fig. 1, in an effort to further facilitate such percolation and to permit the passage of water from one side of the flue to the other.

As is shown in Fig. 3, upon the under side of the top cover member **30**, there are provided downwardly extending baffles which provide channels through which the gases are routed in their passage through the uppermost horizontal run and by means of which means is provided so that the gas is wiped whereby the maximum amount of heat is removed therefrom.

Water may be carried in the boiler substantially to the level which is indicated by the dash line W in Fig. 1 so as to entirely enclose the heating areas with water and the necessary relief means which are not herein shown may be provided so that the boiler is at all times amply supplied with water. However, if it is so desired, the water level may be lowered so as to provide a dry heated surface on the uppermost portions of the wall members **22**, **23**, **24** and **25** and on the wall member **30**. Thereby the steam rising upwardly is dried as it rises so as to avoid the objection which oftentimes arises of a steam which is too moist for the best possible and effective use.

The parallel end walls of the inner shell **23** and **25** are substantially in spaced alignment with the respective parallel walls **12** and **12** of the outer shell so as to provide relatively thin vertically-disposed water-spaces therebetween. It has been found by experimentation that such thin water spaces are best adapted for the purposes which it is desired to serve. By means of these thin spaces, the water is most easily heated.

When the boiler is fired, the hot gases pass upwardly from the combustion chamber into and through the flue where they travel in a zig-zag circuit. Quick steaming is accomplished by reason of the fact that there is a layer of water between the adjacent walls of adjacent sections of the flue. Water in the boiler tends to circulate inwardly between the sections and upwardly through the passageways through the flue sections and through the vertical spaces along the sides.

Among the various other features which have not been shown in an effort to make the drawing clearly readable are clean-out doors which may be conveniently provided so as to facilitate the cleaning of the flue and a heavy coating of insulation around the outer shell in an endeavor to keep heat losses at a minimum.

If it is desired, a water heater such as **90** may be disposed within the boiler so as to provide a supply of domestic hot water for the home. This may consist of a coil of copper tubing **90** having an inlet **91** and an outlet **92** through the

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side wall 10 of the outer shell. It is disposed between two adjacent runs of the flue so as to receive the benefit of the heat from that portion of the device.

Manifestly the specific details of construction may be considerably varied from those herein shown and described without involving any departure from the principle of the invention or sacrificing any of the advantages inherent therein. While I have described my invention in this specification in great detail and particularly with respect to the present preferred form thereof, it is not desired to be limited thereto since many changes and modifications may be made therein without departing from the spirit and scope of the invention.

The invention may be embodied in other specific forms without departing from the essential characteristics thereof. Hence, the present embodiments are therefore to be considered in all respects merely as being illustrative and not as being restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all modifications and variations as fall within the meaning and purview and range of equivalency of the appended claims are therefore intended to be embraced therein.

What it is desired to claim and secure by Letters Patent of the United States is:

1. A boiler apparatus comprising in combination, a closed outer shell having lower, upper, side and end walls, a closed inner shell having lower, upper, side and end walls, supporting means on the lower wall of the outer shell supporting the lower wall of the inner shell, portions of the side walls of the inner shell at lower and upper ends being spaced apart to provide with the end walls thereof a lower combustion chamber and an upper chamber, an intermediate portion of one side wall of the inner shell extending inwardly partially over said combustion chamber and then back and forth in horizontal spaced runs to the upper chamber, the intermediate portion of the other side wall extending from the lower portion thereof in conformity with and in spaced relation relative to the intermediate portion of the one side wall co-operating therewith and with the end walls of the inner shell to provide a restricted passageway between relatively larger combustion and upper chambers, the walls of said inner chamber being spaced from adjacent walls of the outer chamber to provide relatively narrow vertical and lower horizontal water spaces at the ends and sides of the inner shell in communication with horizontal water spaces between the intermediate portions of the side walls thereof and a water space above the upper chamber whereby said inner shell is surrounded by a water space, and a flue connection extending from the upper chamber through the water space above the upper chamber and through an outer wall of the upper chamber.

2. A boiler apparatus comprising in combination, a closed outer shell having lower, upper, side and end walls, a closed inner shell having lower, upper, side and end walls, supporting means on the lower wall of the outer shell supporting the lower wall of the inner shell, portions of the side walls of the inner shell at lower and upper ends being spaced apart to provide with the end walls thereof a lower combustion chamber and an upper chamber, an intermediate portion of one side wall of the inner shell extending inwardly partially over said combustion chamber and then back and forth in horizontal spaced runs to the upper chamber, the intermediate portion of the other side wall extending from the lower portion thereof in conformity with and in spaced relation relative to the intermediate portion of the one side wall co-operating therewith and with the end walls of the inner shell to provide a restricted passageway between relatively larger combustion and upper chambers, the walls of said inner chamber being spaced from adjacent walls of the outer chamber to provide relatively narrow vertical and lower horizontal water spaces at the ends and sides of the inner shell in communication with horizontal water spaces between the intermediate portions of the side walls thereof and a water space above the upper chamber whereby said inner shell is surrounded by a water space, a flue connection extending from the upper chamber through the water space above the upper chamber and through an outer wall of the upper chamber, and baffles associated with the upper wall of the inner shell extending into the upper chamber thereof.

GEORGE H. BORK.