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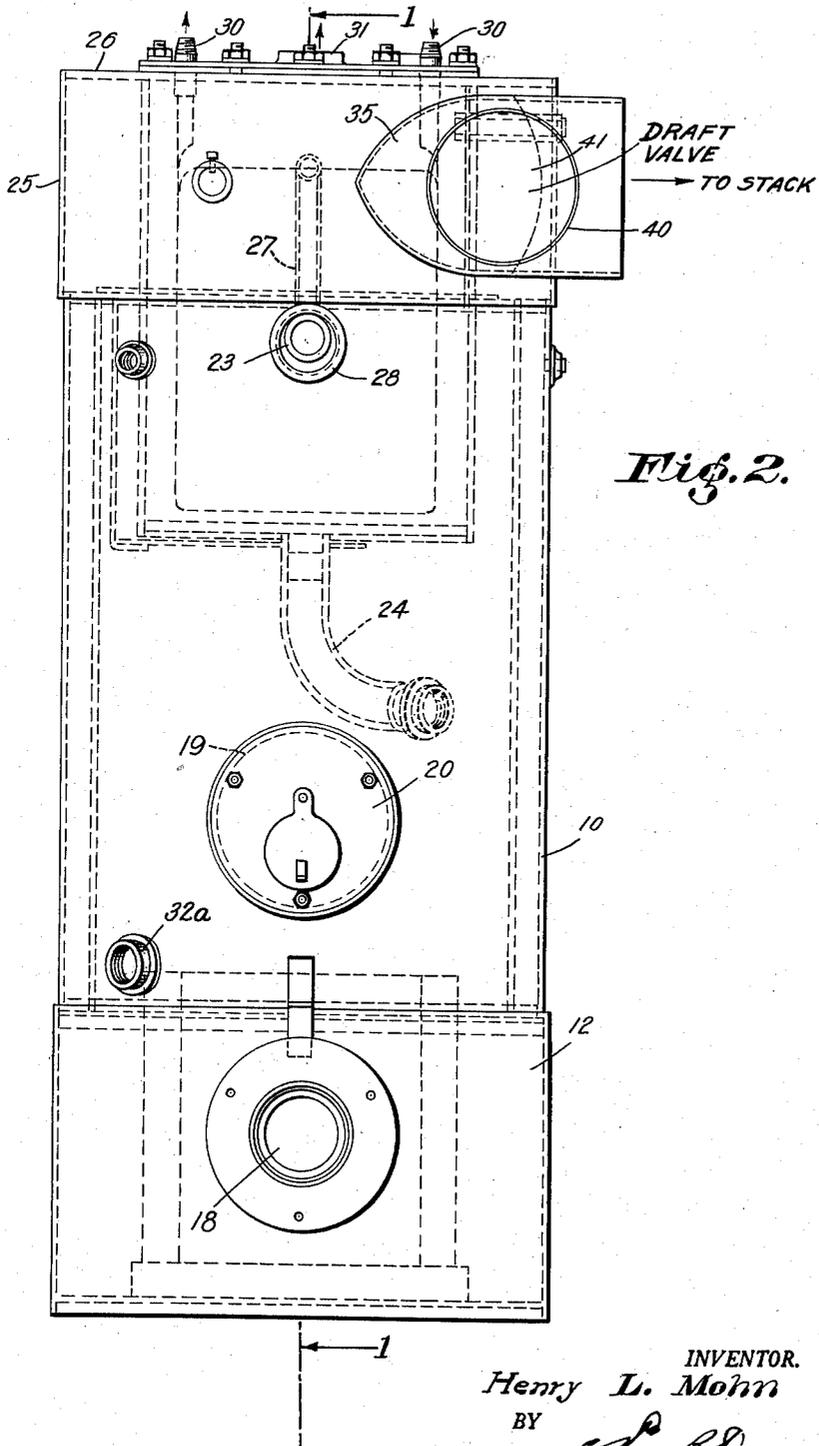
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WATER HEATER ASSEMBLY

Filed Aug. 18, 1949

5 Sheets-Sheet 2



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5 Sheets-Sheet 3

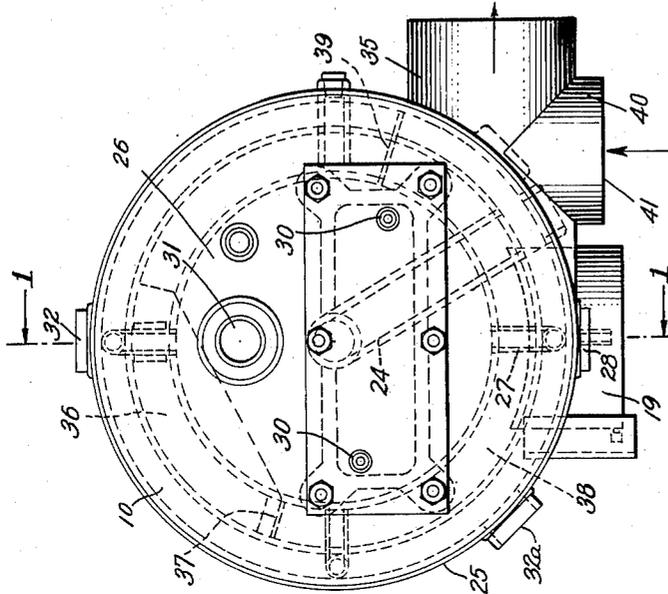


Fig. 3.

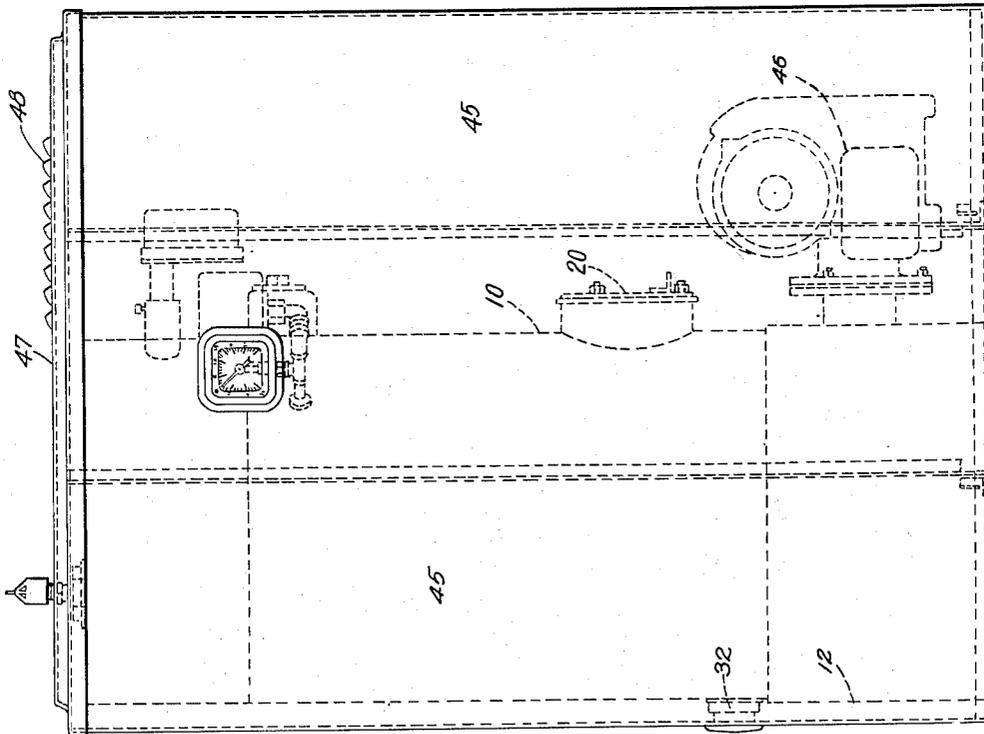


Fig. 4.

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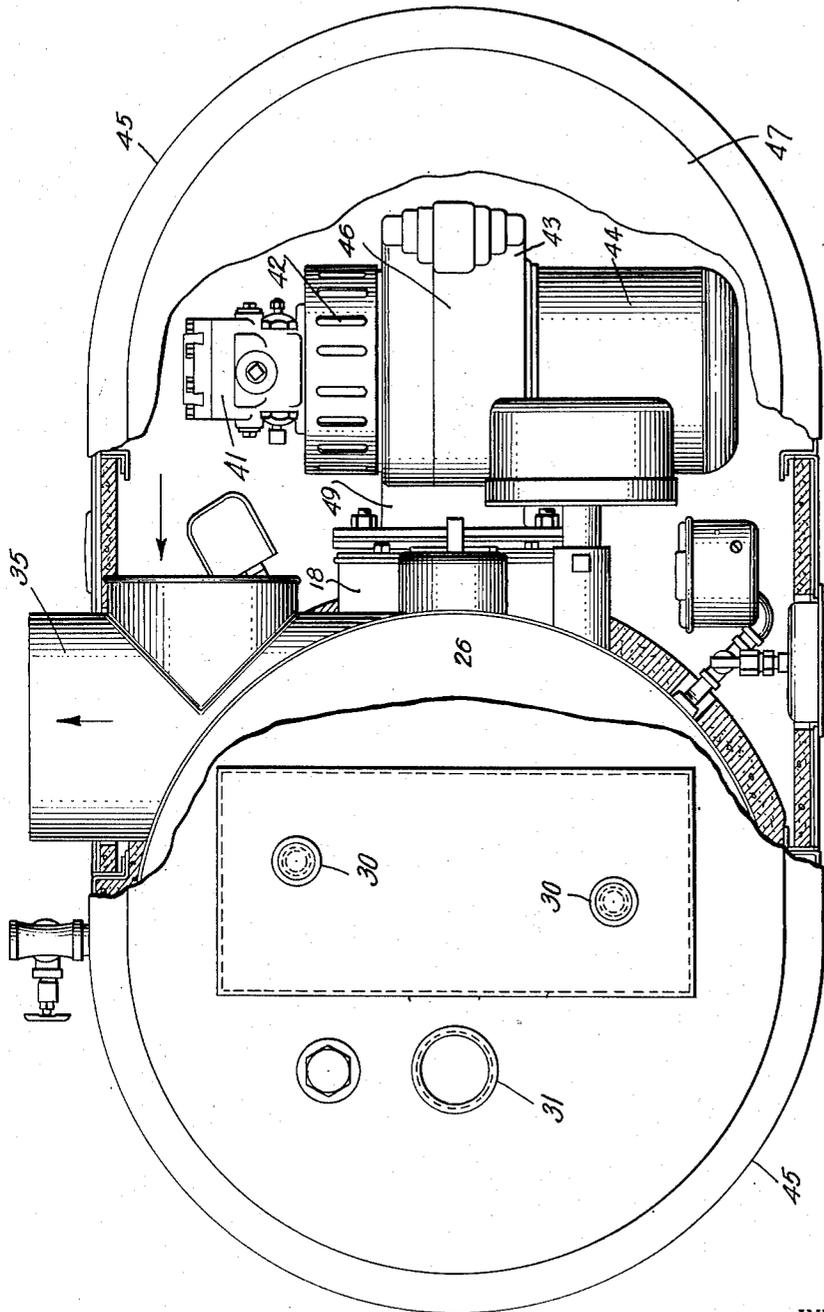


Fig. 5.

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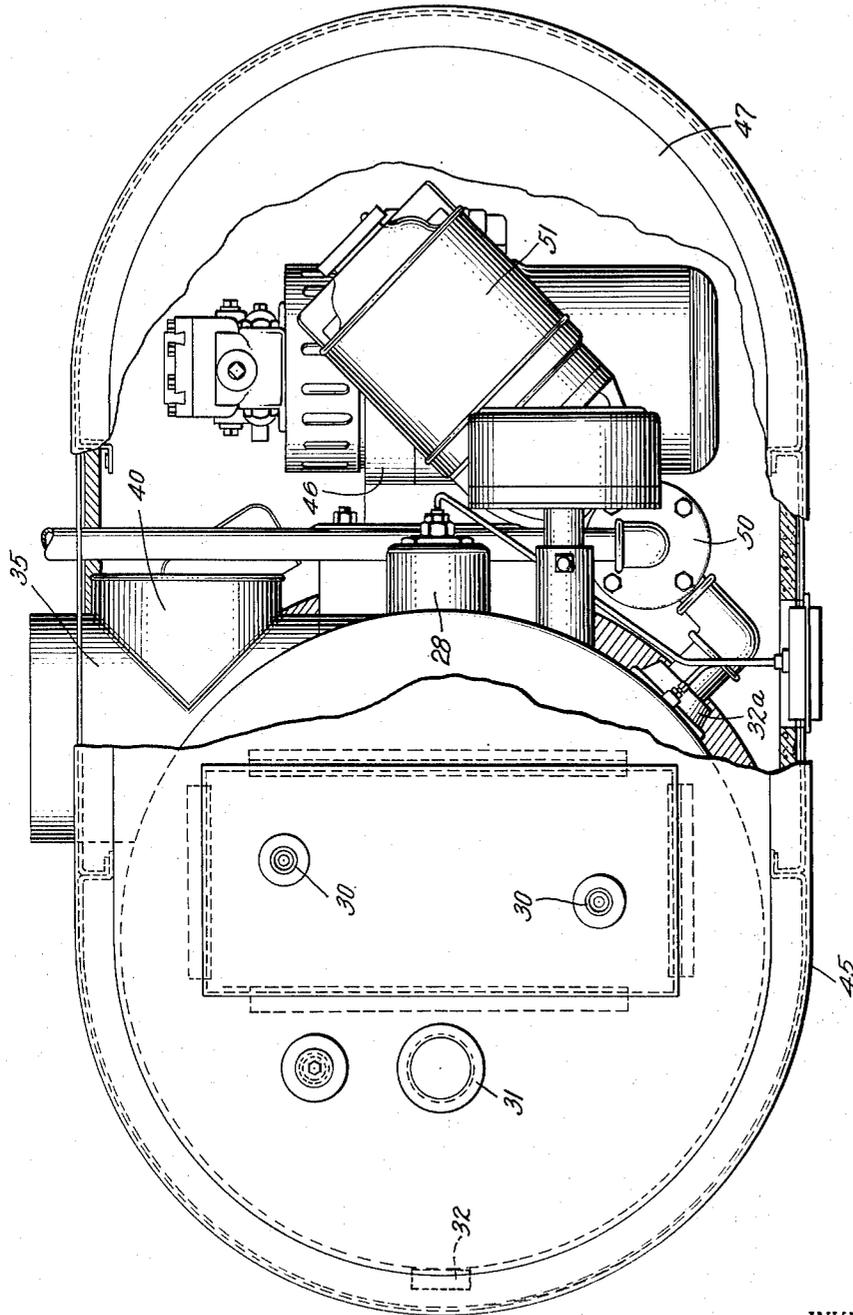


Fig. 6.

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# UNITED STATES PATENT OFFICE

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## WATER HEATER ASSEMBLY

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Application August 18, 1949, Serial No. 110,931

4 Claims. (Cl. 122-37)

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This invention relates to heating systems and more particularly to an improved heating boiler and domestic hot water heating unit.

Conventional water heating units and steam generators have been provided with water tubes and tanks, and with flue passages for hot combustion products extending through the tanks and between the tanks and the boiler casing. Such prior constructions generally include the use of multiple flue passages difficult to clean and the use of external stabilizer tubes or loop.

The heating unit of the present invention provides an efficient and economical assembly having many advantages.

It is an object of this invention to provide a water heating boiler and burner assembly which may be completely contained within a single housing, and which provides for heating water or for generating steam, and also provides for heating domestic hot water.

It is another object of this invention to provide a tubeless boiler assembly of relatively high efficiency and devoid of external stabilizer pipes or connections.

It is another object of this invention to provide an improved boiler unit including a fuel burner mechanism, circulating pump and draft connections all within a simple housing.

It is another object of this invention to provide a tubeless boiler assembly having an improved baffle arrangement facilitating cleaning of the flue passages therein.

It is another object of this invention to provide a boiler assembly having an improved arrangement of flue passages and enclosing housing which assures quiet operation of the heating unit.

It is a further object of this invention to provide an improved heating boiler and burner assembly which may be manufactured as a packaged unit, and which is easily installed and connected to residential or other heating systems.

Other objects and advantages of this invention will be readily apparent from the following description and the accompanying drawings illustrating a preferred embodiment of the invention, wherein,

Figure 1 is a vertical sectional view of a preferred form of boiler assembly removed from its housing and taken on line 1-1 of Figures 2 and 3.

Figure 2 is an elevational view of the boiler assembly shown in Figure 1.

Figure 3 is a plan view of the top of the boiler assembly shown in Figure 2.

Figure 4 is a front elevation view of the outer housing for the boiler assembly shown in Figure

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1 with the position of the boiler and fuel burner indicated in dotted lines.

Figure 5 is a plan view, partly cut away, of the top of the housing shown in Figure 4.

Figure 6 is a plan view, partly cut away, of the top of the housing when the boiler assembly is provided with a water circulating pump.

Referring to the drawings, particularly Figure 1, the heat exchanger unit includes a tubular upright casing 10 supported above a base plate 11 by an annular member 12. The tubular casing 10 forms an annular water wall or jacket closed at the bottom by a ring 13 and closed at the top by a ring 14. The water wall jacket 10 may be fabricated from sheet steel sections suitably joined together and to the rings 13 and 14 by welding. Within the member 12 and on the base plate 11 is a high temperature cement base 15 supporting a replaceable combustion chamber formed by blocks 16 of refractory material. Vermiculite fill 17 may be provided as heat insulation between the combustion chamber and the member 12. An opening 18 is provided through the member 12, fill 17 and combustion chamber wall 16 to receive the combustion tube (not shown) of a conventional oil burner device. The water jacket 10 is also provided with an observation and cleanout opening 19 closed by a plate 20.

Supported within the upper portion of the water jacket 10 and extending above the top of the jacket is a water tank 22. The tank 22 is connected to the annular jacket 10 by a connecting nipple 23 and also by a circulation tube 24, the latter extending from the bottom of the tank 22 downwardly and then laterally into the water jacket 10 about midway of the height of the jacket 10. An annular casing member 25 extends above the top of the jacket 10 spaced from the outer surface of the upper portion of tank 22 and closed at the top of the assembly by a circular cover plate 26 which may also serve as a cover for the tank 22. A stabilizer connection 27, similar to a "Hartford" loop, extends from the upper portion of the tank 22 outward and then downward through the ring 14 into the water jacket 10 adjacent the return line connection 28. The stabilizer conduit 27 is within the flue space enclosed by the casing member 25. The tank 22, member 25, and top 26 may be formed from sheet steel with welded joints. A tankless type domestic hot water heating coil 29 is immersed in the water contained in tank 22, and is provided with inlet and outlet connections 30 extending through the top 26. The top 26 is also provided with an

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outlet connection 31 from which steam may be led to conventional radiators, heating panels, or other devices. A drain or return connection 32 may be provided at the bottom of the water jacket 10.

The annular space between the tank 22 and the upper portion of water jacket 10 and member 25 constitutes a flue or passage for the combustion gases, and is provided with horizontal and vertical baffles which cause the gases to travel around the tank in a counter-clockwise spiral path to a tangential flue outlet 35, shown in Figures 2 and 3. The baffle members shown in Figures 1 and 3 include a horizontal baffle 36 removably supported on angle irons secured to the inner wall of jacket 10 and extending between the bottom of tank 22 and the inner surface of water jacket 10. A vertical baffle 37 is provided extending from one end of baffle 36 upwards between the outer surface of tank 22 and the inner surface of the upper portion of water jacket 10. A second horizontal baffle member 38 extends from the top of baffle 37 around the tank 22 to the lower end of a second vertical baffle 39. The baffle 39 extends upward from the end of baffle 38 to the top plate 26 adjacent the draft outlet conduit 35. The draft outlet 35 extends tangentially from the member 25, and is provided with a draft adjuster opening 40 having a conventional automatic flap valve 41 mounted therein. The hot gaseous products of combustion pass upwardly from combustion chamber 16 into space A, and thence counter-clockwise over the baffle 36 to the vertical baffle 37 which directs them upward to space B. In space B, the hot gases again travel counter-clockwise over the baffle 38 to the vertical baffle 39 which directs them into the tangential outlet 35 to a conventional stack. The inlet valve 41 admits additional air into the outlet 35 to permit control of the stack draft. The arrangement of horizontal and vertical baffles and tangential outlet provides a single somewhat spiral path for the combustion products and assures quiet operation, since there are no plural paths which might create resonant conditions tending to amplify combustion noises or result in a definite heat or pulsation of the draft. The arrangement of the four baffle members 36, 37, 38, and 39 also facilitates cleaning of the flue passages since space B is conveniently reached through the draft inlet opening 40, and since space A may be reached through the inspection opening 19, at which time the lower horizontal baffle 36 may be removed from its supporting lugs.

The heat exchanger shown in Figures 1, 2, and 3, is enclosed in an outer housing 45 which may be of somewhat oval shape as shown in Figures 5 and 6. The housing 45 has the heat exchanger positioned in one end, and provides space in the other end for a conventional liquid fuel burner 46, the latter being connected to the opening 18 of the heater assembly. The burner 46 includes a fuel pump 41, an air inlet 42, a blower 43, and a motor 44, the blower 43 being connected to the opening 18 by a tube 49, as illustrated in Figure 5. The top member 47 of the housing 45 is provided with suitable louvres 48, shown in Figure 4, to admit air into the housing for the fuel burner 46 and for the draft adjuster 40. The housing 45 is provided with removable panels to provide access to the burner 46 and to the piping connections, automatic controls, and indicator connections. The housing 45 may be provided with a heat-insulating lining in that por-

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tion of the jacket extending around the heater assembly.

Where the heater assembly is to be used for supplying hot water to heating radiators or radiant heat panel units, a circulating pump 50 driven by a motor 51 is provided within the housing 45 above the fuel burner 46 and is connected to a low point return connection 32a in the jacket 10, as shown in Figures 2 and 6. In such installations, hot water for the radiators is taken from the tank through upper connection 28, conducted to the heat radiators through conventional pipe systems, and returned to the heater assembly through circulating pump 50 within the housing 45. In such installations, the top steam outlet 31 is closed and the air space above the water level in tank 22 serves as a built-in expansion tank.

Where the heater assembly is to be used for supplying steam, steam generated in the space above the water level of tank 22 is conducted to its point of use through connection 31 and suitable piping, and the condensate is returned to the boiler through a return line connected to inlet 28. In such installations, an automatic low-water cutoff at this point is desirable since the cutoff mechanism will be exposed to a flow of clean return water which prevents the accumulation of mud. The provision of the stabilizer tube 27 serves as a Hartford loop to prevent the loss of water through the return line. The stabilizer tube being within the boiler flue assembly eliminates the cost of providing an outside loop and eliminates unsightly piping.

An adequate supply of hot water for domestic purposes is furnished by the tankless coil 29 immersed in hot water in the tank 22. The water in tank 22 is easily maintained at a temperature high enough to heat normal demands of domestic hot water. Controls such as disclosed in my co-pending application Serial Number 44,690, filed August 17, 1948, now Patent Number 2,540,055 issued January 30, 1951, may be used with the heater assembly shown herein to provide water of a desired temperature in each of several zones or portions of the assembly.

The provision of the draft adjuster 40 within the space enclosed by housing 45 is advantageous in that any flue blast which may occur when a fluid or liquid fuel burner mechanism is started blows into the housing 45 where it is sucked up by the fuel burner blower and pumped back into the combustion chamber. This arrangement avoids blowing soot into the atmosphere outside of the unit, and also effectively reduces the noise level of the operating heater assembly.

The improved baffle arrangement disclosed herein also reduces the noise level of the assembly, and increases the efficiency of the assembly through a reduction in the draft loss. The baffle arrangement also permits easy cleaning of the flue passages and provides a single flue passage which practically eliminates noise-producing resonant conditions.

It will be apparent that many changes in minor details, proportions, and design may be carried out within the scope of this invention as defined in the following claims.

I claim:

1. In a heater, a heat exchanger comprising in combination, a vertical annular water jacket, a closed water drum supported partly within and spaced from the upper portion of said water jacket, circulation tubes connecting said drum

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to said water jacket, a circular casing extending upward from the top of said water jacket surrounding and spaced from the upper portion of said drum, a horizontal baffle extending from the lower end of said drum outward to said water jacket and closing a portion of the annular space between said drum and said jacket, a vertical baffle extending upward from one end of said horizontal baffle and within said annular space, a second horizontal baffle extending between said drum and the top of said water jacket and extending laterally from the top of said vertical baffle and closing another portion of the annular space between said drum and said jacket, and a second vertical baffle extending upward from that end of said second horizontal baffle removed from said first vertical baffle, said second vertical baffle extending radially from the upper portion of said drum to said circular casing, and a flue connection extending tangentially from said circular casing, whereby said arrangement of baffles provides a single passage for conducting hot gases upward around said drum to said flue connection.

2. In a heater, a heat exchanger as set forth in claim 1, said annular water jacket having an opening therethrough below the level of the bottom of said drum, and said flue connection having a draft inlet opening therein adjacent said circular casing, whereby portions of the hot gas passage defined by said baffles are accessible through said two openings for cleaning.

3. In a heater, a heat exchanger as set forth in claim 1, said water jacket having means projecting from the inner wall thereof toward the bottom of said drum for removably supporting said first mentioned horizontal baffle, whereby said first horizontal baffle is removable to provide access for cleaning portions of the flue passage between said drum and said jacket.

4. In a heater, a heat exchanger comprising in combination, an annular water jacket, a water connection adjacent the upper end of said jacket, a water drum supported partly within and spaced inward from the upper portion of said jacket and extending above the upper end of said jacket, a circulation tube extending from the central portion of the bottom of said drum downward and

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laterally into said water jacket substantially midway of the height of said jacket, a casing extending upward from the outer wall of said water jacket and spaced from and surrounding the upper portion of said drum and enclosing a flue space surrounding the upper portion of said drum, a stabilizer tube extending from the upper portion of said drum downward within said flue space into the upper end of said water jacket adjacent to said connection, a flue connection secured to said casing, a housing surrounding said heat exchanger, a draft inlet in said flue connection and opening into said housing, and a fuel burner including a blower in said housing, whereby said blower circulates gases emitted from said draft inlet back into said heat exchanger.

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