Nov. 13, 1928. 1,691,334

M. H. BRADEN

HOT WATER HEATER

Filed Dec. 13, 1926 2 Sheets-Sheet 1

Fig. 1.

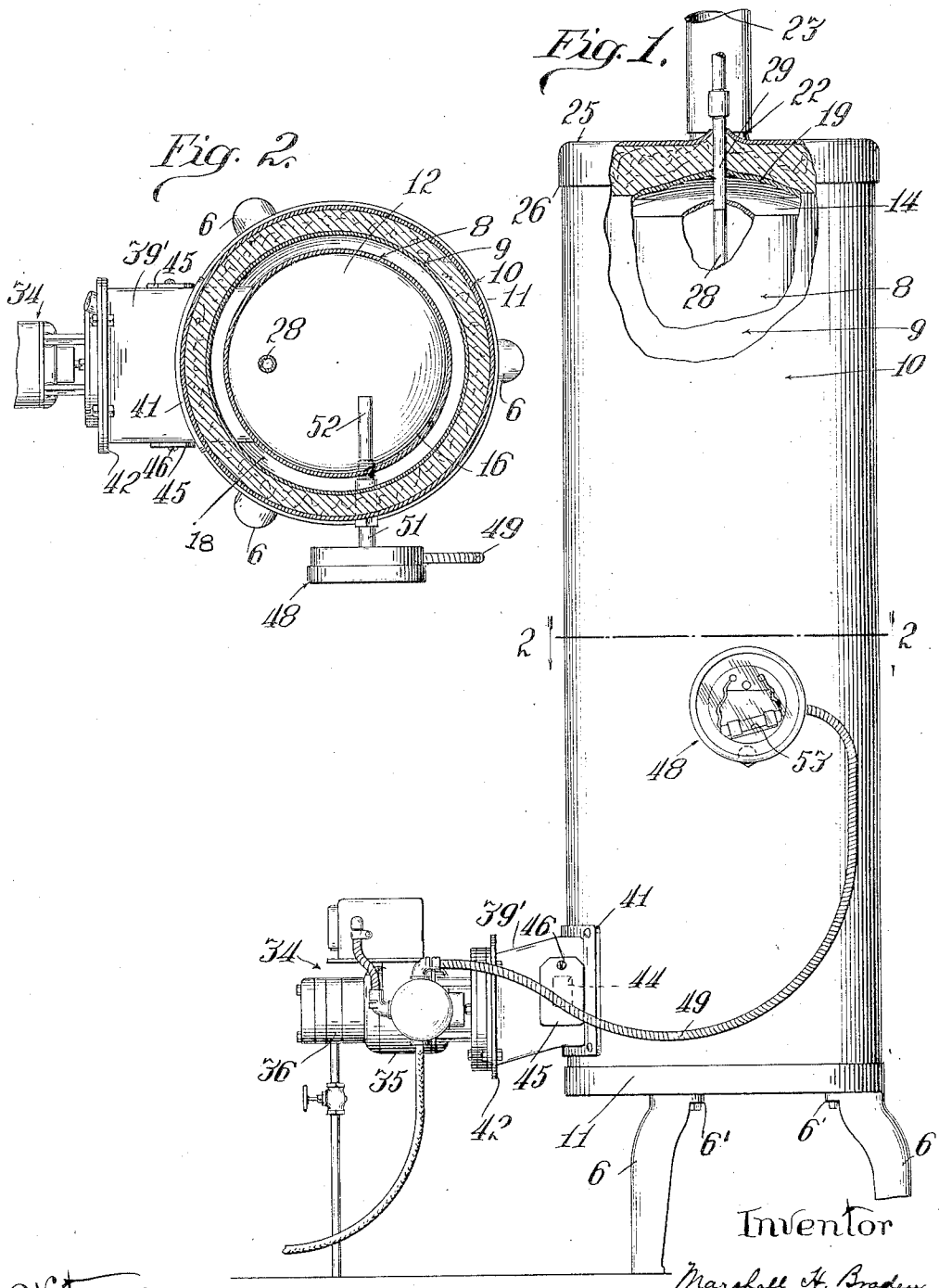


Fig. 2.

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Fig. 4.

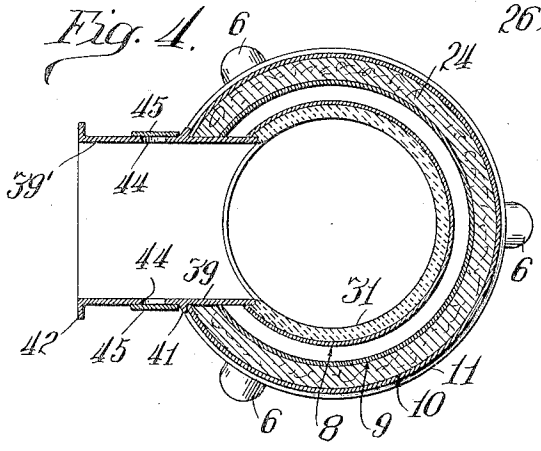


Fig. 3.

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UNITED STATES PATENT OFFICE.

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HOT-WATER HEATER.

Application filed December 13, 1926. Serial No. 154,378.

The present invention relates to hot water heaters, and has particular reference to domestic types of heaters, such as are commonly installed in kitchens, bathrooms and basements for supplying hot water for household use.

More specifically, one of the principal objects of the invention is to provide an improved construction of hot water heater utilizing liquid fuel as the combustible medium. The present heater embodies certain characteristic features which particularly adapt it to the burning of liquid fuel, as will be hereinafter described.

A further object of the invention is to provide a hot water heater of this type which is constructed substantially entirely of sheet metal, and which is therefore of very inexpensive and light weight construction.

Referring to the accompanying drawings wherein I have illustrated a preferred embodiment of my invention:

Figure 1 is a side elevational view of the present heater, with a portion thereof broken away in section.

Fig. 2 is a transverse sectional view, taken on the plane of the line 2—2 of Figure 1.

Fig. 3 is a vertical longitudinal sectional view through the heater, and

Fig. 4 is a transverse sectional view taken on the plane of line 4—4 of Fig. 3, with the burner unit removed.

The heater is preferably of cylindrical outline, although it might, of course, be of any other form, and is supported in elevated position upon a plurality of legs 6—6. The upper ends of these legs have horizontally extending flange portions 6′ which are bolted or screwed to a circular plate 7 constituting the bottom of the heater. Resting on this plate are three cylindrical concentric shells 8, 9 and 10. The bottom plate 7 has an upwardly extending marginal flange 11 which embraces the lower edge of the outer shell 10, such flange being suitably secured thereto in any desired manner.

The upper portion of the inner shell 8 constitutes a water containing chamber 12 which is closed at the top by a crowned circular plate 14 having a downwardly extending marginal flange 15 which is secured within the upper end of the shell 8. The lower end of the water chamber 12 is similarly closed by a head 16 having a depending peripheral flange 17 which is welded or otherwise secured within the shell 8.

The intermediate shell 9 is spaced from the inner shell 8 to form an annular flue area 18 through which the products of combustion are conveyed upwardly, completely enveloping the water chamber portion of the inner shell. The upper end of the intermediate shell is closed by a crowned head 19 having a depending flange 21 which is secured within the upper end of the shell, this head being spaced from the head 14 of the inner shell to permit the products of combustion to pass up over the top of the inner shell. A tubular outlet duct 22 extends upwardly from the center of the head 19, this outlet duct projecting from the top of the heater and having communication with any suitable outlet flue 23 extending to a stack or other point of flue gas discharge.

The outer shell 10 is also spaced from the intermediate shell 9 to permit of a filling of heat insulating material 24 between said shells. This heat insulating material may consist of an asbestos compound or any suitable lagging, such as is commonly employed for heat insulating purposes. The top of the outer shell is closed by a head 25 having a depending flange 26 which is suitably secured over the upper end of the outer shell, such head being spaced from the head 19 to permit the heat insulating filling to be extended across the top of the latter head. Water is supplied to the chamber 12 through a water inlet pipe 28 extending down through the top of the heater and down into the water chamber 12, discharging therein at a low point adjacent the bottom head 16. The hot water is discharged from the upper part of the chamber 12 through an outlet pipe 29 extending upwardly from the head 14 through the top of the heater. The head 14 may be welded or otherwise secured in watertight joints to the pipes 28 and 29.

The lower portion of the inner shell 8, below the head 16, defines a combustion chamber or fire box wherein occurs the initial combustion of the liquid fuel. The circular inner walls of this shell are lined with a facing of heat refractory material 31, which

protects the sheet metal shell against burning by the high temperatures at this point. The upper edge of the heat refractory lining terminates somewhat below the head 16, and a plurality of holes 32 are formed in the inner shell intermediate the head and the heat refractory lining, and through these holes the products of combustion are conveyed outwardly into the annular flue area 18 surrounding the inner shell. The heat refractory lining 31 also extends across the bottom plate 7 to protect this plate against the high temperatures.

The liquid fuel burner which I preferably employ in this hot water heater is of the atomizing type, although, other types of liquid fuel burners may be employed if desired. The burner, indicated generally at 34, is of the general construction disclosed in my copending application, Serial No. 146,922, filed November 8, 1926, wherein the electric motor 35, the fuel pump 36 and the air fan 37 are all disposed on a common horizontal shaft. The electric motor and fuel pump are disposed exteriorly of the heater, and the air fan 37 is contained within a relatively large air nozzle 38 which discharges into the fire pot 31. A rectangular casing 39 extends horizontally through alined openings cut in the three shells 8, 9 and 10, and opens at its inner end into the fire pot 31. This casing has an attaching flange 41 which is riveted or otherwise secured to the outer side of the shell 10, and has a downwardly inclined portion 39′ extending outwardly from the flange 41, such latter portion receiving and enclosing the air nozzle 38. A flange 42 at the extremity of this outwardly extending portion affords a mounting member to which a radially extending flange on the nozzle is bolted or otherwise secured. As best shown in Figures 1 and 4, the outwardly extending portion 39′ of this casing is provided with an opening or openings 44 in one or both side walls, which openings are normally covered by closure elements 45 in the form of swinging flaps pivoted to the casing on screws or pivot studs 46. The opening or openings 44 are disposed in proximity to or slightly in advance of the discharge end of the air nozzle 38, and through these openings the combustible mixture projected from the nozzle can be ignited or the operation of the burner can be observed.

The present heater may be designed for manual control, i. e. wherein the electric motor 35 is stopped and started by a manually operated switch. It will be understood that fuel is only supplied to the combustion chamber when the motor is operating, as is fully described in my above mentioned copending application. In such manually controlled embodiment the ignition of the mixture, upon bringing the burner into operation, may be effected by manually igniting the same through one of the openings 44; or, if desired, a suitable pilot burner, or electrical ignition means, may be provided for igniting the same. In many instances it will be desirable to have the heater arranged for automatic control, and I have illustrated a preferred arrangement of such control in the drawings. In this construction, a thermally responsive control switch 48 is mounted on the side of the outer shell 10 and has suitable electrical connection with the electric motor, or with control switch mechanism therefor, through circuit wires contained within the conduit 49. The operation of the thermally responsive switch 48 is controlled by the temperature of the water in the chamber 12, such switch unit comprising a stem portion 51 which is suitably secured to the outer shell 10, and which has a tubular portion 52 extending into the water chamber 12, as best shown in Fig. 2. The tubular extension 52 has a closed inner end and contains any thermally responsive element which will be effective for actuating the switch mechanism in the switch unit 48. Such switch element may be of the type commonly referred to as a mercury switch, wherein the tipping of a glass tube 53 is operative to cause mercury to flow into or out of engagement with electrical contacts extending into the tube. The bi-metallic ribbon within the tubular stem portion 52, being subject to the temperature of the water in the chamber 12, twists or untwists with the variation of temperature and tips the mercury switch 53 to start or stop the operation of the burner 34, to the end of maintaining the water in the chamber 12 between certain temperature limits. With this automatically operating burner, a pilot light, or electrical ignition means, is employed for automatically re-igniting the mixture with each successive operation of the burner.

It will be seen from the foregoing that the burning mixture and products of combustion in passing from the combustion chamber up through the annular flue 18 will be conveyed through a relatively long pass so that complete combustion is assured before they are discharged from the heater. Moreover, these burning gases and products of combustion will have direct heat transferring contact with all sides of the water chamber. Owing to the relatively large area of the annular flue 18 and the complete absence of small flues there is no possibility of the heater becoming clogged with flue dust. The three sheet metal shells afford a light and inexpensive construction.

What I claim as my invention and desire to secure by Letters Patent, is—

1. A domestic hot water heater comprising three spaced concentric shells, a single bottom plate on which all three of said shells rest, separate heads closing the upper ends of the inner and intermediate shells, said upper heads being spaced to define an upper flue

area therebetween, an outlet duct communicating with said upper flue area, a lower head in said inner shell above said bottom plate and defining a water chamber in the upper part of said inner shell, and defining a combustion chamber in the lower part of said shell, a heat refractory lining extending around the side walls of said combustion chamber and across the top surface of said bottom plate, said heat refractory lining terminating short of the lower head in said inner shell, said inner shell having a plurality of holes therein between said insulating lining and said lower head for conducting the products of combustion from said combustion chamber to an annular flue area defined between the inner and intermediate shells, said annular flue area communicating with said upper flue area, heat insulating material between the intermediate and outer shells and extending down around said combustion chamber, casing means defining a laterally extending opening passing through all three of said shells and through said insulating lining for communicating with said combustion chamber, and an atomizing liquid fuel burner mounted on the outer end of said casing means and discharging through said opening into said combustion chamber.

2. A domestic hot water heater comprising three spaced concentric shells, a single bottom plate on which all three of said shells rest, separate heads closing the upper ends of the inner and intermediate shells, said heads being spaced to define an upper flue area therebetween, an outlet duct communicating with said upper flue area, a lower head in said inner shell to define a water chamber above said lower head, and a combustion chamber between said head and said bottom plate, said inner shell having a plurality of holes therein adjacent to said lower head for conducting the products of combustion from said combustion chamber to an annular flue area defined between the inner and intermediate shells, said annular flue area communicating with said upper flue area, heat insulating material between the intermediate and outer shells and extending down around the sides of said combustion chamber substantially to said bottom plate, and burner means associated with said combustion chamber.

3. A domestic hot water heater comprising three spaced concentric shells, a single bottom plate on which all three of said shells rest, an annular flue area defined between the inner and intermediate shells and extending down substantially to said bottom plate, an outlet duct communicating with the upper portion of said flue area, heat insulating material between the intermediate and outer shells and extending down substantially to said bottom plate, a head in said inner shell spaced from said bottom plate and defining a water chamber in the upper portion of said inner shell, an outlet pipe for withdrawing the heated water from said water chamber, a heat refractory lining extending around the inner sides of said inner shell, and across the top surface of said bottom plate for defining a combustion chamber, said inner shell having a plurality of holes therein between said head and said insulating lining for conducting the products of combustion from said combustion chamber to said annular flue area, casing means defining a laterally extending opening passing through all three of said shells and communicating at its inner end with said combustion chamber, and a motor driven liquid fuel burner mounted on the outer end of said casing means and discharging through said opening into said combustion chamber.

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