Nov. 14, 1950 B. H. PIERCE 2,529,707

WATER HEATER FOR INTERNAL-COMBUSTION ENGINES AND THE LIKE

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Fig. 1.

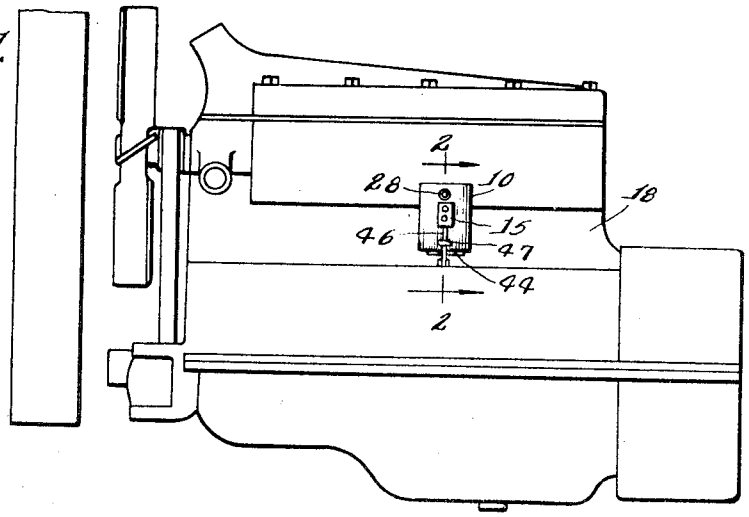


Fig. 2.

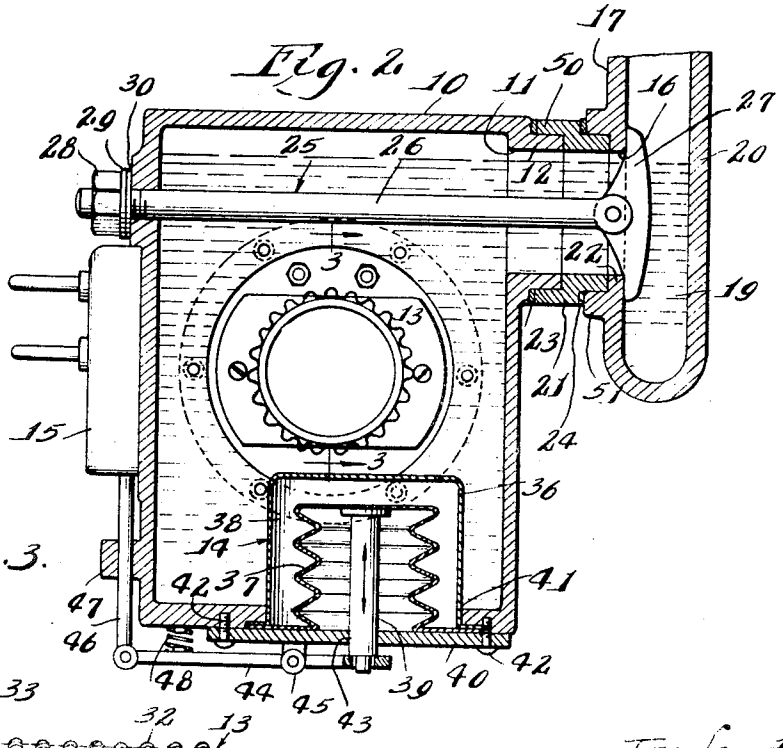
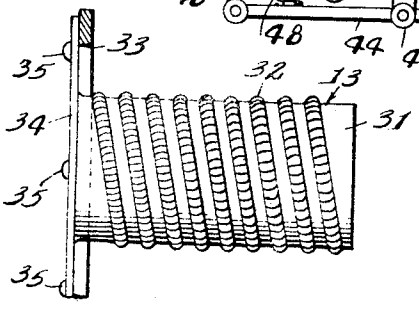


Fig. 3.



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WATER HEATER FOR INTERNAL-COMBUSTION ENGINES AND THE LIKE

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8 Claims. (Cl. 123—142.5)

1

This invention relates to a fluid heater for heating a body of fluid and relates particularly to a heater for heating the cooling liquid of an internal combustion engine or the like.

One of the features of this invention is the provision of improved means for heating a body of fluid by heating a small portion of the fluid contained in a chamber connected to the body and thereby causing the heated fluid to flow out of the chamber into the body while cool fluid flows from the body into the chamber; another feature of the invention is the provision of a single opening connecting the body of fluid with the chamber whereby the heated fluid flows out of the top portion of the opening while the cooler fluid flows in at the bottom of the opening; still another feature of the invention is the provision of such an opening near the top of the chamber with heat being applied to the fluid in the chamber at a point beneath the opening; a further feature of the invention is to provide heat responsive control means in the chamber to control the temperature with the heat control means being preferably located beneath the heating means; another feature of the invention is to provide a chamber for fluid connected to a body of fluid by a single opening located near the top of the chamber, heating means within the chamber and beneath the opening and heat responsive control means also in the chamber and located beneath the heating means; a specific feature of the invention is the provision of an improved apparatus for warming, or keeping warm the water in the cooling system in an internal combustion engine.

The present invention comprises broadly a fluid heater comprising a chamber, a single opening connecting the chamber with a body of fluid, and means for heating at least a portion of the fluid within the chamber. During the heating operation, heated fluid passes from the chamber out through the top of the opening and into the body of fluid, while cool fluid passes from the body of fluid through the bottom of the opening into the chamber. With such an apparatus, the fluid and the body of fluid may be heated uniformly at all levels substantially above the bottom of the opening. This principle may be used for heating gases or liquids and may be used also to distribute and mix one fluid with another. Thus, if the body of the fluid were of one type and the fluid in the chamber were of another type, the heat would cause the fluid in the chamber to mix uniformly with the body of the fluid.

The principle of operation of the present invention may be used to heat the cooling liquid in the cooling system of an internal combustion engine. In this embodiment a small chamber is provided adjacent the cooling system and connected to the system by a single opening. A heating means is employed to heat the liquid within the chamber and the heated liquid passes out through the opening at the top thereof, while unheated liquid passes in through the opening at the bottom. A heat responsive temperature control may be provided, if desired, in order to maintain the temperature within a desired range. Where this temperature control is set relatively low, the liquid in the cooling system is only heated at those levels above the bottom of the opening. It is, of course, true that a very small amount of heat will be conducted to those levels below the bottom of the opening, but this is very minor. However, if the temperature control is set for an extremely high temperature, a substantial amount of heat may reach below the bottom of the opening, with the heat transfer being by conduction, convection, or the like.

2

In order to aid in starting internal combustion engines, it is only necessary to warm the upper parts of the cylinders and the cylinder heads. These parts only may be heated by locating the bottom of the opening on a level even with the bottom of the zone where heat is to be supplied.

The invention will be described as related to the embodiment shown in the accompanying drawings.

Of the drawings:

Fig. 1 is an elevation of an internal combustion engine with a water heater constructed according to the principles of this invention attached thereto,

Fig. 2 is a vertical section taken through the water heater along the line 2—2 of Fig. 1, and

Fig. 3 is an elevation of the heating element used in the embodiment shown.

The water heater shown in the accompanying drawing comprises a rectangular chamber 10 having an opening 11 near the top thereof bounded by an extended flange 12, an electric heating element 13 within the chamber attached to a side wall thereof and arranged horizontally at substantially the center of the chamber, and a temperature control 14 within the chamber and located beneath the heating element 13 with the temperature control operating a snap-acting switch 15 mounted on the outside of the chamber.

The opening 11 of the chamber 10 is arranged to be connected with an opening 16 in the block 17 of the internal combustion engine 18. The

opening 16 provides communication with the water 19 and the water jacket 20 of the engine. The flange 12 of the chamber 10 is held within the outer end of an annular collar or adapter 21 and the inner end of the annular adapter bears against an annular flange 22 defining the block opening 16. Gaskets 23 and 24 are provided between the flange 50 of the adapter 21 and the chamber 10 and between the adapter 21 and the flange 51 in order to make the assembly liquid tight. By using an adapter 21, the water heater may be made with a standard size opening 11 and applied to any engine with any size opening 16 by merely providing the right adapter for the particular engine opening. All adapters will have the same size outer end to fit the opening 11 of the water heater, but will have inner ends of different sizes to fit the different engine openings 16. This is quite an important feature.

The chamber 10 is held in place by means of a toggle 25 including stem 26 and rotatably mounted head 27. The head 27 is adapted to be located within the water jacket 20 and span the opening 16. This head bears against the inner surface surrounding the opening 16 and the stem 26 extends through the opposite wall of the chamber 10, and is provided with a nut 28, a washer 29, and a gasket 30. The toggle 25 serves to hold the chamber 10 in place and to maintain the telescoping portions 12 and 21 in proper alignment and against the flange 22.

The heating element 13 comprises an insulating cylindrical core 31 having a spring resistance wire 32 wound thereon in helical fashion. The heating element may be inserted and removed through a hole 33 in the chamber wall of considerably greater diameter than the diameter of the core 31. The base of the heating element has the form of a flat plate 34 of a larger diameter than the hole diameter 33 and the edges of the plate are fastened to the marginal area around the hole by means of a plurality of screws 35. The heating element may be removed through the hole 33, when necessary, by merely removing the screws 35.

The temperature control 14 is of the expansible gas type and includes a shell 36, a bellows 37 within the shell with the gas being arranged in the space 38 between the shell 36 and the bellows 37. The shell 36 and the bellows 37 are attached to a bottom plate 40 so that the two may be removed as a unit. The shell 37 extends through a hole 41 in the bottom of the chamber and is held in place by means of screws 42 extending through the edge portions of the plate 40 and into the bottom of chamber 10.

The plunger 39 extends through a hole 43 in the bottom of the plate 40 and engages the end of a rocker arm 44 mounted for rotational movement around a fulcrum 45 located at the bottom surface of the plate 40. The opposite end of the rocker arm 44 rotatably engages a vertical arm 46 that extends through a collar 47 mounted on the outer surface of the chamber 10. The upper end of the vertical arm 46 operates the switch 15 to make and break the electrical circuit to the resistance wire 32. The outer end of the rocker arm 44 is provided with a compression spring 48 between the arm and the bottom wall of the chamber 10.

The water heater shown is adapted to be used on any type of electric current. Thus, when the engine is an automobile engine with the automobile being stored in an unheated garage, the heater may be plugged into ordinary 110 volt house current. The temperature control may be set to operate at any desired temperature range. The most desirable range has been 60 to 70 degrees Fahrenheit as this maintains the water in the block at sufficient temperature so that the engine will be easy to start. The switch 15 is of the ordinary snap-acting type so as to prevent corrosion of the electrical contacts caused by the relatively heavy current. These switches are of the ordinary type known to those skilled in the art.

When the water heater is in operation, heated water will flow from the chamber 10 through the top of the opening 16 into the water jacket of the engine. Cooler water will flow from the water jacket through the bottom of the opening and into the chamber. Thus, a constant circulation of water will be maintained.

Although the embodiment shown includes a temperature control, this control is not absolutely necessary. Where no temperature control is used, the heater may be plugged into an electric line a few minutes before the engine is to be used and the water in the engine block will be heated to a temperature at which the engine can be readily started.

The opening 16 in the engine block 17 may be one of those openings ordinarily provided with engine blocks for the removal of cores used in making the blocks. These openings are ordinarily closed by plugs known as "freezer plugs."

Any type of temperature control, where desired, may be used. Also any type heating unit may be used. The type of heating unit shown permits the water in the chamber to contact the resistance wire 32 and the core 31 and is preferably provided with small holes under or adjacent the resistance wire in order to insure better heat transfer between the wire and the water.

The chamber 10 may be provided with a normally closed vent (not shown) at the top for venting any air that may be entrapped within the chamber. It may also be provided with an opening (not shown) at the bottom, normally closed by a removable plug or the like for removing sediment that may be carried into the chamber.

The water heater shown may be designed to operate on ordinary house current of 110 volts, as described, or it may operate from the battery used by the engine. Any other desired heating means also may be used.

The new water heater has been found to work most efficiently with an engine having a thermostat control between the block and the radiator. This thermostat prevents circulation of the water from the block through the radiator until a predetermined temperature has been reached. As this predetermined temperature is always greater than that at which the thermostat 14 operates, the heated water from the water heater will be maintained in the block around the cylinder heads and none will escape into the radiator.

Having described my invention as related to the embodiment shown in the accompanying drawings, it is my intention that the invention be not limited by any of the details of description unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

I claim:

1. A water heater of the character described for heating the water in the cooling system of

an internal combustion engine, said heater comprising: a chamber containing water; a heating means in communication therewith a single opening only in the water-containing portion of the engine block and communicating with said chamber; and a temperature responsive means communicating with the water within the chamber for actuating the heating element to start it at a predetermined minimum temperature and stop it at a predetermined maximum temperature.

2. A water heater of the character described for heating the water in the cooling system of an internal combustion engine, said heater comprising: a chamber containing water; a single opening near the top of the chamber and communicating with the water-containing portion of the engine block; and a temperature responsive means communicating with the water within the chamber at a point beneath the heating means to start the heating at a predetermined minimum temperature and stop the heating at a predetermined maximum temperature.

3. A water heater of the character described for heating the water in the cooling system of an internal combustion engine, said heater comprising: a chamber containing water; a single opening in the water-containing portion of the engine block and communicating with the chamber near the top thereof; an electric heating element in said chamber beneath said opening; and a thermostat-operated switch in the electrical circuit of said heating element having its heat responsive portion in said chamber beneath the heating element.

4. A water heater of the character described for heating the water in the cooling system of an internal combustion engine, said heater comprising: a chamber normally substantially filled with water and having a single opening therein for registering with a similar opening in the engine block; a securing means adapted to extend from the inner surface of said engine block opening through a wall of said chamber for holding the chamber tightly against said engine block opening; and a heating means for heating the water within the chamber.

5. A water heater of the character described for heating the water in the cooling system of an internal combustion engine, said heater comprising: a chamber normally substantially filled with water and having a single opening therein for registering with a similar opening in the engine block; a securing means adapted to extend from the inner surface of said engine block opening through a wall of said chamber for holding the chamber tightly against said engine block opening; and an electrical heating unit within the chamber.

6. A water heater of the character described for heating the water in the cooling system of

an internal combustion engine, said heater comprising: a chamber normally substantially filled with water and having a single opening near the top of one side wall for registering with a similar opening in the engine block; a securing means adapted to extend from the inner surface of said engine block through an opposite wall of said chamber for holding the chamber tightly against said engine block opening; and an electric heating element within the chamber beneath the chamber opening.

7. A water heater of the character described for heating the water in the cooling system of an internal combustion engine, said heater comprising: a chamber normally substantially filled with water and having a single opening near the top of one side wall for registering with a similar opening in the engine block; a securing means adapted to extend from the inner surface of said engine block through an opposite wall of said chamber for holding the chamber tightly against said engine block opening; and a thermostat-operated switch in the electrical circuit of said heating element and mounted on said chamber with the heat-responsive portion of said switch being in said chamber.

8. In a water heating apparatus for heating the water in an internal combustion engine comprising: a chamber containing heating means therein; an opening in the chamber; and a core removal opening in the block of the engine; an adapter having one opening for registering in sealing relationship with the chamber opening, and a second opening for registering in sealing relationship with the core removal opening, whereby said chamber may be used on a plurality of engines having core removal openings of different sizes; and means for holding the chamber and adapter in place to provide a water passageway between the chamber and the block of the engine.

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