Jan. 2, 1968 A. E. ELZY 3,361,184

HEATER

Filed May 23, 1966 2 Sheets-Sheet 1

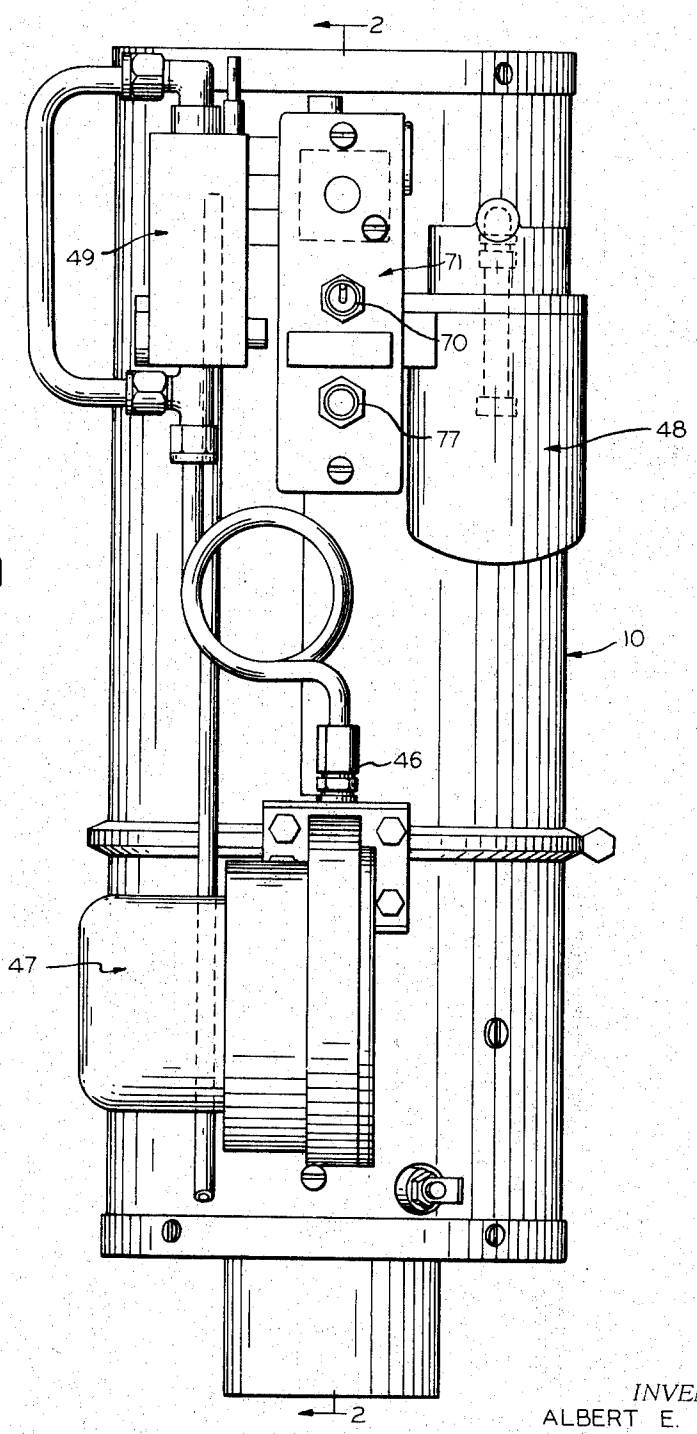

FIG. 1

INVENTOR.
ALBERT E. ELZY

ATTORNEYS

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HEATER

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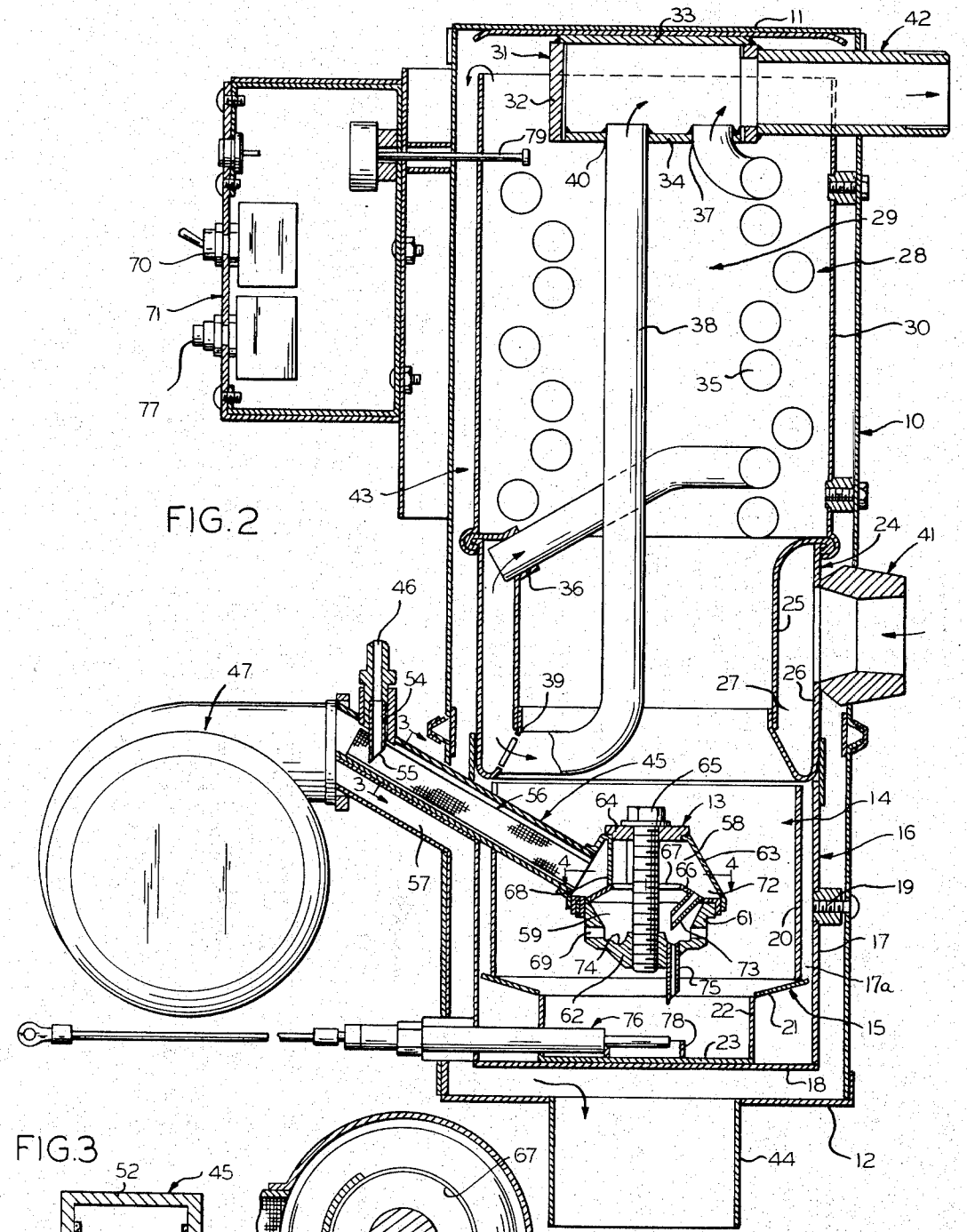
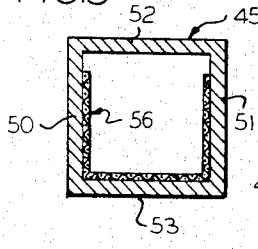


FIG. 2

FIG. 3



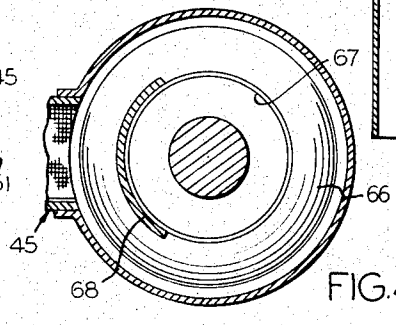


FIG. 4

INVENTOR.
ALBERT E. ELZY

ATTORNEYS

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3,361,184

HEATER

Albert E. Elzy, Algonquin, Ill., assignor to Vapor Corporation, Chicago, Ill., a corporation of Delaware

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ABSTRACT OF THE DISCLOSURE

A heater including a burner in a firepot, wherein the firepot is defined by an upright wall forming a radiation baffle against which the products of combustion are directed by said burner, and an insulating chamber surrounding said radiation baffle.

This invention relates in general to a heater, and more particularly to a heater capable of providing stand-by heat, and still more particularly to a low capacity efficient heater for maintaining a predetermined temperature in standing coaches such as buses, trucks, postal vans and the like, although other uses and purposes will be apparent to one skilled in the art.

The heater of the present invention is adapted to provide stand-by heat for a coach, such as a bus, truck, a postal van or the like where heretofore it has been necessary to leave the coaches in running operation when not using same in order to maintain a predetermined temperature. More specifically, the heater of the present invention is capable of maintaining the cooling liquid of a coach engine at a predetermined temperature to maintain the engine warm. Usually this cooling medium is employed for radiators within the coach in order to provide heat within the coach and therefore the heater would also provide heat for the radiators to maintain same at a predetermined temperature. Thus, the heater would be permanently attached and left on a coach, and would eliminate the need to store the coaches in garages or to keep the engines running when not using same. Normally, the heater would be fired up when the engine is turned off, although it could also be used to boost the heat within a coach when the coach is in operation. In general, the heater of the invention includes a burner generating products of combustion for a flue gas collection chamber within which is arranged a heat exchanger.

Accordingly, it is an object of the present invention to provide a heater capable of providing stand-by heat to coaches while they are not in operation.

Another object of the present invention is in the provision of a heater for coaches that includes a vaporizing fuel burner to provide highly efficient blue flame combustion.

Still another object of the present invention resides in the provision of a heater for use in generating stand-by heat for a coach, and which is simple and compact in construction, and which includes a vaporizing fuel burner, wherein no electrical heat is employed for vaporizing of the fuel.

Other objects, features and advantages of the invention will be apparent from the following detailed disclosure, taken in conjunction with the accompanying sheets of drawings, wherein like reference numerals refer to like parts, in which:

FIG. 1 is a vertical front elevational view of the heater according to the present invention;

FIG. 2 is a vertical sectional view taken through the heater of FIG. 1, and substantially along line 2—2 thereof;

FIG. 3 is an enlarged transverse sectional view taken through the air vaporizer tube and substantially along line 3—3 of FIG. 2; and

FIG. 4 is an enlarged sectional view taken through the vaporizing chamber of the burner, and substantially along line 4—4 of FIG. 2.

Referring now to the drawings and particularly to FIG. 2, the illustrated embodiment of the invention shows a heater having a housing defined in general by an external cylindrical wall **10** closed at the upper end by a top wall **11** and the lower end by a bottom wall **12**. A burner **13** is arranged within a combustion chamber **14** of a firepot **15** at the lower end of the housing. The firepot **15** is received within and supported by a frame **16** defined by an upstanding generally cylindrical wall **17** spaced inwardly from the side wall **10** of the housing and a bottom wall **18**. A suitable number of fasteners **19** secure the frame **16** to the outer side wall **10**. While the upstanding wall **17** generally defines the combustion chamber, the chamber is further defined by a radiation baffle **20** that is cylindrical in shape and spaced concentrically within the wall **17** and is supported at its lower end on an upwardly and outwardly flared annular wall member **21**. The annular air space between the wall **17** and the radiation baffle **20** defines an insulating chamber **17***a*. An upstanding cylindrical wall **22** is supported on a bottom wall **23** and the latter of which rests upon the bottom wall **18** of the frame **16**. The upper end of the wall **22** is suitably secured to the inner edge of the annular wall member **21**. It should be further noted that the bottom wall **18** of the frame **16** is spaced from the bottom wall **12** of the outer housing.

Combustion gases from the combustion chamber **14** are directed upwardly through the center of an annular liquid or water inlet manifold **24** having inner and outer walls **25** and **26** suitably connected at their upper and lower ends and defining therebetween an annular water chamber **27**. The outer wall **26** is substantially contiguous and upstanding from the outer upstanding wall **17** of the frame **16**, while the inner wall **25** is slightly diametrically smaller than the radiation baffle **20** of the firepot. The inlet manifold **24** is therefore a part of a heat exchanger **28** that is arranged thereabove and within a flue collection chamber **29** defined by an upstanding side wall **30** that extends upwardly and substantially contiguous from the outer wall **26** of the inlet manifold **24**. While the heat exchanger **28** is in the form of a coil, it should be appreciated that it could be of any suitable type. The heat exchanger **28** also includes an outlet manifold **31** arranged at the upper end of the heat exchanger, and defined by a circular upstanding wall **32** closed at the top by top wall **33** and at the bottom by bottom wall **34**. An annularly arranged coil of tubes **35** is positioned between the inlet manifold **24** and the outlet manifold **31**, and wherein the coil is connected to the inlet manifold at the upper end thereof at **36**, and to the outlet manifold at the bottom wall **34** at **37**. Further, a tube **38** extends between the inlet and outlet manifolds and is connected to the inlet manifold at the lower end thereof at **39** and to the outlet manifold through the bottom wall **34** thereof at **40**. An inlet fitting **41**, adapted to be connected to the heating system of a coach, is provided for the inlet manifold **24**, while an outlet fitting **42**, adapted to be connected to the heating system of a coach, is provided for the outlet manifold **31**.

The upper end of the flue gas collection chamber terminates below the top wall **11** of the outer housing to interconnect the flue gas chamber with an annular flue gas passageway **43** that extends between the outer housing wall **10** and the flue gas collection wall **30**, the outer inlet manifold wall **26**, and the upstanding wall **17** of the frame **16**. Thus, the flue gases after passing through the flue gas collection chamber **29** are directed downwardly through the flue gas passageway **43** and inwardly at the

bottom wall 12 to a flue gas discharge outlet 44 that is arranged in the bottom wall 12 of the housing. The direction of the flue gases thereby provides a blanket of heat about the heater to further enhance the efficiency thereof.

The burner 13 is supported on the end of an air-fuel vaporizing tube 45 that extends through the housing wall and downwardly into the combustion chamber 14. A fuel fitting 46 is provided on the tube to feed fuel to the air-fuel vaporizing tube, while a high pressure type blower 47 is arranged on the end of the tube to deliver combustion air thereto. Thus, the air-vaporizing tube 45 serves to deliver air and vaporized fuel to the burner 13. A fuel pump 48, preferably of the pulse type, delivers fuel to a metering valve 49 which is in turn connected to the fuel inlet 46. Both the fuel pump and the blower are adapted to be operated by the battery of the coach upon which the heater is mounted. The air-vaporizing tube 45 as shown in FIG. 3 in cross section, is essentially rectangular in cross section, although it should be appreciated that it could be of any desired configuration, and it includes opposed side walls 50 and 51, a top wall 52 and a bottom wall 53. The tube is elongated, extending into the combustion chamber 14 and being connected at its inner end to the burner 13, and outside of the housing and connected at its other end to the high pressure type blower 47. Fuel is fed into the inlet end of the pipe at the fuel inlet 46 which is connected to a tube 54 extending down into the air vaporizer tube and at an angle relative to the longitudinal axis of the tube so that the tube 54 extends substantially vertically. Further, the end of the tube 54 indicated by the numeral 55 is cut at an angle to prevent back-up of fuel and so that fuel immediately moves downwardly to the air vaporizer tube. The cut-off end 55 is so that it directs the fuel downwardly toward the burner 13.

In order to cause spreading of the fuel within the air vaporizer tube 45, a screen 56 is arranged through the tube and along the bottom and opposite side walls. The screen is preferably of fine mesh such as about 1/32 mesh and serves to spread the fuel into a thin film and further condition the fuel for vaporization. Further heat is applied to the tube by the flue gases passing through the flue gas passageway 43, wherein a flue gas chamber 57 is provided about the sides and bottom of the air vaporizer tube 45 and which is in communication with the flue gas passageway 43 as seen most clearly in FIG. 2.

The burner 13 includes a vaporizing chamber 58 and a burner chamber 59 that is arranged below the vaporizing chamber, although both chambers are arranged substantially centrally of the combustion chamber 14. The burner chamber 59 is defined by a casting that includes an annular side wall 61 and a bottom wall 62, while the vaporizing chamber 58 is defined by an outer conical wall 63 and a top wall 64. The wall member 63 is secured to the top wall 64, and a fastener 65 holds the assembly of the burner housing and vaporizer chamber housing together. An annular conical shelf 66 separates the vaporizing chamber 58 and burner chamber 59 and also defines with the fastener 65 an annular opening 67 that provides intercommunication between the vaporizer chamber and the burner chamber, this opening being centrally located of both chambers. The air vaporizer tube 45 is connected into the side wall 63 of the vaporizing chamber 58, and a spreading baffle 68 is provided at the side where the air vaporizer tube is connected in order to spread the fuel and air throughout the vaporizing chamber and prevent the air and fuel from immediately dumping into the burner chamber 59. As seen in FIG. 4, the baffle 68 is arcuate in shape and only serves to block immediate dumping of the air and fuel in through the burner chamber through the opening 67.

The burner side wall 61 is provided with a plurality of circumferentially arranged and radially extending burning orifices 69 through which the air fuel mixture is discharged from the burner chamber 59 in a blue flame condition and against the radiation baffle 20 that aids in completing the combustion and regeneration of heat to all of the vaporizing surfaces. The burning orifices 69 are constructed in order to prevent flame flash back and burning within the vaporizing chamber.

In operation of the heater, the heater is initially ignited or started by turning on the blower 47 and fuel pump 48. This is accomplished by operation of the toggle switch 70 on the control panel 71. As already mentioned, the blower and fuel pump would be electrically operated from the power of the battery of a coach upon which the heater would be mounted. The raw fuel, fuel oil, kerosene or the like, would then be admitted into the air vaporizer tube 45 and spread along the screen 56. The parts of the heater not being warm or heated, would preclude vaporization of the fuel during ignition. The fuel would pass down through the air vaporizer tube and into the air vaporizing chamber 58 and along a trough shaped bottom 72 until a sufficient amount of fuel is present to cause it to flow down through a drip tube 73 that delivers the fuel into the burner chamber 59. The fuel then collects in an annular trough 74 formed in the bottom wall 62 of the burner and ultimately passes downwardly through a second drip tube 75 and onto a glow plug 76. The glow plug 76 would be energized upon turning on the blower 47 and fuel pump 48 or shortly thereafter by pressing of a button 77 located on the control panel that would actuate a suitable relay (not shown) that would hold the glow tube 76 energized. A short circular wall member 78 is provided below the drip tube 75 and coacts with the bottom wall 23 of the firepot 15 to define a fuel collecting area about the end of the glow plug. The area below the burner 13 and about the glow plug may be considered as a pilot chamber, and the glow plug will ignite the fuel and build a pilot flame that preheats the burner 13 and combustion chamber 14, as well as the vaporizing chamber and air vaporizer tube thereby causing vaporization of the fuel. As the fuel begins to vaporize, it will no longer drip down onto the glow plug, and then the proper mixture of air and fuel will cause combustion in the burning orifices 69 to generate a blue flame which will extend outwardly and impinge against the radiation baffle 20. As already stated, the re-radiation from the baffle 20 will support combustion and complete same. If the baffle is too small it will cause overheating of the burner and ultimate failure and if too large it will cause incomplete combustion and smoking, therefore the baffle must be properly sized to properly support combustion so that no smoke is produced by the unit.

When a predetermined temperature is obtained, a temperature responsive switch 79, located at the upper end of the flue collection chamber 29 will de-activate the holding relay for the glow plug. Any suitable circuitry (not shown) may be provided for inner action of the electrical components of the heater. Continued operation of the heater will cause the heating of fluid in the heat exchanger 28 to perform the function of providing heat for a coach as desired.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention, but it is understood that this application is to be limited only by the scope of the appended claims.

The invention is hereby claimed as follows:

1. A heater comprising, a firepot including an upright wall forming a radiation baffle, a housing surrounding said radiation baffle and in spaced relation thereto and forming an insulating chamber, a flue gas collection chamber above said firepot, a heat exchanger in said collection chamber, a burner in said firepot including a fuel vaporizing chamber and a burner chamber, fuel passage means between said chambers, said radiation baffle surrounding said burner, said burner cham-

ber having a plurality of burning orifices arranged to direct products of combustion radially outwardly against said radiation baffle, an air vaporizer tube extending through said firepot and interconnected to said vaporizing chamber, means for feeding fuel to said tube, and means for feeding forced combustion air to said tube, whereby the products of combustion from said firepot cause vaporization of the fuel in the air-vaporizer tube and vaporizing chamber to mix with the air and provide a proper combustible air-fuel mixture to said burner chamber.

2. A heater as defined in claim 1, and means within said tube spreading the fuel into a thin film.

3. A heater as defined in claim 2, wherein said spreading means includes a fine mesh screen.

4. A heater as defined in claim 1, wherein said tube is inclined downwardly towards said vaporizing chamber.

5. A heater as defined in claim 1, and means below said burner for igniting same.

6. A heater as defined in claim 5, wherein said igniting means includes a glow plug.

7. A heater as defined in claim 6, wherein said igniting means also includes means for allowing the fuel to pass from said vaporizing chamber into and through said burner chamber and onto said glow plug.

8. A heater as defined in claim 1, wherein baffle means is provided in said vaporizing chamber to spread the air-fuel mixture in said chamber prior to passing same into the burner chamber.

9. A heater as defined in claim 1, wherein said air feeding means includes a high pressure blower.

10. A heater as defined in claim 1, wherein said fuel feeding means includes a fuel pump.

11. A heater as defined in claim 1, and a flue gas passageway jacketing said firepot and collection chamber through which the flue gases pass upon discharge from the collection chamber.

12. A heater as defined in claim 11, and a flue gas chamber adjacent that part of said air-vaporizer tube extending outside of the firepot intercommunicating with said flue gas passageway.

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JAMES W. WESTHAVER, *Primary Examiner.*