May 7, 1940. H. J. DE N. McCOLLUM 2,200,232

AUTOMOBILE HEATER

Filed Jan. 14, 1937 2 Sheets-Sheet 1

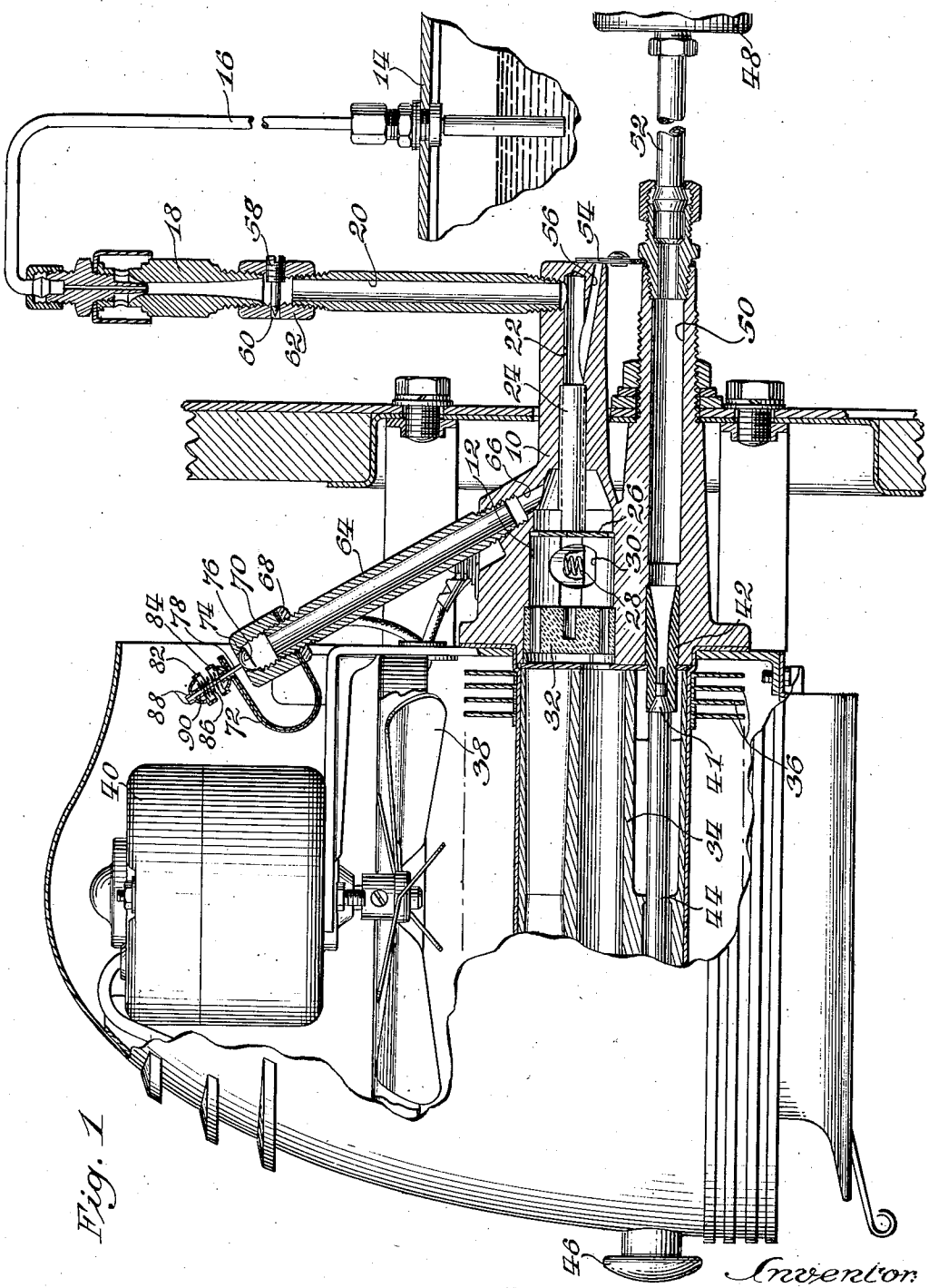


Fig. 1

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Filed Jan. 14, 1937 2 Sheets-Sheet 2

Fig. 2

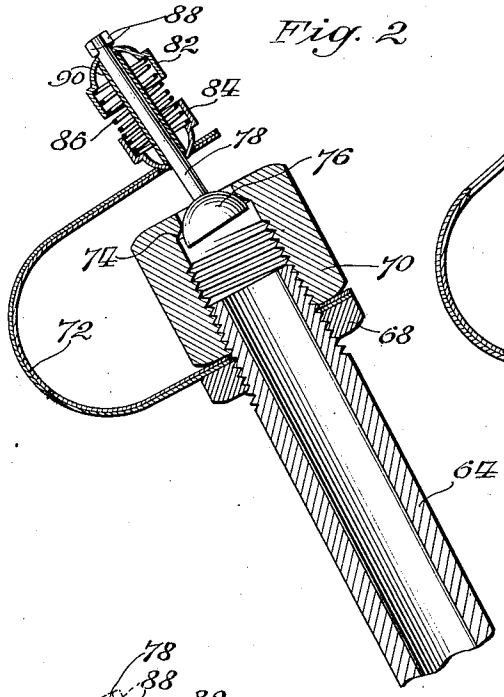
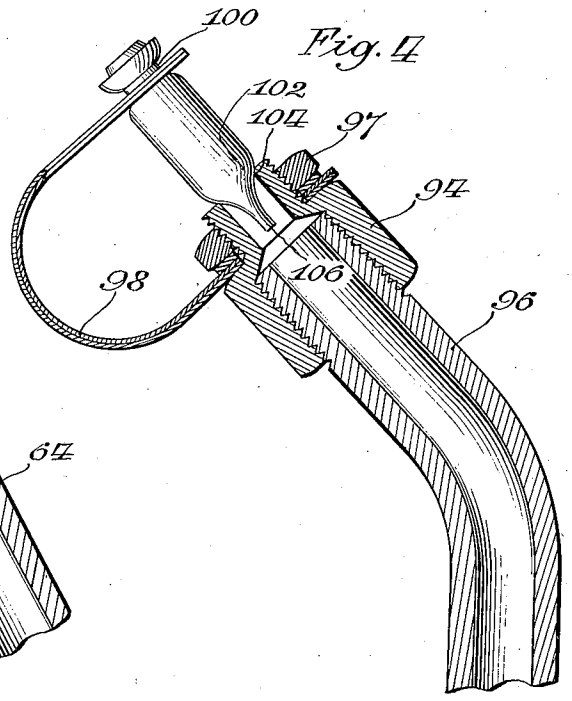


Fig. 4



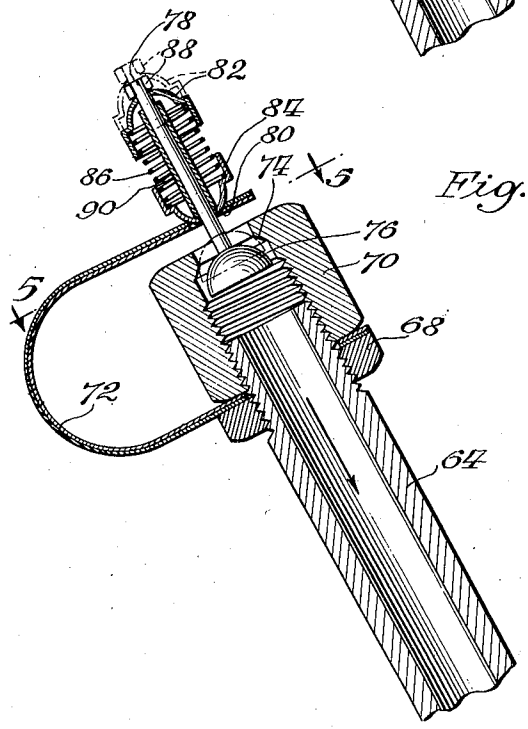
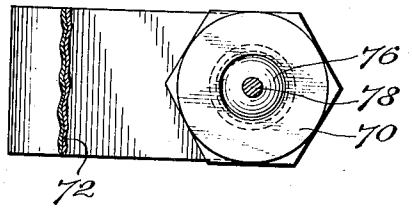


Fig. 3

Fig. 5



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AUTOMOBILE HEATER

Henry J. De N. McCollum, Evanston, Ill.

Application January 14, 1937, Serial No. 120,524

16 Claims. (Cl. 237—12.3)

My invention relates generally to automobile heaters of the internal combustion type, and more particularly to improved control means therefor whereby the heater will automatically be rendered inoperative and the flame therein extinguished whenever the temperature thereof exceeds a predetermined maximum value.

The present invention pertains to heaters of the type disclosed in my prior co-opending application, Serial No. 61,213, filed January 28, 1936, and the instant application is a continuation in part of said prior application.

In the operation of heaters of the type disclosed in my aforesaid application, it is desirable to provide some means for extinguishing the flame in the combustion chamber when the radiator becomes overheated. This may occur due to failure of the motor used to drive the fan or through other defect in the means for circulating air past the radiator. If some means were not thus provided to extinguish the flame, the heater might, under such circumstances, become excessively hot with the possibility of melting parts thereof and otherwise damaging the heater or adjacent parts of the automobile on which it is mounted.

It is thus an object of my invention to provide improved means for controlling the operation of an automobile heater of the internal combustion type to extinguish the flame upon failure of the fan motor, or upon any other unusual condition which might result in the radiator becoming excessively hot.

In the accompanying drawings, Fig. 1 is a fragmentary central vertical sectional view of the heater and accessory parts;

Fig. 2 is an enlarged central vertical sectional view of the control valve showing the parts in normal position;

Fig. 3 is a view similar to Figs. 2 showing the valve in operation;

Fig. 4 is a central vertical sectional view of a modified form of control valve; and

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 3.

As more fully disclosed in my aforesaid application, the heater of my invention comprises generally a casting 10 having a combustion chamber 12 formed therein. Liquid fuel, such as gasoline, may be supplied from a suitable auxiliary reservoir 14 or the float bowl of the engine carburetor through a tube 16 which is connected to an auxiliary carburetor 18 wherein the fuel is mixed with air and discharged through a pipe 20 into the bore 22 formed in the casting 10. The mixture flows through a pre-heating tube 24 and is discharged into the combustion chamber against a baffle disc 26.

The mixture of fuel and air in the combustion chamber 10 is raised to the kindling temperature by means of an igniter 28 preferably located in a bore at the side of the combustion chamber 12 and communicating therewith through an opening 30. The forward wall of the combustion chamber is forward by a refractory ceramic plug 32 which is provided with suitable passageways for the flow of the gases of combustion into a radiator 34 provided with a circuitous passageway for the gases, and which has a plurality of heat radiating fins 36 pressed thereover. Air from the passenger compartment of the vehicle is circulated downwardly past the radiator 34, 36 by means of a fan 38 driven by an electric motor 40.

The flow of the combustible mixture of fuel and air into the combustion chamber is controlled by a manually operable valve 41 which may be used to close the inlet to a Venturi nozzle 42. The valve 41 is carried by a stem 44 at the outer end of which is secured a control handle or knob 46. When the valve is open, the circuitous passageway in the radiator 34 communicates with the intake manifold 48 of the automobile engine through a passageway 50 formed in the casting 10, and through a suitable tube 52 which connects this passageway with the intake manifold.

A thermostatically operated valve 54 preferably made of thermostatic bi-metal is adapted to control the opening at the end of a passageway 56 which is adapted to connect the bore 22 with the atmosphere when the heater is in normal operation and the casting 10 heated. The heat will be transmitted to the thermostatic valve 54 and cause the latter to open to admit additional air to the mixture of gasoline and air to make it less rich.

With the construction heretofore described, the flow of the mixture of fuel and air into the combustion chamber is initiated by opening the valve 41 which permits the suction of the intake manifold to be transmitted to the auxiliary carburetor 18 which in turn reduces the pressure at the end of the pipe 16 and thus draws liquid fuel from the reservoir 14. A more or less permanent adjustment in the mixture may be obtained by proper adjustment of a needle valve 58 which controls the effective size of an opening 60 formed in a nipple 62 connecting the auxiliary carburetor 18 with the pipe 20. Suitable means controlled by the knob 46 and a thermostatically operated switch, not shown in the drawings, but more fully disclosed in my co-pending application Serial No.

120,523, filed January 14, 1937, are provided for closing the circuit to the electrically heated igniter 28, whereupon the latter will raise the temperature of the fuel mixture in the igniter chamber above its kindling point, causing ignition of the mixture in the combustion chamber 12. The reigniter plug 32 will become heated substantially to incandescence and will serve as a means for maintaining the flame should it accidentally become extinguished due to some irregularity in the supply of the combustible mixture to the combustion chamber.

The gases of combustion will flow through the passageways formed in the reigniter and hence through the circuitous passageway formed in the radiator 34 through the passageway in the Venturi nozzle 42 and through the passageway 50 and conduit 52 into the intake manifold of the engine. Suitable thermostatic controls are provided, as more particularly disclosed in my aforesaid application Serial No. 120,523, to break the circuit to the electrical igniter 28 and to close the circuit to the motor 40 when normal operation of the heater has been attained.

If, for any reason, such as failure of the motor 40, or accidental breaking of the circuits supplying current to the motor 40, the motor should cease operating, the heater would, unless means were provided to prevent it, continue operation. Such continued operation of the heater without the circulation of air past the radiator to maintain it at a reasonably low temperature might result in heating the radiator and the combustion chamber parts to such a high temperature as might cause parts thereof to melt. In any event, the heating of the radiator to such excessive temperatures would present a fire hazard. For this reason, I have provided a means to put out the flame whenever the temperature of the radiator becomes excessive, due particularly to the failure of the motor driven fan. This means comprises a tube 64 which communicates with the inlet end of the combustion chamber 12 through a passageway 66. The tube 64 extends at an angle so that its upper end lies substantially above the end of the radiator 34. The end of the pipe 64 is threaded to receive a nut 68 and a valve body 70. A U-shaped strip of thermostatic bi-metal 72 is apertured to fit over the threaded end of pipe 64 and is clamped in position between the nut 68 and valve body 70. As best shown in Figs. 2 and 3, the valve body 70 is provided with a conical seat 74 against which a hemispherical valve 76 is adapted to engage. The valve 76 is preferably formed integrally with a stem 78 which projects through a hole 80 formed in the free end of the thermostatic strip 72. A pair of oppositely facing cup-shaped spring saddles 82, 84 are slidably mounted upon the stem 78, being normally held in separated position by a compression coil spring 86. Upward sliding movement of the saddle cup 82 is prevented by ears 88 struck on the stem 78. A separator 90, illustrated as a tube, holds the spring saddle cups 82, 84 separated. Under normal operating conditions, the hemispherical valve 76 will be held in position closing the port in the end of the valve seat member 70, as shown in Fig. 2, wherein the bi-metal thermostatic strip 72 resiliently engages the lower saddle 84 and through the latter, the spacing sleeve 90 and saddle 82 resiliently holds the valve 76 against its seat.

When, however, the radiator becomes excessively hot due to the failure of the fan 38, the heat rising from the radiator will cause the thermostatic strip 72 to contract to the position in which it is shown in Fig. 3. In this position, the valve 76 can be held against its seat only by the spring 84, so that if the heater is in operation and the pressure in the combustion chamber thus less than atmospheric pressure, the atmospheric pressure acting upon the valve 76 will move the latter from the position in which it is shown in dotted lines in Fig. 3 to the position in which it is shown in full lines in said figure. The resulting admission of the relatively large quantity of air directly to the combustion chamber upon the opening of the valve 76 will extinguish the flame therein and this relatively cooler air drawn into the combustion chamber past the valve 76 will likewise tend to cool the latter and to cool the radiator 34. The heater will thus be put out of operation until the temperature of the radiator drops sufficiently that the thermostatic strip 72 will again resume its normal shape, as shown in Fig. 2, holding the valve 76 in closed position, and until the thermostatic element which controls the electrical igniter 28 is cooled sufficiently to render it operative again to supply current to the igniter. The sudden rush of air past the valve 74 will make a sound sufficient to apprise the operator of the abnormal conditions so that he may take steps to repair the motor or other part which has failed.

The provision of the resilient connection between the thermostatic strip 72 and the valve 76 is of advantage in maintaining this valve closed irrespective of the position of the free end of the thermostatic strip 72 when the pressure in the combustion chamber is substantially atmospheric. Thus, assuming that the valve has opened to extinguish the flame, and the driver of the vehicle, noting that the heater is not operating properly, closes the valve 40, the spring 84 will immediately close the valve 76 and prevent the possibility of the escape of gasoline fumes from the combustion chamber to the passenger compartment of the vehicle through the tube 64.

The modified construction shown in Fig. 4 comprises a valve member 94 threaded upon the end of a bent pipe 96. Rigidly clamped to the valve member 94 by means of a nut 96 is a U-shaped strip 98 of thermostatic bi-metal which is apertured to receive the stem 100 of a valve 102. The valve 102 normally seats against the valve seat 104 formed at the reduced outer ends of the valve member 94, and preferably has a reduced diameter extension 106 which, upon opening of the valve, holds it in position to reengage its seat upon being moved toward the latter. The put-out valve mechanism shown in Fig. 4 operates in substantially the same manner as that shown in Figs. 1, 2, 3, and 5, except that it lacks the advantage of closing automatically as soon as the combustion chamber to which the pipe 96 is connected is at atmospheric pressure. Upon overheating of the radiator, the thermostatic strip 98 will be heated and its ends spread apart until an outwardly directed force of sufficient magnitude is exerted thereby against the valve 102 to pull the latter away from its seat against the differential air pressure resultant from the reduced pressure within the pipe 96. As soon as this pressure is overcome, the valve will snap from its seat and suddenly admit a large quantity of air to the pipe 96, and hence to the combustion chamber to which it is connected, thereby extinguishing the flame.

The put-out valve mechanisms herein shown and described thus provide a safety control which

is very effective in preventing possible accidents due to overheating of the radiator.

The thermostatically controlled valve disclosed herein is not claimed in this application, but is disclosed and claimed in my co-pending divisional application, Serial No. 177,077, filed November 29, 1937.

While I have shown representative forms in which my invention may be embodied, it will be apparent to those skilled in the art that the invention may be embodied in numerous other forms, all coming within the scope of the claims which follow:

I claim:

1. In an automobile heater of the internal combustion type, a combustion chamber, means for supplying a combustible mixture to said chamber, means to withdraw the products of combustion from said chamber and convey them to the intake manifold of the automobile engine, a heat radiator having passageways forming part of the means to conduct the hot gases of combustion from said chamber to said intake manifold, a passageway for admitting sufficient quantities of atmosphere air to said combustion chamber to dilute said mixture below the combustion point, a valve normally closing said passageway, and a thermostatic element located adjacent said radiator and operable to open said valve when the temperature of said radiator exceeds a predetermined maximum value.

2. In an automobile heater, the combination of a combustion chamber, means for supplying a combustible mixture of fuel and air to said chamber, a heat radiator connected to said combustion chamber to receive the gases of combustion therefrom and having its other end connected to the intake manifold of the automobile engine, a motor driven fan for circulating air from the passenger compartment of the vehicle downwardly past said radiator, and a thermostatically controlled valve located above said radiator for admitting atmospheric air to said combustion chamber in sufficient quantities to extinguish the flame whenever the temperature above said radiator exceeds a predetermined maximum value.

3. In an automobile heater, the combination of a combustion chamber, means for supplying a combustible mixture of fuel and air to said chamber, a heat radiator connected to said combustion chamber to receive heat from the gases of combustion produced therein and having its other end connected to the intake manifold of the automobile engine, a motor driven fan for circulating air from the passenger compartment of the vehicle past said radiator, and a thermostatically controlled valve located near the path of air flowing toward the radiator for admitting atmospheric air to said combustion chamber in sufficient quantities to extinguish the flame whenever the temperature above said radiator exceeds a predetermined maximum value.

4. In an automobile heater, the combination of a combustion chamber, a radiator connected to receive the heated products of combustion from said chamber, means to connect said radiator to the intake manifold of the automobile engine, a thermostatic element having one end fixed and located adjacent said radiator in a position displaced from the normal path of air which has been heated by said radiator, a passageway connecting said combustion chamber with the atmosphere of a size to admit to said chamber sufficient air to quench combustion in said chamber, a valve normally held in position closing said passageway by said thermostatic element, and a relatively light spring to hold said valve closed when said thermostatic element is heated above a predetermined temperature and no longer holds said valve closed, said spring being sufficiently weak to permit opening of said valve when subjected to the suction of the intake manifold.

5. In an automobile heater, the combination of a combustion chamber, a radiator connected to receive the heated products of combustion from said chamber, means to connect said radiator to the intake manifold of the automobile engine, a thermostatic element having one end fixed and located adjacent said radiator in a position displaced from the normal path of air which has been heated by said radiator, a passageway connecting said combustion chamber with the atmosphere of a size to admit to said chamber sufficient air to quench combustion in said chamber, an inwardly facing valve seat in said passageway, a valve cooperable with said seat, a stem for said valve, a pair of spring retainers on said stem, a spacing sleeve around said stem between said retainers and a spring surrounding said stem and compressed between said retainers, the free end of said thermostatic element engaging one of said retainers and normally exerting a force through said sleeve to hold said valve against its seat, said thermostatic element relieving pressure on said retainer when the former is heated above a predetermined temperature and thereby permitting said valve to open when the difference in the pressures upon the opposite sides thereof are sufficient to overcome the force of said spring.

6. In a heater, a combustion chamber, means to connect said combustion chamber to a source of suction, atmospheric pressure operated means to supply a combustible mixture of liquid fuel to said combustion chamber, and means responsive to excessive heat derived from the gases of combustion to admit air from the atmosphere into said combustion chamber in quenching quantities.

7. In a heater, a combustion chamber, means to connect said combustion chamber to a source of suction, atmospheric pressure operated means to supply a combustible mixture of liquid fuel to said combustion chamber, and heat responsive means to supply sufficient quantities of air to said combustible mixture supplying means to extinguish combustion and cool said heater.

8. In an automobile type heater, the combination of a combustion chamber, means to supply a combustible mixture of fuel and air to said chamber, means to ignite said mixture, a heat exchanger connected to receive the products of combustion from said chamber, means to connect said heat exchanger to a source of suction, a fan for forcing air past the exterior of said heat exchanger, means for driving said fan, and means responsive to heat received from the heat exchanger natural convection air currents to admit atmospheric air to said combustion chamber at a relatively rapid rate, whereby, upon accidental cessation of operation of said fan while said heat exchanger is hot, the flame in said combustion chamber will be extinguished.

9. In an automobile type heater, the combination of a combustion chamber, means to supply continuously a combustible mixture of fuel and air to said chamber, means to ignite said mixture, a heat exchanger connected to receive the products of combustion from said chamber, means to connect said heat exchanger to a source of suction, a fan for forcing air past the exterior of said heat exchanger, means for driv-

ing said fan, and means responsive to heat received from the heat exchanger natural convection air currents to extinguish the flame in said combustion chamber to permit said continuously supplied combustible mixture to cool said heater.

10. In an internal combustion heater for automotive vehicles, the combination of a combustion chamber, means to supply a combustible mixture of liquid fuel and air to said chamber, means for igniting said mixture in said combustion chamber, a heat exchanger having a passageway extending therethrough and connected to receive the products of combustion from said chamber, a conduit for connecting said passageway to the intake manifold of the vehicle engine, and a thermostatically operated valve for admitting atmospheric air to said combustion chamber at a relatively rapid rate thereby to extinguish the flame therein whenever the heater becomes excessively hot.

11. In an internal combustion heater for automotive vehicles, the combination of a combustion chamber, means to supply a combustible mixture of liquid fuel and air to said chamber, means for igniting said mixture in said combustion chamber, a heat exchanger having a passageway extending therethrough and connected to receive the products of combustion from said chamber, a conduit for connecting said passageway to the intake manifold of the vehicle engine, a relatively large port for admitting atmospheric air to said combustion chamber, a valve normally closing said port, and a bimetal thermostatic element normally resiliently holding said valve closed and operable when subjected to greater than a predetermined temperature to render said valve free to open.

12. In an internal combustion heater for automobiles, the combination of a combustion chamber, means for supplying a combustible mixture of air and liquid fuel to said chamber, a heat radiator having a circuitous passageway therein and connected to receive the products of combustion from said chamber, a conduit connecting said passageway to the intake manifold of the automobile engine, a motor driven fan above said radiator for circulating air from the passenger compartment of the automobile past said radiator, a valve for admitting atmospheric air to said combustion chamber at a sufficiently rapid rate to extinguish the flame therein, and a thermostatic element located above said radiator and resiliently holding said valve closed when the element is at normal operating temperatures, and operable to open said valve when the temperature of the element exceeds a predetermined maximum, as might occur upon cessation of operation of said motor driven fan.

13. In a heater for automobiles, the combination of a heat radiator located in the passenger compartment of the automobile, an electric motor driven fan for circulating air in the passenger compartment of the vehicle downwardly past said radiator, and a thermostatically operated control element located above said radiator and operable upon a predetermined increase in temperature to render the heater inoperative.

14. In an automobile heater, the combination of a radiator located in the passenger compartment thereof, means for supplying a heating medium to said radiator, a motor driven fan for circulating air from the passenger compartment downwardly past said radiator, a bimetal thermostatic element controlled means located above said radiator and operable upon upward flow of heated air from said radiator, resultant upon cessation of operation of said motor driven fan, to cut off the supply of heating medium to said radiator.

15. In a heater for automobiles, the combination of a fuel and air mixing device, a combustion chamber connected to receive a combustible mixture from said device, and temperature controlled means for admitting air to said combustion chamber in sufficient quantities to extinguish the flame therein when the temperature in the passenger compartment of the vehicle exceeds a predetermined maximum value.

16. In an internal combustion heater for automotive vehicles, the combination of a combustion chamber, means to supply a combustible mixture of liquid fuel and air to said chamber, means for igniting said mixture in said combustion chamber, a heat exchanger having a passageway extending therethrough, located in the passenger compartment of the vehicle, and connected to receive the products of combustion from said chamber, a conduit for connecting said passageway to the intake manifold of the vehicle engine, and a thermostatically operated means to admit an excess of air to said chamber thereby to extinguish the flame therein whenever the heater becomes excessively hot.

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