

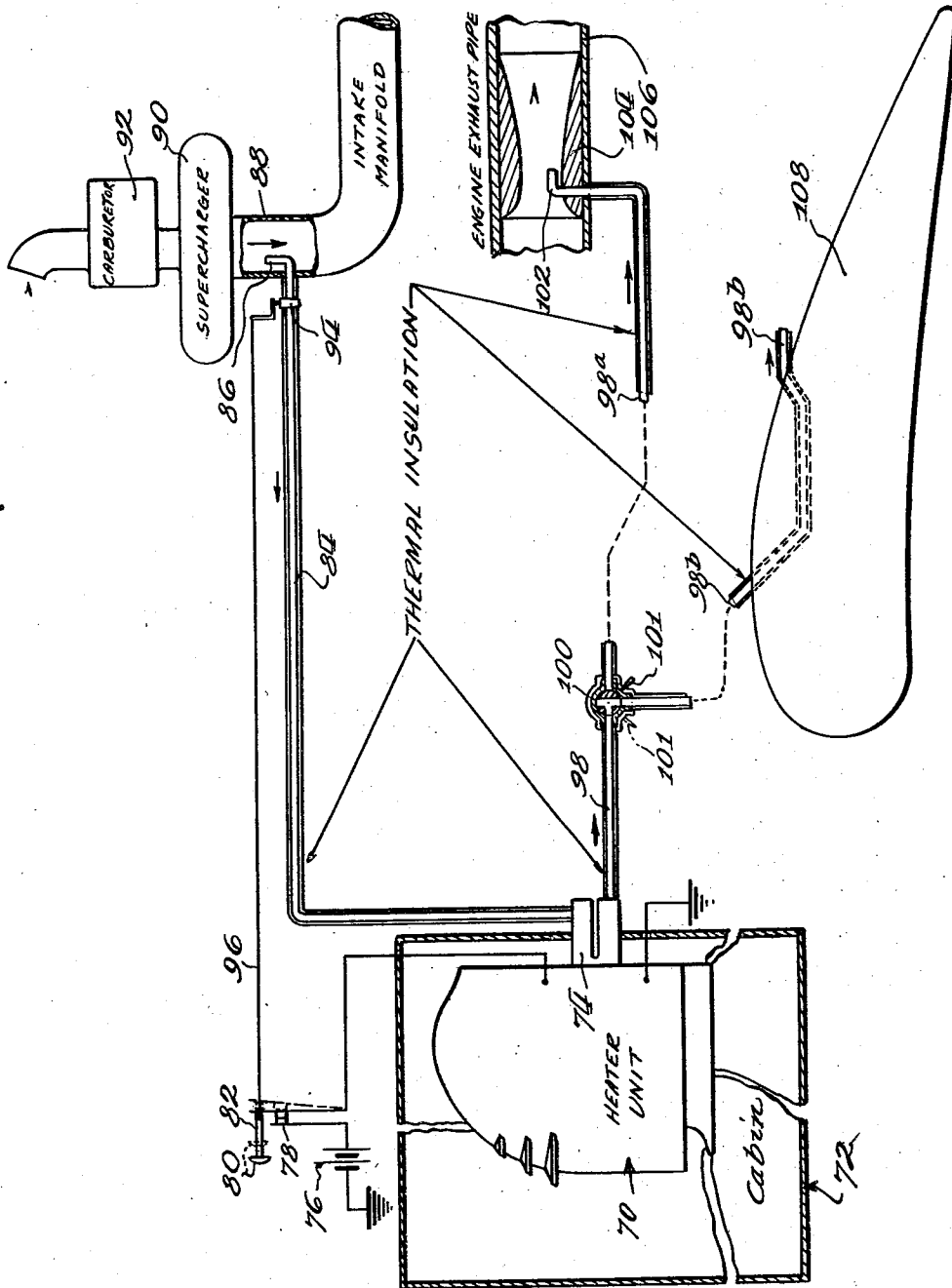
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AIRCRAFT HEATER

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AIRCRAFT HEATER

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6 Claims. (Cl. 237-12.3)

My invention relates generally to vehicle heaters and more particularly to improvements in aircraft heaters of the internal combustion type.

This application is a continuation in part of my copending application Serial No. 61,213, filed January 28, 1936, which has matured into Patent No. 2,191,173 dated February 20, 1940.

In automobile heaters of the type more fully disclosed in the aforesaid application, it has been the general practice to secure the necessary suction to draw the combustible mixture into the heater and to withdraw the products of combustion therefrom by making a connection to the intake manifold of the automobile engine. If the engine carburetor is very carefully adjusted so as to secure maximum efficiency in the operation of the engine, the discharge of the products of combustion from the heater into the intake manifold may cause the engine to operate less efficiently or may make it necessary to readjust the engine carburetor to make allowances for the admixture of the heater combustion gases with the mixture flowing through the intake manifold. To obviate the necessity of making such adjustments, the heater of the present invention is adapted to have its discharge conduit connected to the engine exhaust conduit, and to secure the necessary flow through the heater, a Venturi-type nozzle is inserted in the engine exhaust pipe and the heater discharge conduit connected to the throat of the nozzle. In this way, the performance of the engine is not materially affected since the Venturi nozzle will not raise the engine exhaust back pressure perceptibly.

Furthermore, in adapting the heater for use on aircraft, it is in some instances undesirable to introduce the products of combustion from the heater into the intake manifold of the engine. Therefore, in applying the heater to some types of aircraft, the suction is preferably produced either by connection of the discharge pipe of the heater to a Venturi shaped passageway located in the exhaust pipe of the engine, or by connecting the discharge pipe of the heater to a trailing pipe located above the wing at a point at which a partial vacuum is present. Since it is also very desirable to reduce as much as possible the number of parts of the heater, when it is installed upon airplanes, the fuel supply for the heater is preferably obtained from the discharge of the engine supercharger, the fuel being thus pre-mixed with the proper amount of air to assure complete combustion.

It is thus an object of my invention to provide an improved vehicle heater of the internal com-

bustion type in which the flow through the heater is obtained by the aspirating effect of a Venturi nozzle located in the vehicle engine exhaust pipe.

A further object is to provide an improved vehicle heater of the internal combustion type with a device for causing flow through the heater, which will not perceptibly affect the operation of the vehicle engine.

A further object is to provide an improved suction producing means for automobile and aircraft heaters of the internal combustion type.

A further object is to provide an improved heating system for the cabins of aircraft.

A further object is to provide an improved heater for use on aircraft in which a portion of the fuel mixture normally supplied to the engine is burned in the heater and in which the withdrawal of the products of combustion from the heater is caused by a partial vacuum produced either in the engine exhaust pipe or by a pipe trailing from the body of the airplane.

A further object is to provide an improved internal combustion type heater installation for aircraft employing a simplified control means and embodying features contributing to certain and safe operation.

Other objects will appear from the following description, reference being had to the accompanying drawing, which is a diagrammatic view of an internal combustion type heater system as installed upon an airplane.

In utilizing the heater for heating the cabins of aircraft, the heater casing 70 is mounted within the cabin 72, the heater being provided with the usual combustion chamber casting 74 and having within the casing 70 the usual heat exchange device or radiator, together with a motor driven fan for circulating air past the radiator. The heater will have the usual electrical igniter, the operation of which will be controlled by a thermostatic switch, so as to disconnect the igniter from the source of current when the radiator approaches substantially its normal operating temperature. In the drawing the heater 70 is illustrated as being supplied with current from a source 76 through a switch 78 which is manually operated by a control button 80, the control button having a stem 82 which engages one arm of the switch 78 to open the switch when the control button is pushed to the right and which permits the switch to close when the control button is in the position in which it is shown in full lines.

The supply of the combustible mixture of fuel and air for the heater is derived from the engine

fuel mixture supply through a conduit 84, one end of which is connected to the combustion chamber casting 74 and the other end of which terminates in an elbow 86 located in the outlet pipe 88 of the engine supercharger 90 which derives a mixture of fuel and air from the engine carburetor 92. A valve 94 is located in the conduit 84 adjacent the end thereof which extends into the pipe 88, the valve being connected for manual operation by the control button 80 through a Bowden wire 96 or through any other suitable operating connection, the valve being so arranged as to be open when the control button 80 is moved to the left, in its full line position, and to be closed when the control button is moved to its dotted line position. The conduit 84 is preferably wrapped with a thermally insulating material so that should this conduit be broken due to vibration or accident, the insulating material will tend to hold the portions of the conduit at the fracture in juxtaposition and prevent rapid leakage of the fuel from the conduit. Since the elbow 86 faces the supercharger 90, the mixture of air and fuel will be forced into the conduit 84 under pressure, and it is for this reason that it is desirable to provide the insulating material around the conduit 84 as well as to locate the valve 94 closely adjacent the supercharger outlet pipe 88.

The products of combustion from the heater are discharged through a conduit 98 which, by means of a two-way valve 100 may communicate with a conduit 98a or a conduit 98b. The conduit 98a terminates in an elbow 102 located at the throat of a Venturi-shaped passageway formed in the nozzle 104 located in the engine exhaust pipe 106. The conduit 98b extends through the wing 108 of the airplane to the upper surface thereof at the point at which the air pressure is less than atmospheric while the plane is in flight. The conduit 98 as well as its extensions 98a and 98b are covered with a suitable thermal insulation so that the products of combustion from the heater passing there-through will retain sufficient heat to prevent the formation of ice at the trailing extremity of the conduit 98b or at any place within the conduit 98, 98a, or 98b. It will be understood that if the conduit 98 or its extensions 98a or 98b were exposed to cold air, the water vapor, constituting a large part of the products of combustion from the heater, might condense and freeze in this conduit, thus rendering the heater inoperative due to the clogging of the conduit.

In any particular installation, it may not be necessary to provide the two-way valve 100 since the subatmospheric pressure present in the Venturi nozzle in the engine exhaust pipe may be relied upon as the sole means for producing the subatmospheric pressure necessary to draw the products of combustion from the heater. On the other hand, if it is desired to utilize the heater only while the airplane is in flight, it will be unnecessary to supply the Venturi nozzle, the conduit 98a, or the valve 100, in which case the conduit 98b may be formed integrally with or as an extension of the conduit 98. The valve 100, if utilized, is preferably positioned in a place such that the pilot may operate it by means of its handle 101. With the particular valve illustrated, it will be apparent that the conduit 98 may be connected either to the conduit 98a or to the conduit 98b, or may be connected to both of these conduits.

The heater installation shown may be used

on airplanes having supercharged cabins, in which case the pressure within the cabin will normally be greater than that within the combustion chamber and radiator of the heater so that an accidental leak in the combustion chamber or radiator will not be dangerous because the products of combustion would not flow into the cabin, but instead some of the air of the cabin would leak into the combustion chamber or radiator without any harmful result.

For the heating of large cabin airplanes, a plurality of heater units may be suitably located within the cabin, in which event two or more of the units may be supplied with a fuel mixture through a common conduit, such as 84, and the products of combustion drawn from two or more of the units through a common discharge conduit, such as 98. In such multiple unit installations, it is of course desirable that the conduits 84 and 98, and their connections on the unit, be of such character that the flow rate through the units will be substantially the same and one unit will not receive the combustible mixture at an excessive rate at the expense of the supply of the mixture to other units.

To cause operation of the heater, the pilot will pull the control button from the dotted-line to the full-line position shown in the drawing, thus closing the switch 78 and opening the valve 94. Thereupon, the igniter which is located in the combustion chamber casting 74 will become energized and ignite the mixture forced into the conduit 84 by the supercharger 90. After the casting 74 or the radiator connected thereto becomes heated to substantially its normal operating temperature, the igniter circuit will be opened by a thermostatically operated switch in the usual manner. Depending upon the position of the valve 100, which may be manually controlled by the pilot, the products of combustion from the heater unit will be drawn into the exhaust gases flowing through the engine exhaust pipe through the conduit 98a, or will be drawn through the conduit 98b because of the sub-atmospheric pressure at the outlet of this pipe due to the shape of the wing surface and due also to the flow of air past the trailing extremity of this conduit. The heater will thus continue in operation until the control button 80 is moved from the position in which it is shown in full lines to its dotted line position, whereupon the switch 78 will be opened and the valve 94 closed. The usual motor driven fan will be located within the casing 70 to circulate the air in the cabin 72 past the heater radiator in the usual manner, and the opening of the switch 78 will likewise open the circuit to the motor driving the fan in a manner well known in the art.

While I have shown and described a particular embodiment of my invention, it will be apparent to those skilled in the art that variations and modifications thereof may be made without departing from the underlying principle thereof. I therefore desire, by the following claims, to include within the scope of my invention all such similar and equivalent constructions whereby substantially the results of my invention may be obtained by substantially the same or equivalent means.

I claim:

1. In an airplane having a cabin, an internal combustion engine, a carburetor, and a supercharger for supplying a combustible mixture of fuel and air to the engine, the combination of an internal combustion type heater unit located

in the cabin for heating the air therein, a conduit leading from a point where combustible mixture is maintained under pressure by said supercharger to said heater unit to supply a combustible mixture thereto, and a heater discharge conduit leading from said heater unit to a point on the outer surface of said airplane at which the pressure is less than atmospheric pressure.

2. In an airplane having a cabin, an internal combustion engine, a carburetor, and a supercharger for supplying a combustible mixture of fuel and air to the engine, the combination of an internal combustion type heater unit located in the cabin for heating the air therein, a conduit leading from a point at which combustible mixture is maintained under pressure by said supercharger to said heater unit to supply a combustible mixture thereto, and means for aiding the flow of fluid through said heater unit, comprising a discharge conduit, a nozzle in the engine discharge pipe, said nozzle having a Venturi-shaped passageway extending therethrough, and a connection between said discharge conduit and the throat of said Venturi-shaped passageway.

3. In an airplane having a cabin, an internal combustion engine, a carburetor, and a supercharger for supplying a combustible mixture of fuel and air to the engine, the combination of an internal combustion type heater unit located in the cabin for heating the air therein, a conduit leading from a point where combustible mixture is maintained at a pressure above atmospheric by said supercharger to said heater unit to supply a combustible mixture thereto, and means to aid the flow of fluids through said heater unit, comprising a discharge conduit leading from said heater unit to a point adjacent a surface of the aircraft at which the pressure is less than atmospheric pressure.

4. In a heater for the cabin of an airplane powered by an internal combustion engine, the combination of an internal combustion type heat-

er unit arranged to heat the airplane cabin, means to supply a combustible mixture of fuel and air from the engine combustion mixture supply system to said heater unit, a discharge conduit connected between said heater unit and a space maintained at subatmospheric pressure by the motion of said airplane, and means to thermally insulate said discharge conduit to maintain the temperature of the products of combustion flowing therethrough above freezing temperature.

5. In a heater for the cabin of an airplane powered by a supercharged internal combustion engine, the combination of a heater unit of the internal combustion type constructed and arranged to heat the air in the airplane cabin, conduit means to convey a combustible mixture of fuel and air to said heater unit from a point at which said combustible mixture is maintained at a pressure above atmospheric by the engine supercharger and a manually operated valve located close to the supercharger for controlling the flow of the combustible mixture through said conduit means.

6. In an internal combustion heating system for the passenger compartment of an airplane powered by an internal combustion engine having a supercharger, the combination of an internal combustion heater arranged to heat a passenger compartment of the airplane, conduit means for supplying combustible mixture to the heater from a point in the engine combustible mixture supply system between the supercharger and the engine, a first passageway for discharging the products of combustion from said heater to a point in the engine exhaust system, a second passageway for discharging the products of combustion to a space maintained at subatmospheric pressure by the motion of the airplane, and means selectively operable to cause the discharge of the products of combustion from said heater to either of said passageways.

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