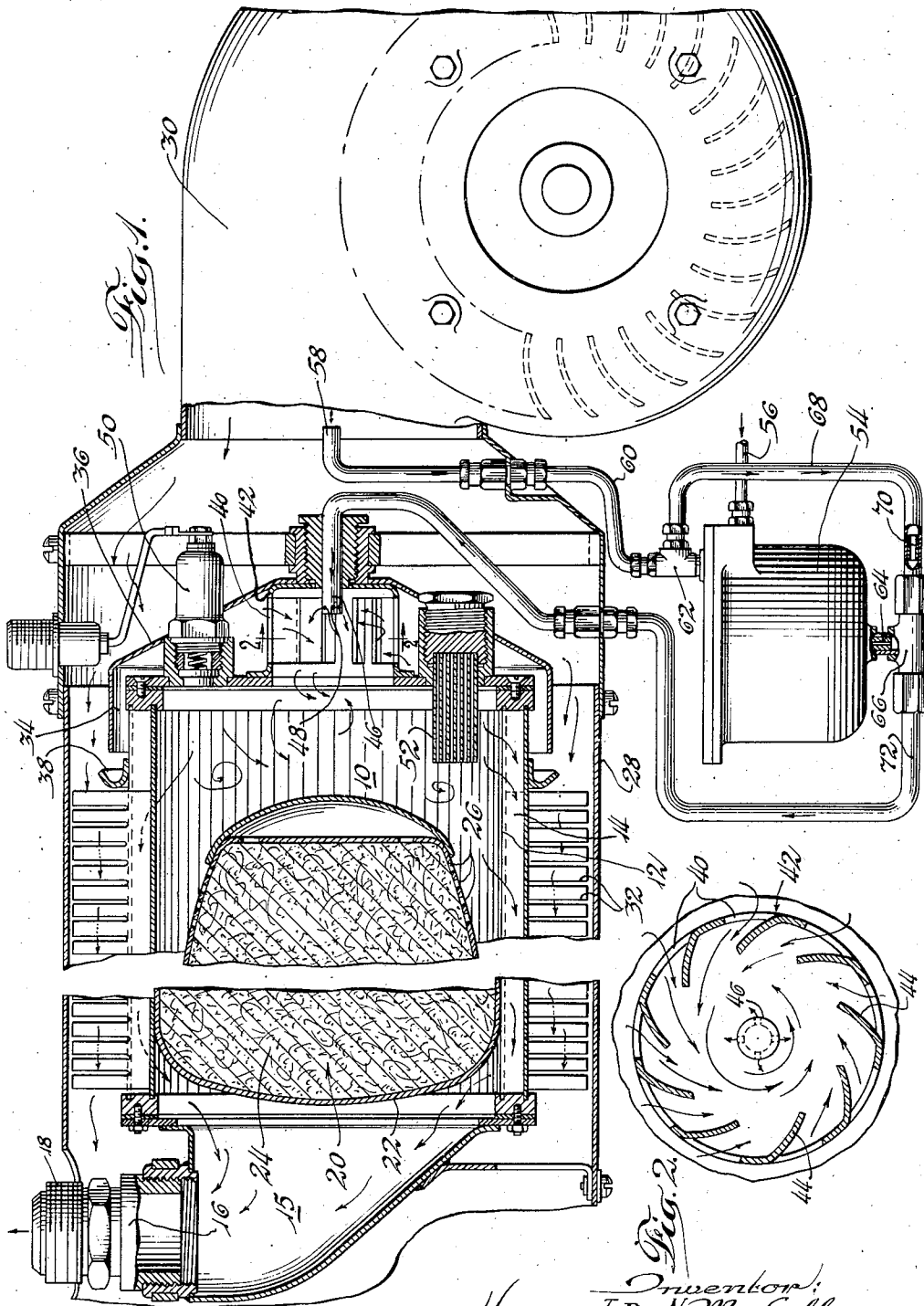


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H. J. DE N. McCOLLUM
COMBUSTION HEATER HAVING AIR PREHEATING
AND CARBURETING MEANS
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Inventor:
Henry J. De N. McCollum
By Thiele, Norton, Chelley, Kausmann & Wupper
Attorneys

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COMBUSTION HEATER HAVING AIR PRE-HEATING AND CARBURETING MEANS

Henry J. De N. McCollum, Chicago, Ill.; Thelma McCollum, executrix of said Henry J. De N. McCollum, deceased, assignor to Stewart-Warner Corporation, Chicago, Ill., a corporation of Virginia

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1 Claim. (Cl. 158—28)

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My invention relates to heaters and more particularly to heaters of the internal combustion type, such as are commonly used for aircraft and other vehicles and for general purposes.

In heaters of the internal combustion type to which my invention pertains, it is customary to supply the heater with air to support combustion and also with ventilating air from a ram, blower, or other suitable source of supply. In some instances the same ram, blower or other source is utilized to furnish both the combustion air and the ventilating air, whereas in other instances separate rams, blowers or other sources are utilized to furnish the air for these two purposes. In such heaters there is a certain resistance to the flow of air through the heater and where these heaters are provided with the conventional carburetor utilizing a Venturi tube to suck fuel thereinto, the resistance of the heater to flow of air therethrough is materially increased. Such increase of resistance is objectionable in that a relatively high pressure ram or blower is required to supply the necessary amount of air for heater operation.

An object of my invention is to provide a heater which offers a minimum resistance to flow of air therethrough and which can, therefore, be operated from a low pressure ram, blower, or other source of air supply.

Another object of my invention is to provide a heater in which the conventional carburetor is eliminated and wherein fuel mixing means is provided which offers a minimum of resistance to air flow.

Another object of my invention is to provide novel means for mixing air and fuel to form a combustible mixture and which will provide any desired degree of preheating.

Another object of my invention is to provide a low resistance heater which is particularly adapted for use in connection with a single low pressure blower, ram, or other means for supplying air to support combustion and for ventilating purposes.

Other objects and advantages will become apparent as the description proceeds.

In the drawings:

Fig. 1 is a somewhat diagrammatic view of a heater embodying a preferred form of my invention, parts of this heater being shown in longitudinal section; and

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

In Fig. 1 of the drawings, I have shown an in-

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ternal combustion type of heater having a combustion chamber 10 located in one end of a tubular heat exchanger 12 of the type disclosed and claimed in my co-pending application, now Patent No. 2,380,602. The hot gases formed in the combustion chamber flow through the flues 14 extending lengthwise of the heat exchanger 12 and are discharged into an outlet chamber 15 from which the cooled gases pass to atmosphere through an outlet fitting 16 and any suitable exhaust pipe attached to the threaded end 18 of this fitting.

A muffler 20 is located in the heat exchanger 12 and comprises a metal shell 22 containing sound absorbing material 24, such as stainless steel wool or glass wool. Perforations 26 in the shell 22 form acoustic couplings between the flues 14 and the interior of the muffler shell, permitting sound to pass into the interior of this shell and be absorbed by the material 24 therein.

The heater is enclosed in a casing 28 whose righthand or inlet end is connected to the outlet of a low pressure blower 30 which may be driven by any suitable means. The blower 30 is illustrated as being of the centrifugal type, as this type of blower forms a highly efficient and desirable low pressure source of supply for my novel heater. It is to be understood, of course, that my invention is not limited to use with this particular type of blower or in fact with any blower, since the air required for heater operation may be supplied by a ram or any other suitable means.

Most of the air supplied by the blower 30 passes over the fins 32 of the heat exchanger and is heated thereby. This heated air passes from the lefthand end of the casing 28 into the airplane cabin or other space to be heated, or into a duct system having selected outlets located in the same or different cabins or other enclosed spaces, as may be desired.

Part of the air supplied by the blower 30 has its direction reversed by an annular scoop 38 secured to the outer wall of the combustion chamber. The diverted air flows into an annular space 34 provided between the outer wall of the combustion chamber and the inner wall of an annular skirt formed as a portion of a cap 36 which covers the combustion chamber end of the heat exchanger. The air entering the annular space 34 forms the air for the combustible mixture supplied to the combustion chamber 10. This combustion air flows rearwardly and thence radially inwardly over the end wall of the combustion chamber and is preheated before passing through the slots 40 in a cup-shaped spinner 42. As shown

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most clearly in Fig. 2, the slots 40 are formed by punching and bending inwardly the tongues 44 which serve to give the air a whirling motion as it passes into the interior of the spinner 42. This whirling motion is in a plane perpendicular to the longitudinal axis of the heater and is clearly indicated by the arrows in Figs. 1 and 2.

A fuel jet 46 is located in the center of the spinner and delivers a rich mixture of fuel and air thereto through outlets 48. This rich mixture is picked up by the whirling air in the spinner which breaks up the rich mixture to form a thoroughly homogeneous mixture of air and fuel of the proper richness for efficient combustion. This latter mixture passes from the open lefthand end of the spinner into the combustion chamber, where it is initially ignited by the usual electrical igniter 50. The igniter may be cut out by the usual thermostatic switch after combustion has been initiated, and a re-igniter 52 is provided to maintain combustion thereafter.

I shall now describe the means for furnishing an exceedingly rich mixture of fuel and air to the jet 46. This means comprises a float bowl 54 connected by pipe 56 with any suitable source of fuel. The float bowl 54 is maintained under slight pressure by a ram 58 located in the heater inlet and projecting into the stream of air flowing to the heater from the blower or other suitable source of air supply. The ram communicates with the float bowl 54 by way of pipes 60 and T 62.

The bottom of the float bowl 54 communicates by way of restriction 64 with a T 66. This T communicates with the ram 58 by way of pipes 68 and 68 and restriction 70. The T 66 also communicates with the jet 46 by a pipe 72. The restriction 70 is preferably in the neighborhood of four times as large in cross section as the restriction 64.

This fuel supply means requires only a slight pressure differential for its operation so that the pressure at the ram 58 need be only slightly above the pressure at the jet 46. This is of particular importance where the heater is used as a ram supplied aircraft heater intended for operation at high altitudes under low atmospheric pressure and low air density and also where it is desired to operate the heater from a low pressure blower or other low pressure source of air supply.

The air pressure at the ram 58 is communicated to the float bowl 54 and this pressure, plus the hydrostatic head of the fuel in the float bowl forces the fuel through the restriction 64 into the T 66. Pressure in the ram 58 forces a small amount of air through pipes 60 and 68 and restriction 70 into T 66, where it mixes with the fuel flowing into this T through the restriction 64. The rich mixture of fuel and air thus formed flows through pipe 68 to jet 46. Since the pipe 72 contains a mixture of fuel and air instead of being filled with solid liquid fuel, only slight force

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is required to lift this fuel and air mixture from the T 66 to the jet 46.

The interior of the spinner is in open communication with the combustion chamber and receives heat directly therefrom. This additional heat aids the preheated air in completely vaporizing the rich mixture of fuel and air supplied by the jet 46.

While I have illustrated a form of my invention, it is to be understood that my invention is not limited to the details shown and described, but may assume numerous other forms and that the scope of my invention is defined in the following claim.

I claim:

In a heater having a combustion chamber having a cylindrical wall and an end wall, and heat exchange means receiving hot products of combustion from the combustion chamber, the combination of a cup-shaped combustion air spinner attached to the end wall of the combustion chamber and in open communication with the combustion chamber, said spinner having a series of slots in the cylindrical wall thereof, an inwardly directed tongue associated with each of said slots to give the air passing therethrough a whirling motion, a plate spaced from the end wall and having a cylindrical portion in telescopic relation to and spaced from the cylindrical wall, said plate enclosing said spinner, means forming a jet delivering at the axial center of said spinner and at a point spaced from the base thereof, means for supplying a rich mixture of fuel and air to said jet, and means for supplying preheated combustion air to said spinner by forcing said air between said plate and the combustion chamber walls.

HENRY J. DE N. McCOLLUM.

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