

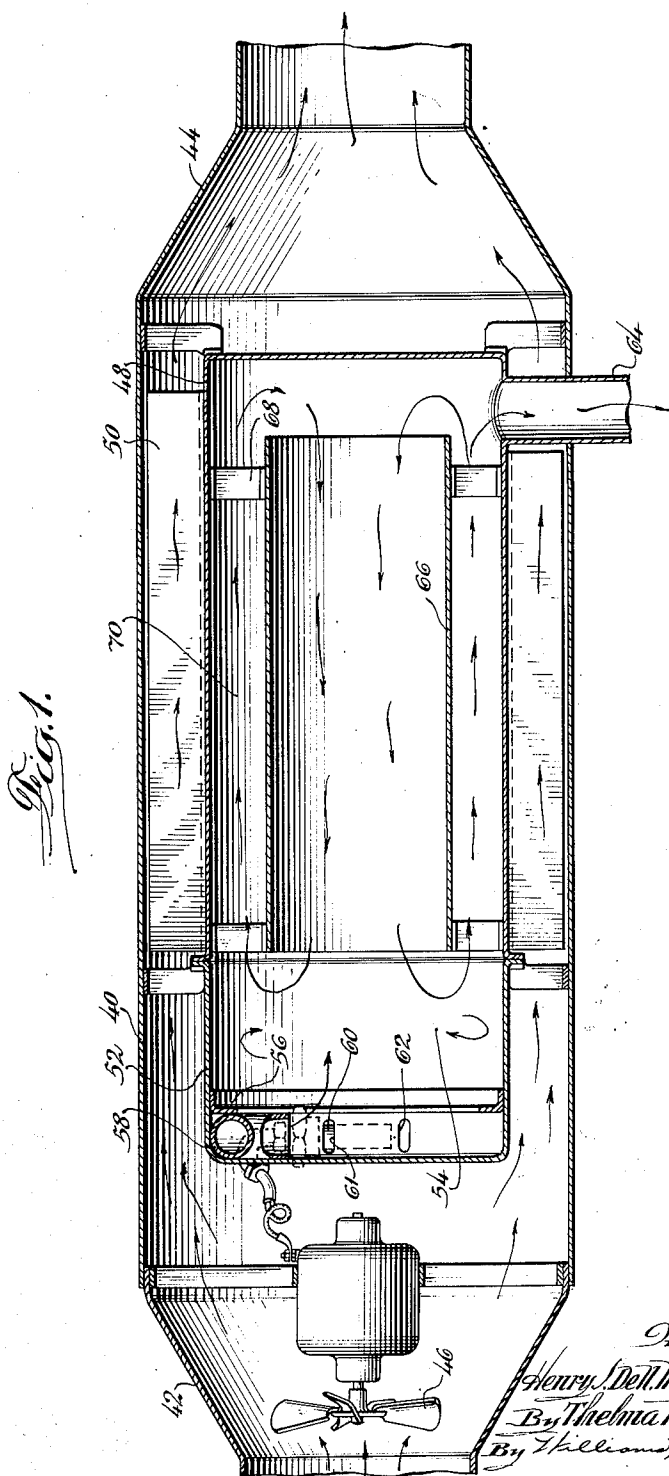
Aug. 1, 1950

H. J. DE N. McCOLLUM
HEATER HAVING MEANS TO RECIRCULATE PARTIALLY
COOLED PRODUCTS OF COMBUSTION

2,517,399

Filed March 23, 1945

2 Sheets-Sheet 1



Inventor:
Henry J. De N. McCollum, Deceased,
By Thelma McCollum, Executrix,
By Williams, Bradbury & Kunkle
Attorneys

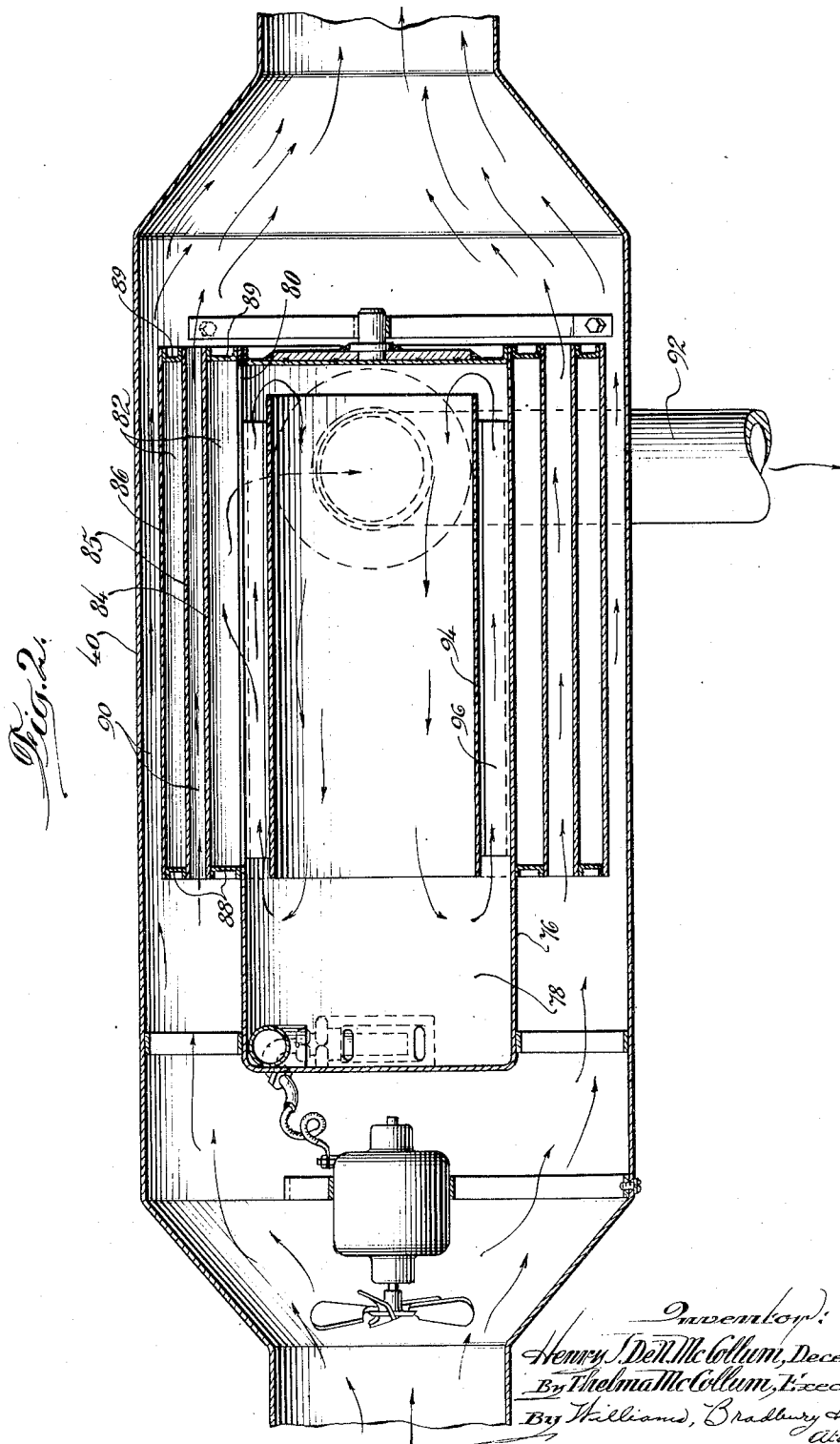
Aug. 1, 1950

H. J. DE N. McCOLLUM
HEATER HAVING MEANS TO RECIRCULATE PARTIALLY
COOLED PRODUCTS OF COMBUSTION

2,517,399

Filed March 23, 1945

2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,517,399

HEATER HAVING MEANS TO RECIRCULATE
PARTIALLY COOLED PRODUCTS OF COM-
BUSTION

Henry J. De N. McCollum, deceased, late of Chi-
cago, Ill., by Thelma McCollum, executrix, Chi-
cago, Ill., assignor to Stewart-Warner Corpo-
ration, Chicago, Ill., a corporation of Virginia

Application March 23, 1945, Serial No. 584,360

2 Claims. (Cl. 126-116)

1

The invention relates generally to heaters and more particularly to heaters of the sealed combustion type, adapted for use in aircraft.

In heaters which burn mixtures of liquid hydrocarbon fuels and air, difficulty is occasionally experienced in maintaining combustion. Due to temporary interruptions or reductions in the pressure of the mixture supplied, the flame may become extinguished. It has also been found that if some of the exhaust gases of a heater are mixed with the burning fuel-air mixture, combustion of the fuel is more complete and the flame will be blue.

It is therefore an object of my invention to provide an improved sealed combustion type heater having means for mixing a certain proportion of the exhaust gases with the burning fuel-air mixture.

A further object is to provide a sealed combustion type heater in which improved combustion is obtained by mixing exhaust gases with the burning fuel mixture in the combustion chamber, thereby reducing the temperature of the exhaust gases.

A further object is to provide an improved sealed combustion type heater which is simple in construction, efficient in operation and may be economically manufactured.

Other objects and advantages will appear from the following description, reference being had to the accompanying drawings, in which

Fig. 1 is a view of one form of the invention; and

Fig. 2 is a similar view of a modification of the invention.

In the form of invention shown in Fig. 1, there is provided a casing 40 having an inlet shroud 42 and an outlet shroud 44. At the inlet end of the casing 42, there is located a motor driven fan 46 for causing flow of ventilating air through the casing. A shell 48, provided with heat exchange fins 50, is suitably mounted within the casing 40 and has a stamped cup 52 suitably secured thereto, this cup 52 forming a combustion chamber 54. An annular flange baffle 56 is secured within the cup 52. The mixture of fuel and air is supplied through a pipe 58 which is located between the baffle 56 and the end wall of the cup 52, the end portion of this pipe extending along the inner wall of the cup 52 so as to introduce the combustible mixture tangentially and thus impart a rotary swirling motion to the air and fuel mixture as it enters the combustion chamber 54.

An igniter 60 is located in a suitable housing

2

member forming a chamber which communicates with the combustion chamber through a pair of openings 61 and 62 in the manner more fully shown in applicant's Patent No. 2,417,604. The combustible mixture enters the igniter chamber through the port 61 and the ignited mixture flows into the combustion chamber through the port 62. The products of combustion are exhausted from the shell 48 through an exhaust conduit 64. Within this shell 48 is a return tube 66 suitably supported by brackets 68, forming a passageway 70 of annular cross-section between the tube and the shell.

When the heater is in operation, the combustion takes place mainly in the combustion chamber but combustion continues for a time as the mixture flows through the passageway 70. However, it will have been completed by the time the gases reach the exhaust end of the passageway 70. Due to the swirling flow, the tendency will be for the pressure to be greater along the inner surface of the combustion chamber wall and the products of combustion will therefore tend to flow through the passageway 70, and also due to this fact that the pressure near the axis of the combustion chamber will be relatively low, a certain proportion of the products of combustion will return from the exhaust end of the heater to the combustion chamber end through the return tube 66. The products of combustion thus admixed with the burning mixture will have the effect of maintaining uniform complete combustion, and since the products of combustion are cooler than the burning mixture flowing from the combustion chamber, the temperature of the gases flowing through the passageway 70 will be lowered. Such admixture of the products of combustion to the burning mixture will also result in some reduction in the temperature of the exhaust gases flowing through the exhaust pipe 64.

The invention is illustrated in Fig. 2 as applied to a heater having a spiral flow heat exchanger. A heat exchanger of this type is disclosed in the patent of William C. Parrish, No. 2,432,929. Such of the elements of the heater of Figure 2 which correspond to parts of the heater of Fig. 1, have had corresponding reference characters applied thereto and their description will not be repeated. In the heat exchanger of Fig. 2, the central shell 76 provides a combustion chamber 78. The products of combustion flow through an elongated port 80 formed at one side of the shell 76 and through a spiral passageway 82 formed by a plurality of spirally shaped sheets 84, 85 and 86.

The sides of the passageway 82 are closed by spiral header plates 88 and 89 while the plates 84 and 85 provide a passageway 90 which is generally spiral in cross section, the outer end of the passageway 90 being formed between the sheet 86 and the casing 40. The products of combustion are discharged through an exhaust conduit 92 which is connected to the outermost turn of the spiral passageway 82.

Within the shell 76 is a return pipe 94 suitably spaced from the shell to provide a passageway 96 for the flow of the products of combustion from the combustion chamber to the port 80.

As in the embodiment of the invention shown in Fig. 1, a portion of the products of combustion are returned to the burning mixture as it leaves the combustion chamber, such returned products of combustion serving to insure complete combustion of the fuel and lowering the temperature at which the products of combustion are discharged into the spiral passageway 82.

While particular embodiments of the invention have been disclosed herein, it will be apparent to those skilled in the art that numerous additional variations and modifications may be made without departing from the more fundamental principles of the invention. It is therefore intended by the following claims to include within the scope of the invention all such variations and modifications by which substantially the results of the invention are obtained by the use of substantially the same or equivalent means.

The invention claimed is:

1. A heater of the sealed combustion type comprising a casing, means forming a cylindrical combustion chamber mounted within said casing, a heat exchanger having its inlet end connected to said combustion chamber to receive the burning mixture therefrom and an outlet, said heat exchanger having a relatively large cylindrical compartment, means for supplying a combustible mixture to said combustion chamber including an induction pipe for the mixture having an outlet end extending along the inner cylindrical wall of said combustion chamber at the end of said chamber opposite the inlet to said heat exchanger in a tangential direction to cause helical flow of the mixture within the combustion chamber thereby creating a space of reduced pressure at the center of the combustion chamber, and

a central tube having its outlet end facing said combustion chamber for conducting a portion of the products of combustion from within said compartment to the reduced pressure space in the combustion chamber for admixture with the burning mixture therein, said tube being arranged so that its inlet end is located at a point within said compartment where the combustible mixture has ceased burning.

2. A heater of the sealed combustion type comprising a casing, means forming a cylindrical combustion chamber mounted within said casing, a heat exchanger having its inlet end connected to said combustion chamber to receive the burning mixture therefrom, and an exhaust end, said heat exchanger including a relatively elongated cylindrical chamber forming an axial extension on said combustion chamber, means for supplying a combustible mixture to said combustion chamber including an induction pipe having an outlet end extending along the inner cylindrical wall of said combustion chamber at the end of said chamber opposite the inlet to said heat exchanger in a tangential direction to cause a helical flow of mixture within the combustion chamber, thereby creating an area of reduced pressure at the center of the combustion chamber, and a return tube extending axially in said elongated cylindrical chamber for conducting a portion of the products of combustion flowing therethrough from adjacent the exhaust end of the heat exchanger to the area of reduced pressure in said combustion chamber.

THELMA McCOLLUM,

Executrix of the Last Will and Testament of Henry J. De N. McCollum, Deceased.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
751,350	Schutz	Feb. 2, 1904
883,236	Rehbein	Mar. 31, 1908
1,879,011	Appel	Sept. 27, 1932
1,885,674	Beadle	Nov. 1, 1932
2,150,345	Schramm	Mar. 14, 1939
2,174,663	Keller	Oct. 3, 1939
2,197,495	Faulds	Apr. 16, 1940