

Oct. 13, 1931.

H. ALFARO

1,827,276

AEROPLANE

Filed Dec. 21, 1927

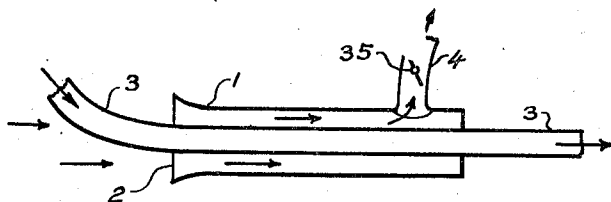


Fig. 1

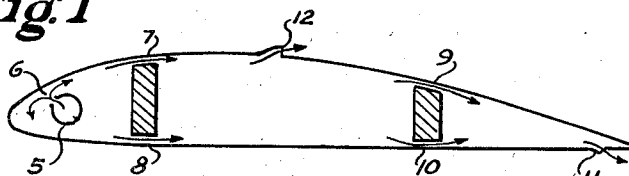


Fig. 2

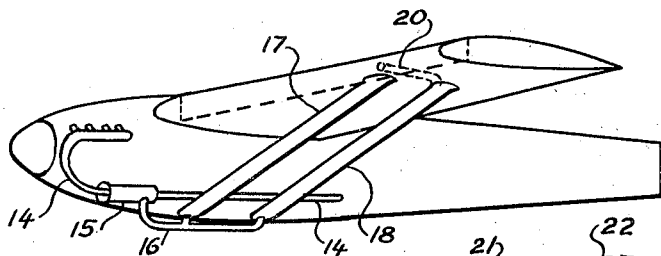


Fig. 3

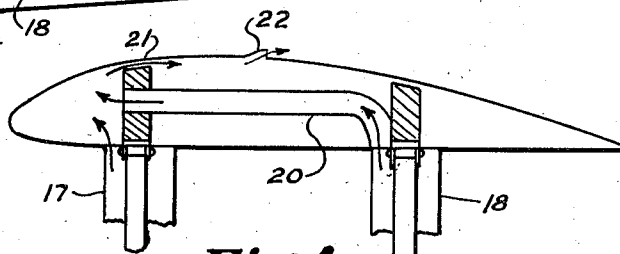


Fig. 4

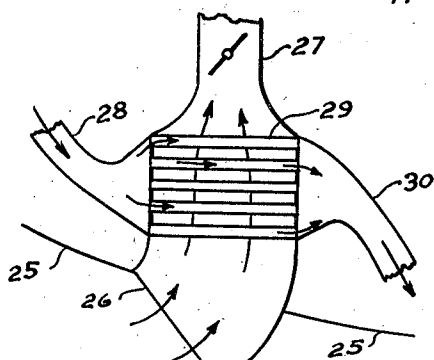


Fig. 5

Inventor

Heracio Alfaro

Evans & McCoy

Attorneys

UNITED STATES PATENT OFFICE

HERACLIO ALFARO, OF EAST CLEVELAND, OHIO

AEROPLANE

Application filed December 21, 1927. Serial No. 241,482.

This invention relates to aeroplanes and more particularly to heaters for use in cold climates where sleet formation on aeroplane parts is likely to occur.

Cold weather has offered peculiar difficulties to flying machines due to ice formation on wings, struts, and other parts. Thus, when flying in certain weather conditions, the wings and other parts of the machine get partially covered with a coat of ice that overloads the machine considerably. Moreover, the piling of ice breaks the contour of wings and other stream line parts to a very detrimental extent. The drag of the covered parts through the air is increased and more power is required for flight.

Furthermore, besides increasing the drag, piling of ice on the wings reduces the lifting capacity of the wings to a considerable extent. The increased weight and drag, and reduction of lift due to ice or sleet formation in aeroplanes has in many instances been the cause of forced landings and has resulted often in serious accidents.

One object of this invention is to provide aeroplanes with heaters of a character such as to minimize the formation of ice on wings and other aeroplane parts.

My invention contemplates means of heating the inner side of the aeroplane parts where sleet or ice is likely to be formed. It is preferred to take the heat from the most available source in aeroplanes, the engine exhaust, and to carry that heat at not too high a temperature into the parts desired. It is considered an advantage to use air as a carrier of said heat from the exhaust to the parts to be protected, thus reducing the actual temperature of the heat carrier from the temperature of the source and avoiding possible damage.

Aircraft wings, as a rule, are hollow bodies; struts ailerons and tail surfaces, fuselages, etc. are also hollow bodies which may serve as containers for a fluid heating medium.

Another object of this invention is to provide satisfactory heating of the parts of aircraft subject to sleet formation with gases at relatively low temperatures, so as to mini-

mize danger of damaging parts of wood or other material used in the construction.

A further advantage of the invention is to provide at the same time a heater for preventing formation of sleet and a heater for the passenger quarters.

With the above and other objects in view, the invention may be said to comprise the device as illustrated in the accompanying drawings hereinafter described and particularly set forth in the appended claims together with such variations and modifications thereof as will be apparent to one skilled in the art to which the invention appertains.

In the drawings, Figure 1 shows one type of air heater which may be employed.

Fig. 2 shows the section of a wing provided with heating means such as contemplated by my invention.

Fig. 3 shows an aircraft to which the present invention is applied.

Fig. 4 is a section of the wing of the aircraft shown in Fig. 3.

Fig. 5 shows a modified form of air heater.

Referring to Fig. 1 of the drawings, a collector 1 is exposed to the outside air stream which enters said collector through the flaring mouth 2 and contacts with a pipe 3 which extends centrally through the collector 1 and through which pass the hot engine exhaust gases. The velocity of the air stream forces the air through the collector 1 and through an exit pipe 4 from which it is distributed to the different parts of the aircraft.

A pipe 5 connected with exit 4 can be carried into a wing along its leading edge where sleet is more likely to pile. At intervals along the length thereof, a hole or slot 6 may be pierced in said pipe 5 through which the heated air may escape, thereby warming up the nose of the wing. From the nose, the heated air will flow through gaps 7, 8, 9 and 10 between the wing beams and the fabric and escapes finally through suitably positioned openings which may be near the trailing edge as indicated at 11, or in the top wall of the wing as indicated at 12.

The exhaust gases could be carried directly through pipe 5 to a final exhaust at the wing

tips. This, however, may not be as suitable for all aircraft construction as the temperature of the exhaust gases is quite high and might damage the interior of the wings. In
 5 all metal wings, however, the direct heating by means of the exhaust gases may be advantageous. When desirable, the exhaust gases may be discharged directly into the metal wings or struts and allowed to leave from
 10 openings in suitable points after heating the same.

In the arrangement shown in Figs. 3 and 4, exhaust pipe 14 extends rearwardly through a collector 15, and an exit pipe 16 carrying
 15 the heated air from collector 15 to wing struts 17 and 18. These struts are hollow and carry the heated air preferably through the leading edge portion of the streamlining part of the strut up to the wing. The air from strut
 20 17 enters directly to the nose of the wing, while from strut 18 it is carried forward through a pipe 20 extending forwardly within the wing to the wing nose, the air passing through openings 21 between the upper part
 25 of the front wing beam and the fabric and finally reaching a free outlet at openings 22 as shown in Fig. 4.

A symmetrical duplication of the arrangement above described may protect the opposite side of the aircraft not shown in the drawings, or if desired, a second pipe 16 can be led from collector 15 to the other side of the aeroplane.

By using the necessary auxiliary piping,
 35 the heated air can be carried to such other parts of the aircraft as may be desired. One or more shutters such as shown at 35 may be provided to regulate the flow of heated air and consequently the amount of heat carried
 40 to the wings and other heated parts.

All of the distributing pipes leading from the air collector can be made removable for inspection and may be left off when not needed in fair weather.

45 Sleet formation is due to the slight drop of temperature resulting from the small decrease in pressure of the air flowing past certain parts of an aircraft when the temperature of the air having a high moisture content is close to the freezing point.

Thus, at lower temperatures than the critical one, no sleet formation will take place due to lack of excess moisture in the air. At temperatures nearing freezing temperature
 50 and with sufficient excess moisture in the air, the above mentioned slight drop of temperature will condense and freeze a certain amount of said moisture in contact with certain parts of the aircraft. A small amount
 60 of heat supplied at the points on the aircraft where the slight drop in pressure occurs will be sufficient to prevent a drop in temperature that would cause condensation and freezing of the moisture.

Another type of heater is shown in Fig. 5

in which the outer skin of the aircraft's body is indicated at 25, the air intake at 26 and the exit pipe at 27. The hot engine gases come through a pipe 28 and are dispersed through
 70 a plurality of pipes 29 extending across the air passage and surrounded by the air to be heated, the exhaust gases finally leaving through a discharge pipe 30.

Other heater arrangements may be used as for instance, funnel shaped pipes placed behind the cylinder heads of air cooled cylinders or collecting hot air from the stream
 75 past water radiators.

The same heater can serve for both the antisleet formation and the heating of passenger compartments. This will have the advantages of economy and simplicity together with smaller weight.

With my invention adapted in the above mentioned relation to an aircraft, safe flying
 85 is made possible during cold weather without danger of sleet formation. The exhaust heated air carried to different parts prevents ice formation and the relatively low temperature of the heated air will not damage the
 90 different parts with which it comes in contact.

It will thus be seen that I have provided a simple and practicable means for supplying sufficient heat to exposed surface portions
 95 of an aircraft to prevent the cooling thereof to a temperature such as to cause condensation of moisture and freezing thereof on such surfaces, and that this result is accomplished without substantially reducing the efficiency
 100 of the aircraft.

Furthermore, it is to be understood that the particular form of apparatus shown and described, and the particular procedure set forth, are presented for purposes of explanation and illustration and that various modifications of said apparatus and procedure can be made without departing from my invention as defined in the appended claims.

What I claim is:

1. In an aeroplane having hollow wings, an air heater, means for delivering the heated air from the heater to the interior of the wings adjacent the forward edges thereof, and openings in the upper and lower walls
 115 of the wings which are directed rearwardly whereby the air streams along the exterior surfaces of the wings exert an entraining action on the heated air within the wings.

2. In an aeroplane having a hollow wing, a longitudinal partition member within the forward portion of the wing providing a longitudinal chamber in the nose portion of the wing, narrow gaps being provided between said partition member and the top and
 120 bottom walls of the wing, said wing having openings for discharge of air rearwardly of said partition member, an air conduit for delivering heated air from said heater having a discharge portion extending longitudinally
 125 130

of the wing within said chamber, said discharge portion of the conduit having openings for directing streams of heated air forwardly toward the nose of the wing, the heated air passing rearwardly from said chamber through said gaps and along the top and bottom walls to the discharge openings.

In testimony whereof I affix my signature.

HERACLIO ALFARO.

10

15

20

25

30

35

40

45

50

55

60