

Sept. 1, 1931.

A. C. VINING

1,821,776

ANTIICE AIRPLANE AND IMPROVED WING CONSTRUCTION THEREFOR

Filed May 9, 1928

3 Sheets-Sheet 1

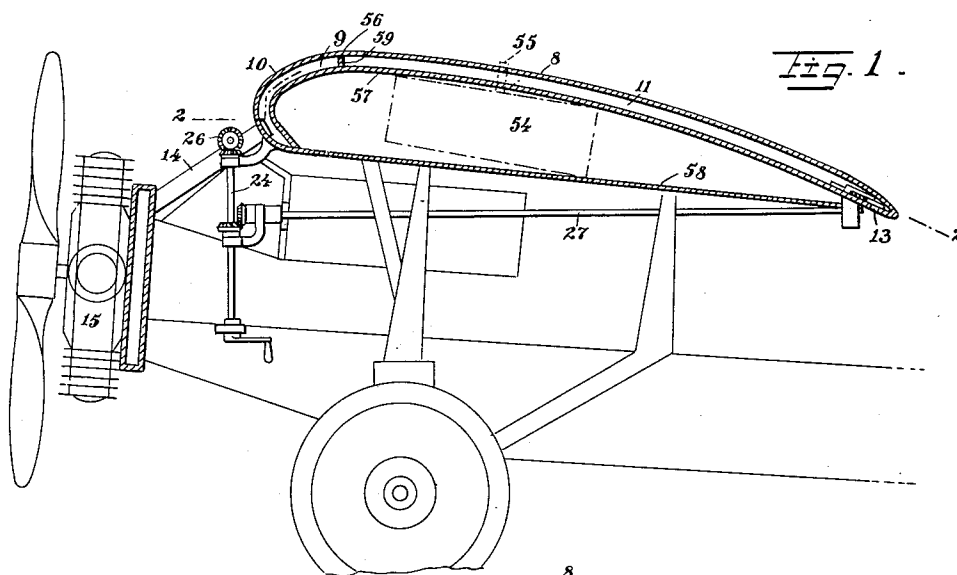
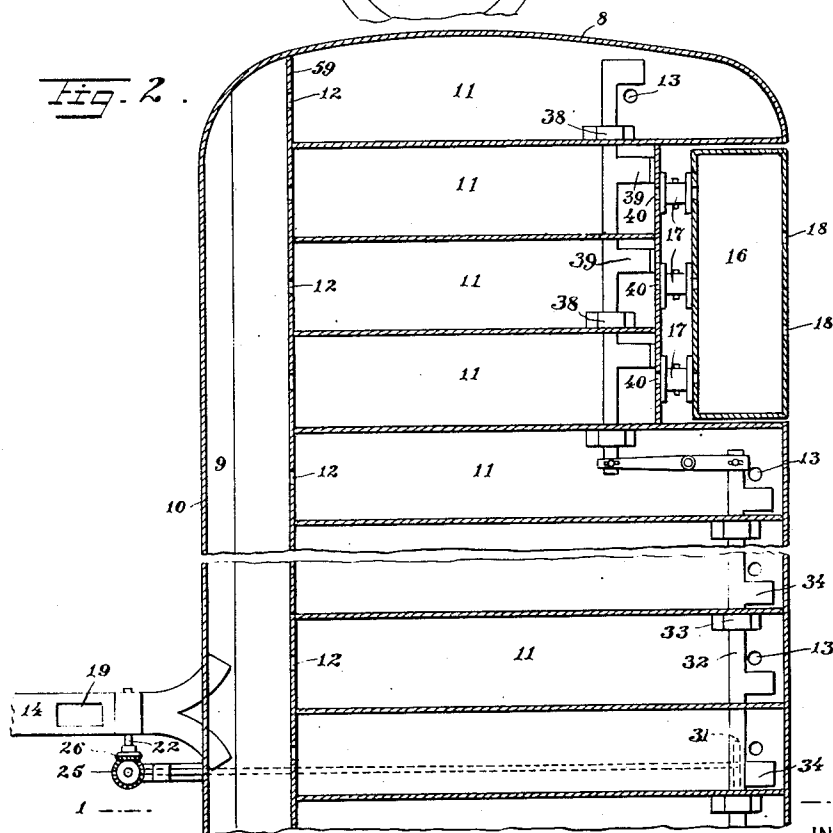


Fig. 2.



WITNESSES

H. T. Walker
Charles A. Morton

INVENTOR

Archie C. Vining
BY *Munn & Co.*
ATTORNEY

Sept. 1, 1931.

A. C. VINING

1,821,776

ANTIICE AIRPLANE AND IMPROVED WING CONSTRUCTION THEREFOR

Filed May 9, 1928

3 Sheets-Sheet 2

Fig. 4.

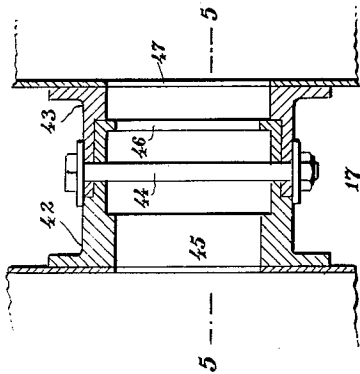


Fig. 3.

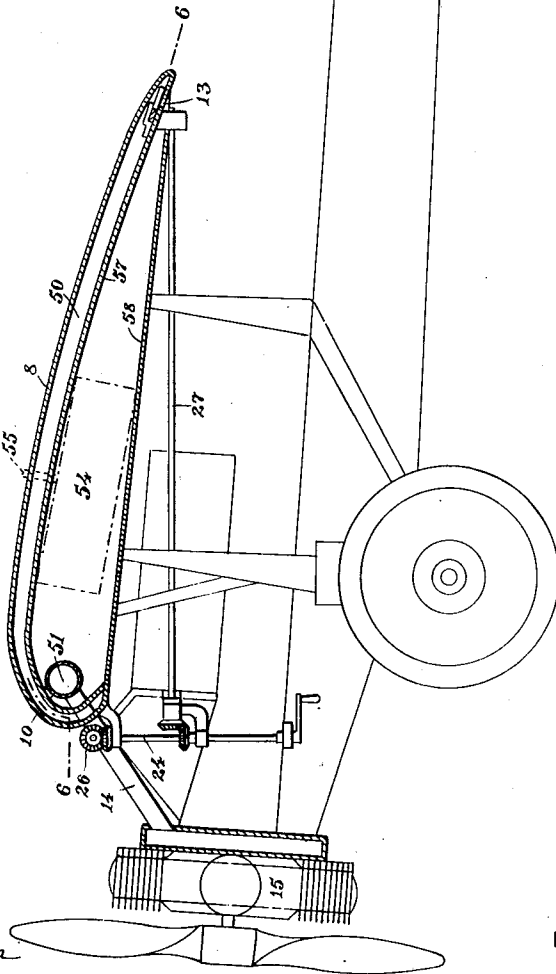
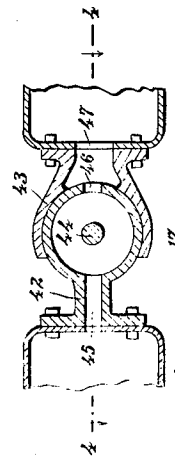


Fig. 5.



WITNESSES

H. J. Walker
Charles A. Norton

INVENTOR
Archie C. Vining
BY *munroe*
ATTORNEY

Sept. 1, 1931.

A. C. VINING

1,821,776

ANTIICE AIRPLANE AND IMPROVED WING CONSTRUCTION THEREFOR

Filed May 9, 1928

3 Sheets-Sheet 3

Fig. 6.

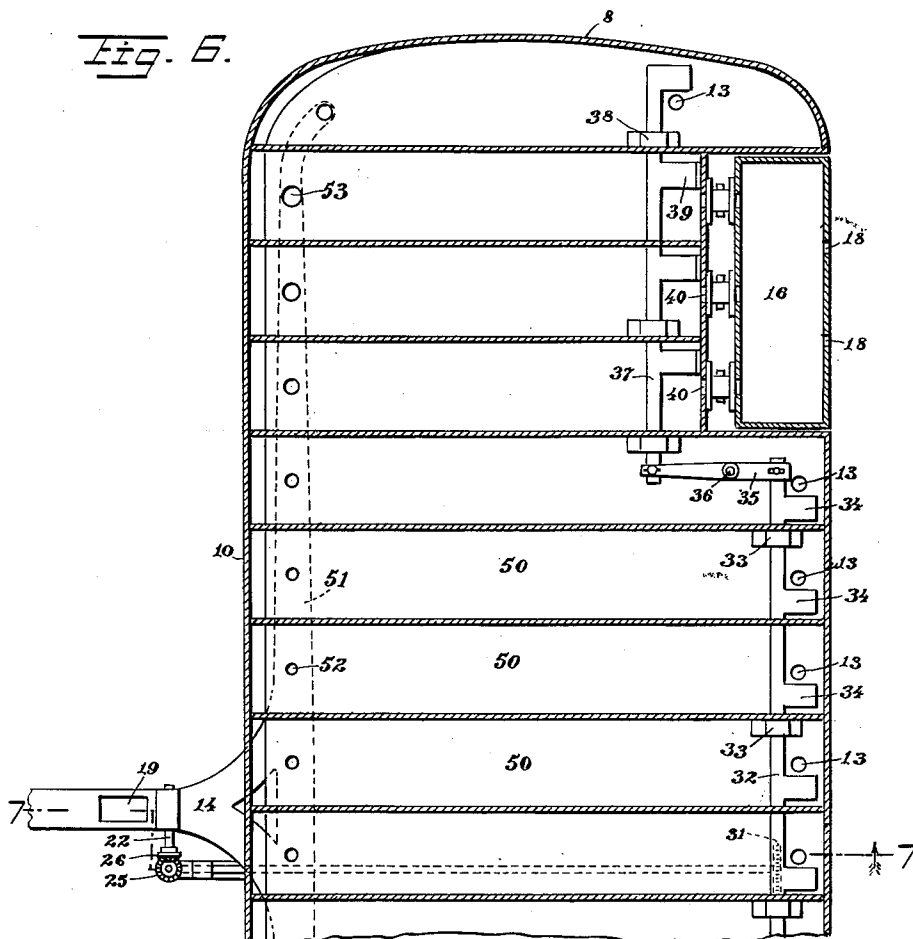
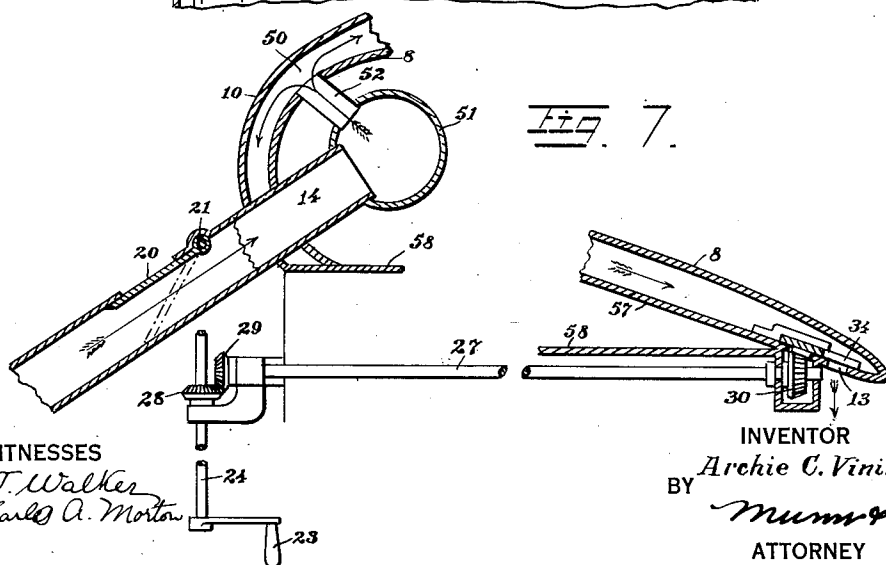


Fig. 7.



WITNESSES

H. T. Walker
Charles A. Morton

INVENTOR

Archie C. Vining
BY *Mum & Co.*
ATTORNEY

UNITED STATES PATENT OFFICE

ARCHIE C. VINING, OF BROOKLYN, NEW YORK

ANTI-ICE AIRPLANE AND IMPROVED WING CONSTRUCTION THEREFOR

Application filed May 9, 1928. Serial No. 276,359.

This invention relates to improvements in airplanes, to heating systems for use therein, and to an improved wing construction for airplanes as a new article of manufacture.

An object of this invention is the elimination of ice formations upon the wing of an airplane.

Figure 1 is a side view of the forward part of an airplane, showing the wing in section—taken along the line 1—1 of Fig. 2.

Fig. 2 is a plan view of a portion of the wing with its upper surface removed, taken along the line 2—2 of Fig. 1.

Fig. 3 is a side view of the airplane illustrating one modification of the invention.

Fig. 4 is a vertical section of a hinge taken along the line 5—5 of Fig. 5.

Fig. 5 is a horizontal section of said hinge taken along the line 4—4 of Fig. 4.

Fig. 6 is a plan view of a part of a wing with its upper surface removed, which is constructed in accordance with the modification in Fig. 3, taken along the line 6—6 of Fig. 3.

Fig. 7 is a vertical section of the wing, partly broken away, taken along the line 7—7 of Fig. 6.

Like characters of reference designate corresponding parts throughout the several figures.

In the form at present preferred the wing 8 is provided with an intermediate partition wall 57 paralleling the upper surface of the wing 8, and in connection therewith defining a compartment (or plurality of compartments) 9 paralleling the leading edge of the wing, and a plurality of compartments 11 positioned at right angles to the compartment 9. The compartment 9 is connected to each of the compartments 11 by means of a series of openings or vents 12. Near the trailing edge of the wing 8, the partition wall 57 is provided with a plurality of exhaust outlets 13, there being preferably at least one such outlet for each compartment 11. The lower surface of the wing is indicated at 58 (Figs. 1 and 3).

The exhaust pipe 14, of the engine 15 which consists of any preferred form of

internal combustion engine, is connected with the compartment 9 so that it will, except as hereinafter specified, force the exhaust and superheated gases emitted by the engine 15 into the compartment 9. The heated gases traverse the chamber 9 and pass through the vents 12 into the chambers 11, thence by way of the outlets 13 to the atmosphere. The ailerons are also constructed in the form of a chamber as at 16 (Figs. 2 and 6) and the heated gases from certain of the compartments 11 (Fig. 2) or 50 (Fig. 6) are conducted by way of the hinges 17 (Figs. 4 and 5) into the chamber 16 of the aileron, thence via the exhausts or vents 18, to the atmosphere.

The construction and arrangement hereinbefore set forth may be said to constitute a heating system employing superheated gases from the exhaust to maintain the wing (particularly its leading edge 10) sufficiently heated to prevent the formation of ice thereon. The purpose of the compartment (or compartments) 9 paralleling the leading edge is to insure utilization of the maximum heat of the superheated gases at the point where said heat is principally needed, to wit, adjacent the leading edge of the wing.

It should, of course, be understood that the invention contemplates that while the wing 8 may be constructed of any desired material, it is preferably made of metal.

The heating system is not required at all times, hence means is provided for conducting the gases direct to atmosphere when the heating system is not in use. This means consists of a port 19 (Figs. 2 and 6) in the exhaust pipe 14 provided with a shutter 20 (Fig. 7), which is pivoted at 21 to the exhaust pipe 14. The shutter 20 is connected to a rod 22 which is operated from a suitable control device 23 (Fig. 7) by way of shaft 24 and gears 25 and 26. Imparting rotary movement to the control device 23 in one direction tends to close the port 19 by positioning the shutter 20 as indicated in bold outline in Fig. 7; when the direction of movement of the control device 23 is reversed, the shutter 20 is moved to the position indicated in dotted lines in Fig. 7, to

open the port and conduct the exhaust gases directly to atmosphere.

Whenever the shutter 20 is open the outlets 13 are closed by the operation of the control device 23. This is accomplished by means of the mechanism (Fig. 7) consisting of the rod 27, gears 28, 29 and 30 and the teeth 31 (Fig. 6) forming a part of the rack bar 32, which is adapted to slide back and forth in the guideways 33, to permit the projecting members 34 of the rack bar 32 to open and close the exhaust outlets 13 dependent upon the position of the rack bar 32. The reciprocating movement of the rack bar 32 is translated by means of the shaft 35, which is pivoted at 36, into a rotary movement and said rotary movement is again translated into a reciprocating movement to cause the bar 37 to slide in the guideways 38 to permit the projecting members 39 to open and close the outlets 40 whereby the superheated gases are conducted to the chamber 16 by way of the hinge 17, thence by way of the exhausts or vents 18 to atmosphere.

The hinge 17 (Figs. 4 and 5) consists essentially of two parts 42 and 43 rabbeted to effect a substantially airtight pivotal connection, which elements are secured together by the pintle or hinge bolt 44. The walls of the element 42 are provided with apertures 45 and 46 which serve to conduct the gases into the hollow chamber of element 43, thence by way of its associated aperture 47 to the chamber 16 of the aileron.

The modification illustrated in Figs. 3 and 6 consists in eliminating the compartment 9 paralleling the leading edge 10 and subdividing the wing interior by means of partitions into a plurality of compartments 50 (Fig. 6) extending from the leading to the trailing edge of the wing 8. In lieu of the compartment 9 a conduit 51 is employed, which conduit parallels the leading edge of the wing and is provided with a series of feed pipes 52 (Fig. 7) which feed pipes gradually increase in diameter as at 53 (Fig. 6) as they approach the outer end or tip of the wing 8. The conduit 51 forms a continuation of the exhaust pipe 14. The feed pipes 52-53 obtain access to the compartments 50 as best indicated in section, in Fig. 7.

Recent transatlantic flights have demonstrated the importance of preventing the formation of ice upon the wing surface. By means of this invention the temperature of the leading edge of the wing may be maintained above the point where ice particles are able to cake and form a coat of ice upon the wing.

It should be understood that various modifications may be suggested. For example the control mechanism may be concealed within the wing instead of being positioned below its lower wall 58 as disclosed in the drawings herein. Fuel tanks may be posi-

tioned within the wing as at 54 (Figs. 1 and 3), the fuel tanks being furnished with vents 55 leading to atmosphere. These vents may pass through the compartments 11 and 50 and are preferably suitably insulated.

As will best be observed from Figs. 1 and 2 the partition which defines the rear wall 59 of the chamber 9 is positioned at the crown 56 of the wing, that is, at approximately the point of maximum wing curvature. The wing surface between the crown 56 and the forward tip of the wing defines the leading edge 10 to which reference has heretofore been made throughout the specification. The transverse partition walls defining the compartments 11 (Fig. 2) and 50 (Fig. 6) will also be ancillary to and function as wing ribs, thereby imparting additional strength to the wing structure.

What is claimed is:

1. As a new article of manufacture, a hollow airplane wing having a wall spaced intermediate its upper and lower surfaces which in combination with the upper surface constitutes a double skin, a partition wall paralleling the leading edge of the wing, merging with the inner wall of the upper surface and with the intermediate wall to define a relatively long, narrow, compartment, a plurality of other partition walls for reinforcing the walls of the double skin, said reinforcing walls merging into the first partition wall and extending rearwardly therefrom toward the trailing edge of the wing to define a plurality of transverse compartments, and a plurality of apertures in the first partition wall for connecting the relatively long, narrow, compartment with the said transverse compartments.

2. As a new article of manufacture, a hollow airplane wing having a wall spaced intermediate its upper and lower surfaces which in combination with the upper surface constitutes a double skin, a partition wall paralleling the leading edge of the wing, merging with the inner wall of the upper surface and with the intermediate wall to define a relatively long, narrow, compartment, a plurality of other partition walls for reinforcing the walls of the double skin, said reinforcing walls merging into the first partition wall and extending rearwardly therefrom toward the trailing edge of the wing to define a plurality of transverse compartments, a plurality of apertures in the first partition wall for connecting the relatively long, narrow compartment with the said transverse compartments, and a series of apertures through the wall of the lower surface of the wing constituting vent holes to atmosphere for said transverse compartments.

3. In an airplane including a wing having exhaust gas compartments therein and means for discharging waste gases to said

wing, means for controlling the passage of gases to said wing, and associated means for controlling the discharge of gases from said wing, said first-mentioned means including a pivoted valve permitting the discharge of gases to the atmosphere, said last-mentioned means including longitudinally slidable shutters.

4. In an airplane including a wing having exhaust gas compartments therein and means for discharging waste gases to said wing, means for controlling the passage of gases to said wing, and associated means for controlling the discharge of gases from said wing, said first-mentioned means including a pivoted valve permitting the discharge of gases to the atmosphere, said last-mentioned means including longitudinally slidable shutters actuated in response to the actuation of said valve.

Signed at New York, in the county of New York, and State of New York, this 3rd day of May, 1928 A. D.

ARCHIE C. VINING.