A. V. VERVILLE.
AIRPLANE RADIATOR MOUNTING.
APPLICATION FILED AUG 23, 1919.

1,427,872. Patented Sept. 5, 1922.

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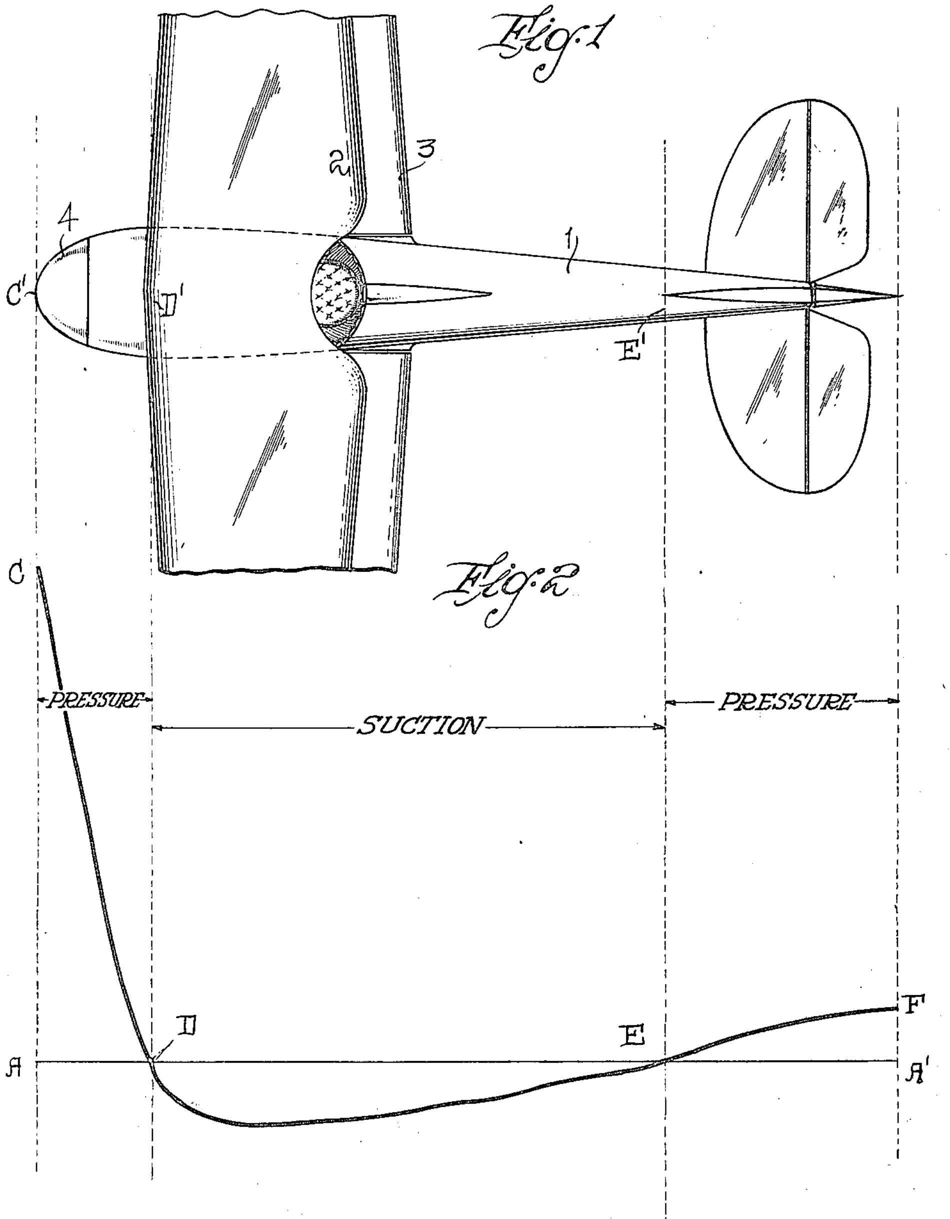

Inventor

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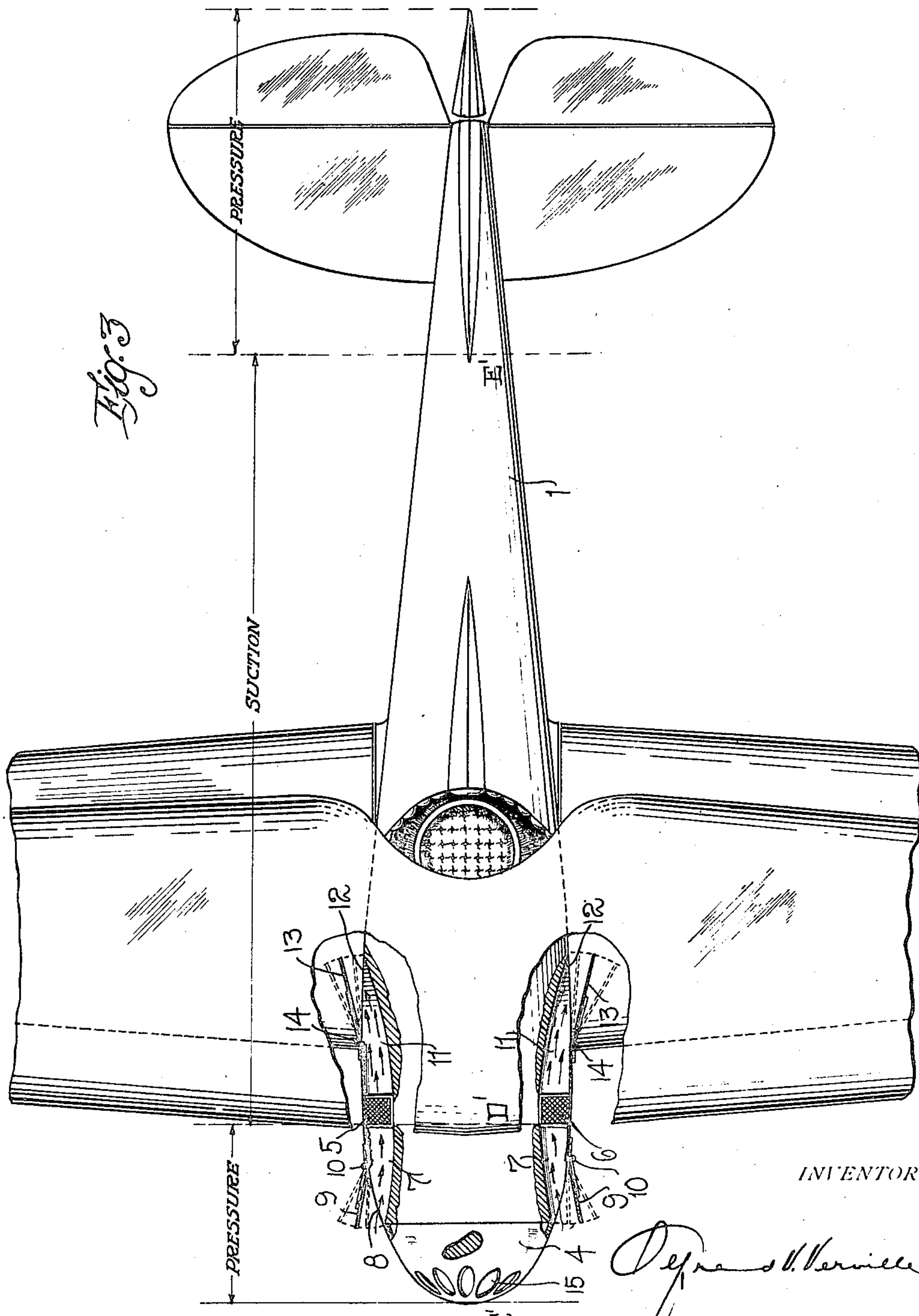

Fig. 3

INVENTOR

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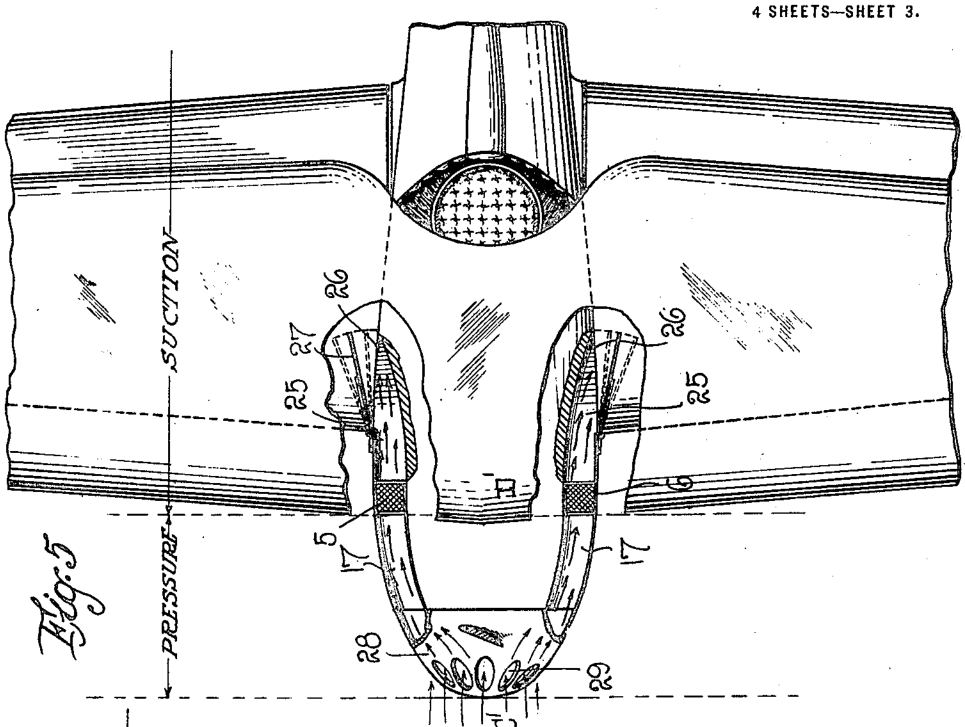

Fig. 5

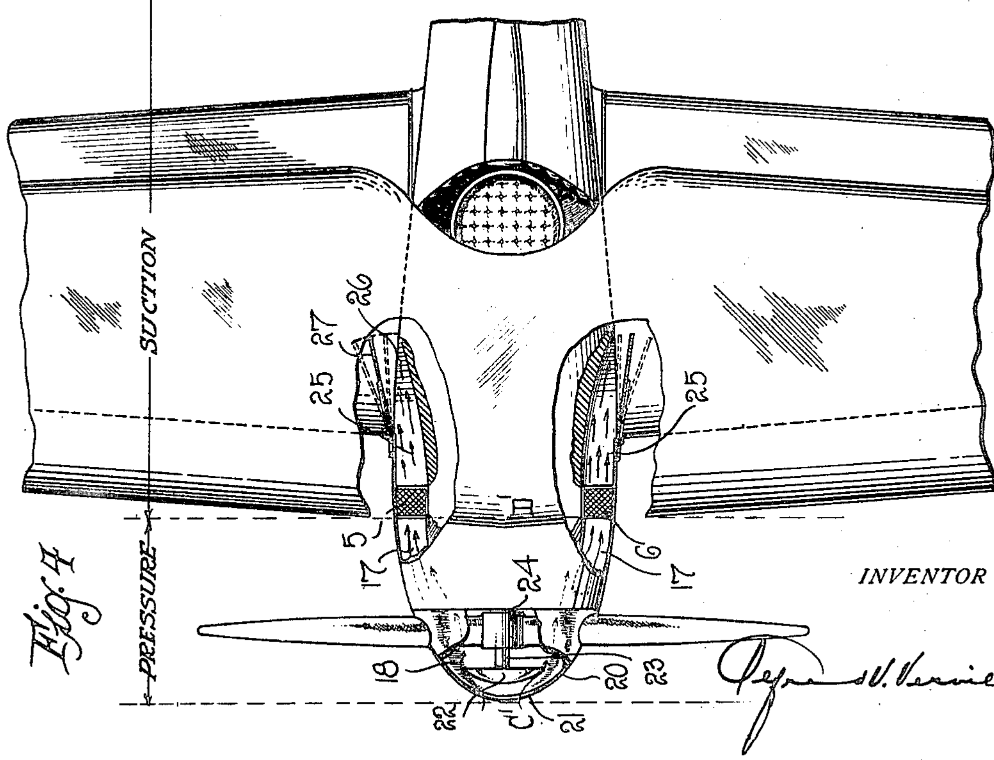

Fig. 4

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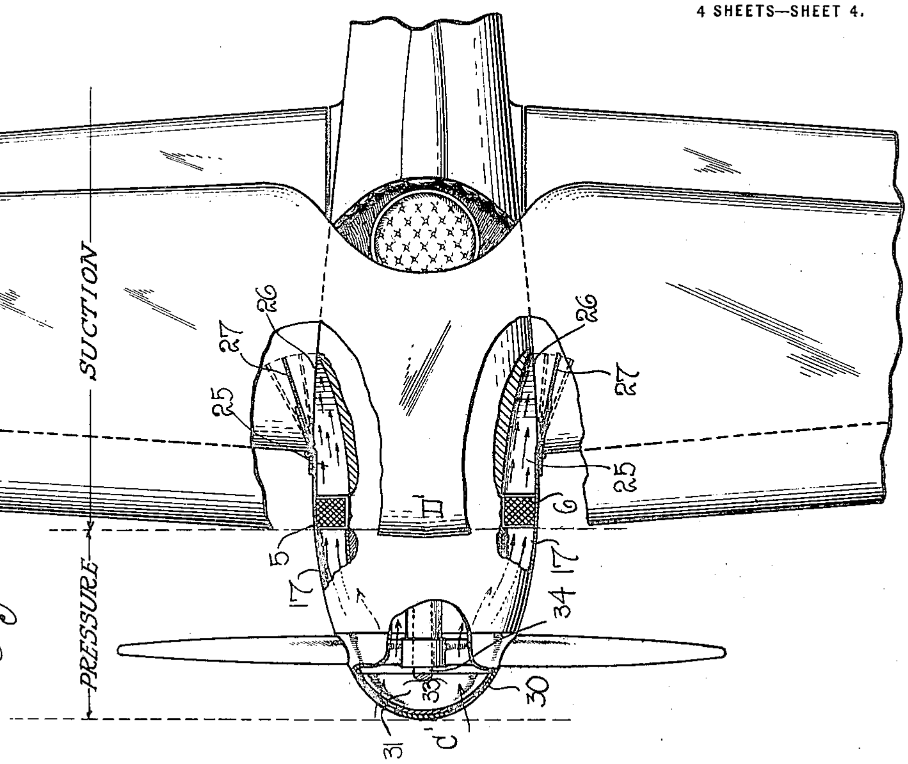

Fig. 6

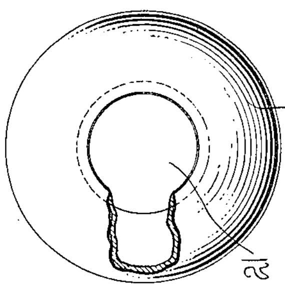

Fig. 8

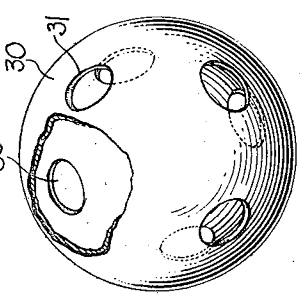

Fig. 7

Inventor

Alfred V. Verville

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UNITED STATES PATENT OFFICE.

ALFRED V. VERVILLE, OF DETROIT, MICHIGAN.

AIRPLANE-RADIATOR MOUNTING.

Application filed August 23, 1919. Serial No. 319,468.

To all whom it may concern:

Be it known that I, Alfred V. Verville, am a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Airplane-Radiator Mountings, of which the following is a specification.

This invention relates to a radiator mounting for an airplane, and more particularly to the means for leading air to and carrying air away from the radiator.

It has been found as the result of wind tunnel tests on airplane fuselages, that for a short distance along the nose of the fuselage there is an area of rather high pressure when the airplane is in flight; that is to say, an air pressure more or less above the normal atmospheric pressure. This is the natural result of the movement of the fuselage through the air.

Wind tunnel tests further show that back of the just described pressure area there is a somewhat longer suction area. By suction area is meant an area in which the pressure is below the normal atmospheric pressure.

The main consideration in radiator design in an airplane is to cause as rapid a flow of air through the radiator as possible, with a minimum amount of head resistance. Keeping this in mind, I mount the radiator preferably inside the fuselage, at about the point where the described pressure area ends and the suction area begins. Further, I provide air intake means to lead air to the radiator, this air intake means being provided with an intake opening located in the pressure area.

I also provide an air exit means to lead air away from the radiator, this air exit means being located in the suction area.

It is obvious that by putting the intake in the pressure area and the air exit in the suction area, a rapid flow of air through the radiator is obtained.

Another object of my invention is to provide adjustable closures for both the air intake and air exit, which closures, when in the closed position, conform to the normal streamline shape of the fuselage. When the air is unusually cold, when the airplane is at great altitudes for instance, these closures may be practically closed against the fuselage, whereby the head resistance is minimized.

Other objects and advantages will appear as the description proceeds.

In the drawings illustrating certain embodiments of my invention:—

Fig. 1 is a plan view of an airplane, parts of the wings being broken away.

Fig. 2 is a curve obtained as the result of wind tunnel tests showing approximately the location of the pressure and suction areas along the fuselage when it is in flight.

Fig. 3 is a plan view of the fuselage showing one form of my invention.

Fig. 4 is a similar view showing another form of my invention, in which the air is taken in through the spinner cap carried by the propeller.

Fig. 5 shows a modification somewhat similar to Fig. 4.

Fig. 6 is a still further modification in which the air is taken in through the spinner cap.

Fig. 7 is an enlarged view of the spinner cap of Fig. 6, partly broken away, and

Fig. 8 is a front view of the spinner cap of Fig. 4, partly broken away.

Referring now to Figs. 1 and 2, 1 indicates a typical airplane fuselage, and 2 and 3 indicate the upper and lower planes respectively. The spinner cap is indicated at 4. Referring now to the curve shown in Fig. 2, the line A A′, which is equal to the length of the fuselage from the nose to the tip thereof, represents the line of zero pressure. Points above the line A A′ indicate pressure above atmospheric, while points below said line indicate pressures below atmospheric. The curve of pressures is indicated at C D E F. This curve is intended to illustrate qualitative values only, and is not intended to indicate any definite units of pressure.

Referring now to the curve C D E F, it will be noted that the highest pressure is at the point C at the extreme tip of the fuselage. The pressure rapidly drops off as one goes backwardly to the point D, where the curve crosses the axis A A′, at which point the pressure is substantially atmospheric pressure. Passing backwardly from the point D the curve goes below the line A A′ indicating a suction area, that is to say, a pressure below atmospheric pressure. The curve crosses the axis again at the point E and terminates at the point F, the area back of the point E thus being a pressure area.

Referring now to Fig. 1, the pressure area is indicated between C′ and D′. The suction area is indicated between the points D′ and E′. This invention is not concerned with the pressure area corresponding to the E F part of the curve.

Referring now to Fig. 3, 5 and 6 indicate a radiator which may be made in two parts or which may be made annular, as desired.

The pressure area is indicated by C′ D′ and the suction area by D′ E′. It will be noted that the radiator is positioned at substantially the point D′, that is to say, at the point where the pressure area ends and the suction area begins. The radiator is also preferably entirely within the fuselage as indicated, in order to minimize wind resistance.

Air is led to the radiator through the channel 7 which has an air intake opening 8 located in the described pressure area. The amount of air that is taken into the opening 8 may be controlled by the door 9, hinged at 10 and controlled in any suitable manner so as to be set in various adjusted positions, as indicated in dotted lines.

An air exit channel for the air leaving the radiator is indicated at 11. The channel 11 is provided with an air exit opening 12, the opening of which is controlled by the door 13, pivoted at 14 and movable by any desired means to be closed entirely or to be set in the adjusted positions shown in dotted lines. It is important to note that the air exit opening 12 is located in the suction area D′ E′.

The positioning of the intake 8 and the exit 12 in the pressure and suction areas, respectively, will obviously give a very rapid flow of air through the radiator. The adjustable doors 9 and 13 also give an adjustment of the amount of air, and therefore of the amount of cooling afforded the radiator.

When the air is very cold, the doors 9 and 13 may be practically closed and the cooling of the engine accomplished by the air which flows in through the holes 15 in the spinner cap 4 and flows over the engine cylinders. 16 indicates a section of a propeller blade extending through the spinner cap.

Referring now to the modification as shown in Fig. 4, the pressure area is indicated as located between the points C′ D′, while the suction area extends toward the rear of the fuselage from the point D′. 5 and 6 indicate the usual radiator sections positioned substantially at D′, that is to say, where the pressure area ends and the suction area begins.

Air is led to the radiator through channels 17 inside the fuselage, these channels extending forwardly and opening into the space 18 inside the spinner cap 20. Cap 20 is provided with an opening 21 at its forward end, where the pressure is highest. A valve 22, mounted on the valve stem 23, is adapted to be moved forwardly and backwardly so as to close the opening 21 more or less in order to control the amount of air that is taken in through this opening. The stem 23 may extend backwardly through the propeller hub 24 to a position where it may be operated by the pilot.

Air exit channels 25 are provided to lead air away from the radiator, these exit channels being provided with exit openings 26 controlled by the adjustable doors 27. As usual, the exit opening 26 is located in the suction area already described. The operation in this modification is obvious, and the air flow is indicated by the arrows.

Referring now to the modification shown in Fig. 5, the pressure area is located between the points C′ D′ and the suction area is located to the rear of the point D′. This modification is very similar to that shown in Fig. 4 and corresponding reference characters indicate corresponding parts. A modified form of spinner cap 28 is shown, this cap being provided with a series of air inlet openings 29. The air enters these openings 29, passes into the inlet channel 17, then through the radiators 5 and 6, and thence out through the air exit openings 26. The air inlet openings 29 are positioned in the pressure area, while the air exit openings 26 are positioned in the air suction area.

In the modification shown in Fig. 6, a still further modified form of spinner cap is shown. The other parts are practically the same as those shown in Figs. 4 and 5 and are indicated by corresponding reference characters.

The pressure area is indicated between the points C′ D′ and the suction area is located rearwardly of the point D′. In this modification the spinner cap, indicated at 30, is provided with a series of apertures 31. A shutter 32, provided with a series of apertures 33 corresponding to the apertures 31, is mounted inside the spinner cap 30 to rotate on the axis 34. Rotation of the shutter 32 to bring the apertures 33 and 31 into or out of registry gives an adjustable control for the amount of air that is taken in through the spinner cap. The flow of air is indicated by the arrows. The air inlet, as is usual, is located in the pressure area, while the air exit opening is in the suction area.

The shaft 34 controlling the shutter 32 may extend backwardly through the propeller hub and propeller shaft to a position for convenient manual operation by the pilot.

It should also be noted, in regard to Fig. 3 particularly, that when the doors 9 and 13 are wide open an air channel is provided which is comparatively wide at the inlet and outlet and which narrows down from both ends toward the middle. Such a shape approximates that of a Venturi tube, a shape which is well known to be highly efficient for rapid air flow.

While I have illustrated a number of embodiments of my invention, it should be understood that I do not intend to be limited to the form shown, but that the broad principle of my invention can be carried out in many other ways. The gist of the invention is locating the air inlet openings and the air exit openings in such positions with relation to the pressure and suction areas existing along a fuselage in normal flight, that a rapid flow of air is caused through the radiator.

I claim as my invention:

1. In combination with a symmetrical aircraft fuselage, a radiator of symmetrical formation having its axis of symmetry coincident with the axis of symmetry of the fuselage, said radiator being located between the areas of high pressure and suction of the fuselage while in flight and exposed to an air stream, and also having its peripheral surface flush with the corresponding surface of the fuselage.

2. In combination with a symmetrical aircraft fuselage, a radiator of symmetrical formation having its axis of symmetry coincident with the axis of symmetry of the fuselage, said radiator being housed wholly within the fuselage and located between outer and inner concentric walls of the fuselage and also between the areas of high pressure and suction of the fuselage while in flight and exposed to an air stream.

3. In combination with a symmetrical aircraft fuselage, a radiator of symmetrical formation having its axis of symmetry coincident with the axis of symmetry of the fuselage, said radiator being arranged within the normal flying contour of the fuselage and at the junction of the high and low pressure areas thereof, means for conveying air through the radiator receiving such air from the high pressure area and liberating the same from the low pressure area, and adjustable doors for regulating the volume of air flowing through the radiator.

In testimony whereof I affix my signature.

ALFRED V. VERVILLE.