May 9, 1933. J. SQUIRES 1,907,454

AIRPLANE CONSTRUCTION

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Fig. 1.

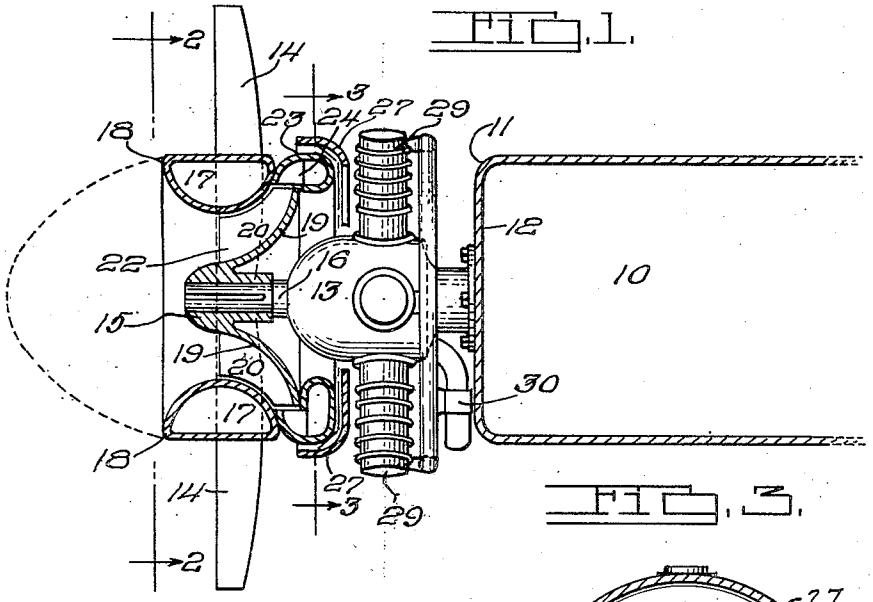


Fig. 3.

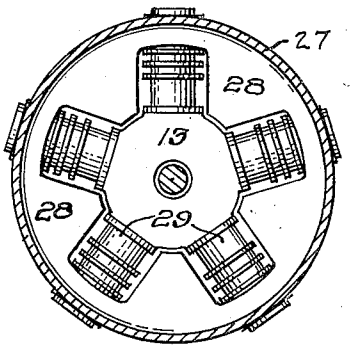


Fig. 2.

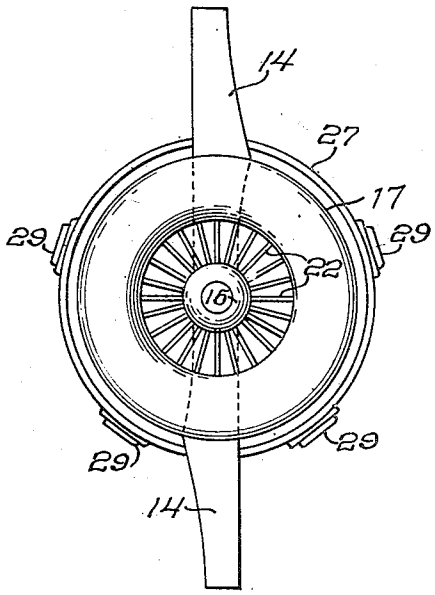
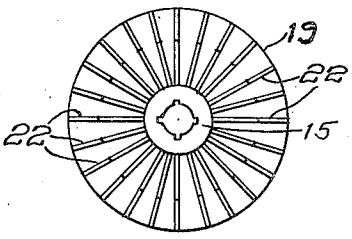


Fig. 4.



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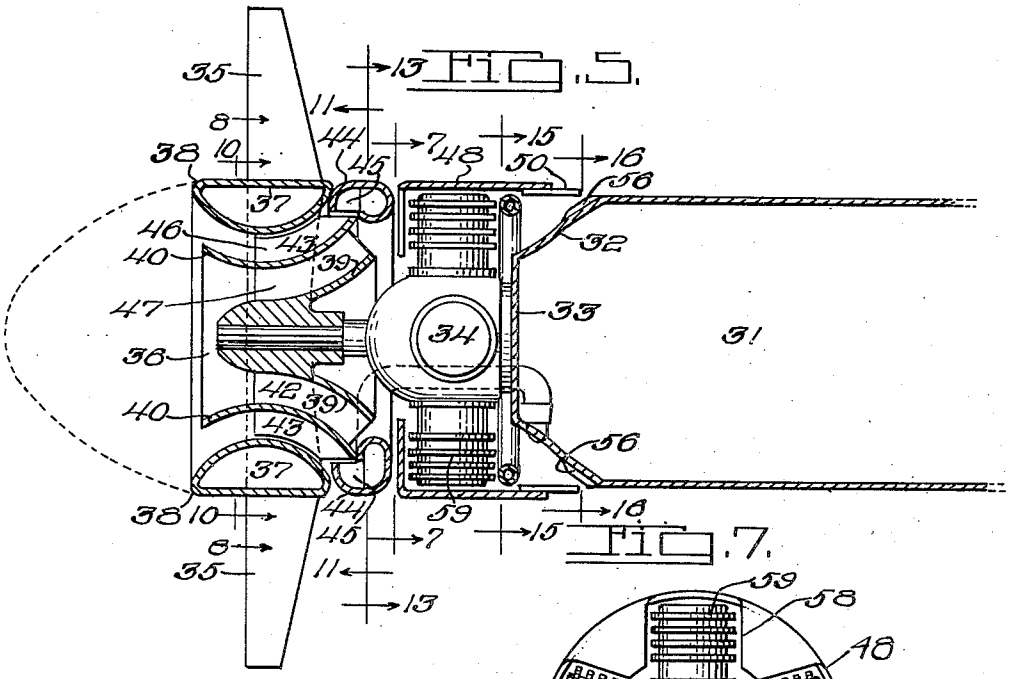

Fig. 5.

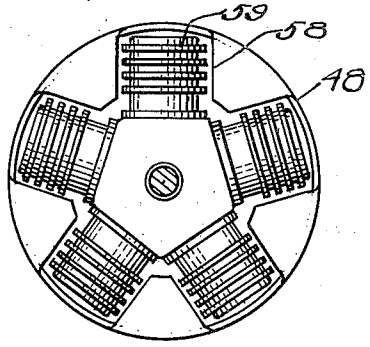

Fig. 7.

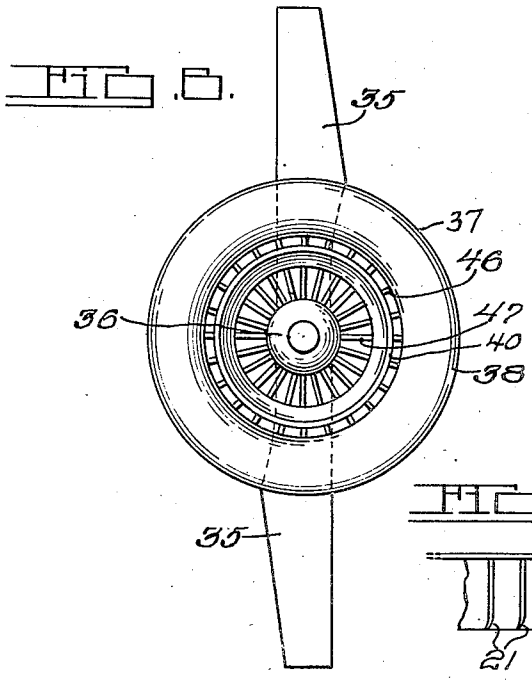

Fig. 6.

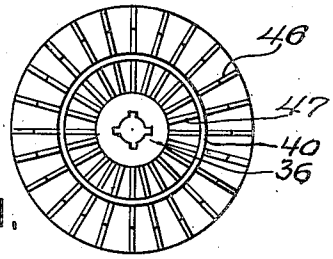

Fig. 8.

Fig. 9.

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Fig. 10.

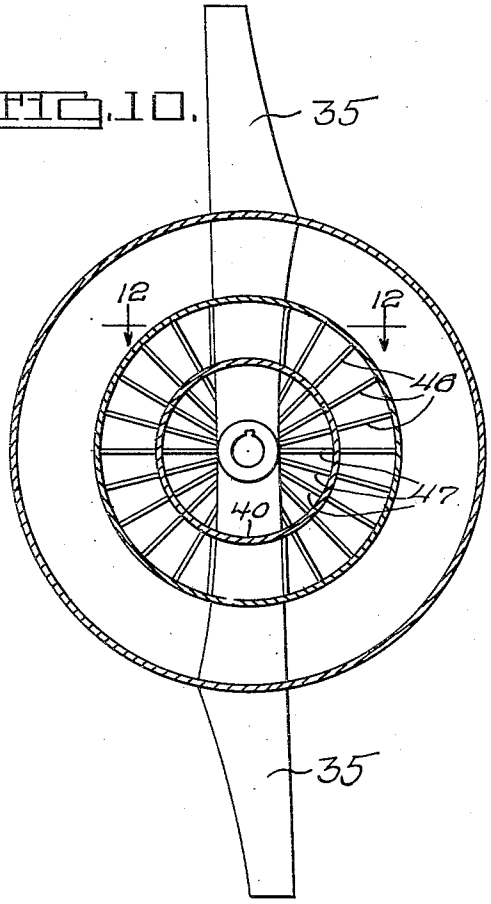
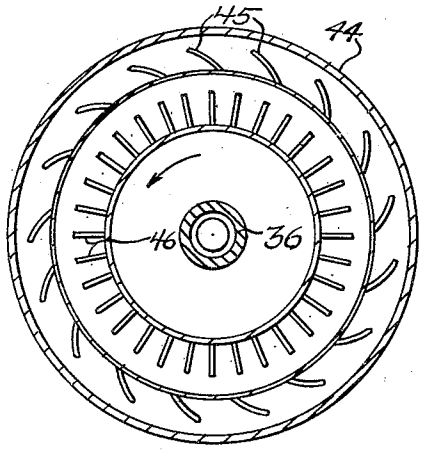


Fig. 11.



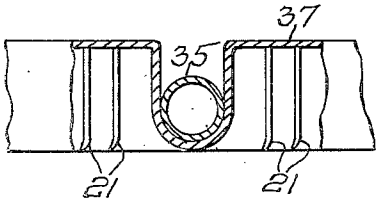


Fig. 12.

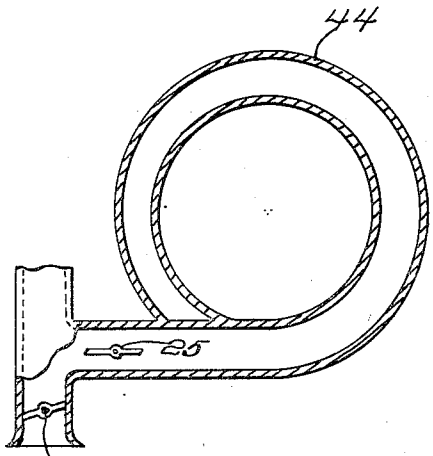


Fig. 13.

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Fig. 14.

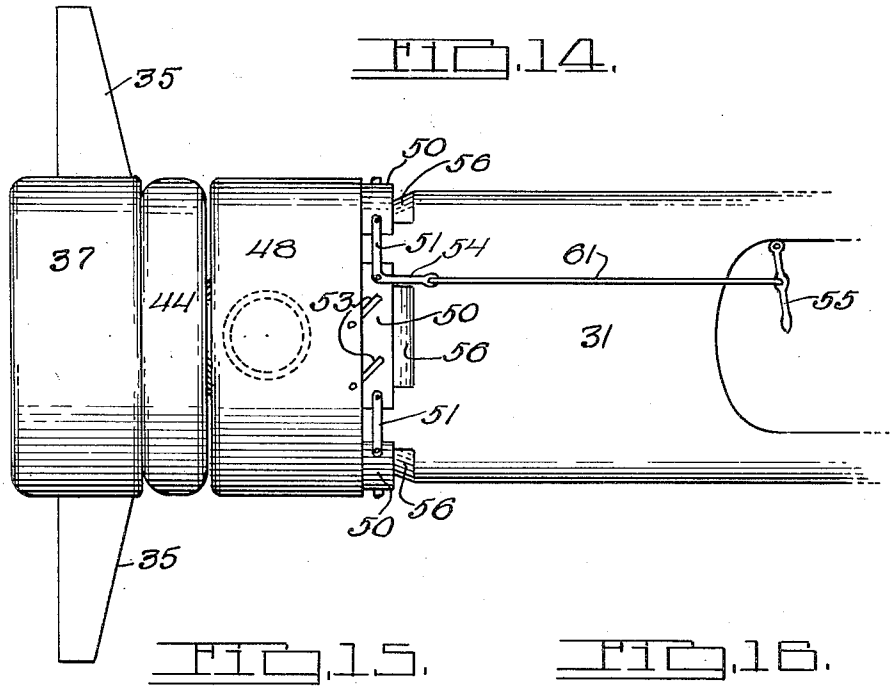


Fig. 15.

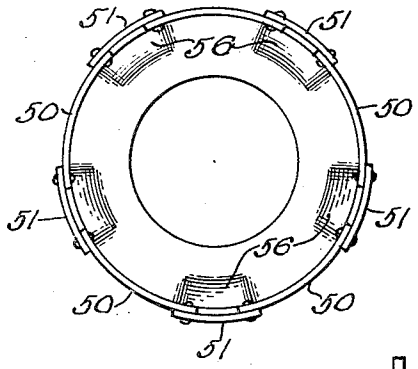
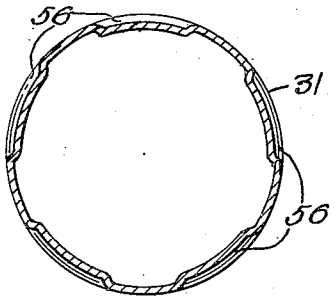


Fig. 16.



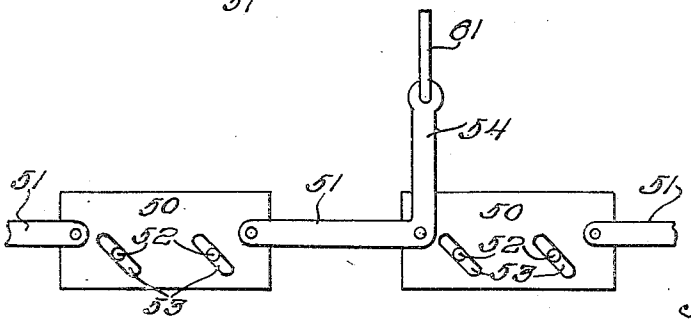


Fig. 17.

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UNITED STATES PATENT OFFICE

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AIRPLANE CONSTRUCTION

Application filed August 28, 1929. Serial No. 388,900.

This invention relates to airplanes, and particularly to a construction therefore that will result in a more efficient operation thereof.

Another object is the provision of a novel construction for the power unit section of an airplane designed to offer a minimum air resistance and maximum efficiency.

Another object is the provision of a centrifugal air fan rotatable with the propeller for cooling the cylinders of an airplane engine.

Another object is the provision of a means rotatable with the propeller of an airplane to utilize the air normally flowing through the central portion of the propeller to supercharge the engine driving the airplane.

Another object is the provision of means to control the cooling air passing the cylinders of an airplane engine.

Another object is the provision of means for increasing the cooling efficiency of a hooded air cooled airplane engine.

Another object is to provide certain novel features of construction that will be specifically pointed out or will be obvious in the following specification.

The above being among the objects of the present invention, the same consists in certain novel features of construction and combinations of parts to be hereinafter described with reference to the accompanying drawings, and then claimed, having the above and other objects in view.

In the accompanying drawings which show a suitable embodiment of the present invention, and in which like numerals refer to like parts throughout the several different views.

Fig. 1 shows a more or less diagrammatic fragmentary vertical sectional view taken through the front end of an airplane fuselage and showing the engine and propelling means mounted thereon.

Fig. 2 is a front view of Fig. 1 as on the line 2—2 of Fig. 1.

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is a front view of the impeller blades.

Fig. 5 is a view similar to Fig. 1 showing another form of construction.

Fig. 6 is a front view of Fig. 5.

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 5.

Fig. 8 is a front view showing the fan and impeller blades taken as on line 8—8 of Fig. 5.

Fig. 9 is a fragmentary plan view of Fig. 8.

Fig. 10 is an enlarged sectional view taken on line 10—10 of Fig. 5.

Fig. 11 is an enlarged sectional view taken on line 11—11 of Fig. 5.

Fig. 12 is an enlarged fragmentary view taken on line 12—12 of Fig. 10.

Fig. 13 is a sectional view of the compressed air receiving chamber.

Fig. 14 is a side elevation showing the cooling air control.

Fig. 15 is a sectional view taken on line 15—15 of Fig. 5.

Fig. 16 is a sectional view taken on the line 16—16 of Fig. 5.

Fig. 17 shows an enlarged fragmentary view of the cooling air control.

In the conventional design of airplanes of the tractor type, the engine is mounted at the front end of the fuselage and drives a propeller positioned forwardly thereof. Some of these engines are partially hooded to reduce the resistance offered by the same through their passage through the air. In all cases, as far as I am aware, no means except the conventional and relatively small spinner is provided at the center of the propeller. The result is that a portion of the air having a relative flow toward the propeller, and through which the central portion of the propeller moves, is lost as far as propulsive efforts of the same is concerned. Furthermore, due to the shape of the forward end of the fuselage, the bulk of the air having a relative flow toward the propeller is moving outwardly with respect to the axis of the propeller at the time it is engaged by the propeller blades, and this results in less efficient action of the propeller than would be possible were the air flowing toward it in a substantially parallel direction with respect to its axis. Furthermore, when such motors are hooded to lessen their air resistance, the cooling efficiency of the motor is invariably reduced, thus resulting in an unsatisfactory condition. By the employ-

ment of the present invention, I am enabled to provide a construction in which a minimum air resistance is offered at the forward end of the fuselage, in which the propeller is permitted to work at its greatest efficiency, in which the carburetor is automatically supercharged, and in which the engine may be completely hooded to eliminate its resistance to the air without interfering with its cooling efficiency.

As illustrative of the present invention, I have shown in the drawings, and particularly in Fig. 1, the front end of a fuselage 10 preferably of circular section and of maximum diameter at its forward end and curved as at 11 into the front wall 12 to form a projectile-like shoulder designed to offer a minimum resistance to air passing over it. An engine 13 of the radial air-cooled type is shown mounted on the forward wall of the fuselage 10. A propeller having blades 14 and a hub 15 is secured to the crank shaft 16 of the engine so as to rotate with it. An annular ring-like member 17 having a cylindrical outer surface of substantially the same diameter as the fuselage, and provided with a projectile-like shoulder 18, is secured to and rotates with the propeller. Secured integral with the hub 15 is a rearwardly and outwardly flaring flange 19 which cooperates with the ring member 17 to secure a venturi effect in the curved passage 20 between the ring member 17 and the flange 19. Secured integral with the flange 19 and positioned in the passage 20 are impeller blades 22. The forward end of these blades are preferably curved as at 21 to better scoop in the air. At the upper end of the passage 20 a stationary annular compression chamber 23 preferably of sheet metal with helically disposed deflecting baffles 24, arranged in the same manner as baffle 45 as shown in Fig. 11, is positioned to receive the air from the impeller blades 22. The compression chamber 23 is connected to the carburetor 30 and provides a means to supercharge the engine. The baffles 24 tend to direct the air going into the compression chamber 23 in such a manner as to keep the air in the compression chamber and aid in building up the pressure therein.

Throttles 25 and 26, as shown in Fig. 13, are used to switch from straight induction to supercharge, and vice versa. These throttles may be separately or inter-controlled.

A cup-shaped hood member 27 of slightly greater diameter than the chamber 23 extends over the chamber 23 in advance of the motor 13, and the bottom of the member 27 is formed to provide a plurality of baffles 28 extending inwardly toward the axis of the engine 13 and positioned between each pair of cylinders 29 of the engine. Each of these baffles 28 is shaped as viewed from the front of the engine and indicated in Fig. 3, so as to block the bulk of the space between the adjacent cylinders 29.

In this construction, the air to supercharge the carburetor is compressed in the chamber 23 by the impeller blades 22 and the air to cool the motor passes under the hood 27 and against the cylinders upon the forward motion of the plane. The air to supercharge the engine is taken from the central portion of the propeller by the impeller blades 22 rotating with the propeller. The forward motion of the plane also aids the impeller blades in forcing air into the receiving chamber 23. The ring member 17 is so designed as to cause that air in the central portion of the propeller that does not go through the impeller blades 22, to pass around it, so that the air passes the outer portion of the blades 14 substantially parallel to the axis of the propeller in the manner desired, and displacing such air to a position where the propeller blades may efficiently act upon it. The cup member 27 behind the propeller blades catches the air and forces it against the cylinders 29 of the engine as directed by the baffles 28.

To further carry out the idea of the present invention, I have shown in Fig. 5 a device similar to that shown in Fig. 1, except for certain modifications. The similar features of this modification include the fuselage 31, engine 34, a propeller with blades 35 and hub 36, a ring-like member 37 with a projectile-like shoulder 38, and a receiving chamber 44 with helically disposed baffles 45, also shown in Fig. 11. The front end of the fuselage is preferably forwardly tapered as at 32 into the front wall 33 so as to give the least resistance to the flow of air. Secured integral with the hub 36 is a rearwardly and outwardly flaring cone-like flange 39. Adjacent and substantially parallel to the flange 39 is a concentric annular curved baffle 40 positioned between the ring-like member 37 and the flange 39, and is integrally secured with the flange 39 by fan blades 47. The passage 42 which is formed between the annular curved baffle 40 and the flange 39 receives the air for cooling the engine 34. In the passageway 43 formed between the curved baffle 40 and the ring-like member 37, impeller blades 46 are provided on the baffle 40 to force the air flowing into the passageway 43 rearwardly and outwardly into the chamber 44 in the same manner as the device previously described, in order to provide a supercharger for the engine. Substantially all the air passing through the passage 42 is directed to the cylinders of the engine and is utilized in cooling of the same. The impeller blades 46 and the fan blades 47 rotate with the propeller, and therefore always keep the engine cylinders cooled and supplies sufficient air under pressure to the carburetor of the engine.

A hood 48 covering the engine 34 is bent

inwardly in advance of the engine. A plurality of baffles 58 carried by the hood 48 extend inwardly towards the axis of the engine 34 and are positioned between each pair of cylinders 59. Each of the baffles 58 is shaped as viewed from the front of the engine, as indicated in Fig. 7, so as to block the bulk of the space between the adjacent cylinders 49 and thus direct the air flowing from the cooling fan directly against the engine cylinders. Arcuate strips 50 secured together circumferentially by the strips 51 are secured to the hood 48 by pins 52 which slidably engage angular elongated slots 53 in the strips 50. A lever 54 operated by the handle 55 positioned convenient to and controlled by the pilot is pivotally connected to one of the strips 50 through a rod such as 61. Movement of the handle 55 thus causes the strips 50 to move in a circular direction and causes them to move toward or away from the fuselage either to cover or uncover openings 56 on the circumference of the fuselage to control the volume of cooling air flowing around the cylinders of the motor.

It will be noted that with this construction the maximum cross sectional area of the fuselage portion of the airplane, and therefore the point of maximum air resistance, is preferably present at a point in advance of the propeller, and that portion thereof in advance of the propeller is designed to offer a minimum resistance to its passage through the air. The central portion of the propeller which, because of its relatively low velocity, its comparatively small area and inefficient shape due to structural limitations, is of little value in its propulsive efforts, is eliminated as far as propulsive efforts are concerned, and part of the air which would otherwise be lost to this portion of the propeller is utilized in the provision of a supercharger for the engine and in cooling air for the engine. The hood 48 is so designed as to cause that portion of the air passing over it to flow parallel to the axis of the propeller, which is the result desired. The air which is drawn into the interior of the hood 48 through the passage 42, and which may represent a relatively small portion of the air flow against the front of the fuselage, is directed in its passage directly against the cylinders 59 by the baffles 58, thus insuring against an escape of an appreciable volume of air between the cylinders without acting to cool the cylinders, and then escapes through the openings provided. The air passing through the passage 43 is compressed in the compression chamber 44 to provide compressed air for the carburetor, which tends to increase the efficiency of the engine 34, particularly at high altitudes. The result is that with this construction a much higher efficiency is obtained in flight than is possible in any of the constructions that have heretofore been provided.

While the drawings show fixed propeller blades, the design does not preclude the use of adjustable pitch blades as is usual when superchargers are used on aircraft, and I claim this design applicable to both.

It is obvious that although the above description has been limited to the application of the invention to the forward end of the fuselage, the construction is equally applicable for use in connection with nacelles.

While I have described the fuselage as being preferably of circular section and of maximum dimensions at the forward end thereof, it will be apparent that these limitations are not essential in the broader aspects of my invention, but may be varied without departing from the teachings of the present invention, and these and other formal changes may be made in the specific embodiment of the present invention without departing from the spirit or substance of the broad invention, the scope of which is commensurate with the appended claims.

What I claim is:

1. In an aircraft, in combination, a fuselage, a motor carried thereby, a propeller driven by said motor, a hood around the central portion of said propeller and rotatable therewith, means rotating directly with said propeller co-operating with said hood for compressing air, and means for collecting and delivering said compressed air to said motor.

2. In an aircraft, in combination, a fuselage, a motor carried thereby, a carburetor for said motor, a propeller driven by said motor, a streamlined hood around the central portion of said propeller and rotatable therewith, means rotatable with said propeller within said hood for compressing air, a receiver for said compressed air, and means for delivering said compressed air to said carburetor.

3. In an aircraft, in combination, a fuselage, a motor carried thereby, a carburetor for said motor, a propeller driven by said motor, a hood around the central portion of said propeller and rotatable therewith, means rotating with said propeller and co-operating with said hood for compressing air, means for collecting and delivering said compressed air to said motor, and means co-operating with said hood for cooling the motor.

4. In an aircraft, in combination, a fuselage, a motor carried thereby, a carburetor attached to said motor, a propeller driven by said motor, a hood around the central portion of said propeller, impeller blades rotating with said propeller and co-operating with said hood for compressing air, and means for collecting and delivering said compressed air to said carburetor.

5. In an aircraft, in combination, a fuselage, a propeller in advance of said fuselage, a motor for driving said propeller, deflect-

ing means of substantially the same diameter as said fuselage co-operating with said propeller limiting the effective blade area thereof to a portion positioned radially outwardly of said deflecting means, means co-operating with said deflecting means for compressing air, and means for delivering said compressed air to said motor.

6. In an aircraft, in combination, a fuselage, a propeller in advance of said fuselage, a motor for driving said propeller, deflecting means of substantially the same diameter as said fuselage co-operating with said propeller limiting the effective blade area thereof to a portion positioned radially outwardly of said deflecting means, impeller blades within said deflecting means and rotating therewith for compressing air, and means for delivering said compressed air to said motor.

7. In an aircraft, in combination, a fuselage, a motor carried thereby, a propeller driven by said motor, deflecting means concentric with and carried by said propeller limiting the effective blade area thereof to that portion positioned radially outwardly of said deflecting means, and air displacing blades within said deflecting means and rotating therewith for forcing cooling air to said motor and for compressing air, a receiver for receiving said compressed air, and means for delivering said compressed air to said motor.

8. In an aircraft, in combination, a fuselage, a motor carried in advance thereof, a propeller driven by said motor, a streamlined hood around the central portion of said propeller, impeller blades around the central portion of said propeller rotating therewith and co-operating with said hood to force air having a relative flow towards said hood to said motor to cool said motor and for compressing a part of said air, an annular receiver for receiving said compressed air, and means connecting said receiver and said motor for delivering said compressed air to the motor.

9. In an aircraft, in combination a fuselage, an engine carried at the forward end thereof, a propeller driven by said motor, a streamlined hood around the central portion of said propeller, impeller blades arranged centrally of said propeller co-operating with said hood and rotating with said propeller for forcing cooling air to said engine, a hood over said engine, and means for controlling the volume of said cooling air passing through said hood around said engine.

10. In an aircraft, in combination, a fuselage an engine carried at the forward end thereof, a propeller driven by said engine, a streamlined hood around the central portion of said propeller, impeller blades arranged centrally of said propeller within said hood and rotating with said propeller for forcing cooling air to said engine, a hood over said engine, and means for controlling the volume of said cooling air passing through said hood around said engine comprising a shutter mechanism co-operating between said fuselage and said hood, and a hand lever to control said shutter mechanism.

11. In an aircraft, in combination, a fuselage, an engine supported at the forward end thereof a propeller forward of said engine, a hood encircling the central portion of said propeller, said hood being provided with a projectile-like shoulder and rotating with said propeller, means rotatable with said propeller for compressing air flowing into said hood, means for collecting said compressed air, and means for delivering said compressed air to said motor.

12. In an aircraft, in combination, a fuselage, an engine supported at the forward end thereof, a propeller forward of said engine, a hood encircling said engine a second hood encircling the central portion of said propeller, said second hood having a projectile-like shoulder and being rotatable with said propeller, impeller blades rotatable with said propeller co-operating with said second hood causing air to be forced into the first mentioned hood about the motor, and a shutter mechanism attached to said first hood and co-operating with the forward end of said fuselage for controlling the escape of said air from said first mentioned hood.

13. In an airplane, in combination, an engine, a propeller in advance of said engine driven thereby, an annular hood concentric with and enclosing the central portion of said propeller, a pair of concentric fan elements interposed between said hood and the hub of said propeller positioned to act upon air having a relative flow into said hood, and means for delivering the air acted upon by one of said elements to the fuel induction system of said engine.

14. In an airplane in combination, an air-cooled engine, a propeller in advance of said engine driven thereby, an annular hood concentric with and enclosing the central portion of said propeller, a pair of concentric fan elements interposed between said hood and the hub of said propeller positioned to act upon air having a relative flow into said hood, and means for delivering the air acted upon by one of said elements against the cylinders of said engine.

15. In an airplane, in combination, an air-cooled engine, a propeller in advance of said engine driven thereby, an annular hood concentric with and enclosing the central portion of said propeller, a pair of concentric fan elements interposed between said hood and the hub of said propeller positioned to act upon air having a relative flow into said hood means for delivering the air acted upon by one of said elements to the fuel

induction system of said engine, and means for delivering the air acted upon by the other of said elements against the cylinders of said engine.

16. In an aircraft, in combination, a fuselage, an engine carried thereby, a propeller driven by said engine, and means comprising fan blades rotating with said propeller and acting upon such air as has a relative flow toward the center of the propeller for dividing the flow into two separate streams, one for supercharging said engine and one for forcing cooling air about said engine.

17. In an aircraft, in combination, a fuselage, an engine carried thereby, a propeller driven by said engine, an air collecting chamber concentric with said propeller and of approximately the same diameter as said fuselage, and means rotating with said propeller for centrifugally propelling air approaching the center of the propeller and delivering this air to said collecting chamber which operates as a supercharger for said engine.

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