R. M. THOMPSON.

AIRPLANE.

APPLICATION FILED OCT. 23, 1918.

1,389,797.

Patented Sept. 6, 1921.

5 SHEETS—SHEET 1.

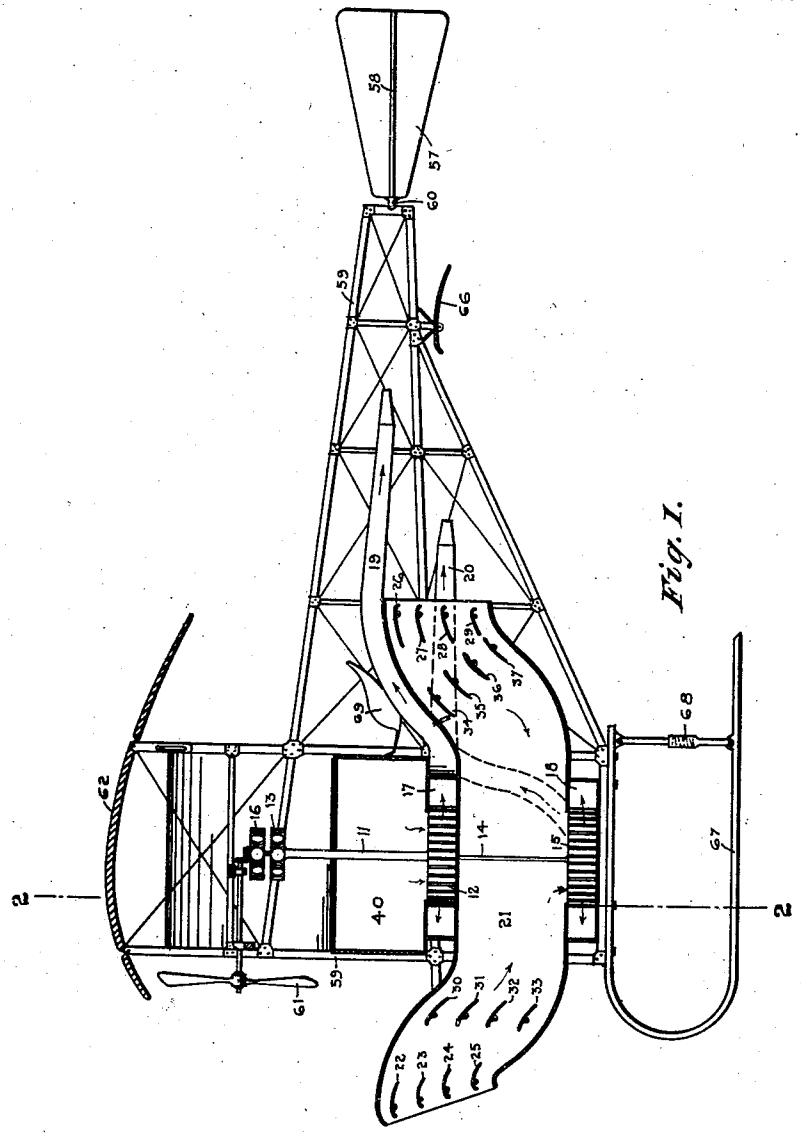


Fig. 1.

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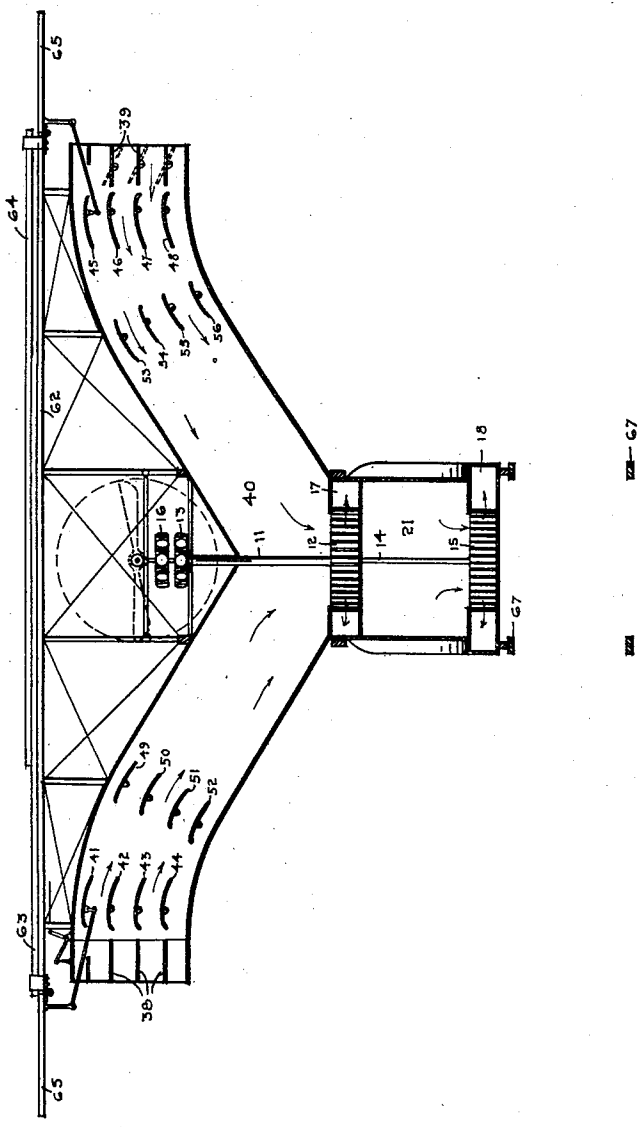


Fig. 2.

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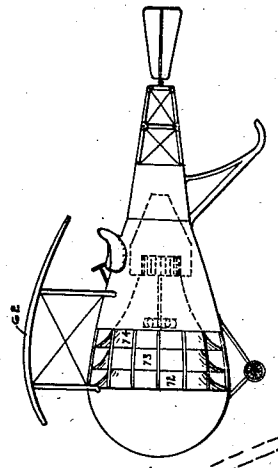


Fig. 4.

Fig. 5.

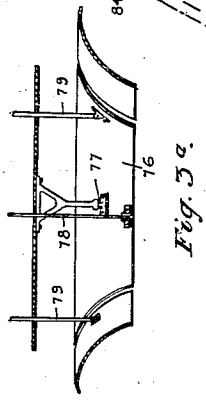


Fig. 3a.

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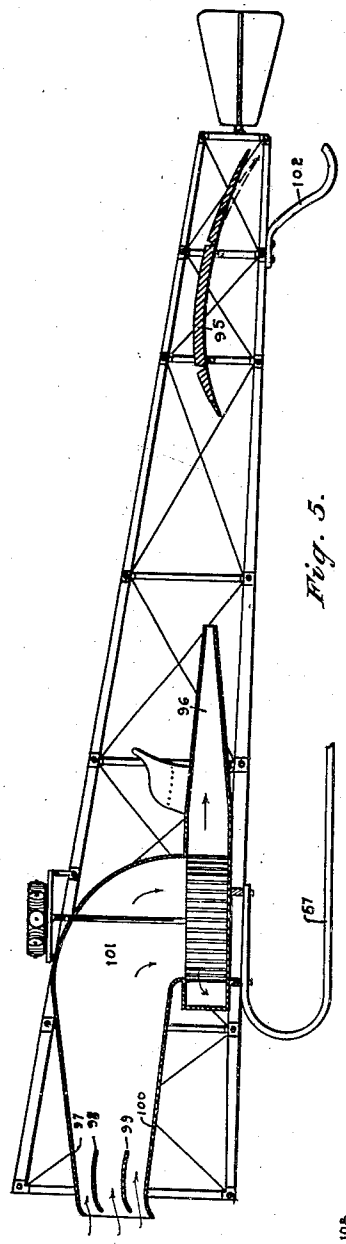


Fig. 5.

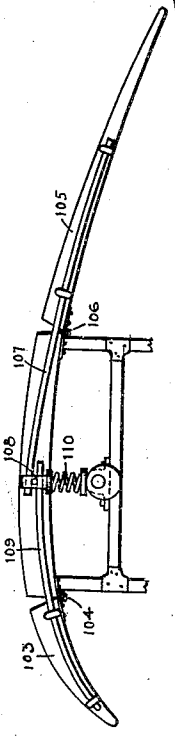


Fig. 6.

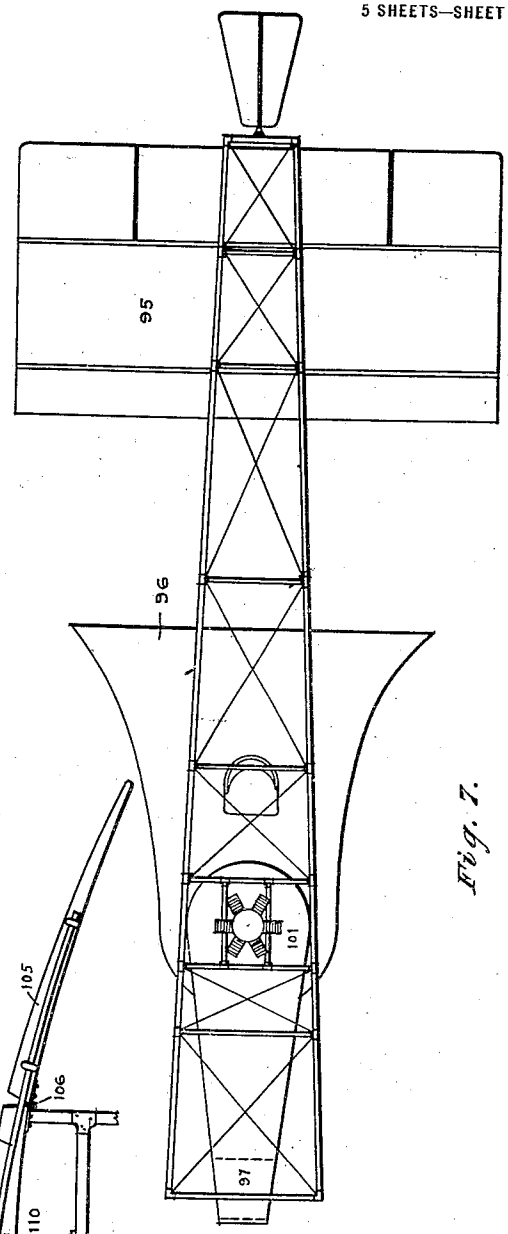


Fig. 7.

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5 SHEETS—SHEET 5.

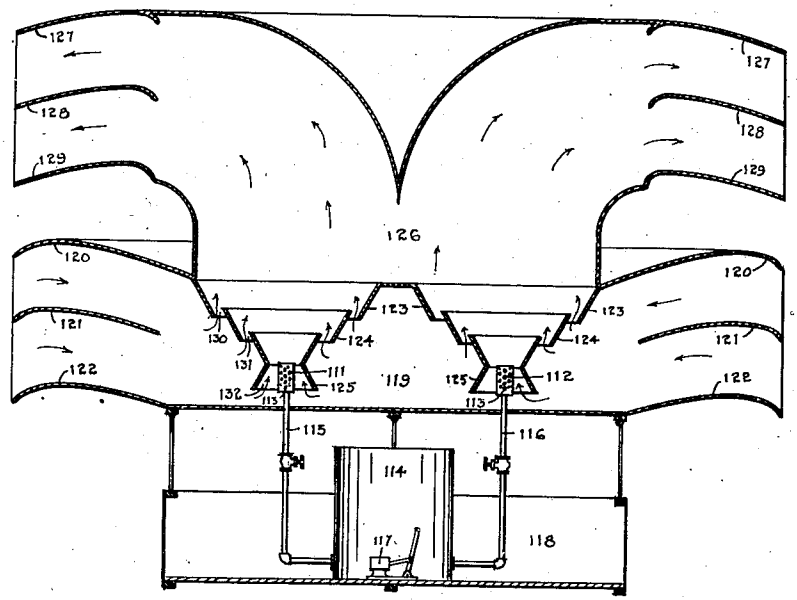


Fig. 8.

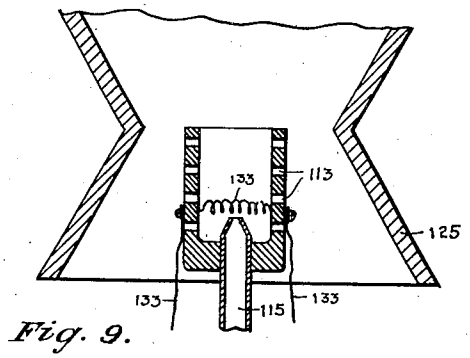


Fig. 9.

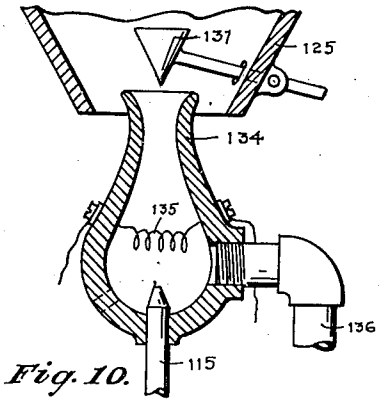


Fig. 10.

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UNITED STATES PATENT OFFICE.

ROBERT M. THOMPSON, OF TACOMA, WASHINGTON.

AIRPLANE.

1,389,797. Specification of Letters Patent. Patented Sept. 6, 1921.

Application filed October 23, 1918. Serial No. 259,391.

To all whom it may concern:

Be it known that I, ROBERT M. THOMPSON, a citizen of the United States, residing at Tacoma, in the county of Pierce and State of Washington, have invented a certain new and useful Improvement in Airplanes, of which the following is a specification.

My invention relates to improvements in airplanes.

In heavier than air machines, as is well known, the sustaining force is the upwarding re-acting pressure on the planes created by the relative movement of the air past the surfaces of the planes. This relative movement of the air past the surface of the planes is obtained in one type of heavier than air machine, the airplane, by rapidly impelling the machine against the air, while in the other type, the box kite for example, by the air passing through the machine. My improved airplane is of the latter type, that is, the sustaining force is derived principally by causing the air to react forcibly against the lifting planes disposed about the axis of the machine so that the forces acting upon the planes are balanced.

One of the great objections to the present airplane is its inability to maintain itself in stationary position relative the surface of the earth and incidental thereto is the inability to start or stop without being at a high speed over the ground immediately preceding either the flight, or coming to rest. The obvious reason for this objection is that so soon as the machine ceases to travel through the air at a velocity sufficient to overcome the weight of the machine, it must fall. Even this minimum speed or velocity is so great that it is most difficult to attain even a fair degree of accuracy in the dropping of projectiles.

The purpose of my invention is to provide a machine capable of rising into the air directly from the ground or alighting directly upon the ground, without having such rising or alighting preceded by movement over the ground; said machine being capable of rising vertically, or at any desired angle, and a machine which is capable of remaining stationary over the earth at any desired elevation.

Other primary objects of my invention are to provide a machine which derives its motion horizontally and vertically from the forces developed by the movement of air through the machine, a machine which can move horizontally at any desired speed from no velocity to the maximum possible to the particular machine, a machine which is capable of being tilted or balanced by the impinging or reaction of forced air against controlling means, said forced air being so utilized as to secure a cushion or bearing upon the relatively quiet surrounding air, a machine which requires much less motive power to maintain itself in the air, and a machine which has one or more air fans or has a means to highly heat the air or other means so as to force air against lifting planes,—"to force" meaning by drawing in or expulsion; also a machine of such a design as to permit the use of exceptionally high velocity air currents, thus securing the benefits of the multiplying effects of increased velocities and the use of correspondingly decreased size of sustaining and propelling surfaces; and also a machine built on perfect stream line design thus reducing the power requirement and increasing the speed of the machine.

The above objects of my invention together with others inhering in the same, are attained by the machines illustrated in the accompanying drawings, the same being merely preferred exemplary forms of embodiment of my invention, chosen for purposes of illustration, throughout which drawings like reference numerals designate like parts:

Figure 1, is a view in vertical longitudinal section of a machine embodying my invention;

Fig. 2, is a view in vertical transverse section on line 2—2 of Fig. 1;

Fig. 3, is a modified form of a machine of circular or pear shape design embodying my invention;

Fig. 3ª, is a modified form of control;

Fig. 4, is a view of another modified form of airplane embodying my invention;

Fig. 5, is a modified form wherein the lifting planes are balanced by a plane disposed to receive the discharged air;

Fig. 6, is a view of a modified form of plane wherein the camber may be adjusted;

Fig. 7, is a top plan view of form shown in Fig. 5;

Fig. 8, is a cross-sectional view of an airplane embodying my invention, wherein the air current is produced by siphon jets arranged in multiple system;

Fig. 9, is a view of a heating nozzle wherein the air for combustion purposes is supplied under atmospheric pressure; and

Fig. 10, is a view of a modified form of heating nozzle wherein the air for combustion purposes is supplied under pressure.

Upon a shaft 11, an air fan 12, operated by engine 13 is mounted, and upon a shaft 14 a second air fan 15, operated by engine 16 is mounted. These fans 12 and 15 are in chambers 17 and 18, having a common double outlet in the discharge pipes 19 and 20. Extending longitudinally of the machine is the air tunnel 21 whose inlets are provided with lifting planes 22, 23, 24 and 25, and 26, 27, 28 and 29. Also preferably auxiliary lifting planes 30, 31, 32 and 33, and 34, 35, 36 and 37 are provided. All these planes are in step formation. The vanes 38 and 39 are provided in front of the lifting planes to guide the air in entering the tunnel and may be adjustable to regulate the effectiveness of the air current. At right angles to the air tunnel 21 is the air tunnel 40, similar to tunnel 21 and similarly provided with lifting planes 41, 42, 43 and 44, and 45, 46, 47 and 48, disposed on opposite sides to balance as well as with the auxiliary planes 49, 50, 51 and 52, and 53, 54, 55 and 56.

A rudder or controlling means with vertical plane 57 and horizontal plane 58 is connected to a suitable frame 59 by means of a universal joint 60. The propeller 61 is connected to the motive power and may be run either independently of or in conjunction with said fans.

A volplane plane 62, having extensions 63 and 64, is provided to insure a safe landing in the event of injury to the motive power. The aileron portions 65 are made to operate in conjunction with the same controlling means which operate planes 41 and 45, so that when volplaning and it is desirable to adjust said portions of the plane, same may be done by the same lever which controls the said lifting planes when employed for controlling purposes.

An auxiliary lifting plane 66 is provided on the rear part of the frame 59. Runners 67, with a shock absorber 68, are provided under the machine for alighting and are a supporting mechanism for the machine as it rests upon the ground. At 69 the operator's station is located.

In Fig. 3, a modified circular or pear-shaped form of airplane is shown, designed to have stream lines in order to overcome the deleterious effect of eddying currents. Within a body frame composed of horizontal hoop-like ribs 70 and vertically extending bars 71, are secured washer-shaped, aero-curved planes 72, 73 and 74, against which air may be forcibly drawn from all sides by fans 12 and 15, superimposed. Fan 15 in this design is preferably caused to revolve faster than fan 12. This positioning of the fans serves to increase the vacuum produced. A cylindrical gate divided into a plurality of sections 75, serves as a controlling mechanism for all controls—balancing, propulsion, steering and lifting. For example, when the gate is lowered it cuts off the air impinging upon that part of the plane and by so much lessens the force exerted upon that portion of the airplane and thus affects the control.

In Fig. 3ª, a modified form of control for said pear-shaped design of airplane is illustrated, consisting of sections 76 of the washer-shaped, aero-curved plane, mounted on a universal joint 77, with means 78 to tilt the section to the horizontal and means 79 to change the position of the section with respect to the vertical axis of the washer-like planes—thus overcoming rotative forces.

The top 80 is provided with port holes 81 and may constitute a parachute for the safe landing of passengers in the event of accident to the motive power.

Jointed supports or legs 82 to alight upon and for maintaining the machine in upright position while on the earth, are provided with shock absorbers 83 and are pivotally connected at 84. These may be folded up while in flight in recesses in the body of the airplane and may be forced outwardly by suitable controlling mechanism at the will of the operator.

As an auxiliary steering mechanism, a frame 85, provided with a rudder 86 of common design, similar in all respects to the rudder with planes 57 and 58 hereinabove set forth, excepting that rudder 86 is adapted by connection 87 to be moved so as to fall in the wake of the machine. As an auxiliary means to overcome lateral rotation, a plane 88 is fixed in front of the discharge 89, adapted by means of the spring 90 to be maintained in edgewise position in the current of air from the discharge, the innermost edge 91 being weighted or thick so as to drag back when rotation starts and so cause the air to impinge at an angle upon the face of the plane to counter-act the rotation force. Obviously the centrifugal force set up by the rotation of the machine would cause the innermost edge of the plane 88 to tend to fly out and thus I have shown as an example one method of utilizing this centrifugal force arising from the rotation to create counter-acting forces to stop said rotation.

Still another auxiliary control may be provided in the form of a plane 92 below the discharge or exhaust 93 pivotally mounted upon a ring 94, whereby the position of said plane may be changed and thereby the direction of exerted force be altered by suitable controls at the will of the operator and the degree of tilt of said plane can be changed by moving ring 94ª up or down.

Fig. 4, shows a modified form of the circular design wherein the planes 72, 73 and 74 serve as propelling means while plane 62 serves to supply the buoyant effect. The engine is here shown as being positioned directly in the air current which thus is made to cool the engine as well as supply the impelling force.

In Figs. 5 and 7 is another modified form in which the plane 95 positioned to receive the jetted air from the discharge 96 serves to balance the buoyant effect produced by the planes 97, 98, 99 and 100, situated in the special converging-from-fan-to-inlet form of tunnel 101. Runner 102 serves to support the rear of the machine. Manifestly, the converging of the tunnel serves to increase the velocity of the air impinging against the planes 97, 98, 99 and 100. And conversely, if it should become necessary to reduce the velocity of the air current as in case of using directly connected fans with very high velocity gas turbine engine the air tunnel would be made diverging.

In Fig. 6, a modified form of lifting plane is shown wherein the camber may be adjusted, said plane consists of the front plane 103, pivotally fixed at 104, the rear plane 105 being pivotally secured at 106. The rear plane 105 bears the extended bar 107 and said bar has a roller bearing 108, upon a similar bar 109, fixedly mounted upon plane 103. Spring 110 tends to urge the forward end portion of the plane 103 downwardly, and the rear end of plane 105 downward. Obviously, the faster the airplane is moving horizontally the greater the air pressure upwardly upon the plane 105. This pressure is transmitted through the bars 107 and 109, thereby overcoming the spring action and raising the front part of plane 103,—thus causing said plane to give less resistance to the horizontal movement of the machine, and also less buoyant force. This automatic adjustment may be made subject to control of the operator.

In Fig. 8, a novel method is illustrated of producing the air current. This consists in providing nozzles 111 and 112, through which fuel fluid may be supplied under pressure. Openings 113 admit air for combustion purposes, which thereby effects a rapid burning of said fuel which may be stored in air tight reservoir 114, and supplied to the nozzles through pipes 115 and 116. As a matter of precaution, each nozzle could be supplied from its own individual reservoir and have its own separate ignition. This fuel fluid is subject to air pressure produced by air pump 117. The pump and reservoir are located in the compartment 118. The said nozzles 111 and 112 are located in the air tunnel 119, the peripheral margin portion being supplied with aero-curved planes 120, 121 and 122. (The circular or pear-shaped form of airplane hereinabove described being selected to illustrate the novel method of producing the air current.) The jet casings 123, 124 and 125 are arranged as a multiple jet system opening directly and upwardly into tunnel 126, in the peripheral margin of which are located aero-curved planes 127, 128 and 129. Between said jet casings are openings 130, 131 and 132. Operator's station would be in compartment 118.

In Fig. 9, is represented a fuel supplying and atomizing nozzle—said fuel being set in combustion by an electrically charged wire 133.

In Fig. 10, is represented a fuel supplying and atomizing nozzle 134, said fuel being set in combustion by an electrically charged wire 135. Air under pressure is supplied by pipe 136. Adjustably attached to the jet casings 125 is the spreader 137, for the purpose of deflecting the burning gas.

The operation of my invention is as follows:

The fans 12 and 15 moving preferably in opposite directions so as to have the torsional effect developed by their motion balanced draw in air through their respective air tunnels 21 and 40, thus causing the air to be forcibly impinged against the lifting planes at the openings of the said tunnels. Obviously, the machine might be designed to have the moving forces developed by the forcing out of the air against the planes rather than a drawing in of the air against the planes. It is in this manner that the lifting force of the air currents on the lifting planes in the air tunnels disposed upon opposite sides of the machine balance each other and so perform the function of the kite string one to the other. The fact of drawing in the air would develop forces tending to move the machine in the direction from which said air is drawn, and this tendency I overcome in one form of my machine by providing sets of planes oppositely disposed. It should also be noted that there is a lifting effect produced on the top part of each of the lifting planes by virtue of the air rushing over the top of said plane inasmuch as the tendency is to produce a vacuum above the rear portions of said lifting plane. In the case of the circular or pear-shaped type air is drawn in around the entire circumference. The vanes 38 and 39 control the course of the entering air and insure the proper direction and distribution of the same in respect to the planes, and by being adjustable permit the control of the effectiveness of the passing air. Two styles of vane-control are illustrated in Fig. 2. Vanes 38 move up and down while vanes 39 are pivotally fixed and are made to turn within predetermined limits by suitable controlling mechanism.

After entering, the upward lifting force against the first planes, for example 22, 23, 24 and 25, in the inlets of the air tunnels, the air current is deflected downwardly where it strikes the auxiliary planes 30, 31, 32 and 33, set at the most efficacious angle. Since the air is being deflected downwardly by the planes, the fans are preferably located in the lower part of the tunnel and thus is avoided the downward thrust of the air current upon the bottom of the tunnel, which would tend to decrease the lifting force. Also a certain lifting effect is derived from the fan sucking in the air from above downward and if desired, in discharging part of the exhaust air in downward direction.

In having the fans operated by separate engines, danger from accident is reduced to a minimum, as either fan is calculated to be able to maintain the machine in the air, but as a further precaution, the plane 62 for volplaning purposes is provided. This plane is made in folding sections, in order to present as little resistance to the machine rising in the air as possible and yet being capable of being extended at will.

Relative to the control of the upward and downward movement of the machine, (Figs. 1 and 2), manifestly the upward forces of the air current may be controlled in different ways. Among these is first by the speed of the engine and second by altering the angle or camber of the lifting planes, or further by regulating the effectiveness of the air reacting upon the lifting planes, by means of the adjustable vanes 38 and 39.

These planes are preferably made adjustable in unison or in unison as respects any opposing pair of planes, so that when desired the planes are caused by suitable controlling mechanism to be turned so that the effective upward force is so adjusted that gravity and wind velocity is just overcome and the machine is caused to remain in stationary position over the earth.

To cause the machine to move horizontally, it is only necessary to cause the machine to pitch or tilt in the direction to be followed. To this end, the air ejected by the fans in whole or part is directed against the rudder or controlling mechanism, which by suitable controlling levers is actuated as desired.

It will be noted that the outlet of the pipe 19 is distanced from the rudder or controlling mechanism as is similarly pipe 20 with respect to the auxiliary plane 66. This construction provides for the jetted current a mixing or cushion effect or bearing upon the surrounding relatively non-moving air, to enable the said current of air to act effectively upon the rudder. With the machine thus tilted, the upward force of the air current acting upon the lifting planes is resolved into a horizontal component,—it being well known that a slight pitch from the vertical will greatly increase the horizontal component while only slightly decreasing the vertical force. To further assist in the horizontal movement, the propeller 61 may be operated, and as said propeller is not provided to produce a buoyant force it can be smaller than at present in the air planes as heretofore designed. A suitable clutch device may be used to connect the propeller to the fan motive power.

When the machine is tilted as above described, the volplaning plane should be adjusted so as not to oppose more than necessary the horizontal movement of the machine and to this end the plane 62 is pivoted at its foremost mounting and is provided with an adjustable mounting in the rear, which adjustment is subject to control by the operator.

Since a machine embodying my invention derives its buoyant force and balancing ability by reason of forcibly drawing air into the machine against the lifting planes, it can obviously rise from the ground or settle upon the ground without having the same preceded by horizontal movement over the ground. The runners 67 with the shock absorbers 68 serve as alighting mechanism, and further said runners serve in alighting where said alighting is preceded by horizontal movement over the ground as would be caused where it was necessary to volplane to earth.

The operation of the modified form of airplane shown in Fig. 8, wherein the air currents which impinge against the lifting planes are produced in the novel manner of causing fuel fluid under pressure to burn at the outlets of the nozzles 111 and 112, arranged in combination with a multiple siphon jet system. This conversion of the fuel fluid by combustion itself produces a great expansion of the gas and the heating of the air likewise produces a great expansion of said air, thereby producing convection currents, all of which, together with said expansion of the burning gas causes the same to be impelled upwardly at a great velocity. The air of this current being in a rarified condition draws in air at a great velocity through openings 130, 131 and 132, of the jet casings 123, 124 and 125, and thus produces an air current which upon entering the tunnel 126 is caused to impinge upon the planes 120, 121 and 122. The current of air is discharged against the planes 127, 128 and 129. By positioning the jets in pairs and so arranged as to discharge in opposite directions, a balanced condition of the reaction or negative work is obtained.

I claim:

1. An airplane embodying two air tunnels disposed at right angles to each other, the outermost openings of said tunnels being

supplied with lifting planes against which air may be forced, the direction of said forced air being by a common outlet intermediate said planes.

2. An airplane embodying an air tunnel whose inlet is provided with lifting planes and whose outlet is through an exhausting means, the cross-sectional area of said outlet being larger than said inlet whereby the velocity of said air current operating upon the planes is increased.

3. An airplane embodying air tunnels disposed at right angles to each other, the outermost openings of which tunnels are supplied with lifting planes against which air may be forced, the direction of said forced air being to a common outlet intermediate said planes, and said machine having a rudder disposed opposite said outlet which is distanced from said rudder whereby said air current is cushioned upon the surrounding air in producing its effect upon said rudder.

4. A heavier than air flying machine embodying a circular tunnel with its outlet radially directed, a plurality of siphon jets arranged in multiple system operatively connected with said tunnel, and a plurality of washer shaped aero-curved planes in said tunnel whereby fuel fluid in said jets may be caused to burn with an intense heat and thereby cause a large body of cooler air to pass as a current by said planes.

5. An airplane embodying oppositely disposed lifting planes against which air is forced, the direction of said forced air being to a point intermediate said planes, and adjustable vanes disposed in front of said planes whereby the course of the air impinging upon said planes may be controlled.

6. In combination with a heavier than air flying machine embodying a tunnel through which an air current may be passed, lifting members in said tunnel, and means to create said air current, a rotation retarding control embodying a plane disposed in edgewise position in the current from said tunnel, said plane having its innermost edge weighted whereby said edge is caused to drag when rotation commences and serves to maintain said plane normally in edgewise position.

7. In combination with a heavier than air flying machine embodying a tunnel through which an air current may be passed, lifting members in said tunnel, and means to create said air current, a rotation retarding control embodying a discharge outlet and means disposed to be actuated by the centrifugal forces created by the rotation tendency whereby counter-rotation forces are caused to be developed.

8. In combination with a heavier than air flying machine embodying a tunnel through which an air current may be passed, lifting members in said tunnel and means to create said air current, a steering control embodying a nozzle connected to the outlet of said tunnel, an elevator rudder member, and a frame work connected to said nozzle, and supporting said rudder at a spaced distance from the end of said nozzle whereby an air current from said nozzle can act upon said elevator rudder member.

9. In combination with a heavier than air flying machine embodying a tunnel through which an air current may be passed, lifting members in said tunnel and means to create said air current, a steering control embodying a nozzle connected to the outlet of said tunnel, and elevator rudder member supported at the end of said nozzle.

10. A heavier than air flying machine embodying a tunnel through which an air current may be passed, lifting members in said tunnel, and two independently operated fans one of which is adapted to be operated faster than the other, said fans being in multiple relationship whereby the greater speed of one coöperates with the other to create an air current of high velocity.

11. In combination with a heavier than air flying machine, embodying a tunnel through which an air current may be passed, lifting members in said tunnel and means to create said air current, a sectional valve means disposed in said tunnel whereby the quantity of air passing by any lifting member or part thereof may be controlled to effect balance of the machine.

12. A heavier than air flying machine embodying a tunnel through which an air current may be passed, lifting members disposed in said tunnel, longitudinal partitions dividing said tunnel into compartments, means to limit the amount of air passing through said compartments for the purpose of effecting the balance of said machine, said tunnel and lifting members being disposed about the longitudinal axis of the machine in balanced relation and means to produce said current.

In witness whereof, I hereunto subscribe my name this 14th day of Oct. A. D., 1918.

ROBERT M. THOMPSON.