S. D. MOTT.

HIGH ALTITUDE FLYING MACHINE.

APPLICATION FILED SEPT. 12, 1919.

1,380,406.

Patented June 7, 1921.

3 SHEETS—SHEET 1.

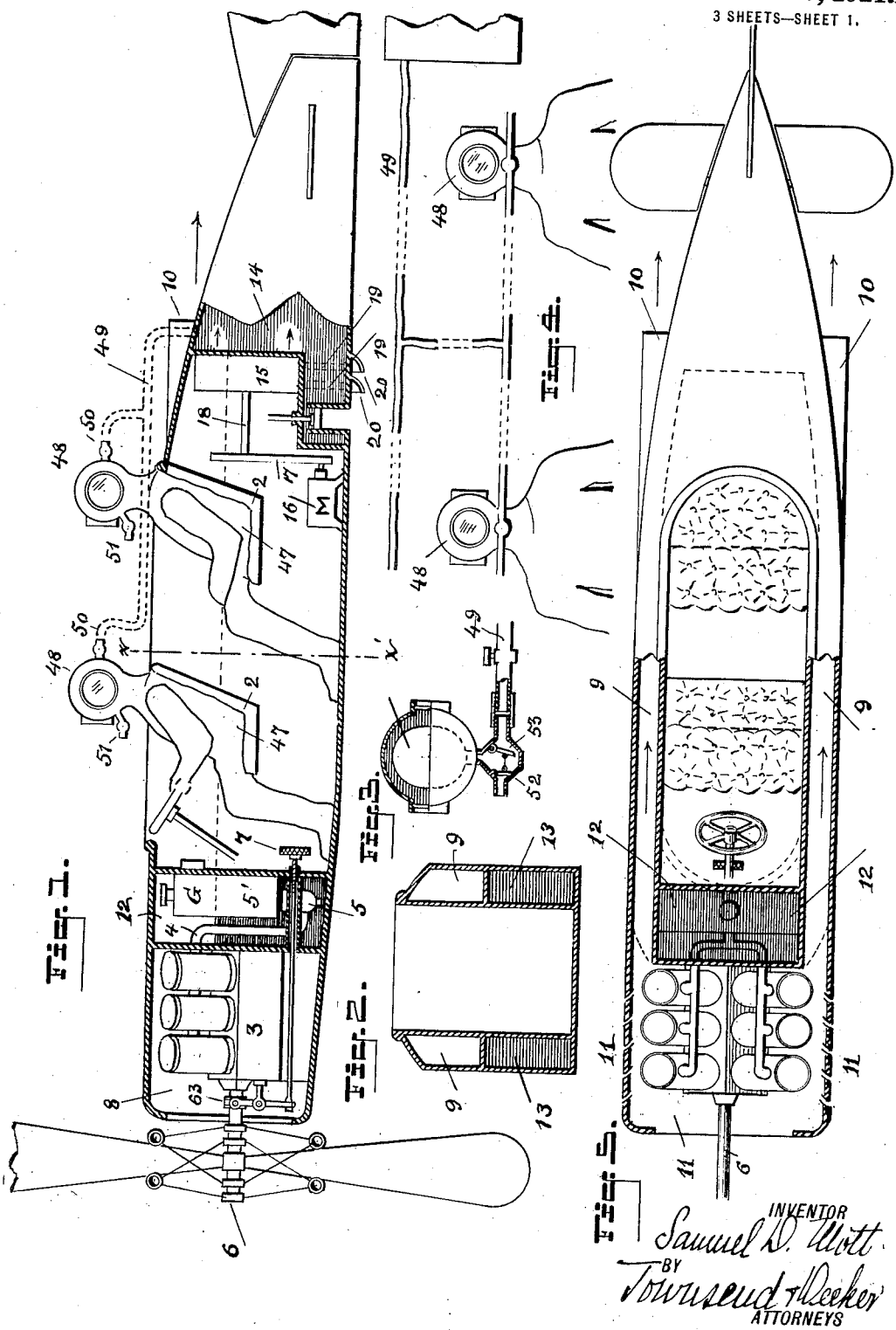


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

INVENTOR

Samuel D. Mott.

BY

Townsend & Decker

ATTORNEYS

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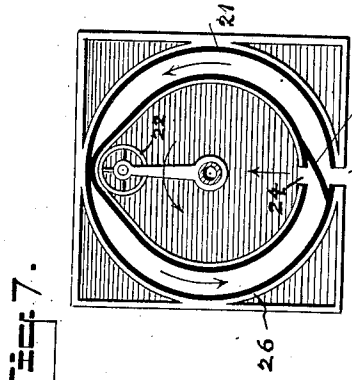


Fig. 7.

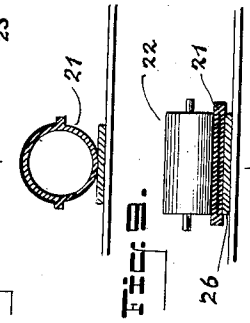


Fig. 8.

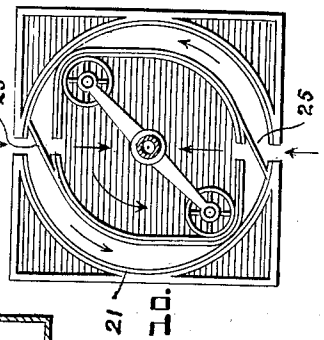


Fig. 10.

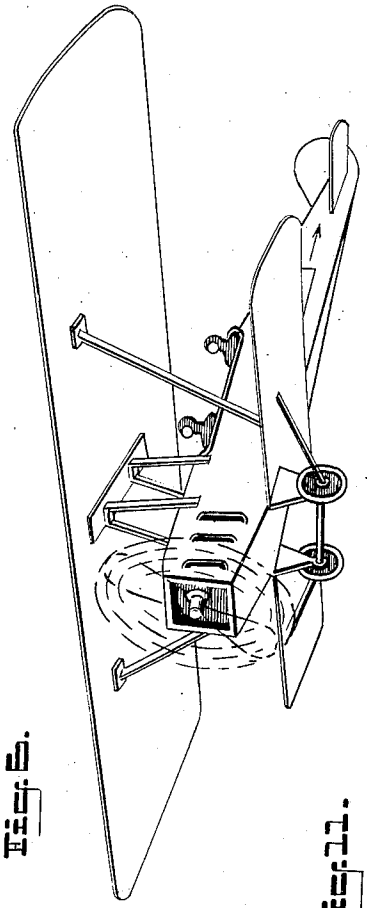


Fig. 6.

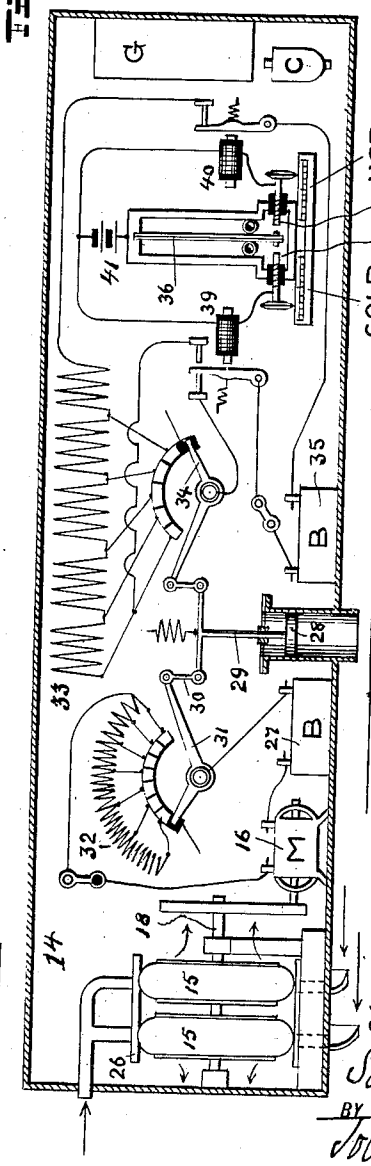


Fig. 11.

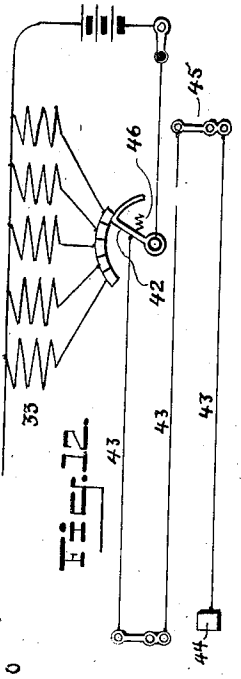


Fig. 12.

INVENTOR
Samuel D. Mott
BY
Townsend & Decker
ATTORNEYS

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3 SHEETS—SHEET 3.

Fig. 7.

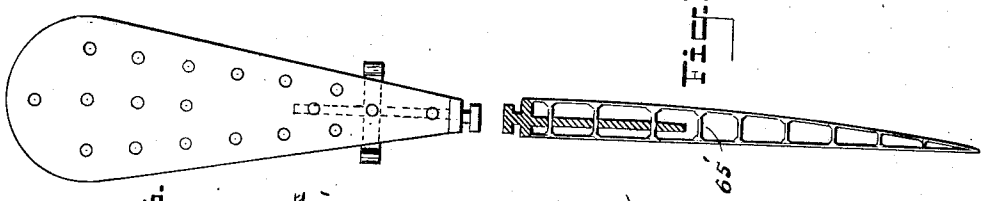


Fig. 6.

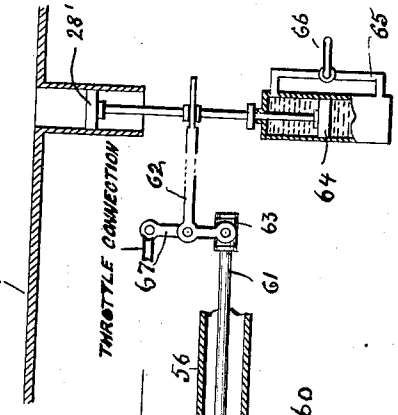


Fig. 8.

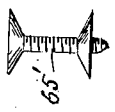


Fig. 5.

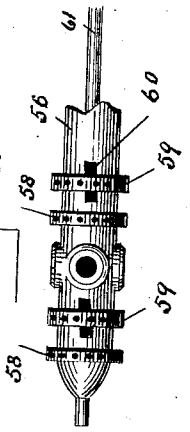
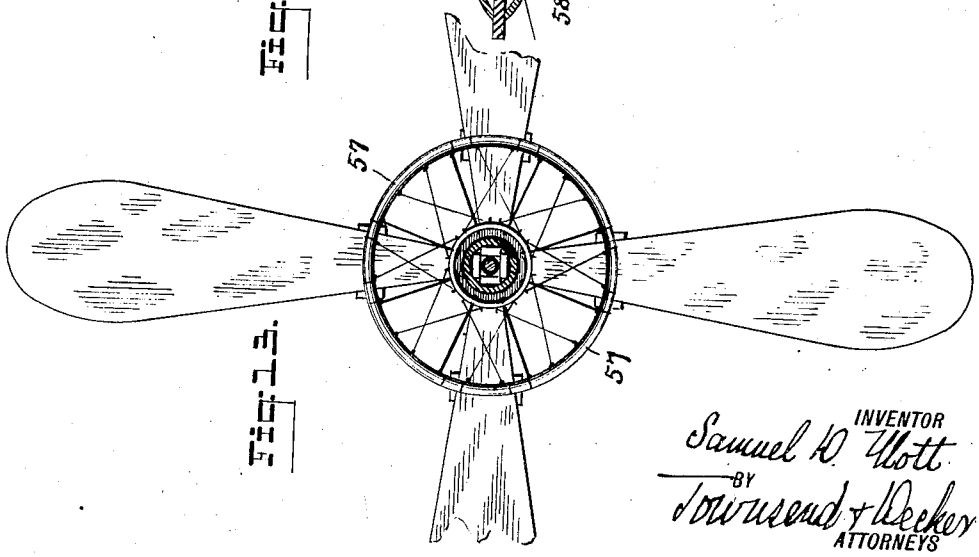


Fig. 4.

Fig. 3.



INVENTOR

Samuel D. Mott

BY

Townsend & Decker

ATTORNEYS

UNITED STATES PATENT OFFICE.

SAMUEL D. MOTT, OF PASSAIC, NEW JERSEY, ASSIGNOR OF ONE-HALF TO ARTHUR B. SULLIVAN, OF ALLENDALE, NEW JERSEY.

HIGH-ALTITUDE FLYING-MACHINE.

1,380,406. Specification of Letters Patent. Patented June 7, 1921.

Application filed September 12, 1919. Serial No. 323,324.

To all whom it may concern:

Be it known that I, SAMUEL D. MOTT, a citizen of the United States, and a resident of Passaic, in the county of Passaic and State of New Jersey, have invented certain new and useful Improvements in High-Altitude Flying-Machines, of which the following is a specification.

My invention relates to aircraft designed for use at high or largely varying altitudes.

The invention is particularly applicable to airplanes or heavier than air machines although it is also applicable to aircraft of lighter than air type.

My invention has particularly to do with means for preventing interference with normal operation of the driving engine by changes of air density or temperature of the air supplied to the engine as the altitude of the machine changes.

The invention also relates to means for maintaining the reaction between the propeller blades and the atmosphere as the density of the atmosphere decreases with increasing altitude, thus permitting the driving thrust to be maintained at high altitudes for increased speed of travel owing to the attendant decrease of atmospheric resistance and also to means for concurrently controlling the engine power by action on its throttle due to changing barometric conditions.

The invention further relates to means designed to enable the occupants to exist without danger or discomfort at high altitudes and without interfering with their freedom of movement in the rarefied air as would be the case if they were inclosed in a sealed compartment of the fuselage.

In carrying out the first part of my invention I employ a propeller constructed to permit its pitch to be changed by changing the obliquity of the plane of the blades to the plane of rotation and combine therewith suitable means responsive to changes of atmospheric density adapted, through intermediate mechanism, to change the pitch as the atmospheric density changes, so that the pitch and re-action of the blades upon the atmosphere may be accommodated to the decreasing density of the atmosphere with increase of altitude. By this means the lessened buoyancy of planes or wings in diminished density of the air is compensated by the higher speed attainable in higher altitudes.

Another part of my invention consists essentially in the combination with a sealed space or compartment of a blower or injector feeding air thereto and a motor operating independently of the aircraft engine and means automatically responsive to changes of atmospheric density for changing the speed of said motor whereby, as the machine rises and the density of the atmosphere decreases, the blower may feed, through its increase of speed, the normal amount of air to maintain a surface density in said sealed space or compartment.

Another part of my invention consists in means for maintaining an even temperature in a compartment of the aircraft which may be a compartment feeding air to the engine or a sealed compartment or space formed as a garment worn by the aviator and comprising essentially a heater for warming the sealed compartment or space of the aircraft and means automatically responsive to changes of atmospheric density for regulating the action of the heater.

The invention further consists of a sealed air-tight garment and headpiece adapted to be worn by the aviator and combined with an air supply device and means responsive to changes of density of the atmosphere for regulating the action of said air supply device so as to maintain normal density of air within said garment and headpiece.

The invention further consists in details of construction and combinations of devices more particularly hereinafter described and then specified in the claims.

In the accompanying drawings:

Figure 1 is a partial longitudinal section of an aeroplane equipped with apparatus embodying my invention.

Fig. 2 is a cross-section of Fig. 1 on the line x—x'.

Fig. 3 is a partial section through the headpiece for the aviator's use and the connecting air pipe.

Fig. 4 shows diagrammatically the arrangement whereby two or more headpieces may be supplied with air from a common source.

Fig. 5 is a top view and partial longitudinal section of Fig. 1.

Fig. 6 is a perspective view of the aero-

plane showing the occupants wearing the improved garment.

Fig. 7 is a cross-section through the single-acting air injector or blower constructed in accordance with my invention.

Fig. 8 is a cross-section through the collapsible tube forming an essential part of the injector.

Fig. 9 is a section through said tube showing it collapsed.

Fig. 10 is a modification showing in a view similar to Fig. 7 a double-acting injector or blower.

Fig. 11 shows diagrammatically a closed compartment and means for regulating the heating and the speed of the injector.

Fig. 12 shows diagrammatically a modification in the manner of the means for regulating the action of the heater when said heater is of the electric type.

Fig. 13 is an end elevation of the air propeller in enlarged view.

Fig. 14 is an edge view and longitudinal section of the hub part of said propeller together with means for regulating the pitch thereof.

Fig. 15 is a plan of the hub portion of the propeller with the blades removed.

Fig. 16 is a plan of one of the propeller blades constructed in the preferable manner.

Fig. 17 is a longitudinal section through said propeller blade.

Fig. 18 shows one of the studs employed as reinforcement for the blade.

1 is the fuselage of an aeroplane provided with seats 2, 2, for the occupants as shown in a pit open to the atmosphere thereby allowing the usual freedom of movement to aviators when traveling at ordinary altitudes. 3 indicates an internal combustion engine of any desired type and 4 the intake to the manifold thereof for supplying combustible gas or vapor thereto from the carbureter or similar device 5, and 5′ the fuel supply. Said engine drives the propeller shaft 6 as usual in the art whether the same be employed for propelling an airplane or a lighter than air type of machine. The pitch of the propeller blades when running in ordinary altitudes may be regulated by means of the handle 7 as shown in Fig. 1 and described in my prior application for patent filed December 13th, 1915, Serial No. 66,466; and also set forth in my Patent No. 1,279,742, issued September 24th, 1918; but as hereinafter described and claimed, the regulation of such pitch is effected automatically and as will be later described.

The exhaust of the engine is into compartment 8 connected through side passages 9 (Fig. 11) of the fuselage with the rear of the machine to discharge the gases at their rear ends 10 as shown, passage of the spent gases being assisted by the intake of air through the forward end of the fuselage or through openings as indicated at 11. 12 indicates a sealed compartment in which the carbureter 5 and gasolene supply 5′ are located, said compartment being connected by the side passages 13 (Fig. 2) with a rear compartment 14 so that the density or pressure of compartments 12 and 14 will be the same. 15 indicates the air injector or blower driven by any suitable power. The cross-section of Fig. 2 is through the fuselage.

In the particular embodiment of my invention herein shown an electric motor 16 is indicated which is coupled by belt 17 or otherwise with the shaft 18 of the injector. The intake of the injector is connected by the pipe or pipes 19 with the surrounding atmosphere while the outlet of the injector connects directly with the compartment 14 and feeds air into the same as indicated by the small arrows Fig. 1. Vanes or scoops 20 may be arranged at the end of the inlet pipes 19 as shown, to assist in directing air to the inlet pipes as the craft moves through the atmosphere. I prefer to employ a rotary type of silent air injector or blower and may use the form illustrated more particularly in Figs. 7, 8 and 9.

Fig. 7 shows the single action type of which two or more may be employed on the same shaft as indicated in Fig. 11. Each comprises a flexible and compressible tube 21 preferably of fabric and rubber supported within a case and subjected, by rotation of the main shaft 18, to the action of a compressing roller 22 mounted on the end of an arm secured to the main shaft 18. The intake of the tube and compressor is indicated at 23 while the outlet for the air compressed by the operation of the roller is indicated at 24. A flexible partition or valve 25 is interposed as indicated, between the ports 23 and 24. As the arm carrying the roller turns in the direction of the arrow, said roller compresses the tube as indicated, progressively, forcing the air in the tube ahead of the same through the outlet 24 and at the same time drawing the air in behind it through the inlet 23 ready for a repetition of the operation which begins as soon as the roller passes the compressible or flexible partition 25. A suitable rigid floor or backing for the exterior circumference of the tube is indicated at 26.

Obviously the compressor may rotate at any speed desired and by its action a large volume of the attenuated air introduced from the atmosphere at high altitude through the port 23 may be forced into the compartment 14 and the desired pressure maintained therein dependent upon the speed of operation of the compressor shaft 18. By multiplying the tubes 21, all discharging into said space 14, the desired effect may be multiplied or increased as required.

In Fig. 10 the compressor is provided with two flexible partitions 25 and two inlets and outlets, together with two corresponding compressor rollers 22 with the effect that the compressing action is repeated at every half revolution of the main shaft.

Inasmuch as with increase of elevation the atmosphere becomes less dense, it becomes necessary to increase the speed of the injector 15 with increasing elevation in order that the normal or desired pressure may be maintained in the compartment 14. The compressor is driven by a motor operating independently of the aircraft engine or motor as for instance by an electric motor, as shown. The increase of speed may obviously be obtained by the use of any regulating resistance or electric controller connected between the motor and the source of electric energy 27 supplying the same. The source 27 is here typified as a storage battery. Regulation of the speed of the motor is attained automatically by connecting said controller with a device which responds to changes of atmospheric density as the craft rises or changes its level above the earth. As typical of such a device which, as will be understood, typifies any barometric apparatus, I show a piston 28 working in the cylinder and exposed on one side to the outer atmosphere and on the other to the pressure of air in the compartment 14 or other compartments of the aircraft in which it is desired to maintain a normal pressure of air supplied to the engine and garment or head piece of the aviator. Said piston 28 is connected by its rod 29 and link 30 or by other suitable means with the arm 31 of the electric controller which governs the speed and power of the motor 16. As the machine rises and the pressure of the surrounding atmosphere falls, piston 28 evidently will be depressed by the pressure within and the controller will be operated to vary the resistance 32 in a manner to increase the speed and power of the motor and thereby speed up the compressor so that a larger volume of the more tenuous air will be supplied to the compartment 14. The motor resistance 32 is arranged to increasingly accelerate the motor speed-ratio as the piston 28 moves down or outward since the higher we go the more rarefied is the outer supply of air to be forced into the sealed compartment.

Obviously as the aircraft descends and the atmosphere becomes more dense, the speed of the motor and injector diminish and at normal elevation nearer the ground all automatic functions automatically cease.

The barometric device or appliance and the construction of the intermediate devices controlling the action of the motor and rate of the air supply may obviously be varied indefinitely without departing from the principle of my invention.

Obviously, also, the speed of the injector might be regulated in other ways, as for instance by maintaining a constant speed of the driving motor and regulating the intermediate driving devices to speed up the shaft 18 in well known mechanical ways, said speed changing devices being regulated in their action by the operation of the piston 28 or other barometric device.

For the purpose of maintaining the temperature of the air in the compartment or space 14 at high altitudes where the temperature of the surrounding atmosphere, as is well understood, drops very greatly, I propose to employ a heating device automatically regulated in its action by the means 28 or other similar device responsive to changes of altitude. Combined with said heating device may be means responsive to changes of temperature in the space 14 for regulating their action. Means typical of means that may be employed for this purpose and acting upon the general principle forming my invention are illustrated diagrammatically in Fig. 11, wherein I have shown an electric heater the heated resistance of which is shown at 33, divided into sections and regulable as to its heating action by means of an arm 34 moved over a series of contacts as shown, whereby any desired number of said sections may be thrown out or in to vary the heating effect. Said arm 34 being connected, as shown, to the piston or diaphragm 28, it is obvious that, as the temperature of the atmosphere falls at the increasing altitude, commutator arm 34 will be operated to increase the heating effect and maintain the temperature in the space 14 or spaces connected therewith.

The source of heating current is in this instance shown as consisting of the storage battery 35 but any electric generator might be used for the purpose as for instance a dynamo generator driven by the engine 3 or by other power. Whatever the type of heater, whether the same be electrical or of other form, the principle of my invention consists in the automatic regulation of its action by any well known device suitable for the type of heater employed, governed in its operation by the changes of atmospheric density operating through the piston 28 or other barometric device suitably connected to said regulator. The regulation of the heating so far described will take care of the general changes of temperature due to increased elevation but as this is not a constant decrease and takes place at a higher rate at higher altitudes, compensation is introduced through calibration of the regular resistance or contacts by making them of

different lengths as indicated or graduating them so that the heater action will increase at an increasing rate as the craft rises.

Inasmuch as the changes of temperature of the surrounding atmosphere with change of altitude may not be the same under all conditions or in all situations, I introduce a compensation for this by employing in connection with the heating means suitable devices for regulating the same thermostatically controlled by the changes of temperature in the heated space. As typical of such a thermostatic control of the heat within the sealed space when an electric heater is employed, I show a thermostat 36 working between two contacts 37, 38 connected to the circuits respectively of the electromagnets 39, 40, and including a battery or other suitable generator 41. These magnets being furnished with front and rear contacts connected into the circuit of the electric heater as shown, it is obvious that a rise of temperature above the regulated or desired degree causing the thermostatic bar 36 to flex in one direction, as for instance to close the contact 38, will result in opening the circuit of the heater and the same will cease to act so long as the temperature remains above the normal within the space and irrespective of the action of the barometric controlling device. On the other hand, when the temperature falls below the desired degree within the contained space, bar 36 will close the circuit upon the other contact 37, thereby closing circuit for the heater independent of the arm 34, so that the heater will operate with its full power irrespective of any action of the arm 34 under the influence of the barometric device and the temperature will be brought up within the space to the desired normal degree, thus causing the bar 36 to flex back into position indicated, wherein both magnets 39, 40 being deënergized, the heater circuits and heater are left to the control of the barometric device.

Fig. 12 shows another device that may be employed for increasing the action of the electric heater upon decrease of temperature. In this instance the arm 42 moves over a series of contacts to control the number of sections of the heater that shall operate in multiple at the same time and is governed by the longitudinal expansion and contraction of wires or bars 43 connected in tandem between the fixed point 44 and the lever 42 by means of links or levers 45, so that the contraction of all the sections 43 with decrease of temperature is multiplied in the arm 42 to bring in more sections of the heater, while vice versa, their expansion by increase of temperature allows the arm 42 to move under the influence of the spring 46 and cut out sections of heater to decrease the heat.

The desired heat and pressure contained in compartment 14, to whatever altitude the machine may rise, is employed also for maintaining the comfort, safety and ease of movement of the aviators in the tenuous atmosphere by furnishing them with suitable air-tight suits or vestments 47 and connected headpieces 48, which may be in general structure like those worn by divers but light, thin and inflated for ease of movement. These are supplied from the tank or compartment 14 through a pipe 49, branched to the headpieces or neck as indicated in Fig. and connected with said headpieces through the nipples or couplings 50 for inlet of the air thereto. The gas or spent air may be exhaled or forced through the outlets 51, or, if desired, the air may be supplied and exhaled through a device of the type indicated in Fig. 3, wherein I show the connected flap valves 52 and 53, the latter closing the inlet or supply and the former, 52, the outlet or waste. Pressure from the supply pipe 49 opens the valve 53 and closes the valve 52 while pressure from the headpiece above the normal or graduated supply and for the purpose of opening the waste valve acts upon the rear side of valve 53 which is of larger size, closes the same, and thereby, through the connection between the valves, opens the valve 52.

Obviously the system of tubing supplying the air to the headpieces and suits may also serve as a speaking tube for communication between the aviators.

As will be seen, my invention permits unrestrained movement of the aviators in the highly tenuous atmosphere found at extremely high altitudes and furthermore maintains comfort and safety by comparatively simple means and so that they may quickly disengage themselves from the ship or aeroplane when it is necessary to resort to a parachute, which obviously would not be possible if they were within a confined space or compartment.

The regulable pitch of propeller required for carrying out my invention may be obtained by any desired construction as for instance that described in my prior application for patent filed December 13th 1915, Serial No. 66,466, or my Patent No. 1,279,742, or by any other desired construction.

As shown in Figs. 13 and 14, each propeller blade 54 is mounted at 55 upon the hollow propeller shaft 56 in a manner permitting it to turn on its own longitudinal axis so that its obliquity to the plane of rotation of the propeller may be changed, thereby varying its reaction on the atmosphere. At one edge and by means of the ring 57 connected to said blades and connecting wires joined thereto, said blades are connected to the fixed hubs 58 of the propeller shaft. At their opposite edges the said blades are connected to the longitudinally movable hubs

59, movable longitudinally on the shaft 56 and having cross arms working in inclined slots 60 in the hollow shaft whereby, on longitudinal movement of the hubs 59 imparted by longitudinal movement of the rod 61 connected thereto, said hubs 59 will be caused to turn slightly, thereby twisting the edge of the blade to which they are connected slightly and varying the pitch.

An important feature of my invention is the automatic adjustment of this pitch in accordance with changes of altitude in a manner to increase the pitch and reaction as the altitude increases. For this purpose I use any barometric device similar to that already described or of any suitable character adapting it to respond to changes of atmospheric density external to the machine and as illustrative of such a device I show piston 28′ movable in its cylinder and exposed on the one side to the varying pressure of the external atmosphere and on the other to the substantially maintained pressure of the sealed space on the aircraft, a wall of which space is indicated at 14′. Said barometric device is suitably connected with means whereby, as the position of the piston 28′ changes with change of altitude, movement may be imparted to the rod 61 to change the pitch of the propeller blade. As typifying and illustrating means suitable for this purpose I show an elbow lever 62 one arm of which is engaged with a rod extending from the piston 28′, while the other arm connects with a sleeve 63 upon rod 61 suitably constructed to permit rod 61 to rotate freely in sleeve 63 or to cause movement of 63 under the action of lever 62 to impart longitudinal movement to rod 61. This may obviously be accomplished by the use of flanges or collars on the rod embracing sleeve 63 between them. Extension 67 of lever 62 connects to throttle of engine for the purpose of increasing the power of the engine when the pitch increases.

The action of the barometer device may be steadied by a dash-pot indicated at 64 the piston of which is connected with the piston rod for piston 28′. The circulation of liquid as the dash-pot piston rises and falls is allowed by bypass 65 and the stop-cock 66 in said bypass may be turned to stop the circulation and thereby fix the devices in any desired position for any particular set pitch or adjustment of the propeller and other devices. As the machine rises into the increasing vacuum of high altitudes the engine's power obviously increases without adjustment owing to the diminishing back-pressure at the exhaust. The adjustment of propellers to varying pitches compensates their fulcrum in a medium of varying density like the atmosphere. Other things being equal the higher the machine the faster it may speed owing to diminished resistance like hydroplanes rising from the water into the air, or like migratory birds flying beyond unaided vision 11,000 miles from the artic to the antarctic without food or rest. Likewise the sustaining component of planes or wings is compensated by the greater speed of translation, for when speed is doubled in one-half density obviously there is neither gain nor loss of buoyancy. In case the air injector is driven from the engine shaft, an automatic variable speed control may be interposed in this connection as already mentioned. Likewise the generation of current for warmth may be produced by using the shaft of the air propeller as a prime mover for running the dynamo generator to supply current in place of the heavy battery, or said generator might be run by an air propeller driven by the rapid motion of the aeroplane through the air as is done with wireless equipments.

For the propeller blades I prefer to employ the construction shown in Figs. 16, 17 and 18. In this the blade consists essentially of a metal shell the walls of which are connected by metal struts or studs 65′ uniting the walls to form a braced shell, the surfaces of which act as tension members while the studs act as the rigid strut members of a girder, this construction being preferably attained by shaping up the body to the desired form in paraffin, wax or similar substance with the studs inserted therethrough and then electroplating said form and subsequently removing the core or body by the application of heat and through a perforation in the plating.

This machine is intended for low as well as high altitude flying and devised to take care of itself in so far as altitude is concerned.

Were the turbine prime mover used to drive airplanes it would be in the outer air, and the boiler and its adjuncts, including bunsen flames from liquid fuel would be located in the sealed compartment.

My present invention is an improvement on that of my prior application filed Dec. 13, 1915, Serial No. 66,466, wherein I have described and claimed a high altitude flying machine having a sealed compartment for the aviator and the carbureter of the engine and means for automatically maintaining the atmospheric pressure within the inclosure independent of the speed and at any altitude, said means being responsive to changes of pressure within said compartment, and wherein I have also described the use of the variable pitch propeller adjustable as to pitch from the sealed compartment to control the reaction on the air.

What I claim as my invention is:—

1. A high altitude aircraft having a sealed compartment combined with an injector or blower supplying air to the same from the surrounding atmosphere, a motor therefor

operating independently of the speed of the aircraft engine, and means for automatically changing the speed of the motor as the altitude changes.

2. In a high altitude aircraft having an air compartment, the combination with said compartment of an air supply device connected with the atmosphere, a motor therefor operating independently of the speed of the aircraft engine, means responsive to changes of atmospheric pressure and means controlled thereby for automatically increasing the speed of said motor as the atmospheric density lessens.

3. In a high altitude aircraft, the combination with a sealed compartment and an air compressor supplying air thereto from the surrounding atmosphere, of a driving motor therefor operating independently of the speed of the aircraft engine, means for increasing the driving power of said motor and means responsive to changes of atmospheric density controlling the action of the latter means.

4. In an aircraft, the combination of a sealed air compartment, an air compressor supplying air thereto from the surrounding atmosphere, a driving electric motor for said compressor, a controller for said motor and means responsive to changes of atmospheric density for governing the position of said controller as and for the purpose described.

5. The combination with an aircraft, of an air compressor comprising a flexible tube and a compressor roller acting on said tube and mounted on an arm connected to the compressor shaft and means operating independently of the speed of the aircraft engine for automatically changing the velocity of rotation of said shaft in response to changes of atmospheric density.

6. In an aircraft of the character described, the combination of a heater and means responsive to decrease of atmospheric density for increasing the heater action with changes of altitude and lessening density of the surrounding atmosphere.

7. In an aircraft, the combination of a heater, means for governing the same in accordance with changes of atmospheric density to maintain the heat of a compartment as the craft rises and a thermostatic heat control having its controlling thermostat responsive to changes of heat condition in the heated compartment so as to compensate for want of uniformity in changes of temperature due to changes of altitude.

8. In a high altitude aircraft, the combination of a variable pitch propeller and means responsive to changes of atmospheric density for automatically governing the pitch of said propeller and the air supply for the engine.

9. In an airplane, the combination of a variable pitch propeller and means responsive to changes of atmospheric density for automatically governing the pitch as it rises into high altitudes, and means for automatically governing the rate of air supply for the engine.

10. In a high altitude aircraft, the combination of a variable pitch propeller and means responsive to changes of atmospheric density for automatically governing the pitch of said propeller and concurrently therewith the throttle of the engine.

11. In an aircraft, the combination with the air propeller having a variable pitch blade, a barometric device governing the position of the blade with changes of atmospheric density surrounding the aircraft, a dash-pot connected to the barometric device and a bypass having a stop-cock for setting the blade at any adjusted pitch.

12. The combination with an aircraft, of a variable pitch propeller and means for automatically adjusting the reaction between the propeller blades and the atmosphere in accordance with changes of atmospheric density.

13. An aircraft having a sealed compartment combined with means for maintaining the temperature and density of air therein constant, an aviator's air-sealed suit and means for connecting said compartment with said suit.

14. An aircraft having a sealed compartment combined with means for maintaining the temperature and density of air therein constant, an aviator's air-sealed head gear and means for connecting said compartment with said head gear.

15. A high altitude aircraft having a sealed air compartment, an engine drawing its air supply therefrom, a compressor and motor therefor acting independently of the aircraft engine speed and means responsive to changes of altitude of the machine for automatically changing the speed of said motor to maintain the density of air in said compartment.

16. In an aircraft, the combination with a multiplicity of aviators' headpieces, and a source of air supply of pipes to supply two or more headpieces, whereby the piping may serve as a speaking tube.

17. The combination with an aircraft, of an electric heater having a control responsive to changes of density of the surrounding atmosphere and a thermostatic device in the warmed compartment provided with means for opening a circuit of the barometric control when the temperature rises above a predetermined degree and for closing the heater circuits independently of the barometrically controlled devices when the temperature falls to a predetermined degree.

18. A high altitude aircraft with a sealed

compartment maintained at normal air density and containing the adjuncts of an outside engine, an outside air tractor driven by said engine exhausting into the partial and ever increasing vacuum as the machine rises, means to maintain the normal air density in said compartment combined with means for automatically increasing the power of said tractor as the machine rises to maintain the driving thrust.

19. A high altitude airplane with an air-tight compartment of normal density and temperature containing fuel and carbureter, an outside variable pitch propeller run by an outside engine exhausting into the partial and ever increasing vacuum as the machine rises in the air, together with automatic means for maintaining said normal air density and temperature, together with barometric means to increase or diminish the pitch of said propeller as described.

20. In an airplane for the purpose described, the following elements in combination, a closed compartment system containing air of fixed density and temperature in which the fuel elements for an outside engine function, an outside variable pitch propeller run by said engine, means for automatically changing the pitch of said propeller with change of altitude to maintain the reaction thereof at high altitudes and means connected with said compartment system for protecting aloft the occupants of said airplane against the effects of cold and high rarefaction at high altitudes.

Signed at New York, in the county of New York and State of New York, this 11th day of September, A. D. 1919.

SAMUEL D. MOTT.

Witnesses:
F. B. TOWNSEND,
IRENE LEFKOWITZ.