S. M. WILLIAMS.

AEROPLANE.

APPLICATION FILED JAN. 2, 1909.

1,014,194.

Patented Jan. 9, 1912.

3 SHEETS—SHEET 1.

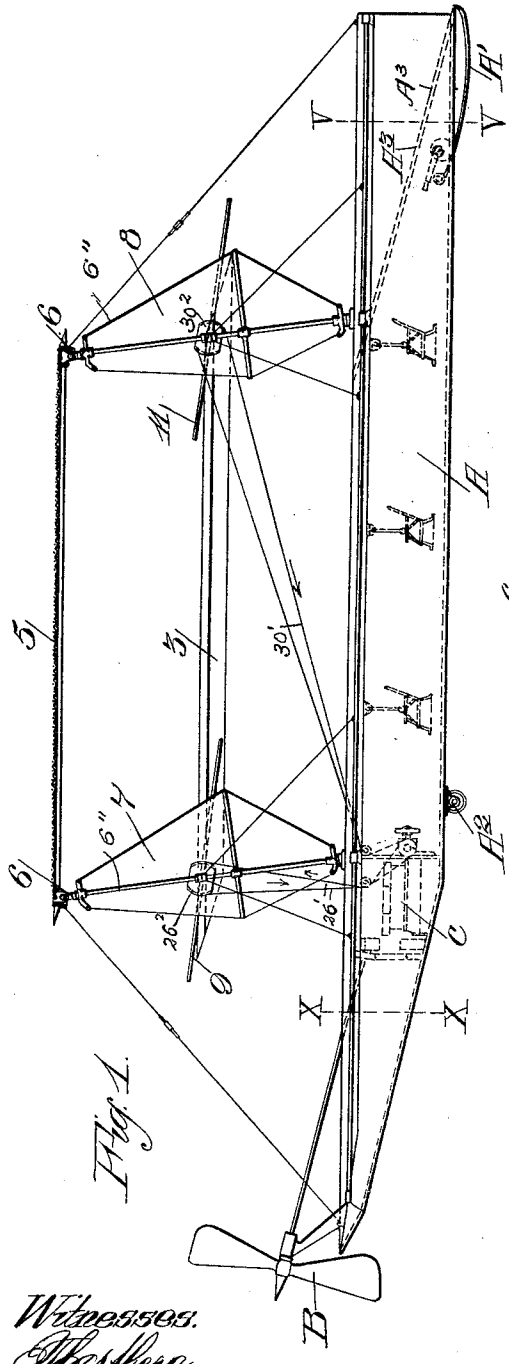


Fig. 1.

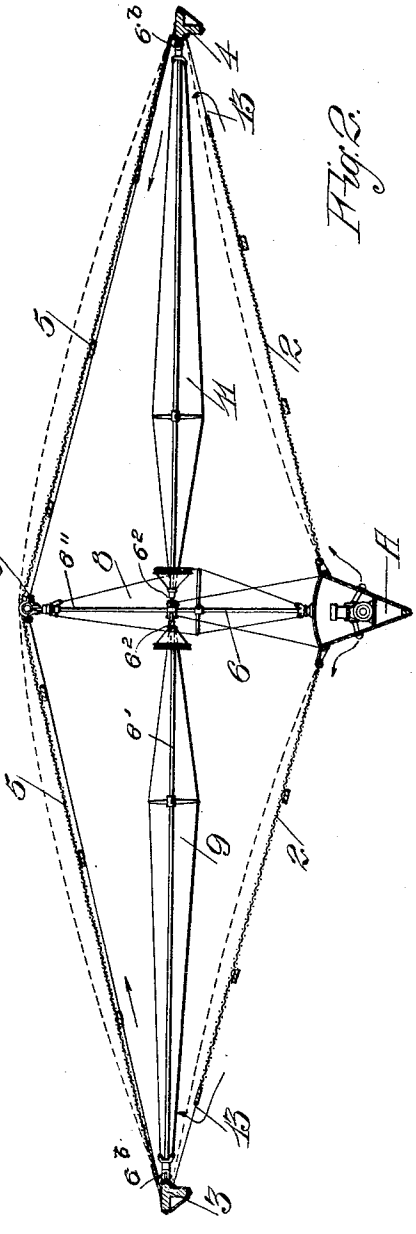


Fig. 2.

Witnesses.
Hasbrouck
Louis S. Berry.

Inventor.
Sylvester M. Williams
by Geo. H. Strong.
his Atty.

S. M. WILLIAMS.

AEROPLANE.

APPLICATION FILED JAN. 2, 1909.

1,014,194.

Patented Jan. 9, 1912.

3 SHEETS—SHEET 2.

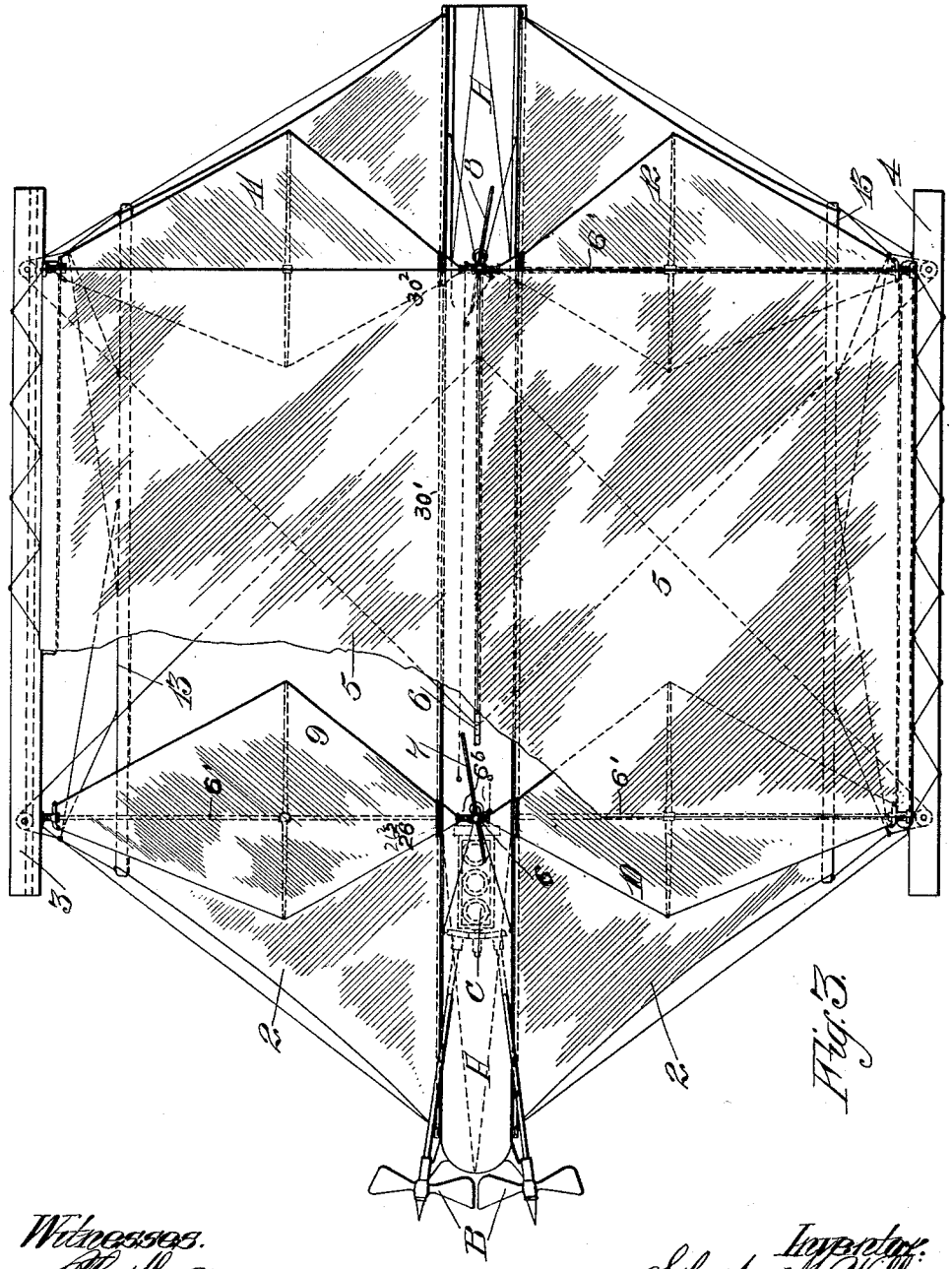


Fig. 5.

Witnesses.
Rossberg
Roni S. Barry,

Inventor:
Sylvester M. Williams.
by: Geo. H. Strong,
his Atty.

S. M. WILLIAMS.

AEROPLANE.

APPLICATION FILED JAN. 2, 1909.

1,014,194.

Patented Jan. 9, 1912.

3 SHEETS—SHEET 3.

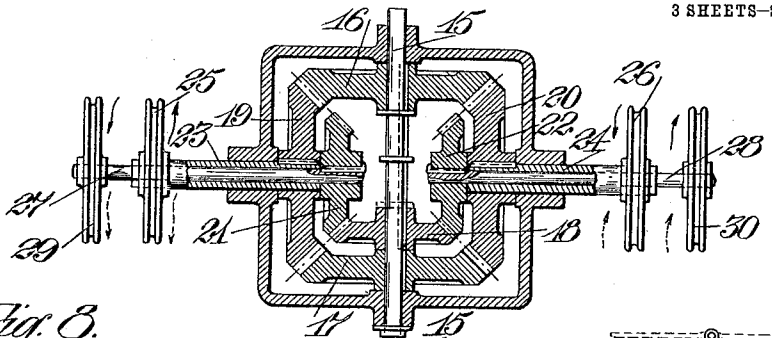


Fig. 8.

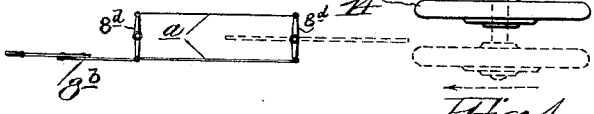


Fig. 4.

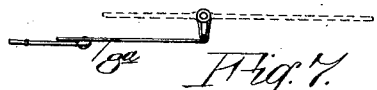


Fig. 7.

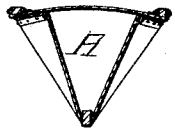


Fig. 5.

Fig. 9.

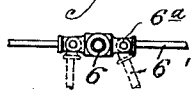


Fig. 6.

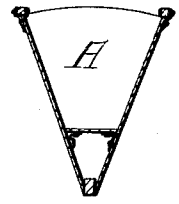
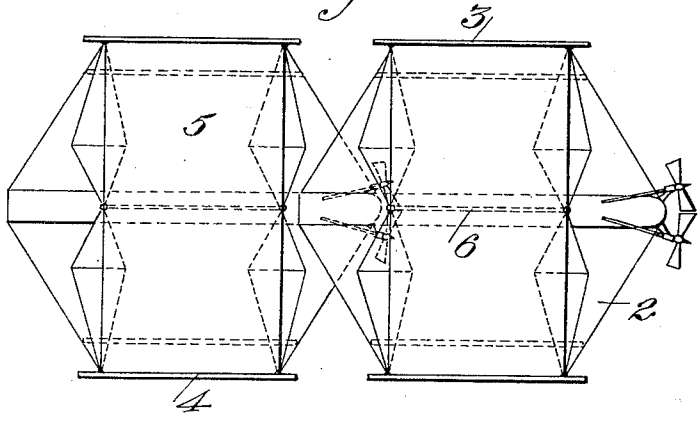


Fig. 10.



Witnesses.
H. Hasbrouck
Remi S. Berry

Inventor.
Sylvester M. Williams.
by Geo. H. Strong.
his Atty.

49

UNITED STATES PATENT OFFICE.

SYLVESTER M. WILLIAMS, OF SAN FRANCISCO, CALIFORNIA.

AEROPLANE.

1,014,194. Specification of Letters Patent. Patented Jan. 9, 1912.

Application filed January 2, 1909. Serial No. 470,439.

To all whom it may concern:

Be it known that I, SYLVESTER M. WILLIAMS, citizen of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Aeroplanes, of which the following is a specification.

My invention relates to that class of flying machines, in which the weight is sustained by the reactions resulting when one or more aeroplanes are moved through the air edgewise at a small angle of incidence, either by the application of mechanical power, or by utilizing the force of gravity.

The object of my invention is so to arrange the different aerial planes that the greatest efficiency may be derived therefrom; and in providing means for restoring and maintaining the equilibrium, or lateral balance of the apparatus, means for guiding the machine both vertically and horizontally, and to so construct the machine that both lightness and stiffness will be secured.

The invention consists in the arrangement of parts and in the details of construction which will be more fully described by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of my machine. Fig. 2 is a cross section of same. Fig. 3 is a plan view partially broken away. Fig. 4 is a section of a controlling mechanism, used in connection with the horizontally movable planes. Fig. 5 is a section on line *x*—*x* of the body portion. Fig. 6 is a similar section on line *v*—*v*. Figs. 7 and 8 are views of means for controlling the steering planes. Fig. 9 is an enlarged view showing the pivot connections used throughout the structure. Fig. 10 is a plan view showing two aeroplanes connected.

In flying machines of the character to which this invention relates, the apparatus is supported in the air by reason of the contact between the air and the under-surface of the several planes also by the vacuum produced by the upper surface, the contact surface being presented at a small angle of incidence to the air. The relative movements of the aeroplane may be changed in different air as wind blowing in a direction opposite to that in which the apparatus is traveling, or it may be used on the principle of the gliding or soaring machine; or power may be applied to propel the machine forward and cause the air to support the machine in a similar manner. There are also numerous disturbing forces which tend to shift the machine from the position which it should occupy, and to obtain the desired results as before stated, the chief object of my invention is to arrange the aeroplanes so as to gain the greatest efficiency, and so that they will always be under perfect control.

Referring to Figs. 1 and 2, A is the main frame of the machine from which the different aeroplanes extend.

2 are aeroplanes suspended between the outer-frames 3 and 4 and the main frame.

5 is another large aeroplane also fastened to the outer frame, and to the top rail of a vertical frame, 6, having a trussed standard 6″.

The aeroplanes 2 and 5 constitute the carrying planes of the machine.

7 and 8 are two vertically disposed planes which I term the steering planes; when these planes are turned at a slight angle to the straight line of the machine, and the same is under way, the pressure of the inrushing air will strike the angular face of the plane, and cause the machine to turn to one side or the other, whichever the case may be. These steering-planes may be controlled in any suitable manner. Fig. 7 shows the front plane operated by a lever 8^a; Fig. 8 shows a lever 8^b and means for operating the rear plane, said means including suitable parallel ropes *a* connected to centrally pivoted levers 8^d one of which connects with the lever 8^b.

9, 10, 11, 12 are horizontally disposed planes supported between the outer frames 3 and 4, and the central frame 6. These planes are used both as supporting planes, and in controlling the vertical movements of the machine by setting the forward planes 9 and 10 at a slight upward angle, and the rear planes at an opposite angle. The air striking the surface of the forward planes, will tend to lift that part of the machine up; while the air striking the opposed

surface of the rear planes will force that portion of the machine down. By so placing the planes that they act opposed to each other a quick action is obtained, and the machine can be quickly restored to its equilibrium.

The main body of the apparatus containing the driving mechanism and controlling mechanism, is located below the center of gravity of the structure, adding to the stability and balance of the apparatus.

It will be seen in Fig. 2 that the lower aeroplanes 2 do not extend out all the way to the frames 3 and 4, and as the machine is being propelled forward against the air, a great pressure will be exerted against the lower face of the aeroplanes 2, and air escaping over the edges will act on planes 5.

Referring to Fig. 2 it will be seen that the aeroplanes 2 and 5 are set at opposite angles to each other, and the upward angles of planes 2, force the air outward and cause it to escape over the edges 13. The opposed angles of aeroplanes 5 catch the upward rushing air escaping from the planes 2, and force it toward the center of the machine, causing an upward pressure, and increasing the lifting efficiency of the planes.

Fig. 4 is a section of the controlling mechanism used in connection with the horizontal planes 9, 10, 11, 12.

14 is the controller wheel mounted on a slidable shaft 15. This shaft is slidable to draw the key out of engagement with the gear 16, and into engagement with gear 17; gear 18 always being in engagement when the shaft stands in the position shown; the key engages gears 16—18 causing these to be the drivers. Gears 16—17 engage other gears 19—20, and gear 18 engages the gears 21—22. Gears 19—20 are keyed to the hollow shafts 23—24, on which are mounted the pulleys 25—26. Gears 21—22 are keyed to the shafts 27—28 turnable within the hollow shafts 23—24. The shafts 27—28 also carry a pair of pulleys 29—30. The pulleys 30 and 26 are on one side of the center of the machine, and the pulleys 25 and 29 are on the opposite side of the center of said machine. The pulley 30 connects by a rope 30′ with a pulley 30^2 on the axis of the rear plane 11, and the pulley 26 connects by a rope 26′ with a pulley 26^2 on the axis of the front plane 9. The pulleys 25 and 29, on the side of the machine opposite to pulleys 30 and 26, are connected to the planes 10 and 12, on that side by a rope arrangement similar to that before described. When the shaft 15 stands in the full line position shown in Fig. 4, the key engages the gears 16—18, causing these to be drivers, and if the controller wheel is turned in the direction of the arrow, it will, through the shaft and gears, the pulleys 30 and 26 and 25 and 29, the ropes 30′ and 26′ and corresponding ropes on the opposite side, and the pulleys 30^2 and 26^2 and similar pulleys on the opposite side, tilt the front and rear planes in opposite directions, and the corresponding planes on the two sides will be tilted in reverse directions. If the controller shaft, 15, is pulled out into the position shown in dotted lines in Fig. 4, the key will engage the gears 17 and 18, causing these to be drivers. If the controller wheel is now turned in the direction of the arrow, the pulleys will turn in the direction of the dotted arrows, or if the controller wheel is turned the other way, it will cause the pulleys to turn in the opposite direction of the dotted arrows; through the rope connections before described, each pair of planes on the same side of the machine will now be turned in unison and will assume substantially the same angle; the planes at the opposite side of the machine will at the same time, through the gearing shown in Fig. 4 and the rope connections before mentioned, be turned in unison, but in directions opposite to the first-named planes so that the planes at one side stand at an angle to those at the other side.

The machine may be driven ahead by any suitable or well known power, as a gas engine C, connected with a set of propellers B, said engine representing any desired and well known form of motor, and said propellers being of any well known and appropriate type. The burned gas from the engine may be discharged from either side of the main body; these hot gases having more or less lifting power, striking the face of the planes 2, adds to the efficiency of same. The body portion of the apparatus containing the main weight, is shaped in such a manner as to add more lifting surface to the machine, and cause the least resistance possible.

The aeroplanes in this machine may be constructed of any suitable material, as cloth, or flexible material of any kind. These surfaces may receive more or less curvature from the resistance of the air as shown in dotted lines, Fig. 2, without being injured in any way. The different frames and aeroplanes may be braced and supported in any suitable manner well known to the art.

In Fig. 9 the brace rods 6′ are shown as pivoted at their ends 6^a. This construction is very desirable; by loosening the wire guys, 6^b, the rods will be free to swing forward and lie parallel with the body portion of the apparatus. The big planes being folded together, the machine can be stored in a very small space. By this construction it is also very easily and quickly taken apart for shipment, repair, or replacement.

The outer frames 3—4 are constructed on the lines of catamaran outriggers, in many instances it might be desirable to make a

landing on the water, the frames 3—4 would then act as floats and prevent the machine from overturning, or sinking.

A′ is an elastic shoe at the rear of the machine, which may be adjusted to strike the ground first, when alighting, and thus relieve the machine of the greater portion of the shock.

A^2 represents a wheel journaled near the forward part of the body, and when this portion approaches the ground, the wheel will allow the machine to run until its momentum ceases.

It will be understood that the shape of the body portion of this apparatus is of great importance. The wedge-shaped bow, when traveling through the air tends to lift, if anything. The after part, having the inclined deck line A^2, shown in Fig. 1, while traveling through the air, produces more or less vacuum, adding to the lifting surface as well as the bow portion. The remainder of the body has only a skin friction.

The form of the body is well shown in Figs, 1, 4 and 5, and by reason of its shape it will be seen that the sides also form aeroplanes which are important accessories to the other parts of the machine.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. In a flying machine, the combination with a plurality of superposed aeroplanes set at opposed angles to each other, of parallel frames holding the outer edges of the planes, upright standards connecting the planes, and horizontal arms pivoted at their ends, extending from each side of the standards, and bracing the parallel frames.

2. In a flying machine, the combination with superposed aeroplanes set at opposed angles, of upright standards connecting the planes, vertical steering planes turnable on the standards, horizontal brace arms connecting the outermost edges of the planes, and horizontally disposed controller planes turnable thereon.

3. In a flying machine, comprising superposed aeroplanes set at opposed angles, parallel frames holding the outer edges of the planes horizontal, brace arms connecting the frames, horizontal controller planes turnable thereon and means for moving said planes to present different angles of incidence to the horizontal.

4. In a flying machine, comprising superposed aeroplanes set at opposed angles, parallel frames holding the outer edges of the planes horizontal, upright standards connecting the planes, horizontal brace arms connecting the parallel frames, horizontally disposed controller planes, and means for moving the planes at angles opposed to each other.

5. In an apparatus of the character described, aeroplanes set at opposed angles open at the ends and approaching each other at the sides, and means for maintaining the planes in an extended position, with the edges of the uppermost planes extending beyond the edges of the lower planes to allow air to enter between the two, and act upon the uppermost planes.

6. In an apparatus of the character described, transversely disposed aeroplanes set at opposed angles, a frame or body, means connected therewith by which the planes are maintained in their relative and extended position, horizontally and vertically turnable planes disposed in pairs between the main planes, means for turning said planes to raise, lower or turn sidewise, and a motor and propelling mechanism carried by the frame.

7. In an apparatus of the character described, a main frame or structure, transversely disposed aeroplanes set at opposed angles with supporting and extending means carried by the main frame, members buoyant in water forming the exterior parallel edges of the apparatus, vertically and horizontally turnable planes journaled in pairs toward the front and rear of the machine, and means by which said planes may be turned to steer and to raise and lower the apparatus while in motion.

8. In an apparatus of the character described, a main frame or body, transverse aeroplanes set at opposed angles, means for supporting and extending said planes, elevating and depressing and steering planes located in pairs between the main planes, and means for absorbing the shock and the momentum of the machine when alighting.

9. In an apparatus of the character described, a main frame, motor and propeller, transverse aeroplanes set at opposed angles open at the ends, with the uppermost planes extending beyond the edges of the lowermost whereby air may be admitted to act upon the upper planes, means for absorbing the shock and momentum of alighting, said means including an elastic shoe, and a wheel located beneath the body of the machine.

10. In an apparatus of the character described, transverse aeroplanes set at opposed angles, a main frame or body, arms by which the planes are maintained in an extended position said arms being hinged or jointed and capable of folding to reduce the machine for storage.

11. In an apparatus of the character described, a main frame or body having substantially convergent sides, and a greater depth at the rear than the front, an elastic shoe at the rear and a bearing-wheel at the front to absorb the shock and momentum of alighting, transverse aeroplanes set at opposed angles, said aeroplanes having foldable arms by which the planes are normally

maintained in an extended position, the uppermost of said planes extending beyond the edges of the lowermost planes whereby air passing over the edges of said lowermost planes will be converged into the arch of the uppermost planes.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

SYLVESTER M. WILLIAMS.

Witnesses:
GEO. H. STRONG,
CHARLES A. PENFIELD.