1,310,389

Draftsman

F. A. CERRUTI.

AEROPLANE.

APPLICATION FILED MAY 17, 1917.

1,310,389.

Patented July 15, 1919.

4 SHEETS—SHEET 1.

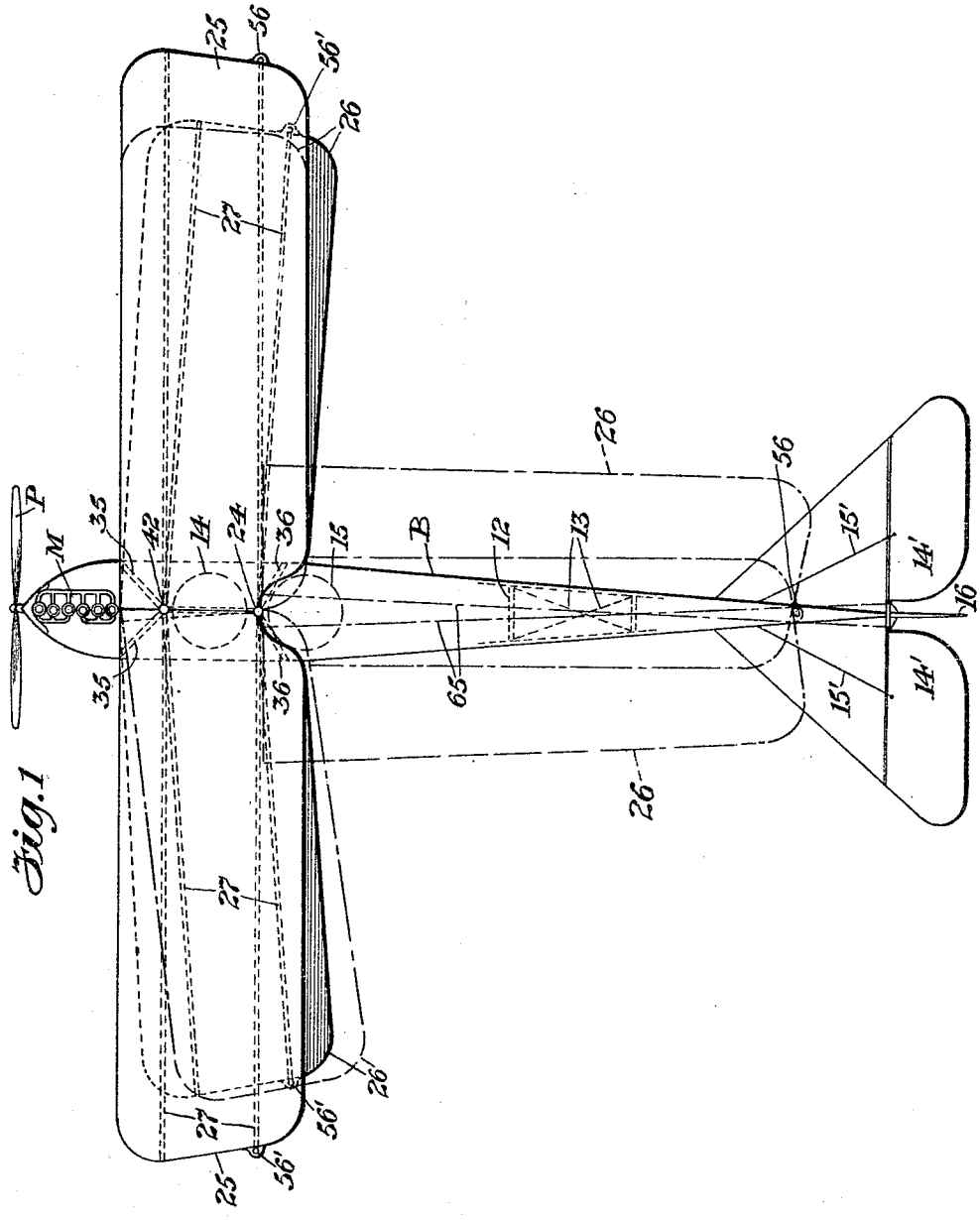


Fig. 1

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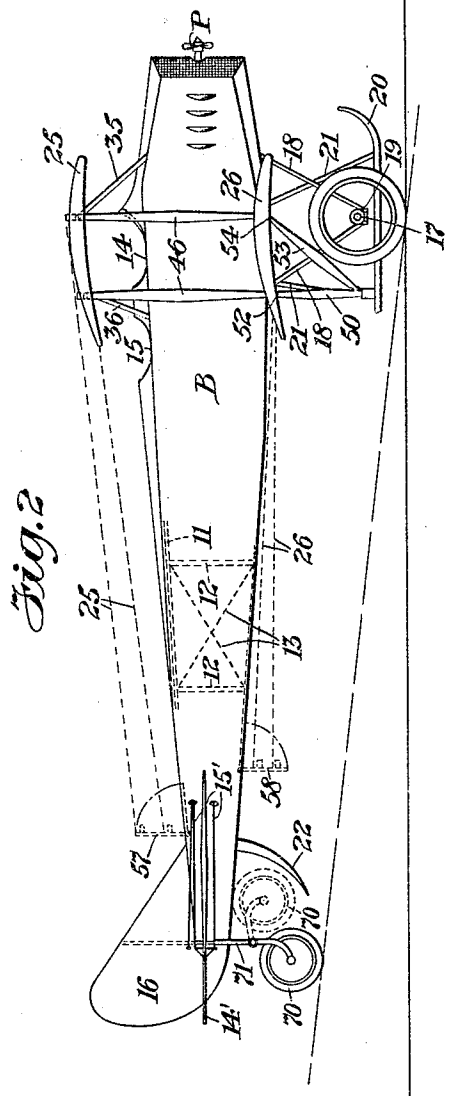


Fig. 2

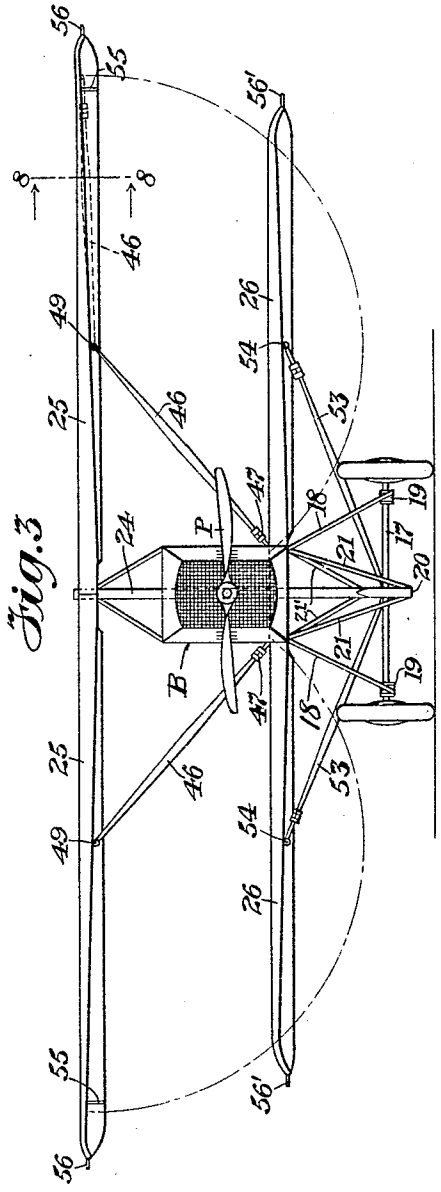


Fig. 3

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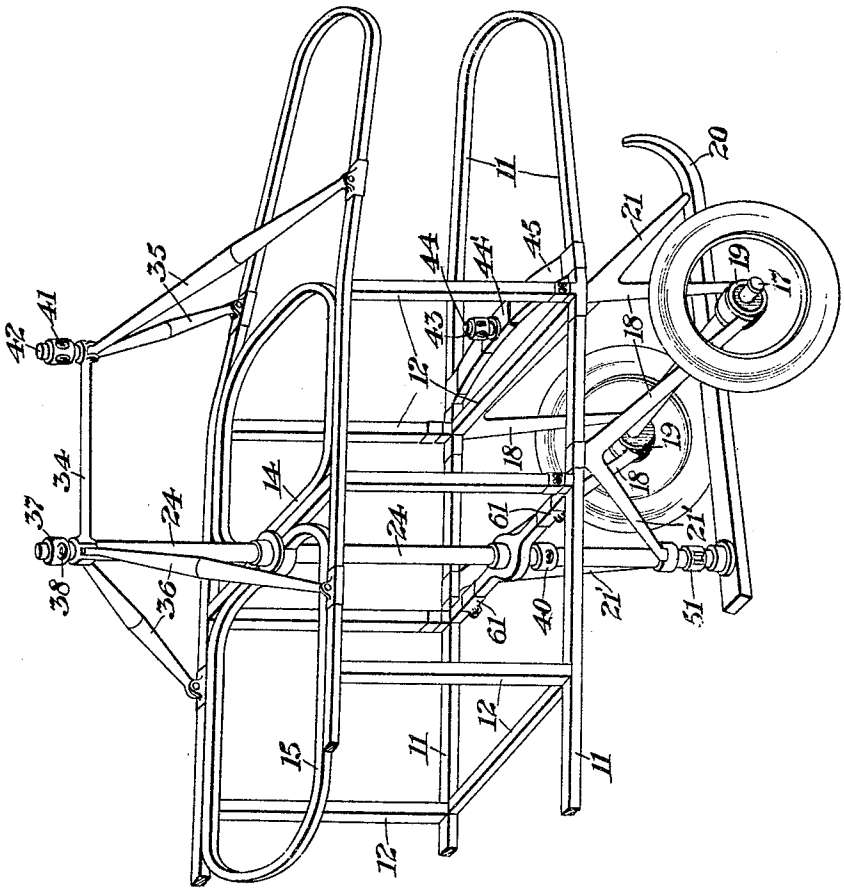
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4 SHEETS—SHEET 3.

Fig. 4



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4 SHEETS—SHEET 4.

Fig. 5

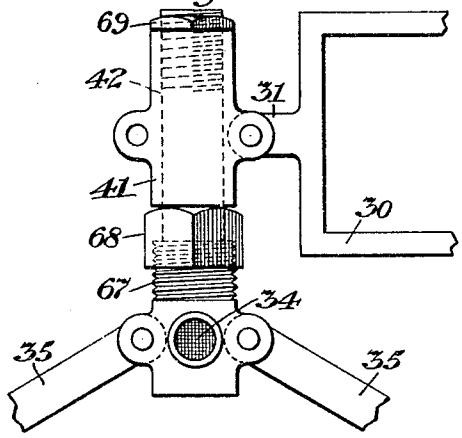


Fig. 6

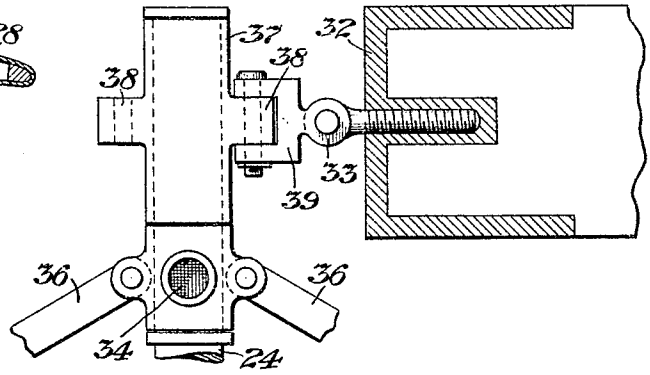


Fig. 8

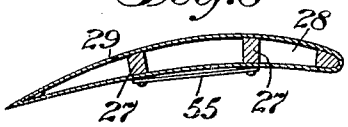


Fig. 7

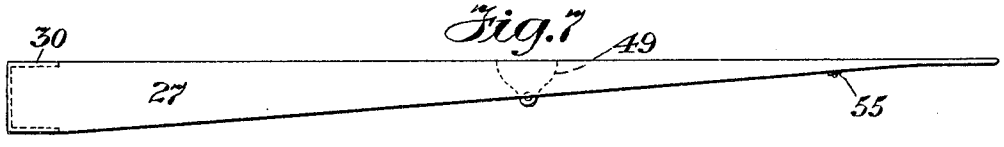


Fig. 9

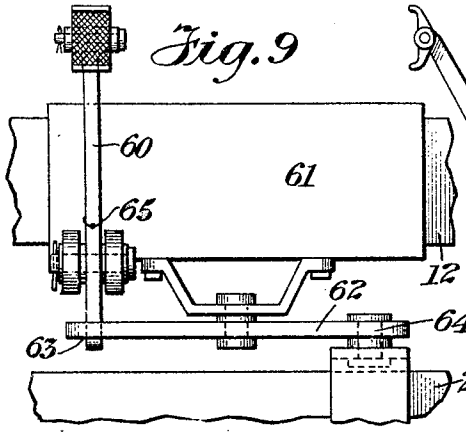
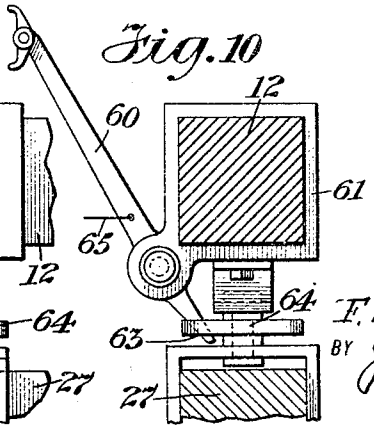


Fig. 10



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244. AERONAUTICS
46

UNITED STATES PATENT OFFICE.

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AEROPLANE.

1,310,389. Specification of Letters Patent. Patented July 15, 1919.

Application filed May 17, 1917. Serial No. 169,177.

To all whom it may concern:

Be it known that I, FRANK A. CERRUTI, a citizen of the United States, and a resident of the borough of Bronx, in the county of Bronx, city and State of New York, have invented certain new and useful Improvements in Aeroplanes, of which the following is a specification.

This invention relates to flying machine or aeroplanes, and it is the primary object of the invention to improve the general construction of aeroplanes to increase the efficiency thereof not only in flying but also in transporting the same upon the ground and to facilitate the ready storing of the same.

It is a further object of the invention to provide improved means to control lateral balancing without the necessity of the provision of independent ailerons or by the warping of the supporting surfaces to change the angle of incidence.

It is another object of the invention to provide an aeroplane in which the supporting surface is pivotally and rigidly supported to extend laterally of the fuselage or transversely to the line of flight, and to provide means whereby the lateral portions of the surface may be adjusted forwardly and backwardly or advanced and retracted relative to the line of flight, to increase and decrease the lifting efficiency of the supporting surface at opposite sides of the aeroplane to control lateral stability.

A further object of the invention is to provide an aeroplane having superposed planes the lateral portions of the lower planes of which are adapted to be advanced and retracted relative to the line of flight to control lateral stability.

It is a further object of the invention to provide an aeroplane having a fuselage with superposed planes in their normal position extending laterally and rigidly of the fuselage, and are adapted to be swung backwardly with the upper planes extending in overlapped relation above the fuselage and the lower planes below the fuselage to permit of the ready transporting of the aeroplane on the ground and to facilitate the storage of the same.

It is a further object of the invention to provide improved means to support the planes without the use of trussing wire or the like and permit of the ready and quick assembling and disassembling of the same.

Another object of the invention is to provide adjustable supporting means for the supporting planes whereby said planes may be supported at different angles of incidence and at right angles to the fuselage, or at different dihedral angles.

Other objects and advantages will hereinafter appear.

In the drawings accompanying and forming a part of this specification Figure 1 is a plan view of an aeroplane illustrating an embodiments of my invention, the parts being shown in full lines and dotted lines in which positions the parts will be in the normal operation of the aeroplane, and in dot and dash lines the advancing and retracting of the lateral ends or portions of the lower planes in the operation of restoring lateral stability, as well as the positions the planes will assume when swung back for transporting the aeroplane on the ground or storing the same.

Fig. 2 is a side elevation.

Fig. 3 is a front elevation.

Fig. 4 is a perspective view of the forward portion of the framework of the fuselage and the running gear.

Fig. 5 is a detail view of the support for a front supporting spar of the upper planes looking at the rear.

Fig. 6 is a detail view of the support for a rear supporting spar of the upper planes looking at the front.

Fig. 7 is a front elevation of a supporting spar for the planes.

Fig. 8 is a cross sectional view of one of the upper planes taken substantially on the line 8—8 of Fig. 3 and looking in the direction of the arrows.

Fig. 9 is a front elevation of a foot lever control for advancing and retracting the lateral portions of the lower planes; and

Fig. 10 is a side elevation of the foot lever control shown in Fig. 9.

Similar characters of reference designate like parts throughout the different views of the drawings.

The embodiment of my invention shown in the drawings comprises an elongated fuselage or body (designated in a general way by B), the framework of which consists of longitudinally extending members 11 with upright and transverse members 12 and trussing wires 13, said framework tapering from the front to the rear and covered with a suitable material. Adjacent the forward end the fuselage is provided with seats for

the aviator and passenger, as shown at 14 and 15, with the motor or power plant M at the front end, the power shaft of which projects through the front wall of the fuselage and having a propeller P connected thereto. An elevating rudder or plane 14′ is mounted at the rear of the fuselage to swing on a horizontal axis to control the ascending and descending movements of the aeroplane, and is adjusted by control wires 15′ as is usual. To control the horizontal direction of the aeroplane there is provided a steering rudder 16 adjustable on a vertical axis.

The fuselage is adapted to be supported upon a wheel axle 17 by supports 18 through a resilient suspension, such as rubber, as shown at 19. A skid 20 to engage with the ground and retard the movement of the aeroplane is also connected to the fuselage by supports 21 and 21′, to extend below the wheel axle 17 the supports 21′ being connected to an upright or mast 24 secured at its lower end upon the skid 20 and intersecting the longitudinal axis of the fuselage. A skid 22 is also provided at the rear of the fuselage.

The supporting surface comprises superposed pairs of planes 25, 25 and 26, 26 to extend laterally of the fuselage and transversely to the line of flight. Each of the planes is constructed of a pair of supporting spars 27 (Fig. 7), said spars tapering from the inner ends of the planes to the outer ends and being located adjacent the forward and rear edges of the planes, and carrying transversely extending ribs 28, said spars and ribs being covered with a suitable material 29, as shown in Fig. 8. The inner ends of each of the forward spars of the upper and lower planes has a bracket 30 secured thereto with a laterally extending perforated lug 31, (Fig. 5), and the inner ends of the rear spars have a bracket 32 secured thereto with an eye-bolt 33 threaded therein (Fig. 6).

The mast 24 extends above the top of the fuselage (Fig. 4) and has a forwardly projecting arm 34 fixed thereto, the forward end of the arm being supported by braces 35, and to brace the upper end of the mast 24 braces 36 are provided. The rear supports of the upper planes are connected to the mast 24 by a sleeve 37 mounted on the mast above the arm 34, said sleeve having oppositely extending ears 38 with perforations therethrough in line with the mast (Fig. 6) to which the eye-bolt 33 is connected by a shackle 39 to permit the inner ends of the rear spars of the upper planes to have up and down and forward and rearward movement. The rear spars of the lower planes are connected through a sleeve 40 (Fig. 4) on the mast in a manner substantially the same as the connection of the rear spars for the upper planes. The inner end of the front spars of the upper planes are connected to a sleeve 41 (Figs. 4 and 5) mounted on a stud 42 at the forward end of the arm 34, said sleeve having oppositely extending perforated ears or lugs between which the ears or lugs 31 of the spar brackets 30 engage and are pivotally supported by a pin or bolt passing through the perforations in the sleeve ears and lugs 31 to permit the lateral ends of said spars to be moved upward and downward. The inner ends of the forward spars of the lower planes are connected in a manner similar to the forward spars of the upper planes to a sleeve 43 mounted on a stud 44 projecting up from a saddle 44′ slidably mounted on a support 45 (Fig. 4) to have to and fro movement in the arc of a circle whose center is in the axis of the mast 24 for a purpose to be hereinafter described.

As stated it is an object of the invention to eliminate trussing wires or the like to rigidly support the planes to extend laterally from the fuselage, and for which purpose I provide what will be herein termed as cantaliver planes. It will be obvious that by connecting the inner ends of the planes as explained the said ends will be rigidly supported. To support the lateral portions of the upper planes there is provided for each upper plane a pair of adjustable struts 46, said struts preferably comprising sections connected by turn buckles 47. These struts are releasably connected at their lower ends to the longitudinally extending members of the framework of the fuselage and diverge upwardly with the upper ends pivotally connected to hangers substantially midway of the plane spars 27, as shown at 49 Figs. 3 and 7.

The lateral portions of the lower planes are supported by struts 50 connected at their lower ends to a collar or sleeve 51 (Fig. 4) rotatably mounted on the mast 24 adjacent the support thereof on the skid 20, said struts diverging or extending upwardly and laterally, and releasably and pivotally connected at their upper ends substantially midway of the rear spars of the lower planes, as shown at 52, Fig. 2. The forward end of the lateral portions of the lower planes are supported by struts 53 pivotally connected to the sleeve 51 at their lower ends and diverging upwardly, or extending upwardly and forwardly and laterally with their upper ends pivotally connected to the forward spars of the lower planes substantially midway thereof, as shown at 54, Fig. 2. The struts 50 and 53 are similar to the struts 46 comprising sections connected by turn buckles. It will be obvious that by a structure as just described there is provided a structure in which the planes are rigidly supported to extend laterally of the fuselage.

As stated it is also an object of the invention to provide a structure in which the planes are adapted to be swung backward with the upper planes to extend in overlapped relation above the fuselage and the lower planes below the same to permit of the transporting of the aeroplane readily upon the ground as along a narrow roadway, and to facilitate the starting of the aeroplane. To swing the planes to such position the pins or bolts connecting the forward spars of the upper plane to the sleeve 42 are removed, as well as the pins or bolts to connect the forward spars of the lower planes to the sleeve 43 on the saddle 44′. The struts 50, 53 are then released from the lower planes and the lower planes swung backward to assume an overlapped position below the fuselage, which is permissible due to its shackle connection with the collar 40 on the mast, and secured in such position by a pin or staple passing through a perforation in lugs 56′ at the lateral ends of the planes and in lugs on a bracket 58 pivotally secured to the bottom of the fuselage, said brackets being adapted to normally lie contiguous to the bottom of the fuselage and secured in such position. After the lower planes are secured in their rear position the struts 50, 53 are folded up against the fuselage and secured in such position in a suitable manner. The struts 46 are then disconnected from the fuselage and swung up under the upper planes and retained in such position by a flexible or resilient band 55 (Figs. 3 and 8), when the upper planes are swung back on the connection of the rear spars with the collar 37, the shackles 39 not only permitting the planes to be moved backward but also upward or downward so that they may assume an overlapped position over the fuselage, as shown in dot and dash lines in Fig. 2. The upper planes are secured in this position by a pin or staple passing through a perforation in lugs 56 at the outer ends of the planes and in lugs on a bracket 57 pivotally mounted on the top of the fuselage and normally adapted to assume a position contiguous to the fuselage. It will be obvious that the planes may be as readily moved and rigidly secured in position to extend laterally from the fuselage.

It will be noted that the upper planes are secured in fixed position while the lower planes due to their connection with the mast 24 and the saddle 44′ are adapted to have a limited to and fro movement. As stated it is an object of the invention to also eliminate the use of ailerons or the warping of the supporting surface to control lateral stability or balancing, and for this purpose the lower planes are pivotally supported whereby the lateral portions of a plane at either side of the fuselage may be moved forward or advanced in a direction relative to the line of flight, while the lateral portion of the lower plane at the opposite side of the fuselage is moved rearward or retracted in a direction relative to the line of flight, and thereby increasing the lifting efficiency of the plane at the side of the aeroplane at which the plane is moved forward and decreasing the lifting efficiency of the plane at the side of the aeroplane at which the plane is moved rearwardly. The upper planes are preferably so constructed that the leading edge thereof will be at right angles to the fuselage with the leading edge of the lower planes inclining to the rear from a point in line with the axis of the fuselage and the leading edge of the upper planes, as clearly shown in Fig. 1. By so sweeping back the lower planes there will be a certain spill of the air from the lateral ends of said planes. But assuming the aeroplane is tipping to the right side as viewed from Fig. 1, to right the aeroplane or bring it back to balance the lower plane at the right is moved forward to a position with the leading edge thereof substantially parallel with the leading edge of the upper plane at the right, the lower plane at the left being simultaneously moved a corresponding distance to the rear, as shown in dot and dash lines in Fig. 1. It will be obvious with the lower right plane in this position the spilling of the air from the lateral end of said plane will be retarded, with the result that the lifting efficiency of the air or leverage of said plane will be increased and thereby raise said side of the aeroplane, whereas the inclination of the lower plane at the left being increased the spill of the air from the lateral end of such plane will be increased with the result that the lifting efficiency of the air or leverage of the plane at the left will be decreased and causing said side of the aeroplane to lower. When the aeroplane is brought to balance the lower planes are again moved to the dotted line position shown in Fig. 1. As the lower planes are moved to increase the lifting efficiency at one side of the aeroplane and decrease the lifting efficiency at the opposite side of the aeroplane the aeroplane will have a tendency to turn in that direction or side at which the lifting efficiency is increased, and to counteract this action the rudder 16 is moved simultaneously to that side of the aeroplane at which the lower plane is being retracted.

To adjust the lower planes to advance and retract the lateral portions and simultaneously swing the rudder 16 to that side of the aeroplane at which the lower plane is being moved to the rear there is provided a pair of foot levers 60, one of which, as the one to adjust the right hand plane is shown in Figs. 9 and 10. These levers are

pivotally carried by brackets 61 fixed to one of the braces 12 of the fuselage. In order that the plane at the right will be moved forward as the foot lever at the right is moved forward, and the plane at the left will be moved forward when the lever at the left is moved forward, the foot levers are operatively connected to the respective planes through levers 62 pivotally carried by the brackets 61 and to one end of which the foot levers are operatively connected, as at 63, the other ends of said levers being pivotally connected to the rear spars 27 of the lower planes, as at 64. These foot levers 60 are also connected to the rudder 16 by control wires 65, and in order to move the rudder 16 to that side of the aeroplane at which the plane is being moved to the rearward the lever for the right plane is connected to the left side of the rudder 16, and the other foot lever to the right side of said rudder.

By the provision of the turn buckles in the supporting struts 46, 50 and 53 for the planes the angle of incidence of the planes, or the angle from the front to the rear, may be adjusted by raising or lowering the leading edge of the planes by shortening or lengthening the struts for the front of the planes through the turn buckles. To permit of this upward and downward adjustment of the forward edges of the planes the sleeves 41 and 43 to which the forward spars of the respective planes are connected are mounted to be adjusted up and down upon their respective supports and locked in adjusted positions. The adjustable mounting for the sleeve 41 is shown in Fig. 5, and the mounting for the sleeve 43 on the saddle 44′ is substantially similar. For this purpose the supporting stud is provided with screw threads, as shown at 67, with which a nut 68 has screw threaded connection and upon which the sleeve rests, the sleeve being secured in adjusted position upon the stud by a nut 69 threaded onto the end of the stud. It will be evident that the planes may be adjusted to extend at right angles to the fuselage and have the same angle of incidence, or at different angles of incidence relative to each other.

It will be obvious that by the adjustment of the supporting struts for the planes they may be supported to extend not only at right angles to the fuselage, but that the planes may be given different dihedral angles.

The rear skid 22 is adapted to support the aeroplane upon the ground in starting a flight and in alighting, at which time it serves in coöperation with the skid 20 as a brake to retard the movement of the aeroplane.

To facilitate the transporting of the aeroplane on the ground a traction wheel 70 is provided for the rear end of the aeroplane, said wheel being carried by a fork connected to the vertical post 71 of the rudder 16 to have movement imparted thereto by the control wires for the rudder. The support for the wheel has a hinged connection with the rudder post 71 whereby while flying the wheel may be swung up to the dotted line position shown in Fig. 2 above the skid 22 and secured in such position. It will be obvious that said wheel serves as a means to steer the aeroplane while transported on the ground, and by the use of this wheel with the planes swung back to extend above and below the aeroplane the aeroplane may be transported on the ground under its own power through the use of the propeller.

Variations may be resorted to within the scope of my invention, and portions of the improvements may be used without others.

Having thus described my invention, I claim:

1. In an aeroplane the combination of a fuselage; superposed supporting planes; and means to secure the planes to the fuselage to extend laterally therefrom and adapted to be swung backward independently of each other to extend longitudinally of the fuselage in overlapped relation, substantially as and for the purpose specified.

2. In an aeroplane the combination of a fuselage; superposed planes; and means to releasably secure the planes to the fuselage to rigidly extend laterally therefrom and adapted to be swung backward one independently of the other to extend longitudinally of the fuselage with the upper planes in overlapped relation above and the lower planes in overlapped relation below the fuselage, substantially as and for the purpose specified.

3. In an aeroplane the combination of a fuselage; superposed planes; means to rigidly support the upper planes to extend laterally from the fuselage; and means to support the lower planes to extend laterally and rigidly from the fuselage and adapt the lateral portions of said lower planes to be moved forward and backward.

4. In an aeroplane the combination of a fuselage; superposed planes; means to rigidly support the upper planes to extend laterally from the fuselage; and means to pivotally support the lower planes to extend laterally and rigidly from the fuselage and adapt the lateral ends of said lower planes to be moved forward and backward, substantially as and for the purpose specified.

5. In an aeroplane the combination of a fuselage; superposed planes with the leading edge of the upper planes extending substantially at right angles to the axis of the fuselage; means to rigidly support the upper planes to extend laterally from the fuselage;

means to pivotally support the lower planes to normally extend laterally and rigidly from the fuselage with the leading edge of said planes inclining to the rear from a point centrally of the fuselage and the leading edge of the upper planes, and said lower planes adapted to be moved forward and backward, substantially as and for the purpose specified.

6. In an aeroplane, the combination of a fuselage; superposed planes; means to rigidly support the upper planes from the fuselage to extend laterally therefrom; means to pivotally support the lower planes from the fuselage to extend laterally and rigidly therefrom; and means to move the lateral end of either of said lower planes forward and simultaneously therewith the lateral end of the other plane rearward and maintain them in adjusted position, substantially as and for the purpose specified.

7. In an aeroplane the combination of a fuselage; a rudder pivotally carried by the fuselage; superposed planes; means to rigidly support the upper planes from the fuselage to extend laterally therefrom; means to pivotally support the lower planes to extend laterally of the fuselage; means to move the lateral end of either of said lower planes forward and simultaneously with such movement move the lateral end of the other plane a corresponding distance rearward and move the rudder toward the side of the rearward moving plane, substantially as and for the purpose specified.

8. In an aeroplane the combination of a longitudinally extending fuselage; superposed planes connected adjacent their inner ends to the fuselage; and struts connected to the fuselage and planes to rigidly support the lateral ends of the planes from the fuselage independently of each other, said struts diverging upwardly from the fuselage.

9. In an aeroplane the combination of a longitudinally extending fuselage; superposed planes connected adjacent their ends to the fuselage, each plane having a spar extending longitudinally thereof adjacent the forward and rear edges; and struts connected to the fuselage and each of the spars of the planes to rigidly support the lateral portions of the planes from the fuselage one independently of the other, said struts diverging upwardly from the fuselage.

10. In an aeroplane the combination of a longitudinally extending fuselage; superposed planes connected adjacent their inner ends to the fuselage, each plane having a spar extending longitudinally thereof adjacent the forward and rear edges; struts connected to the fuselage and each of the spars of the planes to rigidly support the lateral portions of the planes and diverging upwardly from the fuselage, the struts for the upper planes being releasably connected to the fuselage and adapted to fold up under the upper planes and the struts for the lower planes being releasably connected to the lower planes and adapted to be folded up against the fuselage, substantially as and for the purpose specified.

11. In an aeroplane the combination of a longitudinally extending fuselage; superposed planes pivotally connected adjacent their inner ends to the fuselage to adapt said planes to extend laterally of the fuselage and swing backward with the upper planes in overlapped relation above the fuselage and the lower planes below the fuselage; spars extending longitudinally of the planes adjacent the forward and rear edges; and struts connected to the fuselage and each of the spars of the planes to rigidly support the lateral portions of the planes and diverging upwardly from the fuselage, the struts for the upper planes being releasably connected to the fuselage and adapted to fold up under the upper planes and the struts for the lower planes being releasably connected to the lower planes and adapted to be folded up against the fuselage, substantially as and for the purpose specified.

12. In an aeroplane, the combination with a fuselage, of superposed planes to extend laterally from the fuselage; means to support the lower planes from the fuselage to move the lateral end of either of said planes forward and simultaneously move the lateral end of the other lower plane backward to increase and decrease the lifting efficiency at opposite sides of the aeroplane; and means to move the lower planes backward and forward for the purpose specified.

13. In an aeroplane, the combination with a fuselage, of planes in superposed pairs to extend laterally from opposite sides of the fuselage; and means to support and adapt the lower planes to be adjusted to move either of the lateral ends forward and simultaneously therewith move the lateral end of the other lower plane rearward to increase and decrease the lifting efficiency of said planes at opposite sides of the fuselage for the purpose specified.

14. In an aeroplane the combination with a fuselage, of rigid planes extending in superposed pairs laterally from the fuselage; means to move the lateral end of either one of the lower planes forward to increase the lifting efficiency at one side of the aeroplane and simultaneously move the lateral end of the other lower plane to the rear a corresponding distance to decrease the lifting efficiency at said side of the aeroplane; and a vertical rudder movable to that side of the aeroplane at which the lower plane is moved to the rear, substantially as and for the purpose specified.

15. In an aeroplane the combination of a fuselage; planes extending in superposed

pairs laterally from the fuselage; means to move the lateral end of either of the lower planes forward to increase the lifting efficiency at one side of the aeroplane and simultaneously move the lateral end of the other plane a corresponding distance to the rear to decrease the lifting efficiency at said side of the aeroplane; a vertical rudder; and means to move the rudder to that side of the aeroplane the lower plane of which is moved to the rear, substantially as and for the purpose specified.

16. In an aeroplane the combination of superposed planes, the upper planes of which are secured in fixed position to extend laterally, and the lower planes adjustably supported to move the lateral ends forward and rearward to increase the lifting efficiency at one side of the aeroplane and simultaneously decrease the lifting efficiency at the opposite side of the aeroplane; a vertical rudder; and means to adjust either one of the lower planes to move the lateral end forward and simultaneously adjust the other lower plane to move the lateral end to the rear a distance to correspond with the forward movement of the forwardly moving plane and move the rudder to that side of the aeroplane at which the lower plane is moving to the rear, substantially as and for the purpose specified.

17. In an aeroplane a fuselage, supporting surfaces to extend laterally from the fuselage and transversely to the line of flight and pivotally supported at their inner rear edges by the fuselage to swing on a vertical axis whereby either of the lateral portions of said surfaces being adapted to be advanced relative to the line of flight and simultaneously therewith the opposite lateral portion retracted to decrease and increase the lifting efficiency at opposite sides of the aeroplane, substantially as and for the purpose specified.

18. In an aeroplane a supporting surface to extend transversely to the line of flight; a vertical rudder; and means to advance and retract the lateral portions of said supporting surface relative to the line of flight and simultaneously therewith move the rudder in a direction toward the lateral portion of the supporting surface having the retracting movement, substantially as and for the purpose specified.

19. In an aeroplane the combination of a fuselage; supporting surfaces to extend laterally from the fuselage and transversely to the line of flight; a horizontal steering rudder movable on a vertical axis; a rudder movable on a horizontal axis to control the upward and downward direction of the aeroplane; and means to advance and retract the lateral portions of the surface at opposite sides of the fuselage relative to the line of flight and simultaneously move the horizontal steering rudder to that side of the fuselage at which the lateral portion of the supporting surface is retracted, substantially as and for the purpose specified.

20. In an aeroplane the combination of a fuselage; superposed planes connected at their inner ends to the fuselage to extend laterally therefrom; upwardly diverging struts to support the lateral portions of the upper planes from the fuselage; and upwardly diverging struts to support the lateral portions of the lower planes from the fuselage independent of the upper planes, substantially as and for the purpose specified.

21. In an aeroplane the combination of a fuselage including a perpendicular mast intersecting the longitudinal axis of the fuselage; superposed planes to extend laterally of the fuselage; means to support and connect the inner ends of the upper planes to the mast; struts to support the lateral portions of the upper planes from the fuselage; means to connect the lower planes at the inner ends to the mast; and struts to support the lateral portions of the lower planes by the mast, substantially as and for the purpose specified.

22. In an aeroplane the combination of a fuselage including a perpendicular mast intersecting the longitudinal axis of the fuselage; superposed planes; means to rigidly support the upper planes to extend laterally of the fuselage; and means to pivotally support the lower planes by the mast, substantially as and for the purpose specified.

23. In an aeroplane the combination of a fuselage including a perpendicular mast intersecting the longitudinal axis of the fuselage; superposed planes; means to rigidly support the upper planes to extend laterally of the fuselage; means to pivotally support the lower planes at the inner ends adjacent the lateral edges and the lateral portions thereof by the mast; a saddle to which the inner ends of the lower planes are connected toward the forward edges; and a support in the fuselage upon which the saddle is slidably mounted, substantially as and for the purpose specified.

24. In an aeroplane the combination of a fuselage including a perpendicular mast having a forwardly extending arm; superposed planes; means to secure the inner ends of the upper planes to the arm extending from the mast; upwardly diverging struts connected to the fuselage and upper planes to support the lateral portions of said planes; means to connect the inner ends of the lower planes adjacent the rear edge to the mast; a saddle to which the inner ends of the lower planes are connected toward the forward edges; a support in the fuselage upon which the saddle is slidably mounted; and struts connected at one end to the mast and at the opposite ends to the lower planes

adjacent the forward and rear edges to support the lateral portion of said planes, substantially as and for the purpose specified.

25. In an aeroplane the combination of a fuselage; supporting surfaces pivotally connected to the fuselage at their inner ends to extend laterally therefrom; and adjustable struts to support said surfaces in fixed position from the fuselage in a substantially horizontal plane and at right angles to the fuselage or at different dihedral angles thereto.

26. In an aeroplane the combination of a fuselage; supporting surfaces pivotally connected to the fuselage at their inner ends to extend laterally therefrom; and adjustable struts to support said surfaces in fixed position from the fuselage at different angles of incidence and at right angles to the fuselage or at different dihedral angles thereto.

27. In an aeroplane superposed supporting surfaces, and adjustable means to change the position of the entering edge of the surfaces and maintain them in such position to support said surfaces in fixed position at different angles of incidence, and to support said surfaces in fixed position at the same angle of incidence or at different angles of incidence relative to each other.

28. In an aeroplane the combination of a fuselage; supporting surfaces to extend in superposed pairs laterally from the fuselage; and adjustable struts to fixedly support the lateral portions of the surfaces from the fuselage in a horizontal plane and at right angles to the fuselage or at different dihedral angles thereto.

29. In an aeroplane the combination of a fuselage; supporting surfaces to extend in superposed pairs laterally from the fuselage; and adjustable struts to fixedly support lateral portions of said surfaces from the fuselage at different angles of incidence and at right angles to the fuselage; or at different dihedral angles thereto.

30. In an aeroplane the combination of a fuselage; supporting surfaces to extend in superposed pairs laterally from the fuselage; and adjustable struts to fixedly support lateral portions of said surfaces from the fuselage at the same angle of incidence, or at different angles of incidence relative to each other, and at right angles to the fuselage or at different dihedral angles thereto.

31. In an aeroplane the combination of a rudder; a post to carry said rudder rotatable on a vertical axis to control the lateral movements of the rudder; means to adjust said post and thereby the rudder and maintain it in adjusted position; a traction wheel; and a fork carrying said traction wheel connected to and supported by the rudder post to have movement therewith and to have adjustment on an axis transverse to the axis of the rudder post, substantially as and for the purpose specified.

32. In an aeroplane, the combination with a fuselage of supporting surfaces to extend laterally thereof, and adjustable means to support and change the position of the entering edge of the surfaces relative to the line of flight and maintain them in such position to support said surfaces in fixed position at different angles of incidence, comprising a support on the fuselage adjustable in a vertical direction to which the surfaces are connected at their inner ends adjacent the forward edges, and adjustable struts connected to the fuselage to support the lateral portions of the planes adjacent the forward edge.

33. In an aeroplane, the combination of a fuselage; supporting surfaces to extend laterally from the fuselage; means to support said surface at the inner forward ends from the fuselage adjustable in a vertical direction; and adjustable struts connected to the fuselage and the supporting surface to rigidly support the lateral portions of the surfaces and the surfaces to extend in a substantially horizontal plane and at right angles to the fuselage, or at different dihedral angles thereto.

34. In an aeroplane, the combination of a fuselage; supporting surfaces to extend laterally from the fuselage; means to support said surfaces at the inner rear edges to swing on a horizontal axis; a support for the inner forward edge of the planes adjustable in a vertical direction; and adjustable struts connected to the fuselage and the supporting surfaces adjacent their forward and rear edges to rigidly support the lateral portions of the surfaces and adapted to change the entering edge of the surfaces to change the angle of incidence of the surfaces, and the surfaces to extend in a substantially horizontal plane and at right angles or at different dihedral angles to the fuselage.

35. In an aeroplane, the combination of a fuselage; superposed planes to extend laterally from the fuselage; means to connect the inner rear edges of the upper planes to the fuselage to have movement on horizontal and vertical axes; means to support the inner forward edge of the upper planes to have movement on a horizontal axis and to adjust the entering edges of both planes as a unit in a vertical direction; adjustable struts connected to the fuselage and planes to rigidly support the lateral portions of said planes; means to support the lower planes at their inner rear edges to have movement on vertical and horizontal axes; adjustable struts to support the lateral portions of the planes from the pivotal support of the planes at the inner rear edges; means to connect the lower planes at their forward inner edges to adjust the entering edges of both of the lower planes as a unit in a vertical direction and permit both of said planes

to be adjusted as a unit in a vertical direction and move both planes as a unit on a vertical axis on the rear inner support of said planes; and means to impart movement to the lower planes to move the lateral portions fore and aft, substantially as and for the purpose specified.

36. In an aeroplane, the combination of a fuselage; supporting surfaces to extend laterally from the fuselage; means to connect the inner rear edges of the planes to the fuselage to have movement on horizontal and vertical axes; and means to adjustably support the inner forward edge of the planes to adjust the entering edges of the planes as a unit in a vertical direction and maintained fixed in adjusted position.

37. In an aeroplane, the combination with superposed pairs of supporting surfaces, the lower surfaces of which are adjustable to move the lateral portions thereof forwardly and backwardly for lateral balancing, of means to support the planes to change the angle of incidence and the dihedral angle of the planes.

Signed at New York city, in the county of New York and State of New York, this 16th day of May, 1917.

FRANK A. CERRUTI.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."