A. F. W. MACMANUS

AEROPLANE.

APPLICATION FILED NOV. 26, 1909.

1,010,932.

Patented Dec. 5, 1911.

6 SHEETS—SHEET 1.

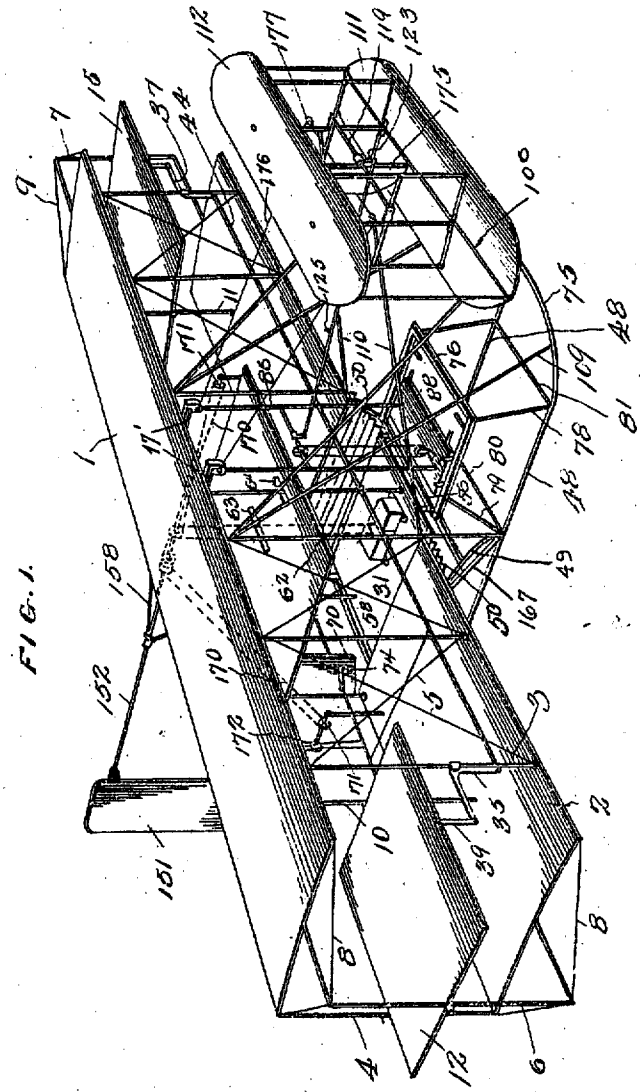


FIG. 1.

WITNESSES

C. K. Davis.

R. P. Fuhrmann

INVENTOR

A. F. W. Macmanus

By C. L. Parker.

Attorney

A. F. W. MACMANUS.

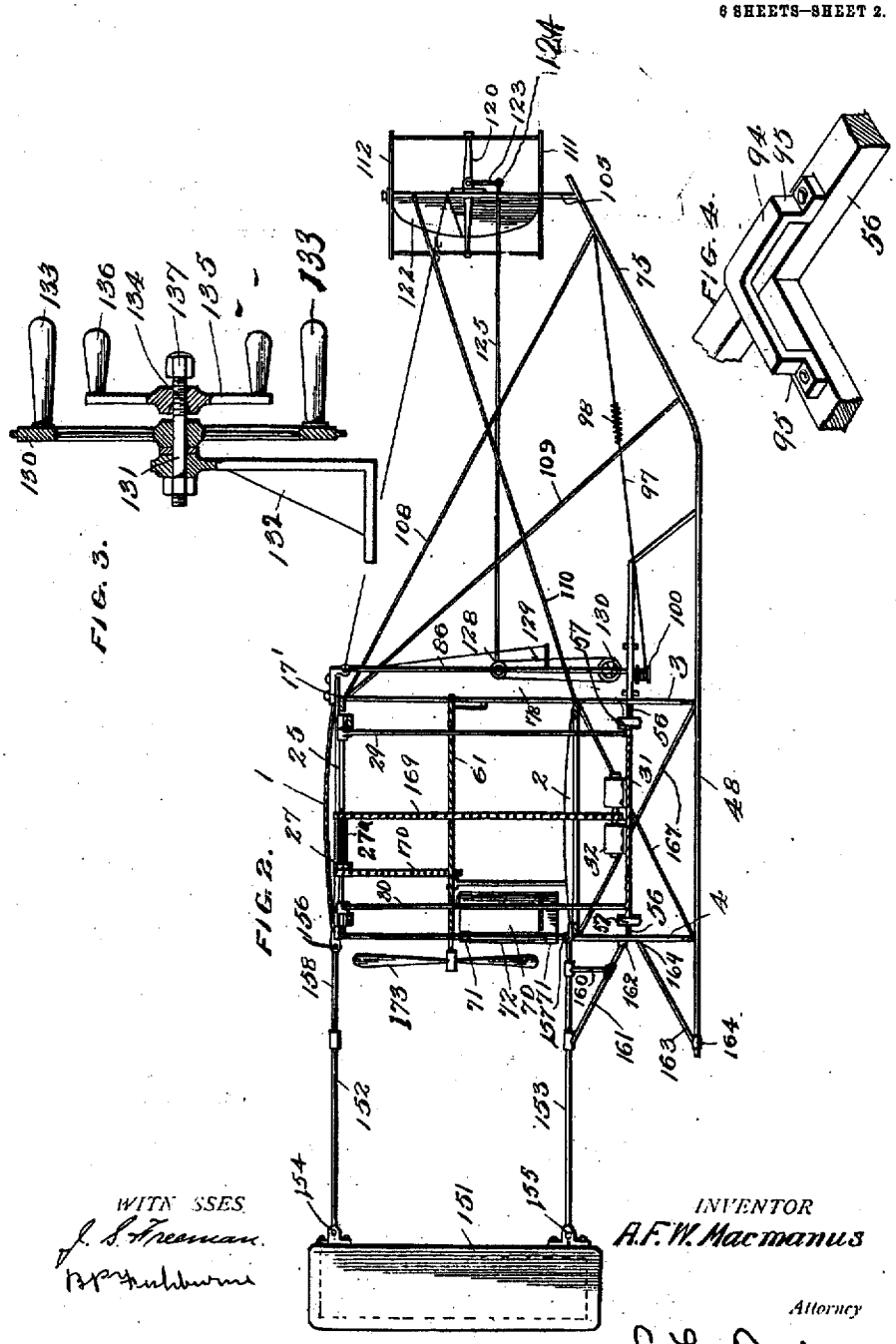
AEROPLANE.

APPLICATION FILED NOV. 26, 1909.

1,010,932.

Patented Dec. 5, 1911

6 SHEETS—SHEET 2.



WITNESSES

J. S. Freeman.

INVENTOR

A. F. W. Macmanus

Attorney

C. L. Parker.

A. F. W. MACMANUS.

AEROPLANE.

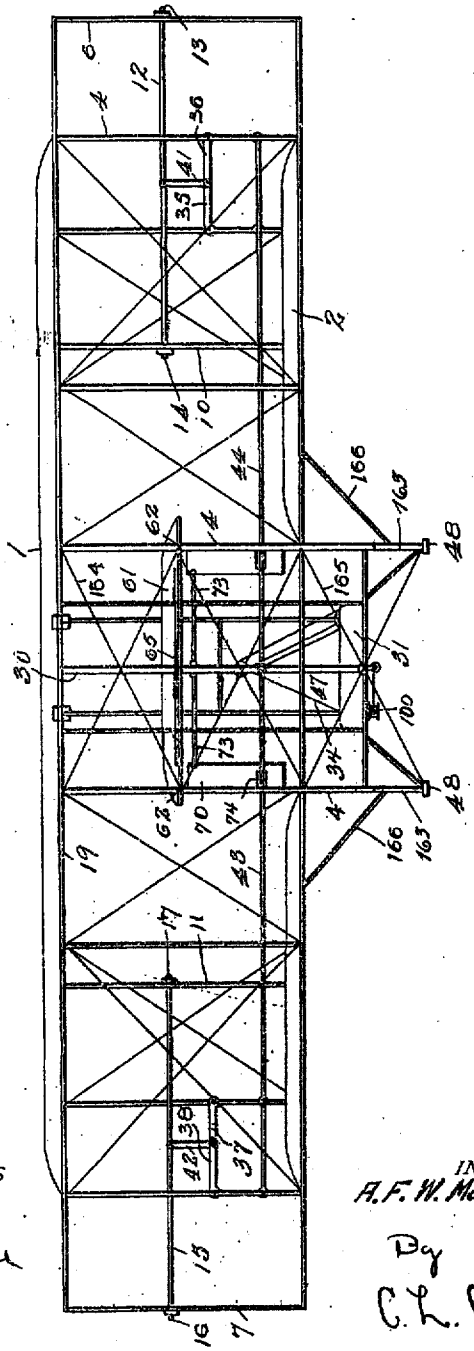
APPLICATION FILED NOV. 28, 1908.

1,010,932.

Patented Dec. 5, 1911.

6 SHEETS—SHEET 3.

FIG 22



WITNESSES

C. K. Davis

B. P. Fuhrhouse

INVENTOR

A. F. W. Macmanus,

By

Attorney

C. L. Parker.

A. F. W. MACMANUS.

AEROPLANE.

APPLICATION FILED NOV. 26, 1909.

1,010,932.

Patented Dec. 5, 1911.

6 SHEETS—SHEET 4.

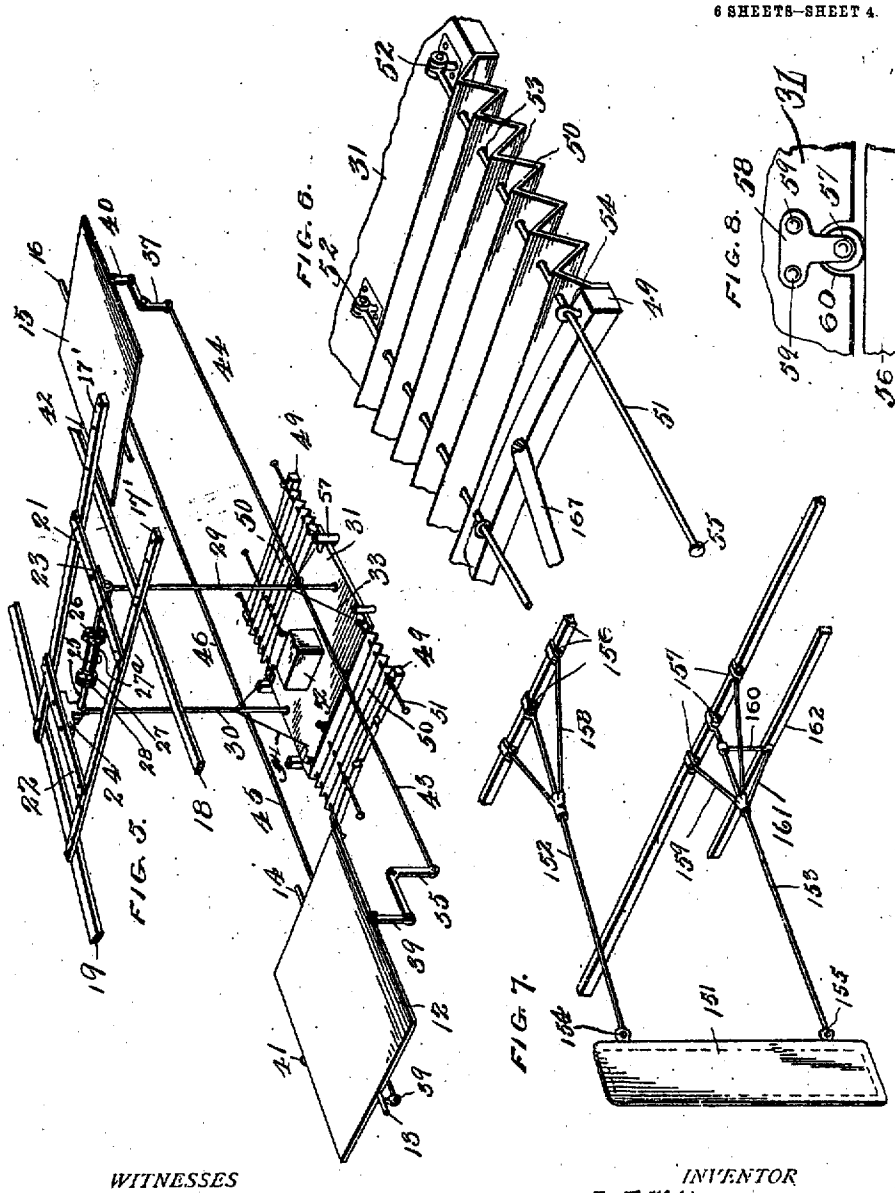


FIG. 5.

FIG. 6.

FIG. 8.

FIG. 7.

WITNESSES

C. K. Davis

B. P. Hubbard

INVENTOR

A. F. W. Macmanus.

By

Attorney

C. L. Parker.

A. F. W. MACMANUS.

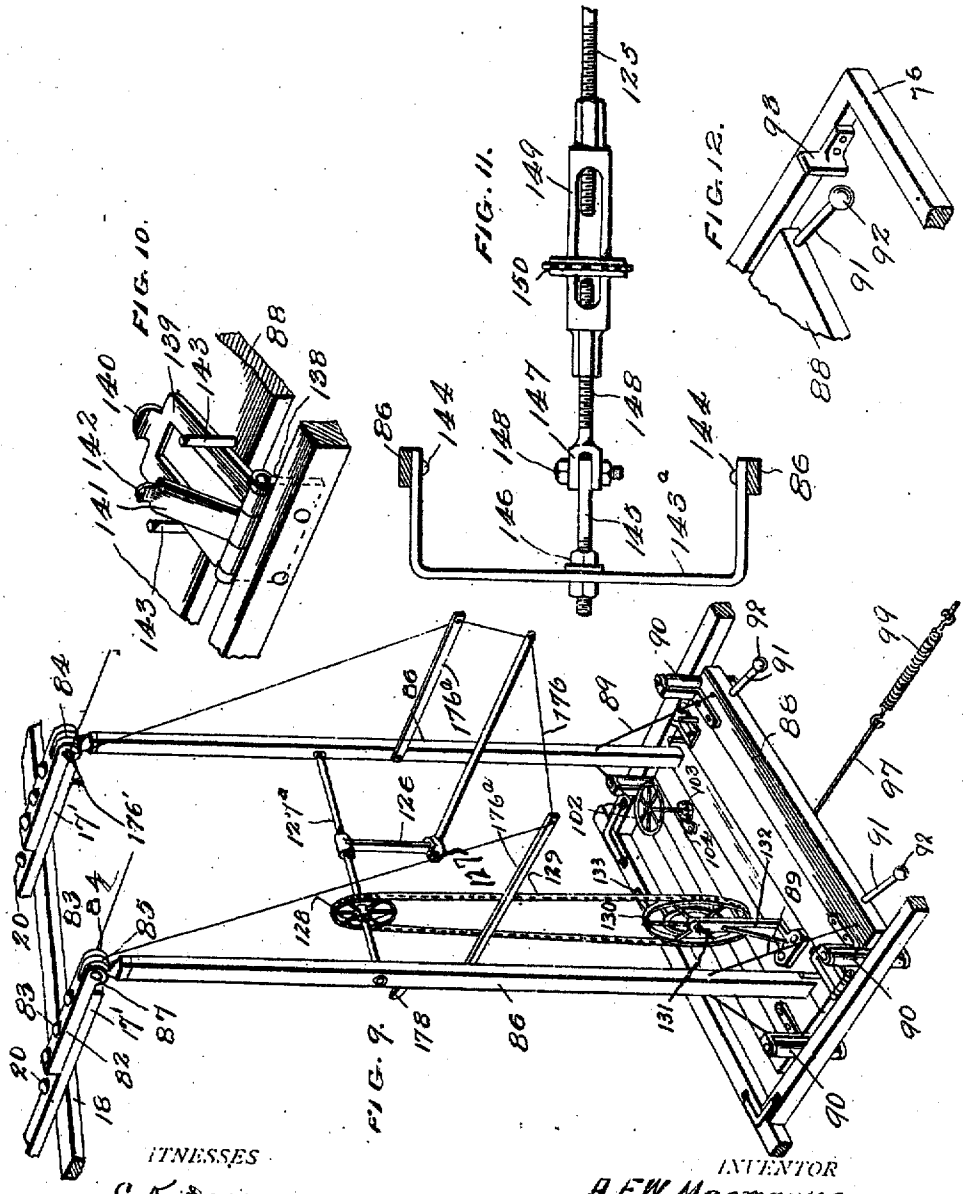
AEROPLANE.

APPLICATION FILED NOV. 26, 1909.

1,010,932.

Patented Dec. 5, 1911.

6 SHEETS—SHEET 5.



WITNESSES

C. F. Davies

H. P. Hinkhouse

INVENTOR

A. F. W. Macmanus.

By

C. F. Parker.

Attorney

A. F. W. MACMANUS.

AEROPLANE.

APPLICATION FILED NOV. 26, 1909.

1,010,932.

Patented Dec. 5, 1911.

6 SHEETS—SHEET 6.

FIG. 13.

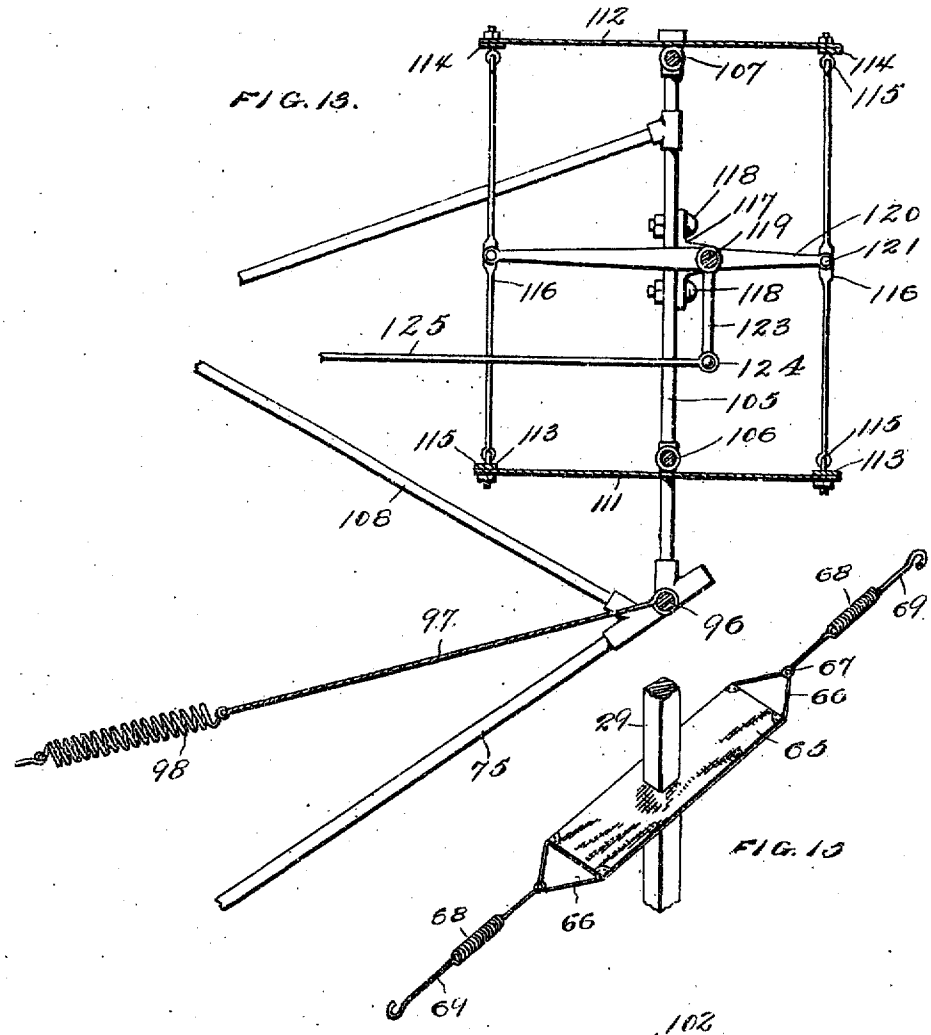
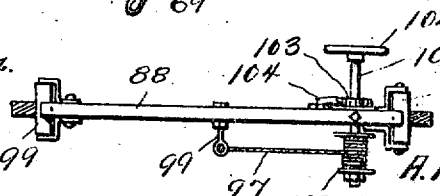


FIG. 13

FIG. 14.



WITNESSES

C. K. Davis.

B. P. Fruhburne

INVENTOR

A. F. W. Macmanus.

By

Attorney

C. L. Parker.

UNITED STATES PATENT OFFICE.

AUGUSTUS F. W. MACMANUS, OF SAN ANTONIO, TEXAS.

AEROPLANE.

1,010,932. Specification of Letters Patent. Patented Dec. 5, 1911.

Application filed November 26, 1909. Serial No. 528,965.

To all whom it may concern:

Be it known that I, AUGUSTUS F. W. MACMANUS, a citizen of the United States, residing at San Antonio, in the county of Bexar and State of Texas, have invented certain new and useful Improvements in Aeroplanes, of which the following is a specification.

This invention relates to flying machines, and more particularly to "heavier-than-air" flying machines.

An important object of my invention is to provide a flying machine, embodying automatic means for completely retaining the equilibrium of the same, during its flight.

A further object of my invention is to provide a flying machine embodying means for automatically preventing the body planes of the same from being inclined to the course of flight, the said automatic means being convertible into manually operative means, whereby the machine may be raised and lowered.

The final object of my invention is to provide a flying machine, which will always be under complete control of the operator, and which will normally pursue a horizontal straight flight when propelled through the air.

My machine consists generally of superposed body-planes arranged transversely to the course of flight, means for preventing the lateral tilting of said body planes, and means for preventing said body planes from tilting upon their longitudinal axes for assuming inclined positions with relation to the course of flight of the machine.

In the accompanying drawings, forming a part of this specification, and in which like numerals of reference are used to designate like parts throughout the same, Figure 1 is a perspective view of my machine. Fig. 2 is a vertical cross-sectional view of the same. Fig. 2ª is a rear view of my device. Fig. 3 is a vertical cross-sectional view of a device used to operate the forward horizontal rudder. Fig. 4 is a fragmentary view of the frame within which the passenger platform swings, showing in perspective one of the bumpers. Fig. 5 is a perspective view of the horizontal equilibrium retaining planes, and actuating means therefor. Fig. 6 is a fragmentary view of the motor platform, and members associated therewith. Fig. 7 is a perspective view of the rear vertical rudder. Fig. 8 is an enlarged fragmentary view of a portion of the motor-platform, showing in detail one of the rollers secured thereto. Fig. 9 is a perspective view of the passenger platform, and associated members. Fig. 10 is an enlarged perspective view of a device used to lock the passenger-platform to the frame within which the same is arranged. Fig. 11 is a perspective view of a modified form of connecting means between the passenger-platform and the forward horizontal rudder. Fig. 12 is a fragmentary perspective view of the passenger-platform and frame within which the same is arranged, and showing in perspective members associated therewith. Fig. 13 is a vertical cross-sectional view of the forward horizontal rudder. Fig. 14 is a front view of the passenger platform, and Fig. 15 is a fragmentary perspective view of one of the supports for the motor platform, showing in perspective a device for covering an opening in a plane through which the support extends.

In the preferred embodiment of my invention as shown, 1 and 2 designate superposed body-planes which are arranged transversely to the line of flight of the machine and are connected upon the forward and rear edges thereof by means of spaced parallel vertical uprights 3 and 4 respectively, which are braced by the diagonally arranged wires 5 connected thereto. The body planes 1 and 2 are provided at the ends thereof with U-shaped brackets 6 and 7, which are in alinement with each other and with the central longitudinal axes of said body-planes 1 and 2. The U-shaped brackets 6 and 7 are braced by means of the wires 8 and 9, which are connected thereto and to the corners of the body planes 1 and 2. Near and equidistantly spaced away from the U-shaped brackets 6 and 7 respectively, are uprights 10 and 11, which are also in alinement with said U-shaped brackets. Between the U-shaped bracket 6 and upright 10, is pivotally secured an equilibrium retaining plane 12, provided with the trunnions 13 and 14 arranged within the central longitudinal axis of the plane 12 and rotatably mounted within the U-shaped bracket 6 and the upright 10 respectively, and near the centers thereof. Between the U-shaped bracket 7 and the upright 11, is arranged a corresponding equilibrium retaining plane 15, provided with the trunnions 16 and 17 arranged within the central longitudinal

axis of the plane 15 and rotatably mounted within the U-shaped bracket 7 and the upright 11 respectively. The equilibrium retaining planes 15 and 12, are in horizontal alinement with each other when they assume their normal horizontal position.

I will now proceed to explain the means by which the equilibrium-retaining planes 12 and 15 may be inclined longitudinally to the course of flight of the machine.

The upper plane 1, is provided with strips 17′ longitudinal of the machine, which are spaced from each other and arranged near and equidistantly from the central transverse axis of the plane 1. The strips 17′ are arranged upon the upper side of transverse rods 18 and 19, which form the forward and rear edges of the upper plane 1, respectively and are secured to said rods 18 and 19 by any suitable means, as at 20. The strips 17′ extend forwardly beyond the forward edge-rod 18, for a purpose hereinafter to be explained and said strips 17′ support spaced strips 21 and 22, which are parallel with each other and arranged at substantially right angles to said strips 17′, and said strips 21 and 22 are provided at the middle thereof with the depending brackets 23 and 24 respectively, which are suitably secured thereto. The strip 22 is arranged near the rear-edge strip 19, while the strip 21 is farther removed from the forward-edge strip 18. Within the depending brackets 23 and 24, is mounted a shaft 25 which is provided near its center with a rotatable sleeve 27ª, which in turn is provided at its forward end with a fixed sprocket wheel 26 and at its rear end with fixed sprocket wheels 27 and 28.

Loosely mounted upon the shaft 25, between and near the brackets 23 and 24, are the supports 29 and 30 respectively, which have their lower ends secured to a platform 31, carrying a motor 32, which is the source of power for operating the propellers hereinafter to be described. The supports 29 and 30 are further connected to the platform 31, which I will now term the motor-platform, by means of diagonal brace wires 33 and 34 respectively which are connected to said platform 31 near the corners thereof.

Near the equilibrium-retaining planes 12 and 15 are arranged bell-crank-levers 35, 36 and 37, 38 respectively. The forward bell-crank levers 35 and 37 are pivotally mounted upon the outer uprights 3 near the end of said planes 1 and 2, said bell-crank levers 35 and 37 being oppositely arranged and connected to the forward edge of the equilibrium retaining planes 12 and 15 respectively, by means of pivotal links 39 and 40. The bell-crank levers 36 and 38 are pivotally connected to the uprights 4 near the ends of said planes 1 and 2 and are connected to the equilibrium retaining planes 12 and 15 at the rear edge thereof by means of pivotal links 41 and 42 respectively. The bell-crank levers 35 and 36 are oppositely arranged with relation to each other and the bell-crank levers 37 and 38 have the same relative arrangement reversed. The forward bell-crank levers 35 and 37 are pivotally connected to the support 29 by means of rods 43 and 44 respectively, and the rear bell-crank levers 36 and 38 are connected to the support 30 by means of the pivotally connected rods 45 and 46. This arrangement of the equilibrium retaining planes 12 and 15 and the means by which they are connected to the supports 29 and 30, is similar to the construction shown in my copending application bearing the Serial Number 518,208.

The equilibrium-retaining planes 12 and 15, as shown in Fig. 5, are rigid and are adapted to be inclined at an angle to the course of flight without being flexed. I desire it understood however, that I may substitute flexible planes for the rigid planes 12 and 15, and the actuating members for the same will be slightly modified, in a similar manner as described in my said pending application.

The lower body plane 2 is provided at its center with a rectangular opening 47 extending transversely thereof the entire width of the plane 2, and within this opening 47 and below plane 2 is arranged the motor-platform 31 above referred to. The uprights 3 and 4 arranged upon the forward and rear edges of the body planes 1 and 2 and adjacent the opening 47, are produced to extend down below the body plane 2 and are connected by horizontally arranged strips 48 hereinafter to be described. Between the produced uprights 3 and 4 below plane 2 and in horizontal alinement with the platform 31, are arranged horizontal curved strips 49 upon each side of said platform 31. It will be obvious by reference to Fig. 1 that the opening 47 in plane 2 is relatively large and unless this opening is covered, the resisting efficiency of said plane 2 would be greatly reduced. I overcome this however, by employing sections of accordion-plaited material 50, which are secured to each side of the motor-platform 31 and to the curved horizontal strips 49. Each of the sections of accordion-plaited material is prevented from sagging by means of rods 51, which are pivotally connected to the edge of the platform 31 as at 52 and extends through openings 53 in the said accordion-plaited material 50, and through a screw-eye 54 secured upon the strip 49. It is to be understood that the rod 51 is slidably mounted within the screw-eye 54, and is provided with an enlarged end 55 which will prevent the same from being drawn out of said screw-eye 54.

By this construction, when the body planes 1 and 2 are tilted laterally upon the shaft 25, and the platform 31 becomes arranged nearer one side of the opening 47 and nearer one of the strips 49, the corresponding accordion-plaited section will be collapsed, while the opposite accordion-plaited section will be expanded, and the opening 47 will thus be kept covered.

Connected to the curved rods 49 near the forward and rear ends thereof are spaced transversely arranged guide-strips 56 which are engaged by rollers 57 mounted upon the forward and rear edges of the motor platform 31. The rollers 57 are arranged vertically and are of sufficient length to remain in engagement with said guide-strips 56 when said planes 1 and 2 are tilted laterally. Each of the rollers 57 is arranged within a bracket 58 which is secured to the platform 31 by means of bolts 59, and said roller 57 is further arranged in a semi-circular recess 60 formed upon the edge of the platform 31.

Arranged above the opening 47 and approximately equidistant from the body planes 1 and 2 and between the same, is a horizontally arranged plane 61 which is secured near its corners to the prolonged uprights 3 and 4 as at 62, said plane 61 being provided with a centrally arranged longitudinal opening 63, for a purpose hereinafter to be described. The plane 61 is further provided with longitudinal openings 64, through which extend the supports 29 and 30. In order that the pressure resisting efficiency of the plane 61 may not be reduced, I provide a means for covering the openings 64, which covering will admit of the relative movement of plane 61 with the uprights 29 and 30. The covering for each of the openings 64 is similar and I will therefore describe only one of them. The covering comprises a section of flexible material 65, such as canvas, which is secured at its middle to the support 29, by the said support 29 passing through it, as shown in Fig. 15. This section of material 65 is arranged below and adjacent the plane 61 so as to cover the opening 64, and is provided upon the ends thereof with metallic brackets 66, each provided with an aperture 67, within which is arranged one end of a retractile coil spring 68, which has its opposite end bent to form the hooked portion 69. The retractile coil springs 68 are suitably secured to the under surface of plane 61, so as to allow of relative movement between plane 61 and the section of flexible material 65, it being understood that the section 65 is made considerably larger than the opening 64. Arranged upon the vertical prolonged standards 4 near each side of said opening 47 and upon the rear edges of said body planes 1 and 2, are vertically arranged planes 70. The planes 70 are of similar dimensions and are mounted upon the prolonged uprights 4 in a similar manner, and therefore I will describe only one of them.

Each of the planes 70 is provided upon the rear edge thereof at the upper and lower ends, with ears 71 which surround said upright 4 and are supported and prevented from displacement by sleeves 72 rigidly secured upon said prolonged uprights 4. It is to be understood from this construction that the plane 70 is free to be swung upon the prolonged upright 4 as an axis. Plane 70 is further provided near the upper end thereof and near its forward edge, with the connecting rod 73 which is pivotally connected to said vertical plane 70 and the rear support 30. The vertical plane 70 is further provided near its lower edge with a horizontally arranged slot 74, through which extends the rod which connects said support 30 to one of the bell-crank levers. The normal position of each of the planes 70 is shown in Fig. 1. Upon the lateral tilting of the planes 1 and 2, and for the sake of illustration we assume that the right end of the planes 1 and 2 is lowered, the vertical plane 70 nearer said right end will be swung toward the same, while the vertical plane nearer the left end of planes 1 and 2 which is the high end, will be swung away from said left end. When the right end of the planes 1 and 2 are lowered, the motor platform 31 will be arranged nearer the same, and for this reason greater resistance will be offered to the right end of the machine, during its flight which would tend to cause the same to change from its normal straight line of flight. When, however, the vertical plane 70 nearer said right end is swung toward the same, it will assume a position approximately transverse to the body planes 1 and 2 and will present its forward edge to the course of flight, thus reducing the resistance which is offered by the same when it is arranged at an angle to the course of flight, as shown in Fig. 1. On the other hand the vertical plane 70 nearer the higher left end of the planes 1 and 2 will be swung to a position approximately parallel with the longitudinal edges of said planes 1 and 2, and hence the resistance normally offered by the same will be increased. The purpose of the equalizing vertical planes 70 is therefore to compensate for the resistance due to the relative position of the platform 31.

The horizontal strips, which are secured to and connect the prolonged vertical uprights 3 and 4, as above stated, extend forwardly in such horizontal positions for a considerable distance and then extend upwardly as at 75, for a purpose to be explained. Secured to the forward guide-strip 56 is a forwardly extending U-shaped frame 76 which is sup-

ported at its forward end by braces 78 which are suitably secured to said U-shaped frame and to said horizontal strips 48. The U-shaped frame 76 is further supported near the rear end thereof by means of braces 79. The horizontally arranged strips 48, are connected by means of the transverse strip 80 secured to the same adjacent the ends of the braces 79 and the prolonged uprights 3, and said strips 48 are connected forwardly of said strip 80 by means of the second transverse strip 81 secured to the horizontal strips 48 adjacent said braces 78. As above stated the strips 17 extend forwardly beyond the body plane 1, and each of said strips 17 is provided with a member 82 which has the body portion thereof secured upon the upper side of said strip 17 by means of bolts 83, and which has its forward end bifurcated to form spaced ears 84.

Between the spaced ears 84 is arranged the reduced upper end 85 of a support 86, said reduced end being held in place by means of a bolt 87 passing through the same and through said spaced ears 84, whereby the supports 86 may be swung fore and aft with relation to the body planes 1 and 2. The supports 86 are similar and extend downwardly for rigid engagement with the platform 88, which may be termed the passenger-platform. The supports 86 are further connected to the passenger-platform 88 by means of brace wires 89 which are secured thereto and to the corners of the passenger-platform. The passenger-platform 88 is arranged within the U-shaped frame 76, and is provided with rollers 90 upon the opposite ends thereof, which are adapted to permanently engage opposite sides of said U-shaped frame 76, whereby the passenger-platform is guided during the relative movement of the said U-shaped frame 76 and the same. The object of the passenger platform 88 is to carry the operator of the machine and to automatically actuate a forward horizontal rudder mechanism which is adapted to raise and lower the machine. The passenger-platform 88 is pivotally supported as above stated, and will therefore assume a vertical position during the course of flight of the machine. If the body planes 1 and 2 should become inclined upon their transverse axes so as to be disposed at an angle to the course of flight, the passenger platform 88 and uprights 86 will act as a pendulum or plumb weight and maintain the normal vertical position of said supports 86, while the machine as a whole and the U-shaped frame 76 will be swung fore and aft with relation to the platform 88. In order that the platform 88 and the U-shaped frame 76 within which the same is arranged may not be damaged by the relative movement of said U-shaped brackets with reference to said passenger platform, I provide the forward edge of the passenger platform 88 with the bumpers 91 which are arranged near the ends of said passenger platform and are provided with heads 92, which may be preferably formed of rubber. The bumpers 91 are curved downwardly so that they will engage the forward transverse portion of the U-shaped frame 76, which moves in an arc of a circle about the bolts 87 as its center. The U-shaped frame 76 is further provided upon opposite sides thereof with bumpers 93 which may engage the forward edge of the passenger platform 88. The rear ends of the U-shaped frame 76 adjacent the guide strip 56, are provided with L-shaped bumpers 94 having angular ends 95 which are secured to said U-shaped frame 76 and to the guide-strip 56. This L-shaped bumper 94 limits the relative movement between the entire machine and the platform 88 and also serves as a brace between the U-shaped frame 76 and the guide-strip 56, to which the same is secured. By reference to Fig. 1 it will be seen, that, owing to the position of the passenger-platform 88 and the U-shaped frame within which the same is arranged, the machine will be heavier forward of the longitudinal central axes of the body planes 1 and 2, and hence the planes 1 and 2 will have a tendency to assume downwardly inclined positions with relation to the course of flight. It is obvious therefore that the principal object in employing the forward horizontal rudder mechanism above referred to is to overcome this downward inclination of planes 1 and 2, and it is also true that the platform 88 within the U-shaped frame 76 will be actuated rearwardly more than forwardly, as will appear hereinafter.

As before stated, the horizontal strips 48 extend upwardly as at 75 and are connected at their forward ends by a transverse rod 96, to which is secured a section of a flexible member 97 having a spring 98 connected thereto, the opposite end of said sections 97 being arranged within an eye-screw 99 secured upon the lower surface of the passenger-platform 88 at the middle thereof, and the flexible member 97 is wound around a spool 100 which is rigidly secured upon a rotatable pin 101 arranged upon and near one end of the passenger platform 88, said pin 101 being provided with an operating wheel 102. The pin 101 is further provided above the platform 88 with a sprocket wheel 103 rigidly secured thereto, and near which is pivotally mounted a pawl 104 adapted to be arranged between the teeth of the sprocket wheel 103, for locking the pin 101 in a rigid position. The purpose of the flexible member 97 and the associated members above described will be explained hereinafter. Each of the upwardly extending portions 75 of the horizontal strips 48 has secured upon its upper end a vertically ar-

ranged rod 105. The vertical rods 105 upon each of the portions 75 are united by transverse horizontal members 106 and 107 near the lower and upper ends of the same respectively. The forwardly extending portions 75 are connected to the forward edge of the upper body plane 1 by means of diagonally disposed rods 108 and 109, while said vertical members 105 secured upon the forwardly projecting portions 75, are connected to the forward edge of the lower body plane 2 by means of diagonal rods 110. The transverse horizontal members 106 and 107 are rotatably mounted within the vertical members 105 and have rigidly secured thereto the superposed planes 111 and 112, which are secured to the rotatable rods 106 and 107 at the central longitudinal axes of the same. The planes 111 and 112 are normally arranged in a horizontal position and are flexible. The forward and rear edges of the planes 111 and 112 are provided with strips 113 and 114 through which and said planes are arranged eye-bolts 115, within which are arranged the hooked ends of rigid connecting rods 116. Each of the vertical members 105 is provided near the middle thereof with a forwardly arranged bracket 117 secured thereto by means of bolts 118 and through which is rotatably mounted the shaft 119. Rigidly secured to the shaft 119, are operating levers 120 which are pivotally connected to the rigid members 116 as at 121. The shaft 119 is further provided at one side of the vertical rudder 122 hereinafter to be described, with a depending arm 123 which is rigidly secured to the shaft 119. The depending arm 123 has its lower end pivotally connected as at 124, to a rod 125 which has the inner end thereof pivotally connected to a depending arm 126 as at 127, the said depending arm 126, being rigidly mounted upon a shaft 127ª which is in turn rotatably mounted on the supports 86. The shaft 127ª is provided at one side of the depending arm 126 with a sprocket wheel 128 around which is trained a sprocket chain 129, which also engages a larger sprocket wheel 130 rotatably mounted upon a pin 131 supported by a bracket 132 rigidly secured upon the platform 88. The sprocket wheel 130 is provided with handles 133 which are diametrically arranged upon the same. The pin 131 extends forwardly through sprocket wheel 130 and is screw-threaded as at 134 for the reception of the smaller clamping wheel 135 provided with handles 136, and the pin 131 is provided with a head 137 which prevents the clamping wheel 135 from working off the same. The object of the clamping wheel 135 is to rigidly engage, upon being rotated, the sprocket wheel 130 and prevent the same from having rotation until manually released. It is also necessary to sometimes lock the passenger platform 88 to the U-shaped frames 76, as will appear hereinafter. For this purpose I may employ the device illustrated in Fig. 10, which may be applied to one side of the U-shaped frame 76 or to both sides. This device comprises a body portion 138 which is secured to one side of the U-shaped frame 76, and upon the body portion 138 is pivotally mounted an outer U-shaped member 139 provided with an ear 140, and within the U-shaped member 139 is pivotally mounted a smaller member 141 also provided with an ear 142. The passenger-platform 88 is provided near one end thereof with spaced pins 143, between which the outer U-shaped member 139 is adapted to fit snugly. It is obvious by referring to Figs. 9 and 10, that when the U-shaped member 139 is arranged between the pins 143 that the platform 88 and the U-shaped frame are rigidly locked together. If, however, the U-shaped member 139 is swung back out of engagement with the pins 143 and the smaller member 141 is swung downwardly to assume a position between the same, the U-shaped frame 76 and the passenger-platform 88 may have relative movement with relation to each other, but this movement will be restricted.

Instead of employing the rotatable shaft 127 and the sprocket wheel 128 and the depending arm 126, I may provide the supports 86 with a U-shaped bracket 143ª which is secured thereto by means of the bolts 144. The U-shaped bracket 143ª is provided centrally thereof with a pin 145 which is rigidly secured thereto as at 146 and which has its forward end arranged between the spaced ears 147 of the screw-threaded member 148. The screw-threaded member 148 is pivotally mounted upon the pin 145 by means of the bolt 148 which passes through the ears 147 and said pin. In connection with this modified form of my invention it may be stated that the connecting rod 125 has its inner end screw-threaded for the reception of a turn-buckle 149 upon which is rigidly secured sprocket wheel 150. It is to be understood that a chain similar to the sprocket chain 129 is trained about sprocket wheel 150 and around a sprocket wheel similar to the sprocket wheel 130, and that the sprocket wheel 130 will in this instance be arranged longitudinally of the platform 88. It is also unnecessary to provide a means for preventing the rotation of the sprocket wheel 130, for the forward horizontal rudder cannot rotate the turn-buckle 149.

Rearwardly of the body planes 1 and 2 is arranged a rear vertical rudder 151 which is pivotally connected to upper and lower supporting rods 152 and 153 respectively as at 154 and 155. The rods 152 and 153 have their forward ends pivotally connected to the upper and lower planes 1 and 2 at the middle of the rear edges thereof, as at 156

and 157 and are further connected to said planes 1 and 2 by means of the brace rods 158 and 159 which have their rear ends rigidly secured to supporting rods 152 and 153 and their opposite ends pivotally connected to said planes 1 and 2. The lower supporting rod 153 is provided with a vertically disposed depending rod 160 which engages a diagonal rod 161 also secured to the support 153 and which is provided at the extremity thereof with a transverse strip 162 which engages the rear extended uprights 4, and thus prevents the rudder 151 from swinging downward. It is evident, however, that the rudder 151 is free to move upwardly, which is a great advantage when the machine is being landed, for otherwise the rudder 151 would be liable to be broken by said landing.

The horizontal strips 48 have their rear ends braced by means of the rods 163 secured thereto and to the produced uprights 4 as at 164. The rear prolonged uprights 4 are connected together by diagonal brace wires 165, and are further connected by means of braces 166 to the lower body plane 2. The prolonged uprights 3 and 4 are connected transversely of the planes 1 and 2 by means of the diagonal rods 167 which cross each other and are connected to the uprights 3 and 4 adjacent said body plane 2 and the ends of said uprights. It is to be understood that the rods 167 are arranged outwardly of the curved rods 49, as shown in Fig. 6.

The shaft 25 is rotated by a sprocket chain 169 which is trained about the sprocket wheel 26 and a sprocket wheel of the motor 32. The sprocket wheels 27 and 28 are provided with sprocket chains 170 which engage sprocket wheels 171 rigidly mounted upon propeller shafts 172, which are arranged upon both sides of the opening 47 and equidistantly spaced therefrom. Each of the propeller shafts 172 is provided with a propeller 173, which is arranged rearwardly of planes 1 and 2. One of the sprocket chains which is used to drive the propeller shafts is crossed so that the propeller actuated by the same will be rotated in an opposite direction from the other propeller, and this will of course necessitate the blades of the propellers being arranged at right angles to each other.

Between the horizontal planes 111 and 112 of the forward horizontal rudder, is arranged the vertical half-moon shaped rudder 122, which is arranged equidistantly from the ends of said planes 111 and 112 and comprises a forward rod 175, the ends of which are rotatably mounted in the members 106 and 107. Attached to the rear curved edge of the half moon vertical rudder 122 is a flexible member 176 which extends laterally in opposite directions and is passed through eyes 177 secured upon the vertically arranged rods 105, and is then carried rearwardly and passed through eyes 176' which are formed upon the bolts 87, from which said flexible member extends downwardly and is passed through apertures 75 upon the forward end of rods 176' which are rigidly secured to the supports 86 at substantially right angles thereto. By this arrangement the vertical half-moon rudder may be swung laterally by the operator, and will not be actuated by the relative movement of the machine with the platform 88.

In the operation of my device the same is propelled forwardly in the direction indicated by the arrow. The platform 88 is locked to the U-shaped frame 76, by the operator inserting member 139 between pins 143, and the operator may then actuate the forward horizontal rudder for raising the machine by turning the sprocket wheel 130. When the machine has been elevated to a desired height the operator may clamp the sprocket wheel 130 in a rigid position with relation to the platform 88, by rotating the clamping wheel 135. The operator then arranges the smaller member 141 between the pins 143 and withdraws the U-shaped member 139 from between said pins, thus allowing the forward horizontal rudder to be automatically actuated, but this actuation will be restricted to the movement of the member 141 between the pins 143. When the machine is flying in a horizontal plane the operator removes the member 141 from between the pins 143 and the machine is free to have greater relative movement with the passenger-platform 88. When the body planes 1 and 2 are tilted laterally, for instance to the right, the equilibrium retaining plane 12 will be moved to assume an upwardly inclined position and the equilibrium retaining plane 15 will be moved to assume a downwardly inclined position with relation to the course of flight, and this movement of the planes 12 and 15 in opposite directions will return the body planes 1 and 2 to their normal positions. When the body planes 1 and 2 swing upon their transverse axes to assume inclined positions to the course of flight, and for the sake of illustration we assume that they are inclined downwardly, the entire machine will swing upon the bolts 84 as an axis, the arm 126 will remain rigid which will prevent movement of the connecting rod 125 which in turn will cause the arm 123 to be swung forwardly and the operating levers 120 to swing anticlockwise which will arrange the planes 111 and 112 in upwardly inclined positions to the course of flight and flex the same, whereby the machine will be returned to its normal horizontal position.

By reference to Fig. 1 it will be obvious that the passenger-platform 88 is arranged to swing fore and aft with respect to the

body planes 1 and 2, and that during the flight of the machine the pressure of the air against the platform 88 as the speed of the machine increases, would tend to swing said platform 88 rearwardly, and thus the same would be unable to properly actuate the forward horizontal rudder for automatically retaining the equilibrium of the machine to its course of flight. To overcome this I have provided the flexible member 97 which is connected to the coil spring 98 and which has its rear end adjustably connected to the passenger-platform 88. The purpose of the flexible member 97 and the spring 98 is to overcome the pressure exerted by the air upon the platform 88 during the flight of the machine, so that the platform 88 may properly actuate the forward horizontal rudder mechanism. When the machine is flying in a straight line and in a horizontal plane, the same may be turned to the right or left by the operator actuating the flexible member 176 laterally, whereby said half-moon shaped rudder may be swung laterally in either direction. The rear vertical rudder 151 serves as a guide whereby the machine is adapted to normally fly in a straight line.

It is to be understood that I may construct my machine of any suitable material having sufficient strength and lightness. The body planes 1 and 2 may be formed of a frame upon which is secured a fabric covering, and this fabric covering is forced by pressure to present an upper convex surface.

Having fully described my invention what I claim is,

1. In a flying machine of the character described, the combination of superposed planes arranged transversely to the course of flight and forming the body portion of the machine, of a forward horizontal rudder mechanism for preventing said superposed planes from being tilted at an angle to the course of flight of the machine, a transversely arranged frame disposed near the lower of said superposed planes, supports pivotally suspended from the upper of said superposed planes and carrying upon their lower end a passenger-platform arranged within said frame, connecting means between said platform and said horizontal rudder mechanism whereby the former may be automatically actuated by the latter, and means whereby said connecting means may be made manually operative, substantially as described.

2. In a flying machine of the character described, the combination with superposed body planes, of a forward horizontal rudder mechanism, a swinging platform arranged forwardly of said superposed planes, connecting means between said horizontal rudder mechanism and said platform comprising a connecting rod, means for locking said platform in a rigid position, and means for moving said connecting rod toward said platform after the same has been locked, substantially as described.

3. In a flying machine of the character described, the combination with superposed body planes, arranged transversely to the course of flight, of a horizontal rudder mechanism for preventing said body planes from tilting longitudinally to the course of flight, a platform swingingly mounted forwardly of said body planes adapted to move fore and aft with relation thereto, connecting means between said platform and said horizontal rudder mechanism, and means for equalizing resistance exerted against said platform during the flight of the machine, substantially as described.

4. In a flying machine of the character described, the combination with superposed body planes, arranged transversely to the course of flight, of a horizontal forwardly arranged rudder mechanism for preventing said body planes from tilting longitudinally to the course of flight, a swinging member mounted forwardly of said body planes and adapted to move fore and aft with relation thereto, connecting means between said swinging member and said horizontal rudder, comprising a connecting rod, means connecting said connecting rod to said swinging member comprising a turn buckle, and means for rotating said turn buckle, substantially as described.

5. In a flying machine of the character described, the combination with body planes arranged transversely to the course of flight, of a horizontal rudder mechanism arranged forwardly of said body planes and adapted to prevent said body planes from tilting longitudinally to the course of flight, a platform swingingly mounted and adapted to move fore and aft with relation to said body planes suspended from the upper of said body planes by means of supports, a connecting rod associated with said rudder mechanism and having its rear end provided with a turn buckle, a screw threaded link adapted for engagement with said turn buckle and pivotally connected to said supports, a sprocket wheel arranged upon said turn buckle, a sprocket wheel mounted upon said platform provided with a sprocket chain in engagement with said first named sprocket wheel, and means for locking said platform in a relatively rigid position, substantially as described.

6. In a flying machine of the character described, the combination with superposed body planes arranged transversely to the course of flight, of a forward horizontal rudder mechanism for preventing said body planes from being tilted longitudinally to the course of flight, a frame arranged near the lower of said superposed body planes, a

platform arranged within the said frame and adapted to swing fore and aft with relation to said body planes, connecting means between said platform and said horizontal rudder mechanism, means for connecting said platform to said frame comprising a member secured to said frame and having a body portion provided with an outer U-shaped portion pivotally mounted thereon, a smaller member pivotally mounted upon said body portion adapted for arrangement within said U-shaped portion, and spaced pins secured to said platform between which said U-shaped member and said smaller member are adapted to be arranged, substantially as described.

7. In a flying machine, body planes arranged transversely to the course of flight, equilibrium retaining planes arranged between said body planes, a motor platform pivotally connected to one of said body planes, connecting means between said motor platform and said equilibrium retaining planes to actuate the latter in opposite directions, a forward rudder mechanism, a swinging passenger platform, connecting means between said rudder mechanism and passenger platform, and means for locking said passenger platform in a relatively rigid position to allow of the manual actuation of said last named connecting means.

8. In a flying machine, a gliding structure, a movable plane to raise and lower said gliding structure, a pendant structure connection with the gliding structure, connecting means between the pendant structure and movable plane, and adjustable means to lock the pendant structure against movement with relation to the gliding structure and the locking means being adapted to be operated to permit said pendant structure to have a restricted movement.

9. In a flying machine, superposed body planes, a rudder mechanism, a swinging platform, connecting means between said swinging platform and rudder mechanism, and means to compensate for the resistance exerted upon said swinging platform during the flight of the machine.

10. In a flying machine, a body plane arranged transversely to the course of flight, a rudder mechanism associated with said body plane, a swinging platform, connecting means between said platform and rudder mechanism, and adjustable means to compensate for the resistance exerted upon said swinging platform during the flight of the machine.

11. In a flying machine, a gliding structure, a movable plane to raise and lower said gliding structure, a pendant structure connected with the gliding structure, connecting means between the pendant structure and said movable plane, means to lock the pendant structure against movement with relation to the gliding structure, and manually operated means for actuating said connecting means when the pendant structure is in its locked position.

12. In a flying machine, a gliding structure, a movable plane to raise and lower the gliding structure, means to operate the movable plane including a pendant structure connected with the gliding structure to swing fore and aft with relation thereto, and means including an elastic member to compensate for the resistance offered to the pendant structure during the flight of the machine.

In testimony whereof I affix my signature in presence of two witnesses.

AUGUSTUS F. W. MACMANUS.

Witnesses:
B. GRAY,
A. J. WELLS.