A. F. W. MACMANUS.

AEROPLANE.

APPLICATION FILED SEPT. 17, 1909.

1,068,437.

Patented July 29, 1913.

5 SHEETS—SHEET 1.

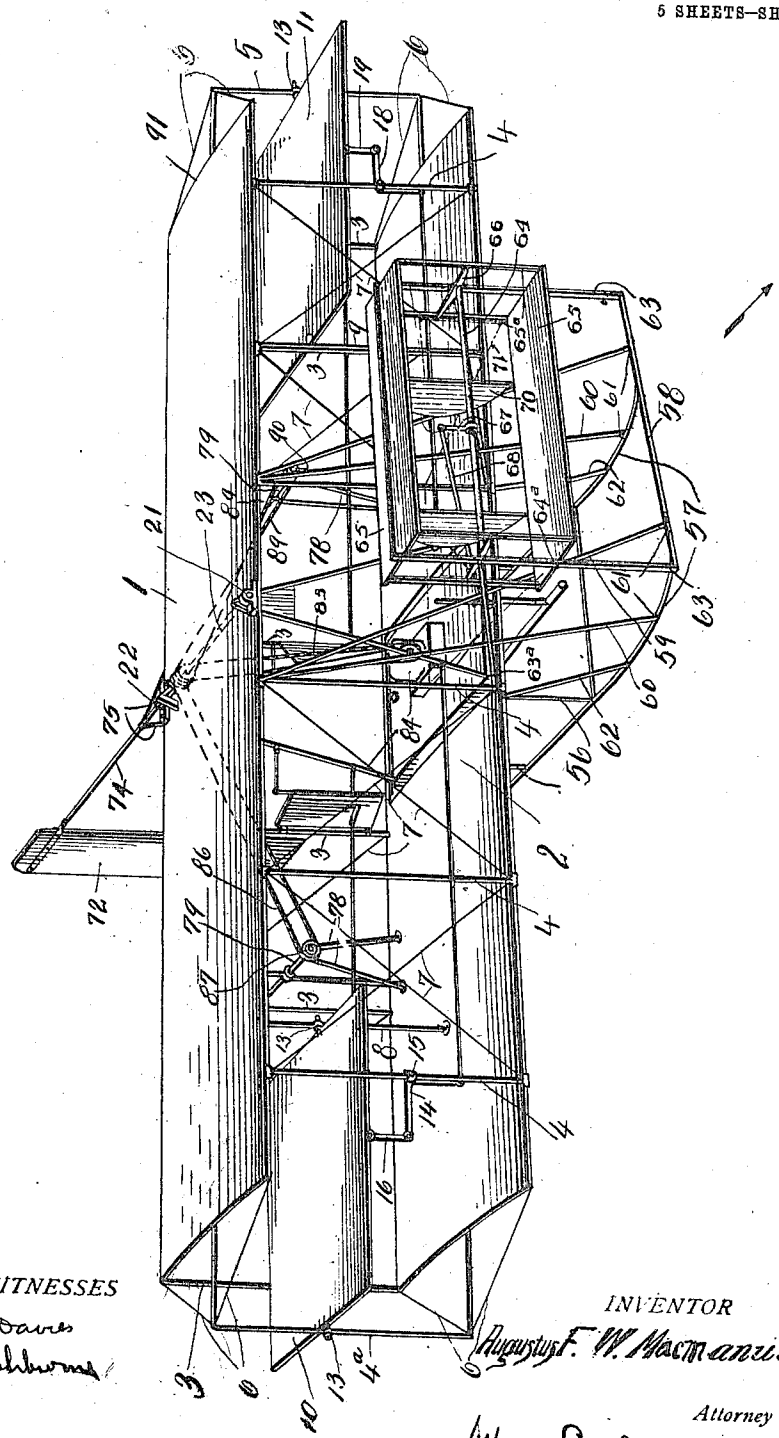


FIG. 1.

WITNESSES

C. K. Davis

B. P. Richmond

INVENTOR

Augustus F. W. Macmanus

Attorney

by C. L. Parker

A. F. W. MACMANUS.

AEROPLANE.

APPLICATION FILED SEPT. 17, 1909.

1,068,437.

Patented July 29, 1913.

5 SHEETS-SHEET 2.

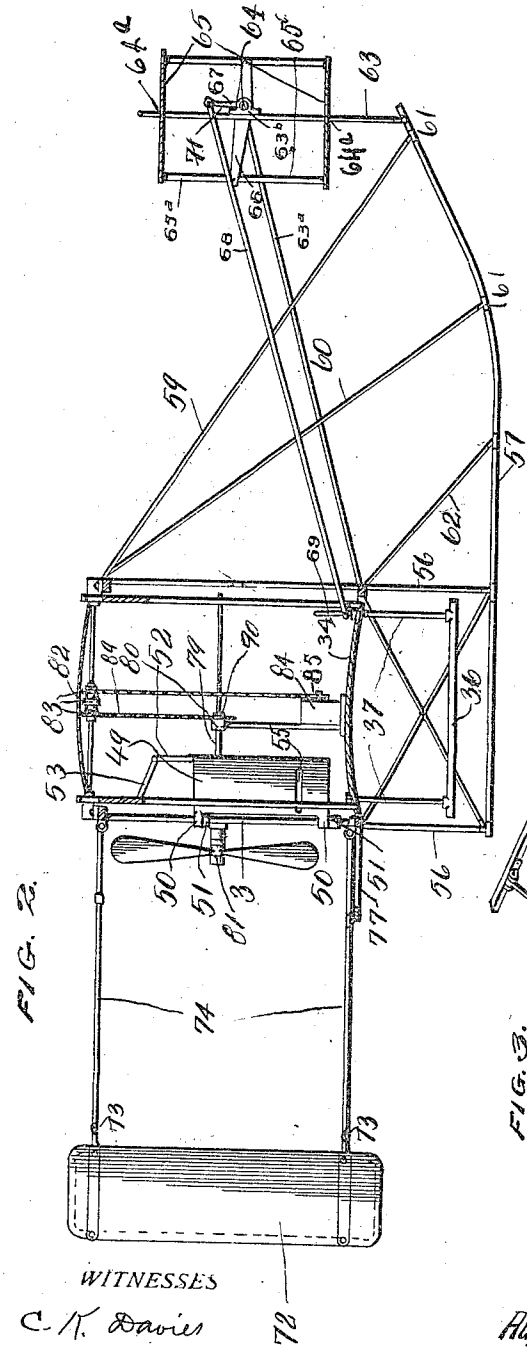


FIG. 2.

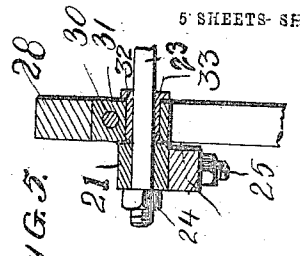


FIG. 5.

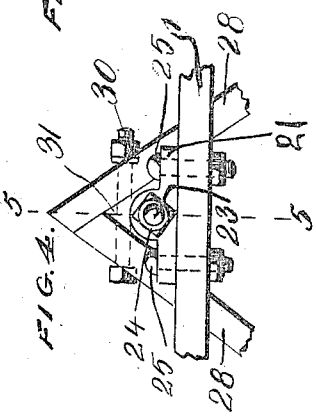


FIG. 4.

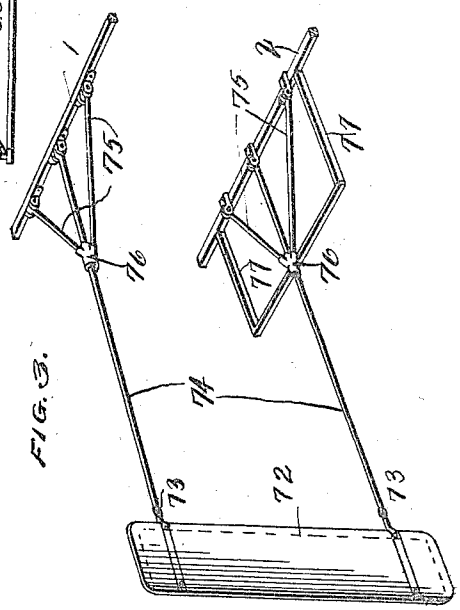


FIG. 3.

WITNESSES

C. N. Davies

B. P. Fehlbaum

INVENTOR

Augustus F. W. Macmanus

Attorney

C. L. Parker.

A. F. W. MACMANUS.

AEROPLANE.

APPLICATION FILED SEPT. 17, 1909.

1,068,437.

Patented July 29, 1913.

5 SHEETS—SHEET 3.

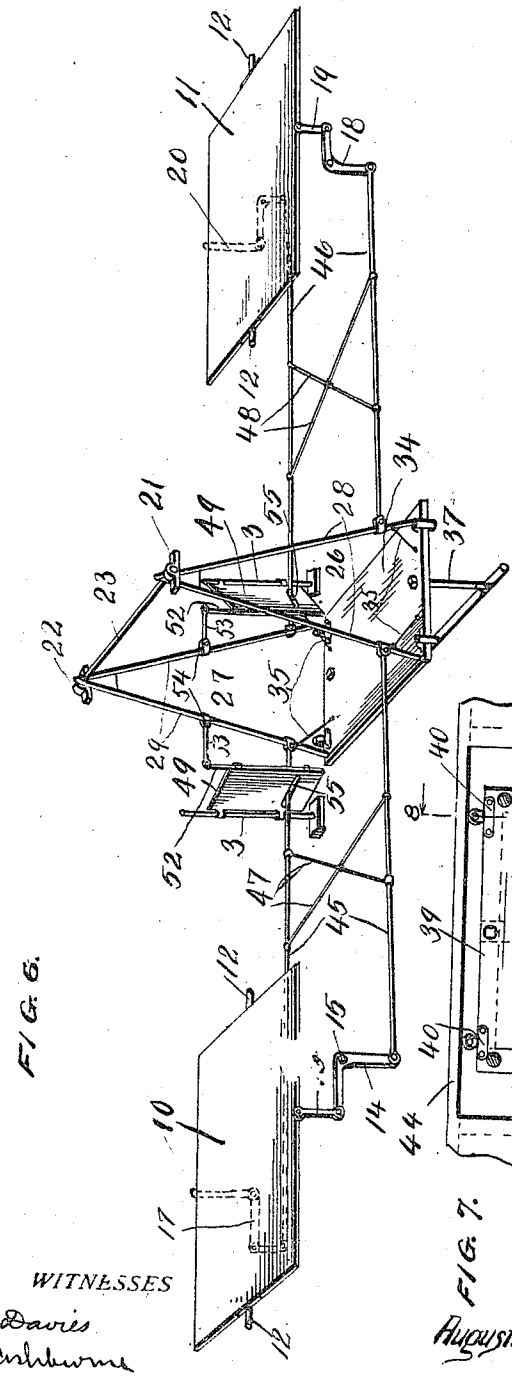


FIG. 6.

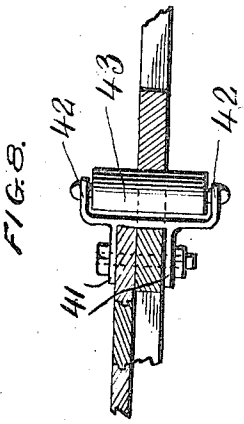


FIG. 8.

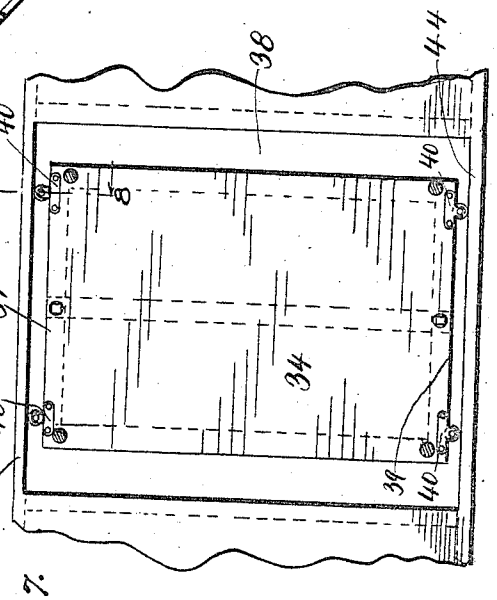


FIG. 7.

WITNESSES

C. K. Davies

R. P. Strickmore

INVENTOR

Augustus F. W. Macmanus

Attorney

C. L. Parker

A. F. W. MACMANUS.

AEROPLANE.

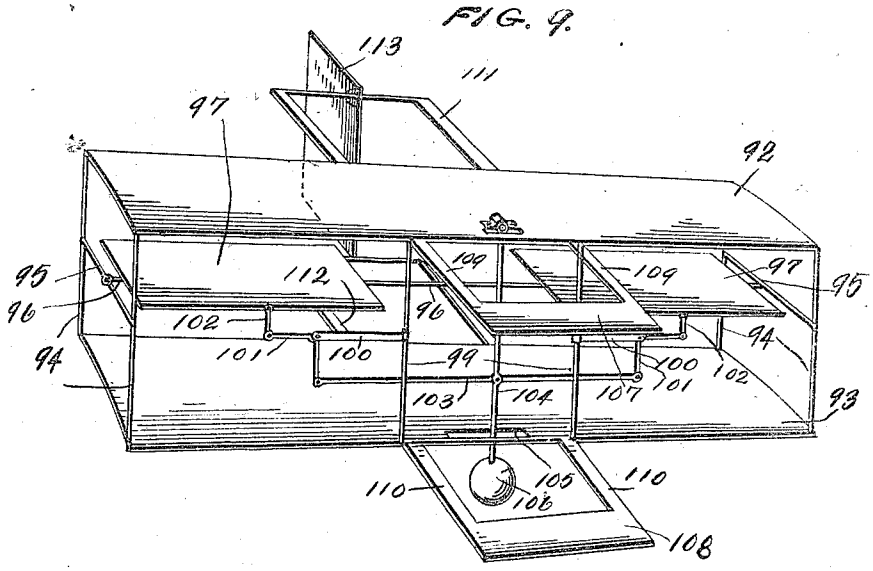
APPLICATION FILED SEPT. 17, 1909.

1,068,437.

Patented July 29, 1913

5 SHEETS—SHEET 4.

FIG. 9.



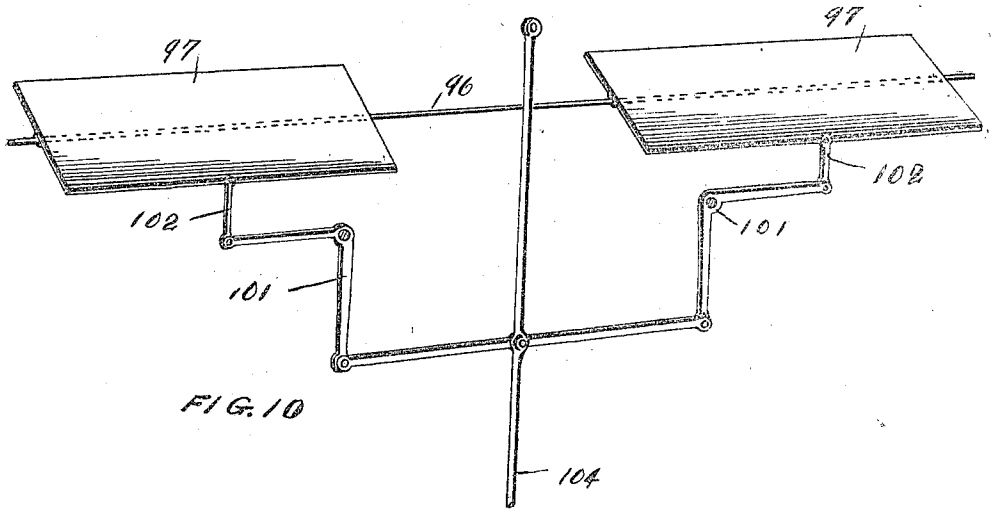
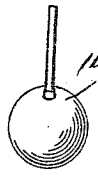


FIG. 10

WITNESSES

C. K. Davies

B. P. Fishburne



INVENTOR

Augustus F. W. Macmanus.

Attorney

C. L. Parker.

A. F. W. MACMANUS.

AEROPLANE.

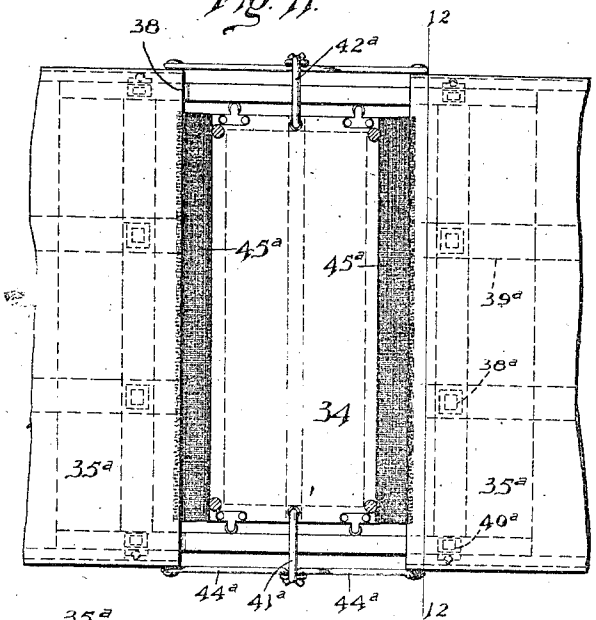
APPLICATION FILED SEPT. 17, 1909.

1,068,437.

Patented July 29, 1913.

5 SHEETS—SHEET 5.

Fig. 11.



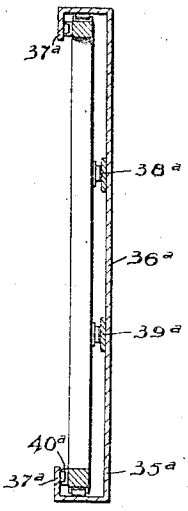


Fig. 12.

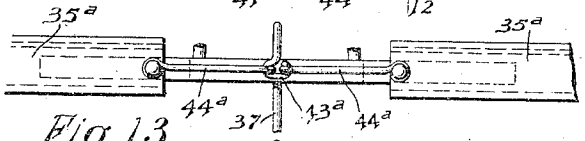


Fig. 13.

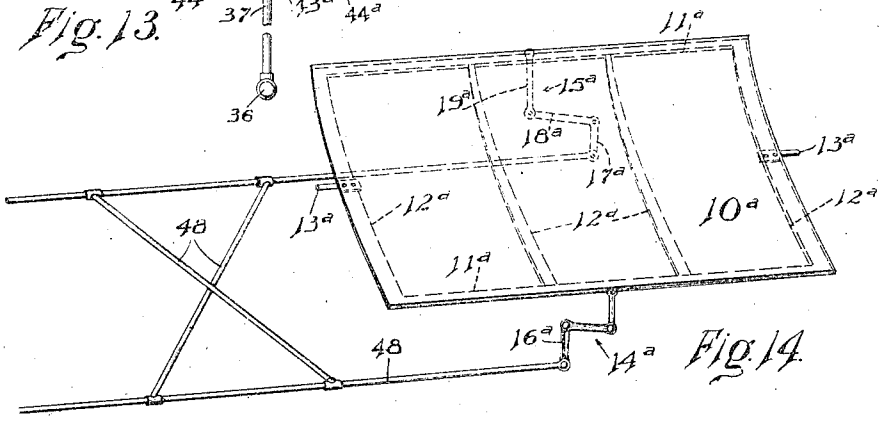


Fig. 14.

Witnesses

J. S. Freeman.

P. P. Fehlbaum.

Inventor

Augustus F. W. Macmanus,

By C. L. Parker.

Attorney

UNITED STATES PATENT OFFICE.

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

AEROPLANE.

1,068,437. Specification of Letters Patent. Patented July 29, 1913.

Application filed September 17, 1909. Serial No. 518,208.

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.

My invention relates to flying machines of the type known as "heavier-than-air" machines, and has special reference to a machine of this character embodying means whereby the same may automatically retain its equilibrium during flight.

An important object of my invention is to provide a flying machine embodying automatic means for limiting or retarding the tilting or angular displacement of said machine from a horizontal plane, said means comprising a support for the passengers and the propelling motor, said support being suspended as a pendulum or plumb weight, thus utilizing the weight of said passengers and the motor to steady the machine.

A further object of my invention is to provide a flying machine which will be automatically returned to its normal horizontal position if tilted or swung angularly from such position.

In the accompanying drawings, forming a part of this specification, and in which like numerals designate like parts throughout the same, Figure 1 is a perspective view of my machine complete. Fig. 2 is a vertical longitudinal sectional view of my machine. Fig. 3 is a perspective view of the rear rudder of my machine and showing parts associated therewith. Fig. 4 is an enlarged fragmentary side view of a portion of my machine. Fig. 5 is a transverse vertical sectional view taken on the line 5—5 of Fig. 4. Fig. 6 is a perspective view of the mechanism used upon my machine for preserving the equilibrium of the same. Fig. 7 is a top plan fragmentary view of the lower plan and a plan view of the platform or cradle. Fig. 8 is an enlarged sectional view taken on line 8—8 of Fig. 7. Fig. 9 is a perspective view of a modified form of my machine, and, Fig. 10 is a perspective view of the mechanism for automatically retaining the equilibrium of the machine shown in Fig. 9. Fig. 11 is a detailed fragmentary top plan view of the lower plane, showing members associated therewith. Fig. 12 is a vertical cross sectional view taken on line 12—12 of Fig. 1. Fig. 13 is a side view of Fig. 11. Fig. 14 is a perspective view of a modified form of the similar planes 10 and 11 shown in Fig. 1, showing members associated therewith.

In the preferred embodiment of my invention, I provide the superposed planes 1 and 2 which have an upper convex surface and are connected together upon one edge by means of the spaced vertical uprights 3 and upon the forward edge thereof by the spaced vertical uprights 4. For the sake of clearness, I will hereafter refer to the connected superposed planes 1 and 2 as the body of the machine, and it is to be understood that the planes 1 and 2 are arranged transversely of the machine. At the ends of said planes 1 and 2, I provide the U-shaped brackets 4^a and 5 which are suitably secured thereto, and in alinement with the central longitudinal axes of said planes. The U-shaped brackets 4 and 5 are prevented from lateral displacement by means of the wires 6 or the like, secured to the upper and lower portions thereof and to the corners of said planes 1 and 2. The uprights 3 and 4 are provided with the diagonally arranged wires 7 which are secured thereto at the upper and lower ends thereof, to brace the same. The vertical uprights 8 and 9 are arranged in alinement with said U-shaped brackets 4 and 5 and are at the same distance therefrom, respectively. It is to be understood that the uprights 8 and 9 are suitably secured to the planes 1 and 2 by any desired means.

Arranged between the brackets 4 and the upright 8 and the bracket 5 and the upright 9, are the movable planes 10 and 11 respectively. The similar planes 10 and 11 as shown in Figs. 1 and 6 are flat and are provided upon the ends thereof with the trunnions 12 which are in alinement with each other and lie within the central longitudinal axis of the same. The planes 10 and 11 are pivotally mounted between bracket 4 and upright 8, and bracket 5 and upright 9 respectively, by means of the trunnions 12 being journaled through said brackets and uprights as at 13. Said planes 10 and 11 are also arranged so that the central longitudinal axes of the same are parallel with planes 1 and 2, said planes 10 and 11 being free to be swung forwardly and backwardly upon said axes. A bell-crank-lever 14 is pivotally mounted upon the outer forward upright 4 at a point near the middle thereof.

as shown at 15, and has a pivotal link 16 connecting one end thereof to the forward edge of said plane 10. A second bell-crank-lever 17 is pivotally mounted upon the rear outer standard 3 at a point centrally thereof and is pivotally connected to the rear edge of said plane 10 and in alinement with said pivotal connecting link 15. It is obvious by referring to Fig. 6, that bell-crank-lever 14 and bell-crank-lever 17 are inverted with relation to each other and that a similar movement of each of the same will cause an opposite movement of the forward and rear edges of said plane 10. A bell-crank-lever 18 similar to bell-crank-lever 14 is pivotally mounted upon upright 4 at a point centrally thereof and connected by a pivotal link 19 to the forward edge of said plane 11, while a bell-crank-lever 20 inverted in relation to bell-crank-lever 18 and similar to bell-crank-lever 17, is pivotally mounted upon the rear outer upright 3 at a point centrally thereof, and pivotally connected to the rear edge of plane 11, and in alinement with said pivotal link 19. The operation of bell-crank-levers 18 and 20 is precisely the same as the operation of bell-crank-levers, 14 and 17, above described, and therefore, need not be again explained. The planes 10 and 11 are thus mounted so that they may be inclined in opposite direction to each other, up or down, and present such an inclination to the course of travel. The form of the planes 10 and 11 is flat and non-flexible, so that the forward and rear edges of the same are swung through relatively equal arcs of a circle. This is the form of the planes to be used upon machines built for speed, while I may employ a slightly modified form of movable horizontal planes, upon machines designed to carry heavier loads and built for slower speed.

By reference to Fig. 14, it will be seen, that I may employ a plane 10^a as a substitute for the planes 10 and 11. The plane 10^a is formed of canvas or the like stretched over and suitably secured to a frame, comprising the longitudinal strips 11^a connected by the transverse strips 12^a. The transverse strips 12^a are made of some suitable material which will bend, such as oak, or the like, and said transverse strips 12^a are tapered toward their rear ends. Thus it will be possible to obtain a plane which will be more flexible throughout its rear portion than in its forward portion. I prefer to have this increase of flexibility confined principally to the rear half of the planes, or behind the pivotal connecting members 13^a. The pivotal members 13^a are arranged in alinement with each other and within the central longitudinal axis of said plane. The bell-crank-levers 14^a and 15^a which are oppositely arranged with relation to each other are connected to the forward and rear edges respectively of the plane 10^a, and the bell-crank-lever 15^a is adapted to move the rear edge faster and through a greater distance than the forward edge will be moved by the bell-crank-lever 14^a. Owing to the fact that the plane 10^a is pivoted at its longitudinal central axis, this unequal movement of its edges wil cause a bending or flexing of the plane, and the bending will be greater in the rear half of the same, owing to the increased flexibility therein, as above stated. I cause a quicker and greater movement of the rear edge of the plane 10^a than the forward edge thereof, by decreasing the length of the lower portion of bell crank lever 14^a, as shown at 17^a in bell-crank-lever 15^a. I further increase the length of the horizontal portion as shown at 18^a, and also increase the length of the connecting link 19^a. When the bell-crank-levers 14^a and 15^a are actuated, as in a similar manner to the bell-crank levers 18 and 20, hereinafter to be described, they will cause the flexing of the plane 10^a, and thus present an upwardly or downwardly inclined curved surface to the course of travel. By flexing the horizontal planes 10^a, their efficiency is greatly increased over a plane which is merely inclined, for the same purpose, for it affords greater resistance to the course of travel. This form of plane as before stated is especially applicable to machines designed to slow speed and heavy loads.

The brackets 21 and 22 are arranged centrally upon plane 1 in alinement with each other and in the transverse central axis of said plane 1. Shaft 23 has the ends thereof extending through said brackets 21 and 22, and is provided upon the outer sides of said brackets 21 and 22 with the nut 24 as shown in Fig. 5. The brackets 21 and 22 are secured upon the upper plane 1 by means of bolts 25 which pass through said brackets 21 and 22 and said plane 1. Swingingly mounted upon said shaft 23 near the ends thereof are the V-shaped supporting brackets 26 and 27. The supporting brackets 26 and 27 comprise the converging uprights 28 and 29 respectively, which are secured together at the upper ends by means of the bolts 30. Arranged between each of the pairs of uprights 28 and 29 is a triangular block 31, which is held in place by said bolt 30 passing therethrough and is provided with a centrally arranged opening 32 adapted to receive collar 33 through which passes shaft 23. By this form of joint the uprights 28 and 29 respectively are securely held together at their upper ends and are free to swing laterally upon said shaft 23. A platform 34 of a rectangular shape has the four corners thereof connected to the lower ends of said uprights 28 and 29. The diagonally arranged wires 35 are secured to the lower portion of said uprights 28 and 29 and to

said platform 34, and serve to prevent the displacement of said uprights with relation to said platform. A horizontally arranged shaft 36 is connected to the under surface of said platform 34 by means of the alined vertical standards 37 which lie within the central longitudinal axis of said platform 34. The shaft 36 as above stated is centrally arranged upon platform 34, and serves as a load or weight by which platform 34 is retained in its true position, it being understood that the rod 36 may not be used upon my machine when the same is provided with a sufficient number of passengers or the like. Said platform 34 has the same curvature as the lower plane 2, as clearly shown in Figs. 1 and 2. The lower plane 2 is provided centrally thereof with the rectangular opening 38. The platform 34 is arranged within said opening 38 and owing to the fact that said opening 38 is much larger than said platform 34, the latter is free to swing laterally within said opening. The comparative size of opening 38 and platform 34 is clearly illustrated in Fig. 11. The forward and rear edges 39 of platform 34 are provided with the brackets 40, near the ends thereof, each of said brackets 40 comprising spaced ears 41 adapted to be secured upon the upper and lower surface of said platform, said bracket being further provided upon the opposite side thereof with the spaced ears 42 between which is mounted the roller 43. The roller 43 of each of the brackets 40 is arranged in engagement with the horizontally arranged portions 44 of said plane 2, and positively prevents the platform 34 from having relative transverse movement with said plane 2. It is obvious that platform 34 must travel in the arc of a circle, and I therefore provide the rollers 43 with considerable length in order that they may remain in engagement with the portions 44 of plane 2 when the same are being swung in the arc of a circle by platform 34. It is obvious, by referring to Fig. 7 that the resisting efficiency of the lower plane 2 is greatly reduced by the portions of the opening 38 upon each side of the platform 34. To overcome this disadvantage (see Fig. 11) I provide the lower plane 2 with the upper plane 35^a upon each side of the platform 34. Each of the upper planes 35^a comprises a body portion 36^a the ends of which are bent downwardly and inwardly as at 37^a to engage the under surface of plane 2. The upper surface of plane 2 is provided with spaced rollers 38^a which are adapted to engage the tracks 39^a secured upon the under surface of the upper planes 35^a. The inwardly bent ends 37^a of each of said planes 35^a is provided upon the upper surface thereof with the rollers 40^a which are adapted to engage the under surface of plane 2. By this construction each of the planes 35^a may be moved longitudinally upon the plane 2, and as platform 34 assumes a position near one side of the opening 38, one of the planes 35^a will be drawn over the opposite edge of the opening 38 for the purpose of covering the same. The vertical rods 37 extend upwardly through ends of platform 34 and are bent outwardly and downwardly as at 41^a and 42^a respectively and provided with the hooked ends 43^a. The connecting links 44^a pivotally connect the upper planes 35^a to the hooked extremities of the vertical rods 37, which connection causes said planes 35^a to follow the platform 34 in its travel. As above stated the platform 34 travels in the arc of a circle and therefore the edges of the same may swing upwardly a sufficient distance to engage the planes 35^a if said planes were not sufficiently removed therefrom. As shown in Fig. 11 the planes 35^a are spaced away from platform 34 and the intervals between said planes and platform 34 are spanned by some suitable form of elastic fabric 45^a, which prevents the air from passing between the platform and the planes 35^a, and yet will permit said platform to be swung upwardly above said planes 35^a if necessary. The bell-crank-levers 14, 17 and 18, 20 are pivotally connected to the lower portions of said uprights 28 and 29 by means of the rods 45 and 46 respectively. The rods 45 are connected transversely to each other by means of the diagonally arranged rods 47, and the rods 46 are connected to each other in a similar manner by the diagonally arranged rods 48. By reference to Fig. 6, it will be apparent that the opposing and longitudinally arranged bell-crank-levers 14, 18 and 17, 20 are oppositely arranged with relation to each other, and that when said rods 45 and 46 are moved in one direction, that planes 10 and 11 will be swung in opposite directions with relation to each other. Arranged upon the vertical standards 3 near each side of said opening 38 and upon the rear edges of said planes 1 and 2, are vertically arranged planes 49. The planes 49 are of similar dimensions and are mounted upon said uprights 3 in a similar manner and therefore I need only describe one of them. The plane 49 is provided upon the rear edge thereof at the upper and lower ends with the ears 50 which surround the uprights 3 and are supported by collars 51 rigidly secured upon said uprights. It is to be understood by this connection that plane 49 is free to be swung upon upright 3 as an axis. Plane 49 is further provided upon the forward edge thereof and at the upper end with the upstanding arm 52 upon which is rotatably mounted the link 53 which is in turn pivotally connected to the upright 29 at a central point thereof as at 54. Plane 49 is provided near the lower

edge thereof with horizontally arranged slot 55 through which extends the rod 54, as shown in Fig. 6. The normal position of the vertically arranged planes 49 is shown in Fig. 6. Upon the lateral swinging of platform 34 in either direction, it is obvious that said vertical planes will be swung in the same direction with relation thereto, but owing to the fact that said planes 49 are connected to the uprights 29 at a central point, said planes will not be moved through as great a distance as said platform 34.

Arranged below the plane 2 near the sides of opening 38, are arranged the vertical rods 56 upon the lower ends of which are secured the forwardly extending and upwardly curved rods 57, which have their forward ends united by a transverse rod 58. The diagonally arranged rods 59 and 60 which join each other at their upper ends and are suitably secured to the upper end of the uprights 4, have their lower ends connected to the curved rods 57 at 61. The diagonally arranged rods 62 connect the curved rods 57 with the lower plane 2. An inverted U-shaped bracket comprising the vertically arranged spaced sides 63 is secured upon the projecting ends of rods 58, as clearly shown in Fig. 1. Diagonally arranged rods 63^a are secured near the central point of the spaced sides 63 and have their inner ends suitably secured to the lower plane 2 near the diagonal rods 62. The spaced sides 63 are provided with alined brackets 63^b upon one side thereof, through which is rotatably mounted the horizontally arranged shaft 64. The parallel normally horizontally arranged superposed planes 65 are pivoted near the middle thereof to the spaced sides 63 as at 64^a, and have their edges pivotally connected by the means of the rods 65^a. The levers 66 are rigidly secured to the shaft 64 and have their opposite ends pivotally connected to corresponding rods 65^a. It is to be understood that the superposed planes 65 are flexible and that when the levers 66 are swung upon their pivots, that owing to the fact that their pivots are eccentric with relation to said superposed planes 65, planes 65 will be inclined and at the same time curved or flexed. An arm 67 is rigidly secured to shaft 64 at its middle and has a pivotal connection with a rod 68 which extends rearwardly and is connected by means of a suitable form of universal joint to an operating lever 69 arranged upon the platform 34, whereby said planes 65 may be actuated to raise and lower the machine. The vertically arranged half moon rudders 70 are pivoted to and between the superposed planes 65, at equal distances from the central transverse axes thereof. The half moon rudders are connected together by means of a string 71 or the like, which string extends laterally and is trained around suitable pulleys upon the rear connecting rod 65^a and thence rearwardly around pulleys upon the standards 4. By the actuation of said string 71 the rudders 70 may be swung laterally in either direction and the machine thus be steered to the right or left of its normal straight line of flight. The vertically arranged rudder 72 is pivotally connected at 73 to the horizontally arranged superposed rods 74, the inner ends of which are pivotally connected to the rear edges of the planes 1 and 2 at a point centrally thereof and in alinement with each other. The rearwardly converging rods 75 have the forward ends thereof pivotally connected to the upper and lower planes 1 and 2 and have their rear ends secured within a sleeve 76 which is secured to the rod 74. It is obvious from the above description that the rudder 72 may be swung in a vertical plane but that the same will be positively prevented from moving laterally. The U-shaped frame comprising the spaced sides 77 has the forward ends thereof secured to the lower plane 2 near the forward ends of said rods 75, and serves to support the lower horizontally arranged rod 74. The purpose in having the vertically arranged rudder mounted so that the same may be swung upwardly, is to avoid the breaking or damaging of the same when the machine is being landed from a flight. The chief function of the vertically arranged rudder 72 is to maintain the flying machine in a straight line of travel.

The supporting brackets 78 are arranged at equal distances from the ends of the planes 1 and 2 and are in transverse alinement with two of the uprights 3. A shaft 79 is rotatably mounted through the upper portion of each of said brackets 78 as at 80 and has its rear portion journaled through the upright 3, and is provided upon its rear end with the propeller 81. A rotatable pulley 82 comprising the three sprocket wheels 83 rigidly secured together is rotatably mounted at a central point upon shaft 23, and has means associated therewith for preventing the same from having longitudinal movement upon said shaft 23. A suitable motor 84 is arranged centrally upon platform 34 and has a sprocket chain 85 associated therewith and trained over one of the sprocket wheels 83, whereby rotation may be imparted to pulley 82 from said motor 84. A chain 86 engages one of the sprocket wheels 83 and extends laterally to engage a sprocket wheel 87 rigidly secured upon the forward end of one of said shafts 79, while a sprocket chain 89 extends laterally in opposite direction to chain 86 and engages a sprocket wheel 90 which is rigidly secured to the corresponding propeller shaft. The chain 89 is crossed so that the propellers secured upon the ends of the propeller shafts 79 will be rotated in oppo-

site directions to each other, it being understood that the set of blades of the propeller secured upon one of said shafts 79 is at right angles to the set of blades of the other propeller. It is obvious that by locating the motor 84 upon the central portion of the platform 34, that the same will be normally in vertical alinement with shaft 23, and I consider this of importance for the operation of said motor 84 will not cause the platform 34 to be swung laterally sufficiently to actuate the equilibrium planes to any perceptible extent. It is also obvious that the swinging of the planes 1 and 2 upon the transverse shaft 23 will not affect the operation of the motor and the actuating of the propellers by the same.

In the operation of my machine, the propellers are driven by the motor 84 which causes the machine to travel forwardly in the direction of the arrow shown on Fig. 1. During the course of flight should the body portion of the machine swing angularly out of its normal horizontal plane, and for the sake of illustration, we may suppose that the end 91 be lowered, the shaft 23, being free to rotate between standards 28, the platform 34 together with standards 28 will maintain their normal hanging position while the rods 46 will be pressed inwardly against said standards 28, thus causing bell-crank-levers 19 and 20 to be swung outwardly upon their pivot point and draw the rear edge of plane 11 downwardly and force the forward edge upwardly. It is obvious that this movement of plane 11 would cause the elevation of the end 91 and thus restore the equilibrium of the machine. During the upward movement of the forward edge of plane 11, plane 10 has its forward edge drawn downwardly a corresponding distance which of course helps plane 11 in restoring the equilibrium of the machine. It is obvious from Fig. 6, that when platform 34 is swung toward one side of the machine, that planes 10 and 11 are swung in opposite directions with relation to each other, as hereinabove described. During the flight of the machine, and lowering of end 91 as above described, the platform 34 has assumed a position nearer the end 91 than it has when the machine is in its horizontal position. This new position of platform 34 increases the resistance upon the side of the machine the end of which is 91, and this will cause said end 91 to be retarded somewhat in its travel and which will in turn cause the machine to be swung from its straight path of travel. To overcome the above difficulty, I have provided the vertically arranged equalizing planes 49. It is to be understood that these planes in their normal position are arranged angularly as shown in Fig. 6, thus offering an equal amount of resistance upon each side of the body portion of the machine, and that the limit of the travel of said planes 49 outwardly, is to assume a position transversely of said plane 2. In the swinging of the end 91 downwardly, as above described, the plane 49 nearer end 91, is swung outwardly to assume a transverse position with relation to plane 2, thus reducing the resistance upon that side of the machine while the other plane 49 upon the opposite side of said platform 34 is drawn toward the same to assume a somewhat parallel position with relation to the rear edge of plane 2, thereby increasing the resistance on that side of the machine. By the operation of the planes 49, as above described, the extra amount of resistance caused by the swinging of the platform 34 to either side of the machine is equalized. It is also obvious that in the last referred to illustration that the pressure exerted upon plane 49 the farther away from end 91 will tend to swing platform 34 toward said end 91 or in a direction opposed to the pressure exerted by the planes 10 and 11 upon the platform 34 and therefore steady the platform and quicken the movement of planes 10 and 11. It is also worthy of note that the vertical planes 49 in their normal position, tend to steady platform 34 and prevent the same from undergoing unnecessary oscillation.

The modified form of my invention as shown in Figs. 9 and 10 comprises the parallel superposed planes 92 and 93 connected at their corners by the uprights 94. The horizontally arranged rods 95 are connected to uprights 94 near the middle thereof, said rods 95 being in alinement with each other. At a central point upon rods 95 is rigidly secured a horizontally arranged shaft 96 and upon said shaft 96 near the ends of planes 92 and 93, are swingingly mounted planes 97. The planes 92 and 93 are further connected near their middle portions by the uprights 99, provided at a point centrally thereof with the horizontally arranged and outwardly extending bars 100. Upon the end of each of said bars 100 is pivotally mounted a bell-crank-lever 101, said bell-crank-lever 101 having a pivotal link 102 associated therewith for connecting the same to the forward edge of one of the planes 97. The bell-crank-levers 101 are oppositely arranged with relation to each other and are pivotally connected by a horizontally arranged rod 103. A vertically arranged rod 104 adapted to normally assume said vertical position, has its upper end pivotally mounted near the forward edge of plane 92 and at a point in the middle thereof. Rod 104 is pivotally connected to the horizontally arranged rod 103 at a point centrally thereof, said rod 104 extending downwardly through a longitudinally arranged slot 105 upon plane 93, being provided upon its lower end with a ball 106 which serves as a weight.

The forward edges of planes 92 and 93 are provided with the horizontally arranged rudders 107 and 108 respectively, spaced away therefrom and connected thereto by means of the spaced strips 109 and 110 respectively. Upon the rear edge of planes 92 and 93 and in alinement with strips 109 and 110 are arranged the rectangular brackets 111 and 112 respectively, upon the rear ends of which is rigidly mounted a vertically arranged rudder 113, and at a central point thereon.

The operation of the form of my machine disclosed in Figs. 9 and 10 may be more clearly understood by stating that the same is to be used as a toy. This form of my device is propelled by securing a string or the like to the forward portions thereof at a central point, and attaching the other end of the string to the far end of a long pole which is moved around in a circle by the person holding the same, thus imparting to the toy aeroplane the required speed. I wish it understood that I do not restrict myself to this manner of using or propelling my toy aeroplane, for I may replace the string and pole by using suitable form of spring motor. The ball 106 being comparatively heavy acts as a pendulum or in a manner similar to platform 34, and will move planes 97 in opposite directions to each other, whereby the equilibrium of the machine will be restored in the same manner as in the first form of my device.

In the last form of my device, I have omitted the vertically arranged equalizing planes 49, but have increased the size of the rear vertically arranged rudder and thus overcome the resistance placed upon one side of the machine, when the ball 106 assumes a position nearer to that side.

I wish to state that I may manufacture the first form of my device by the use of any suitable material which is sufficiently strong and light. However, the second form of my device may be manufactured partly of pasteboard, tissue paper and wooden strips, or any form of inexpensive material. I wish it further understood that the forms of my device herein shown and described, are to be taken only as an illustration of the preferred form of my device, and that many changes in the shape, size and details of the same may be made without departing from the spirit of my invention.

Having fully described my invention, I claim:

1. A flying machine of the character described, comprising superposed planes, movable planes mounted between said superposed planes near the ends thereof and adapted to be swung in a vertical plane, a depending member swingingly mounted upon one of said superposed planes and adapted to retain a vertical position, means connecting said swinging member and the swinging planes for moving the same in opposite directions to each other, vertically arranged swinging planes adapted to be swung in a horizontal plane arranged between said superposed planes, means connecting said vertical planes and said swinging member, a vertical rudder arranged rearwardly of said superposed planes, means for raising and lowering said machine, and means for propelling said machine, substantially as described.

2. A flying machine of the character described, comprising superposed planes, movable planes arranged between said superposed planes at the ends thereof, and adapted to be swung in a vertical plane, the lower of said superposed planes being provided with an opening arranged centrally thereof, a support swingingly mounted upon the upper of said superposed planes arranged within said opening adapted to have longitudinal movement with relation to said lower of said superposed planes, means connecting said movable planes with said support for moving the same in opposite directions to each other when one end of said superposed plane is raised or lowered, a vertical plane mounted upon each side of said support adapted to be swung in a horizontal plane, connections between said vertical planes and said support for moving said vertical planes in opposite directions to each other, a vertical rudder arranged centrally of and rearwardly of said superposed planes, and adapted to be moved in a vertical plane only, means for raising and lowering the machine, propellers mounted rearwardly of said plane, and means for actuating said propellers, said means being mounted upon said support, substantially as described.

3. A flying machine of the character described, comprising superposed planes, planes swingingly mounted between said superposed planes at the ends thereof, means for swinging said planes so that the same are arranged at opposite angles to the course of flight of the machine, a platform swingingly supported by the upper of said superposed planes and adapted to move within an opening provided within the lower of said superposed planes, planes movably arranged upon the lower of said superposed planes on both sides of said platform, a section of elastic material connecting said planes with said platform, means connecting said planes with said platform whereby the former are forced to move with the latter, and means connecting said platform with said means for swinging said planes, substantially as described.

4. In a flying machine of the character described, a sustaining plane, ailerons disposed near the opposite ends of the sustain-

ing plane, a pendant structure to swing transversely to the direction of flight of the machine, means connected with both the forward and rear edges of the ailerons and with the pendant structure whereby the ailerons will be positively moved up and down in opposite directions with relation to each other when the machine tilts transversely, vertical planes disposed upon opposite sides of the pendant structure and connected therewith to be automatically moved by the same, an elevation rudder, a direction rudder, and propelling means for the machine.

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

AUGUSTUS F. W. MACMANUS.

Witnesses:

DON P. BLISS,

NELSON LYTLE