

E. M. YATES.
AEROPLANE.

APPLICATION FILED DEC. 27, 1909.

991,259.

Patented May 2, 1911.

3 SHEETS—SHEET 1.

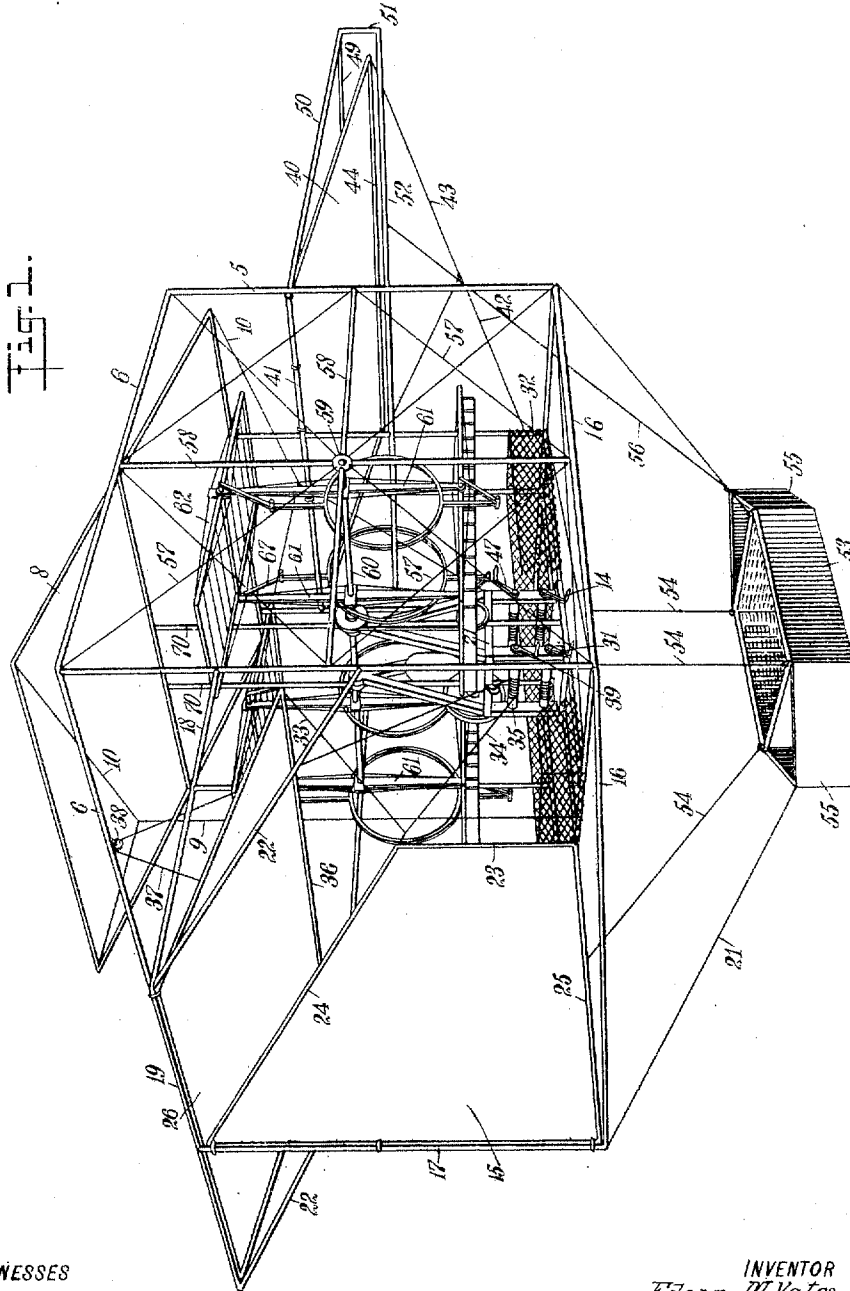


Fig. 1.

WITNESSES

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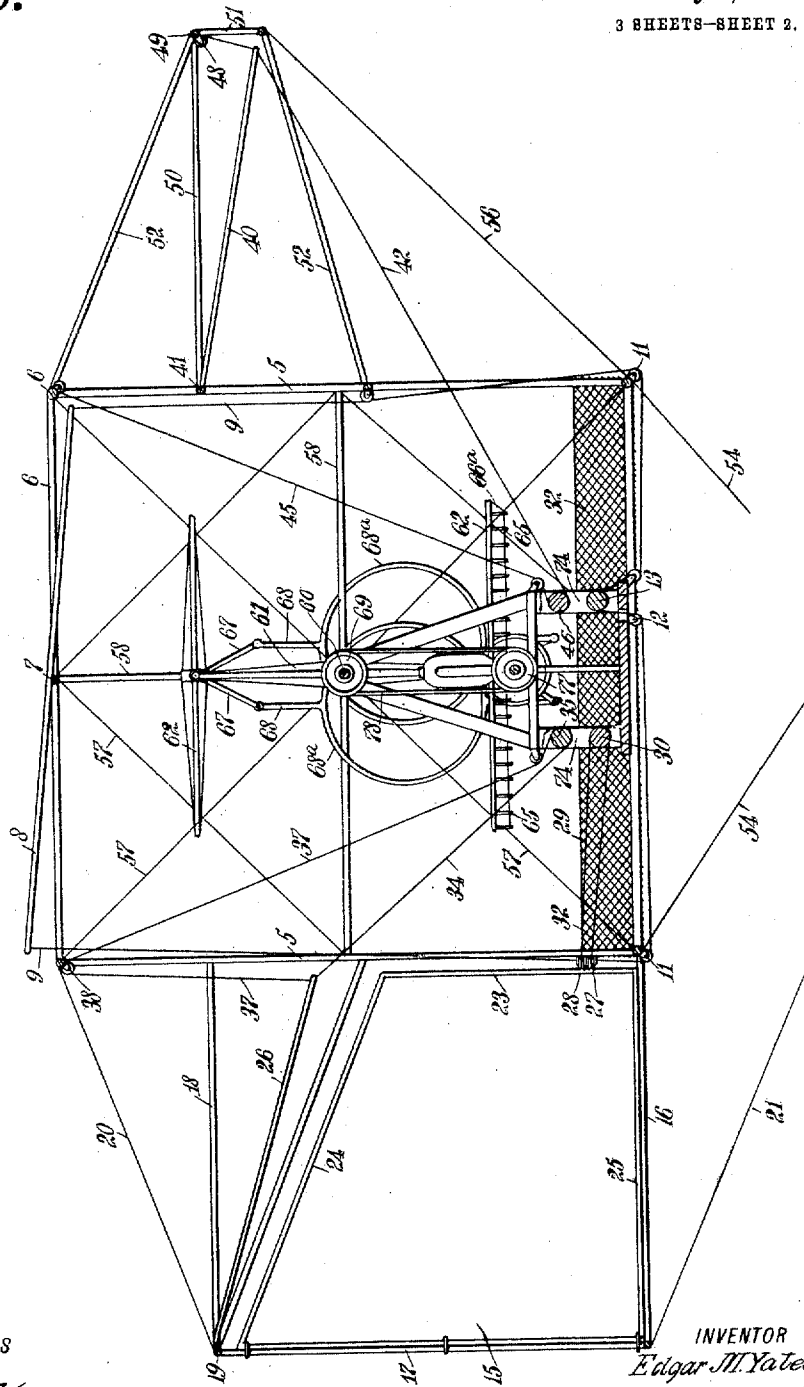
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3 SHEETS-SHEET 2.

991,259.

Fig. 2.



WITNESSES

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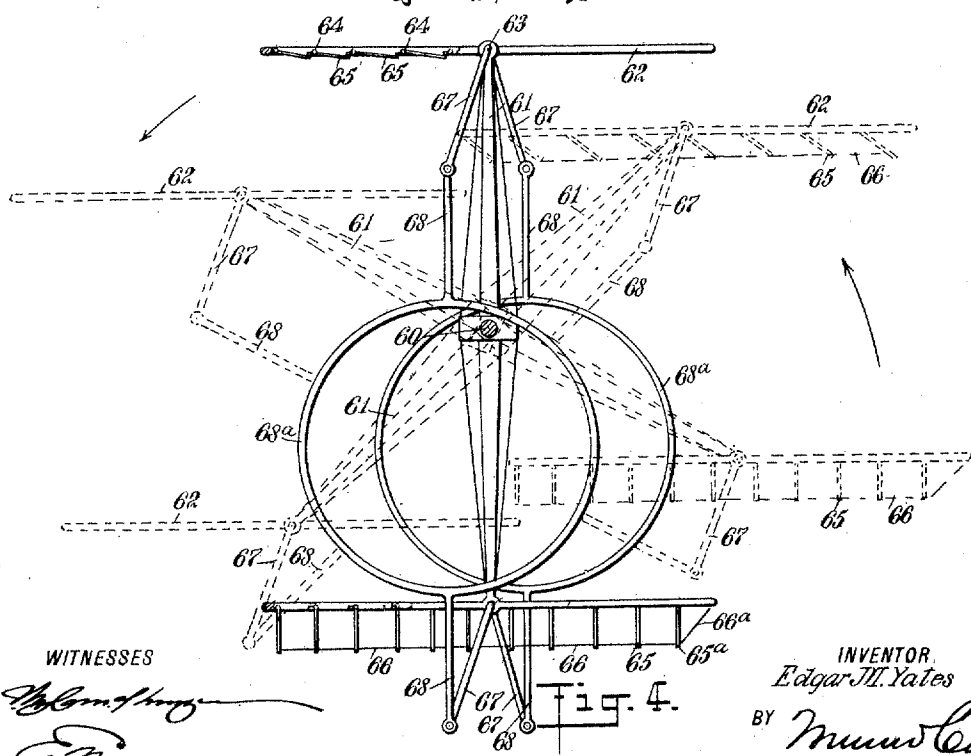
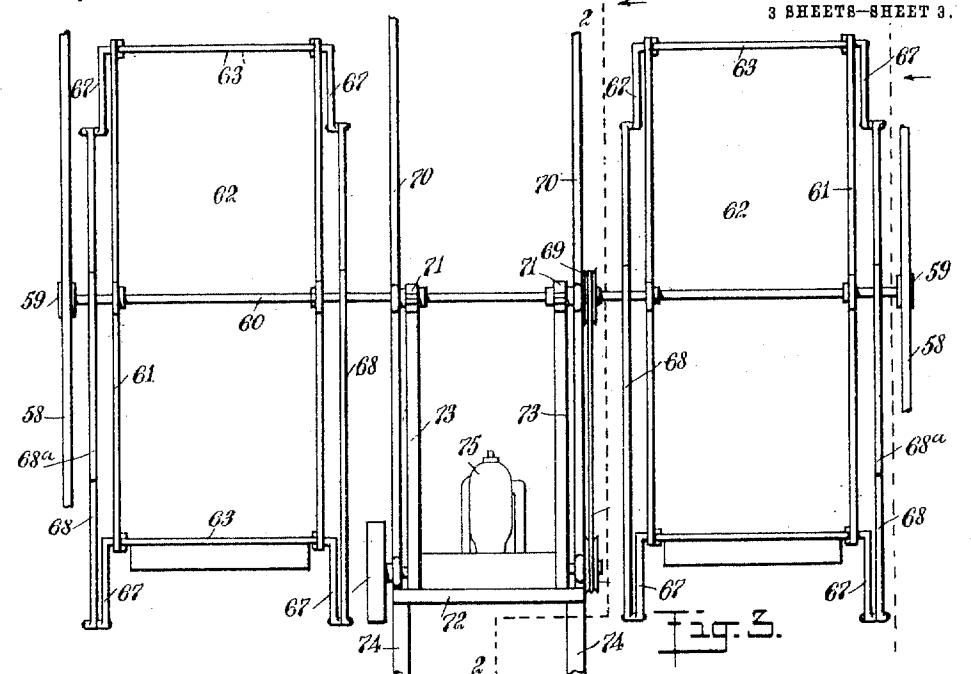
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3 SHEETS—SHEET 3.



WITNESSES

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AEROPLANE.

991,259.

Specification of Letters Patent.

Patented May 2, 1911.

Application filed December 27, 1909. Serial No. 535,114.

To all whom it may concern:

Be it known that I, EDGAR M. YATES, a citizen of the United States, and a resident of Norman, in the county of Cleveland and State of Oklahoma, have invented a new and Improved Aeroplane, of which the following is a full, clear, and exact description.

Among the principal objects which the present invention has in view are: to provide means whereby the aeroplane is levitated from a stationary position; to provide means for propelling the aeroplane in a horizontal plane; and to provide a structural arrangement to co-act with central ballasting devices whereby the aeroplane is automatically balanced.

One embodiment of the present invention is disclosed in the structure illustrated in the accompanying drawings, in which like characters of reference denote corresponding parts in all the views, and in which—

Figure 1 is a perspective view of an aeroplane constructed and arranged in accordance with the present invention; Fig. 2 is a longitudinal central vertical section of the aeroplane on the line 2—2 in Fig. 3, the ballasting car being omitted; Fig. 3 is a fragmentary view in front elevation, of the levitating and propelling wings and motor for operating the same; and Fig. 4 is a diagrammatic view, illustrating in various positions the propelling wings and connecting means therefor.

An aeroplane constructed in accordance with this invention differs from the usual machines in that the propelling devices employed perform the dual function of lifting and propelling the machine in a horizontal plane. These devices are located axially and centrally in the machine, a frame work substantially rectilinear in form being constructed from vertical bars 5, 5. The vertical bars 5, 5 are connected by horizontal bars 6, 6 disposed in the box-like frame illustrated in the drawings.

Extended between the upper horizontally extended bars 6, is a shaft 7, forming the pivot on which a main plane 8 rocks. The plane 8 extends between the sides of the machine and is formed of any suitable and usual material, such as canvas or silk, reinforced to maintain the plane in a smooth and gliding surface. The plane 8 is shifted

by means of guy lines 9, 9, which are connected to slings 10, 10, the outer ends of which are connected to the corners of the plane 8 when the centers are fixedly joined to the guy lines 9. The guy lines 9 are led downward and reeved under sheaves 11, 11, from which they are drawn toward the center and passed over the sheaves 12, 12 and wound upon a winch 13. The winch 13 is provided with a crank 14, by the turning of which the guy lines are drawn in and paid out to alter the horizontal angle of inclination of the plane 8. As in the usual construction of aeroplanes, the disposition of the plane 8 is proportioned to the speed of horizontal travel of the aeroplane, the inclination to the air through which the machine is traveling resulting in an upward lift of the machine by the said plane.

Set out from the forward end of the square form structure is a frame, on the forward vertical member of which is pivotally secured a steering plane 15. The frame within which the plane 15 is suspended consists of horizontal, outreaching and converging bars 16, 16, a perpendicular connecting bar 17, and the outreaching and square frame formed by the bars 18, 18 and 19. The bars thus arranged are braced by guy lines 20 and 21. The frame formed by the bars 18 and 19 is further braced by rods 22, 22.

The plane 15, which is utilized as a rudder, is pivotally mounted on the connecting bar 17 and is converged at the inner extended end, which is formed by a vertical bar 23. The bars 17 and 23 are connected by bars 24 and 25. The upper edge of the plane 15 is backwardly inclined, as shown more particularly in Fig. 2 of the drawings. By this means the plane 15, in its swing in the horizontal direction, does not interfere with the levitating rudder plane, which is pivotally secured to the bar 19, and which, in its operation, is adjusted at various angles directly above the plane 15.

The plane 15 and the vertical short bar 23 thereof are connected by guy lines which are reeved over sheaves 27 and 28 mounted in the car body 32. Guy lines 29, 29 being thus reeved are wound upon a winch 30, which is provided with a crank handle 31, as illustrated in Fig. 1 of the drawings. By

manipulating the said handle and winch connected therewith, it is obvious that the angle of inclination of the vertical plane 15 to the horizontal progression of the machine

5 may be effected at will.

A plane 26 is utilized for shifting the machine to change its horizontal path of progression, to accomplish which the plane is shifted on the pivotal bearings thereof formed on the bar 19. The inner corners of the said plane 26 are joined by a sling 33, which is in turn connected to a guy line 34. The guy line 34 is reeved upon a winch 35. A bar 36 forming the inner edge of the plane 26 is connected to a guy line 37, which is reeved over a sheave 38 suspended from the bar 6 of the main frame. The guy line 37 and the guy line 34 are joined to form an endless cable wound upon the winch 35. The winch 35 is provided with a crank handle 39, by operating which it is obvious that the angle of inclination of the plane 26 to the path of travel of the machine may be altered at will.

From the rear of the main frame of the machine is extended a plane 40. The plane 40 is pivoted to a cross bar 41 extended between the vertical bars 5, 5 of the main frame of the machine. The plane 40 is suitably constructed, and is similar in most instances to the plane 26, and operates as an adjunct to the said plane 26. By means of the plane 40, constructed and disposed as shown, the rear end of the machine may be independently lifted or depressed. The said plane 40 is operated by a guy line 42, which is secured to a sling 43, which is attached to each outer corner of the square plane 40. To the center of a bar 44 forming the outer edge of the plane 40 is connected a guy line 45. The guy lines 45 and 42 are united to form an endless cable, which is wound upon a winch 46. The winch 46 is provided with a crank handle 47 whereby the same may be operated to change the angle of extension of the plane 40. The guy line 45 is reeved over a pulley 48 suspended in a bar 49 of the frame extended rearwardly from the main body of the machine. The bar 49 is maintained in position by brace rods 50, 50, uprights 51, 51 and rods 52, 52, the said rods and uprights constituting the box-like extension shown in the drawings.

The main frame of the machine is maintained in a normally level position by suitable dead ballast carried in a crate 53. The crate 53 is suspended from the four corners of the main frame by cables 54, 54. The ends of the crate 53 are provided with wedge-shaped extensions 55, 55. It is to one of the extensions 55 that the guy line 21 is connected. To the opposite extension 55 is connected a cable 56. The cable 56 is passed around the bar 49 and anchored to the upper horizontal bar 6 of the main

frame, as shown particularly in Fig. 2 of the drawings. By means of the various attachments described the ballast is held in relation to the machine so that at all positions of the planes the operation of the said ballast is to maintain the machine in a normally horizontal position.

The rectilinear sides of the machine are reinforced by tie lines 57, 57. The two side frames are further reinforced by cross bars 58, 58. At the junction of the cross bars 58, 58, are formed bearings 59 for the main driving shaft 60. The bearings 59 may be constructed in any preferred manner, it being desired that they shall be of the so-called frictionless type employing some form of rolling support for the shaft. The shaft 60 is extended transversely across the machine, and is provided at suitable intervals with arms 61, 61, between the ends of which are pivotally mounted propeller vanes 62, 62. The arms 61, 61 are mounted in pairs and are extended from both sides of the shaft 60, as shown particularly in Fig. 4 of the drawings. Between the extended ends of the arms 61 are extended shafts 63, 63, upon which the said vanes are fixedly mounted. There are two pairs of arms 61, 61, each pair being equally distant from the longitudinal center of the main frame and at each side thereof. All the arms 61, 61 are fixedly attached to the said shaft 60 and aligned thereon.

The vanes 62, 62 are provided with longitudinally extended side arms fixedly attached to the shafts 63, 63. Extended between the said arms are pivot rods 64, 64, upon which are pivotally hung swinging slats 65, 65. The lower ends of the slats 65, 65 are connected by flexible tie lines 66, 66. The end slats 65^a are connected by short tie lines 66^a to the end bar of the frame of the vanes. The tie lines 66^a, 66^a prevent the swinging slats 65 passing beyond the perpendicular position, as illustrated in Fig. 4 of the drawings, thereby offering flat or vertically extended sides of the swinging slats to produce propelling impulses when the vanes are passed backward on the lower reach of their rotary travel.

Each of the shafts 63 is provided with two extended cranks 67, 67. The ends of the cranks 67 are connected pivotally by links 68, 68. The links 68, 68 are provided with a circular part 68^a, to encompass the shaft 60, as shown particularly in Fig. 4 of the drawings. The shaft 60 is further provided with a driving pulley 69, fixedly attached to the said shaft at or near the center of the machine, as shown in Fig. 3 of the drawings. Supported by the shaft 60, and by bearing boxes 71, 71, is a platform 72. The platform 72 is supported by knees 73, 73. The shaft 60 at this point is reinforced by vertical brace bars 70, 70. The

platform 72 is further supported by underpins 74, 74, which are suitably connected with the lower framing of the car 32. Mounted on the platform 72 is a suitable internal combustion engine 75, the crank shaft of which is provided with a fly wheel 76 and a driving pulley 77. The driving pulley 77 is connected by means of a belt 78 with the pulley 69. Suitable clutch mechanism for throwing the driving mechanism into operative relation with the shaft 60 is provided but not herein shown or described.

In the rotation of the vanes 62, 62 the operation of the swinging slats 65, 65 is such that when the said vanes are being advanced in the horizontal plane they are, by the resistance of the air, closed, as shown in the upper position in Fig. 4. From this position, as the vane is rotated downward the said slats remain closed, and thereby form a solid wall or plane which operates to elevate the machine. From the horizontal position the vane is forced downward and rearward. At the extreme point in its lowered position, as shown in Fig. 4, there being no counter-resistance of the air to keep the vane closed, the slats drop to the opened position therein shown. On the rising side of the rotary path of the vanes the slats remain and are maintained in the full open position until the said vanes have arrived at the median elevation. From this point the vanes enter on the fourth quarter of their rotation wherein the vane is being advanced, as well as raised, and wherein the slats begin to receive the counter-force of the air through which the vane is being moved. As shown in dotted lines, the vanes at this point begin to assume the horizontal position shown in full lines at the extreme of the upper position of the vane. The result of this action of the slats is that from the upper vertical position of the vanes to near the lower vertical position of the vanes, the slats are maintained in closed position, thereby arranging the vanes for a lifting impulse. From near the lowest position, or when the relatively backward pressure of the air does not maintain the slats closed, they open by gravity, which is augmented by the backward pressure of the slats on the air to produce a forward impulse on the machine. This impulse is maintained until the vanes assume the full median line on the rise of the vane. From this point it will be seen that the vane, in traveling upward, does not exert a lifting action, and the slats hang loosely, offering no resistance to the surrounding air. In other words, the operation of the slats is such that the vanes composed thereby operate through approximately three quarters of their rotation, the first half of the operative period being devoted to a vertical lifting action, while the third quarter of the operative period is de-

voted to a horizontal propelling action. It will also be observed that the action of the slats herein described is automatic.

By advancing the cranks 67, 67 to the forward side of the median line of the arms 61, 61, and connecting the ends of the said cranks by the links 68, 68^a, the vanes are maintained in the horizontal and parallel positions illustrated in Fig. 4 of the drawings. This parallel position of the vanes is due to the balancing of each vane and connecting the vanes with each other by the links, so that the tendency of one to turn is counteracted by the other, or in other words the vanes balance each other.

When the aviator is seated within the car 32, and the engine 75 has gained sufficient headway, the clutch is thrown in, causing the shaft 60 to rotate with the crank shaft of the engine. At the minute of starting it will be understood that the slats 65, 65 in the upper, as well as the lower position, are depending. In starting the shaft 60, therefore, the resistance offered by the vanes 62, 62 is very slight. The slats 65, 65 do not close into solid plane arrangement until considerable speed has been acquired by the shaft 60 and the vanes 62 attached therewith. By means of this arrangement the construction accommodates itself to the desired object of permitting the engine to acquire headway before receiving the lifting strain of the vanes. When now the slats 65 are closed, the operation in the first instance will be to lift the machine from the ground, which action is immediately followed by a forward impulse due to the vanes passing toward the rear of the machine with the slats 65 in the depended position. In the beginning of this operation the cables 54, 54 are slackened, the machine resting on the upper edge of the crate 53. In this position the weight of the crate and the ballast contained therein does not retard the levitation of the machine. When, however, the machine has risen to the end of the cables 54, 54 the ballast contained in the crate 53 is lifted from the ground, and the machine is launched on its flight. During the flight it will be seen that the constant tendency of the vanes 62, 62 is to lift and propel in a forward direction the machine. If in the course of the operation the elevation desired has been acquired, by shifting the planes 8, 26 and 40 the further elevation may be counteracted or avoided. By temporary suspensions of the motor and the rotation of the vanes 62 connected therewith, the aeroplane may be caused to swoop and glide, as in machines of usual construction.

The operation of the various planes is caused by the manipulation of the cranks 14, 31, 39 and 47 connected with the winches controlling the disposition of the various planes 8, 15, 26 and 40. By the careful

manipulation of these planes the machine may be adjusted to any vertical angle in the air, or may be turned horizontally from one to another path of flight.

5 Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In an aeroplane, a frame, a rotary shaft mounted in the frame and provided with 10 oppositely projecting pairs of arms rigidly secured thereto, a plane mounted between each pair of arms, and means for connecting the planes, whereby they balance each other and are caused to assume horizontal posi- 15 tions as they revolve around the said shaft.

2. In an aeroplane, a frame, a rotary shaft mounted in the frame and provided with 20 oppositely projecting pairs of arms rigidly secured thereto, a plane mounted between each pair of arms, each plane being provided with a plurality of pivoted slats, and means for connecting the planes, whereby they balance each other and are caused to 25 assume horizontal positions as they revolve around the said shaft.

3. In an aeroplane, a frame, a rotary shaft mounted in the frame and provided with 30 oppositely projecting pairs of arms, a shaft mounted in the free ends of each pair of arms, a plane secured to each crank shaft, and links connecting the crank arms of the shafts, and having intermediate of their

ends enlarged portions encompassing the said shaft.

4. In an aeroplane, a frame, a rotary shaft 35 mounted in the frame and provided with oppositely projecting pairs of arms, a shaft mounted in the free ends of each pair of arms and provided at its ends with crank 40 arms, a plane secured to each crank shaft and provided with a plurality of pivoted slats, and links connecting the crank arms of the shaft and having intermediate of 45 their ends enlarged circular portions encompassing the said shaft.

5. In an aeroplane, a frame, a shaft 50 mounted in the frame, and provided at each end with pairs of oppositely projecting arms, a shaft mounted in the ends of each pair of arms and provided with crank arms at its ends, a plane secured to each crank shaft and provided with a plurality of pivoted 55 slats, links connecting the crank arms of the shafts and having intermediate of their ends enlarged circular portions encompassing the said shaft, a motor mounted in the frame at about the center thereof, and means for operating the said shaft from the motor.

In testimony whereof I have signed my 60 name to this specification in the presence of two subscribing witnesses.

EDGAR MURRY YATES.

Witnesses:

EARL E. SNEED,
J. M. BURCH.