

E. J. & S. A. RANDALL.

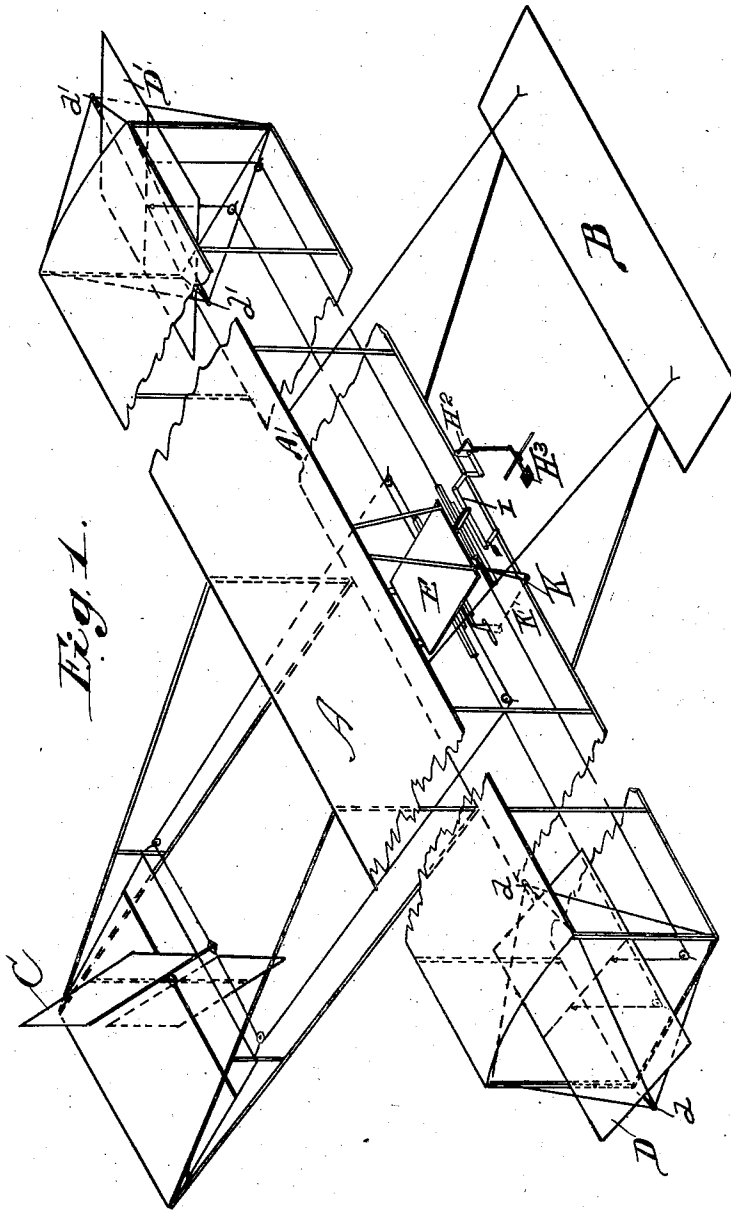
AEROPLANE.

APPLICATION FILED AUG. 15, 1910.

1,062,116.

Patented May 20, 1913.

3 SHEETS—SHEET 1.



Witnesses

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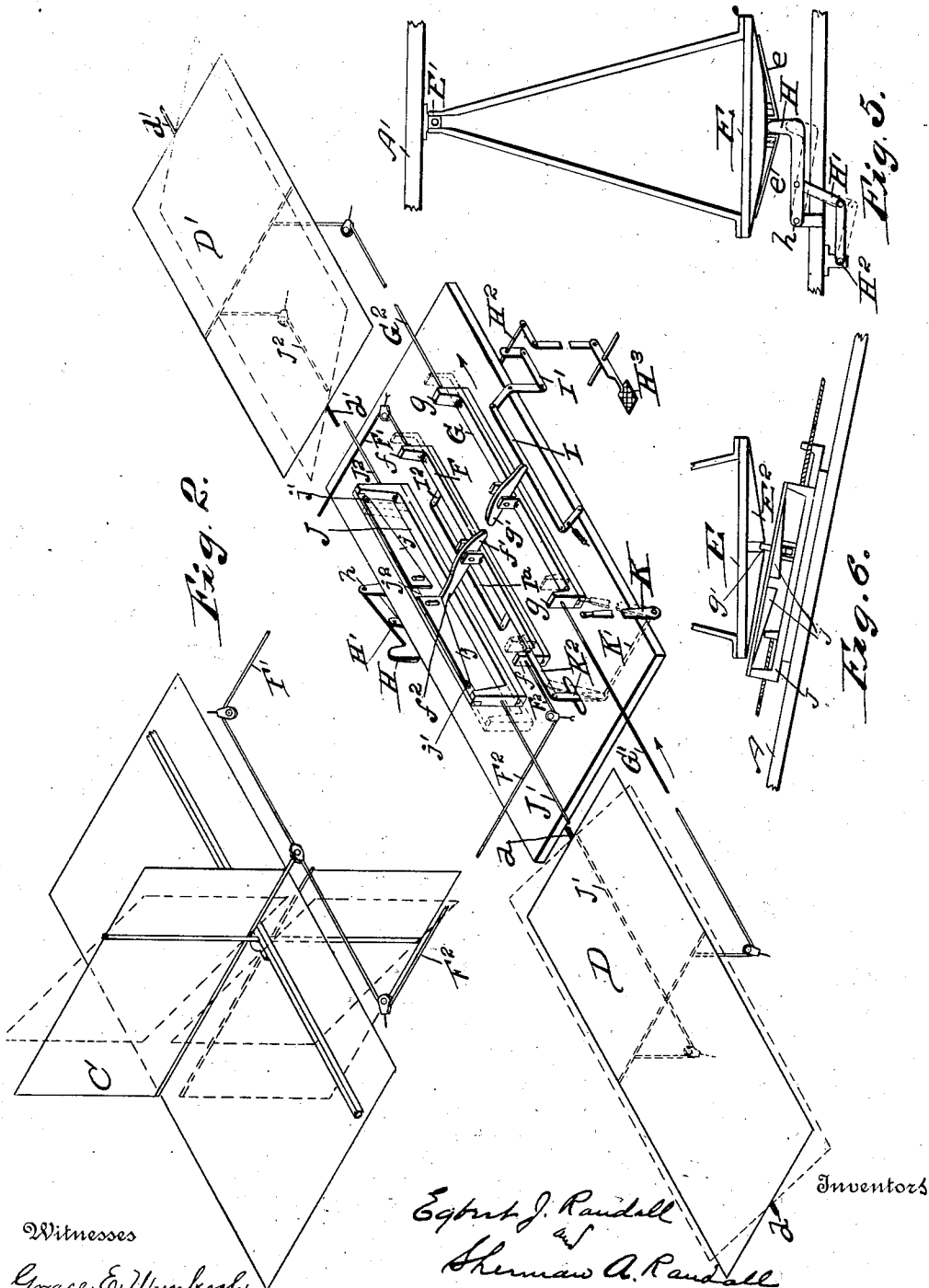
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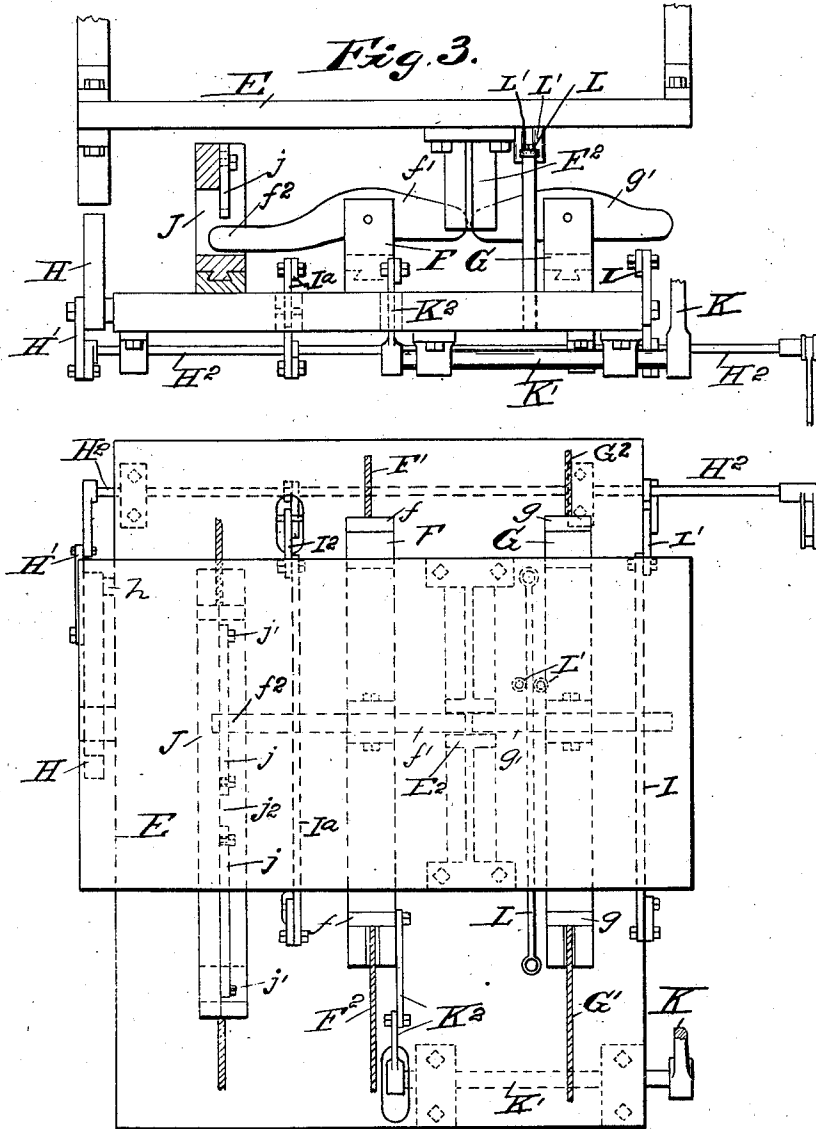


Fig. 4.

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UNITED STATES PATENT OFFICE.

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AEROPLANE.

1,062,116.

Specification of Letters Patent.

Patented May 20, 1913.

Application filed August 15, 1910. Serial No. 577,262.

To all whom it may concern:

Be it known that we, EGBERT J. RANDALL, residing at Pontiac, county of Oakland, State of Michigan, and SHERMAN A. RANDALL, residing at Rochester, county of Monroe, State of New York, have invented a certain new and useful Improvement in Aeroplanes, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

Our invention relates to an improvement in aeroplanes, shown in the accompanying drawings and more particularly described in the following specification and claims.

The object of our invention is to provide means for automatically operating stabilizing planes or ailerons whereby the lateral balance of the aeroplane is maintained.

Other advantages and improvements will hereafter appear.

In the drawings accompanying this specification:—Figure 1 is a perspective view of an aeroplane, with parts broken away. Fig. 2 is a perspective view of a detail showing diagrammatically the manner of actuating the stabilizing planes and rudder. Fig. 3 is a detail view with parts broken away and in section, showing the manner of engaging the slides controlling the operation of the stabilizing planes with the swinging motor platform. Fig. 4 is a plan view of the swinging platform and slides shown in Fig. 3. Fig. 5 is a detail view indicating the manner of locking the swinging platform in fixed relation to the frame of the aeroplane previous to operating the rudder and stabilizing planes manually. Fig. 6 is a similar view showing the swinging platform engaged by the dogs of the slides controlling the automatic operation of the stabilizing planes.

We will now denote the several parts by reference letters in which A indicates a biplane of the usual type, though the invention is equally well adapted to a monoplane or other form of aeroplane,—the general structure of the aeroplane and means for driving same forming no part of this invention.

In the embodiment shown in the draw-

ings, B represents an elevating plane, and C the rudder.

D, D', indicate stabilizing planes located at either end of the aeroplane for maintaining its lateral balance.

E is a swinging platform operating somewhat in the nature of a pendulum though it may be a sliding frame, on which the motor and other driving mechanism may be mounted. In the form shown in the drawings, the platform E is pivoted at E' to the upper spars A' or framework of the aeroplane. Beneath the platform and adapted to slide in suitable guides or tracks supported by the lower spars or frame of the apparatus are slides F, and G, having upwardly turned ends *f* and *g*. To the slide F are secured cables F' and F² passing around suitable sheaves or other supports and respectively engaging the rudder C. To the slide G are also secured similar cables G', and G², suitably supported and guided and in turn respectively engaging the stabilizing planes D and D'.

Carried by the slides F and G and pivoted thereon are dogs *f'* and *g'* provided with springs (not shown) or so weighted as to insure normally a locking engagement with the notched member E² secured to the underside of the platform,—it being understood that any other suitable means of securing a locking engagement may be employed, the drawings merely indicating in this and other respects of like character, a working embodiment of the invention.

H is a locking dog adapted to secure the swinging platform E in a fixed position for purposes which will be hereafter explained. The locking dog H is pivoted at *h* to the frame and actuated by suitable lever mechanism H' carried by the rock shaft H² in turn operated by the foot lever H³ supported by suitable hangers (not shown) to the frame.

I and I^a are tripping bars actuated by suitable toggle mechanism I' and I² operated by the rock shaft H² whereby upon operating the foot lever H³, the spring actuated dogs *f'* and *g'* are forced out of engagement with the notched member E²,—the swinging platform being thereby released from engagement with the slides F and G. Upon actuating the tripping bar I^a, the end *f*² of the dog *f'* is forced upward

into engagement with the slide J between the plates j, j , pivoted at j', j' , to the slide.

J^1 and J^2 are cables connected with the slide J and which pass through guides and around suitable sheaves and respectively connect with the stabilizing planes D, and D', but on the opposite side of the pivots d and d' to that on which the cables G^1 and G^2 connect, whereby upon operating one set of cables the planes may be turned in one direction and in the opposite direction by operating the other set of cables.

K is a lever adapted for manual operation, supported in bearings mounted upon the rock shaft K' to which is engaged the toggle arms K² in turn connected with the slide F.

L is a guide bar secured to a fixed portion of the frame, and L', L', are rolls carried by the swinging platform adapted to bear upon each side of the bar L, to secure the swinging platform against lateral movement.

Having thus indicated the parts by reference letters, we will now describe the operation of our invention. Upon the aeroplane encountering air currents having a tendency to destroy its lateral balance and thus cause it to tilt in one direction or the other, the swinging or pendulum platform E,—on which we prefer to support the driving mechanism or motor of the device,—will have a tendency to swing in exact ratio to the degree of inclination of the aeroplane; or in other words, it will assume a vertical position. This action of the movable or swinging platform serves to actuate the slides F and G,—they being normally connected with the platform by means of the dogs f' and g' ,—the cables on one side of the slides being under tension while those on the opposite side are free or slack, due to the movement of the slide in their direction. We will assume that the movable platform E has swung in the direction indicated by the arrow in Fig. 2 of the drawings. This would cause the slides F and G to move in that direction as indicated by dotted lines in the figure referred to. This action of the slides will put the cable G^1 under tension, thereby tilting the stabilizing plane D as indicated in dotted lines. The slide J being free to move, the cable J^1 connected therewith and with the stabilizing plane D, will draw the slide J in the direction indicated by the dotted lines. The other end of the slide J being connected by the cable J^2 with the stabilizing plane D' being thus put under tension, will serve to tilt the stabilizing plane D' in the direction indicated in dotted lines. It will thus be seen that the stabilizing planes D and D' will be tilted in opposite directions and in direct ratio with the lateral inclination of the aeroplane. Coincident with the movement of the stabilizing planes is the operation of the rudder C,

actuated by the cables F' and F². As shown in Fig. 2, the cable F² being under tension,—as indicated by the dotted position of the slide F,—will serve to move the rudder in the direction indicated by the dotted lines. It may now be seen that the direction thus given to the stabilizing planes and rudder will serve to restore the lateral balance of the aeroplane, and should the aeroplane encounter air currents which have a tendency to tilt it in the opposite direction to that just described, the slides actuated by the platform tilting in the opposite direction, will operate the stabilizing planes and rudder in a like manner but in a reverse direction to that referred to. When it is desired to release the swinging or movable platform from the slides, in order to manually steer the aeroplane, the pilot depresses the foot lever H² which in turn actuates the rock shaft H² and thereby operates the tripping bars I and I^a, which acting upon the dogs f' and g' force them out of locking engagement with the swinging platform at the same time forcing the long arm of the dog f' into locking engagement with the slide J, being locked therewith by means of the plates j, j , pivoted to the slide,—the purpose being to provide a flexible abutment against which the end of the dog may bear should the operator throw the dog f' out of engagement when the platform is in such a position that the long arm of the dog would encounter the flexible plates before entering the spaced opening j^2 between their ends provided for its reception. The relief thus afforded will permit the dog to find its seat between the contiguous ends of the flexible plates j, j , through which it will be locked with the slide. Upon the operation of the tripping bars I and I^a by means of the foot lever H², the locking dog H will be simultaneously actuated through its lever connection H' with the rock shaft. This locking dog is designed to enter between two flexible members e, e , secured to the rear end of the swinging platform on its underside, whereby the platform is locked in a fixed relation with the frame of the aeroplane.

We will now assume that the pilot desires to change the direction in which he is traveling. This is accomplished by grasping the manually operated lever K mounted upon the rock shaft K' in turn connected by the toggle mechanism K² with the slide F. The slide F being likewise connected with the rudder C by means of the cables F' and F² respectively, as previously explained. Upon operating the lever K, as indicated in dotted lines, the slide J will be forced to the position also indicated by dotted lines, thereby putting the cable F² under tension causing the rudder to turn as indicated in dotted lines, while the end f^2 , of the dog f' , being now engaged with the slide J as previously

explained, will cause the slide F and the slide J to move together but in a direction opposite to that indicated by the dotted lines in that figure and opposite to that taken by the slide when the movable platform is engaged with the slides F and G.

It may now be seen that the cables J' and J² connected with the respective ends of the slide J, and in turn connected with the stabilizing planes D and D', will tilt the stabilizing planes D and D' in a direction directly opposite to that indicated by dotted lines in Fig. 2. The cable J' being under tension will tilt the plane D downward, thereby putting the cable G' under tension due to the lifting of the opposite side of the plane D,—this action drawing the slide G and thereby putting the cable G² under tension, resulting in tilting the plane D' downward but in a direction directly opposite to that indicated in the dotted lines in the figure referred to. The inclination given to the stabilizing planes D and D' is in accordance with the degree in which the rudder is turned, and is for the purpose of banking the aeroplane in making the turn.

When it is desired to turn the aeroplane in the opposite direction, the lever K is forced to the left which action will cause the several slides, planes, and rudder to move in the opposite direction to that just described, as will be understood.

While we have described the device as connected with a swinging or pendulum platform, it is apparent that the same results may be obtained by a sliding or rolling platform or element, connected with the stabilizing planes and rudder,—the construction being such that upon the lateral tilting of the aeroplane, the sliding element would be adapted to automatically actuate the stabilizing planes and rudder to restore the normal balance of the aeroplane.

Having thus described our invention, what we claim is:—

1. In an aeroplane, stabilizing planes, a rudder, a movable platform, slidable elements adapted to be engaged with said platform to move thereby, cables connecting the rudder with said slidable means, another set of cables connecting the stabilizing planes with said slidable means, whereby said stabilizing means and rudder are actuated to restore the normal balance of the aeroplane, and means whereby the platform and the slidable means may be thrown out of co-operation so that the rudder and stabilizing planes may be actuated manually.

2. In an aeroplane, stabilizing planes, a rudder, a movable platform, a plurality of sliding elements, connections between one of the slidable elements and the rudder and other connections between the stabilizing planes and the other sliding elements, and means whereby upon swinging movement of

the platform said sliding elements are actuated to manipulate the stabilizing planes and rudder to maintain the normal balance of the aeroplane.

3. In an aeroplane, stabilizing planes, a rudder, a movable platform, a plurality of sliding elements adapted to be engaged with said platform whereby they may move with the platform, and cables connecting the rudder with one set of sliding elements, another set of cables connecting the stabilizing planes with the other sliding elements, for the purpose described.

4. In an aeroplane, stabilizing planes, a rudder, a swinging platform, a plurality of sliding elements, means for interlocking said sliding elements with the platform, and cables connecting one of said sliding elements with the rudder and other cables connecting the stabilizing planes with the other sliding elements.

5. In an aeroplane, stabilizing planes, a rudder, a swinging platform, a plurality of sliding elements, a set of cables connecting one of said sliding elements with the rudder, another set of cables connecting the other sliding elements with the stabilizing planes, means for engaging said sliding elements with the swinging platform whereby they may move therewith, and means for tripping said engaging means, substantially as described.

6. In an aeroplane, stabilizing planes, a rudder, a swinging platform, sliding elements adapted to be locked with said platform, cables respectively connecting one of the sliding elements with the rudder and the other sliding elements with the stabilizing planes, means adapted to lock the swinging platform in fixed relation with the frame of the aeroplane and one of the sliding elements with another, and a manually operated lever adapted to operate the sliding elements whereby the stabilizing planes and rudder may be adjusted.

7. In an aeroplane, stabilizing planes, a rudder, a swinging platform, means connecting the stabilizing planes and rudder with the swinging platform, a guide bar secured to the fixed frame of the aeroplane, and means secured to the swinging platform adapted to bear on either side of the guide bar whereby the swinging platform is secured against lateral displacement.

8. In an aeroplane, stabilizing planes, a rudder, a swinging platform, sliding elements adapted to be locked to said platform, cables respectively connecting one of the sliding elements with the rudder and the other sliding elements with the stabilizing planes and rudder, suitable dogs adapted to lock the swinging platform in fixed relation with the frame of the aeroplane and one of the sliding elements with another, and a manually operated lever adapted to operate

the sliding elements whereby the stabilizing planes and rudder may be adjusted.

9. In an aeroplane, adjustable stabilizing planes, a rudder, a swinging platform adapted to be operated by the inclination of the aeroplane, a plurality of sliding elements, means connecting the stabilizing planes and rudder with said sliding elements, and suitable locking dogs adapted to engage the swinging platform with the sliding elements.

10. In an aeroplane, a frame, stabilizing planes each mounted on a central axis, a rudder, a swinging platform, and means connecting the platform and the stabilizing planes and rudder whereby upon swinging movement of the platform under the influence of tilting action of aeroplane in flight the stabilizing planes and rudder will be adjusted automatically to maintain a normal balance of the aeroplane, and means constructed and arranged whereby the swinging platform may be locked against movement.

11. In an aeroplane, a frame, stabilizing planes each mounted on a central axis, a rudder, a swinging platform, and means connecting the platform and the stabilizing planes and rudder whereby upon swinging movement of the platform under the influence of tilting action of the aeroplane in flight the stabilizing planes and rudder will be adjusted automatically to maintain a normal balance of the aeroplane, means constructed and arranged whereby the swinging platform may be locked against movement, and means whereby, when the platform has been locked against movement, the stabilizing planes and rudder may be manually operated.

12. In an aeroplane, stabilizing planes, a rudder, a movable platform, cables connected to the rudder, cables connected to the stabilizing planes, and movable mechanism

operable under the influence of the movable platform to actuate the cables and thereby adjust the stabilizing planes and rudder to maintain a balance of the aeroplane, said cables being independent of the movable platform.

13. In an aeroplane, stabilizing planes, a rudder, a movable platform, cables connected to the rudder, cables connected to the stabilizing planes, and movable mechanism operable under the influence of the movable platform to actuate the cables and thereby adjust the stabilizing planes and rudder to maintain a balance of the aeroplane, and means whereby the movable platform and said movable means which coöperates with the platform may be thrown out of coöperative relation.

14. In an aeroplane, stabilizing planes, a rudder, a movable platform, cables connected to the rudder, cables connected to the stabilizing planes, and movable mechanism operable under the influence of the movable platform to actuate the cables and thereby adjust the stabilizing planes and rudder to maintain a balance of the aeroplane, and means whereby the movable platform and said movable means which coöperates with the platform may be thrown out of coöperative relation, and means whereby, after said movable platform and said movable means are thrown out of coöperative relation, the aeroplane may be operated manually.

In testimony whereof, we sign this specification in the presence of two witnesses.

EGBERT J. RANDALL.

Witnesses:

GRACE E. WYNKOOP,
SAMUEL E. THOMAS.

SHERMAN A. RANDALL.

Witnesses:

ROY C. WEBSTER,
SAMUEL L. CRABBE.