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AUTOMATIC LATERAL AND LONGITUDINAL BALANCE FOR AEROPLANES.

APPLICATION FILED NOV. 20, 1912.

1,062,074.

Patented May 20, 1913.

2 SHEETS—SHEET 1.

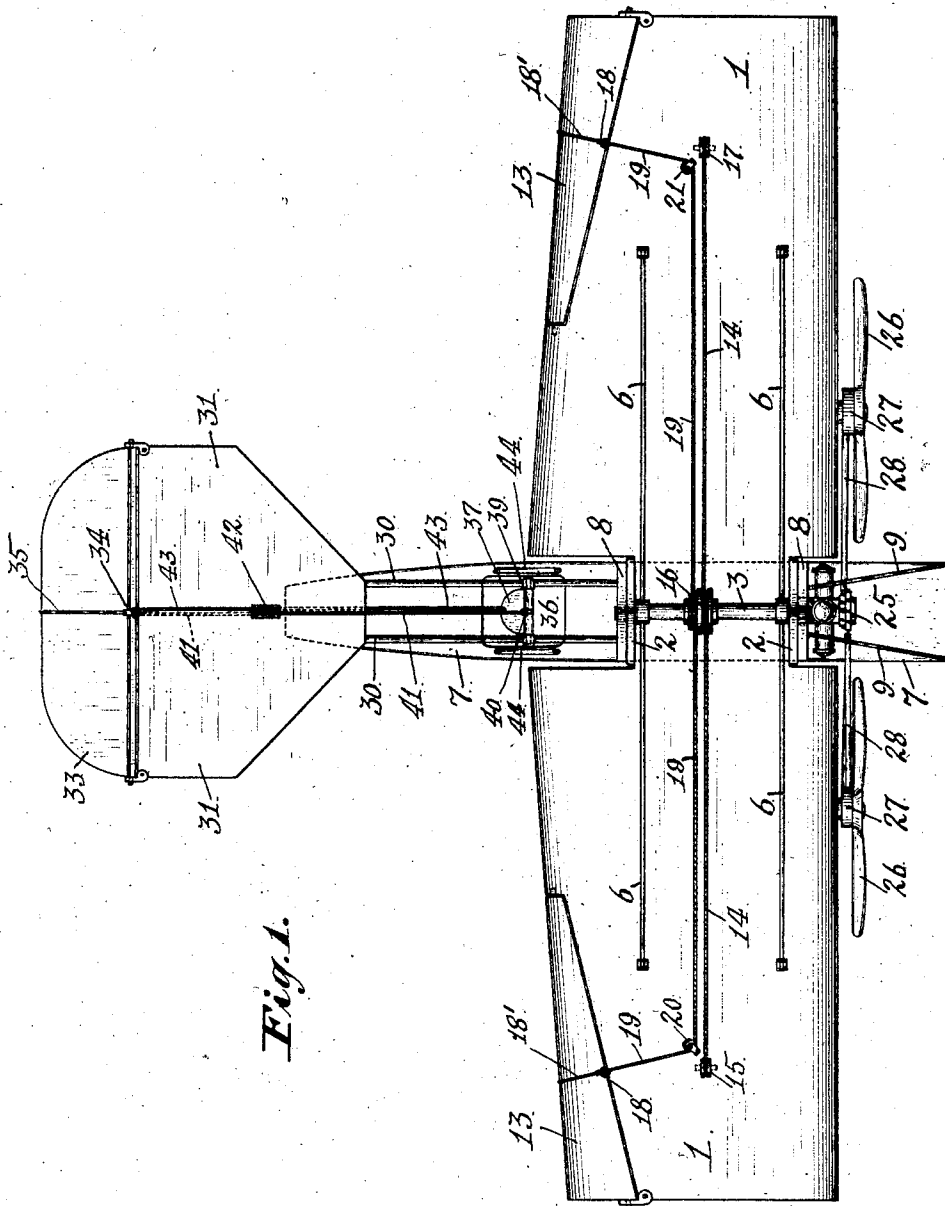


Fig. 1.

WITNESSES

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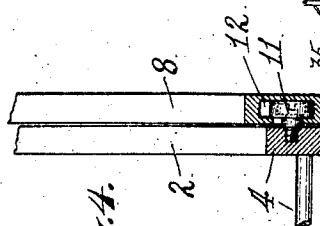
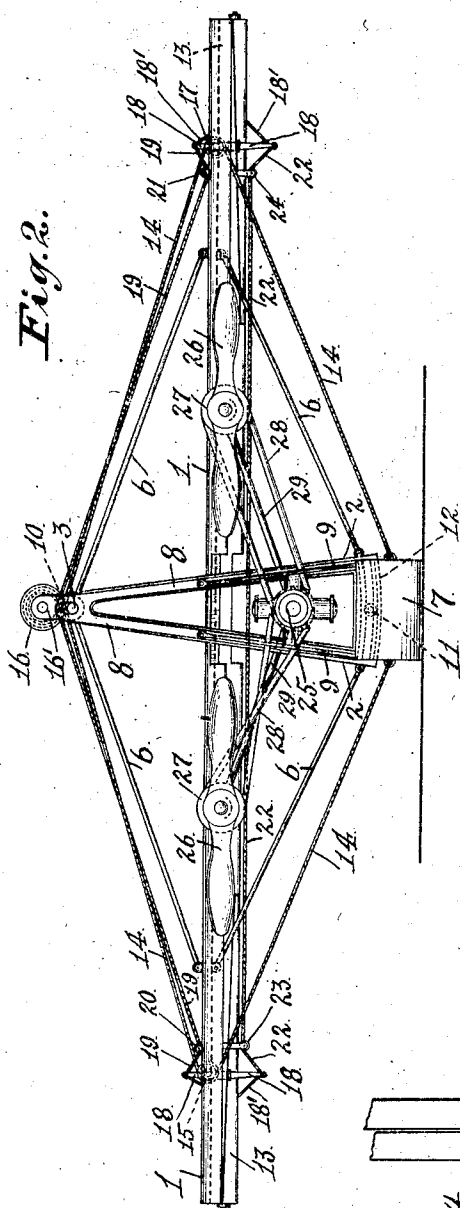
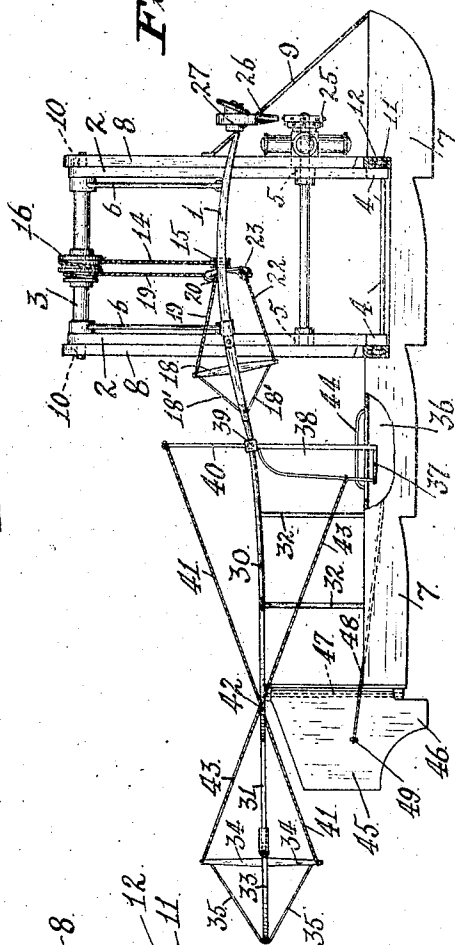


Fig. 4.

Fig. 3.



WITNESSES

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AUTOMATIC LATERAL AND LONGITUDINAL BALANCE FOR AEROPLANES.

1,062,074.

Specification of Letters Patent.

Patented May 20, 1913.

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To all whom it may concern:

Be it known that I, PETER ALLINIO, a subject of the King of Italy, residing at Rust, in the county of Contra Costa and State of California, have invented certain new and useful Improvements in Automatic Lateral and Longitudinal Balances for Aeroplanes, of which the following is a specification.

My invention relates to the class of aeroplanes and particularly to those in which the tendency of freely suspended parts or pendulous swaying structures to maintain their equilibrium is taken advantage of to effect an automatic control or balance.

My invention has for its objects the provision of simple and effective means for automatically effecting both the lateral and longitudinal balance of aeroplanes; for obtaining the full efficiency of the propellers; and for adapting the machine for a hydro-aeroplane; to all of which ends my invention consists in the novel aeroplane and in the construction and combinations of the parts thereof, which I shall hereinafter fully describe, by reference to the accompanying drawings in which—

Figure 1 is a top plan view of my aeroplane. Fig. 2 is a front elevation of the same. Fig. 3 is a side elevation, a part being broken away. Fig. 4 is a detail showing the limiting connection between the bases of the two rigid frames.

1 is the main-plane which, in general, is made in the usual or approved manner with regard to dimensions, shape and structure. In the present case, for the sake of illustration, I have shown a monoplane, though it is to be understood that my invention is applicable to biplanes or other multiplanes. Rigidly secured to the main-plane 1 is a frame which in the present case is composed of two pairs of bars 2, one pair being secured to the front and the other to the back of the plane, a top cross bar 3 extending between the upper ends of the pairs of bars 2, end and side base bars 4, at the lower ends of the bars 2, and suitable braces 5. These several members constitute a rigid frame which extends both above and below the main-plane 1, and is secured to said main-plane at its transverse middle.

Suitable guys or braces 6 extend from the plane 1, both above and below to the top and the base respectively of the said rigid frame.

7 is a car. This, in the general aspect of

my invention, may be any suitable structure which has sufficient weight for the purpose of automatic control or balance. In the present instance, and for the specific purpose of constituting the complete machine, a hydro-aeroplane when desired, I have shown the car 7 as a pontoon or boat capable of floating in water.

Secured rigidly to and rising from the car or boat 7 is a hanger frame 8, with suitable braces 9. The top of the frame 8 is pivotally suspended from the top of the rigid frame of the main-plane 1, the pivotal connection being made by journaling the tops of the members of the frame 8 upon the projecting ends of the cross bar 3 of the main-plane frame. This pivotal connection is best made with a limited vertical play or movement, which is accomplished by making elongated pivotal slots 10 in the top of the frame 8, thereby providing for the vertical play, and by headed pins or studs 11 in the base end bars 4 of the main-plane frame which freely engage and play in T-grooves 12 in the base of the frame 8, thus providing for the limitation of this vertical play, and also providing for limiting the relative swinging movement, and also connecting and holding the two frames together. The effect of this connection is that when the machine is at rest, the main-plane frame finds support at its base directly upon the car; but when it rises, the car drops to the limit of its pivotal connection, thereby freeing the main-plane frame to enable the parts to have their relative movement for balancing purposes, as will be presently described.

13 are the ailerons. These may assume any suitable form and relative disposition. I have here shown them as relatively small triangular planes hinged to the rear edge of the main-plane 1, one at each side of the machine, symmetrically disposed. To operate these ailerons 13 in order to effect the automatic lateral balance, the following connections are made.

14 is a line, which at one end is made fast to one side of the car 7. It thence passes below the main-plane to a pulley 15 carried in said plane near one extremity thereof, and up and over said pulley and centrally again above the plane to a drum 16 which is carried by and is revoluble on a bracket 16' on the cross bar 3 of the main-plane frame. This drum 16, it must be particularly noted, 110

is one which, as shown, has two grooves or faces, one of larger and the other of smaller diameter. Around the larger face of this drum 16 the line 14 takes a gripping or operating turn and thence extends above the main-plane to a pulley 17 near the opposite end of the main-plane. The line 14 passes down on said pulley and thence extends below the main-plane and is made fast to the car 7 on the side opposite to that of its first connection.

It will now be seen that the relative lateral movement of the pendulous car and the main-plane on their pivotal connection, which movement is due to the tendency of the car to hang in stable equilibrium owing to its weight, will be transmitted through the line 14 to the drum 16 to cause the oscillation of said drum on its axis in one direction or the other. This movement of the drum is taken advantage of to effect the automatic operation of the ailerons 13, by the following means: Each aileron 13 has secured to it an arm 18 with guys 18' which arm projects both above and below said aileron. To the top of one of these arms 18 is made fast a line 19 which thence extends to a suitable guide 20 on the main-plane 1, and thence to the drum 16. The line 19 takes a gripping turn around the smaller groove or face of said drum and thence continues to a suitable guide 21 near the other end of the main-plane, and thence to the top of the arm 18 of the other aileron and is made fast to said arm. A second line 22 is secured to the lower extremity of one of the arms 18. This line extends to a suitable guide 23 under the main-plane and thence below said plane to a suitable guide 24 under the opposite end of said plane and thence to the lower end of the arm 18 on the other aileron, and to this arm it is made fast. It will now be seen that as the drum 16 is oscillated, under the conditions heretofore mentioned, it will, through the lines 19 and 22 cause the simultaneous opposite movements of the ailerons, and these movements on account of the difference in diameter of the faces of the drum will be less in degree in proportion to the swing of the pendulous car, this difference being necessary when the relatively large swing of the car and the relatively small movement of the ailerons required for the exercise of their function are taken into consideration.

Now in view of what may be termed the pendulum connection of the car with the main-plane, the propelling mechanism should be carried by the main-plane structure. This results in an advantage in enabling me to mount the propellers proper in a position to yield the highest efficiency, namely, directly upon the edge of the main-plane. This will be presently better understood.

25 is the motor. This is carried directly

by the rigid frame of the main-plane and lies in front but clear of the frame 8 of the car 7.

26 are the propellers. There are two of these, one on each side. Each is mounted by its hub structure 27 directly upon the front edge of the main-plane. 23 represents the housing tubes of the drive connections from the motor, and 29 are braces.

It will now be seen that the propelling mechanism is carried by the plane structure. By removing the propellers proper from the immediate vicinity of the motor, I avoid that interference with their function which would be caused by the obstructing bulk of the motor; and by disposing them on the front edge of the plane, which edge is relatively thin and therefore unobstructive, I gain the full action of the blades by exposing them for practically their full length to the air; and, finally, by thus mounting them, I equalize their effect on the plane, as they act on it equally above and below.

Thus far I have described the lateral balance. I shall now describe the longitudinal balance.

30 are bars which constitute the supporting frame for the horizontal tail-plane or stabilizer 31. These bars are secured at their forward ends to the car-frame 8 and are held by suitable standards 32 rising from the car 7.

33 is the elevator-plane of the tail-plane. It is hinged to the rear edge of the tail-plane, so that it is capable of the usual up and down movement.

The elevator-plane is provided with an arm 34 which extends above and below it, which arm is braced by the guys 35. Within a well 36 in the deck of the car 7 is the aviator's seat 37. This seat is carried by a swing-frame 38 depending from a rock shaft 39 mounted in the tail-plane frame-bars 30. The seat thus swings fore and aft, and the weight of the aviator when occupying it is utilized with a pendulum effect for the automatic operation of the elevator-plane 33 to realize the longitudinal balance. The connections are as follows: 40 is an arm rising from the rock-shaft 39. A line 41 is made fast to the top of the arm 40 and thence extends to a suitable guide 42 in the tail-plane 31. It passes down on this guide through the tail-plane and is made fast to the lower extremity of the arm 34 of the elevator-plane 33. Another line 43 is made fast to the upper extremity of the arm 34 and thence passes forward to the guide 42 and down through the tail-plane 31, and continues to the aviator's seat 37 to which it is made fast. It will now be seen that as the seat 37 swings under its equilibrating action, the elevator-plane will be automatically raised or lowered to perform its usual functions and to maintain the longitudinal balance.

Side rails 44 are placed beside the well 36, within reach of the aviator, who can, by taking hold of them with his hands, move himself and his seat forward or back positively to affect the elevator-plane to any extent desired, whenever occasion requires.

45 is the rudder. In the present case, in which the car 7 is a pontoon or boat, the feature of this rudder is that it is shaped and disposed to serve in itself as a single instrumentality for steering the machine both in the air and in the water. It will be seen that said rudder has an upper portion extensive enough and so located as to serve as the steering means of the aeroplane in flight, and a lower portion or extension, designated by 46, which projects down into the water and serves to steer the machine when afloat. The rudder is mounted by means of the pivotal rudder post 47, and is operated by lines 48 secured to a cross arm 49, and thence extending forwardly to a suitable foot bar, not shown, which is carried by the aviator's seat and adapted to be operated in usual manner by the feet of the occupant.

I claim:—

1. In an aeroplane, the combination of a main-plane; ailerons carried by said plane, symmetrically disposed on each side of its transverse middle; a pendulous swaying car hung from the transverse middle of the main-plane; a drum having faces of different diameters; a line connected at its extremities with opposite sides of the car and thence extending in opposite directions to and guided through the outer end portions of the main-plane and thence to and engaging the larger face of the drum with a gripping turn whereby said drum is turned by the swaying of the car; arms on the ailerons extending above and below them; a line connecting the lower ends of the arms of the opposite ailerons; and a line connected at its extremities with the upper ends of the aileron-arms and engaging at its middle the smaller face of the drum, whereby said ailerons are operated from said drum.

2. In an aeroplane, the combination of a main-plane; ailerons carried by said plane; a frame rigidly secured to the main-plane at its transverse middle, said frame rising above and extending below the plane; a car; a frame rigidly secured to and rising from said car; a pivotal connection between the tops of the two frames whereby the car and plane may have lateral relative movement; a drum mounted in the plane of said pivotal connection, said drum having faces of different diameters; a line connected with the car and engaging the larger face of the drum to turn said drum by the swaying of the car; and a line engaging the smaller face of the drum and connected with the ailerons to operate them from said drum.

3. In an aeroplane, the combination of a

main-plane; ailerons carried by said plane, symmetrically disposed on each side of its transverse middle; a frame rigidly secured to the main-plane at its transverse middle; said frame rising above and extending below the plane; a car; a frame rigidly secured to and rising from said car; a pivotal connection between the tops of the two frames whereby the car and plane may have lateral relative movement; a drum mounted in the plane of said pivotal connection, said drum having faces of different diameters; a line connected at its extremities with opposite sides of the car and thence extending in opposite directions to and guided through the outer end portions of the main-plane and thence to and engaging the larger face of the drum with a gripping turn whereby said drum is turned by the swaying of the car; arms on the ailerons extending above and below them; a line connecting the lower ends of the arms of the opposite ailerons; and a line connected at its extremities with the upper ends of the aileron-arms and engaging at its middle the smaller face of the drum, whereby said ailerons are operated from said drum.

4. In an aeroplane, the combination of a main-plane; a frame rigidly secured to the main-plane at its transverse middle, said frame rising above and extending below the plane; a car; a frame rigidly secured to and rising from said car; a pivotal connection between the tops of the two frames whereby the car and plane may have lateral relative movement, said connection having a vertical play; a laterally moving connection between the two frames at their bases, said connection having a vertical play equivalent to the vertical play of the pivotal connection above; ailerons carried by the main-plane; a drum mounted in the plane of the pivotal connection between the two frames; a line connected with the car and engaging said drum to turn it by the movement of the car; and a second line engaging said drum and connected with the ailerons to operate them from said drum.

5. In an aeroplane, the combination of a main-plane; ailerons carried by said plane; a frame rigidly secured to and extending above and below the main-plane; a car; a frame rigidly secured to and rising from said car; a pivotal connection between the tops of the two frames; connections between the two frames for limiting the relative movement of the main-plane and car; connections from the car to the ailerons to operate the latter by the movement of the car; a motor carried by the frame of the main-plane; propellers carried by the main-plane and located at points to one side of the perpendicular plane in which the motor is located; and driving connections from the motor to the propellers.

6. In an aeroplane, the combination of a
 main-plane; ailerons carried by said plane;
 a frame rigidly secured to and extending
 above and below the main-plane; a car; a
 frame rigidly secured to and rising from
 said car; a pivotal connection between the
 tops of the two frames; connections between
 the two frames for limiting the relative
 movement of the main-plane and car; con-
 10 nections from the car to the ailerons to op-
 erate the latter by the movement of the car;
 a motor carried by the frame of the main-
 plane; propellers carried by the main-plane
 and located at points to one side of the per-
 15 pendicular plane in which the motor is lo-
 cated; said propellers being mounted by
 their hubs directly on the edge of said main-
 plane; and driving connections from the mo-
 tor to the propellers.

20 7. In an aeroplane, the combination of a

main-plane; a car; a tail plane carried by
 the car; an elevator plane carried by the tail
 plane; an aviator's seat; a swing structure
 on the car carrying the seat, and permitting
 it to vibrate fore and aft, said swing struc- 25
 ture having an arm rising above its pivotal
 center; and connections from said seat swing
 structure to operate the elevator plane, con-
 sisting of a pair of lines connected to oppo-
 site sides of said elevator plane and thence 30
 passing oppositely through the tail-plane
 and connected with the swing structure and
 its uprising arm respectively.

In testimony whereof I have signed my
 name to this specification in the presence of 35
 two subscribing witnesses.

PETER ALLINIO.

Witnesses:

WM. F. BOOTH,
 D. B. RICHARDS.