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Patented Oct. 12, 1920.
 2 SHEETS—SHEET 1.

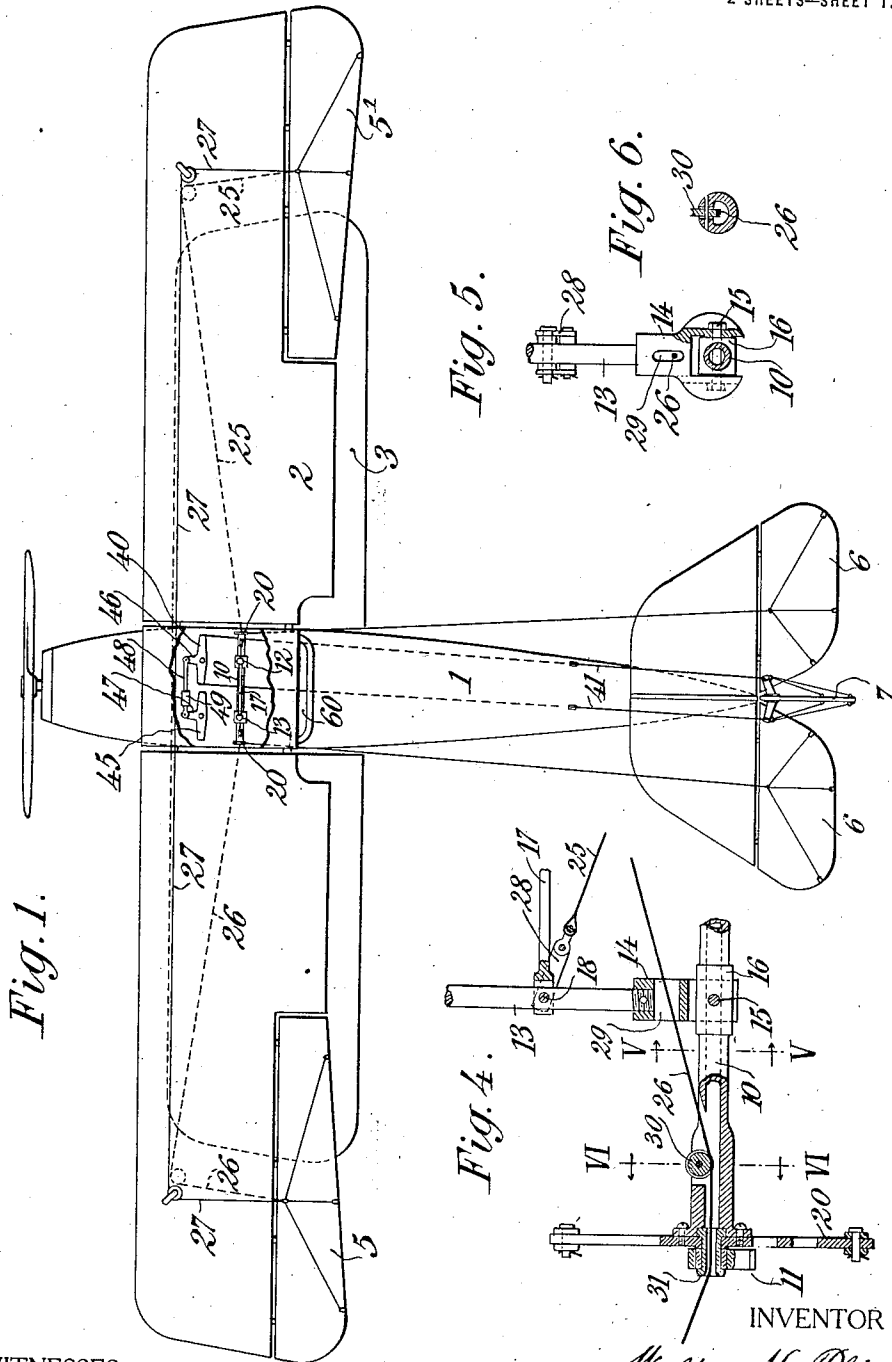


Fig. 1.

Fig. 4.

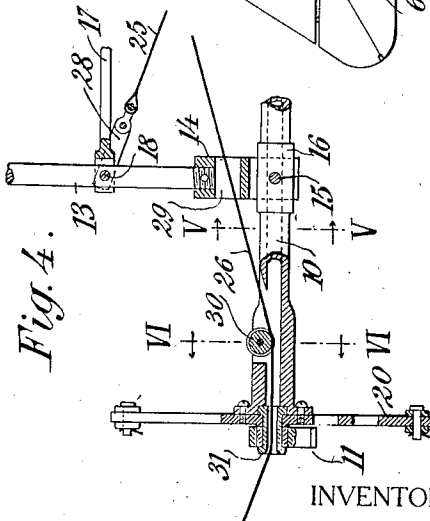


Fig. 5.

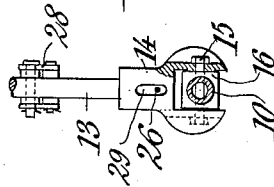
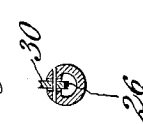


Fig. 6.



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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

WALTER H. PHIPPS, OF BALDWIN, NEW YORK, ASSIGNOR TO ORDNANCE ENGINEERING CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

MULTIPLE CONTROL FOR AEROPLANES.

1,355,355.

Specification of Letters Patent.

Patented Oct. 12, 1920.

Application filed November 10, 1917. Serial No. 201,368.

To all whom it may concern:

Be it known that I, WALTER H. PHIPPS, a citizen of the United States of America, residing in the town of Baldwin, county of Nassau, Long Island, State of New York, have invented certain new and useful Improvements in Multiple Control for Aeroplanes, of which the following is a specification.

10 This invention relates to control mechanism for aeroplanes, or the like, and aims to provide improvements therein.

The present invention provides a dual control wherein the aviators sit side by side in the machine, wherein the single lever or "stick" for operating the lateral stabilizing means and the ascensional plane is used, and wherein the movements of each of the levers are the same as those given the lever in a single control machine having a lever control.

The invention also provides a simple, convenient, reliable, and safe means for effecting control in a multiple control machine.

25 The invention is specially applicable to machines for teaching flying.

An embodiment of the invention is illustrated in the accompanying drawings.

30 Figure 1, is a top plan view of an aeroplane embodying the present invention.

Fig. 2, is a side elevation of an aeroplane, parts of the fuselage broken away to show more clearly the construction.

35 Fig. 3, is a perspective detail of the dual control.

Fig. 4, is a vertical sectional view of part of the control mechanism.

Fig. 5, is a cross sectional view on the line V V, Fig. 4.

40 Fig. 6, is a cross sectional view on the line VI, VI, Fig. 4.

Numeral 1, designates the fuselage of the machine, 2 and 3 the main supporting planes (the machine being shown as a biplane), 45 5, 5', the ailerons, 6 the ascensional planes or elevators and 7 the steering rudder. These parts may be of any well known, or suitable construction.

10 designates a shaft rotatively mounted in bearings 11, fixed upon the machine. Mounted upon the shaft 10, are two or more control levers 12 and 13. The control levers 12 and 13 have bifurcated ends 14, which are pivotally connected to the shaft 10, as 55 by pivot pins 15, and which preferably fit

upon square portions 16 of the shaft 10. The control levers 12 and 13 turn upon the shaft 10 in a plane running transverse of the machine, and are connected so as to move in unison by a tie rod 17 pivotally connected 60 to the levers 12 and 13 as indicated at 18. Movement of the levers 12 and 13 in planes running longitudinally of the machine turns the shaft 10 in its bearings.

The shaft 10 has fixed thereon rock-arms 65 20, to which rock-arms 20 are connected wires 21 for moving the ascensional planes 6.

Connected to the levers 12 and 13, are wires 25, 26, which wires are also connected to the stabilizing planes 5, 5'. 70

27 designates a wire connecting the stabilizing planes 5, 5', on opposite sides of the machine. When one stabilizing plane is pulled down, the pull is transmitted to the other stabilizing plane by the wire 27, so as 75 to pull said other stabilizing plane in the opposite direction, as in well known practice.

The wire 25, is connected to the lever 13, as by a U-strap 28, passes through a slot 29 80 in the opposite lever 12, and passes through the axis of the shaft 10, which is made hollow for the purpose, and a pulley 30 is provided on the shaft 10 for guiding the wire 25 at the point where the wire enters 85 the hollow end of the shaft 10. The ends of the shaft at the points where the wires pass out are provided with a bushing 31, the bushing being provided to minimize wear upon the wire. The wire 26 is simi- 90 larly connected to the lever 12, passes through a slot 29 in lever 13 and passes over a pulley 30 into the hollow end of the shaft 10, and passes out of the shaft 10 through a bushing 31. 95

The shaft 10 is mounted in front of the aviator's and pupil's seats and the tie bar 17, and the U-straps 28, are connected at such a height to the levers 12 and 13 that the legs of the aviators may pass over the 100 tie bar and wires without interference. The connection of the wires 25 and 26 to the lever which is farthestmost from the end of the shaft 10, through which the respective wires pass, is of advantage, inasmuch as the 105 angle which each of the wires form with the shaft is acute, and hence the slack which is formed in the wire when the levers are turned upon shaft 10 is rendered a negligible quantity. It will be seen moreover that 110

the wires 25 and 26 are so arranged that they are little apt to catch the aviator's foot, inasmuch as the tie rod 17 protects the wires on one side of each of the levers, and the wires are very close to the shaft 10 on the other side of the levers.

The steering rudder 7 is controlled by a pivoted foot lever 40, the foot lever and steering rudder 7 being connected by a pair of wires 41. Another foot lever 45 is provided for the second control. The foot levers 40 and 45 are adapted to work in unison by suitable means. This means preferably comprises cranks 46 and 47 projecting from the levers 40 and 45, and a connecting rod 48. A slip, or yieldable connection 49 is preferably provided in the rod 48.

Operation: The aviators, as for example, a pilot and a pupil seat themselves in the machine on the seats 60 with their feet resting upon the foot levers 40, 45. The wires 25, 26, and cross bar 17 connecting the control levers 12 and 13 are low enough so as not to strike the legs of the aviators.

To steer the machine in the horizontal plane, one of the aviators, as for example, the pilot, moves the foot lever 40, thereby transmitting motion to the steering rudder 7, through the wires 41. The movement of the pilot's foot lever is transmitted through the bar 48 to the foot lever 45 of the aviator sitting beside the pilot, as for example, a pupil.

To raise or lower the machine in a vertical plane, the pilot, for example, grasps the lever 12 and pushes it forward, or pulls it toward him, thereby turning the shaft 10 having the rock arms 20 thereon. These rock-arms 20 communicate motion to the elevating planes 6, through the wires 21. The motion which the pilot imparts to the lever 12 is imparted to the lever 13 of the other aviator, as the bifurcated ends of the levers fit upon square portions of the shaft 10.

In order to operate the stabilizing planes 5, 5', the pilot, for example, moves the lever 12 to one side, or the other. Movement of the lever 12 imparts a corresponding movement to the lever 13 through the connecting rod 17, and these rods through the wires 25 and 26 communicate motion to the stabilizing planes 5, 5'. As the wires only transmit a pull, the stabilizing planes 5, 5', are connected by a tie wire 27. A pull upon the wire 25, for example, pulls the stabilizing plane 5' downwardly, and the movement of the plane 5' is transmitted to the stabilizing plane 5, through the connecting wire 27. The upward movement of the plane 5 takes up the slack in the wire 26. As the wires 25 and 26 pass out of the shaft 10 at its axis, and are connected to the control levers in such manner as to form an acute angle with the axis of the shaft 10, there is no

objectionable slackening of the wires 25 and 26 when the levers are moved on their pivots.

As the wires 25 and 26 pass out of the shaft 10, along its axis, there is no slackening of the wires 25 and 26 when the shaft 10 is turned to operate the wires 21 connected to the ascensional planes 6.

The motions described as given to the lever 12 and foot lever 40, may, it will be well understood, be given to the lever 13 and foot lever 45, corresponding movements of the lever 13 and foot lever 45 producing exactly the same effects as the lever 12 and foot lever 40.

The control of the machine may be given to a pupil at the lever 13, and the pilot will be able to follow the actions of the pupil through movement of the lever 12 and foot lever 40.

Where a pupil loses presence of mind through fright, or the novelty of an evolution of the machine, as for example, a steep dip, he usually stiffens in the seat and braces his feet against the foot lever. The yielding, or slip connection in the rod 48 enables the experienced aviator, or pilot, to operate his foot lever, despite the opposition due to the other aviator bracing himself against his foot lever. This is of great importance in banking at a very steep angle, or in righting the machine when it is tilted over by gusts. In case the aviator, who loses his presence of mind, holds onto his lever, the position of the experienced aviator beside him, enables him to push the frightened aviator off of his lever, or to strike him.

The inventive ideas may receive other mechanical expressions than those herein specifically illustrated and described.

What I claim is:

1. An aeroplane control comprising a rotatable shaft running transversely of the machine, and a plurality of operating levers connected to said shaft in a manner to turn it, and pivoted to said shaft in a manner to turn in a plane running transversely of the machine, and control means operating by a pivotal movement of said levers, said levers being connected to move in unison, said levers having control wires, crossing and running off in a line substantially axially of the said rotatable shaft.

2. An aeroplane control comprising a rotatable shaft running transversely of the machine, and a plurality of operating levers connected to said shaft in a manner to turn it, and pivoted to said shaft in a manner to turn in a plane running transversely of the machine, said levers being connected to move in unison, said levers having control wires connected thereto, the wires connected to two control levers crossing and running off in a line substantially axially of the said rotatable shaft, said levers having slots therein near their points

of connection to the rotatable shaft through which said wires pass.

3. An aeroplane control comprising a rotatable shaft running transversely of the machine, and a plurality of operating levers connected to said shaft in a manner to turn it, and pivoted to said shaft in a manner to turn in a plane running transversely of the machine, said levers being connected to move in unison, said levers having control wires connected thereto, the wires connected to two control levers crossing and running off in a line substantially axially of the said rotatable shaft, said levers having slots therein near their points of connection to the rotatable shaft through which said wires pass, said rotatable shaft

having hollow ends through which said wires pass.

4. An aeroplane control comprising a rotatable shaft running transversely of the machine, and a plurality of operating levers connected to said shaft in a manner to turn it, and pivoted to said shaft in a manner to turn in a plane running transversely of the machine, and control means operating by a pivotal movement of the said levers, said levers being connected to move in unison, said levers having control wires connected thereto, running off in a line substantially axially of said rotatable shaft.

In witness whereof, I have hereunto signed my name.

WALTER H. PHIPPS.