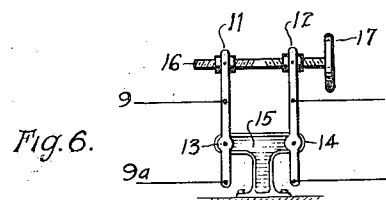
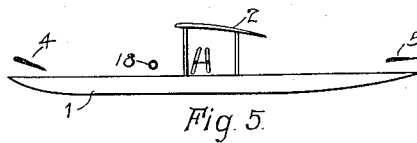
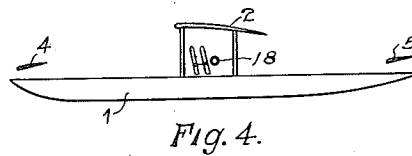
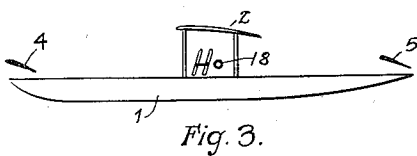
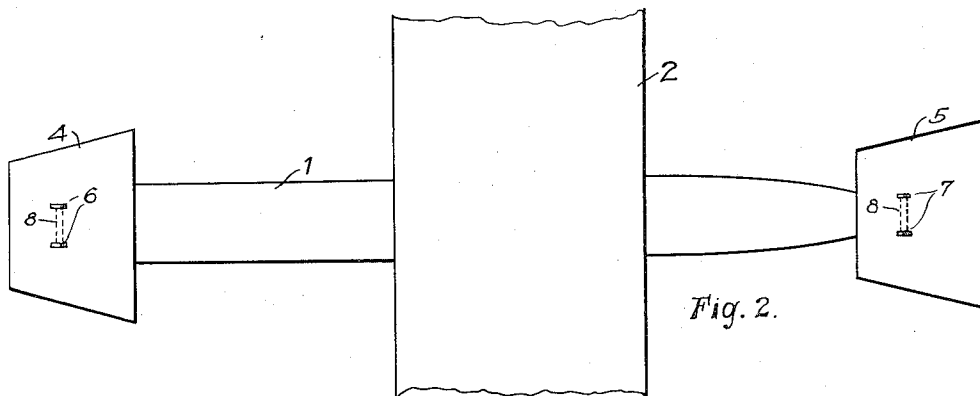
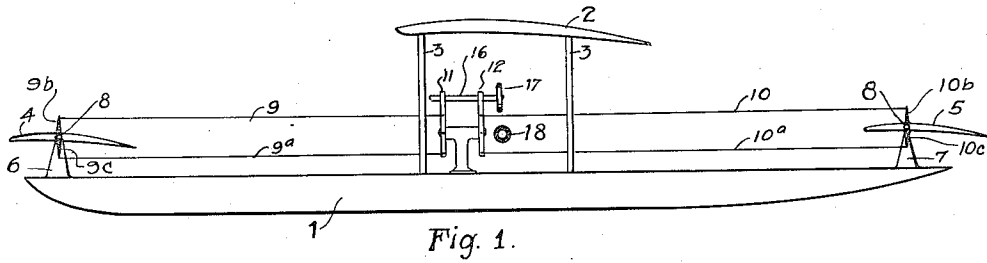


C. J. LAKE.
AIRPLANE.
APPLICATION FILED JAN. 16, 1918.

1,279,127.

Patented Sept. 17, 1918.



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AIRPLANE

1,279,127.

Specification of Letters Patent. Patented Sept. 17, 1918.

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To all whom it may concern:

Be it known that I, CHRISTOPHER J. LAKE, a citizen of the United States, and resident of Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Airplanes, of which the following is a specification.

This invention relates to airplanes, and it has particular reference to a certain arrangement of auxiliary supporting units, relatively to the main supporting unit, and to means of control for said auxiliary units, whereby the airplane may be caused to ascend or descend while maintaining a fairly constant flying angle. Further my invention is directed to the provision of a low center of gravity, as a factor of stability in an airplane having control means whereby vertical movement is accomplished without appreciable variation in the flying angle.

In other words, my purpose is to so coordinate the factors of control for vertical movement and for longitudinal stability that the airplane may maintain approximately the same attitude, when either ascending or descending, as when in horizontal flight.

Other features and advantages of my said invention will hereinafter appear.

In the drawing:—

Figure 1 is a side elevation of an airplane embodying my improvements.

Fig. 2 is a plan view thereof, the main supporting unit being partly broken away.

Fig. 3 is a side view with the auxiliary aerofoils adjusted for ascent.

Fig. 4 is a similar view with the auxiliary aerofoils adjusted for descent.

Fig. 5 is a corresponding view showing the auxiliary aerofoils as variably adjusted for ascent, and

Fig. 6 is a detail of a form of control mechanism for the auxiliary aerofoils.

In the example of my invention illustrated in this application, I have shown it, for the sake of simplicity, as employed with a single main supporting unit, which is here represented as a monoplane, whereas I do not intend to limit myself either to the number or character of main supporting units. Thus, in the figures let 1 indicate the body portion or frame of the airplane, and 2 the main supporting unit, which is connected to the body portion as by struts 3. Auxiliary supporting aerofoils 4 and 5 are mounted

upon the body portion, respectively fore and aft thereof, being pivoted in bearings 6 and 7 respectively, as by the transverse pivots 8.

It should be particularly noted that the main supporting unit 2 is disposed above the center of gravity, this arrangement predicated the condition that the main supporting aerofoil is in fixed relation to the body portion with a predetermined set angle of incidence.

The aerofoils 4 and 5 may have cables 9, 9^a and 10, 10^a respectively, which are shown as engaging, respectively, with control levers 11, 12, which are here shown as pivoted, respectively at 13 and 14, to a common, fixed support 15, to each swing longitudinally, and are engaged with each other, as by a connector 16, whereby the movement of said levers 11, 12 may be concurrent.

It will be noted that the cable 9 extends from a spur 9^b projecting from the upper surface of aerofoil 4, to a point of engagement with the lever 11 above its fulcrum; the cable 9^a extending from a spur 9^c that projects from the under surface of said aerofoil to a point of engagement with said lever below its fulcrum. Similarly, cables 10 and 10^a connect the aerofoil 5 with lever 12 through the respective agencies of spurs 10^b and 10^c. Thus, to incline both aerofoils 4 and 5 upwardly, the levers are swung in manner to draw cable 9 rearwardly and cable 10^a forwardly; while, to incline said aerofoils downwardly, the levers are swung oppositely, to thereby draw cable 9^a rearwardly and cable 10 forwardly.

The connector, as 16, may be of a character to permit the levers 11, 12 to assume varying degrees of angularity relatively to each other, to thus affect the relation between the angles of the fore and aft aerofoils when it is desirable to vary those angles. Thus, considering any condition such as a shift in weight that changes the center of gravity in the machine, affecting its longitudinal equilibrium, this may be easily compensated for by increasing the attacking angle of the aerofoil at that end of the airplane toward which there is an accession of weight, whereby the trim of the airplane enables it to maintain approximately its normal horizontal flying attitude.

In Fig. 5 I have shown an airplane wherein a forward shift of weight may be considered to have occurred, in which instance the fore aerofoil 4 has been given a greater

angle of attack, for increased support, and the aft aerofoil 5 has been given a relatively smaller angle of incidence, affording less support, to thus equilibrate the machine.

5 As here shown, the connector 16 comprises a screw having right and left threads which, respectively, work in threaded bearings therefor in the levers 11, 12.

In the operation of the controls, the pilot 10 moves the connected levers forwardly or backwardly, for which purpose he may grasp the wheel 17; whereby, when it is necessary to vary the relative angles of aerofoils 4 and 5, the pilot may give the necessary turn to said wheel to actuate the screw connector 16.

Obviously, the combined motions of the screw and levers will produce variable relative movements of the aerofoils, embracing 20 a wide range of difference in angularity between said aerofoils.

In an airplane having controls of the character set forth, whereby the airplane may be caused to ascend and descend, as it were on 25 an even keel, it is particularly desirable to provide a low center of gravity, which preferably should be in the vertical line of the center of pressure for the main supporting unit, as at 18. By this means the factors of 30 control and weight coordinate with the supporting pressure to balance the airplane in a normally horizontal attitude, in normal forward flight, as well as in vertical variations thereof.

35 Variations may be resorted to within the spirit and scope of my said invention and parts thereof used without others.

I claim:—

1. The combination in an airplane having 40 a main supporting unit with a fixed angle of incidence, of auxiliary fore and aft aerofoils equal spaces from, and in a horizontal plane passing substantially through, the center of gravity of said airplane, and means 45 for varying the angles of said aerofoils in the same direction to thereby enable the airplane to maintain an approximately horizontal attitude in ascent and descent.

2. The combination in an airplane having 50 a main supporting unit with a fixed angle of incidence, of auxiliary fore and aft aerofoils equal spaces from, and in a horizontal plane passing substantially through, the center of gravity of said airplane, and 55 means for simultaneously varying the angles of said aerofoils in the same direction to thereby enable the airplane to maintain

an approximately horizontal attitude in ascent and descent.

3. The combination in an airplane having 60 a main supporting unit with a fixed angle of incidence, of auxiliary fore and aft aerofoils equal spaces from, and in a horizontal plane passing substantially through, the center of gravity of said airplane, and 65 means for differentially varying the angles of said aerofoils in the same direction to thereby enable the airplane to maintain an approximately horizontal attitude in ascent and descent. 70

4. The combination, in an airplane, having a main supporting unit, with a fixed angle of incidence, disposed above the center of gravity of said airplane, of auxiliary 75 aerofoils mounted respectively equal spaces fore and aft of, and in a horizontal plane passing substantially through, the center of gravity of said airplane, and means for varying the angles of said aerofoils in the same direction to thereby enable the airplane 80 to maintain an approximately horizontal attitude in ascent and descent.

5. The combination, in an airplane, having a main supporting unit, with a fixed angle of incidence, disposed above the center 85 of gravity of said airplane, of auxiliary aerofoils mounted respectively equal spaces fore and aft of, and in a horizontal plane passing substantially through, the center of gravity of said airplane, and means for simultaneously varying the angles of said 90 aerofoils in the same direction to thereby enable the airplane to maintain an approximately horizontal attitude in ascent and descent. 95

6. The combination, in an airplane, having a main supporting unit, with a fixed angle of incidence, disposed above the center of gravity of said airplane, of auxiliary 100 aerofoils mounted respectively equal spaces fore and aft of, and in a horizontal plane passing substantially through, the center of gravity of said airplane, and means for differentially varying the angles of said 105 aerofoils in the same direction to thereby enable the airplane to maintain an approximately horizontal attitude in ascent and descent.

Signed at the borough of Manhattan in the city, county and State of New York this 10th day of January A. D. 1918.

CHRISTOPHER J. LAKE.

Witnesses:

F. W. BARKER,
MONTAGUE PALMER.