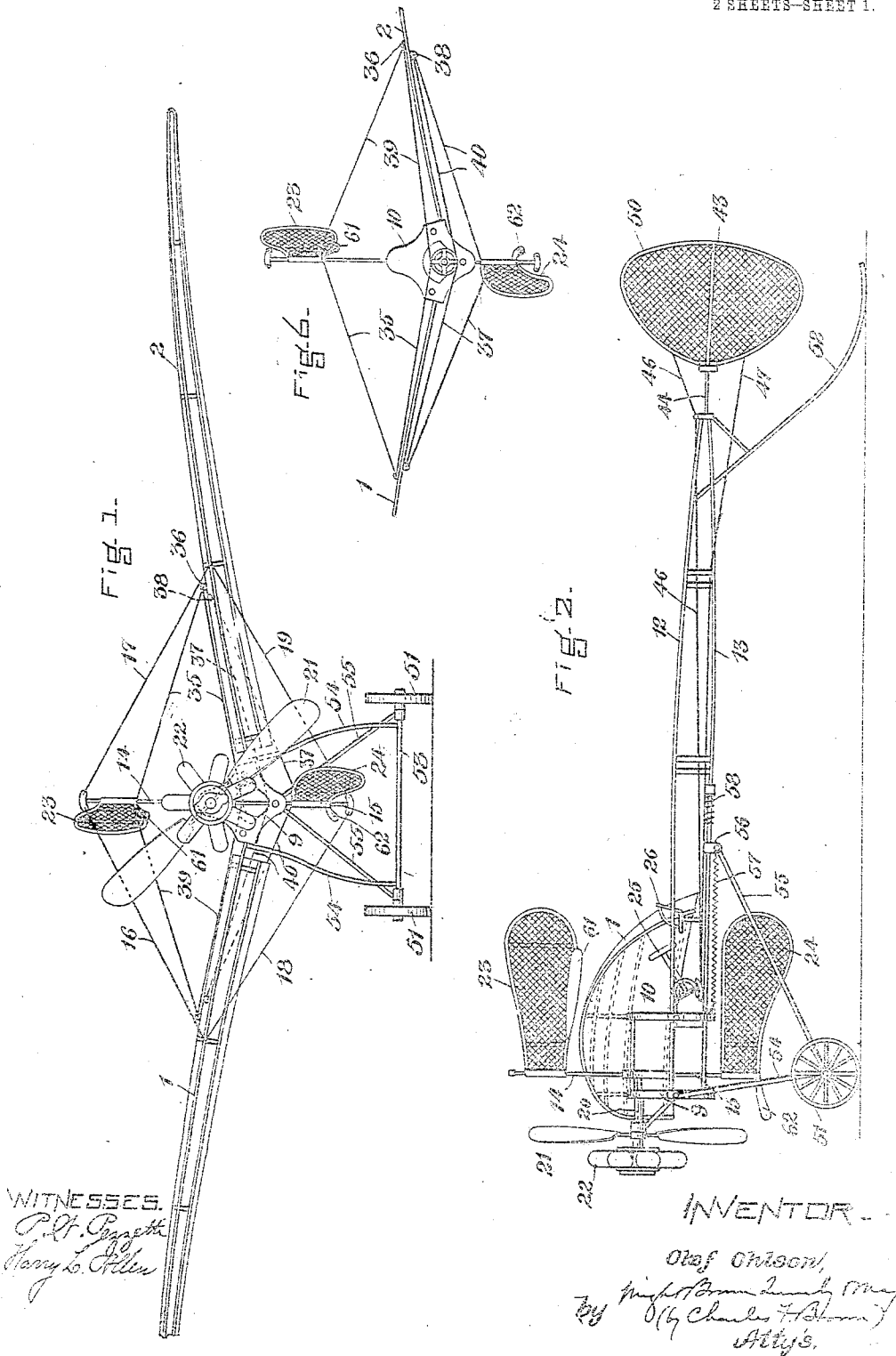


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FLYING MACHINE.
APPLICATION FILED NOV. 11, 1910.

1,060,115.

Patented Apr. 29, 1913.

2 SHEETS-SHEET 1.

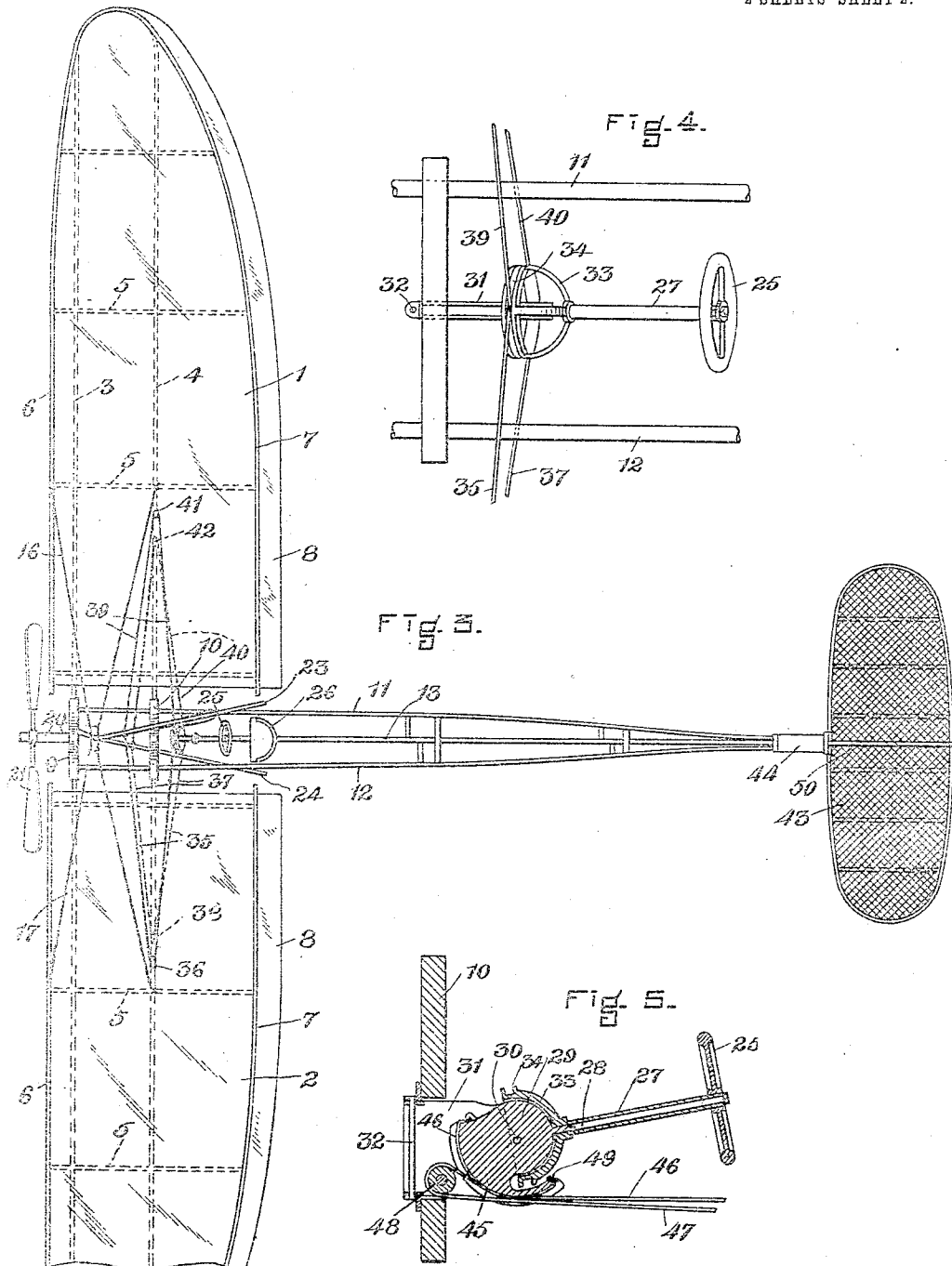


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WITNESSES.

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UNITED STATES PATENT OFFICE.

OLOF OHLSON, OF NEWTON, MASSACHUSETTS.

FLYING-MACHINE.

1,060,115.

Specification of Letters Patent.

Patented Apr. 29, 1913.

Application filed November 11, 1910. Serial No. 591,814.

To all whom it may concern:

Be it known that I, OLOF OHLSON, of Newton, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Flying-Machines, of which the following is a specification.

The object of the present invention is to provide improvements in the mode of control of flying machines, particularly the heavier-than-air machines, and consists mainly in improved and more efficient means for securing lateral stability and in simplified control devices by which the lateral stability, the direction of flight, and the elevation may be controlled by the aviator through a single element or device capable of operation by only one hand if necessary.

Other and minor objects of the invention will appear in the detailed description and in the claims following.

In the drawings I have illustrated the principles of the invention as applied to a flying machine of the monoplane type, this type being the one to which certain of the features of the invention are best applicable, although they are not limited thereto, and may be applied to multiplane flying machines, or even to dirigible apparatus of the lighter-than-air type. I therefore desire it to be understood that in choosing the monoplane type of flying machine to show the application of my invention I have done so for the purpose of illustration only, and not of limitation.

In the drawings Figure 1 is a front elevation of a flying machine in which the principles of the invention are embodied. Fig. 2 is a side elevation of the same with one of the wings removed. Fig. 3 is a plan view. Fig. 4 is a plan view on an enlarged scale of the control member by which the aviator guides the apparatus. Fig. 5 is a longitudinal section of this control member. Fig. 6 is a diagrammatic view showing the stability control more clearly.

Referring to the drawings, 1 and 2 represent the wings or planes which together form the supporting plane or planes of the flying machine, such wings being arranged in this embodiment of the invention in substantially the same manner as exemplified in the present successful types of monoplanes. The wings are preferably con-

structed as usual of a light framework consisting of transverse ribs 3, 4, longitudinal ribs 5, and edge members 6, 7, which define the outline of the wing. The terms "transverse" and "longitudinal" are here used with reference to the direction of flight. This framework is covered with fabric or other light and thin material to afford a supporting surface, which fabric is preferably extended beyond the rear peripheral member 7 to form a flap 8 which is designed to assist in securing stable flight. The wings may be continuous or separate, and are secured in any suitable way to frame members 9 and 10, to which also are secured the longitudinal frame members 11, 12 and 13 which form the backbone or body of the monoplane frame. Masts 14 and 15 rise and depend respectively from the frame and provide points of attachment for the guys 16, 17, 18 and 19 by which the wings are additionally supported and stiffened. A tractor- and motor-shaft 20 is mounted in bearings in the frame and carries the tractor 21 and motor 22.

The principal improvement embodied in the present invention resides in the vanes which constitute both lateral stability controls and rudders to govern the direction of flight. These vanes are represented at 23 and 24 and are preferably pivoted upon the masts 14 and 15 respectively. They are therefore respectively above and below the main supporting planes and are in the same zone with the latter. Also by reason of the fact that the masts intersect the longitudinal axis of the machine, these vanes are pivotally or oscillatively movable about an axis or axes transverse to the supporting planes and midway between the latter. These vanes are capable of turning pivotally in either direction about the masts and control means are provided by which they may be so turned simultaneously either in opposite directions, or in the same direction and in varying degrees. The preferred form of control device for this purpose, which is the one here illustrated, consists in a hand wheel 25, arranged immediately forward of the operator's seat 26, and secured to a sleeve 27 which turns about a stud or rod 28 projecting from a plate or block 29, which turns upon a pivot or trunnions 30 held by a holder or carrier 31. The latter is arranged

to turn horizontally about a vertical pivot 32 secured upon one of the frame members, as 10. Carried by the sleeve 27 are arms 33 to which is secured a pulley 34 preferably occupying such a position that the axis 30 of the block 29 occupies one of its diameters. By virtue of this mode of supporting the hand wheel 25, the latter may swing horizontally about the axis or pintle 32 vertically about the axis 30, and in a third plane on its own axis about the stud 28, which is in the axis of the wheel. In other words the wheel may be turned about its own axis, or be moved bodily both up and down, and to right and left.

Engaging the pulley 34 are lines which run to opposite sides of the vanes 23 and 24. Thus one line, as 35, passes to the left of the aviator along the upper surface of the left-hand wing 2, around a guide 36 and to the upper vane 23. A second line or ligament 37 passes in the same direction under the wing around a guide 38 to the lower guide vane 24. Conversely lines or ligaments 39 and 40 pass from the pulley to the right of the aviator above and below the right-hand wing 1, around the guides 41 and 42 to the right-hand sides of the guide vanes 23 and 24 respectively. The lines are secured to the pulley in a manner such as to prevent slipping, so that when the pulley is turned in either direction by the hand wheel two of the lines will be taken up and the other two paid out. Thus by rotating the hand wheel while its location remains unchanged, the guide vanes are swung oppositely and caused to present opposite surfaces to the resistance of the air. The vanes being thus acted upon on opposite sides, exert lateral impulses in opposite directions and on opposite sides of the axis of the machine, which impulses are approximately equal in amount and exert a turning moment tending to turn or tip the machine. This affords a very ready and sure means of counteracting any tendency to overturn, as well as of careening the machine to the extent necessary to enable it to change its direction of flight without loss of stability. The same vanes 23 and 24 which secure lateral stability also act as rudders to change the direction of flight, and the same control means so operates the vanes. It will be noted that the pulley 34 is mounted at a considerable distance from the vertical axis 32. Hence when the handwheel is moved horizontally the pulley 34 is likewise moved and the two lines on one side thereof are pulled, while the two on the opposite side are slackened. Thus both vanes or rudders are turned in the same direction and caused to oppose corresponding sides against the air, thereby changing the direction. A combination of movements of the hand wheel about its own axis and about the axis

32 enables either rudder to be turned, while the other remains stationary or is turned in the same or the opposite direction to a greater or less degree. Thereby any positions of the rudders necessary to change the direction of the machine and careen it to the extent necessary to preserve its balance while so turning may be obtained. The third movement of the hand wheel in a vertical plane about the axis 30 is provided in order to operate the horizontal rudder and govern the elevation of the machine. The horizontal rudder is a plane or vane 43 mounted at the rear end of the aeroplane frame and connected thereto in a manner permitting either upward or downward inclination. Conveniently the connection may be a flexible resilient strip 44, although it may be an ordinary pivotal connection reinforced with springs to hold the rudder normally horizontal. The plate or block 29 is provided with a segmental portion 45 having a channel to receive tension members such as cords or wires 46 and 47. The former of these is connected with the horizontal rudder at a point above the connection between the latter and the framework and passes around the segment 45 to the forward end thereof. The other line 47 is connected to the horizontal rudder below the connection of the latter with the frame and passes around a guide pulley 48 in front of the segment 45 to the rear end thereof, being attached at the point 49. Thus it will be seen that when the wheel is depressed the line 46 is pulled and the horizontal rudder elevated, thereby causing the machine to travel at an upward slant, whereas when the wheel is raised the line 47 is pulled and the horizontal rudder depressed causing the machine to pitch downward. Conveniently associated with the horizontal rudder is a vertical auxiliary guide plane 50 which assists the rudders in turning the machine, but has no oscillating movement itself except with the horizontal rudder. It always remains in the same vertical plane.

I have described the control means and the connections therefrom to the several guide vanes or rudders in minute detail for the purpose of enabling others to understand and practice the invention. I do not thereby intend, however, to limit the invention to the particular details shown, since many modifications and alterations may be made without departing from the spirit of the invention. Thus it would not be a departure from the invention to place the vertical pivot 32 between the pulley 34 and hand-wheel 35 so that the pulley could be moved laterally in opposite directions from the hand-wheel, nor would it be a departure from the invention to reverse the relative arrangement of the various sets of operating lines or otherwise alter their arrangement.

so as to secure different effects through the manipulations of the hand-wheel already described.

The essence of the invention in so far as it relates to the control means consists in having a single control element which may be operated in three different directions or modes, so as respectively to govern the lateral stability, the direction of flight and the elevation. The principle of combining these controls in a single device which may at need be operated by either hand of the aviator is of great value and advantage in that it reduces the number of different things requiring attention by the aviator and enables him to give his attention if need be to the motor, without endangering his control of the aeroplane. Thereby the safety of the aviator is safeguarded to a greatly increased degree.

When the flying machine rests upon the ground it is supported by wheels 51 at the forward end and a skid or slide 52 at the rear. The wheels also take the shock of alighting and in order to diminish the shock they are yieldingly mounted. For this purpose the axle 53 of the wheels is held in arms 54 pivotally hung from the frame structure and braced by rearwardly extending rods 55 connected to a traveler 56 slidingly supported on one of the members of the frame. The traveler is drawn forwardly so as to hold the wheels in the position shown in Fig. 2 by tension means such as a spring 57, which however yields readily when the wheels strike the ground so as to allow them to swing rearwardly and upwardly with relation to the aeroplane frame. Excessive motion is checked by a buffer such as a short and relatively stiff spring 58.

The two sets of rods 54 and 55 combined with the axle 53 make a framework of great strength and at the same time of sufficient flexibility in the directions in which shock is sustained to yield and avoid injury to the machine.

I propose also to secure automatic balance by causing the stability vanes to move automatically in the directions necessary to restore the balance whenever the machine tips to one side or the other. For this purpose, I arrange the stabilizing vanes with provision for operation by gravity, weighting the vanes so that the upper vane will swing toward the low side, and the lower vane toward the high side to counteract the tipping when it occurs. In the drawings weights 61 and 62 are indicated on the upper vane in rear of its pivotal axis and on the lower vane forward of its axis, which have this effect.

I claim,—

1. In an aeroplane the combination with a main supporting plane of vertical stabilizing planes pivoted on vertical axes above

and below the main plane and having means automatically operative upon careening of the machine for exerting force tending to swing them in the direction to oppose careening movement.

2. In an aeroplane the combination with a main supporting plane, of vertical stabilizing planes pivoted on vertical axes above and below the main plane, their major portions being in rear of their axes, a weight attached to the upper plane in rear of its axis, and a weight connected to the lower plane in front of the axis of the latter, whereby forces are exerted tending to turn said planes when the machine tips, in the direction necessary to counteract such tipping.

3. In combination with a flying machine having vertical steering and stabilizing planes and a horizontal elevation controlling plane, a control device comprising a member pivotally mounted to turn about a horizontal axis, lines passing from points of attachment to the horizontal plane, respectively, above and below the axis of the latter, to said member and connected thereto at separated points removed from its pivot, a pulley in front of said member around which one of said lines passes, whereby opposite oscillative movements of the member may swing the plane correspondingly to such movements, a pulley pivotally mounted on said member on an axis perpendicular to that on which said member turns, lines extending from said pulley in opposite directions to each of the steering and stability planes and connected on each side thereof, whereby rotation of the pulley may turn the planes oppositely and a holder to which the above-named member is pivoted, said holder being itself pivotally mounted at a distance from the pivot of said member on a vertical axis, whereby said member and pulley may swing from side to side to pull equally on the lines passing from the same side of the pulley and thereby to turn both of the vertical planes in unison.

4. In a flying machine having upper and lower vertical planes independently oscillable about vertical axes, and a horizontal plane oscillable about a horizontal axis, a control device for actuating said planes comprising a pulley, lines secured to said pulley and passing in the same direction therefrom to points of attachment with the upper and lower vertical planes respectively, lines passing in the opposite direction from said pulley and connected to the upper and lower vertical planes at the opposite sides thereof, the lines which extend in the same direction being tangent to the pulley at opposite points, whereby in rotating the pulley the vertical planes may be oppositely moved, a hand wheel connected to the pulley in a position accessible to the aviator,

a member upon which said pulley is pivoted in a manner permitting it to turn about its own axis, lines extending from the horizontal plane above and below the axis of the latter to said member and attached thereto at separated points on the under side thereof, a pulley in front of said member about which one of the lines passes so as to reverse its direction before attachment to the member, the other line extending directly to the member, a holder to which said member is pivoted at a horizontal axis to permit oscillations of the member in a vertical plane and thereby tilt the horizontal guide plane, and

a vertical pivot for said holder in advance of the pulley, whereby the latter with the said member and holder may be swung from side to side to pull equally on the lines which extend in the same direction therefrom and slacken the lines extending in the opposite direction, whereby to move both vertical planes in unison.

In testimony whereof I have affixed my signature, in presence of two witnesses.

OLOF OHLSON.

Witnesses:

THOMAS A. SMYTHE,
OSCAR H. BUTLER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."