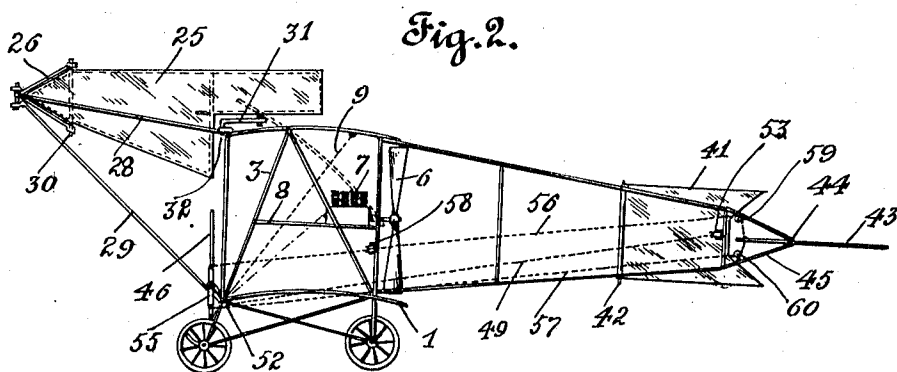
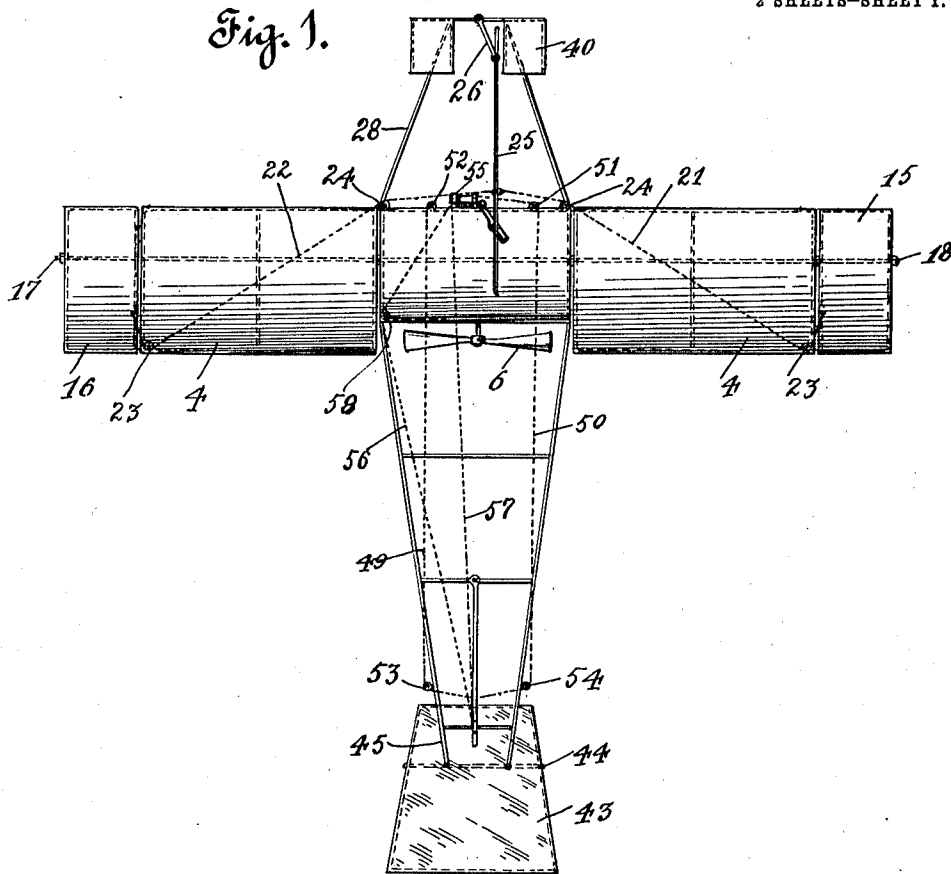


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AEROPLANE.
APPLICATION FILED APR. 20, 1911.

1,021,040.

Patented Mar. 26, 1912.

2 SHEETS-SHEET 1.



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2 SHEETS-SHEET 2.

Fig. 3.

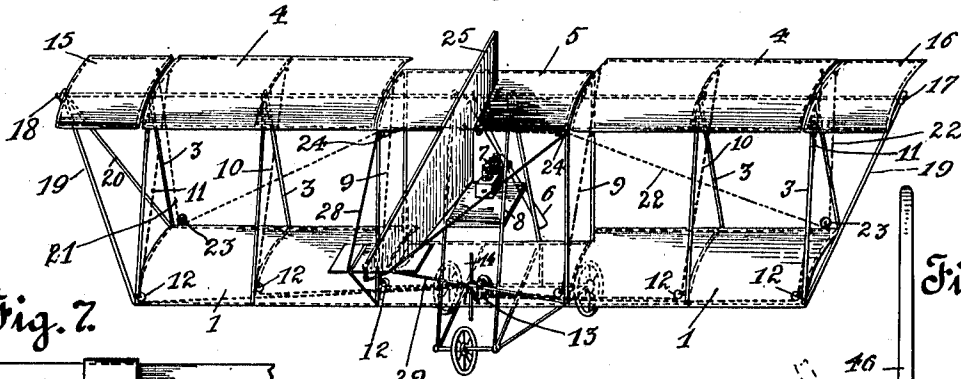


Fig. 7.

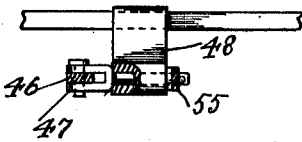


Fig. 6.

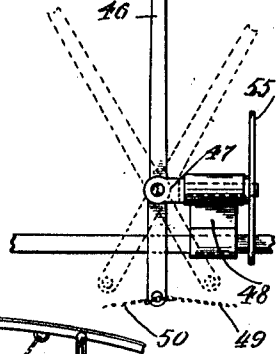


Fig. 4.

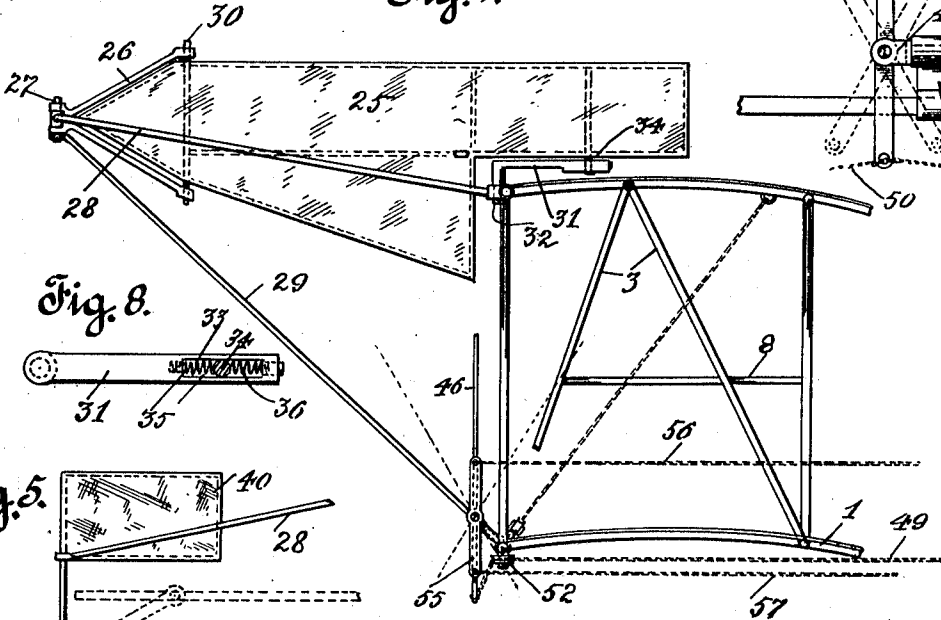


Fig. 8.

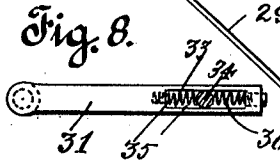
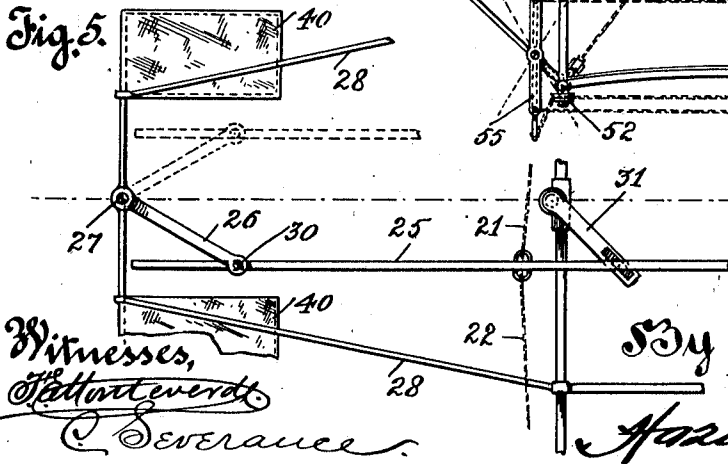


Fig. 5.



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UNITED STATES PATENT OFFICE.

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1,021,040.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HALVOR O. EIANE, a citizen of the United States, residing at San Diego, in the county of San Diego and State of California, have invented new and useful Improvements in Aeroplanes, of which the following is a specification.

This invention relates to improvements in aeroplanes and has particular reference to aeroplanes in which balancing planes are employed, which may be automatically controlled in accordance with the pressure of the air upon the side toward which there is a tendency for the plane to tip.

The present invention is especially adapted to aeroplanes of the biplane type and it is an object of the invention to provide an aeroplane with pivoted wings, said aeroplane also carrying an automatic vane or vertical plane so connected with said pivoted wings as to right the machine in the event of its tending to tip or skid.

It is also an object of the invention to provide a biplane with fixed supporting planes and adjustable supporting planes and means for adjusting the said planes to effect the forward headway of the aeroplane.

It is also an object of the invention to provide guiding means for the improved aeroplane and to connect the same with a universal operating lever for controlling the rising or falling of the aeroplane or the direction of its travel.

In the accompanying drawings forming a part of this specification, Figure 1 is a top plan view of an improved aeroplane embodying the features of the present invention. Fig. 2 is a side elevation of the same. Fig. 3 is a perspective view of the aeroplane looking at the front portion thereof, the tail or rudder portion of the same being removed. Fig. 4 is an enlarged detail view showing a portion of the main frame in section, the automatic vane or vertical plane being shown in side elevation. Fig. 5 is a detail view of an enlarged scale showing the automatic vane or vertical plane in top plan. Fig. 6 in an enlarged detail view in front elevation showing the universal rudder vane actuating lever. Fig. 7 is a detail sectional view showing the mounting of said lever, a portion of the bearing being broken away. Fig. 8 is a detail plan view of the rear lever or arm carrying the automatic plane.

The details of the invention will now be more particularly described, reference being had to the accompanying illustration.

As heretofore intimated the aeroplane is usually built after the biplane type, the body portion of said device having a lower fixed plane 1 preferably slightly arched in across section as indicated in Figs. 2 and 4, the said plane extending for almost the entire width of the machine. This plane is supported by any suitable framing from which rise at intervals triangular shaped frames 3. To the upper portion of the said frames 3, of which there are a plurality arranged parallel to each other, are pivotally mounted upper main planes 4, the pivotal mounting of said planes being arranged nearer their forward edges than their rear edges, whereby the supporting air pressure beneath the said planes will tend to force the rear ends of the planes upwardly. Suitable means herein after described for holding the rear ends of the planes against such pressure is employed. The framing at the central portion of the machine is preferably made approximately rectangular and an upper fixed plane 5 is secured to the central rectangular portion of the frame.

The plane 5 and the portion of the plane 1 immediately below it are made narrower than the plane portions outside thereof, so that a space is thus provided for accommodating a propeller 6 which is carried by an engine 7 mounted centrally of the machine. The platform of the engine is usually supported about centrally of the height of the frame or a little below the same as indicated at 8 in Fig. 4. The movable main planes 4 are adjustably held in position by a series of cords or cables as 9, 10 and 11 arranged upon each end of the machine as clearly shown in Fig. 3. These cables pass downwardly to the front edge of the framing and thence over pulleys 12 to a common winding drum 13, preferably mounted at a point near the front edge of the aeroplane and centrally of its width. The drum 13 may be provided with an arm or lever 14 by which it may be turned for winding in the cables 9, 10 and 11, and thus depress the rear edge of the upper planes 4.

Outside of the upper planes 4 are pivotally mounted wing tips or planes 15 and 16 one being at each end of the plane supporting frame. These wing tip planes 15 and 16 preferably extend outside the end triangular frames 3 and the axial rods 17 and 18 upon which the said tip planes are pivoted are braced by diagonal brace rods 19 and 20. The pivotal action of the said tip

planes 15, 16 is also forward of their centers as in the case of the planes 4 and the rear ends of said tip planes are adapted to be adjustably held against the pressure of the air, by means of cables or cords 21 and 22 which extend downwardly to pulleys 23 arranged at the rear edge of the lower framing as clearly shown in Fig. 3 and thence upwardly and forwardly to pulleys 24 secured to the front edge of the upper framing. The said cables thence extend to fastenings upon the opposite surface of an automatic controlling plane or vane 25. The position of the said planes 15 and 16 is thus controlled by the movement and position of the vertical automatic plane 25. The said plane 25 forms an important feature of the invention and is preferably pointed at its forward end, while it is broadened toward its central portion, its rear end being again reduced in height to extend above the fixed plane 5 as clearly shown in Figs. 2, 3 and 4. The forward pointed end of the plane 25 is pivotally mounted in a yoke 26, the said yoke approximately fitting the contour of the point of said plane or vane 25. The yoke is pivoted at 27 upon a forwardly extending frame 28 which projects from the upper portion of the main framing to a point considerably in front of the same. The frame 28 is braced by an inclined frame 29 which extends upwardly from the lower rails of the main frame.

The frame 28 is of sufficient width to accommodate any lateral movements of the vane or vertical plane 25. The rear ends of the yoke 26 are pivoted to a rod or bar 30 which is secured to the vane 25 a short distance back of the front point thereof. The mounting of the front end of the said vane 25 is thus of such a character that the point of the vane may swing from side to side with the yoke 26 as said yoke moves on its pivot point 27. The rear end of the vane 25 is also pivotally mounted upon a swinging arm 31 which is provided with a vertical pivot pin 32 engaging a bearing formed upon the upper edge of the main frame. The arm 31 extends rearwardly above the edge of the main frame. The arm 31 extends rearwardly beneath the edge of the vane 25 and is provided with an elongated slot 33 near its free end for engaging a depending pin 34 which projects from the said vane 25. Cushion springs 35 and 36 are mounted in the ends of the said slot 33 so as to engage the pivot pin 34 in its movement in either direction.

The cables 21 and 22 which extend to the vane 25 are connected thereto as shown in Fig. 5 at a point just forward of the pivot pin 32 of the arm 31. It will thus be seen that the movement of the vane 25 to one side or the other of the medial line of the aeroplane will operate to pull one or the other

of the tip planes 15 or 16 downwardly, the other plane at the same time being permitted to move upwardly to a corresponding degree. The plane that is moved downwardly at the rear will of course offer more resistance to the air upon the side toward which the aeroplane is skidding and will tend to right the same. Upon the aeroplane reaching its normal balance once more, the forward movement thereof will tend to bring the vertical vane or plane into an intermediate position for restoring the tip vanes and permitting the aeroplane to go forward upon an evenly balanced flight.

It will be observed that the automatic vane 25 is completely automatic in its operation in accordance with the way the machine tends to tip or skid and the tip vanes are thus controlled without the attention of the aviator. The springs 35 and 36 in the slotted arms 31 tend to cushion the action of the vane 25 as it shifts from side to side. The peculiar mounting of the said vane upon the pivoted yoke 26 and the pivoted arm 31 permits of the vane quickly adjusting itself to positions more or less parallel with the line of movement of the aeroplane. The frame 28 may also be provided with the usual forward horizontally arranged vanes or guiding planes as 40, the shape and operation of which forms no part of the present invention.

The aeroplane is guided by rudder or tail planes, there being preferably two in number, one of which as 41 is arranged to operate in a vertical plane and is pivoted upon a vertical axis at 42 while the other rudder 43 extends normally in a horizontal plane and is pivoted at a point intermediate its length, but somewhat nearer its front edge than its rear edge, upon a pivotal axis 44 supporting rearwardly extending frame portions 45. The two rudders 41 and 43 are preferably operated by a universally operating lever 46 which is arranged at the forward edge of the machine in front of the operator and is pivoted in the bifurcated end of a horizontally arranged pivot 47, the shank of said pin being movably mounted in a bearing 48 secured to the main framing of the aeroplane. The lever 46 extends below the bifurcated head of the pin 47 and is connected at its lower ends with cables or cords 49 and 50, which extend over pulleys 51 and 52 and thence rearwardly toward the rudders and around pulleys 53 and 54 to the rear edge of the vertically disposed rudder 41 to the rear edge of which they are fastened. It will be evident that by moving the lever 46 from side to side as indicated in dotted lines in Fig. 6 upon its pivotal points in the bifurcated head of the pin 47 that the rudder 41 may be moved to one side or the other as required. For actuating the horizontal rudder 43 a bar 55 is se-

cured to the opposite end of the bifurcated pivot pin 47 from the lever 46, the said bar being preferably extended approximately in a parallel direction to the lever 46. The upper and lower ends of said bar 55 are connected by cables or cords 56 and 57 with the forward edge of the rudder 43, the upper cable 56 passing about a pulley 58 to avoid the propeller 6, and thence over a pulley 59 from which it passes to the edge of the vane 43 as clearly indicated in Fig. 2. The lower cable 57 passes about a pulley 60 and thence to the forward edge of the said rudder 43, as also shown in said Fig. 2. It will thus be evident that by rocking the pivot pin 47 by means of the lever 46, the bar 55 can be made to change the position of the horizontal rudder 43. In this simple manner the said lever 46 may be made to control the movement and action of both of the said rudders.

In using the aeroplane, it is driven in the usual manner by means of propeller 6 and the engine 7. The direction of the aeroplane is under the control of the aviator by means of the lever 46. In the event of the aviator desiring to make a quick and steep descent from the air, he not only directs the movement of the machine in a downward manner but operates the drum 13 to pull the rear edges of the main planes 4 downwardly so as to retard the forward movement of the machine materially and yet permit it to descend under proper control. The engine not being stopped will create enough of an air current to cause the rudders to properly direct the machine after it has lost headway. In the event of the aeroplane tending to tip and skid to one side or the other, the automatic operating vertical vane 25 comes into play pulling down one or the other of the tip wings 15 or 16 in accordance with the direction in which the aeroplane is inclined. The aeroplane will thus be automatically kept in a practically horizontal position by the action of said vertical vane 25 and the tip wings or planes operated thereby.

What I claim is:

1. An aeroplane comprising main supporting planes and adjustable tip wings, a vertically arranged vane mounted centrally of the machine and having pivoted swinging supports near its front and rear ends, capable of holding the vane in vertical position at all times but permitting it to move from side to side under the action of air currents, and means connecting the said vertical vane with the movable tip planes for facilitating the automatic righting of the aeroplane.

2. An aeroplane comprising main supporting planes and side tipping planes, and a vertically arranged vane capable of move-

ment to parallel positions, carried by the said aeroplane, and connected with the tipping wings for controlling their angle of presentation to the air in accordance with the pressure upon said vertical vane.

3. An aeroplane comprising a framing having main supporting planes, side tipping planes pivotally mounted on said frame, an automatically operating vane carried by the said frame, and having hinged connections at its front and rear end portions whereby it may move in approximately parallel planes under air pressure and means for connecting said vane with the tipping wings for preventing the tipping or skidding of the aeroplane.

4. An aeroplane comprising a frame having main supporting planes, and outer tipping planes, a vertical moving vane mounted upon said frame, a pivoted yoke carrying the front end of said vane, and means for connecting the vane at an intermediate point with the tipping wings or planes, the tipping wings being thus automatically controlled by the movement of the automatic vane under the side pressures exerted thereon.

5. An aeroplane having upper and lower supporting planes, upper tipping planes, said tipping planes being pivoted forward of their centers, means for pulling downwardly the rear portions of said planes, to vary the movement of the aeroplane, end tip planes pivoted forward of their central portions, cables for drawing down their rear ends, a vertical vane mounted upon the frame and connected with said cables, a pivoted yoke, carrying the front end of the vane, a pivoted arm having a slot therein, for supporting the rear end of the planes, cushion springs mounted in said slot, and tending to cushion the action of said plane.

6. An aeroplane, comprising a frame, upper and lower planes for supporting the same, horizontal and vertical rudders carried by the said frame, a rock shaft mounted on the forward part of the frame, a lever pivoted upon said rock shaft whereby the lever may be operated in a longitudinal or transverse plane, cords connecting the lever with one of said planes, and an arm carried by the lever rock shaft and connected with the other plane, the structure being such that the said lever may be operated for controlling either of said planes.

In witness that I claim the foregoing I have hereunto subscribed my name this 11th day of April, 1911.

HALVOR O. EIANE.

Witnesses:

W. L. KAHLN,
A. J. FEUE.