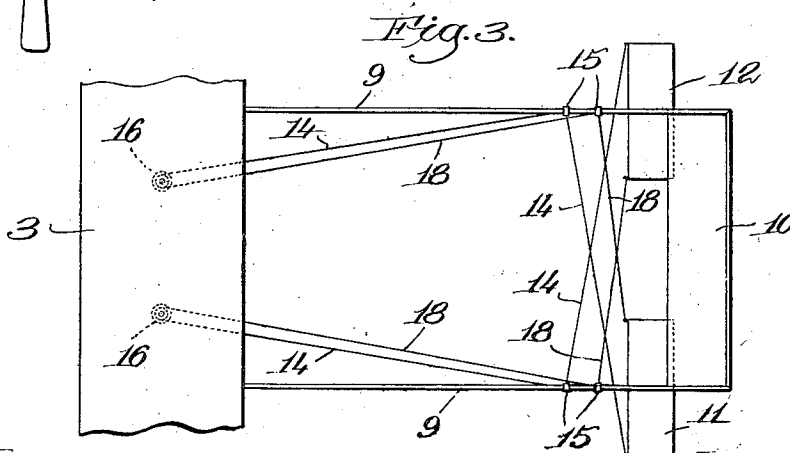
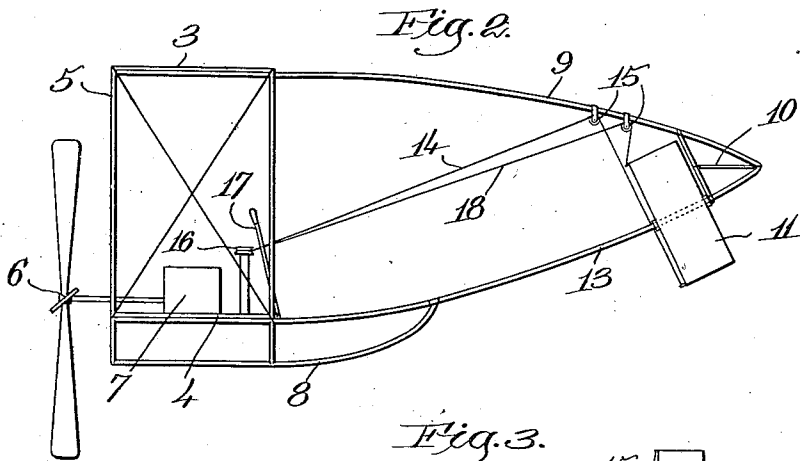
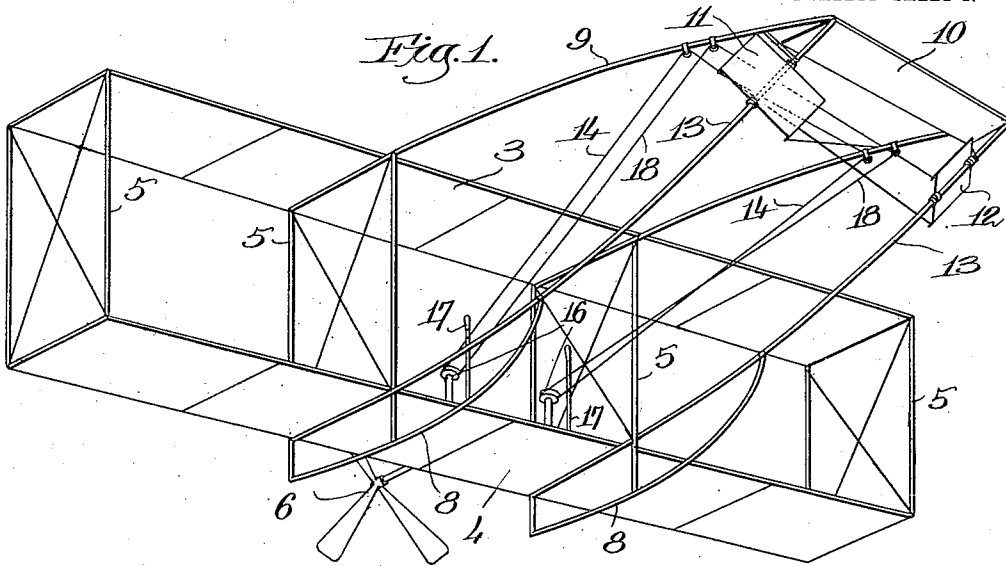


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AEROPLANE.
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Patented Oct. 12, 1909.

2 SHEETS—SHEET 1.



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936,303.

2 SHEETS—SHEET 2

Fig. 5.

12 13

13 11

Fig. 2. A perspective view of the device. It shows an inclined plate 12 with a support 13 attached to its lower edge. The support 13 is a vertical rod with a horizontal flange at the bottom. The plate 12 is tilted at an angle relative to the horizontal.

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UNITED STATES PATENT OFFICE.

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AEROPLANE.

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To all whom it may concern:

Be it known that I, CHARLES W. CHENEY, a citizen of the United States, residing at Brookline, county of Norfolk, and State of Massachusetts, have invented an Improvement in Aeroplanes, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to aeroplanes and especially to steering and guiding means therefor.

My improvements consist in a plurality of guiding or steering planes which are so constructed and arranged that they will not only have a more or less lifting action, depending on their adjusted position thereby assisting in causing the aeroplane to rise or descend, but they will also operate when properly adjusted to change the direction of the aeroplane.

My improved guiding or steering planes are supported so as to turn about axes which extend in the general direction of movement of the aeroplane and they are also so sustained that they can be swung from a vertical position into a horizontal position in which latter position they occupy a plane at an angle to the main supporting planes. By sustaining the guiding planes in this way they can be adjusted so as to have a greater or less lifting effect and can also be adjusted so as to cause the aeroplane to turn in one direction or the other. In the preferred embodiment of my invention these guiding planes are so sustained that they are always in perfect balance, both as to weight and as to wind pressure and, therefore, they can be readily adjusted as desired for proper control of the aeroplane.

An important feature of the invention is that my improved guiding planes not only act as a means for guiding the aeroplane both laterally and vertically, but they also act to prevent skidding and increase the lateral stability of the aeroplane. This result is secured by reason of the peculiar dihedral angle at which they are operated.

Referring to the drawings wherein I have shown a selected embodiment of my invention, Figure 1 is a perspective view of an aeroplane showing my improvements applied thereto; Fig. 2 is a side view of Fig. 1; Fig. 3 is a top plan view of a portion of Fig. 1; Figs. 4, 5, 6 and 7 are diagram views

taken on substantially the line $x-x$, Fig. 2, looking toward the right and showing the guiding planes in different angular positions for securing different effects.

My improvements can be applied to any aeroplane, dirigible balloon, or any other type of air ship, regardless of its principal features of construction. I have herein shown it as applied to an aeroplane comprising the two main planes 3 and 4 which are supported by suitable framework 5 and which are provided with a propeller 6 operated by a motor 7 for causing it to advance. The aeroplane herein shown also has the runners or shoes 8 which are adapted to slide along the track while it is being started, and the frame is provided with the forward extension 9 carrying an auxiliary plane 10 at the forward end thereof. These parts, however, form no part of my present invention but are referred to merely as illustrating one type of aeroplane to which my invention may be applied.

As stated above my improvements relate to the guiding or steering planes, and in the present embodiment I have shown two such planes at 11 and 12 respectively. It is not essential to the invention that only two guiding planes should be used, however, as the number of guiding planes may be varied without departing from the invention. The guiding planes are each so supported that they may be turned from a vertical position into a horizontal position about an axis which extends in the general direction of movement of the aeroplane, and the construction is such that in their horizontal positions they are inclined with relation to the main supporting planes. By pivoting the guiding planes to turn about an axis extending in the general direction of the movement of the main plane, said guiding planes will always be balanced as to wind pressure, and, therefore, can be readily shifted from one position to another with a slight expenditure of power.

In the preferred embodiment of my invention the axes for the guiding planes will be located to pass through said planes, although this is not essential to the invention, provided said axes extend in the general direction of the movement of the aeroplane. Where the axes are arranged to pass through the guiding planes, I propose to place these axes at an angle to the main planes 3 and 4, and this is the construction shown in the

present drawings wherein the guiding planes 11 and 12 are pivoted on rods 13 which form part of the extensions 9. The two axes of the guiding planes are shown as parallel to each other and each extends at an angle to the main plane although they both extend in the general direction of movement of the aeroplane. I prefer to arrange the guiding planes with their axes situated centrally thereof so that the area on opposite sides of the axis of each plane will be the same. The advantage of this construction is that the guiding planes will be always in balance both as to their weight and as to the wind pressure. The placing of the axes centrally of the planes gives the desired balance as to the weight and extending the axes in the general direction of the movement of the aeroplane gives the balance as to the wind pressure.

Provision is made for turning the guiding planes about their axes, and while any suitable mechanism for accomplishing this may be used, I have herein shown each guiding plane as having two flexible cords 14, 18 secured to the top and bottom thereof, respectively, which cords pass through direction pulleys 15 and extend back to the main plane 4 where they are connected together and pass around a pulley 16. An operating lever 17 is connected to one of the cords leading to each guiding plane. By drawing on either cord 14 or 18, the angular position of the corresponding guiding plane can be readily adjusted, as will be obvious, and the mechanism just above described constitutes, therefore, a simple means for adjusting and controlling the angular position of these planes.

The guiding planes are so constructed that they may be swung from the vertical position shown in full lines Fig. 4 into the horizontal position shown in dotted lines said figure, or in any other position intermediate of these two extreme positions. When they stand in the vertical position they have no lifting effect, but they do operate to prevent sluing of the aeroplane to one side. If these guiding planes are swung into the horizontal position shown in dotted lines Fig. 4, they will have a lifting effect because of the angular position of their axes. If they are swung into a position midway between the two positions above referred to, they will have both a lifting effect and a steadying effect against any side sluing.

The normal position of the guiding planes when the aeroplane is sailing horizontally will be somewhere between the vertical and horizontal position, such, for instance, as shown in Fig. 5. When the guiding planes are in this position their lifting effect will augment the lifting effect of the auxiliary plane 10 sufficiently so as to hold the aeroplane in an approximately horizontal po-

sition. If the guiding planes are thrown into the vertical position, however, their lifting action ceases and the loss of such lifting action will permit the aeroplane to gradually descend. If the guiding planes are thrown into a more nearly horizontal position than their normal position then their lifting action increases and such increased lifting action will cause the aeroplane to ascend. So long as the two guiding planes are moved in unison and to the same extent but in opposite directions, they have only a greater or less lifting effect. If, however, one of the guiding planes is turned to a greater or less degree than the other, then they operate to change the direction of the aeroplane. If, for instance, the plane 11 were in the vertical position as shown in Fig. 6 and the plane 12 were swung into the inclined position shown in said figure, then the plane 12 would have a lifting action while the plane 11 would not, and as a result the left-hand side of the aeroplane would rise and said aeroplane would turn to the right. On the other hand, if the guiding plane 11 were thrown into the inclined position and the guiding plane 12 was in the vertical position as shown in Fig. 7, then the right-hand side of the aeroplane would rise and said aeroplane would turn to the left.

The mechanism I have shown for operating the aeroplanes permits them to be adjusted independently or simultaneously, and therefore with my invention it is possible to control the aeroplane perfectly, both as to elevation and as to direction, simply by means of the two guiding planes illustrated.

I regard it as important that the guiding planes should be mounted to turn about axes that extend in the general direction of movement of the aeroplane because by this means each guiding plane is always balanced as to wind pressure and can be moved with a slight expenditure of power. It is not essential that the axes of the two planes should be parallel.

I believe I am the first to provide a guiding plane which is adapted to turn about an axis extending in the general direction of movement of the aeroplane, and which is also adapted to be turned about said axis from a vertical to approximately a horizontal position, in which latter position it occupies a plane inclined to the main supporting planes, and I desire to claim this feature regardless of the particular manner in which the guiding planes are sustained. The shape of the guiding plane is not essential to my invention either and it may be of any shape adapted to perform the required effect.

It is not necessary to my invention that the guiding plane should be situated in front of the main planes, as they might be situated in the rear thereof, or at the sides thereof, or in any other suitable position.

The important features about the invention are that these guiding planes are so sustained that they can be used both for changing the elevation and the direction laterally of the aeroplane merely by shifting their positions, the change in elevation being accomplished by shifting the two planes in unison, and the change in direction being accomplished by shifting said planes relative to each other; and that the guiding planes not only operate to steer or guide the aeroplane, but also give to it an increased lateral stability. Neither is it essential to my invention that only two of these guiding planes be employed for it will be possible to use a larger number, as will be obvious to those skilled in the art.

Where the guiding planes are used in connection with an auxiliary plane 10, as herein illustrated, said guiding planes may act merely to control the balance of power sufficient to properly steer the aeroplane, for the auxiliary plane 10 may be made of a size to very nearly support the front end of the aeroplane properly, and the guiding planes may be of a size just sufficiently large so that when they are thrown into a horizontal position they will cause the aeroplane to ascend, while when they are thrown into a vertical position, they will permit it to descend. If, however, the auxiliary plane 10 is not employed, then the guiding planes might have to be of a greater size.

I find that an aeroplane embodying my improvement will tend to right itself automatically if it should be thrown out of proper vertical position by wind currents or other disturbing elements.

I have herein used the expression "in the general direction of the movement of the aeroplane" in a broad sense to mean any direction which extends generally fore and aft of the aeroplane, and without intending that the expression should be limited to the direction which is at right angles to the transverse axis of the aeroplane. I have used this expression to distinguish from an axis which extends transversely to the general direction of the aeroplane.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In an aeroplane, the combination with main supporting planes, of guiding planes mounted to swing about an axis extending in the general direction of travel of the aeroplane and from a vertical position into approximately a horizontal position with the surface thereof having an inclination to the surface of the main planes.

2. In an aeroplane, the combination with main supporting planes, of guiding planes, each pivoted to turn about an axis extending in the general direction of movement of the aeroplane.

3. In an aeroplane, the combination with main supporting planes, of balanced guiding planes, each pivoted to turn about an axis extending in the general direction of movement of the aeroplane but inclined to the main plane.

4. In an aeroplane, the combination with main supporting planes, of two balanced guiding planes pivoted to turn about parallel axes which extend in the general direction of movement of the aeroplane but are situated at an angle to the main plane.

5. In an aeroplane, the combination with main supporting planes, of guiding planes, each centrally pivoted to turn about an axis extending in the general direction fore and aft of the aeroplane but inclined to the main planes.

6. In an aeroplane, the combination with main supporting planes, of balanced guiding planes, each pivoted to turn about an axis extending in the general direction of movement of the aeroplane but inclined to the main plane, and means to operate the guiding planes independently of each other.

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

CHARLES W. CHENEY.

Witnesses:

LOUIS C. SMITH,
FREDERICK S. GREENLEAF.