

L. B. HOLLAND.
AEROPLANE.
APPLICATION FILED MAR. 21, 1910.

1,003,459.

Patented Sept. 19, 1911.

2 SHEETS—SHEET 1.

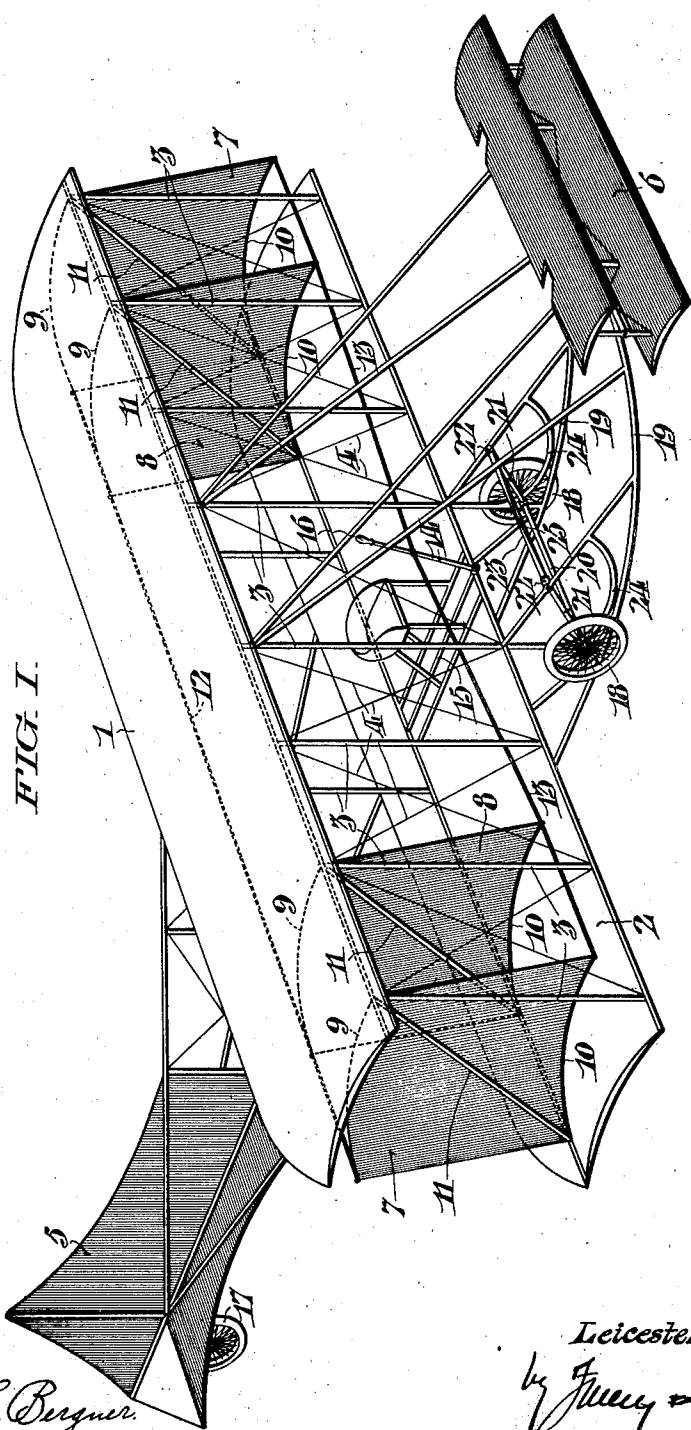


FIG. 1.

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2 SHEETS—SHEET 2.

FIG. IV.

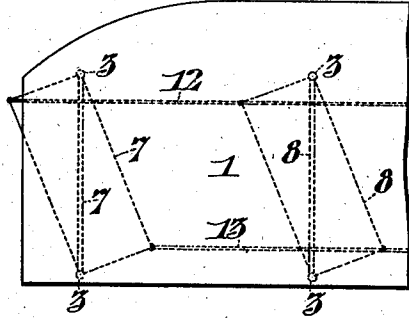


FIG. II.

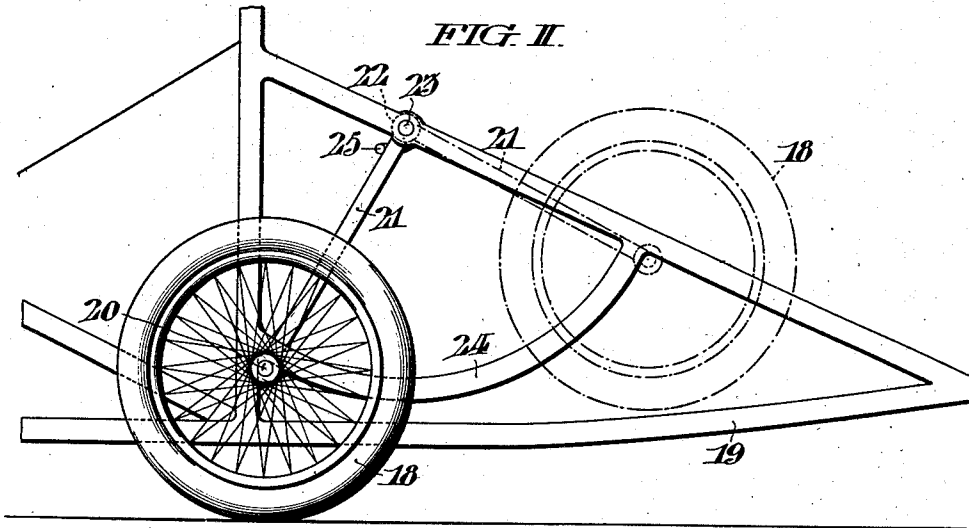
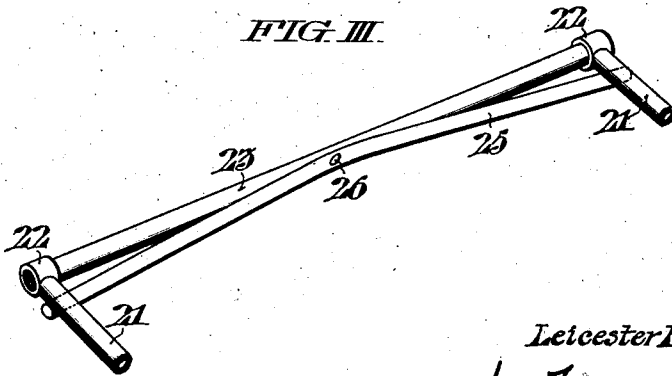


FIG. III.



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UNITED STATES PATENT OFFICE.

LEICESTER BODINE HOLLAND, OF PHILADELPHIA, PENNSYLVANIA.

AEROPLANE.

1,003,459.

Specification of Letters Patent. Patented Sept. 19, 1911.

Application filed March 21, 1910. Serial No. 550,580.

To all whom it may concern:

Be it known that I, LEICESTER B. HOLLAND, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Aeroplanes, whereof the following is a specification, reference being had to the accompanying drawings.

The invention relates to new and useful improvements in aeroplanes of the Voisin biplane type, although it is obvious that from certain aspects my invention is not limited to an aeroplane of the biplane type, the essential features being a horizontal plane of sufficient area to sustain the aeroplane, and vertical planes of sufficient area to give lateral stability to the aeroplane.

An object of the invention is to provide means for moving the vertical planes in an aeroplane of the above type, so that said vertical planes may be so positioned as to avoid any drag or retarding effect in the turning of the aeroplane to the right or left in its flight.

A further object of the invention is to provide means for positioning the vertical planes so as to accompany turning the aeroplane with a lifting tendency at one end of the horizontal supporting plane or planes, and a depressing tendency at the opposite end of said plane or planes.

These and other objects will in part be obvious and will in part be hereinafter more fully described.

In the drawings which show by way of illustration one embodiment of the invention, Figure I, is a perspective view of an aeroplane having my improvements applied thereto. Fig. II, is a side elevation showing a portion of the skids, and the running wheels, and in dotted lines the position of the running wheels during flight. Fig. III, is a detail perspective view showing the spring for lifting the running wheels entirely above the skids. Fig. IV, is a detail in plan of one end of the supporting planes, showing the vertical planes in their normal position; and showing in dotted lines the vertical planes positioned for turning.

I have herein illustrated an aeroplane of the biplane type, which consists of an upper horizontal plane 1, and a lower horizontal plane 2. These horizontal planes are formed in the usual manner of a rigid framework, which is covered by any suitable fabric. Said planes are also curved trans-

versely in the usual manner. The planes 1, and 2, are spaced and connected together by standards 3, and suitable cross braces 4.

The aeroplane is provided with a laterally extending frame carrying a tail and rudder 5, which is of the ordinary construction, and serves for the lateral guiding of the aeroplane. Said aeroplane is also provided with a forwardly projecting frame having a horizontal rudder 6, which as herein shown, consists of two small spaced planes rigidly connected together, and suitably supported for guiding the aeroplane in its vertical movements.

At each end of the horizontal planes 1, and 2, I have arranged vertical planes 7, 7, and 8, 8. The vertical planes 7, are located at points very near the outer ends of the horizontal planes, and the vertical planes 8, 8, are spaced at suitable distances from the planes 7, 7. The purpose of the vertical planes is to afford lateral stability of the aeroplane. Said planes are normally positioned so that they are parallel to the direction of flight. Said vertical planes also assist in a well known manner in forming a pocket which aids in sustaining the aeroplane.

When it is desired to turn the aeroplane either to the right or left in flight, it will be obvious that if the vertical planes are rigid relative to the horizontal planes, the side surfaces of the vertical planes will cause more or less of a drag or retarding effect upon the turning of the aeroplane, and therefore it is impossible to turn an aeroplane having rigid vertical planes in a curved path of comparatively small radius. In order to overcome this objection, I have mounted my vertical planes so that they may be swung relative to the horizontal plane. Each of the vertical planes consists of an independent frame, over which suitable fabric may be stretched.

The upper edge 9, of the vertical planes are curved to conform to the curvature of the horizontal plane 1. The lower edges 10, are similarly curved to conform to the curvature of the horizontal plane 2. Each of the vertical planes are mounted so as to swing about a diagonal axis 11.

When turning the aeroplane to the right, in order to preserve lateral stability, it is necessary that the left hand end of the horizontal planes be lifted slightly, and the right hand end be slightly depressed. I

have therefore mounted the vertical planes, so that they swing about an axis which is inclined downwardly from the front to the rear relative to the horizontal planes. By this movement of the axis of the vertical planes I am able to position the same so as to offer the least possible resistance to the turning of the aeroplane. While I have shown the axis about which the vertical planes swing as extending diagonally of said planes, it is obvious that this axis may be shifted so as to be inclined more or less to the horizontal planes.

In order to swing the vertical planes 7, 7, and 8, 8, I have connected the upper free corners of said planes by a cord or cable 12, and the lower free corners of said planes by a cord or cable 13. The cord or cable 13, is connected to a lever 14, carried by a rock shaft 15, and provided with a handle 16, which is so positioned as to be readily accessible to the operator. By the manipulation of the lever 14, the planes 7, 7, and 8, 8, may be swung to one side or the other, depending upon the desired direction of turning the aeroplane. When turning to the left, the vertical planes are positioned as shown in Fig. I, and when turning to the right, the vertical planes will be swung to the other side of their normal position.

It is obvious that the vertical planes may be geared with the lateral steering mechanism, so that said vertical planes may be automatically positioned in correspondence with the rudder. It is also obvious that from certain aspects of the invention, a single horizontal supporting plane may be used instead of two planes as herein shown.

I have throughout this specification and in the claims, spoken of swinging the vertical plane about an inclined axis, and have illustrated my invention as embodying this idea in a plane which is capable of swinging upon a diagonal pivoting axis, but it is obvious that instead of bodily swinging the entire plane, a twisting or warping of diagonally opposite corners of the plane, would accomplish the same result, and I desire it to be understood that by the term "swinging," I include such warping action as accomplishes the same practical end as the swinging of the pivoted plane.

In order to support the aeroplane for free running during the initial starting of the same, I have provided a rear wheel 17, and two forward wheels 18, 18. It has been found desirable to use running wheels for the starting of the aeroplane, but said running wheels are not sufficiently strong to withstand the impact at landing. As herein shown I have provided my aeroplane, with the usual frame carrying the skids 19. The running wheels 18, 18, are mounted upon an axle 20, and said axle is carried by said arms 21, 21, which are provided with

sleeves 22, at their upper ends, journaled on the cross bar 23, secured to the frame. Said arms 21, together with the running wheels, are free to turn about the cross bar 23, from the position shown in full lines in Fig. II, to the position shown in dotted lines therein. The curved bar 24, carried by the frame, is so constructed that the axle 20, is constantly maintained in sliding contact therewith. When the parts are positioned as shown in full lines in Fig. II, the weight of the aeroplane will tend to turn the arms 21, about the cross bar 23, in a clockwise direction, and will bring the axle into contact with the frame, which limits the movement of the arms 21, and forms a rigid support for the running wheels. It will thus be seen that the aeroplane is supported on the running wheels 18, at its forward end, and the said wheels are held rigidly as to vertical movement at this time. In order that the running wheels may be thrown to a position above the skids 19, when the aeroplane leaves the ground, I have provided a spring 25, which, as herein shown, is in the form of a spring bar, rigidly bolted at 26, to the cross bar 23, with its ends extending underneath the arms 21, 21, which support the running wheels. Said spring 25, is so mounted as to normally move the arms 21, to the position shown in dotted lines in Fig. II, and it will be noted that as soon as the weight of the aeroplane is taken from the running wheels 18, the spring will move the same to a position entirely above the skids, so that in landing the entire impact will be received by said skids.

The particular construction of support herein described forms no part of the present invention, but is shown, described and claimed in my copending application, Serial No. 575,466, filed August 4th, 1910.

I claim:—

1. An aeroplane including in combination, a main horizontal plane; a vertical plane adjacent each end of said horizontal plane; and means for swinging each of said vertical planes about a diagonal axis extending from one edge of said plane to a point in vertical alinement with the opposite edge of said plane.

2. An aeroplane including in combination, a main horizontal plane; spaced vertical planes located near each end of said horizontal plane; and means for swinging each of said vertical planes about a diagonal axis extending from one edge of one of said planes to a point in vertical alinement with the opposite edge of said planes.

3. An aeroplane including in combination, spaced rigid horizontal planes arranged one above the other; a vertical plane adjacent each end of said horizontal planes; and means for swinging each of said vertical planes about a diagonal axis extending

downwardly from front to rear relative to said horizontal planes.

4. An aeroplane including in combination, spaced rigid horizontal planes arranged one above the other; spaced vertical planes arranged between said horizontal planes and adjacent each end thereof, and means for simultaneously swinging said vertical planes about a diagonal axis extending downwardly from front to rear relative to said horizontal planes.

5. An aeroplane including in combination a pair of spaced superimposed rigid horizontal planes; a pair of spaced rigid vertical planes arranged near each end of said horizontal planes and between the same; and means for simultaneously swinging said vertical planes about axes arranged diagonally in said vertical planes.

6. An aeroplane including in combination a pair of spaced superimposed rigid horizontal planes; a pair of spaced rigid vertical planes arranged near each end of said horizontal planes, and between the same; means for pivoting said vertical planes so that each may swing about a diagonal axis extending downwardly from the front to the rear of said planes; a cord connecting the upper free corners of said vertical

planes; a cord connecting the lower free corners of said vertical planes; an arm connected to said last named cord; a rock shaft upon which said arm is mounted; and means for oscillating said rock shaft.

7. An aeroplane including in combination a main horizontal plane, a cooperating vertical plane, and means for swinging diagonally opposite corners of said vertical plane about a diagonal axis connecting the other two corners.

8. An aeroplane including in combination spaced horizontal planes arranged one above the other; a vertical plane located between said horizontal planes and adjacent each end thereof, and means for swinging each of said vertical planes about an axis extending in an inclined direction from a point in vertical alinement with the edges on one side of the horizontal planes, to a point in vertical alinement with the opposite edges of said horizontal planes.

In testimony whereof, I have hereunto signed my name, at Philadelphia, Pennsylvania, this eighteenth day of March, 1910.

LEICESTER BODINE HOLLAND.

Witnesses:

JAMES H. BELL,
E. L. FULLERTON.