A. H. MORRIS.

AEROPLANE.

APPLICATION FILED AUG. 13, 1912. RENEWED DEC. 10, 1913.

1,189,610.

Patented July 4, 1916.

3 SHEETS—SHEET 1.

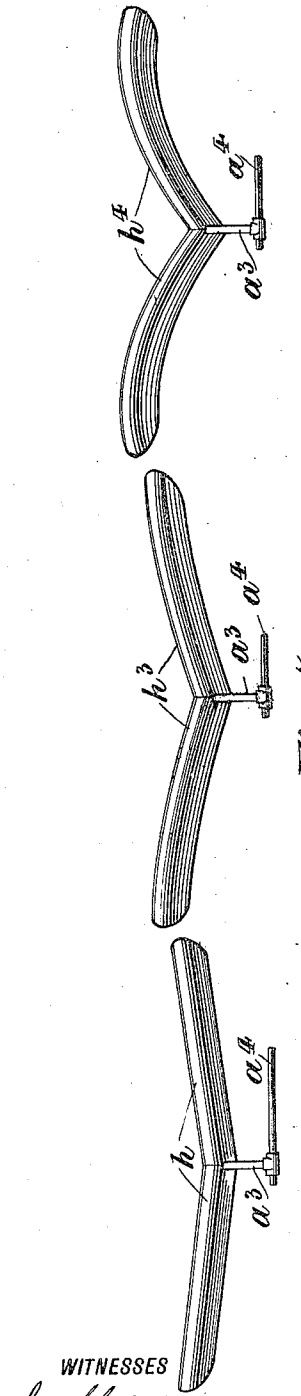


Fig. 1.

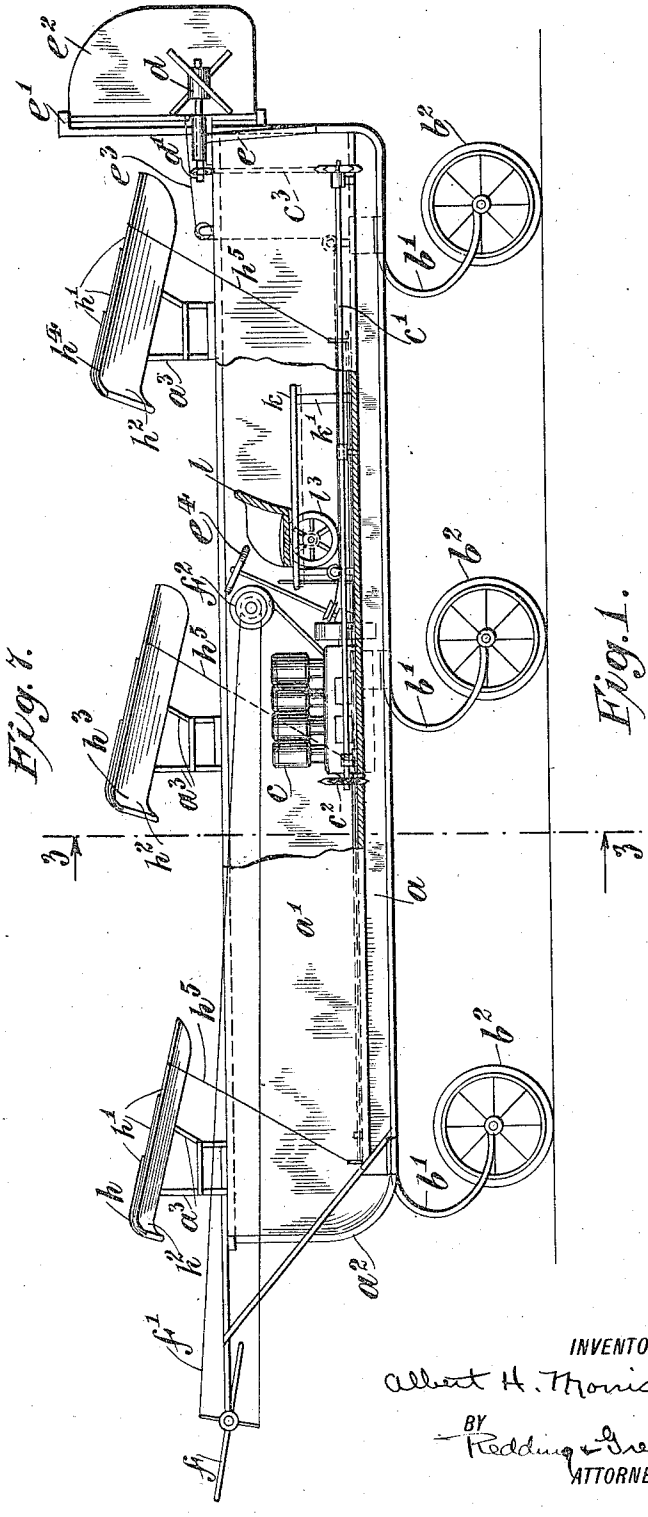


Fig. 1.

WITNESSES

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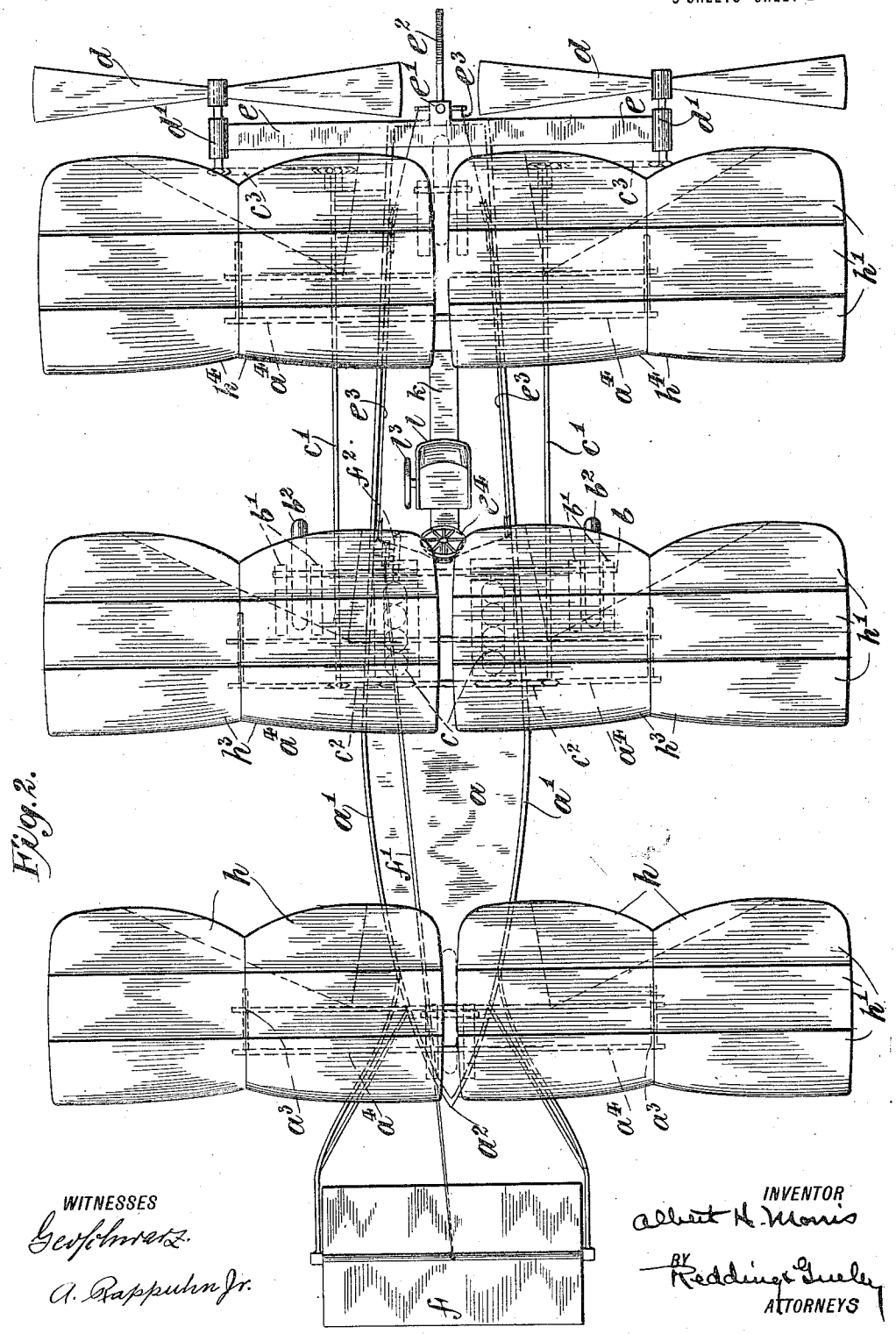


Fig. 2.

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3 SHEETS—SHEET 3.

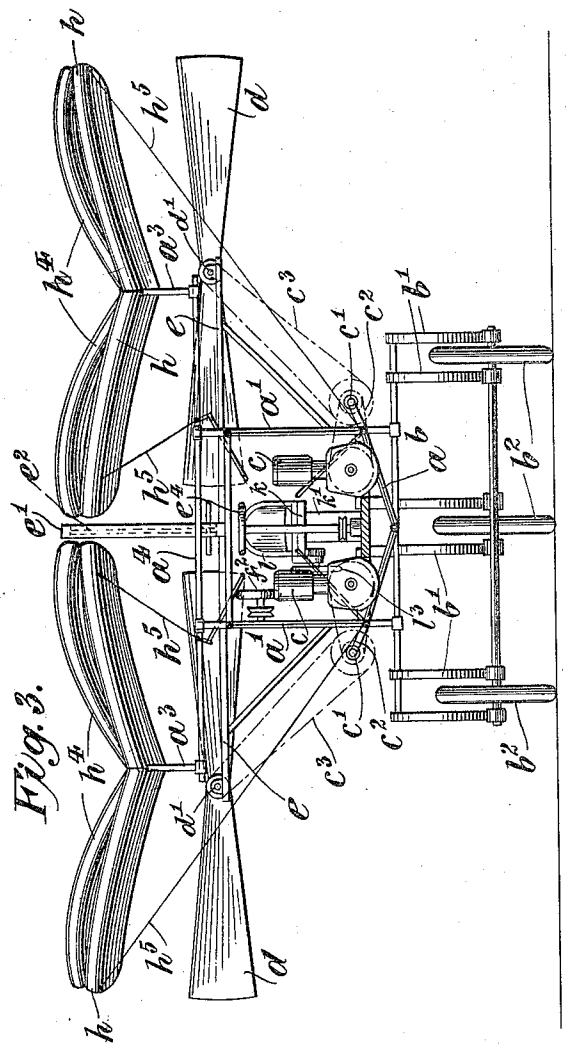


Fig. 3.

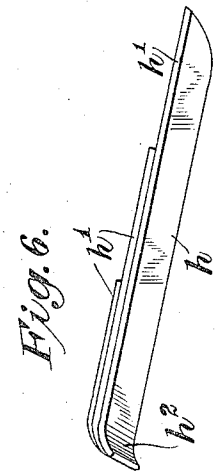


Fig. 6.

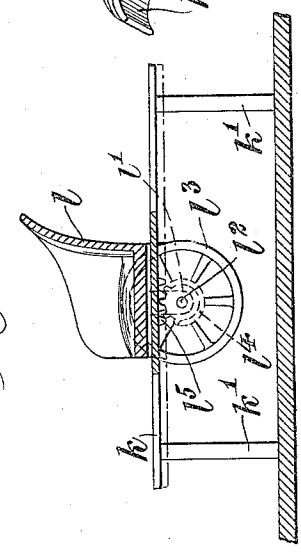


Fig. 5.

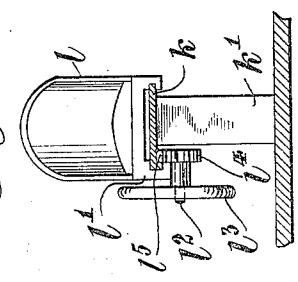


Fig. 4.

WITNESSES

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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, ALBERT H. MORRIS, a citizen of the United States, residing in the borough of Manhattan of the city of New York, county of New York, State of New York, have invented certain new and useful Improvements in Aeroplanes, of which the following is a specification, reference being had to the accompanying drawings, which form a part hereof.

This invention relates to aeroplanes and has for one of its objects to increase the stability of such machines by mounting a plurality of planes symmetrically with respect to the longitudinal and transverse axes thereof so that equal effective sustaining efforts are secured with respect to said axes.

Another object is to mount the planes with respect to each other so that the rear planes will encounter air undisturbed by any of the forward planes without, however, arranging the same in gradient series from front to rear.

Still another object is to provide planes of such a shape that their cutting edges and forward portions will provide the greatest lifting power so that the rear portions may be flexed without varying appreciably the total sustaining effort. In the present invention the forward portions of the planes are made relatively rigid, the flexibility thereof increasing gradually toward the rear to permit warping by warping wires or by wind resistance when traveling, and either separately to control the machine when in flight or simultaneously to stop the same at the desired landing place. The stability of the aeroplane may be further controlled by providing means for moving the operator's seat forward or aft to change immediately the center of gravity of the machine with respect to the longitudinal axis thereof.

A further object is to construct the parts so that a minimum space will be occupied when the same are crated for transit. Previous aeroplanes have been open to objection in this respect by reason of the use of relatively long and bulky planes. The present invention contemplates the provision of a series of sustaining planes consisting of wing-like members arranged in pairs on either side of the longitudinal axis. These wings may be removed and packed separately thus eliminating the objection of bulk. In addition it has been found that the relatively narrow wings when used in the manner above referred to tend to lessen the leverage or turning moment with respect to the axes of the machine and put the center of gravity relatively lower than in ordinary constructions thus lessening the danger from tilting or tipping.

The invention will be more fully described with reference to the accompanying drawings in which—

Figure 1 is a view in side elevation of an aeroplane embodying the invention, one of the frame members being broken away to show the motor and the operator's seat. Fig. 2 is a top view of the same. Fig. 3 is a view taken on the plane indicated by the line 3—3 of Fig. 1 and looking in the direction of the arrows. Fig. 4 is an enlarged detail view of the operator's seat showing a rack and pinion for moving the same. Fig. 5 is a view of the same in vertical section. Fig. 6 is an enlarged view in perspective of a wing made in accordance with the invention. Fig. 7 is a front view of a series of detached pairs of wings shown successively from left to right as arranged from front to rear of the aeroplane.

In the construction of the aeroplane, the body, frame members, planes and other constituent parts, save the motor and similar elements, are made preferably of vulcanized fiber, commercially known as vulcanite, which has been found to combine the qualities of lightness, toughness, rigidity and slight resiliency to the degree desirable in structures of this kind.

The body of the aeroplane, as here shown, is similar in general to that of a well designed boat in order to reduce to a minimum the resistance offered to the air, comprising a tapered bottom a and substantially vertical side walls a' a' which meet in a line at their forward edges to form a prow a^2. The outer edges of the bottom may be of such a shape as to give the side walls a diverging form rearwardly to the mid-section of the body and a slightly converging form from thence rearwardly for reasons which will be understood. The body is mounted on a chassis b of any approved form which has secured thereto by relatively resilient supports b', suitable wheels b^2 arranged in such numbers and in such positions as will serve best to insure an easy and safe landing. Substantially mid-way of the body of the machine and symmetrically disposed with respect to the longitudinal axis thereof, are

the driving motors c, two being herein illustrated. Each of the motors c drives a propeller d through a shaft c' which is operatively connected to the motor and to the propeller through chains c^2 and c^3 respectively. The shafts of the propellers d' are mounted adjacent the ends of a transverse support e carried by the walls a'. This support e may have a vertical stanchion e' secured thereto at a point on the longitudinal axis of the machine and in this stanchion may be journaled a rudder e^2 controlled through flexible connections e^3 attached operatively to a handwheel e^4 disposed within reach of the operator. The vertical rudder, as will be understood, permits the control of the direction of the machine in a horizontal plane, while the vertical control thereof is effected principally through a lifting plane f of usual construction mounted at the forward end of the body. This elevating plane f is controlled through other flexible connections f' which are secured operatively to a second handwheel f^2 also within reach of the operator. The features of construction thus far described are all old in the art and the invention is not to be limited to the forms herein shown.

Referring now to Fig. 2 it will be seen that the stability of the machine is sought to be obtained by the arrangement of a number of pairs of wings disposed symmetrically with respect to the longitudinal and transverse axes thereof so that an equal sustaining effort is secured in each one of the four quadrants formed by the intersection of said axes. In the present embodiment only three sets of pairs of wings and two series thereof are shown although it is obvious that any number of sets and any number of series may be provided so long as the effect above described is procured. The forward set of planes comprises wings h arranged in pairs on opposite sides of the longitudinal axis of the aeroplane and mounted on suitable frame members a^3 secured to transverse bars a^4 which are carried by the walls a' of the body. As shown in Fig. 6 these wings are composed of layers h' of vulcanite, the number of layers gradually decreasing from front to rear so that while the forward edge is rigid, the rearward edge is comparatively flexible and lends itself to warping either by wind or by warping wires as will appear hereinafter. The forward edge of each wing h as well as each of the other wings to be later described, is concave with respect to the longitudinal axis so that an air pocket h^2 is formed whereby the greatest lifting power is obtained at this portion of the wing. This is important as it will be understood that through this construction the rearward portion of the wing may be warped without diminishing appreciably the sustaining effort thereof. While Fig. 6 has been described with reference particularly to the forward wings h it is to be understood that the construction of all of the wings is similar thereto, the one difference residing in the degree of concavity of the wings with respect to their transverse axes. This shape, however, is not essential as the wings may be flat if desired.

As shown most clearly in Fig. 7 two wings h are mounted on a common support a^3 in angular relation transversely to form a sustaining plane. The rearward slope of each wing is the same, and hence the angle of incidence of the air thereon is the same, not only as regards each pair of wings but as regards the wings in all of the pairs. This is not true with respect to the angularity of the wings of each successive set of pairs with respect to each other, however, as appears from Fig. 7. The angle between the wings h^3 of the second set of pairs is less than that between the wings h and the angle between the wings h^4 of the rearmost set of pairs is even less, so that the wings of each set of pairs encounter air undisturbed by those in front. It is to be noted that this effect is here accomplished too, without disposing the successive sets of pairs of wings in gradient series from front to rear. As before mentioned, it may be found desirable to give to the wings of each successive set of pairs a greater transverse concavity than that given those in front and although such a construction is actually shown in the accompanying drawings, it is not an essential feature of this invention and need not be employed.

To the rearward portion of each wing h, h^3 and h^4 is attached a warping wire h^5 which extends to a suitable operating mechanism placed within control of the driver whereby any one wing may be warped or whereby all of the wings may be warped simultaneously. In flight, it will be found necessary to warp only a few of the wings to maintain the stability of the machine, while in landing all of the wings may be drawn downwardly to present great resistance to the air and so bring the aeroplane to the ground in a manner to be compared with the alighting of a bird. It is to be noted particularly that whereas in previous constructions hinged planes have been employed to secure sensitive control of the machine, the integral wing shown in Fig. 6 permits any desired degree of warping of its rearward portion and yet possesses the necessary lifting qualities insured by the relative rigidity of its forward portion.

A further feature of the invention resides in the means for shifting longitudinally the center of gravity of the aeroplane quickly by movement of the operator's seat and the operator. Directly behind the motors c and the steering mechanism f^2 and e^4, is disposed

an elevated platform k supported by vertical members k'' and on which is mounted movably the operator's seat l which has a depending flange l' at one side thereof to support a shaft l^2. On one end of this shaft l^2 is a hand wheel l^3 disposed within easy reach of the operator and on the other end is attached a pinion l^4 adapted to engage operatively a rack l^5 formed on the under side of the platform k and to move the seat when the wheel is rotated. In this manner the operator has an auxiliary and certain means of controlling the stability of the machine in a vertical plane which means is independent of the mechanism before described.

Modifications other than those noted in the body of the specification will suggest themselves to those skilled in the art but all such modifications are to be considered within the scope of this invention provided the combination of parts or their equivalent, hereinafter claimed, are employed.

What I claim is:

1. In an aeroplane, series of sustaining planes disposed symmetrically on opposite sides of the longitudinal axis to maintain the lateral stability thereof, said planes comprising wings mounted angularly each to each, the angularity of each successive pair of wings differing from front to rear of the aeroplane.

2. In an aeroplane, series of sustaining planes disposed symmetrically on opposite sides of the longitudinal axis to maintain the lateral stability thereof, said planes comprising wings mounted angularly each to each, the angularity of each successive pair of wings decreasing from front to rear of the aeroplane.

3. In an aeroplane, sustaining wings composed of a series of layers of vulcanized fiber, the number of layers decreasing from front to rear of said wings, whereby the forward portions are relatively rigid and the rearward portions relatively flexible.

4. In an aeroplane, sustaining wings composed of a series of layers of vulcanized fiber, the number of layers decreasing from front to rear of said wings, whereby the forward portions are relatively rigid and the rearward portions relatively flexible, the forward portions being concave with respect to their longitudinal axes.

5. In an aeroplane, sustaining wings composed of a series of layers of vulcanized fiber, the number of layers decreasing from front to rear of said wings, whereby the forward portions are relatively rigid and the rearward portions relatively flexible, and flexible connections secured to said rearward portions to permit the wings to be warped.

6. In an aeroplane, series of sustaining planes disposed symmetrically on opposite sides of the longitudinal axis to maintain the lateral stability thereof, said planes comprising wings mounted angularly each to each, the dihedral angularity of each successive pair of wings, differing.

7. In an aeroplane, sustaining wings composed of a series of layers of suitable material, the number of layers decreasing from front to rear of said wings, whereby the forward portions are relatively rigid and the rearward portions relatively flexible.

8. In an aeoplane, series of sustaining planes comprising wings mounted angularly each to each, the dihedral angularity of each set of wings differing from front to rear of the aeroplane, said planes being disposed symmetrically on opposite sides of the longitudinal axis, and a supporting frame to which each plane is secured, the supporting frames being symmetrically positioned with respect to each other and to the longitudinal axis of the aeroplane and being disposed at points remote from the longitudinal axis.

This specification signed and witnessed this 7th day of August, A. D., 1912.

ALBERT H. MORRIS.

Signed in the presence of—

E. M. TAYLOR,

WORTHINGTON CAMPBELL.

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