F. C. & F. S. CARPENTER.

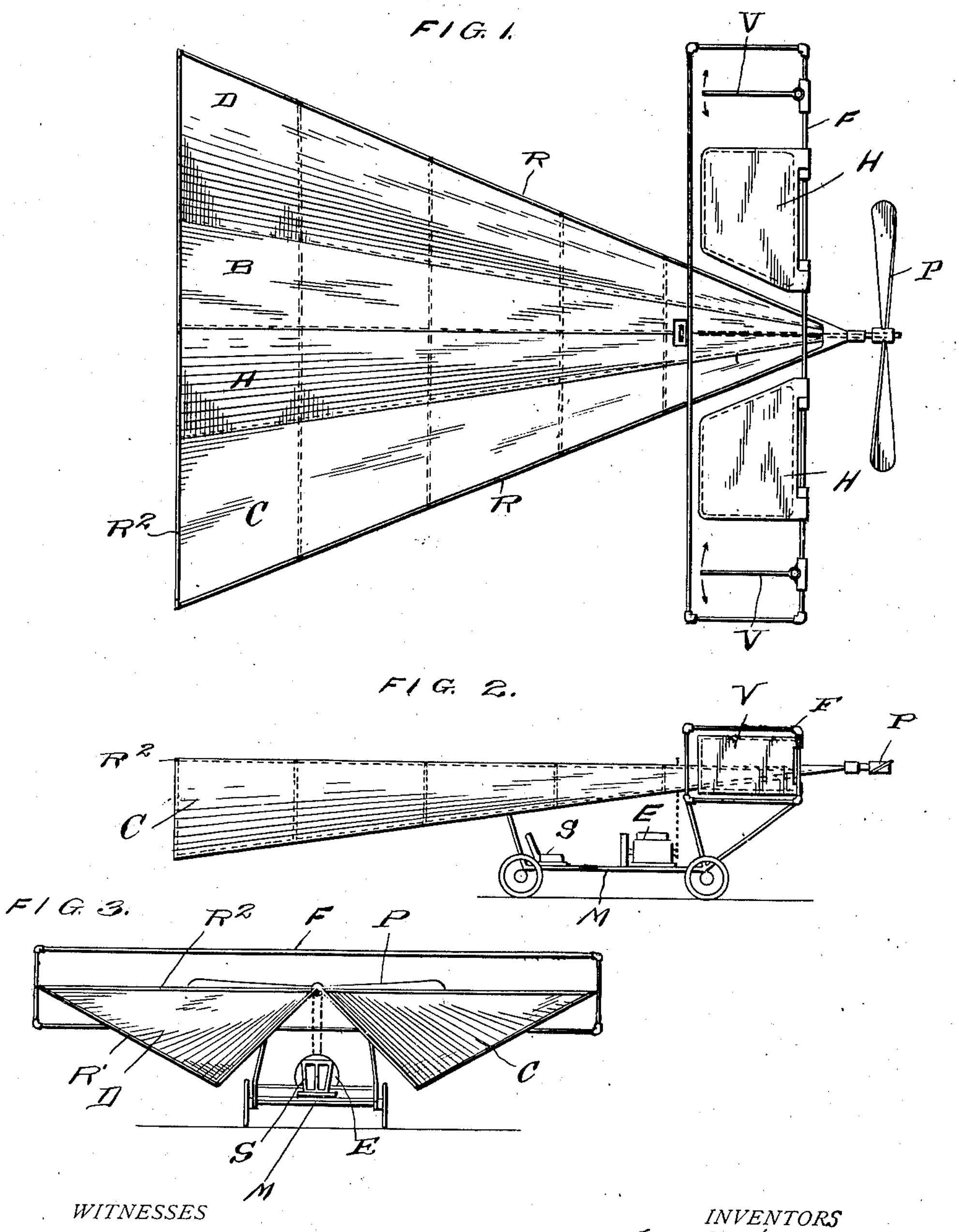
AEROPLANE.

APPLICATION FILED FEB. 28, 1911.

1,016,609.

Patented Feb. 6, 1912.

2 SHEETS—SHEET 1.



WITNESSES

C. K. Davies

L. B. Aveilhé

INVENTORS

F. C. Carpenter

F. S. Carpenter

by Beach, Becker & Smith

Attorneys

F. C. & F. S. CARPENTER.

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2 SHEETS—SHEET 2.

FIG. 4.

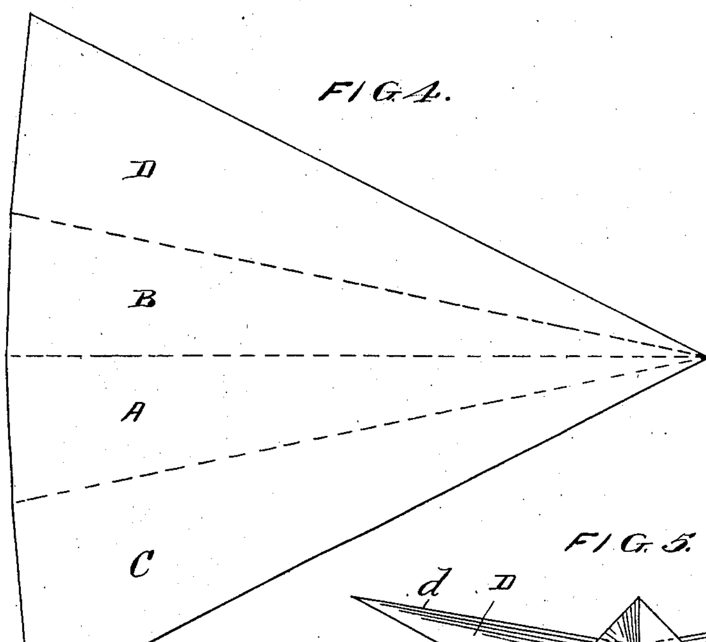


FIG. 5.

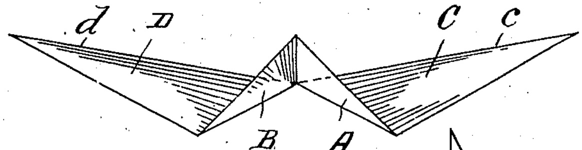
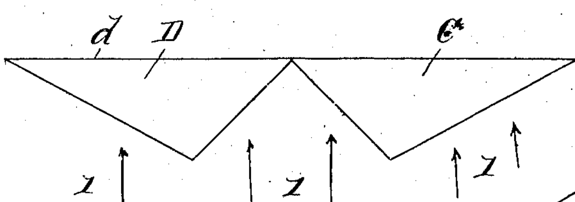


FIG. 6.



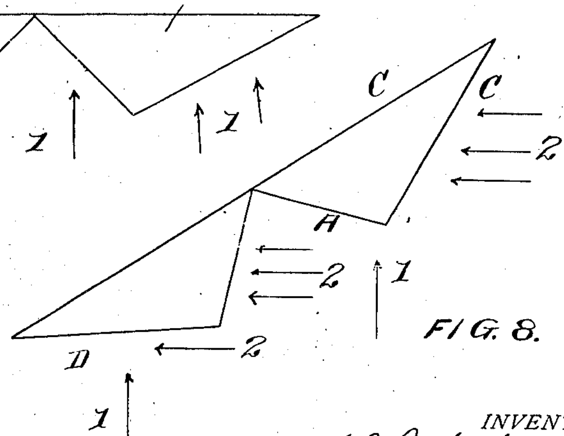


FIG. 7.

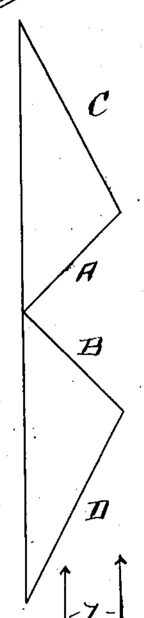


FIG. 8.

WITNESSES

C. K. Davies.

L. B. Aveilhé

INVENTORS

F. C. Carpenter

F. S. Carpenter

Attorneys

UNITED STATES PATENT OFFICE.

FRANK COSBY CARPENTER AND FLOYD SMITH CARPENTER, OF LOUISVILLE, KENTUCKY.

AEROPLANE.

1,016,609. Specification of Letters Patent. **Patented Feb. 6, 1912.**

Application filed February 28, 1911. Serial No. 611,472.

To all whom it may concern:

Be it known that we, FRANK C. CARPENTER and FLOYD S. CARPENTER, citizens of the United States, residing at Louisville, Kentucky, have invented a certain new and useful Aeroplane, of which the following is a specification.

Our invention relates to a novel form of aeroplane.

For a complete flying machine any structure embodying our invention also includes the necessary lifting and lateral deflecting device and propelling mechanism and such parts are shown diagrammatically in combination with planes.

The invention consists in a novel arrangement and shape of the planes proper.

Broadly considered the invention consists in the provision of a compound plane having two downwardly presented dihedral angles, these angles being selected within a certain range to cause the apparatus to perform in the desired manner under the influence of windage and gravity as will be explained.

One of the chief faults of aeroplanes at the present time is the lack of sufficient stability especially in cross currents and inability or insufficient ability to right themselves or even to be righted by any effort of the driver when they have been tilted beyond a certain angle. To overcome this fault we have provided a plane which is self-righting under all anticipated conditions and which moreover tends continually under all conditions of lateral windage to maintain itself in proper equilibrium.

The word plane when used without limitation herein is intended to designate the compound plane surface as a whole.

In plan the shape of the plane may vary greatly but in a preferred form which is chosen for exemplification the plan form of the plane is triangular with the apex forward. In this form of plane the component surfaces also naturally take the form of triangles with their bases to the rear. The individual members composing the planes may be identified conveniently as surfaces.

The structure chosen as an exemplification of the invention will now be described and in connection with this description the broader characteristics of the invention and its characteristics and advantages will be further pointed out so far as is necessary.

Figure 1 is a plan view. Fig. 2 is a side elevation. Fig. 3 is a rear elevation. Fig. 4 is a development (flattened-out plan) of the plane. Fig. 5 is a rear perspective of the plane alone, all appurtenances or non-essentials of the invention being stripped away; the apex or bow of the plane being slightly tipped down so that all the surfaces may be observed. Fig. 6 is a diagrammatic rear elevation of the plane in horizontal position for the explanation of windage effects. Fig. 7 is a view for similar purposes of the plane tilted considerably, and Fig. 8 is a similar view of the plane tilted at right angles to the horizontal for explanation particularly of the effect of air pressure and gravity in righting the plane.

The aeroplane as a whole as shown in Fig. 5 consists of four subordinate planes or surfaces A, B, C, D. Central surfaces A and B in this exemplifying form form a dihedral angle of approximately 90° upwardly convex and the outer surfaces C and D join the inner surfaces A and B to form downwardly convex dihedral angles of approximately 105°. The outer edges *c*, *d* shown terminate horizontally flush with the dihedral intersection of the middle surfaces. Either of these dihedral angles may be varied to a certain extent.

As shown in Fig. 1 the plane as a whole has the plan form of an isosceles triangle, but the plan shape of the main plane can be considerably varied and it might even be made rectangularly. The planes are held in correct relative position and shape by a frame consisting of rods R running along their edges and along the dihedral angles and rods R′ running along the rear edges of the surface (Fig. 3) also a rod R^2 (Figs. 1 and 3) at the rear connecting the rear points of the outer surfaces and the rear point of the dihedral intersection of the inner surfaces. The frame thus formed may be suitably braced in an approved manner to provide the necessary strength and stiffness and to provide for the support of passengers and motive power etc. At the forward end is secured a frame F carrying suitable horizontal rudders H and vertical rudders V and these are to be provided with suitable controlling means. The frame also carries the propeller P. Below the plane is suitably suspended a suitable chassis M carrying the operator's seat S, motor E, etc.

It remains to describe the performance of a plane constructed as above described and this explanation will be made in connection with our theory of the manner in which the desired action is produced. Any misapprehension on our part as to the exact way in which windage and gravity act upon the apparatus is of no consequence since the invention concerns itself with the structure and the structure accomplishes the result hereafter explained without respect to the precise manner in which the effect is brought about.

Suppose that the plane is moving forward horizontally, that is away from the eye as shown in Fig. 6 or Fig. 5, assuming that the eye is slightly below the horizontal level of flight and that the air is stationary. The correct position of the ailerons or horizontal rudders and vertical rudders is to be assumed in all cases and will not be described. Under the conditions named the weight of the machine is supported by air pressure on the under sides of all four surfaces A, B, C and D. Surfaces C and D bear somewhat more pressure than the inner surfaces on account of their larger projected area but the inner surfaces may have an increased supporting effect due to compression of air between them. The supporting forces acting on the plane are represented by the vertical arrows 1. Suppose now a gust strikes the plane from the right moving horizontally. This wind pressure exerts an elevating effect on surface C and, we will assume, tilts the apparatus to the position shown in Fig. 7. The lateral breeze then acts on plane C as shown by arrows 2, but also acts with greater effect at the same time on plane B because said plane is presented to the wind current at a more abrupt angle than plane C. If the apparatus has been tilted so far as shown in Fig. 7 air pressure will also act slightly on plane D. The greater effective force of air against planes B and D will swing the apparatus back toward horizontal position. In addition the force of gravity tending to make the machine descend and always therefore tending to create an upward pressure against the planes in the direction of arrows 1 assists in righting the machine since this vertical force acts now more upon plane D than upon plane A, since plane D is substantially horizontal and plane A is considerably inclined. The effect of gravity can always be utilized by the operator at all reasonable tilts of the plane by permitting the machine to descend more or less, thus increasing the effect of the vertical pressure.

From the foregoing it will be readily understood that tilting is minimized because the identical wind pressure which tends to cause a tilt immediately becomes effective to restore the machine to horizontal position. Thus a very steady flight may be made under all except the most abnormal conditions. As an extreme example it should be assumed however that the plane is placed in the position shown in Fig. 8, that is at right angles to the proper horizontal position or half inverted. Neglecting any possible side winds the machine in this position will tend to fall rapidly and the upward pressure thus exerted at first acts appreciably only upon surface D. But this immediately swings the apparatus back toward the horizontal and the operator is enabled to resume control by means of the movable controlling devices. It is of course desirable to place the center of gravity of the apparatus somewhere below the dihedral angles of planes A and B, and the effect of this gravity center assists in the restoration of proper balance under all the conditions above assumed. Even if the machine is completely inverted there will be an unstable equilibrium due to the center of gravity then above the horizontal center of the plane and if the machine is at any considerable elevation at the time of inversion it will turn sufficiently for the wind pressure to completely right it, in all probability before gravity brings it to the earth.

We have shown and described only one exemplifying form of the invention, but it is to be understood that we contemplate many variations.

It should be understood that the different surfaces of the plane may be made more or less curved in accordance with well known principles of aerostatics. They are shown flat for the sake of clear illustration.

We claim:

1. In an aeroplane, a composite plane structure comprising central planes having a downwardly concave dihedral angle of about 90° and outer planes joining the inner planes to form downwardly convex dihedral angles of about 105°.

2. In an aeroplane, a supporting plane comprising triangular middle plane sections joined to form a dihedral angle of about 90° with their smallest plane angles coming together at the bow and side planes joining the central planes to form downwardly convex dihedral angles of about 105°.

3. In an aeroplane, a supporting plane having the plan form of an isosceles triangle and composed of minor plane sections

joining to form two downwardly convex dihedral angles and an upwardly convex dihedral angle.

4. In an aeroplane, a supporting plane having the plan form of an isosceles triangle and composed of minor plane sections joining to form two downwardly convex dihedral angles and an intermediate upwardly convex dihedral angle.

5. In an aeroplane, a supporting plane having the plan form of an isosceles triangle and composed of minor plane sections joining to form two downwardly convex dihedral angles of about 90° and an upwardly dihedral angle of about 105°.

6. In an aeroplane, a supporting plane having the plan form of an isosceles triangle and composed of minor plane sections joining to form two downwardly convex dihedral angles and an upwardly convex dihedral angle and a suitable frame to hold the planes in proper relation.

7. In an aeroplane, a supporting plane having the plan form of an isosceles triangle and composed of minor plane sections joining to form two downwardly convex dihedral angles and an intermediate upwardly convex dihedral angle and a suitable frame to hold the planes in proper relation.

8. In an aeroplane, a supporting plane having the plan form of an isosceles triangle and composed of minor plane sections joining to form two downwardly convex dihedral angles of about 90° and an upwardly convex dihedral angle of about 105° and a suitable frame to hold the planes in proper relation.

9. In an aeroplane the combination of a supporting plane comprising a plurality of surfaces forming two downwardly convex dihedral angles of approximately 105° and an upwardly convex dihedral angle of approximately 90°, framing horizontal and vertical deflectors and propelling mechanism substantially as described.

FRANK COSBY CARPENTER.
FLOYD SMITH CARPENTER.

Witnesses:
JOHN J. BARRET,
J. RUSSELL BARRET.