H. L., A. E. & H. O. SHORT.

AEROPLANE.

APPLICATION FILED JUNE 21, 1910.

999,266.

Patented Aug. 1, 1911.

2 SHEETS—SHEET 1.

FIG. 1.

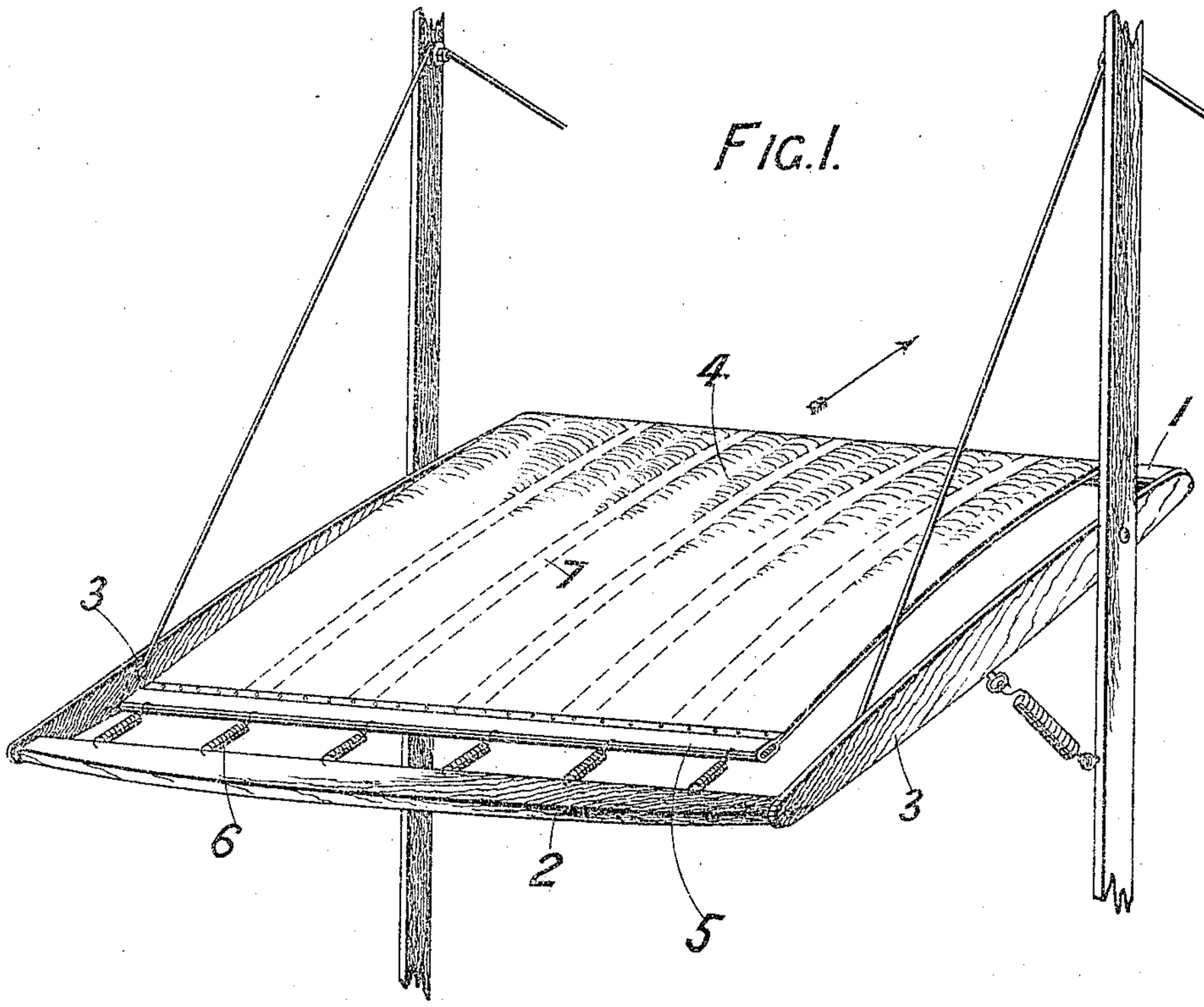
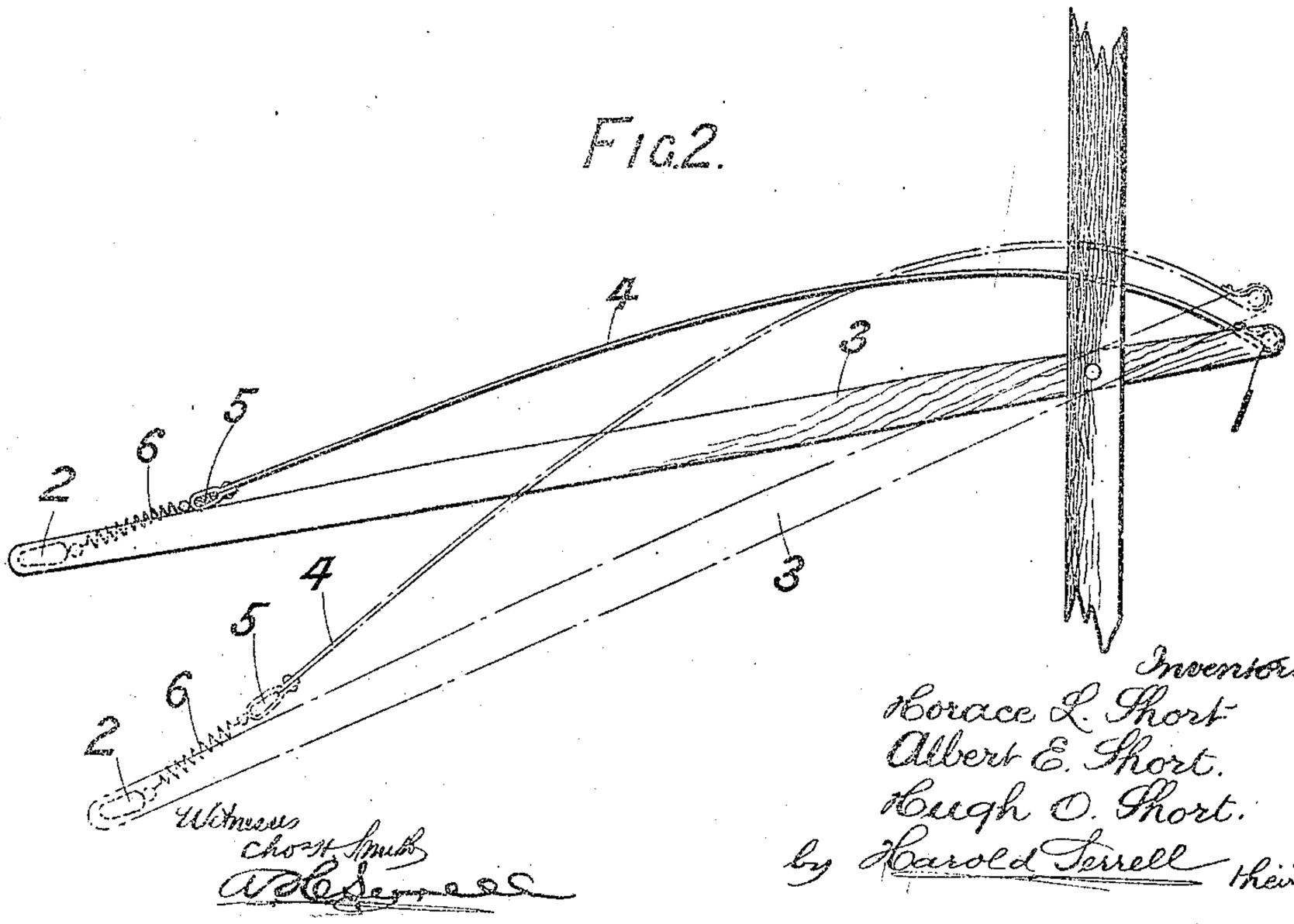


FIG. 2.



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2 SHEETS—SHEET 2.

FIG. 3.

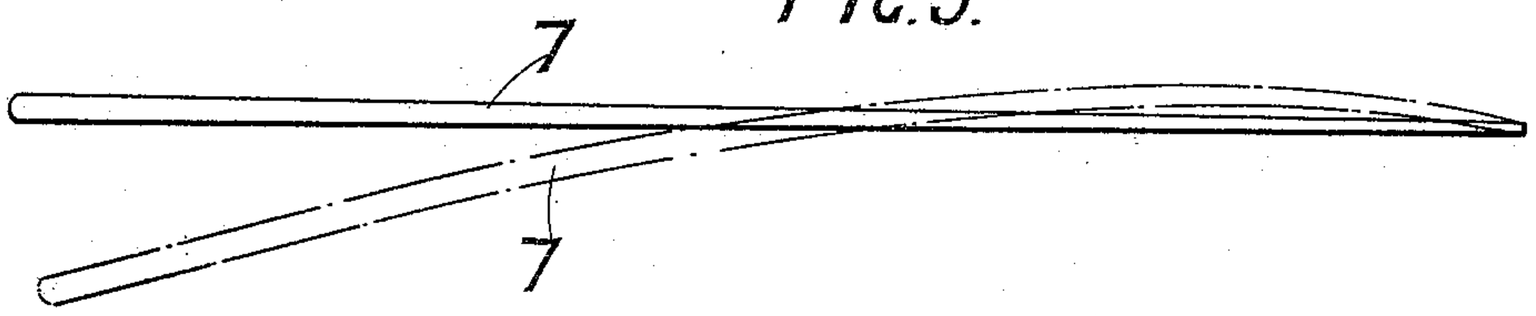


FIG. 4.

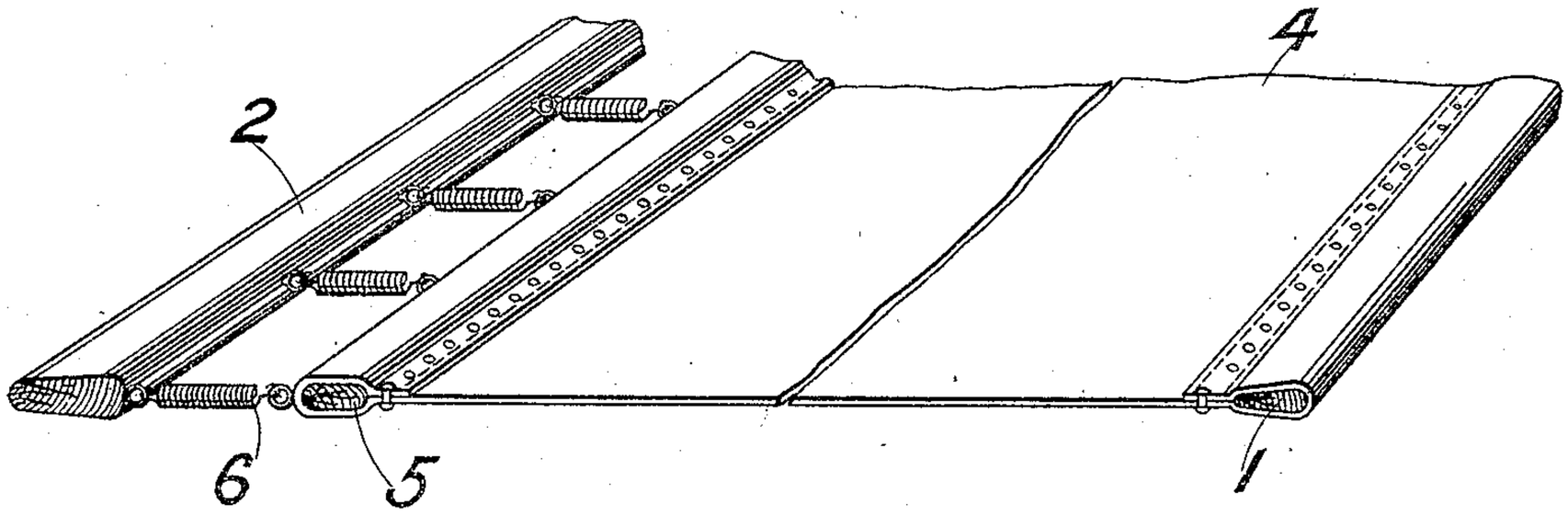


FIG. 5.

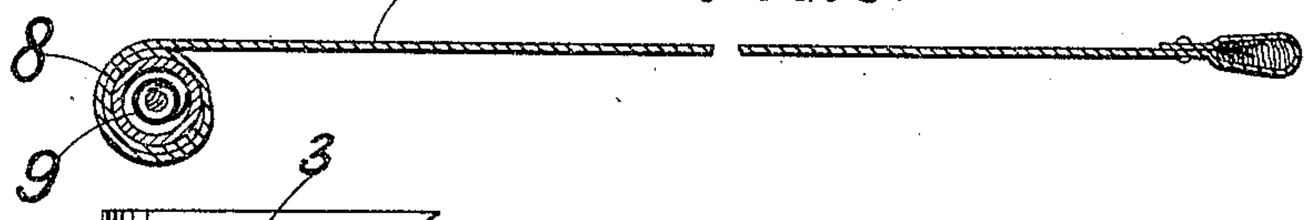


FIG. 6.

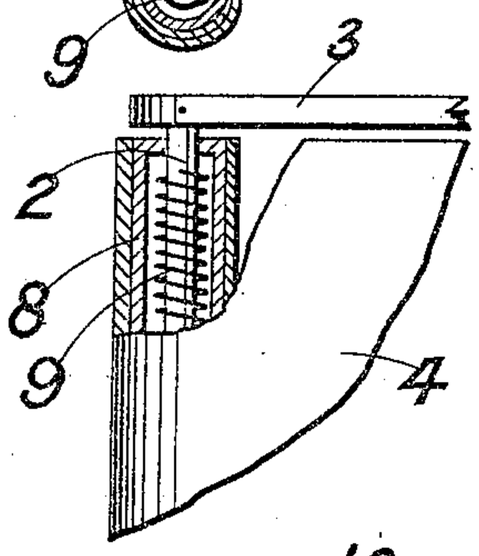
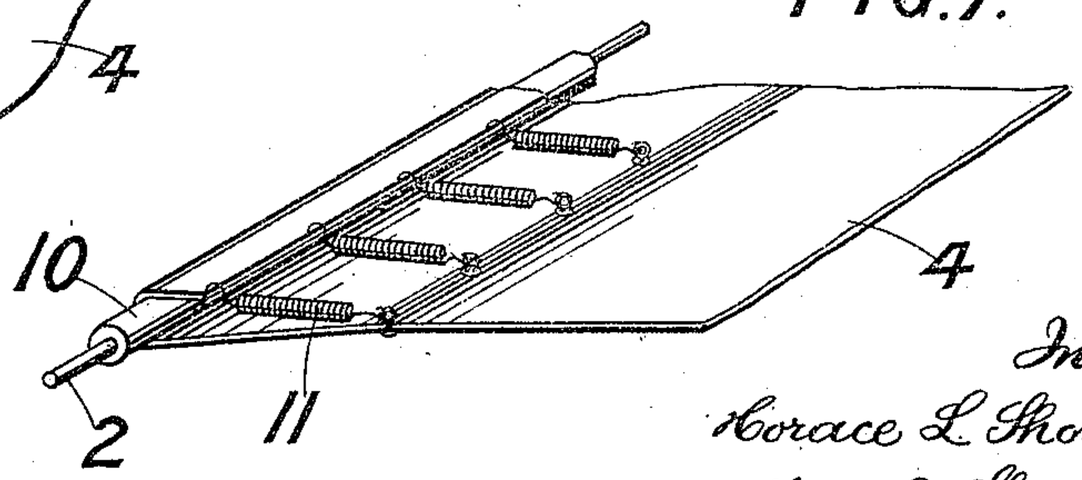


FIG. 7.



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UNITED STATES PATENT OFFICE.

HORACE LEONARD SHORT, ALBERT EUSTACE SHORT, AND HUGH OSWALD SHORT, OF BATTERSEA PARK, LONDON, ENGLAND.

AEROPLANE.

999,266. Specification of Letters Patent. Patented Aug. 1, 1911.

Application filed June 21, 1910. Serial No. 563,162.

To all whom it may concern:

Be it known that we, HORACE LEONARD SHORT, ALBERT EUSTACE SHORT, and HUGH OSWALD SHORT, subjects of the King of Great Britain, residing at Battersea Park, in the county of London, England, have invented certain new and useful Improvements in Aeroplanes, and of which the following is a specification.

This invention relates to improvements in the construction of aeroplanes suitable for the main aeroplanes, subsidiary aeroplanes, or for aeroplanes employed as rudders or balancing apparatus, and the object of the present invention is to provide a simple and efficient construction whereby the aeroplane, when passing through the air without practically any inclination, will be substantially flat, while when the aeroplane is placed at an angle to the direction of motion, its surface automatically assumes the requisite curvature required to give an upwardly or downwardly directed force with the greatest efficiency, and whereby this curve will vary according to the angle at which the aeroplane is set.

According to this invention our new or improved aeroplane consists of an open framework having two parallel members supporting two opposite edges of a flexible membrane, the forward edge of which is connected to the forward member of the said frame (considering the direction of motion), while the rearward edge of the membrane is connected to the rearward edge of the frame. One edge of the said membrane is rigidly connected to one parallel member of the frame, while the other edge of the membrane is elastically connected to the other parallel member of the frame, and thus the flexible membrane will always be maintained in a state of tension in the longitudinal direction in which the aeroplane moves in flight through the air. By this construction, when such an aeroplane is passing through the air without any inclination thereto, the membrane will not receive any curvature, but when inclination is given to the aeroplane, a curvature of the membrane will automatically take place varying with the angle of inclination, and broadly the curvature so attained will be substantially that curve requisite to give an upward or downward force with the greatest efficiency.

The invention will be further described with reference to the examples of construction shown in the accompanying drawings, whereon—

Figure 1 shows an aeroplane such as may be used for maintaining the lateral balance of the machine about the longitudinal axis or line of flight thereof, and Fig. 2 is a vertical longitudinal section of the same. Fig. 3 shows an elevation of a rib detached. Fig. 4 is a sectional perspective view of a construction similar to that at Figs. 1 and 2. Fig. 5 shows a modified construction of an aeroplane in longitudinal vertical section, and Fig. 6 is a part sectional plan of the same. Fig. 7 is a sectional perspective view showing a further modification.

Referring to Figs. 1, 2 and 4 the frame of the improved aeroplane consists of a rectangular or oblong open or skeleton frame composed of forward and rearward members 1, 2 and side members 3, and to the forward member 1 the forward edge of the flexible membrane 4 (which may consist of any suitable fabric or other material) is firmly fixed, while the rear edge of the membrane 4 is fitted with a stiffening bar 5, which by springs 6 is connected to the rear member 2 of the framework. In some cases the stiffening bar 5 may be dispensed with and the springs 6 connected directly to the fabric or other material of which the membrane 4 is composed. Hitherto we have described the membrane as consisting merely of some suitable fabric or flexible material, but in some cases we provide the membrane 4 with elastic or flexible thin strips 7 of some suitable material, constructed as shown at Fig. 3. The forward end of such strip 7 is thinner or of less cross sectional area than its rearward end. When strips 7 are employed the membrane is formed with a number of pockets extending between the forward and rearward edge of said membrane, and into each pocket a strip 7 is inserted as indicated by the dotted lines at Fig. 1, the latter being so placed in the said pockets that the thicker ends or ends having the greater cross sectional area of the strips 7 are at the rearward end of the membrane 4. Obviously, the resilient connection of the membrane with the main frame may be varied, and at Figs. 5 and 6 such a variation is shown where the membrane 4 is passed around a roller 8 revoluble upon a rod 2 forming the

rear (or it may be the forward) member of the framework, and the roller is caused to have a tendency to stretch the membrane 4 by means of a spring such as 9 similar to the springs in common use for spring blind rollers.

At Fig. 7 another construction is shown where the forward or rearward end of the flexible membrane 4 passes over a roller 10 carried upon the rod 2 forming a part of the framework, and the membrane after passing around the roller 10 is connected to itself by means of springs 11. The membrane itself, or some part of it, may be composed of elastic fabric. With such construction when the aeroplane coincides with the plane in which the machine is having motion, that is when the aeroplane has no inclination, the membrane will remain flat and offer substantially no resistance to the travel of the machine, but when the angle of the aeroplane is varied, the membrane will immediately assume a curvature and a curvature which conforms to that required to give an upward or downward force with the greatest possible efficiency, and this curve varies according to the angle of inclination of the aeroplane.

The present invention deals with the construction and combination of parts composing the improved aeroplane as described, and does not deal with any special application of that aeroplane to a flying machine, although the aeroplane shown at Fig. 1 is arranged as one of the balancing aeroplanes for maintaining the lateral balance of a flying machine about its longitudinal axis.

What we claim as our invention and desire to secure by patent is:—

1. An aeroplane, comprising in combination an open rigid frame having two opposite and parallel members located at right angles to the direction of flight, a flexible membrane, means for rigidly fixing one edge of said membrane to one of said parallel members of said frame, and means for elastically connecting the opposite edge of said membrane to the opposite parallel member of said frame to hold said membrane in tension.

2. An aeroplane, comprising in combination, an open rigid frame composed of longitudinal members, and forward and rearward parallel members, the latter two members being located at right angles to the direction of flight, a flexible membrane, means for rigidly fixing the forward edge of said membrane to the forward member of said frame, and springs for elastically connecting the rearward edge of said membrane to said rearward parallel member of said frame to hold said membrane in tension.

3. An aeroplane, comprising in combination, a rectangular open rigid frame composed of two longitudinal members, and forward and rearward parallel members, the latter two members being located at right angles to the direction of flight, a flexible rectangular membrane, means for rigidly fixing the forward edge of said membrane to the forward member of said frame, and springs for elastically connecting the rearward edge of said membrane to the rearward member of said frame to hold the said membrane in tension.

4. An aeroplane, comprising in combination, an open rigid frame composed of longitudinal members, and forward and rearward parallel members, the latter two members being located at right angles to the direction of flight, a flexible membrane, pockets in the said membrane extending from front to rear of the said membrane, flexible strips located in said pockets, means for rigidly fixing the forward edge of said membrane to the forward of said parallel members of said frame, and means for elastically connecting the rearward edge of said membrane to the rearward parallel member of said frame to hold said membrane in tension.

5. An aeroplane, comprising in combination, a rectangular rigid open frame composed of two side members and forward and rearward parallel members extending in a direction at right angles to the line of flight, said forward and rearward parallel members extending between and connecting the said side members at their ends, a flexible rectangular membrane, pockets in said membrane extending parallel to the sides thereof, flexible strips located in said pockets, means for rigidly fixing the forward edge of the membrane to the forward member of the frame, and springs for connecting the rearward edge of said membrane to the rearward member of said frame to hold the said membrane in tension.

6. An aeroplane, comprising in combination, a rectangular rigid open frame composed of two side members and forward and rearward parallel members extending in a direction at right angles to the line of flight, said forward and rearward parallel members extending between and connecting said side members at their ends, a flexible rectangular membrane, pockets in said membrane extending parallel to the sides thereof, strips of flexible material having gradually decreasing cross sectional area from end to end located in said pockets with their smaller ends adjacent to the forward edge of said membrane, means for rigidly fixing the forward edge of the membrane to the forward member of said frame, and springs for connecting the rearward edge of said membrane to the rearward member of said frame to hold the said membrane in tension.

7. An aeroplane, comprising in combina-

tion, a rectangular rigid open frame composed of two side members and forward and rearward parallel members extending in a direction at right angles to the line of flight, a flexible rectangular membrane, a pocket extending along the rearward edge of said membrane, a stiffening bar located in said pocket, means for rigidly fixing the forward edge of said membrane to the forward member of said frame, and means for elastically connecting the rearward edge of said membrane to the rearward member of said frame to hold said membrane in tension.

8. An aeroplane, comprising in combination, a rectangular rigid open frame composed of two side members and forward and rearward parallel members extending in a direction at right angles to the line of flight, said forward and rearward parallel members extending between and connecting said side members at their ends, a flexible rectangular membrane, pockets in said membrane extending parallel to the sides thereof, flexible strips located in said pockets, a pocket extending along the rearward edge of said membrane, a stiffening strip located in said pocket, means for rigidly fixing the forward edge of the membrane to the forward member of the frame, and helical springs between the rearward edge of the membrane for connecting said rearward edge to the rearward member of said frame to hold said membrane in tension.

In witness whereof we have hereunto set our hands in the presence of two witnesses.

HORACE LEONARD SHORT.
ALBERT EUSTACE SHORT.
HUGH OSWALD SHORT.

Witnesses:
GRIFFITH BREWER,
WILLIAM A. MARSHALL.