

APPLICATION FILED JULY 28, 1910.

4 SHEETS—SHEET 1.



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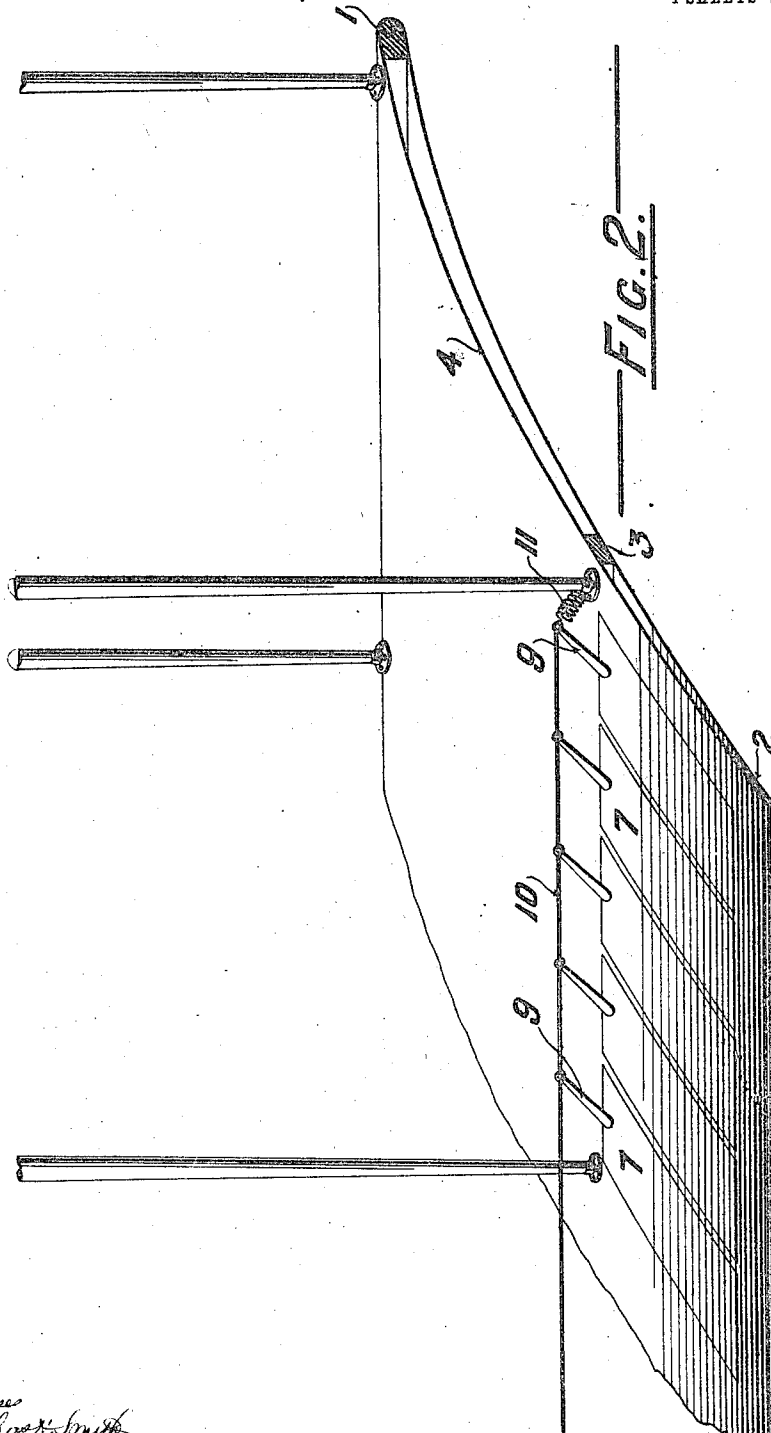
H. L., A. E. & H. O. SHORT.
AEROPLANE.

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Patented Jan. 16, 1912.

4 SHEETS-SHEET 2.

1,015,090.



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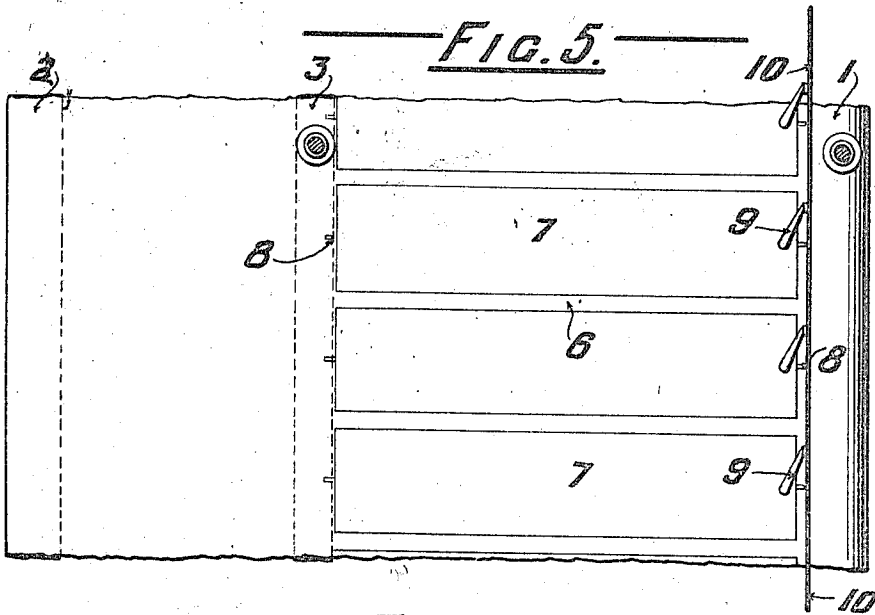
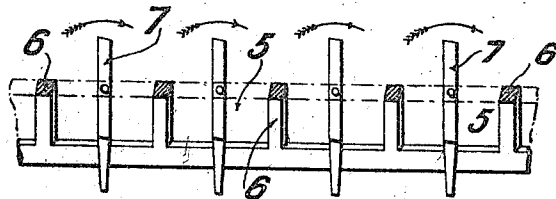
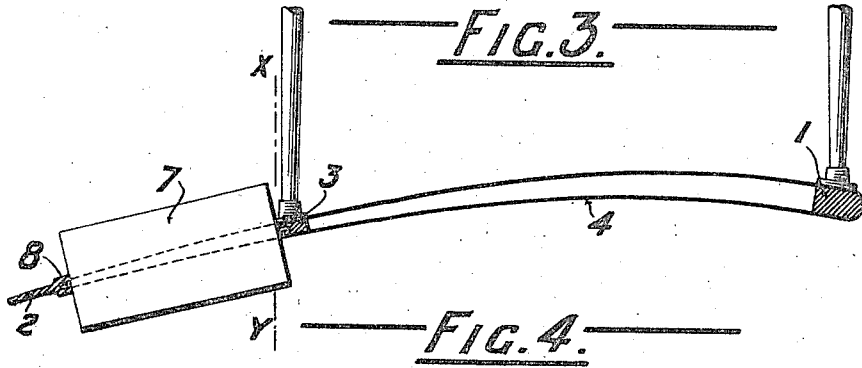
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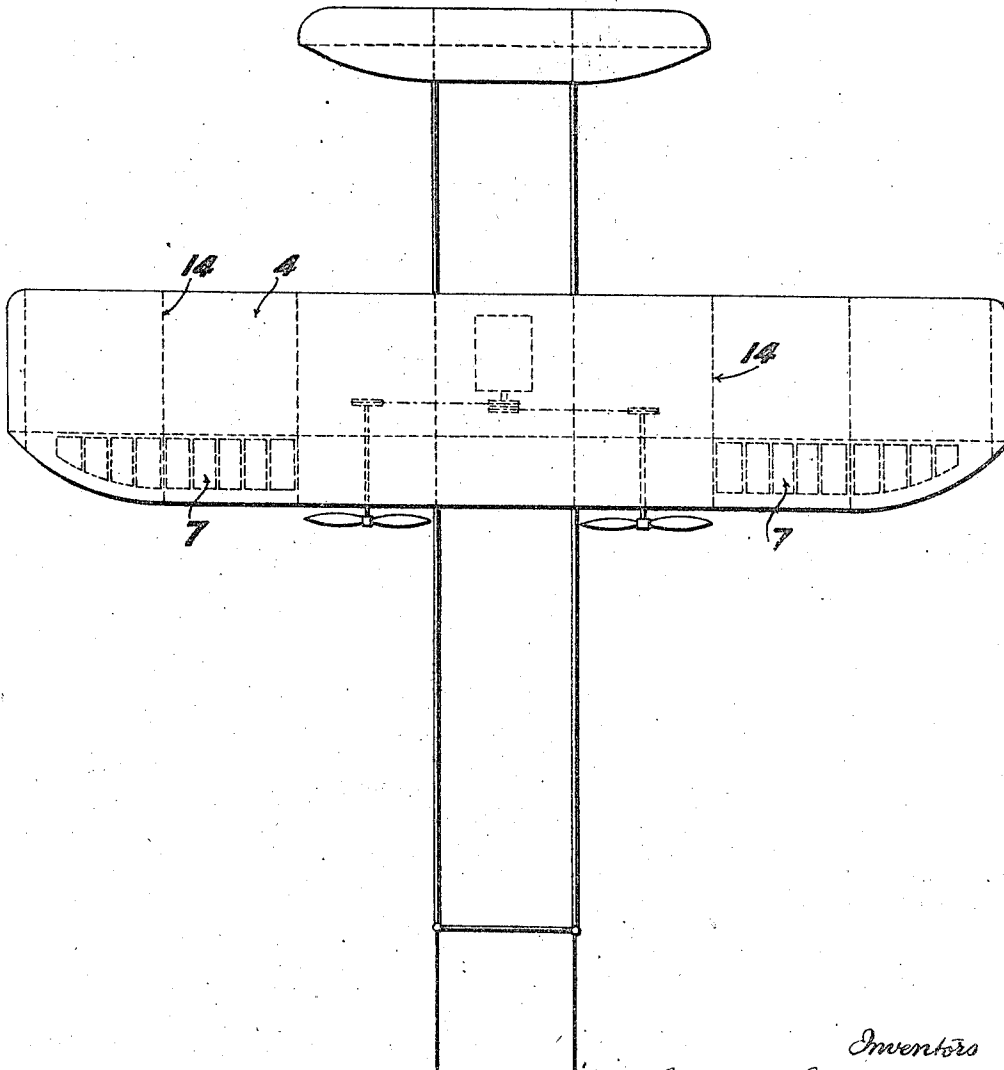
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4 SHEETS—SHEET 4.

FIG. 7.



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UNITED STATES PATENT OFFICE.

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AEROPLANE.

1,015,090.

Specification of Letters Patent.

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Application filed July 28, 1910. Serial No. 574,213.

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.

10 This invention relates to aeroplanes to be applied to flying machines which are caused to travel through the air by the application of mechanical power or the force of gravity, and which aeroplanes are maintained at the requisite angle of incidence in order to sustain the said machines, the latter being usually provided with rudders for lateral and vertical steering. Beyond this, it is requisite to provide the aeroplanes with means by which lateral balance is sustained about the longitudinal axis coincident with the line of flight of the machine, and the object of the present invention is to provide novel or improved means in connection with said aeroplanes for preserving and maintaining this lateral balance without having recourse to the bending or warping of the main aeroplanes as is at present practiced and well known, such warping or bending being effected in order to vary the angle of incidence of some portion of the said planes to produce the required turning movement of the said planes about the longitudinal axis of the machine.

35 According to the present invention, the lateral balancing effect is attained by reducing the lifting power of the laterally extending aeroplane or aeroplanes upon one side or the other side of the longitudinal axis thereof as may be required, this being effected by forming the said aeroplanes with oblong through apertures the length of which apertures extend in a direction parallel with the direction of the motion of the plane through the air, the apertures being normally closed by oblong valves which then fit flush with the surfaces of the planes, and in this position form substantially part of the main surface of the aeroplanes, but which can be turned about axes extending in the direction of flight and parallel with the lengthway side walls of the apertures into a position at which the valves lie in planes at right angles to the surface of the aeroplanes, but present substantially no obstruction

tion to flight. The valves so placed in their vertical positions, leave the aforesaid apertures open and consequently reduce the lifting effect of that part of the aeroplane at which the opened valves are situated. By thus opening one valve or series of valves and closing the other valve or series of valves on the opposite side of the longitudinal axis of the aeroplane, adjustment is effected, the air passing through the opened apertures without deflection, thus releasing the under-side pressure and also nullifying the partial rarefaction which occurs.

This invention is more fully described hereafter with reference to the accompanying drawings, in which,

Figure 1 is a perspective view of a portion of an aeroplane, showing the valves located near the rear edge thereof and in their open position. Fig. 2 is a similar view, showing the valves in their normal or closed position. Fig. 3 is a longitudinal section of an aeroplane fitted with the valves, and showing a method of pivoting the latter to said plane. Fig. 4 is a section on the line $x y$ of Fig. 3, looking toward the rear edge of the aeroplane. Fig. 5 is a plan of a portion of an aeroplane provided with valves extending rearward from near its forward edge. Fig. 6 shows a method of forming the pivoted valves, in which the dividing piece between adjacent valves as shown in Fig. 4 is dispensed with, and Fig. 7 is a plan of a bi-plane flying machine, showing the valves applied near the rear edge and outer ends of the lower plane.

In the construction shown, the aeroplane consists of a forward and rearward member, 1 and 2 respectively, and an intermediate member 3 arranged parallel to the said forward and rearward members, these members being preferably formed of wood. Located at suitable distances apart and connecting the aforesaid members, are longitudinal ribs 14 shown by dotted lines in Fig. 7, of such a shape as to insure the desired configuration of the upper and lower surfaces of the aeroplane, and these ribs, together with the aforesaid members, form a framework for the fabric 4 of the aeroplane, such construction being known.

According to this invention, apertures 5 extending in a longitudinal direction are formed in the fabric forming the main part of the aeroplane between the intermediate

member 3 and the rear member 2 as shown in Figs. 1-3, or may be between the said intermediate member 3 and the forward member 1, as shown in Fig. 5. Each aperture 5 is separated from the adjacent aperture by a longitudinal strip 6 connecting the two parallel members between which the apertures are formed, and which, together with the parallel members, form a rigid frame surrounding each aperture.

Valves or doors 7 are provided, which are of such dimensions that each valve shall, when in its normal position, entirely close one of the apertures 5 and thus form a continuation of the surface of the main aeroplane, each such valve being pivoted to the adjacent parallel members at 8 (see Fig. 3) preferably on its center line extending parallel to the direction of flight, as shown. A projecting arm 9 is securely attached to each such valve 7, and a rod or wire 10 is connected by suitable pivots to the outer ends of these arms, the free end of the rod or wire being so arranged as to be readily accessible to the aviator. This rod is pulled in the direction to retain the valves 7 closed by means of a helical spring 11 secured at one end to the aforesaid rod 10, the other end being suitably attached to the frame of the aeroplane, and the strips 6 at the sides of the apertures 5 are formed say with their edges beveled so as to act as abutments to the correspondingly beveled edges of the valves 7 when the latter are closed.

The valves 7 may be so constructed as shown in Fig. 6, that the division strips 6 shown in Fig. 4 may be dispensed with. In this case the adjacent edges of the valves are slightly beveled at 12, the outer edge of the end valves contacting with a reversely beveled side edge 13 of the frame surrounding the aperture, whereby the valves have to be turned in the direction opposite to the arrows shown in Fig. 6 in order to effect an opening thereof.

With an aeroplane provided with the arrangement of valves as described,—it being borne in mind that a set of valves are provided at or near the opposite ends of the main plane as shown in Fig. 7, and each of which set of valves is operated by a separate rod extending to the center of the machine, and preferably attached to a lever readily accessible to the aviator,—it will be obvious to those acquainted with the art that should the aeroplane list to one side or the other, in order to right the plane, the valves on the higher side of said plane must be opened more or less according to the amount of list, and this is effected by the aviator operating the lever so as to pull the rod 10 against the action of the spring 11, thus through the arms 9 rock the valves upon their pivots. By so doing, the air, which in the ordinary way tends to act through the medium of the

under surface of the aeroplane to raise the plane on that particular side, is allowed to pass through the apertures normally closed by the valves and thereby the raising action nullified.

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

1. An aeroplane having oblong through apertures, the length of said apertures being in a direction parallel with the direction of motion of the plane through the air, said apertures being located between the forward and rearward edges of said plane, oblong valves located within said apertures and adapted to be turned on their axes parallel with the lengthway side walls of said apertures to open and close the latter, pivots on said valves located on the forward and rearward edges thereof, means in connection with said plane to support said pivots, an arm projecting from each valve and securely attached thereto, a rod pivoted to and connecting the free ends of said arms to turn said valves on said pivots to open said apertures, a helical spring located between said rod and said main plane to pull said rod in a direction tending to keep the valves in their closed position, substantially as set forth:

2. An aeroplane comprising in combination a rigid frame composed of rearward, forward and intermediate parallel members and members arranged at right angles to said rearward, forward and intermediate members, a membrane covering said members and having oblong through apertures, the length of said apertures being in the direction of motion of the plane through the air, said apertures being located between said rearward and intermediate members, oblong valves located within said apertures and adapted to be turned on axes parallel with the lengthway side walls of said apertures to open and close the latter, pivots on said valves located on the forward and rearward edges thereof, bearings in the said rearward and intermediate members to support said pivots, means for turning said valves on said pivots to open said apertures, and means for returning said valves to their normal position to close said apertures, substantially as set forth.

3. An aeroplane comprising in combination a rigid frame composed of rearward, forward and intermediate parallel members and members arranged at right angles to said rearward, forward and intermediate members, a membrane covering said members and having oblong through apertures, the length of said apertures being in the direction of motion of the plane through the air, said apertures being located between said rearward and intermediate members, oblong valves located within said apertures and adapted to be turned on axes parallel

with the lengthway side walls of said apertures to open and close the latter, pivots on said valves located on the forward and rearward edges thereof, bearings in the said rearward and intermediate members to support said pivots, an arm projecting from each valve and securely attached thereto, a rod pivoted to and connecting the free ends of said arms to turn the said valves on said pivots to open said apertures, and means to return said valves to their normal closed position, substantially as set forth.

4. An aeroplane comprising in combination a rigid frame composed of rearward, forward and intermediate parallel members and members arranged at right angles to said rearward, forward and intermediate members, a membrane covering said members and having oblong through apertures, the length of said apertures being in the direction of motion of the plane through the air, said apertures being located between said rearward and intermediate members, strips arranged between the rearward and intermediate members and located at the side of said oblong apertures, oblong valves located within said apertures and adapted to be turned on axes parallel with the lengthway side walls of said apertures to open and close the latter, pivots on said valves located on the forward and rearward edges thereof, bearings in the said rearward and intermediate members to support said pivots, an arm projecting from each valve and securely attached thereto, a rod pivoted to and connecting the free ends of said arms to turn said valves on said pivots to open said apertures, and means to return said valves to their normal closed position, substantially as set forth.

5. An aeroplane comprising in combination a rigid frame composed of rearward, forward and intermediate parallel members and members arranged at right angles to said rearward, forward and intermediate members, a membrane covering said members, and having oblong through apertures, the length of the said apertures being in the direction of motion of the plane through the air, strips arranged between the rearward and intermediate members and located at the side of said oblong apertures, oblong valves located within said apertures and adapted to be turned on axes parallel with the lengthway side walls of said apertures to open and close the latter, means in connection with said valves and said strips to insure the correct closure of said valves, pivots on said valves located on the forward and rearward edges thereof, bearings in the

said rearward and intermediate members to support said pivots, an arm projecting from each valve and securely attached thereto, a rod pivoted to and connecting the free ends of said arms to turn said valves on said pivots to open said apertures, and means to return said valves to their normal closed position, substantially as set forth.

6. An aeroplane comprising in combination a main laterally extending plane having through apertures formed in a longitudinal direction therein and located near the opposite ends of said laterally extending plane, valves to close said apertures, pivots on said valves located on the forward and rearward edges thereof, means in connection with said plane to support said pivots, an arm projecting from each valve and securely attached thereto, a rod pivoted to the free ends of the arms on the valves at one end of the plane to turn said valves on said pivots to open said apertures, a second rod pivoted to the free ends of the arms on the valves at the other end of said plane to turn said valves on said pivots to open said apertures, said rods extending toward the longitudinal axis of said plane, and means to return said valves to their normal closed position substantially as set forth.

7. An aeroplane comprising in combination a main laterally extending plane having through apertures formed in a longitudinal direction therein and located near the opposite ends of said laterally extending plane, valves to close said apertures, pivots on said valves located on the forward and rearward edges thereof, means in connection with said plane to support said pivots, an arm projecting from each valve and securely attached thereto, a rod pivoted to the free ends of the arms on the valves at one end of the plane, a second rod pivoted to the free ends of the arms on the valves at the other end of said plane, said rods extending toward the longitudinal axis of said plane and adapted to be moved to turn said valves on said pivots to open said apertures, and a helical spring located between each of the said rods and the main plane to pull said rods in a direction tending to keep the valves in their normal closed position substantially as set forth.

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:

THOMAS WILLIAM ROGERS,
WILLIAM ANDREW MARSHALL.