J. A. GOODWIN.

FLYING MACHINE.

APPLICATION FILED AUG. 19, 1910.

1,002,674.

Patented Sept. 5, 1911.

3 SHEETS—SHEET 1.

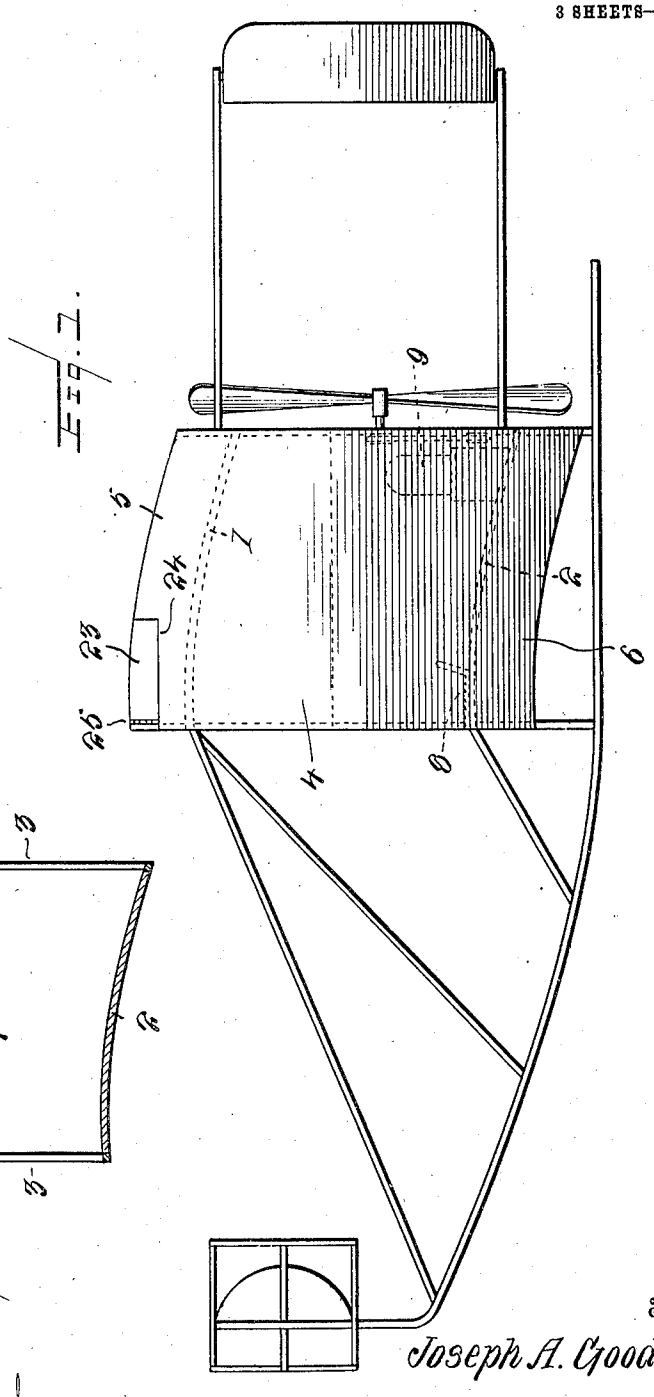

Fig. 1.

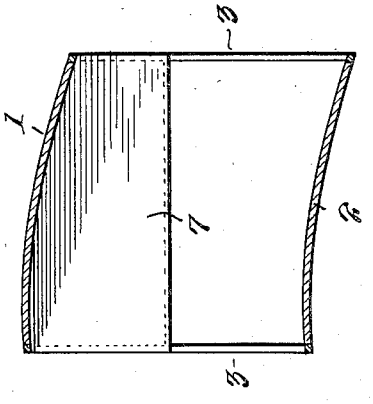

Fig. 2.

Witnesses

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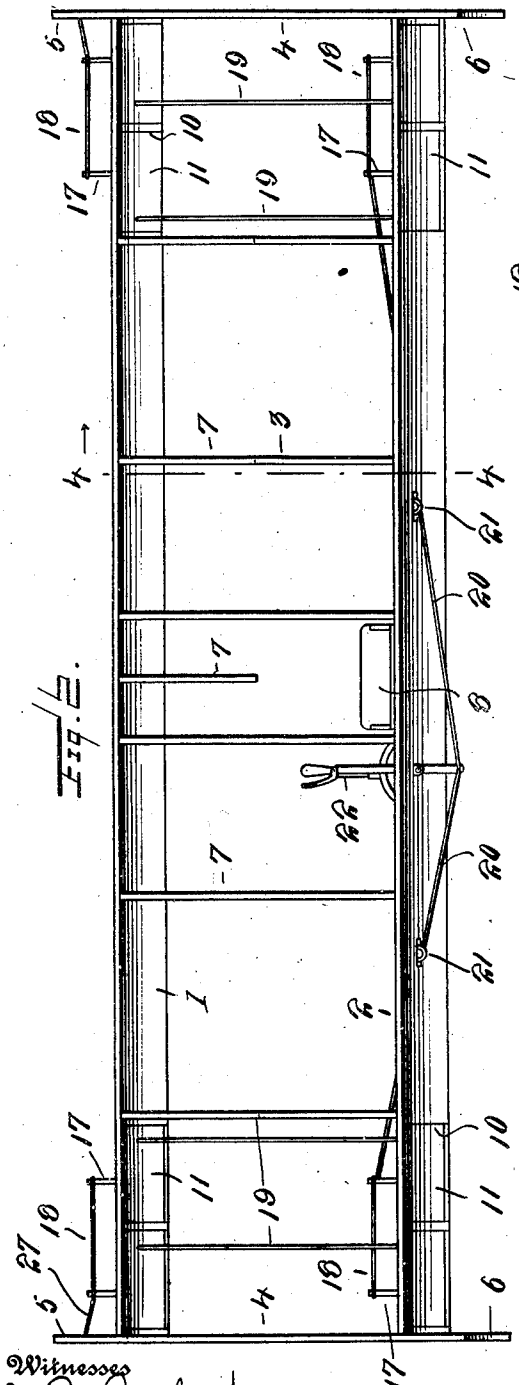

Fig. 2.

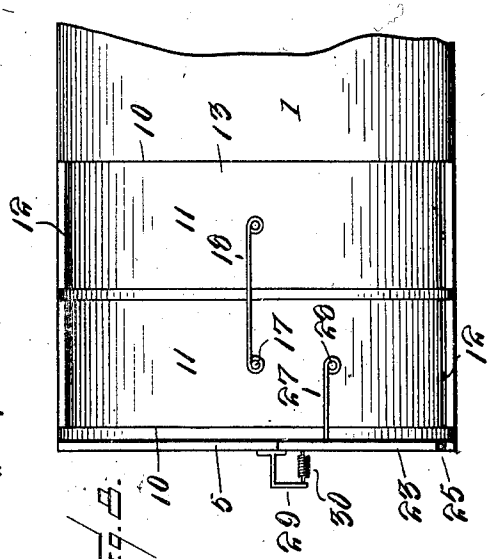

Fig. 4.

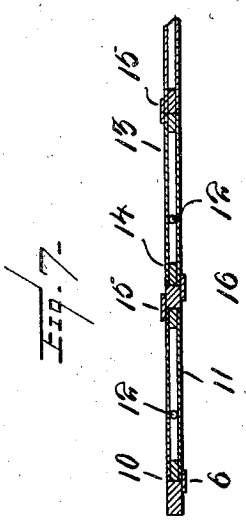

Fig. 7.

Witnesses

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3 SHEETS—SHEET 3.

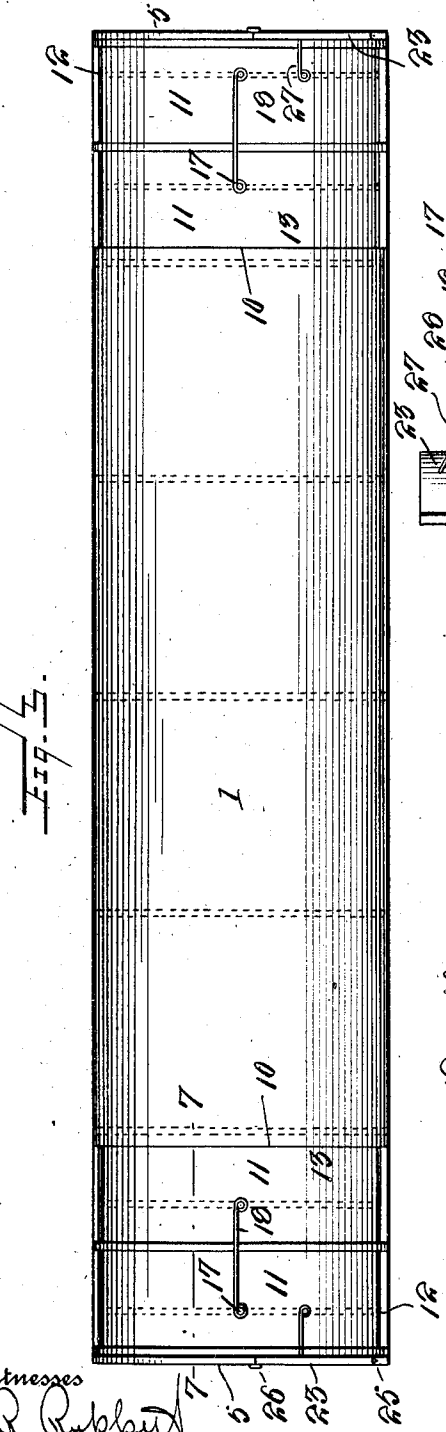

Fig. 4.

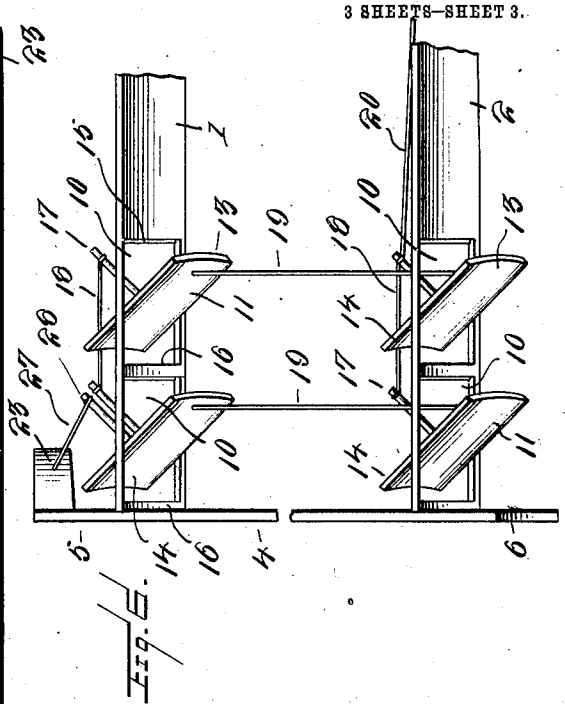

Fig. 3.

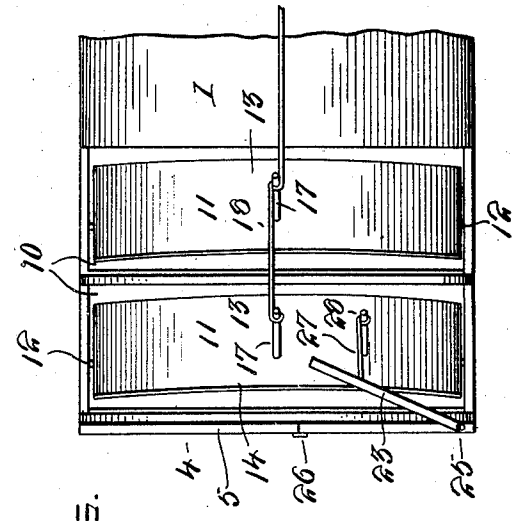

Fig. 5.

Witnesses

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UNITED STATES PATENT OFFICE.

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FLYING-MACHINE.

1,002,674. Specification of Letters Patent. Patented Sept. 5, 1911.

Application filed August 19, 1910. Serial No. 577,973.

To all whom it may concern:

Be it known that I, JOSEPH A. GOODWIN, a citizen of the United States, residing at Millville, in the county of Cumberland and State of New Jersey, have invented new and useful Improvements in Flying-Machines, of which the following is a specification.

This invention relates to flying machines of the heavier-than-air type, and particularly to means for controlling the lateral balance and promoting the lateral stability of such machines.

One object of the invention is to provide means for giving the machine an increased and efficient amount of inherent lateral stability.

Another object of the invention is to provide means for manually controlling the lateral balance and steering and banking the machine in making a turn, which means will counteract and prevent retardation of the machine on the long turning side without the use of the ordinary vertical rudder.

The invention consists of the features of construction, combination and arrangement of parts, hereinafter fully described and claimed, reference being had to the accompanying drawings, in which:—

Figure 1 is a side elevation of the invention as embodied in a heavier-than-air machine of the biplane type. Fig. 2 is a front elevation of the supporting surfaces thereof with the equilibrium planes and control vanes arranged in normal position. Fig. 3 is a top plan view of the parts shown in Fig. 2. Fig. 4 is a fore and aft section on the line 4—4 of Fig. 2. Fig. 5 is a top plan view of one end of the upper main plane, showing the equilibrium planes and associated control vane adjusted to operative position. Fig. 6 is a front elevation of the same. Fig. 7 is a longitudinal section on the line 7—7 of Fig. 3. Fig. 8 is a top plan view of one end of the upper main plane, showing a slight modification in the construction.

While for purposes of illustration, I have shown my invention applied to a biplane machine, it is to be understood that the essential features thereof may be embodied in other types of machines of the heavier-than-air kind, and that the invention resides strictly in the construction of the body of the machine, to wit: the supporting surface or surfaces and balancing devices applied thereto, and that any type of propelling and steering means, frame structure and skids or wheels or other launching and landing appurtenances may be employed.

Referring specifically to the drawings, 1 designates the upper main plane or supporting surface and 2 the lower main plane or supporting surface of the biplane structure disclosed, which planes are connected and spaced in the usual manner by the vertical stanchions or struts 3. These supporting planes or surfaces may be transversely curved in any known or desired way for the dynamic reactions of the air thereon for sustenation of the machine in flight.

In accordance with my invention, the supporting surface or surfaces are provided at the ends thereof with vertical panels or surfaces 4, which in the construction disclosed extend between and connect the proximate ends of the planes and also extend above and below the respective planes to provide marginal stationary stabilizing fins 5 and 6. In a monoplane structure the vertical surfaces may be arranged to form fins projecting above and below the ends of the single supporting plane. These vertical panels or surfaces operate to prevent lateral deflection of the machine from its course in the well-known way and to increase the lateral stability, which action is promoted to a more efficient degree by the fins or extensions 5 and 6.

Depending at intervals from the upper main plane 1 are balancing fins 7, which are also stationary and extend downward to the desired degree for a resisting action on the air to further increase the lateral stability of the machine. All of these intermediate balancing fins 7, except the central balancing fin of the series, are preferably secured at their front and rear edges to the adjacent front and rear struts, the central fin being disposed on a line between the adjoining struts which are arranged on opposite sides of the central longitudinal line of the machine to provide sufficient intervening space for the mounting of the

pilot's seat 8, motor 9 and related parts of the propelling mechanism. The seat 8 is preferably situated at or near the center of the front edge of the main lower plane 2, while the motor 9 is situated at or near the center of the rear edge of said plane in order to lower the center of gravity as much as possible to further increase the stability of the machine.

Each supporting plane is provided at each of its ends with one or more openings 10 extending from front to rear thereof and adapted to receive a corresponding number of equilibrium wings, balancing planes or ailerons 11, each of which is of a size to snugly fit the receiving opening thereof when it, the wing, is adjusted to closed position. Each wing is eccentrically pivoted to swing vertically upon a horizontal axis 12, shown in the form of a rod journaled at its ends in suitable bearings in the frame of the main plane and arranged closer to the outer longitudinal edge of the wing than to the inner longitudinal edge thereof. The wings are curved to conform to the transverse curvature of the main plane and normally, or when in closed position, form a part of the supporting surface of said plane. They are arranged so that their longer inner edges 13 will swing downwardly and outwardly and their upper shorter edges 14 swing inwardly and upwardly when the wings are adjusted to an open position, as shown in Figs. 5 and 6, said edges being adapted to abut against stop strips 15 and 16 so as to fully occupy and close the openings 10.

Each wing is provided with an upstanding arm 17 and the arms of the adjacent wings are coupled for movement in unison by a suitable connection 18. The pairs or sets of wings at the opposite ends of the machine are further connected for movement in unison by cords or other coupling elements 19, which are attached to the broad sides or edges of the respective wings. The arms of the inner wings of the lower plane 2 in a biplane structure, or the arms of the inner wings of the single supporting plane in a monoplane structure, are connected with the outer ends of controlling cords or other flexible connections 20 leading over guide pulleys 21 to a suitable operating lever 22 arranged adjacent to the pilot seat 8, suitable means being provided for locking said lever in adjusted position. When the lever is moved in one direction, one of the connections 20 will be drawn upon to open the equilibrium wings at one side of the machine, while the other connection 20 simply slackens to permit of the movement of the lever so that the equilibrium wings at the opposite side of the machine will remain closed or unaffected.

Forming part of each fin 5 is a control vane 23 which normally occupies a recess 24 formed in the upper front corner of said fin. This vane is pivoted at its forward end to swing upon a vertical axis 25 and is limited in its outward movement by a stop 26. When swung outwardly to its limit the vane lies in the plane of the fin 5 and forms a part of the surface thereof. When swung inwardly the vane lies substantially at an oblique angle to the line of flight to present a resisting surface to the action of the wind. Each vane is connected by a cord or link 27 with an arm 28 on the adjacent outer wing of the upper main plane, so that it will swing inwardly with unison with the wings when they are manually operated. As long as the wings are positively held by the lever into tilted position they will remain open. When the lever is released and restored to normal position, the pressure of the air upon the vane will return the vane and associated connected series of wings to closed position. In the modified form of the invention shown in Fig. 8, a bracket 29 is secured to the fin 5 and a contractile spring 30 is terminally connected with said bracket and the end of the vane, said spring operating in conjunction with the pressure of the air to return the parts after actuation to normal position. The vertical surfaces 4 operate to shield the opened equilibrium wings at either side of the machine from the pressure of cross currents of air, so that the wings will be subjected solely to the pressure of the currents of air traveling rearwardly across the main planes, whereby a positive action of the air on the surfaces of the wings is insured and any tendency of lateral tilting through the pressure of cross currents of air on the wings prevented.

It will be understood that in the operation of the wings to maintain lateral stability, the wings at the ascending side of the machine when the latter tilts will be opened through the manipulation of the actuating mechanism connected therewith, while the wings at the lower or descending side of the machine will be allowed to remain closed, as a result of which the decrease in the area of the supporting surface at the high side will cause such side to drop and the machine to resume a normal horizontal level. Inasmuch, however, as the blades when open stand edgewise at an angle to the line of travel and operate as fixed propeller blades tending to accelerate the forward speed of motion of the side of the machine at which the blades are open, it is desirable to provide means for retarding such side of the machine at such time. To this end the vane 23 is provided for operation in conjunction with each set of

wings, which vane when adjusted to open position will operate as a wing drag or brake, counteracting the propelling action of the wings and operating to prevent the forward motion of the uptilting side of the machine at a greater rate of speed than that of the downtilting side. Either set of wings and the associated vane may also be employed in an obvious manner for steering and banking the machine and making a turn without the necessity of adjusting the vertical rudder, as will be readily understood.

Within the scope of the invention the fins 7 may be arranged upon the underside of the lower plane as well as upon the underside of the upper plane, although it is believed that the lower end extensions of the vertical surfaces will sufficiently hold the lower plane from skidding.

Having thus described the invention, I claim:—

1. In a flying machine, a supporting surface having an aperture at each end, curved wings normally closing said apertures and forming a part of the supporting surface, said wings being pivotally mounted to swing vertically, a fin projecting upwardly at each end of the supporting surface, laterally swinging vanes carried by said fins, means connecting each vane to move in unison with the adjacent wing, and means for operating said wings.

2. In a flying machine, a supporting surface having a plurality of apertures at each end, an upwardly projecting stabilizing fin at each end, curved wings closing the apertures and normally forming a part of the supporting surface, connections between the adjacent wings to adapt them to move in unison, a laterally movable vane upon each stabilizing fin, a connection between said vane and the adjacent wings to adapt it to move in unison therewith, and means for operating the wings.

3. In a flying machine, a supporting surface having an aperture at each end, a panel at each end of the supporting surface forming stabilizing fins projecting above and below said surface, curved wings normally closing the apertures in the supporting surface and forming a part thereof, said wings being pivoted for vertical movement, laterally movable vanes supported by the upwardly projecting fins, a connection between each vane and the adjacent wing to adapt it to move in unison therewith, and means for operating the wings.

4. In a flying machine, a pair of superposed supporting surfaces, vertical panels connecting the ends of said surfaces, said panels having fins extending above the upper supporting surface and below the lower supporting surface, inwardly movable vanes forming a part of the upwardly projecting fins, fixed vanes depending from the upper supporting surface between the panels, and means for adjusting the movable vanes.

5. In a flying machine, a supporting surface having an aperture at each end, pivoted vertically movable wings normally closing said apertures, a laterally movable vane at each end of the supporting surface connected for movement in unison with the adjacent wing, and means for operating said wings.

6. In a flying machine, a supporting surface having an aperture at each end, a fixed upwardly projecting stabilizing fin adjacent said aperture, a laterally movable vane adapted to close within the plane of said fin, pivoted vertically movable wings normally closing said apertures, means for connecting each vane to the adjacent wing for movement in unison therewith, and means for operating the wings.

7. In a flying machine, a pair of superposed supporting surfaces having apertures at the ends thereof, vertical panels between the ends of said supporting surfaces, a series of fins depending from the upper surface between the panels, pivoted vertically movable wings normally closing the apertures, the wings at the respective adjacent ends of the supporting surfaces being connected for movement in unison, laterally movable vanes above and adjacent the ends of the upper supporting surfaces connected for movement in unison with the adjacent wings, and means for independently operating each set of wings and vanes.

8. In a flying machine, a pair of superposed supporting surfaces having apertures at the ends thereof, vertical panels between the ends of said supporting surfaces, said panels having fin extensions projecting above the upper supporting surface and below the low supporting surface, a series of fins depending from the upper surface between the panels, pivoted vertically movable wings normally closing the apertures, the wings at the respective adjacent ends of the supporting surfaces being connected for movement in unison, laterally movable vanes forming part of the upwardly projecting fin extensions of the panels, each vane being connected for movement in unison with the adjacent wings, and means for independently operating each set of wings and vanes.

9. In a flying machine, superposed supporting surfaces, each provided with an aperture at each end thereof, stabilizing fins projecting upwardly at the ends of the upper supporting surface, curved wings normally closing the apertures in the supporting surfaces and forming a part thereof, said wings being pivotally mounted for

movement in a vertical plane, a connection between the wings at each end of the supporting surfaces to adapt the same to move in unison, a laterally movable vane supported by each fin, a connection between the same and the adjacent wings to adapt it to move in unison therewith, and means independently operating the respective sets of wings at the opposite ends of the supporting surfaces.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH A. GOODWIN.

Witnesses:
HARVEY MELSON,
ROY BROWN.