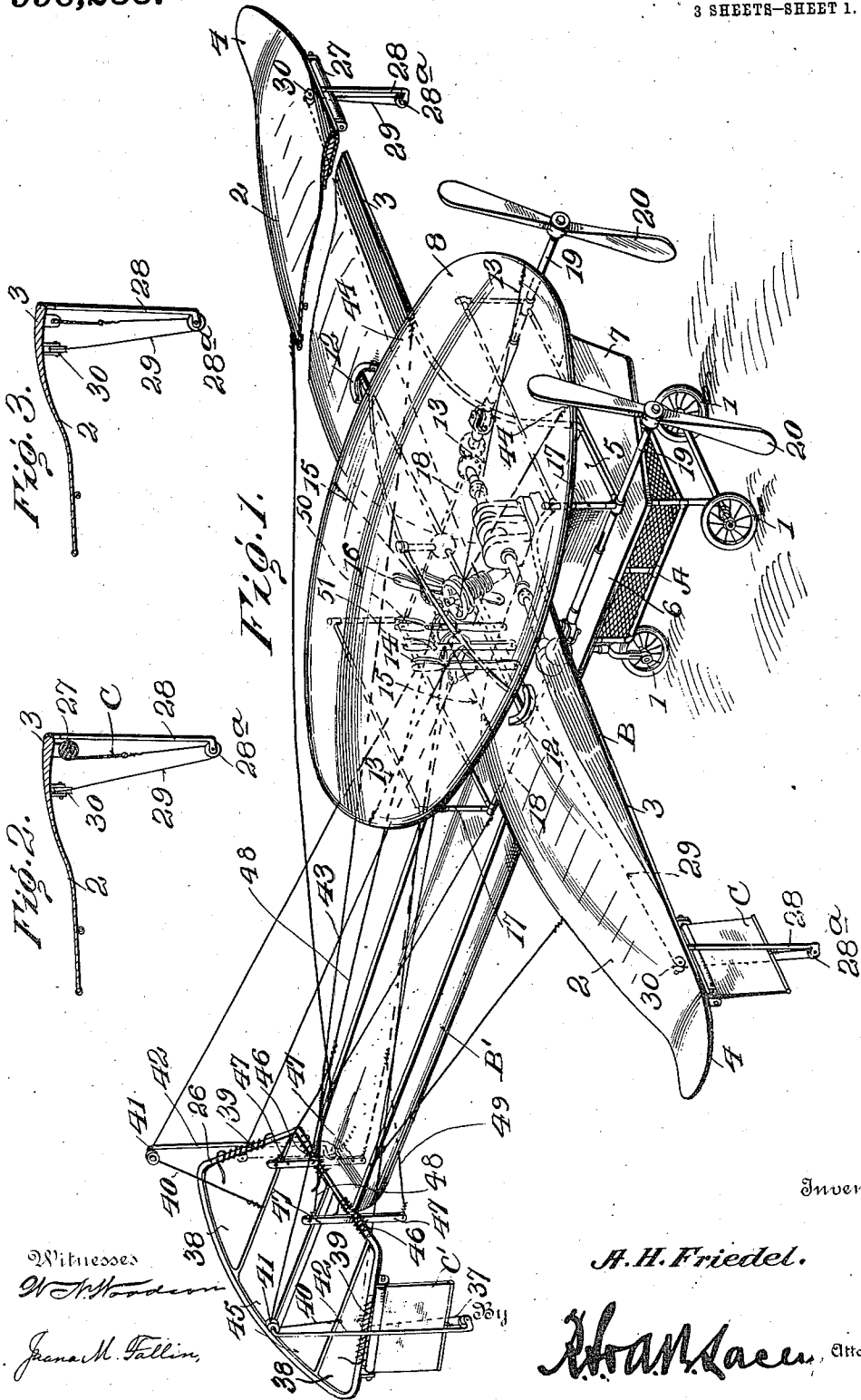


A. H. FRIEDEL.
 FLYING MACHINE.
 APPLICATION FILED JAN. 31, 1910.

Patented June 27, 1911.

3 SHEETS—SHEET 1.

996,233.



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3 SHEETS—SHEET 2.

Fig. 4.

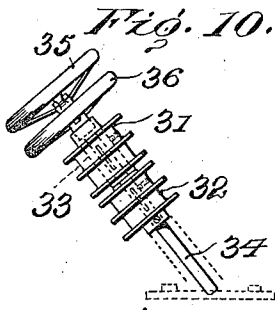
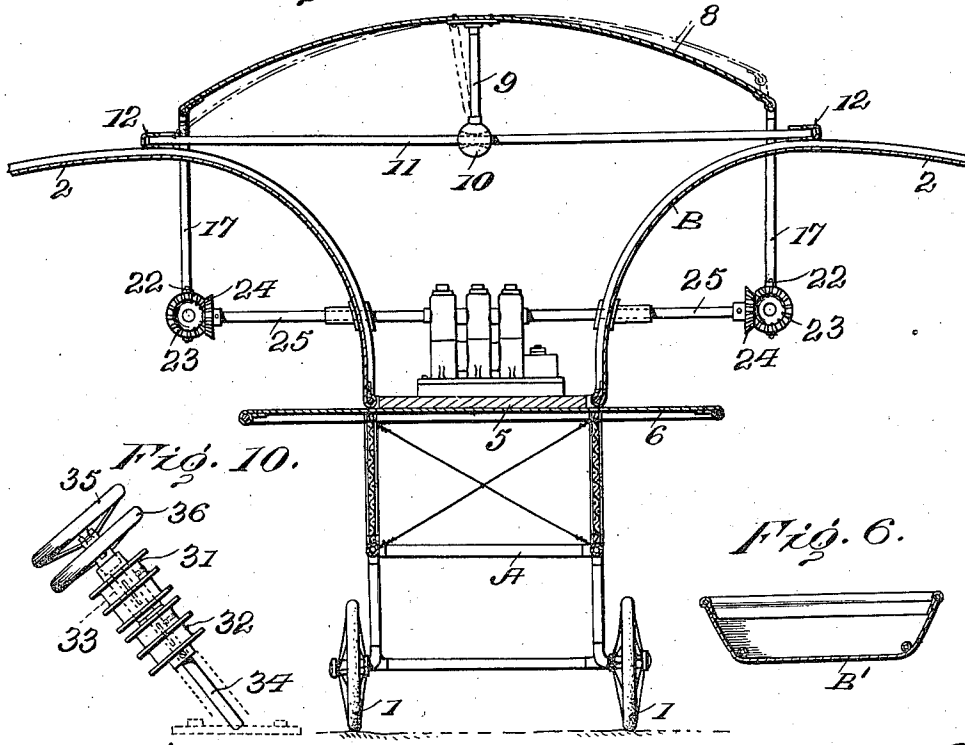


Fig. 6.

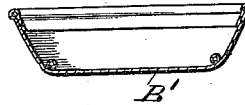


Fig. 11.

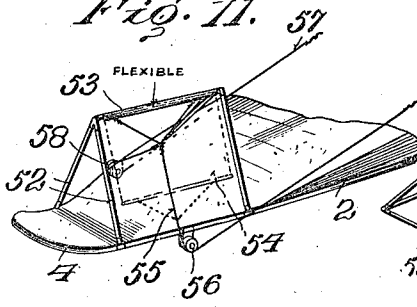
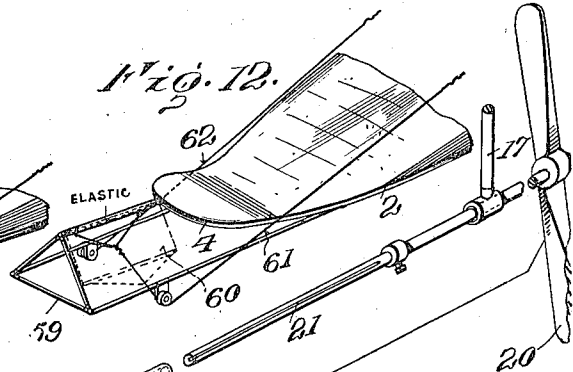


Fig. 12.



TO ENGINE

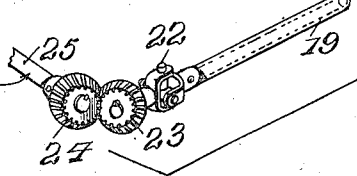


Fig. 5.

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3 SHEETS—SHEET 3.

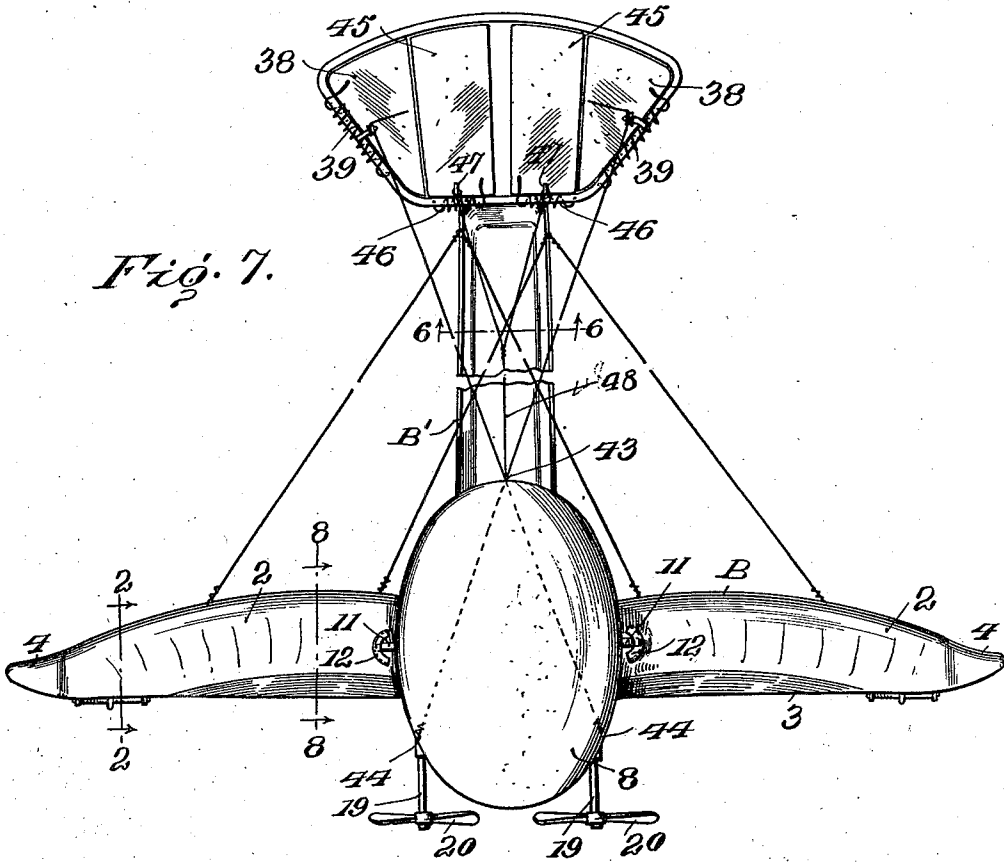


Fig. 7.

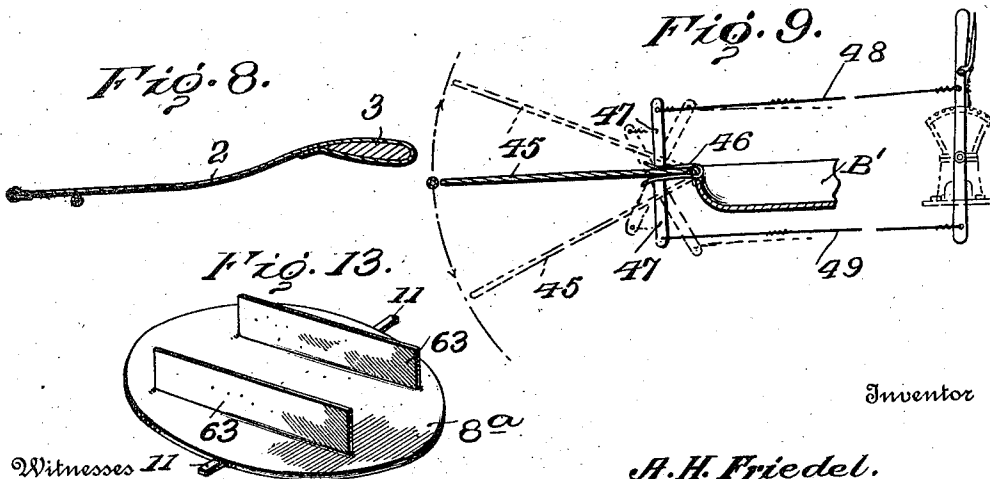


Fig. 8.

Fig. 9.

Fig. 13.

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UNITED STATES PATENT OFFICE.

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FLYING-MACHINE.

996,233.

Specification of Letters Patent. Patented June 27, 1911.

Application filed January 31, 1910. Serial No. 541,119.

To all whom it may concern:

Be it known that I, ALBERT H. FRIEDEL, citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Flying-Machines, of which the following is a specification.

This invention comprehends certain new and useful improvements in flying machines of the heavier than air type, and one of the objects of the invention is a machine of this character which will embody safe and simple means of control.

The invention also has for its object an improved construction of flying machine embodying extensible controlling devices in the nature of slides or curtains which may be opened or stretched at the will of the aeronaut for the purpose of steering the machine to the right or to the left, or for the purpose of overcoming the momentum of the apparatus. And the invention also has for its object an improved construction of flying machine embodying a novel tail and a novel connection between the tail and the main sustaining plane of the apparatus, such connection extending longitudinally and being curved so that its upper face will be concave and its lower face convex.

With these and other objects in view as will more fully appear as the description proceeds, the invention consists in certain constructions, arrangements and combinations of the parts that I shall hereinafter fully describe and claim.

For a full understanding of the invention, reference is to be had to the following description and accompanying drawings, in which:

Figure 1 is a perspective view of a flying machine embodying the principles of my invention; Fig. 2 is a transverse sectional view through one wing of the sustaining plane, illustrating one form of curtain, the section being taken on the line 2—2 of Fig. 7; Fig. 3 is a similar view illustrating a modified form of curtain in which an elastic fabric is employed; Fig. 4 is an enlarged transverse sectional view through the machine; Fig. 5 is a perspective view of one of the propeller shafts and another shaft co-acting therewith; Fig. 6 is a transverse sectional view on the line 6—6 of Fig. 7; Fig. 7 is a top plan view of the machine; Fig. 8 is an enlarged section through one of the

wings of the sustaining plane to illustrate particularly the shape thereof, transversely considered; Fig. 9 is a detail sectional view of a portion of the tail; Fig. 10 is a view of part of the controlling mechanism hereinafter described; Figs. 11 and 12 are detail perspective views of end controlling curtains that may be applied; and, Fig. 13 is a detail perspective view of a modified form of controlling plane that may be used.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

The framework A of the machine may be of any desired construction, shape or design and in the present instance is shown as being mounted upon three main wheels 1, two front and one rear, the rear wheel being in the nature of a caster wheel as shown.

B designates the main sustaining plane of the device, the same embodying transversely extending side wings 2 which are preferably slightly bowed in the direction of their length, that is, in a direction transversely of the machine or direction of flight. The wings also slope upwardly and rearwardly from their front edges 3 and thence slant or are inclined downwardly so as to have substantially the shape of a bird's wing extended, as best indicated in Figs. 1, 7 and 8, and the tips of the wings are preferably upwardly deflected, as indicated at 4.

An auxiliary relatively stationary plane 6 is connected to the main intermediate portion 5 of the sustaining plane B; such portion constituting a platform for the motor and the operator, the said plane 6 being of any desired size and being preferably pointed at the front or prow, as indicated at 7.

A controlling plane 8 is mounted above the main relatively stationary plane B, the plane 8 being convex on its upper surface and concave on its lower surface. The plane 8 is supported upon a relatively short post or standard 9 which extends downwardly therefrom and which is pivotally mounted for a back and forth tilting movement, as well as a slight rocking movement, as indicated at 10, on a transversely extending rod 11. The rod 11 is supported at its ends in slightly curved guides 12 which are channeled to receive the ends of the cross rod 11, the latter being mounted for a slight

back and forth movement in the guides. It will thus be understood that the plane 8 may be shifted to a slight extent laterally on the post 9 as an axis and that it may be also tilted up and down and held at different inclinations according to whether the operator desires the machine shall rise or descend.

In order to tilt the plane 8, I secure to said plane front and rear cables 13, the said cables extending downwardly and inwardly toward each other and being secured to a hand lever 14 which is fulcrumed on the intermediate portion or platform 5 of the plane B. By moving the hand lever 14 forwardly and backwardly, it is obvious that the plane 8 may be tilted forwardly or backwardly, as desired. In order to shift the plane 8 laterally, (this movement being permitted by the engagement of the rod 11 with the curved guides 12) I secure cables 15 to the plane 8 at opposite sides of the latter, said cables extending downwardly toward each other and being secured to a hand lever 16. The two hand levers 14 and 16 move at right angles to each other, as is obvious.

Hanger rods 17 are secured to the edge of the controlling plane 8 and extend downwardly therefrom, said hanger rods being connected together by horizontally extending portions 18, the foremost hanger rods being provided with bearings in which the propeller shafts 19 are journaled. Propellers 20 of any desired type and number of blades are secured to the front ends of the shafts 19. The propeller shafts 19 are preferably constructed in extensible sections (see Fig. 5), which have a feather and groove connection with each other, as indicated at 21, and the rearmost sections are connected by gimbal or other universal joints 22 to shafts which carry bevel pinions 23. These pinions 23 mesh with corresponding pinions 24 on the transversely extending motor shaft 25. The motor is mounted on the platform 5. By this arrangement and construction of the propeller shafts, it is clear that the shafts will either tilt or move in any direction as the plane 8 is moved, thereby assisting in the upward, downward or right or left flight of the machine.

The sustaining plane B is provided with a rear extension B' which forms a connection between the main sustaining plane and the tail which will be hereinafter described, the said connecting plane B', or-extension, being longitudinally attenuated and being concave on its upper face and convex on its lower face, thereby serving to maintain the equilibrium of the machine and insuring that it will always descend on an even keel. At the rear of the extension B and secured thereto is the tail 26, the frame of which preferably embodies rearwardly diverging

side edges and which also embodies a plurality of movable sections which will be hereinafter described.

To further assist in controlling the movements of the flying machine, I secure curtains C to the wings 2 of the plane B, there being two of these curtains in the present instance secured to the front edge of the wings 2 near the tip ends thereof, although it is to be understood that I am not limited to any number or extent of these curtains, nor to any particular place for their location. These curtains C are extensible and may be extended in any desired manner. That is to say, they may be made of sheets of elastic material or substance of any requisite or desired size, as indicated in Fig. 3, or they may slide or wind upon spring turned rollers 27. They are intended to be stretched, and by this term is meant an extensible movement of any character in a vertical direction either upwardly or downwardly or at inclinations to the vertical, as desired.

In order to extend the curtains, I have shown in the present instance vertical rods or arms 28 which are run down from the front edges of the wings 2, said rods supporting at their lower ends pulleys 28^a, and cables 29 are secured to the curtains and extend around said pulleys and around other pulleys 30 secured to the lower surface of the wings. These cables 29 extend inwardly toward each other and wind upon drums 31 and 32 which are mounted on shafts secured to the platform 5. The shaft 33 upon which the drum 31 is mounted is hollow and receives the shaft 34 of the drum 32, and the two shafts are provided with separate hand wheels 35 and 36 whereby one cable may be wound upon its drum without affecting the other cable. It will thus be seen that the two end curtains C are independently operable, and by stretching one curtain and not the other, the direction of the flying machine may be changed to the right or to the left, as desired. By extending both curtains their combined action will produce a braking effect and tend to brake the momentum of the flying machine. In addition to the end curtain C I have provided rear curtains C' which are adapted to be stretched vertically from the side edges of the frame of the tail 26. These curtains may be constructed like the curtains C' and in the present instance they are stretched by means of cables 37 which are connected thereto and arranged like the cables 29 upon the drums 31 and 32. Hence it will be understood that in the present arrangement of parts the front and rear curtains on each side of the machine will be stretched or retracted simultaneously.

From the preceding description in connection with the accompanying drawings, it will be clearly understood by tilting the con-

trolling plane 8 upon the rod 11 as an axis, the machine may be caused to rise or descend and will be driven forwardly by the propellers 20 which move with the plane 8 in any direction. By extending the front and rear side curtains C and C' on either side of the machine, the machine may be caused to steer to the left or to the right at will, while the extension of all the curtains will produce a brake effect on the machine and retard the forward movement thereof. The rear extension B' assists in promoting the safety of the machine, as it tends to maintain the plane substantially horizontal and it insures that the machine will descend on an even keel, even should the power give out or any of the operating parts become broken or otherwise rendered useless.

Referring now particularly to the tail 26, it will be observed (see particularly Figs. 1, 7 and 9) that the same embodies movable side sections 38 which are normally held in substantially horizontal planes by means of springs 39 and which are arranged to be moved laterally, and upwardly also in the present instance so as to present their operative faces to the wind, by means of cables 40 which extend upwardly and forwardly over pulleys 41 carried by vertical arms 42 secured to the rearwardly diverged side edges of the frame of said tail. The cables 40 extend forwardly and cross each other at 43 and have their forward ends connected to opposite sides of the plane 8, as indicated at 44. By this means it will be evident that as the plane 8 is turned to the right, for example, to guide the machine to the right, the side sections on the left hand side of the machine will be presented to the wind and thereby assist in guiding the machine in the desired direction. An opposite movement of the plane 8 will, manifestly, move the other side section 38 so as to assist in guiding the machine to the left. The tail 26 also embodies intermediate sections 45 which are normally maintained in substantially horizontal planes by springs 46 and which may be moved either up or down, if desired, to either assist in upward or downward flights of the machine, or for a braking action to retard the forward movement of the apparatus. In the present instance, actuating arms 47 extend upwardly and downwardly from the intermediate sections 45, the upwardly projecting arms being connected to a cable 48 and the downwardly projecting arms being connected to a corresponding cable 49. The two cables 48 and 49 are connected at their front end to hand lever arms 50 and 51 whereby the movements of these intermediate sections 45 are controlled.

For a modification of the flexible or elastic curtains which may be employed, reference is to be had to Fig. 11. A framework 52 may be secured to each wing near the end

or top thereof, the framework being secured either to the upper or lower face of the wing (the upper face in the present instance), and embodying a cross bar 53 to which the elastic curtain 54 is connected. Two sets of cables are connected to the curtain 54 and are adapted to be operated in any desired way. One cable, designated 55 extends around a pulley 56, while the other cable 57 extends around a pulley 58. It will thus be understood that by pulling upon the cable 55, the curtain will be stretched at such an angle that the resistance of the air in the forward movement of the machine will cause the wing to move downwardly. Conversely, by drawing upon the cable 57 the curtain will be stretched in a rearwardly inclined position and then the resistance of the air in the forward movement of the machine will cause the wing to move upwardly. As another modification of this feature reference is to be had to Fig. 12, in which is seen a framework 59 which is extended out from the tip of the wing to which is secured a curtain 60. Two cables 61 and 62 are so connected to the curtain that when the cable 61 is pulled upon it will correspond in action to the cable 55 while when the cable 62 is drawn the curtain 60 will be stretched in a direction to cause the wing to move upwardly in the forward travel of the apparatus.

It is further to be understood that my invention is not necessarily limited to a controlling plane which is convex on its upper surface and concave on its lower surface. For instance, as illustrated in Fig. 13, the plane there designated 8^a may be flat and provided with any desired number of perpendicularly disposed and preferably longitudinally extending vanes or blades 63. Having thus described the invention, what is claimed as new is:

1. A flying machine, embodying a sustaining plane, a front pair of stretchable curtains secured to said plane at opposite sides thereof, another pair of stretchable curtains secured to the plane in the rear of the first named pair and on opposite sides of the machine, and means for simultaneously stretching the front and rear curtains on the same side of the machine.

2. A flying machine, comprising a sustaining plane, embodying a middle platform portion and two laterally extending curved wings, a motor mounted on the platform and provided with a driving shaft, a controlling plane mounted above the sustaining plane and movably connected thereto, propeller shafts operatively connected to the motor shafts and movable with the controlling plane, and propellers carried by the propeller shafts.

3. A flying machine, comprising a sustaining plane, provided with a rearwardly

projecting attenuated extension, a tail connected to the rear end of said extension and provided with rearwardly diverging side edges, and vertically movable stretchable curtains secured to said side edges.

4. A flying machine, embodying a movable controlling plane, a tail provided with side wings, crossed cables connected to the side wings and to the controlling plane, movable sections embodied in the tail between the side wings thereof, and means for moving said sections.

5. A flying machine embodying a main relatively stationary plane, a controlling plane mounted above the main plane, a standard to which the controlling plane is connected, a transversely extending rod supporting said standard and on which the latter has a pivotal movement, and guides supported by the main plane, the cross rod having its ends movable in said guides for the purpose specified.

6. A flying machine embodying a main relatively stationary plane, a controlling plane mounted above the main plane, a standard to which the controlling plane is connected, a transversely extending rod supporting said standard and on which the latter has a pivotal movement, guides supported by the main plane, the cross rod having its ends movable in said guides for the purpose specified, cables secured to the controlling plane, front and rear, and extending downwardly and inwardly toward each other, and a hand lever carried by the main plane and connected to said cables, for the purpose specified.

7. A flying machine embodying a main

sustaining plane, a controlling plane mounted above the main plane, a transversely extending rod supporting the controlling plane, longitudinally extending curved guides in which the ends of the rod are mounted, cables connected to the controlling plane at opposite sides of the latter, said cables extending downwardly and inwardly toward each other, and a hand lever to which the cables are connected, said hand lever being supported by the main plane.

8. A flying machine embodying a main plane, a controlling plane mounted above the main plane, a standard to which the controlling plane is connected, a transversely extending rod with which the lower end of the standard has a pivotal connection, longitudinally extending curved guides carried by the main plane, the ends of the rod being mounted for movement in said guides, front and rear cables connected to the controlling plane and extending downwardly toward each other, a hand lever to which the lower end of the cables are connected, other cables connected to the sides of the controlling plane and extending downwardly toward each other, and a second lever, the lower end of the last named cables being connected to this last named lever, the two levers being fulcrumed to move at right angles to each other and being both supported by the main plane.

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

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