A. H. FRIEDEL.

FLYING MACHINE.

APPLICATION FILED JUNE 23, 1909.

984,270.

Patented Feb. 14, 1911.

3 SHEETS—SHEET 1.

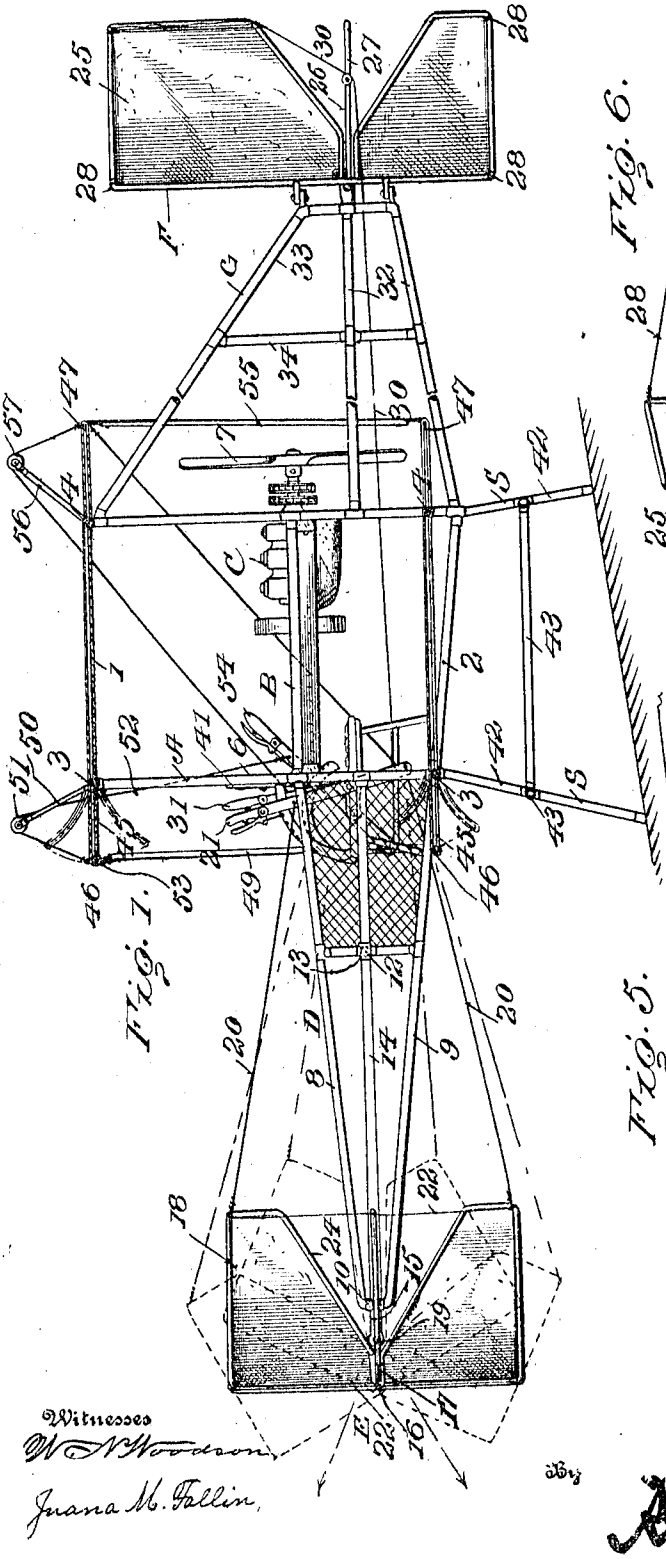

Fig. 7.

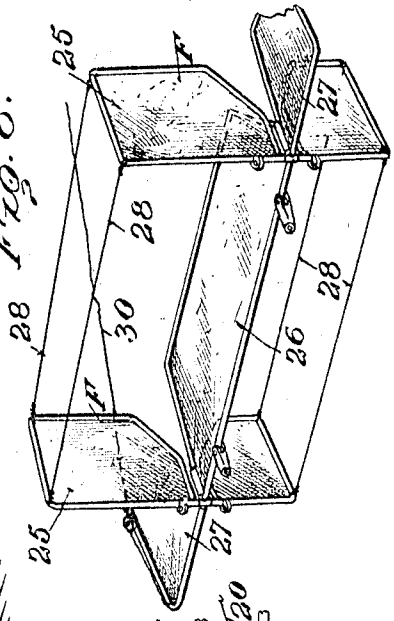

Fig. 6.

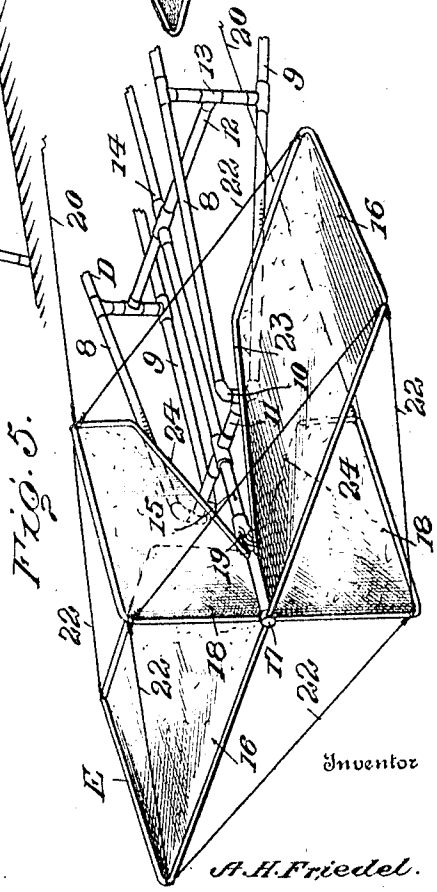

Fig. 5.

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FIG. 2.

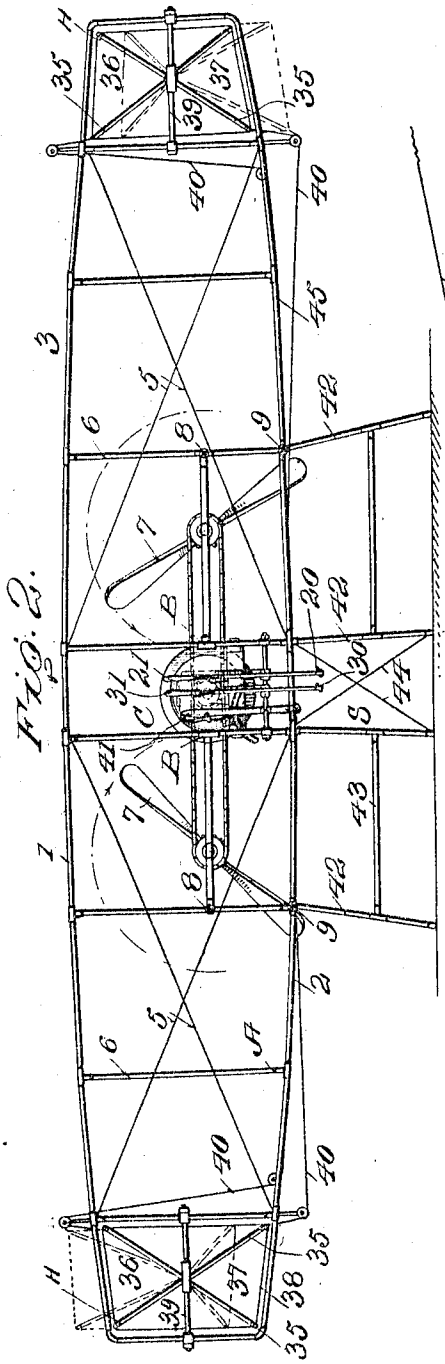


FIG. 3.

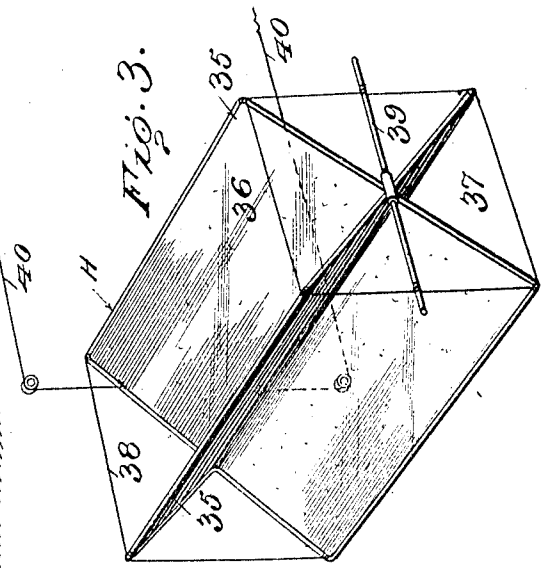
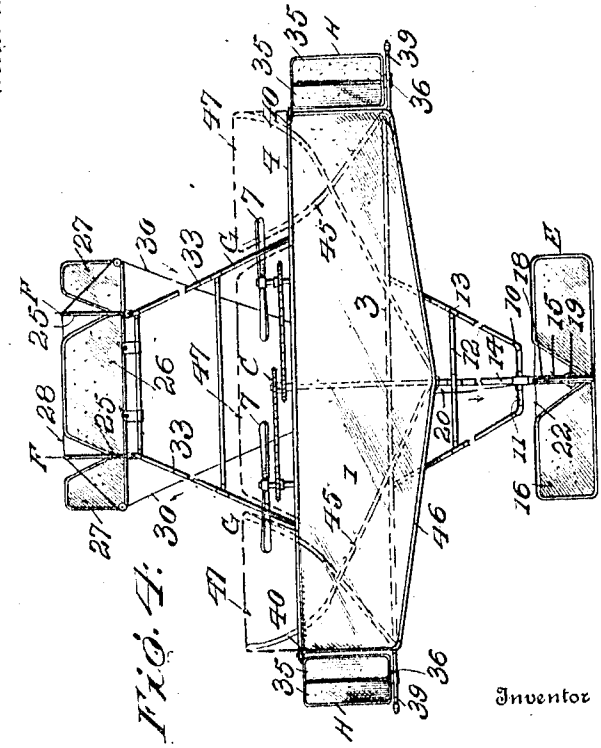


FIG. 4.



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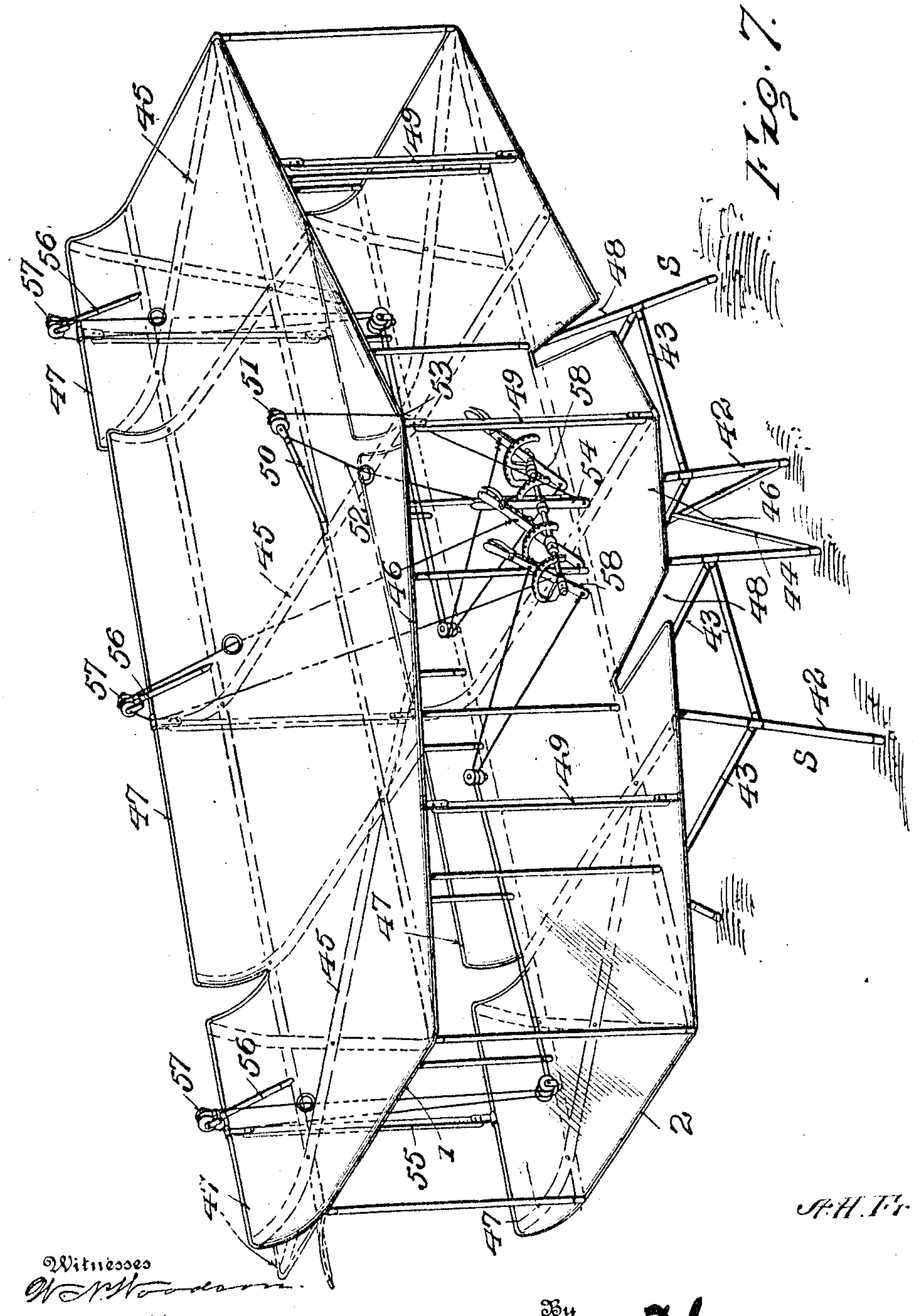
3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

ALBERT HUGO FRIEDEL, OF BALTIMORE, MARYLAND.

FLYING-MACHINE.

984,270. Specification of Letters Patent. Patented Feb. 14, 1911.

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To all whom it may concern:

Be it known that I, ALBERT HUGO FRIEDEL, citizen of the United States, residing at Baltimore, 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 the invention has for its primary object an aeroplane machine of this character which is so constructed and arranged that it may be easily controlled by the operator, and which will be at the same time light and durable and capable of extended flights at slow or high speed with a minimum of fuel expenditure for the driving motor or motors.

The invention also has for its object a system of end control by which the equilibrium of the machine may be easily and quickly restored at the will of the operator.

Another object of the invention is an improved front prow embodying a front rudder pivotally connected to the prow at the front end thereof and arranged to be moved so as to control the upwardly and downwardly inclined movements of the flying machine.

Another object of the invention is an improved steering apparatus or rudder at the rear of the machine capable of being easily manipulated to quickly alter the course of the apparatus to the right or to the left.

Another object of the invention is an aeroplane which is capable of being flexed under the control of the operator to assist in maintaining or restoring the equilibrium of the machine, and assist in directing its flight if desired, and to act in the nature of a brake which will automatically retard any downward movement of the machine, unless such downward movement is desired, and which will also during such downward movement right the machine so that no matter if the mechanism becomes otherwise unmanageable, safety in alighting will be assured. And a further object of the invention is an improved starting stand or support with which the aeroplane is equipped, the same assisting to a considerable extent in the initial rising movement of the machine.

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 longitudinal sectional view of a flying machine embodying the principles and improvements of my invention; Fig. 2 is a front elevation thereof partly in section; Fig. 3 is a detail perspective view of one of the equilibriunr restoring side wings of which there are two located at the ends of the aeroplane; Fig. 4 is a plan view of the machine; Fig. 5 is a perspective view of the front rudder and a portion of the prow which supports the same; Fig. 6 is a similar view of the rear rudder detached; and Fig. 7 is a perspective view of my flying machine, parts being omitted for the sake of clearness.

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

The main body portion A of my improved flying machine comprises an aeroplane of the duplex type, with an upper laterally elongated plane 1 and a corresponding lower plane 2, the same being preferably slightly bowed and tapering toward their ends as best seen in Fig. 2, and being constructed in any desired number of parts, the same in the present instance being illustrated as front and rear rods 3 and 4 of bamboo or any other suitable light and rigid material braced by wires 5 or the like preferably arranged in two diagonally extending and intersecting sets, and a series of vertical rods or standards 6 which connect the front and rear rods of the upper plane with the corresponding rods of the lower plane. These standards or vertical rods 6 may be formed of any desired material suitable for the purpose and may be connected in place in any desired way and arranged at any desired intervals from each other, to secure the desired rigidity without sacrificing lightness.

B designates the car which is pointed as shown and which may be fitted up in any desired way for aerial convenience, and which of course serves as a housing and support for the internal combustion engine or motor of any character designated C

which is arranged to drive the propeller or propellers 7, the same being preferably two in number as illustrated in Fig. 2.

The prow D, which extends forwardly from the main body portion A of the machine tapers toward its front end as shown both vertically and horizontally. It is preferably composed of two pairs of rods designated 8 and 9, upper and lower connected together at their front ends as indicated at 10 and connected at their rear ends to the main body portion A, a front cross rod 11, an intermediate cross rod 12 connected at its outer ends to vertical braces 13, and an intermediate longitudinally extending rod 14 which preferably extends beyond the front cross rod 11 of the prow as indicated at 15.

The front rudder E embodies a horizontally disposed plane 16 comprising two portions extending laterally in opposite directions from a longitudinally extending supporting shaft 17, and a substantially vertical plane 18 which is also secured to the shaft 17 and which embodies two portions, to wit, an upper portion and a lower portion, the shaft being considered, the plane 18 bisecting the plane 16 as shown and the former being somewhat smaller in superficial area than the latter. The shaft 17 is pivotally connected at its rear end to the front end of the rod 15 as indicated at 19 to swing about a substantially horizontal axis and permit the front rudder to be deflected either in an upward or downward direction, and to shift the rudder E, any desired device may be employed such for instance as the cords 20 that are connected at their front ends to the upper and lower rear corners respectively of the vertical plane 18, and that are connected at their rear ends to the arms of a handle lever 21 on opposite sides of the fulcrum thereof, said lever being pivotally connected to any desired portion of the main supporting framework A. I propose to construct the planes 16 and 18 of light and strong frames filled in or covered with silk or cloth and braced at their ends by wires 22. The plane 16 is preferably provided with a rearwardly facing recess 23 to provide a clearance for the front end of the prow and the vertical plane 18 is correspondingly recessed as indicated at 24 for the same purpose.

For the sake of perspicuity, I deem it advisable to describe the operation of the different elements of my flying machine immediately following their description and arrangement of parts. Hence, in now describing the operation of the front rudder E it is to be understood that to cause the machine to rise, it is only necessary for the operator to pull rearwardly upon the handle end of the lever 21, which will move the rudder so that its relatively horizontal plane 16 will assume a forwardly inclined position which will cause the resistance of the air in the forward movement of the machine to strike the lower face of said plane 16 and thereby effect an upward flight. Obviously, it is only necessary for the operator to push forwardly upon the upper end of the handle lever 21 to secure a downward flight. In the true horizontal position of the plane 16, it is manifest that a horizontal flight will be maintained, and it is also evident that the provision of the vertical plane 18 increases the stability of the flying machine in operation and assists in holding it true to its course against any undue oscillation or gyration.

F designates the rear rudder. This embodies two rudder sections 25 right and left as best illustrated in Figs. 4 and 6, spaced from each other in a transverse direction and vertically disposed, and a substantially horizontal plane 26 which preferably projects out on both sides from the sections 25 as indicated at 27, the said sections 25 extending both above and below the plane 26 the required distance. The rear sections 25 as well as the plane 26 are constructed of suitably strong frames covered with any suitable material, preferably silk or cloth and are preferably braced by cross wires 28 front and rear. The rear sections 25 are hinged at their front edges, to a stern section G and may be operated in any desired way as by cords 30 passing forwardly to the hand lever 31.

The section G just mentioned embodies horizontal and longitudinally extending rods 32 and obliquely extending rods 33 connected at their forward ends to the rear side of the main body portion A and any desired number of vertical braces 34.

From the preceding paragraph dealing with the rudder F, it is clear that in order to steer the flying machine to the right or to the left, the requisite lever 31 is manipulated to swing the rudder sections 25 in the desired direction, and it is also evident that the horizontal plane 26 which is incorporated in the rudder F as a part thereof but which is a relatively stationary element, assists in maintaining the stability of the air ship in flight as against any excessive undulatory movements.

It is well recognized that a most important feature of a flying machine of the heavier than air type and a desideratum which is the aim of every inventor of prominence in this field is a controlling system for quickly restoring the equilibrium of the flying machine when the same has been overcome by a sudden gust, or by an accident to one of the propellers or from any cause. To effectually accomplish this result, I have provided a system of end control or side wings shown particularly in Figs. 2, 3 and

4, the same being designated H and each of these two side wings comprises two obliquely disposed planes 35 bisecting each other as shown and forming upwardly and downwardly facing trough-shaped deflectors 36 and 37. These planes are preferably constructed of wire frames covered with cloth or silk and are braced end to end by wires 38 or the like. The side wings H are so positioned relative to the aeroplane at the ends thereof that the deflecting pockets 36 extend longitudinally, that is, forwardly and backwardly, and they are pivotally mounted at the vertical middle of their front ends on shafts 39 that are secured to and extend laterally and outwardly from the front corner standards 6 of the main body portion or aeroplane A. To the rear ends of the respective side sections H upper and lower cords or cables 40 are connected. The cables extend inwardly and cross each other and are so connected to a handle lever 41 that when said lever is moved, one wing will be swung upwardly, and the other wing will be swung downwardly; hence it will be understood that in case the aeroplane should tilt to one side or the other, the operator will promptly, by the manipulation of the lever 41 swing one of the side wings H downwardly and the other wing upwardly so that at that end of the aeroplane which is at that time lowermost the downwardly facing pocket 37 will be inclined forwardly against the wind, while the upwardly facing pocket 36 of the other wing will decline forwardly against the wind, the resistance of the wind in the forward movement of the flying machine consequently quickly bringing the aeroplane back to a state of equilibrium. As both of these side wings are under the control of a single lever, the operator's duties and responsibilities are correspondingly lessened.

As a support for the machine, particularly for use in steering, it is provided with a stand S which comprises a plurality of spaced legs 42 secured at their upper ends to the main body portion or aeroplane, and braced by cross rods 43 and diagonal braces 44. The front legs of the stand S are somewhat longer than the rear legs and are inclined as shown, whereby, the machine will be supported on the ground or other starting surface with its front end relatively higher than its rear end. As the motor C is started and the machine speeds up, the machine will tilt upon the lower ends of the front legs as fulcrum points the rear legs leaving the starting surface, and as soon as the motor has reached a sufficient speed, the entire machine will dip slightly forward and then rise, it being of course understood that by this time, the front rudder E will be deflected upwardly.

As best seen in Fig. 7, the frames of the aeroplanes 1 and 2 include flexible and preferably metallic strips 45, said strips preferably extending diagonally and intersecting each other at the ends of the machine as shown, and there being any desired number of longitudinally extending strips. The aeroplanes 1 and 2 are preferably formed with pointed bow sections 46, into which some of the longitudinally extending strips 45 extend at their forward ends so as to render the bow sections 46 capable of being flexed either upwardly or downwardly to assist in controlling the upward or downward movement of the machine. In addition to the flexible bow sections 46, the aeroplanes may include flexible rear extensions 47 which are arranged in a plurality of sections as shown. In the present instance, although it is to be understood that the invention is not limited to this number, I have provided three of these flexible rear sections 47 for each aeroplane, namely a relatively large middle section and two smaller end sections. These flexible rear portions are also capable of being deflected upwardly and downwardly and are arranged so that they may all be deflected upwardly, or if desired, the middle section may be deflected oppositely to the end sections. By this means it is clear that the aeroplanes may be flexed whenever desired, not only to assist in directing the flight of the machine, but the flexing of the machine may serve as a brake or retarding means to retard whenever necessary, or desired the downward movement of the machine, for instance, if the machine should become temporarily unmanageable and start to descend, it is clear that by flexing the aeroplane the downward movement may be retarded by the sections 47, and the machine brought under control before reaching the ground while at the same time the bow section 46 will serve to retard the machine from its downward course and enable the entire apparatus to be again brought properly under control.

As above stated the aeroplanes are capable of being flexed at will by the operator. As one arrangement for this purpose, although it is to be understood that any desired mechanism may be used, reference is again to be had to Fig. 7 wherein it will be seen that the lower bow section 46 is formed at intervals with recesses or cut out portions 48 to provide the clearance for the prow in the movement of such bow section 46 and that the different portions between the cut-out portions are connected to the upper bow section 46 as by vertically arranged connecting rods 49 so that as the upper bow section 46 is raised or lowered, the lower bow section will be correspondingly moved. To effect the movement of this bow section a standard 50 is extended forwardly and upwardly

from the front transversely extending bar of the main frame of the upper aeroplane 1, and a pulley 51 is journaled in the outer end of said standard. A rope or cable 52 is arranged to run over the pulley 51, said cable being connected to the upper bow section 46 as indicated at 53 and the two runs of the cable being also connected to the opposite arms of a hand lever 54 whereby when the hand lever is moved in one direction, the bow sections will be deflected upwardly, and when the hand lever is moved in the opposite direction, the bow sections will be swung in a downward direction. Practically the same arrangement is provided for the rear flexible extensions 47 of the aeroplanes, the upper sections whereof are connected to the corresponding lower sections by rods 55, cables 56 being connected to said sections 47 and running over pulleys 57 to the opposite arms of handle levers 58. Obviously the flexible strips 45 will automatically bring the flexible portions of the aeroplanes back to normal plane position, when permitted to do so. The levers 54 and 58 are mounted in any desired way at the front of the aeroplane as illustrated in Fig. 7. The levers 21 and 31 for the other controlling mechanism of the machine or other parts of the apparatus are omitted in Fig. 7 for the sake of clearness.

From the foregoing description in connection with the accompanying drawings, it will be seen that I have provided a light and durable flying machine all the movements of which may be easily controlled by a single operator who can readily steer the machine to the right or to the left or cause it to ascend and who can also readily right the machine or restore it to a state of equilibrium by the oppositely shifting movement of the side wings H as well as by flexing the aeroplanes themselves.

While I have shown the main supporting framework A of my improved flying machine as embodying upper and lower planes, it is to be understood that my invention is not limited to any number of aeroplanes so far as the controlling mechanisms are concerned and that various other changes may be made in the construction, arrangement and proportion of the parts without departing from the scope of the invention as defined in the appended claims.

It is to be particularly noted that my improved flying machine embodies a plurality of controlling mechanisms so arranged and combined that if some of them were to be disabled, the machine would still be manageable and capable of being kept entirely under control.

Having thus described the invention, what is claimed as new is:

1. In a flying machine the combination with a supporting framework embodying a forwardly extending prow, of a front rudder embodying a shaft pivotally connected to said prow to swing about a horizontal axis, and a horizontally extending plane secured at its middle to said shaft and recessed at its rear edge to clear the prow.

2. In a flying machine, the combination with a main supporting framework embodying a main supporting prow, of a rudder comprising a shaft pivotally connected to said prow to swing about a horizontal axis, a horizontally extending plane connected at its middle to said prow and formed with a rear recess designed to clear said prow, and a vertical plane secured to said shaft and also provided with a recess as described.

3. In a flying machine, an end controlling side wing consisting of two planes arranged obliquely and bisecting each other.

4. In a flying machine, an end controlling side wing comprising two obliquely disposed planes bisecting each other, and a support on which said wing is arranged to swing about a horizontal axis in a lateral plane.

5. In a flying machine, an end controlling side wing hinged at one end to swing about a horizontal axis in a lateral plane relative to the flying machine, said wing embodying upwardly and downwardly facing pockets.

6. In a flying machine, an end controlling side wing hinged at one end to swing about a horizontal axis in a lateral plane relative to the flying machine, said wing embodying upwardly and downwardly facing pockets elongated in the longitudinal direction of the flying machine.

7. In a flying machine opposite side controlling wings embodying forwardly and rearwardly extending upper and lower pockets, said wings being arranged to swing about horizontal axis in lateral plane relative to the flying machine, and means for swinging the side sections in opposite directions.

8. In a flying machine opposite side controlling wings embodying forwardly and rearwardly extending upper and lower pockets, said wings being arranged to swing about horizontal axes in lateral plane relative to the flying machine, and means for simultaneously swinging the side wings in opposite directions.

9. In a flying machine, an aeroplane provided with end standards, shafts extending horizontally and in an outward direction from the respective end standards, side wings comprising two obliquely disposed planes bisecting each other and connected with said shafts respectively at their forward ends to swing about horizontal axes, and means connected to the rear ends of said wings for raising and lowering the same.

10. A flying machine, embodying a transversely elongated aeroplane, a prow secured

to and extending forwardly from said aeroplane, a front rudder pivotally connected to said prow and embodying vertical and horizontal planes bisecting each other, the said rudder being in spaced relation to the aeroplane, and a rear rudder connected to the aeroplane in spaced relation thereto and in substantially longitudinal alinement with the front rudder, said rear rudder embodying a horizontal plane and vertical planes arranged in laterally spaced relation to each other and intersecting the horizontal plane and arranged to swing about vertical axes, and end controlling side wings hinged to the ends of the aeroplane and arranged to swing about horizontal axes in longitudinal planes relative to the flying machine as a whole, said end controlling wings embodying upwardly and downwardly facing pockets.

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

ALBERT HUGO FRIEDEL. [L. S.]

Witnesses:

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WALTER A. WILLIAMS.