S. BORMAN.

FLYING MACHINE.

APPLICATION FILED MAY 24, 1910.

1,030,803.

Patented June 25, 1912.

6 SHEETS—SHEET 1.

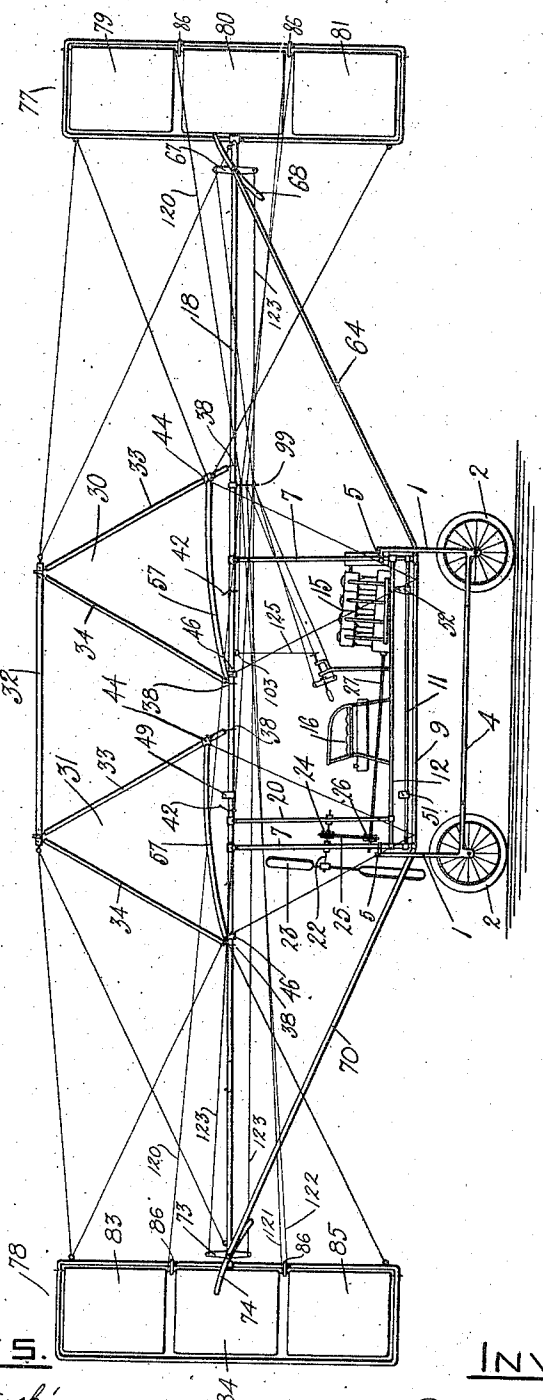

FIG. 1.

WITNESSES.

Albert G. Riegenthowski.

George H. McLaughlin.

INVENTOR.

Sydney Borman

By Horatio E. Bellows

ATTORNEY.

S. BORMAN.

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6 SHEETS—SHEET 2.

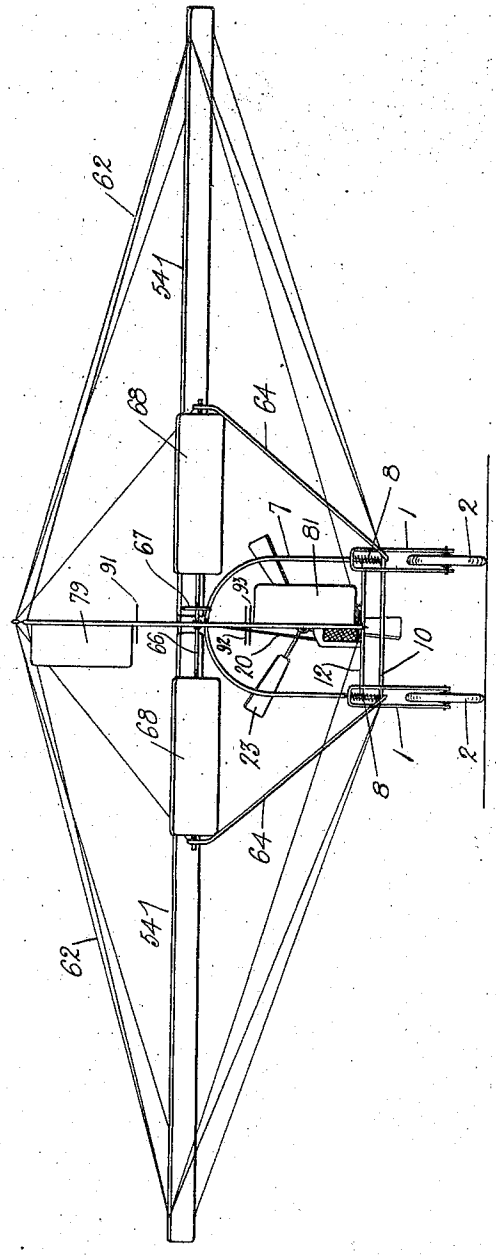

FIG. 2.

WITNESSES.

Albert G. Plegenkowski.

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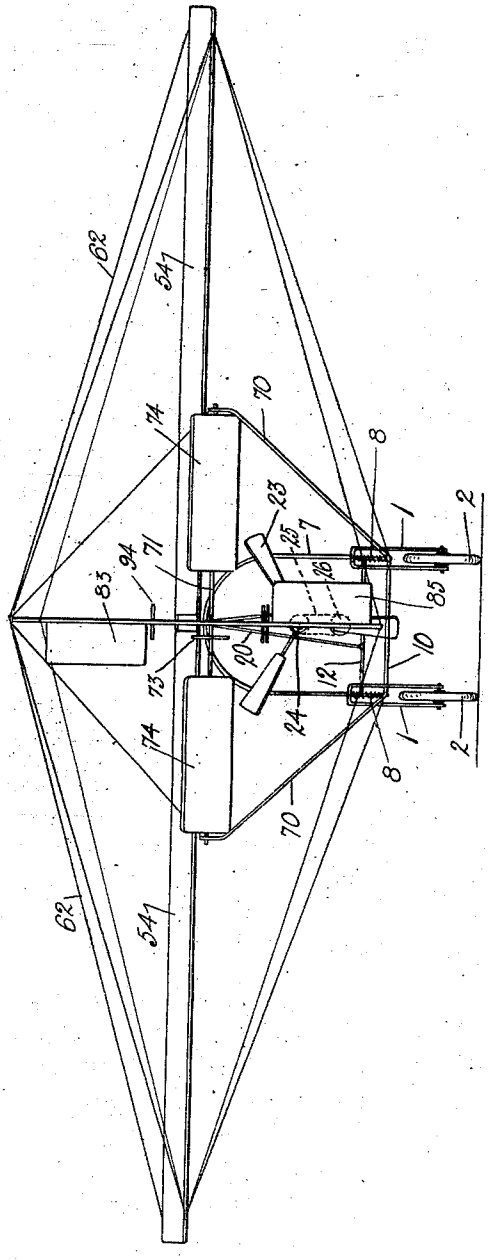

FIG. 3.

WITNESSES.

Albert G. Piegenthowski

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6 SHEETS—SHEET 4.

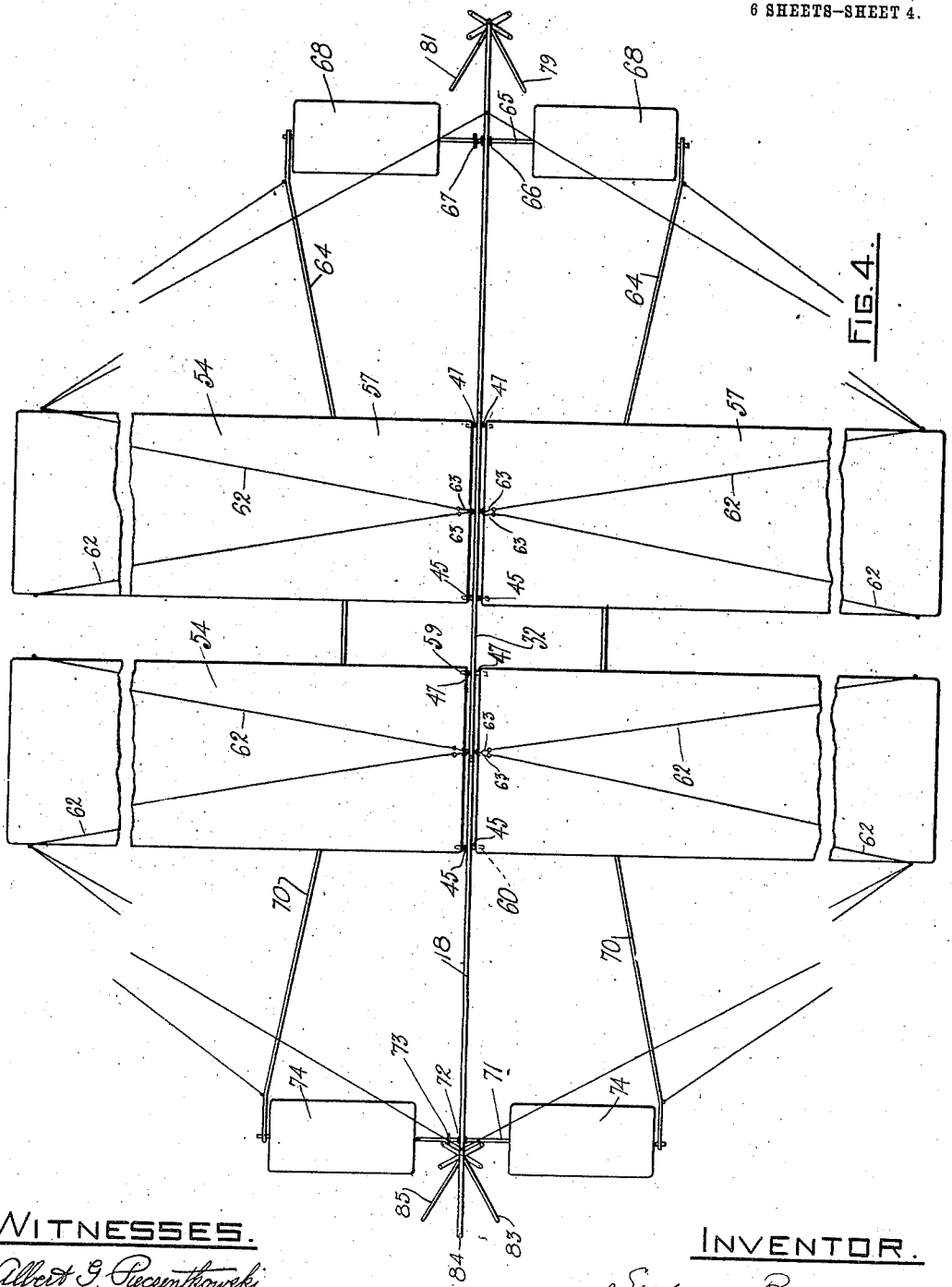

FIG. 4.

WITNESSES.

Albert G. Piegenkowski.

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FLYING MACHINE.

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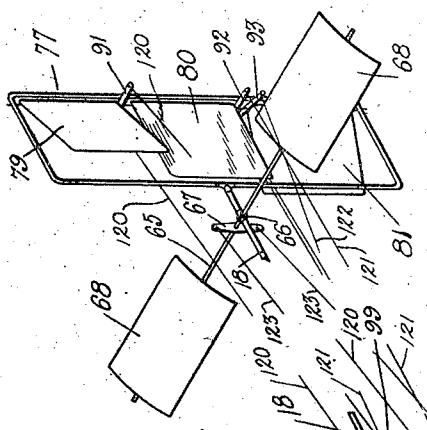
6 SHEETS—SHEET 5.



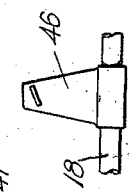


FIG. 11.

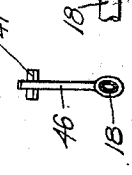


FIG. 10.

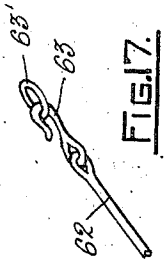


FIG. 17.

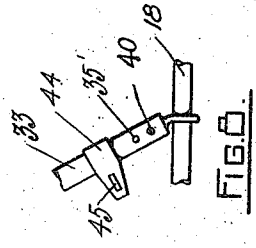


FIG. 8.

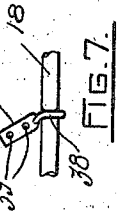


FIG. 7.

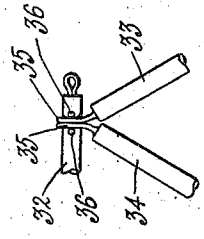


FIG. 9.

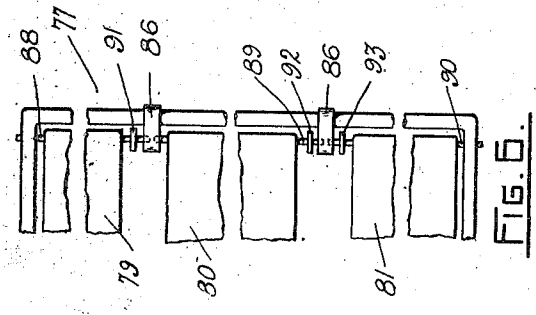


FIG. 6.

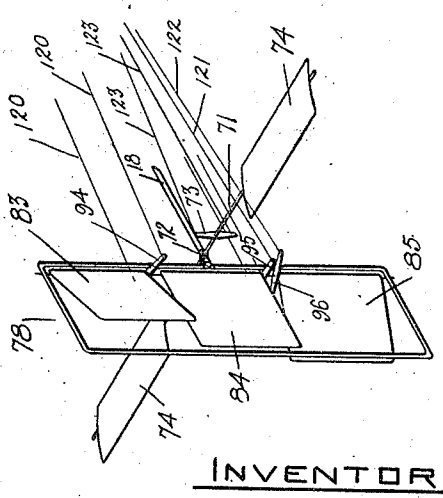


FIG. 5.

WITNESSES.

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FLYING MACHINE.

APPLICATION FILED MAY 24, 1910.

1,030,803.

Patented June 25, 1912.

6 SHEETS—SHEET 6.

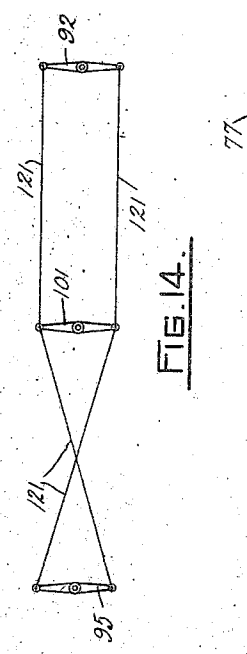

FIG. 14.

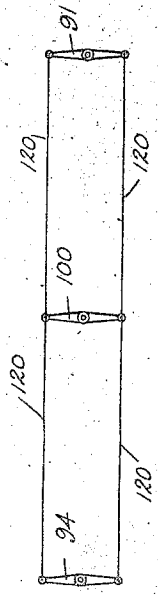

FIG. 13.

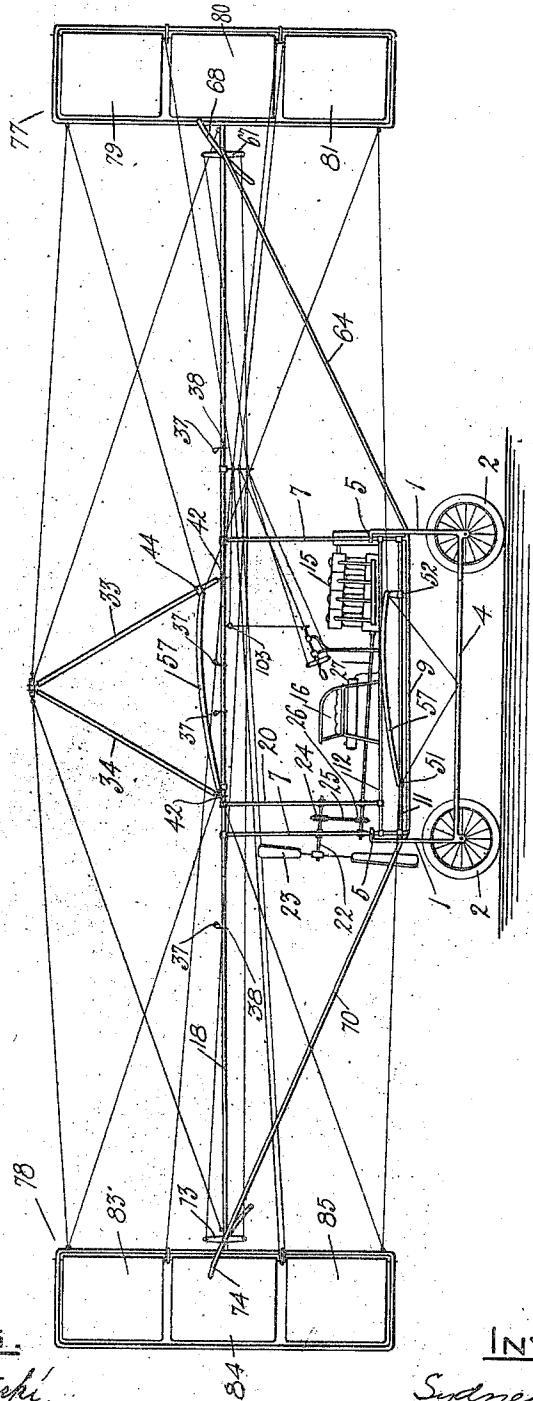

FIG. 12.

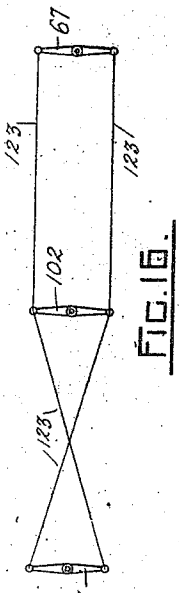

FIG. 16.

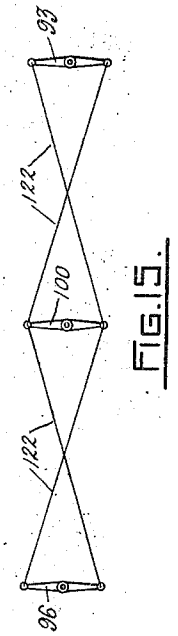

FIG. 15.

WITNESSES.

Albert J. Piegenkowski.

George H. McLaughlin.

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By Horatio E. Ballou

ATTORNEY.

UNITED STATES PATENT OFFICE.

SYDNEY BORMAN, OF ATTLEBORO, MASSACHUSETTS.

FLYING-MACHINE.

1,030,803. Specification of Letters Patent. Patented June 25, 1912.

Application filed May 24, 1910. Serial No. 563,046.

To all whom it may concern.

Be it known that I, SYDNEY BORMAN, a citizen of the United States, residing at Attleboro, in the county of Bristol and State of Massachusetts, have invented certain new and useful Improvements in Flying-Machines, of which the following is a specification.

My invention relates to that type of flying machines wherein the structure is supported by the coöperation of one or more planes with a mechanical propulsive agent, and controlled by the angles of incidence of auxiliary planes.

The essential objects of my invention are to provide an improved means for maintaining the equilibrium of the machine; to provide a naturally operative conveniently located and effective device for operating the guiding, controlling, and elevating means; to facilitate the initial lifting of the machine; to render the machine capable of facile disassemblage or ready conversion into either a monoplane or a biplane; and to attain these ends in a strong and light structure.

My invention consists in the construction, combination, and mode of operation of parts set forth in and falling within the scope of the claims hereto appended.

In the accompanying drawings which form a part of this specification, Figures 1, 2, and 3, are side, front end, and rear end elevations respectively of a machine embodying the various features of my invention in the preferred form, Fig. 4, a plan of the same with parts broken away, Fig. 5, a perspective diagrammatic view of the controlling device and its connections, Fig. 6, a fragmentary view of one of the end frames, Figs. 7, 8, and 9, detail views of the brace joints, Figs. 10, and 11, detail views of the hangers, Fig. 12, a side elevation of my machine when assembled as a biplane, Figs. 13, 14, 15, and 16 diagrammatic views of the arm operating connections, and Fig. 17, a detail of a stay hook.

The power supporting frame work of my machine may be of any form of construction suitable for carrying the several details of mechanism, the main planes, and auxiliary planes. In the form thereof herein shown it consists essentially of hangers 1, in this instance four in number, carrying wheels 2, in their lower ends, and there connected by rods 4. Through perforated lugs 5 upon the hangers pass loosely arched end supports 7 sustained by springs 8 depending from the lugs 5. These supports are connected at their lower ends by side rods 9 and end rods 10. Connecting the centers of the end rods is a third rod 11. Fixed to the supports 7 above and interspaced from the rods 9 is a floor 12 consisting of a framework of rods upon which is the power plant 15 and seat 16. The floor 12 is preferably upwardly inclined toward its forward end. The tops of the supports 7 are fixed to a long rod 18 which constitutes the axis of the entire frame. Inclosed by the rear support 7 is a standard extending from the floor 12 to the arched portion of the support. An angular standard 20 is located upon the floor in advance of the first standard, and journaled in these standards is a propeller shaft 22 inclined upwardly toward its rear, carrying the propeller blades 23 and a sprocket wheel 24, connected by a chain 25 to a second sprocket wheel 26 upon the shaft 27 driven by the power plant 15.

Attached to an intermediate portion of the rod 18 are angular braces 30 and 31 connected at their apexes by a horizontal brace 32. For a purpose later to be detailed it is desirable that these braces be capable of being separated into their constituent parts, therefore, they are constructed as follows, reference being had particularly to Figs. 1, 7, 8, 9, 10 and 11. The frame 30 comprises the rods 33 and 34. Fixed in the top of each rod is a loop or eye 35 loosely inclosing the brace 32 where the loops are held by removable pins 36 in the brace, as shown in Fig. 9. The lower ends of the rods 33, 34 are tubular and, as shown in Fig. 8 provided with openings 35′. The tubular ends are slid over inclined projections 37 fixed to or integral with the rod 18 as shown in Fig. 7. In the present instance the projection is provided with an integral ring 38 brazed to the rod. The member 37 also has perforations 39 adapted to register with the perforations 35′. The described parts are united by pins 40 passing through the openings 35′ and 37. One of these pins is shown inserted in Fig. 8. Two other projections 42 similar to those already described are located intermediate the members 37 for a use hereinafter referred to. Upon the lower portion of each rod 33 is a lug 44, as shown in Fig. 8, provided with a lateral pin 45. Just forward of each rod 34 on the rod 18 is

a like lug 46 provided with a lateral pin 47 similar to pin 45, as shown in Figs. 10 and 11. A member 49, similar in details to the member 46, 47 is fixed to the rod 18 adjacent the rearmost member 42. Upon the rod 11 in vertical alinement respectively with the member 49 and forward member 42 are fixed members 51 and 52 similar in detail to the member 49.

Mounted upon an intermediate portion of the described framework are two main planes indicated in a general way as 54 extending laterally from both sides of the frame. These planes are similar in all respects and a description of one will serve for both. It will be further understood that if preferred a single broad plane may be employed in place of two planes. Each plane 54, in the present instance comprises two similar sections 57 of the usual material and curved cross section provided upon their inner edges with cavities 59 and 60 adapted to receive respectively the pins 47 and 45, as shown in Fig. 4. It will be noted that the planes 54 are upwardly inclined in a forward direction. The bodies of the planes are further supported by stays certain of which are identified as 62, preferably converging in the shanks of hooks 63 shown in Fig. 17 adapted to engage eyes 63′ upon the frame. In the drawings are shown stays for sustaining the various extended portions of the machine but are not herein numbered and described, since the arrangement and number of the same are a matter of choice and form no part of the present invention.

The frame of my machine includes rods 64 diverging laterally and inclined upwardly and forwardly, fixed to the floor 12. In their outer ends is journaled a shaft 65 further supported in lugs 66 upon the rod 18, and fixed to which is a vertical lever 67. Also fixed to each side of the center of the shaft 65 is a horizontally disposed oblong elevating plane 68. Similarly inclined rods 70 extend rearwardly from the floor 12 and carry the shaft 71 rotatable in lugs 72 upon rod 18 and carrying a like fixed lever 73 and elevating planes 74. These planes are intended to elevate or lower the course of the machine.

Fixed to opposite ends of the rod 18 midway their lengths are oblong vertical frames 77 and 78. In the forward part of the front frame 77 are pivotally mounted in axial alinement one above the other wings, vanes or blades 79, 80, and 81. Similar members 83, 84, and 85 are likewise mounted in the frame 78. The pivotal connections of these blades may be of any preferred construction, but in the present instance these connections, which are similar in both frames, are shown in Fig. 6. Interspaced lugs 86 upon the front member of the frame form bearings for the ends of independent pintles 88, 89, and 90 to which are fixed the wings 79, 80, and 81. To the respective pintles are fixed at their centers horizontal arms or levers 91, 92, and 93. Similar levers 94, 95, and 96 are fixed to the pintles of wings 83, 84, and 85. The central blades 80 and 81 are rudders and are intended to determine the direction of the machine, while the upper and lower blades 79, 81, and 83, 85 are intended for balancing or maintaining the equilibrium of the machine. One of the described frames and its contained wings may be omitted but better results are attained by the use of both.

The mechanism for controlling the vanes and elevating planes and their connections, will now be described. Reference being had particularly to Fig. 5. Projecting downwardly from an intermediate portion of the rod 18 is a pin or rod 99 upon which are pivoted at their centers three arms or levers 100, 101, 102. Also fixed upon opposite sides of the rod 18 at the rear of the rod 99 are two eyes or guides 103. Upon the floor 12 of the frame are standards 105 supporting bearings 107 in which is journaled a shaft 109 disposed lengthwise of the frame and to whose forward end is fixed midway its length an arm or lever 110, and to whose rear end is fixed a vertical yoke 111 in whose ends are pivoted trunnions 113 upon a sleeve 114 in which is journaled a handle bar 115 having handles 116. The last described parts will be observed to constitute a universal joint. A vertical arm 118 is fixed at its central point upon the bar 115.

Referring to Figs. 13 to 16 inclusive it will be observed that the arms 91, 100 and 94 are connected at their ends by cords or wires 120; arms 92, 101, and 95 by wires 121 which are crossed between arms 101 and 95; arms 93, 100 and 96 by wires 122 which are crossed between the arms 93 and 100 as well as between arms 100 and 96; arms 67, 102 and 73 by cords 123 which are crossed between the arms 102 and 73. By virtue of the above described connections it will be noted that a vibration of the arm 100 moves the balancing blades 79 and 83 in the same lateral direction, and at the same time moves the blades 81 and 85 together in a lateral direction opposite to the direction of blades 79 and 83, as shown in Fig. 5. The vibration of the arm 101 moves the rudder blades 80 and 84 in a lateral direction opposite each other; and the arm 102 moves the elevating planes 68 and 74 to opposite vertical inclinations.

The arms 100, 101, and 102 are connected with the operating device or mechanism thus. Cords, wires, rods or flexible members 125 connect the ends of arms 100 and 110 through the guides 103. Similar members 126 connect the ends of arms 101 with each side of the center or ends of the handle bar

115. The ends of the arms 102 and 118 are also connected by similar members 127.

From the above description it will be seen that if the machine tilts or dips to the right, the operator by elevating the right end of the handle bar will turn the upper balancing blades 79, 83 to the right, and the lower balancing blades 81 and 85 to the left, into the positions shown in Fig. 5. The rudder blades 80 and 84, as their name implies, controls the direction of the machine in a horizontal plane. In order to direct the machine toward the right the operator pulls the right end of the handle bar toward himself thus throwing the forward rudder blade to the left and the rear rudder blade to the right. The elevating planes 68 and 74 control the vertical inclination of the machine. If the latter is falling and it is desired to bring the machine to a horizontal position the operator pulls upwardly simultaneously both handles 116 which rotates the handle bar and its arm 118 thus elevating the forward edges of the planes 68 and depressing the forward edges of the planes 74. The entire control of the machine is thus assured by simple and instinctive motions of the operator and without the removal of the hands from the handles 116.

A purpose of this invention is to make the machine readily convertible into a biplane when desired. The latter arrangement is shown in Fig. 12. To effect this change the rods 32 and the angular brace 31 are removed and discarded. The sections 57 of the rear plane 54 are removed and attached to the pins 51 and 52 in the lower part of the machine frame. This change is possible by virtue of the described pin connections 45 and 47. In order to bring the upper and lower main planes into vertical alinement the tubular rods 33 and 34 are removed from the projections 37 and engaged with the projections 42 by means of the described pin and slot connections 40 and 35.

The angular inclination of the propeller shaft 22 in an upward direction toward its rear tends to depress the rear of the machine and thus assists in elevating the forward end of the machine which is particularly advantageous in the initial raising of the machine.

The above description is thought to sufficiently indicate the operation of the machine.

I do not desire to be limited to the exact details of construction shown and described, for various modifications will occur to a person skilled in the art.

What I claim, is,—

1. In a flying machine, the combination with the frame and main plane, of vertical balancing blades pivotally mounted upon the frame in advance of said plane and adapted to swing laterally, and means upon the frame for swinging the blades, blades between said balancing blades, and vibratory means for causing said intermediate blades to serve as rudders

2. In a flying machine, the combination with the supporting frame and main plane, of balancing blades pivotally mounted in the frame one above the other, blades between said balancing blades and vibratory connections controlled from the frame whereby said blades may be laterally distended in opposite directions.

3. In a flying machine, the combination with the frame and main plane, of upright balancing blades pivotally mounted upon the frame in vertical alinement with each other and at substantially right angles to the main plane, a rudder blade upon the frame between the balancing blades, vibratory means for actuating said rudder blades, and means upon the frame for laterally distending the balancing blades independently of the rudder blade.

4. In a flying machine, the combination with the frame and main plane, of a plurality of vertical balancing blades pivotally mounted upon the frame one above the other and at substantially right angles to the main plane, means in the frame for swinging one balancing blade in one direction, and means actuated by the first mentioned means for simultaneously swinging another balancing blade in another direction, a rudder blade intermediate said balancing blades and in the same frame.

5. In a flying machine, the combination with the supporting frame and main plane, of vertically disposed balancing blades, pintles in the frame one above the other to which the blades are fixed, means to turn the pintles to vary the angles of presentation of the blades, and a rudder blade upon the frame intermediate the balancing blades and vibratory means for actuating said rudder blades independent of the balancing blades.

6. In a flying machine, the combination with the main frame of auxiliary frames upon the front and rear of said frame, balancing blades pivotally mounted one above the other in each auxiliary frame, a rudder blade pivotally mounted in each frame intermediate the balancing blades, a plane mounted on the main frame, and vibratory connections controlled from the main frame whereby the balancing blades in each auxiliary frame may be simultaneously moved outward laterally.

7. In a flying machine, the combination with an axial rod and a supporting frame, of a main plane upon the rod, auxiliary vertical frames fixed intermediate their lengths to the ends of the rod, rudder blades pivotally mounted at intermediate points in the auxiliary frames, balancing blades pivotally mounted in the auxiliary frames above the

rudder blades, balancing blades pivotally mounted in the auxiliary frames below the rudder blades, and means controlled from the main frame for swinging the upper balancing blades in one direction and the lower balancing blades in another direction.

8. In a flying machine, the combination with the supporting frame and main plane, of a vertical rudder blade and vertical balancing blades pivotally mounted in the forward end of the frame, horizontal elevating planes pivotally mounted in the frame adjacent the blades, a universally movable handle bar in the frame, and independent connections between the handle bar and the balancing blades, the rudder, and the elevating planes whereby all of said parts may be operated from the said handle bar.

9. In a flying machine, the combination with the supporting frame and main plane, of a rudder blade, and balancing blades arranged in vertical alinement and at substantially right angles to the main plane, horizontally disposed elevating planes adjacent the blades, pintles upon which the rudder blade, the balancing blades, and the elevating planes are mounted, arms upon each pintle, two arm levers pivotally mounted in the frame, members connecting the ends of the pintle arms to the ends of the levers, a universally movable handle bar in the frame, and connections between the handle bars and the ends of the levers.

10. In a flying machine, the combination with a supporting frame and main plane, of a standard upon the frame, a rod journaled in the standard, a handle bar, a universal joint connection between the rod and bar, an arm upon the rod, balancing blades pivotally mounted in the frame provided with lateral arms, a lever on the frame, members connecting the lever and the blade arms, and members connecting said lever with the arm upon the rod.

11. In a flying machine, the combination with a supporting frame and a main plane, of a standard upon the frame, a rod journaled in the standard, a handle bar, a universal joint connection between the rod and bar, an arm upon the rod, an upper and lower balancing blade pivotally mounted on each end of the frame, lateral arms upon the blades, a lever on the frame, uncrossed members connecting the lever with the arms of both upper blades, crossed members connecting the arms of the lower blades to said lever, and members connecting the ends of said lever with the ends of the arm upon the rod.

12. In a flying machine, the combination with a supporting frame and a main plane, of a standard upon the frame, a rod journaled in the standard, a handle bar, a universal joint connection between the rod and bar, an arm upon the rod, an upper and lower balancing blade pivotally mounted on each end of the frame, a rudder blade upon each end of the frame, lateral arms upon all the blades, levers pivotally mounted upon an intermediate portion of the frame, uncrossed members connecting one lever with the arms of both upper blades, crossed members connecting the same lever with the arms of the lower blades, uncrossed members connecting the second arm with the arms of one rudder blade, crossed members connecting the second arm with the arms of the other rudder blade, members connecting the ends of the first lever with the ends of the arm upon the rod, and members connecting the ends of the second lever to opposite the center upon the handle bar.

13. In a flying machine, the combination with a supporting frame and a main plane, of a standard upon the frame, a rod journaled in the standard, a handle bar, a universal joint connection between the rod and bar, an arm upon the rod, an arm upon the handle bar, an upper and lower balancing blade pivotally mounted on each end of the frame, a rudder blade upon each end of the frame, lateral arms upon all the blades, shafts rotatably mounted adjacent both ends of the frame, elevating planes fixed to the shafts, arms fixed to the shafts, three levers pivotally mounted upon an intermediate portion of the frame, uncrossed members connecting the first lever with the arms of both upper blades, crossed members connecting the first lever with the arms of the lower blades, uncrossed members connecting the second arm with the arms of one rudder blade, crossed members connecting the second arm with the arms of the other rudder blade, uncrossed members connecting the third lever with the arms of one rotatable shaft, crossed members connecting the third lever with the arms of the other rotatable shaft, members connecting the ends of the first lever with the ends of the arm upon the rod, members connecting the ends of the second lever to different points upon the handle bar, and members connecting the ends of the third lever to the arm upon the handle bar.

14. In a flying machine, the combination of a frame comprising upper and lower longitudinal bars, lugs upon both bars, lateral pins in the lugs, main planes each comprising two sections, each section being provided with marginal cavities adapted to receive the pins.

15. In a flying machine, the combination of a frame comprising upper and lower longitudinal bars and uprights connecting the bars, an angular brace resting upon the upper bar and detachable therefrom, a plane mounted transversely of the frame, means upon the upper bar for engaging the rear margin of the plane, means upon the brace for engaging the forward margin of the

plane, and interspaced lugs upon the lower rod provided with lateral pins.

16. In a flying machine the combination of a frame comprising an axial bar triangular braces fixed to the upper bar a horizontal brace connecting the apexes of the triangular braces, transversely disposed planes connected at their rear margins to the upper bar, and at their forward margins connected to the triangular braces, and stays connecting the margins of the planes with the braces.

17. In a flying machine, the combination of a frame comprising upper and lower longitudinal bars, uprights connecting the bars, inclined projections upon the upper bar, lugs upon the lower bar, laterally projecting pins in the lugs, a triangular brace comprising tubular rods inclosing the projections, pins loosely traversing the tubular rods and the projections, a lug upon the lower portion of tubular rod, a second lug upon the upper bar adjacent the second tubular rod, transversely disposed pins fixed in both the latter lugs and projecting laterally therefrom.

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

SYDNEY BORMAN.

Witnesses:
HORATIO E. BELLOWS,
WALTER LOUIS FROST.