244-48
SR
FIP8301 OR 1,304,398

E. C. SOOY.

FLYING MACHINE.

APPLICATION FILED DEC. 15, 1917.

1,304,398.

Patented May 20, 1919.

7 SHEETS—SHEET 1.

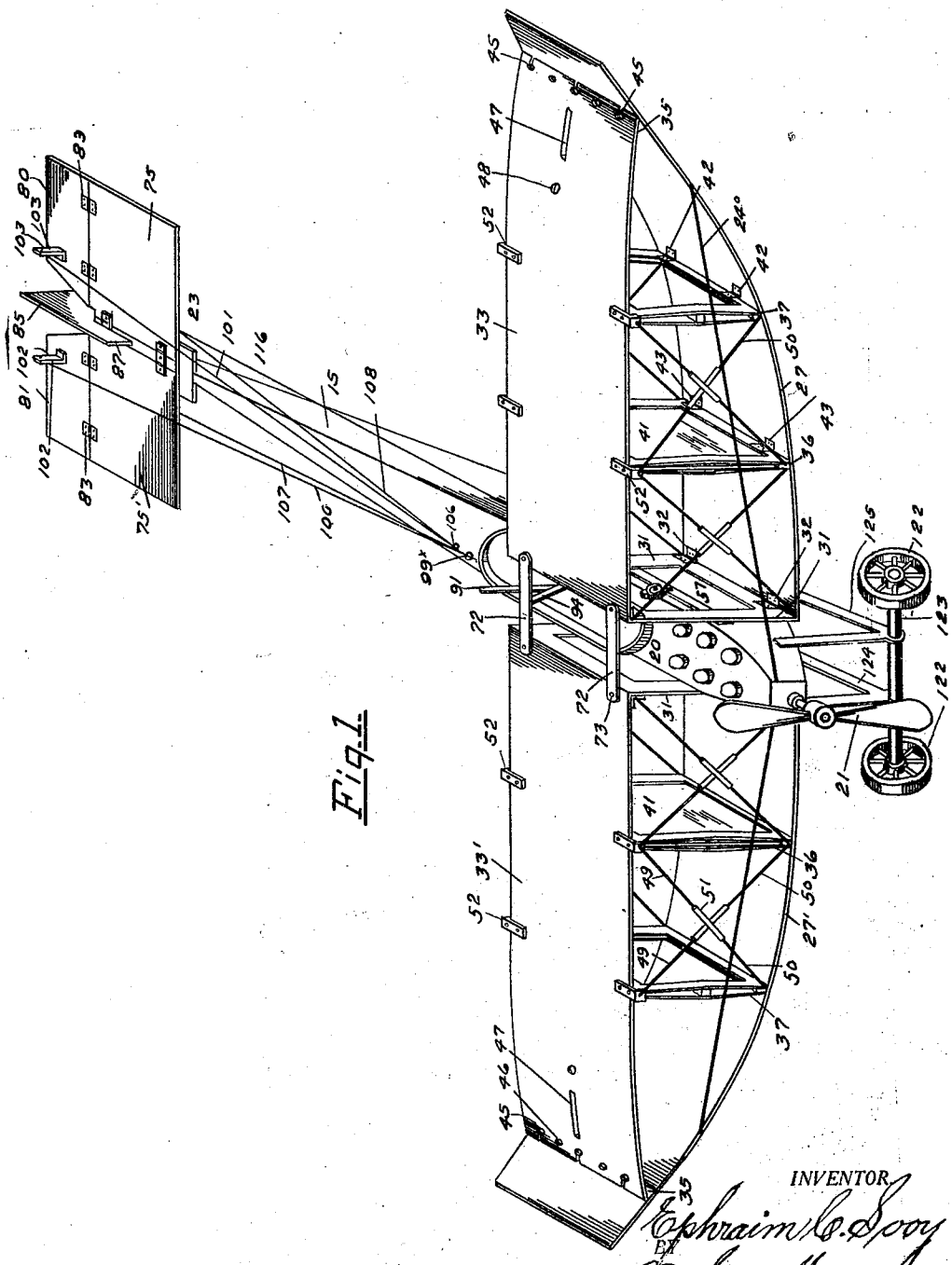


Fig.1.

INVENTOR

Ephraim C. Sooy

BY

Rich & Manning

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

48

E. C. SOOY.

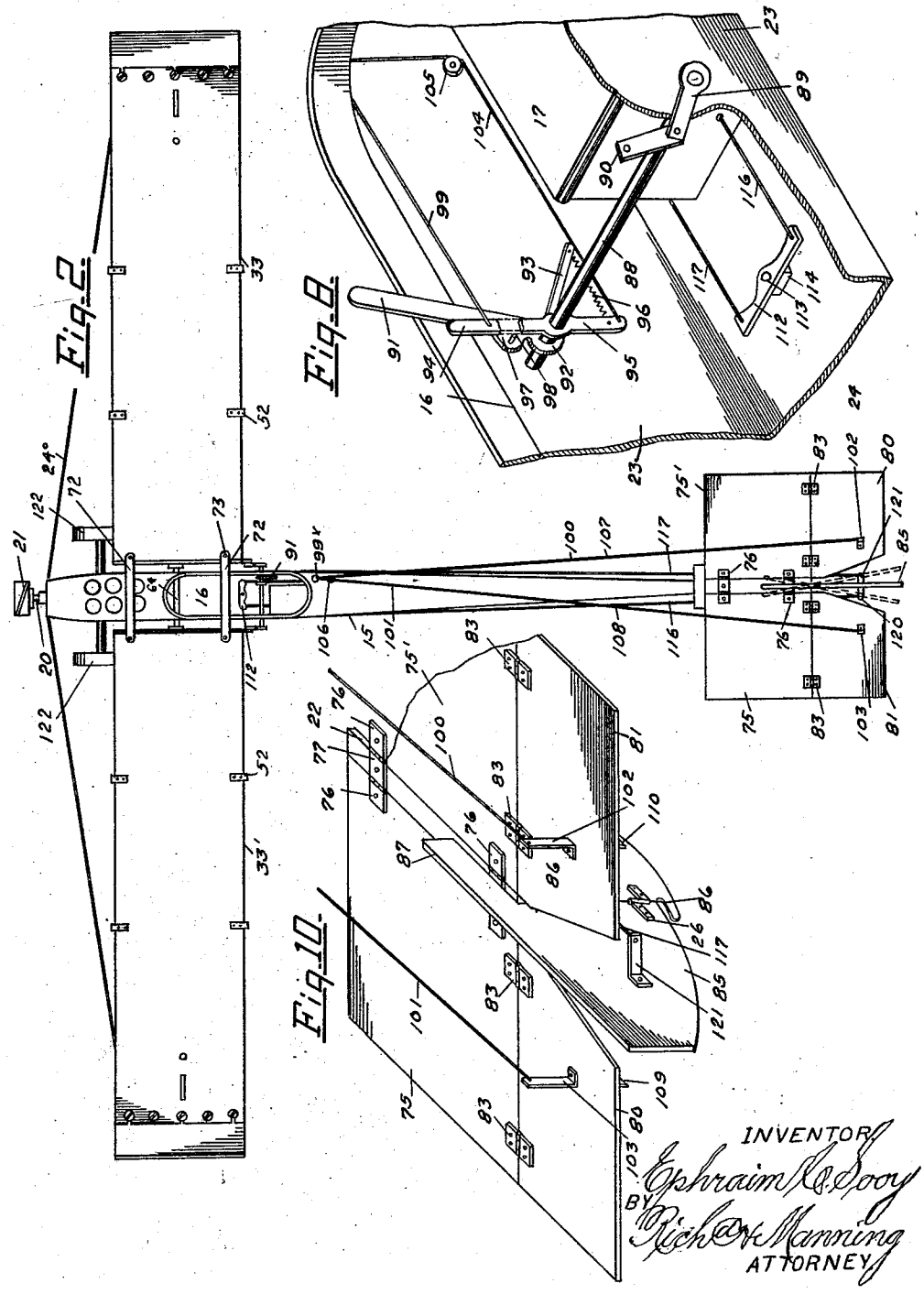
FLYING MACHINE.

APPLICATION FILED DEC. 15, 1917.

1,304,398.

Patented May 20, 1919.

7 SHEETS—SHEET 2.



INVENTOR
Ephraim C. Sooy
BY
Richard Manning
ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

48

E. C. SOOY.

FLYING MACHINE.

APPLICATION FILED DEC. 15, 1917.

1,304,398.

Patented May 20, 1919.

7 SHEETS—SHEET 3.

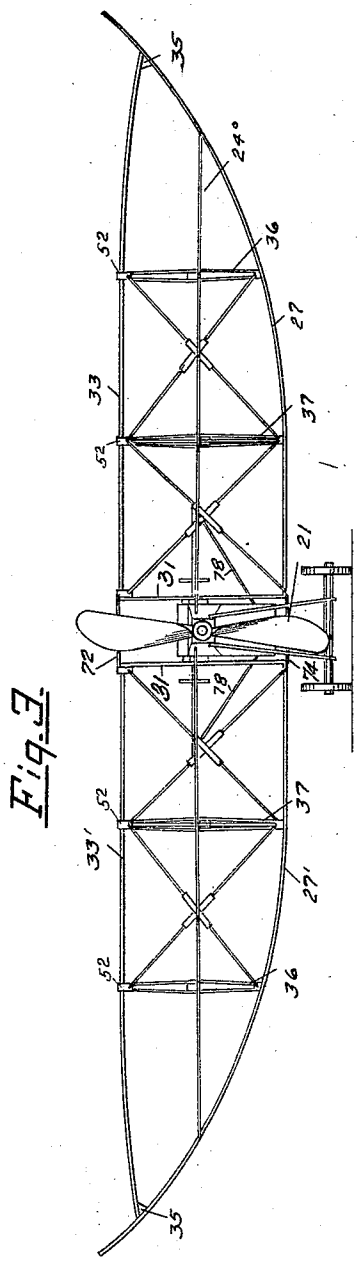


Fig. 3.

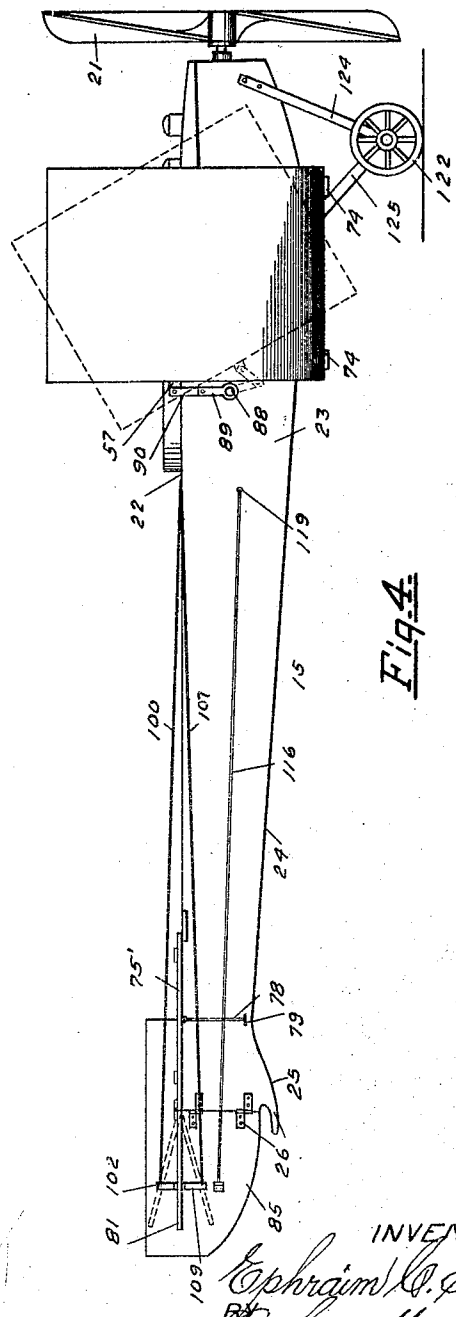


Fig. 4.

INVENTOR.
Ephraim C. Sooy
BY
Fisher & Manning
ATTORNEY.

E. C. SOOY.

FLYING MACHINE.

APPLICATION FILED DEC. 15, 1917.

1,304,398.

Patented May 20, 1919.

7 SHEETS—SHEET 4.

Fig. 11.

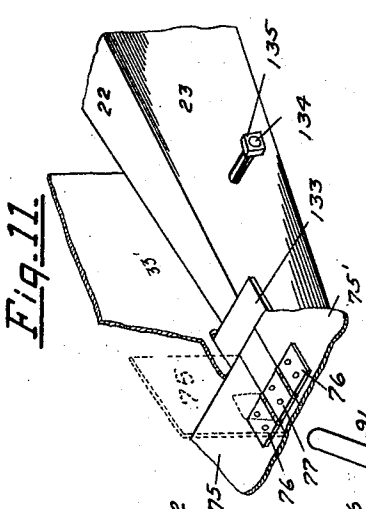


Fig. 5.

INVENTOR.

Ephraim C. Sooy

BY

Fisher & Manning

ATTORNEY.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

E. C. SOOY.

FLYING MACHINE.

APPLICATION FILED DEC. 15, 1917.

1,304,398.

Patented May 20, 1919.

7 SHEETS—SHEET 5.

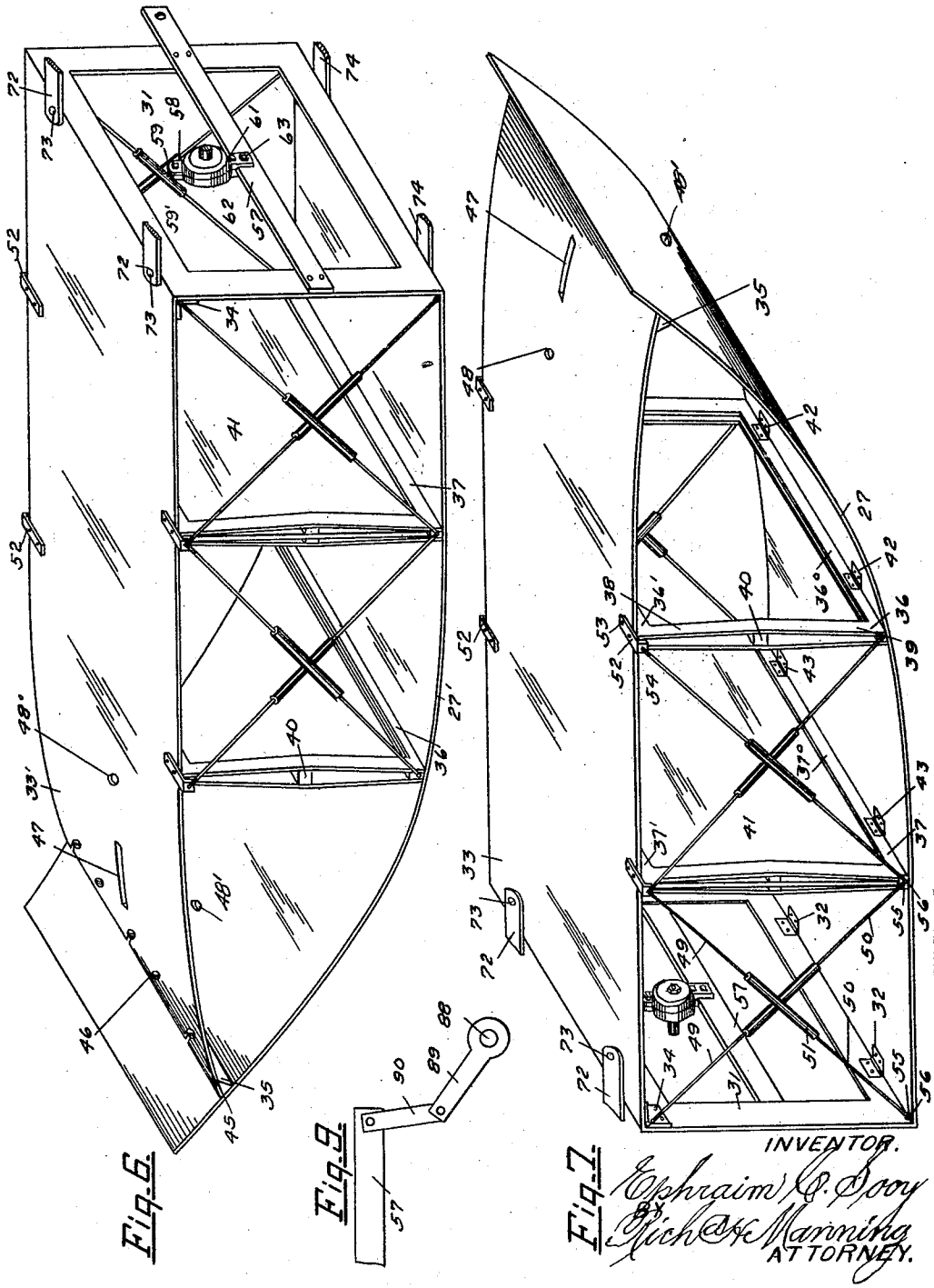


Fig. 6.

Fig. 9.

Fig. 7.

INVENTOR.

Ephraim C. Sooy

by Fisher & Manning

ATTORNEY.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

E. C. SOOY.

FLYING MACHINE.

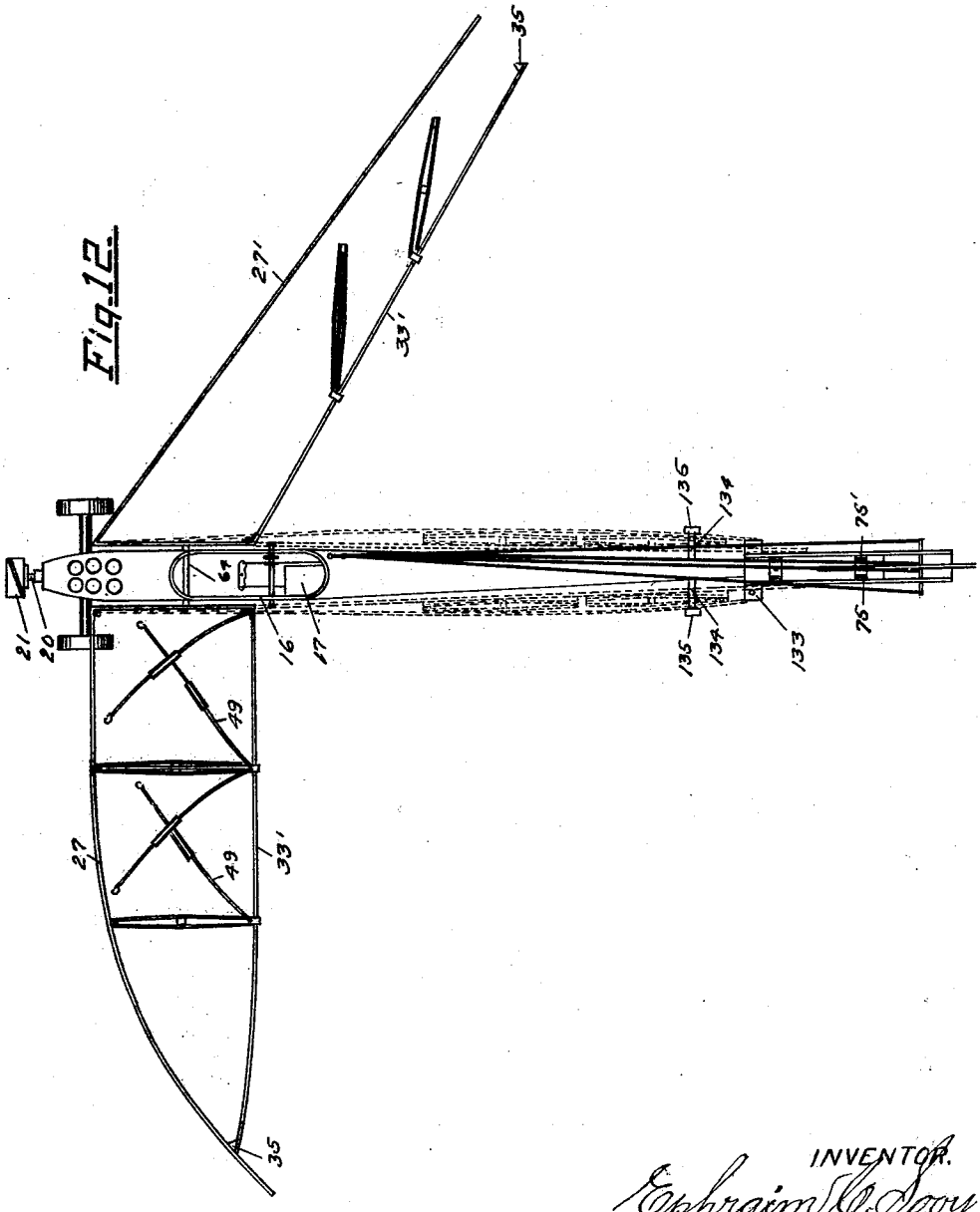
APPLICATION FILED DEC. 15, 1917.

1,304,398.

Patented May 20, 1919.

7 SHEETS—SHEET 6.

Fig. 12.



INVENTOR.

Ephraim C. Sooy

BY

Richards & Manning

ATTORNEY.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

E. C. SOOY.

FLYING MACHINE.

APPLICATION FILED DEC. 15, 1917.

1,304,398.

Patented May 20, 1919.

7 SHEETS—SHEET 7.

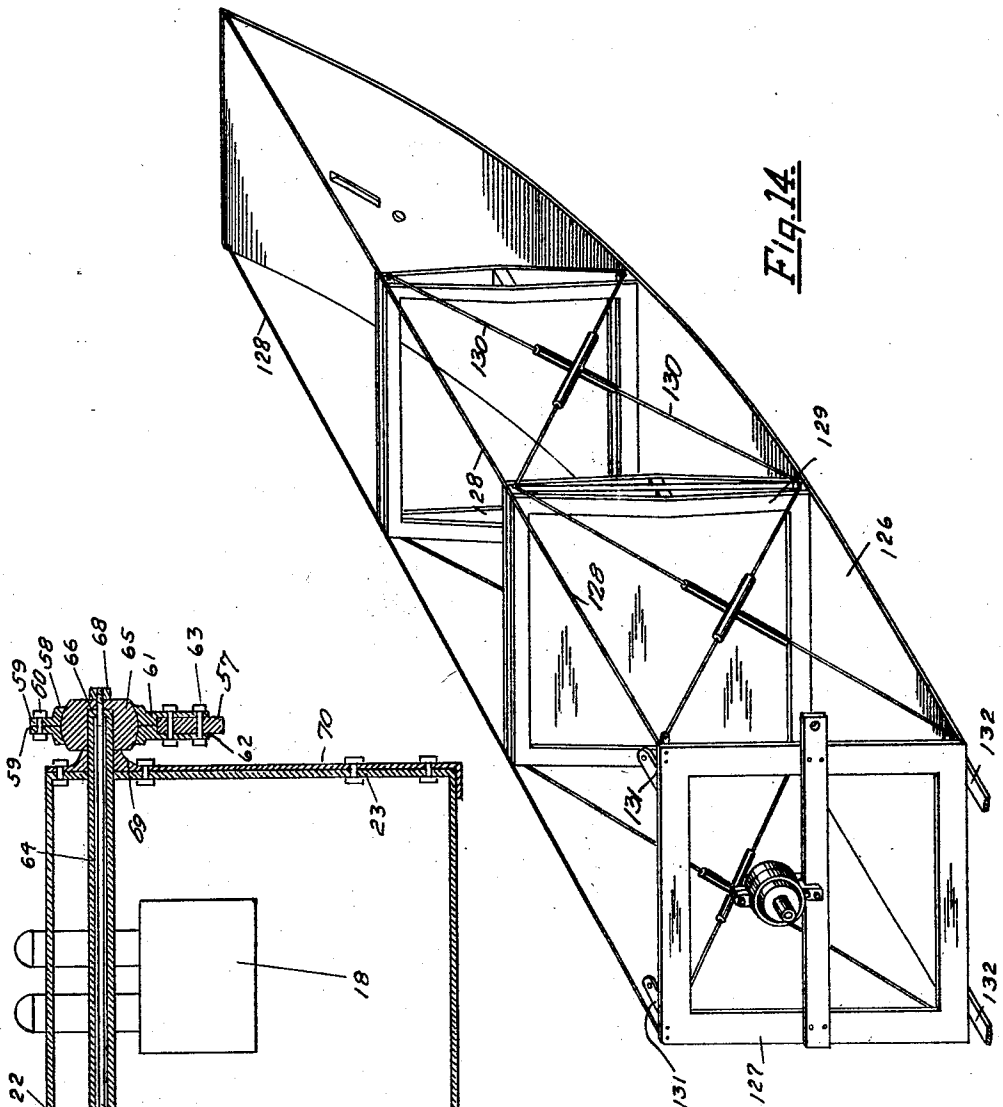


Fig. 14.

Fig. 13.

INVENTOR.

Ephraim C. Sooy

BY

Richey & Manning

ATTORNEY.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EPHRAIM C. SOOY, OF KANSAS CITY, MISSOURI.

FLYING-MACHINE.

1,304,398. Specification of Letters Patent. Patented May 20, 1919.

Application filed December 15, 1917. Serial No. 207,246.

To all whom it may concern:

Be it known that I, EPHRAIM C. SOOY, a citizen of the United States of America, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Flying-Machines; and I do hereby declare that the following is a full, clear, and exact description of the invention.

The invention has for its object:

First, to gain ascent in the air within a minimum length of surface, in the propulsion of the machine upon the ground;

Second, to control the planes so as to check a rapid descent from an aerial height toward the ground;

Third, to obtain an articulate movement of the frames supporting the plane or planes of a flying machine on the fuselage;

Fourth, an automatic, synchronous movement of the horizontal rudders in the change of position of the aeroplanes;

Fifth, to change the position of the planes at the desired angle to the longitudinal axis of the fuselage, simultaneously and at will;

Sixth, to afford an automatic synchronous adjustment of the horizontal rudders to the inclined position of the planes;

Seventh, to enable the planes to fold against the body of the machine, when not in use, and economize space in the hangar and in transportation; and

Eighth, to afford convenient means for the attachment of the aeroplanes to the fuselage when the center of gravity in its relation to the aeroplanes is found.

The invention consists in the novel features above set forth, and also in the construction and combination of parts, which will be first fully described and then specifically pointed out in the claims.

In the drawings:

Figure 1. is an isometric view of a flying machine, embodying the invention.

Fig. 2. is a plan view, showing the lateral positions of the rudder, in dotted lines.

Fig. 3. is a view of the machine, as seen looking toward its forward end.

Fig. 4. is a side view of the machine, showing the upwardly and downwardly-inclined positions of the horizontal rudders, in dotted lines.

Fig. 5. is a longitudinal, sectional view, upon an enlarged scale, of the forward end portion of the body of the machine, showing the propeller and engine, the vertical, adjustable end frames supporting the planes, and the levers controlling automatically the movement of the frames and horizontal rudders, and the lever control for the vertical rudder.

Figs. 6. and 7. are isometric views, reverse in position, upon an enlarged scale, of the biplanes, as seen from the forward and rear ends, respectively.

Fig. 8. is a view, in perspective, of a broken portion of the forward end of the body of the machine, upon an enlarged scale, showing the lever control for the planes and the device for the automatic control synchronically of the horizontal rudders within the vault of the fuselage.

Fig. 9. is a detail side view of the crank arm and the link connection for operating the planes.

Fig. 10. is a detail view, in perspective, of the caudal end of the fuselage, showing the rudder protecting shoe, also showing the vertical rudder and the folding tail plane and folding horizontal rudders thereon.

Fig. 11. is a detail view, in perspective, of the rear end of the fuselage, showing the plate for holding the planes when folded, and the plane-fastening bolt, also showing broken portions of the folding tail plane.

Fig. 12. is a plan view of the novel flying machine, showing the struts disengaged from the biplanes upon one side of the machine, and the planes in readiness for closing, also showing, in dotted lines, the biplanes upon both sides folded against the sides of the body of the machine.

Fig. 13. is a transverse, sectional view of the fuselage, taken on line x, x, in Fig. 5, showing the plane supporting shaft and ball socket joints.

Fig. 14. is a modification of the planes.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

The invention, as shown in the accompanying drawings, embodies the preferred form of flexible curved lower planes, connected with an upper plane, it being within the province of the invention to employ the

flexible curved plane in other forms of aeroplanes, with the advantages further set forth.

In the present embodiment of the invention, a main body or fuselage 15, is employed, of the requisite length for stability, consisting essentially of a longitudinal hollow case, the forward portion having a fuselage vault 16, and a side seat 17, for the aviator. The vault opening is located a short distance in rear of the forward end of the body 15, and within the forward end of the fuselage is the motor 18, of the usual type, the motor shaft 20 extending through the forward end of the body or fuselage, and upon said end is mounted the propeller 21, also of the usual type. The engine cylinders may extend through the top member of the body of the machine, as seen.

In the construction of the body 15, of the machine, the side members 23 are inclined rearwardly and inwardly, and are brought close together at their rear ends, the bottom member 24 extending from the forward end of the fuselage vault, and from said vault rearwardly, and inclined in a slight degree upwardly, at an angle to the top member 22, at which rear end the rear end portions of the sides are curved downwardly, as at 25, in order to form a shoe and protect the rudder in alighting upon the ground. The bottom member 24 is inclined forwardly and upwardly at the forward end of the fuselage in a curved line.

The novel features of the planes or wings, in their preferred construction, embody non-skidding, lower aeroplanes 27, 27′, which extend outwardly and transversely to the body of the machine, in outwardly and upwardly-curved planes. These planes form stabilizers in changes of direction of the machine, and act to return the planes to a normal position, when inverted. In such planes the center of air pressure is between the upturned tips of the planes or wings, the principles which dominate these results being referred to subsequent to the description of the constructive parts.

These aeroplanes 27, 27′ are in the preferred construction made from thin material, so as to be flexible. One form of such aeroplanes is in the utilization of a thin board or thin veneer, of the proper length and width. This veneer makes a plane of great flexibility, and is obviously adapted to save the time and care required in stretching and securing the cloth planes to the frames of the ordinary aeroplane. While the plane construction may be further varied, the essential flexible unit in planes is embraced as a part of my invention.

The main support for each of the planes 27, 27′ consists of a square vertical frame 31, of the same width as the planes, and of the proper lateral and vertical dimensions. The inner ends of the planes are secured to the lower, inner portion of the frame 31, by the hinges 32, as seen in Figs. 6 and 7, so that the planes may fold inwardly upon the side members of the fuselage.

In the biplane construction, upper planes 33, 33′ are employed, which are shorter in length than the planes 27, 27′, the inner ends of which planes are hinged at 34, to the upper member of the frames 31, and upon the inner surface and a short distance inwardly from the outer ends or tips of the planes 27, 27′ are secured fixedly the transverse strips 35, which are triangular in cross-section. As shown, two strut frames 36 and 37 are employed, intermediate the upper and lower planes 27 and 33, and 27′, 33′, respectively. These strut frames are of the same width as the end frame 31. The outer strut frame 36 is of less height than the frame 37, each frame being composed of two frames, having the upper members 36′, and lower members 36°, of frame 36, spaced apart and secured to transverse upper and lower strips 38 and 39, respectively. (See Fig. 7). Transverse blocks 40, wider than the strips 38 and 39, are inserted between the end members of frame 36, which enable the frames to resist lateral strains. The trussed frames 37 are composed of separate frames 37′, 37°, as in frame 36. Instead of the strips and blocks, as described, between said frame a thin panel 41 is employed, the purpose of which will be subsequently explained. This panel is secured firmly to the said frames, and increases their resistance to torsional strains.

The frames 36, which are located a considerable distance inwardly from the outer ends of the respective upper and lower planes, are hinged at 42, to the upper surface of the lower planes and the frames 37, which are located between the frames 36 and the end frame 31, are hinged at 43 to the upper surface of the lower planes 27, 27′, respectively, these frames being adapted to be folded upon said lower planes when the upper and lower planes are folded together.

The outer ends of the lower planes 27, 27′ are bent upwardly, in lines of a curve or the arc of a circle, and the outer ends of the upper planes are bent in a slight degree downwardly, bringing the outer ends of the superposed planes 33, 33′, in contact with the upper surfaces of the respective planes 27, 27′, a short distance inwardly from the outer end or tips of said planes, and also in contact with the upper surfaces of the transverse bars 35. In the outer ends of the planes 30, 33, are slots 47, and in the transverse bars 35 are headed pins 45, as seen in Fig. 6, which enter the slots and serve to position the said outer ends of the said planes on the bars 35, screws 46 being used to secure the parts removably together.

Truss rods 49 and 50 are employed to not only give strength to the frames, but also hold the upper frames firmly upon the strut frames 36 and 37. These rods are connected by turn buckles 51, the inner ends of the rods being screw-threaded. As shown, a strap 52 is secured to the upper planes, by rivets 53, the outer end of the strap extending forwardly, and is bent downwardly and provided with an opening 54. These straps extend forwardly from the planes, directly above the upper ends of the strut frames 36 and strut panel supporting frame 37. The upper end of the truss rod 49 is hooked within the opening 54 in the straps 52. The lower ends of rods 50 are provided with hooks 55, which engage eye-bolts 56, secured to the lower planes 33, 33′.

The means shown for securing these truss rods enable the hooks to be disengaged from the eye-bolts when the planes are folded together.

Transverse bars 57 are secured at their respective ends to the end members of each of the frames 31, of the respective bi-planes, a short distance below the middle point between the upper and lower members of said frames, a short portion of the bars extending rearwardly from the rear ends of the frames 31. Upon these bars are mounted, equidistant from the end members of the frames 31, a portion of the articulate connecting means for the planes with the body of the machine. This consists of a socket 58, which is divided into two parts, best seen in Fig. 13, each portion having a lug 59, which are secured together by a bolt 60. From the lower portion of each part of the socket extend downwardly, on the respective outer and inner surfaces of the bar 57, the supporting bars 61 and 62, which are secured to said bars by the bolts 63, which pass through said bars and the bar 57.

The socket 58 is positioned upon the line of the axis of the planes 27, 33 and 27′, 33′, the planes being capable of movement at an inclination upwardly, as seen in dotted lines in Fig. 4. A hollow shaft 64 extends through the side members 23, 23, of the body of the machine, a short distance downwardly from the line of the upper edges of said member, and at a balancing point between the forward and rear ends of said body, its position, as seen, being immediately forward of the forward, vertical line of the fuselage vault, and rearwardly from the engine, as seen in Fig. 5. The outer ends of the hollow shaft extend short distances beyond the outer surfaces of said side members 23 23, and upon said ends are secured rigidly the circular bearings or balls 65, flattened toward said members 23, which are fitted to and secured within the sockets 58, on the bars 57. The outer ends of the hollow shafts extend within an axial opening extending nearly through the balls 65, from which extend outwardly the smaller openings 66. Through the hollow shaft extends a rod 67, having screw-threaded ends, which ends pass through the openings 66, and a short distance outwardly therefrom, and are provided with the nuts 68.

Shaft bearings 69 extend around the ends of the hollow shaft 64, and are secured to the side members 23, between said members and the balls 65, and form lateral bearings therefor. With these bearings 69 straps 70 are connected, which extend downwardly, and their lower ends are bent at right angles and extended upon the under side of the bottom member 24, of the body of the machine, the straps being secured to said body by suitable rivets or bolts. The joint action of the biplanes 27, 33 and 27′, 33′, is further maintained by connecting bars 72, which are connected removably by the screws 73, at one end with the top of the plane 33, and at the other end with the top of plane 33′, the position of the connecting bars being adjacent the forward and rear edges of the respective planes, to give rigidity thereto with respect to each other.

Similar connecting bars 74 are connected with the lower surfaces of the lower planes 27, 27′, in the same manner as connecting bars 72 with planes 33, 33′. The planes are further held by wire cables 24°, extending from the planes parallel with their longitudinal axis to the forward end of the fuselage. The angle of incidence which the frames 31 assume, in ascent and descent is permitted by the cable 24°, the centrally pivoted frames 31 being central in position to the lines of the cable 24°, which are attached to the tips of the planes, this tilting movement of the frames is slight, and this movement is facilitated by the ball and socket bearings. The rear or tail plane, which sustains the rear end of the fuselage in the air, for the purpose of the invention is made in sectional parts 75 and 75′. With the inner portions of these parts are connected the hinges 76, which hinges are connected with a plate 77, secured to the upper member 22, of the body of the machine, at a point a considerable distance forward of the rear end of said member 22, the hinges serving to support the said sections of the plane in a normal, lateral position, the upward movement of said sections being prevented by the securing wires 78, secured to the respective planes, at one end, and to staples 79, on said member 23, of the body of the machine at the other. (See Figs. 3 and 4.) The horizontal rudders are as seen in two parts 80 and 81, their forward ends being connected by the swinging hinges 83, to the rear ends of the sectional parts 75, 75′, of the normal, stationary tail plane, so that motion may be imparted to the said rudders at

an angle to the planes downwardly and upwardly, as seen in dotted lines in Fig. 4. Both horizontal rudders are cut away at 84, on their inner edge portions, at an angle to each portion, to afford a wide V space for the movements of the vertical rudder 85, which is connected by the hinges 86 with the rear portions of the sides 23 of the body of the machine, in such manner as to permit a lateral, swinging movement to be imparted to the vertical rudder. A portion 87, of the vertical rudder shown, extends forwardly and a slight distance above the top member 22, of the body, and is movable laterally over the inner portions of the sectional parts 75, 75′, of the tail plane, the rudder being protected, as before stated, by the foot extension 25.

The means of control of the machine are located principally within the fuselage vault 16, within immediate control of the aviator, and consist of a transverse rock shaft 88, within the vault, the ends of which shaft extend through the side members 23, of the body 15, at a point approximately equi-distant from the upper and lower edges of said side members 23, and rearwardly in respect to the rear ends of the frames 31.

Upon the outer ends of shaft 88 are crank arms 89, and pivotally connected with the crank arms are links 90, which are pivotally connected with the crank arms and the rear extended portions of the bars 57, on the frames 31, carrying the biplanes. Upon the portion of shaft 88 adjacent the side member 23, and to the right of the aviator, on the seat 17, is secured the inner end of the biplane-operating, primary lever 91, said end having an annular, perforate portion 92, from which portion extends downwardly and rearwardly a lever arm 93. (See Figs. 5 and 8.)

Upon shaft 88, adjacent the lever 91, is a separate, secondary lever arm 94, for automatic control, having an extension 95, extending a short distance downwardly beneath shaft 88 and in line with lever arm 94. An expanding and contracting spring 96 is connected at one end with the lower end of lever 95, and at the other end with the lower end of the lever arms 93.

Upon the forward edge of the lever 91, a short distance above its connection with shaft 88, is a lug 97, from which extends a pin 98, which pin is in the path of movement of the lever 94. With the upper portion of lever 94 is connected one end of the wire or rope 99, the other end of which wire extends through an opening 99ˣ, in the top member 22, of the fuselage, immediately in rear of the fuselage opening 16, and with said end is connected the forward ends of two wires or ropes 100 and 101, the rear ends of wire 100 extending to a position above the rear end of the horizontal rudder 81, and is connected with an upright post 102, on said rudder. The rear end of the wire 101 is connected with an upright post 103, on the horizontal rudder 80. A single wire 104 is connected at its inner end with the lower end of the lever arm 95, and its outer end extended over a pulley 105, upon the side member 23, thence extended upwardly through the opening 106, on the top member 23, and with said end is connected the forward ends of two wires 107 and 108, the rear ends of which wires are connected to the respective posts 109 and 110, on the under side of the respective horizontal rudders 80 and 81. The control for the vertical rudder consists of an oscillating foot lever 112, pivoted at 113, between its ends to a block 114, secured to the bottom member 24, of the body of the machine, at the bottom of the fuselage vault 16, and a considerable distance forward of a vertical line extending through the rotary shaft 88, and in a convenient position for the feet of the aviator.

Operating wires 116 and 117 are connected with the ends of the foot lever 112, and the other ends extended rearwardly through the respective openings 119, in the respective side members 23, of the body of the machine, and are connected with the angle bars 120 and 121, respectively, connected with the respective sides of the rudder 85. (See Figs. 2, 4 and 10).

The forward end of the fuselage is supported in common with the aeroplanes, by the wheels 122, 122, mounted upon the ends of a shaft 123, and upon said shaft are brace bars 124 and 125, in pairs, the brace bars in one pair being connected at their upper ends with the sides of the fuselage, at its forward end, and the brace bars 125 with the side members of the fuselage, in rear of the path of movement of the lower, transverse connecting bars 74, adjacent the forward edges of the aeroplanes 27, 27′, said bars acting as stops to frames 31.

In a forward movement of the machine upon the ground, preceding an ascent in the air, from the power of the propeller 21, the biplanes and horizontal rudders are in a normal position, or with their surfaces in parallel lines with the longitudinal axis of the body of the machine, as seen in Fig. 1. As soon as speed is obtained, the plane-controlling lever 91 is moved a short distance forwardly, thereby imparting a rotary movement to shaft 88, which is transmitted through crank arms 89 and links 90, to the plane carrying frames 31, moving or oscillating thereby said frames, at an angle to said longitudinal axis of the body of the machine, and the forward edges of both upper and lower planes upwardly, thus presenting the bottoms of the lower surfaces, or the inclined planes or wings to the air, which raises the machine from the ground,

and in the same forward movement of said lever 91, the spring 96 exerting a pressure on the arm 95, moves the lever 94 forwardly, the pin 98 keeping in contact with the lever 91, which action of the lever 94 draws upon the horizontal rudder controlling wires 100, 101, and changing the position of the rear edges of the rudders 80, and 81 synchronically with the planes into an upwardly-inclined position, as seen in dotted lines in Fig. 4, in which position of the biplanes and horizontal rudders the machine is in a normal state of equilibrium in air.

Upon obtaining the desired aerial height, the controlling lever 91 is moved rearwardly, until the plane resumes its normal position, the pin 98 acting in conjunction with the spring 96, to move the lever 94 rearwardly, and the horizontal rudders resume their normal positions.

The control of the machine in its direction of flight, to the right or left, is governed by the lateral movements of rudder 85 and by the feet of the aviator, which are in contact with the foot-lever 112, in the bottom of the fuselage vault, which lever operates the wires 116 and 117, connected with the rudder.

During flight, there are two features of the machine which predominate and contribute, in the highest degree, to the value of the aeroplane, one being its means of resisting oscillations and obtaining rapid righting of balance from gliding movements on vertical, curved planes, and the invariable righting movement, which swings the planes into their upward lines of curvature to the horizon, or into their normal, flying position, from a gliding, or from an inverted position in their transitory movement back to their normal flying position. This last result is obtained from biplanes of the construction shown, whereby the air pressure at the tip of the curved planes acts to overbalance the pressure upon the planes. For instance, upon long, undulating curved planes of oscillation, the upwardly-extended curved surfaces of the planes act to right themselves in position, and when control of the machine is lost, from any reason, the machine will reach the ground with the machine in an upright position. These oscillations of the machine are checked by the panels 41, similar to the action of the center board in a sail boat, and may be employed between the aeroplanes, as struts, in any manner preferred, or position, and hence, in a turning movement of the machine, where the stress is thrown upon the wings or aeroplanes, the liability of a skidding movement is minimized or checked.

To obtain descent of the machine, the lever 94 is moved rearwardly, in a slight degree, sufficiently to draw upon the horizontal rudders controlling wire 104, and oscillate or tilt the rear edges of the said rudders in a downward position, and at the proper angle of inclination to the rear tail planes 75, 75′, in which movement the machine inclines downwardly. Upon releasing the lever 94, it automatically resumes its position. Upon approaching the ground, and at a distance therefrom, to alight safely, the lever 91 is moved forwardly, moving the planes in an inclined position, as in Fig. 4, the bottom of the planes moving against the resistance of the air, and in this manner acting as a brake to govern the descent, the tail of the machine, in the meantime, settling downwardly, and striking the ground upon the foot 25, which protects the rudder, and the forward end of the machine falls with little shock, and settles to the ground.

The only occasion upon which the lever 94 is operated by hand is to obtain the movement described for obtaining the descent; otherwise the movement of the biplanes is followed automatically by a like position of the horizontal rudders.

The invention may be utilized in a monoplane, as seen in Fig. 14, in which the lower aeroplane 126 is the same as the aeroplanes 27, 27′, in Fig. 1, and supported at their inner ends by frames 127, (see Fig. 14) which are the same as frame 31, the frames 127 having the same means of attachment to the fuselage as in Fig. 1. In the construction shown in Fig. 14, rods 128, which are connected at their inner ends with the upper members of the tilting frame 127, extend outwardly through the upper curved portions of the lower planes 126. With these rods may be connected the upper planes composed of any suitable material. The strut frames 129 are hinged to the lower plane 126 as described of the strut frames 36, and 37, with the planes 27 27″ seen in Fig. 1, and are braced by the rods 130.

To fold the aeroplanes in the position seen in Fig. 12, the transverse connecting bars 72 connecting the respective upper planes 27—27′ with each other and the bars 74 connecting the respective lower planes 33—33′ with each other, are removed.

The links 90 on the crank arms 89 on the rock shaft 88, are disconnected from the bars 57 on the frames 31. The frames 31 carrying the planes are then oscillated by means of the ball and socket joint 58 and 65 so that the side members of the frames are horizontal with the body of the machine. The truss rods 49 and 50 are disconnected at one end from their connections with the upper planes 33—33′ respectively. The strut frames are then folded upon the inner surfaces of the planes 27, 27′, and the screws are loosened from the planes 33, 33′, disconnecting said planes with planes 27, 27′, when the planes spring outwardly, and to a

longitudinal position, as seen in Fig. 12, the planes 33, 33′ moving on the hinge connections with frames 31, inwardly toward the side members of the body 15, of the machine. Upon the top member of said body is a plate 133, the ends of which extend within the slots 47, of said planes, and support these planes in position. In the engagement of the planes 33, 33′, with said plate 133, the said planes, extend a greater distance rearwardly than the planes 27, 27′, in which are openings 48, 48′, respectively, and which register one with another, and upon the closing of the planes 27, 27′ against the respective planes 33, 33′, the bolts 134, on the side members of said body 15, enter these openings. Upon the bolts are nuts 135.

In a monoplane construction, the folding of the single planes is simply acomplished, and the folding planes extended, so as to occupy but little space upon the sides of the fuselage. The feature of the folding planes may be used or not, as preferred, and such planes constructed upon primarily rigid, curved lines, with the attainment in flying of all the advantages of ascent and descent and that are embodied in the restoration of positions of the machine in air. The planes contribute to the making of the flying machine a safe vehicle for aerial locomotion, and this may be further seen in the descent of the machine. During the approach of the machine to trees or other obstructions, the curvature of the wings will act as an inclined plane, and thus prevent the danger of a direct blow to the wings. Flying machines have had, in many instances, their planes supported by pivoted frames 4 changing the angle of the planes with relation to the body of the machine, none of which frames have been centrally pivoted to the body of the machine. This feature, together with the pivoting of the frames at a balancing point between the forward and rear ends of the body, affords a poise to the body relatively to the upper and lower planes, so that the advantage of the machine for gaining a high altitude with speed as well as the momentum in flight, is obtained. The movements of the body of the machine, with the features described, are made obviously sensitive to the lever control.

It is obvious that other means may be employed for fastening the folded planes to the body of the machine, perhaps simpler and without any punctures of the planes. The novel features of the invention may be applied to other forms of flying machines, and such further modifications employed as are within the scope of the appended claims.

Having fully described my invention, what I now claim as new and desire to secure by Letters Patent is:

1. In a flying machine having a body, the combination with an axial member intersecting the longitudinal axis of the said body at a balancing point between its forward and rear ends, of centrally pivoted vertical aeroplane supporting tilting frames mounted upon said axial member upon the respective sides of said body, outwardly extended upwardly curved lower planes, and outwardly extended upper planes connected together at their outer ends, and having their inner ends connected respectively with the respective upper and lower members of said frames, connecting devices connecting the planes on the tilting frames on the respective sides of the body with each other, and frame tilting devices on said body connected with the said frames, for obtaining a righting movement of the planes and a poise of the body in respect to the planes.

2. In a flying machine having a body, the combination with a shaft extending transversely through said body upon an intersecting line with its longitudinal axis and at a balancing point between its forward and rear ends, of centrally pivoted vertical aeroplane supporting tilting frames mounted upon the ends of said shaft upon the respective sides of said body, outwardly extended upwardly curved lower planes, and outwardly extended upper planes connected together at their outer ends and having their inner ends connected respectively with the respective upper and lower members of said frames, and transverse connecting devices connecting the planes on the tilting frames on the respective sides of the body with each other, a transverse rock shaft on the said body of the machine in rear of said frame supporting shaft, and detachable frame tilting devices on said rock shaft, actuating the frames to obtain righting movements of the planes.

3. In a flying machine having a body, the combination with a shaft extending transversely through said body in line with its longitudinal axis and at a balancing point between its forward and rear ends, of centrally pivoted aeroplane supporting vertical frames mounted upon the ends of said shaft, outwardly extended upwardly curved lower planes and outwardly extended upper planes connected together at their outer ends and having their inner ends connected respectively with the respective upper and lower members of said frames, transverse bars connecting the planes upon the respective tilting frames rigidly with each other, a transverse rock shaft on the body of said machine in rear of said frame supporting shaft, and detachable frame tilting crank arms on said rock shaft, and links connected pivotally with each other and said links with the crank arms and the tilting frames.

4. In a flying machine having a body, the combination therewith of aeroplane supporting vertical frames on the respective sides

of said body, and centrally pivoted to said body upon a line intersecting its longitudinal axis, and at a balancing point between the forward and rear ends of said body, outwardly extended upwardly curved lower aeroplanes and outwardly extended upper planes connected together at their outer ends and at their inner ends with the respective upper and lower members of said tilting frames, and connecting bars connecting said inner ends of the respective planes on the respective upper and lower members of the frames with each other, a transverse rock shaft upon said body in rear of the balancing point of said pivoted frames, detachable frame tilting devices on the rock shaft actuating the said frames in a tilting movement and a control lever actuating the rock shaft.

5. In a flying machine having a body, the combination with the body-supporting bars, of centrally-pivoted aeroplane-supporting tilting frames upon the respective sides of said body, upper and lower transverse bars connecting one of said frames with the other, said lower bars acting as stops to the tilting movement of said frames.

6. In a flying machine, the combination with the fuselage having a transverse rotary shaft, and with pivoted tilting aeroplanes, and pivoted tilting horizontal rudders at the tail of said body, of means connected with the rotary shaft for tilting the aeroplanes, and operating levers mounted on said shaft, connecting means connected with the horizontal rudders and one of said levers, and yielding connecting means connecting operatively one lever with the other.

7. In a flying machine, the combination with pivoted tilting aeroplanes and pivoted tilting horizontal rudders, of a rock shaft, means on said rock shaft for operating the aeroplanes, and separate operating levers for the aeroplanes, and the horizontal rudders mounted on the rock shaft, and having arms, an expanding and contracting spring connected at its ends with the respective arms, and means on the levers for controlling a conjoint movement of said levers.

8. In a flying machine, the combination with pivoted tilting aeroplanes, and with the horizontal rudders, of a rock shaft, and means thereon operatively connected with the aeroplanes, of separate primary and secondary levers mounted on said shaft, the primary lever communicating motion to the rock shaft and provided with a lug and pin, arms connected with said levers, and an expanding and contracting spring connected at its respective ends with the respective arms on said levers, and means connecting the secondary lever and its arm operating with the horizontal rudders.

EPHRAIM C. SOOY.

Witnesses:
ANNIE L. GREER,
ROBERT O. MCLIN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."