

W. D. LINDSLEY.
FLYING MACHINE.
APPLICATION FILED JAN. 26, 1910.

1,002,532.

Patented Sept. 5, 1911.

6 SHEETS-SHEET 1.

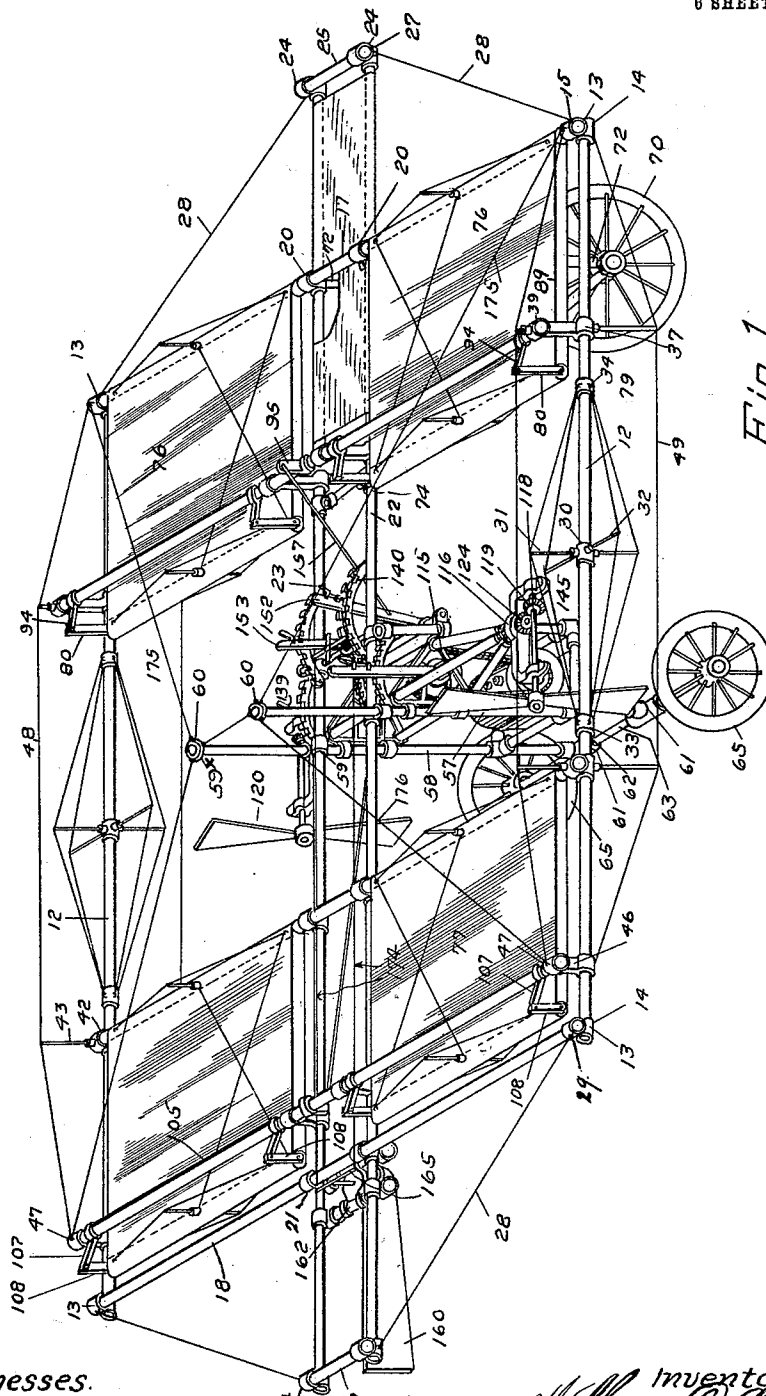


Fig. 1.

Witnesses.
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S. L. C. Hasse

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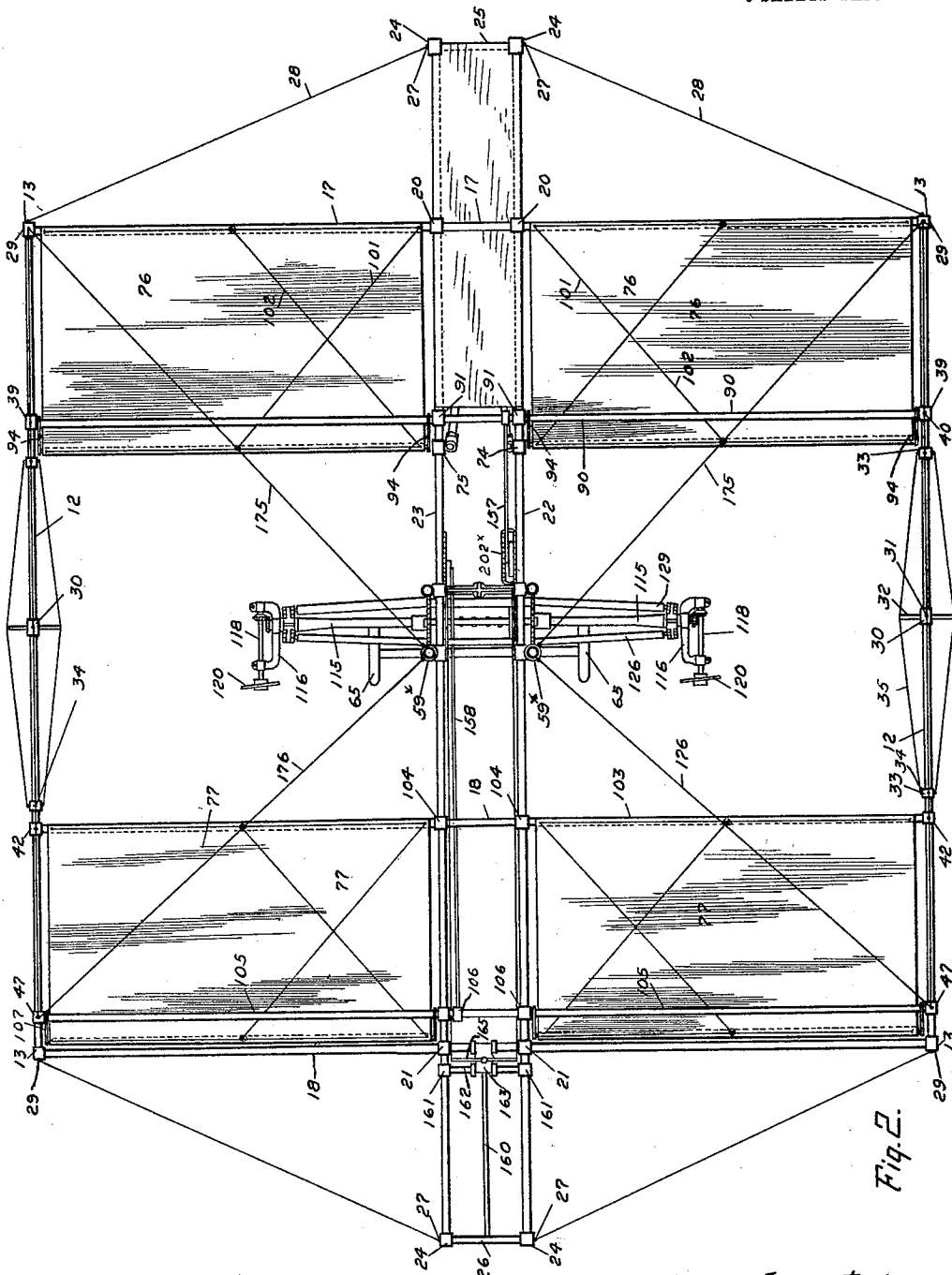


Fig. 2.

Witnesses.
C. L. Brown
S. L. C. Hason

By

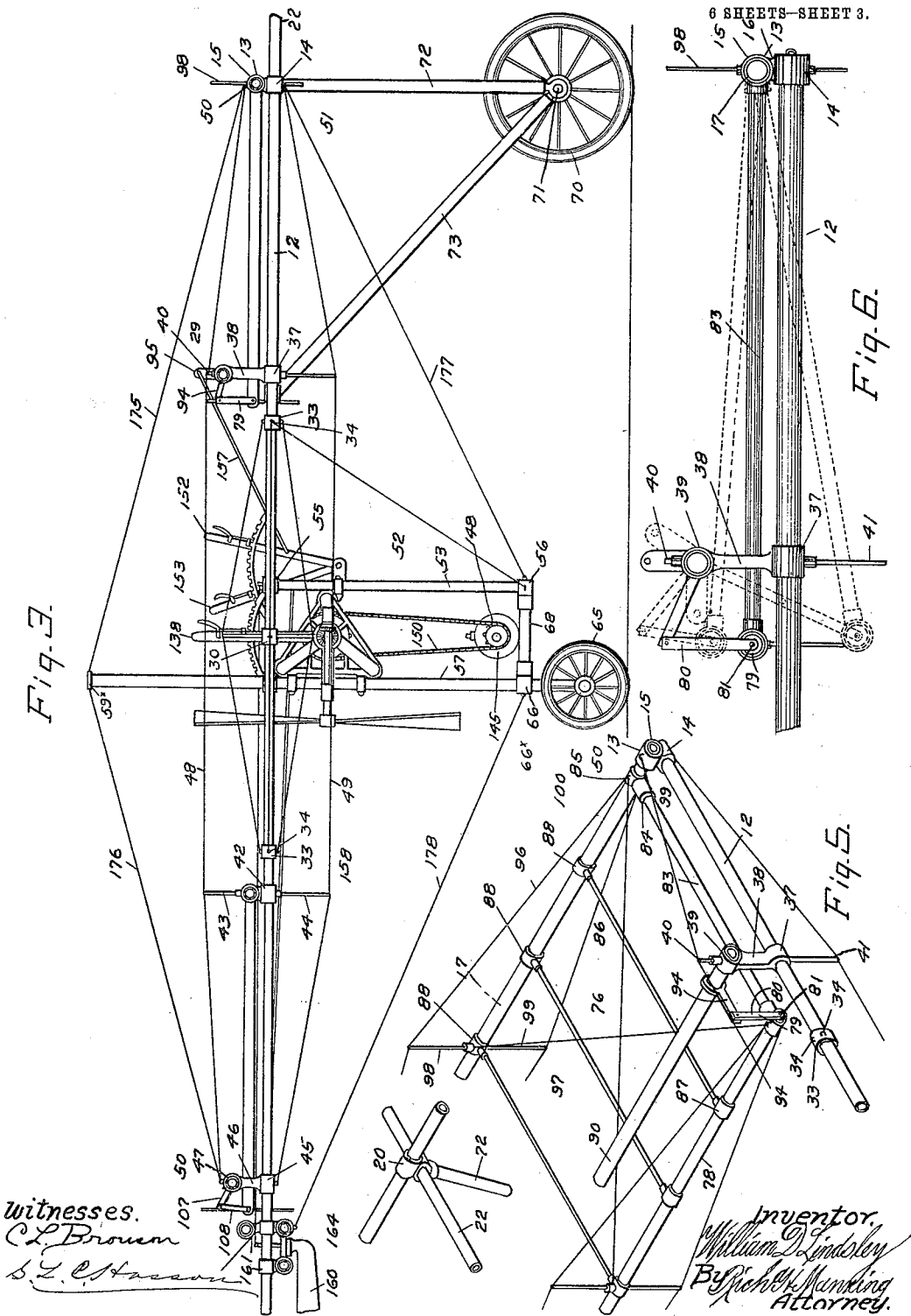
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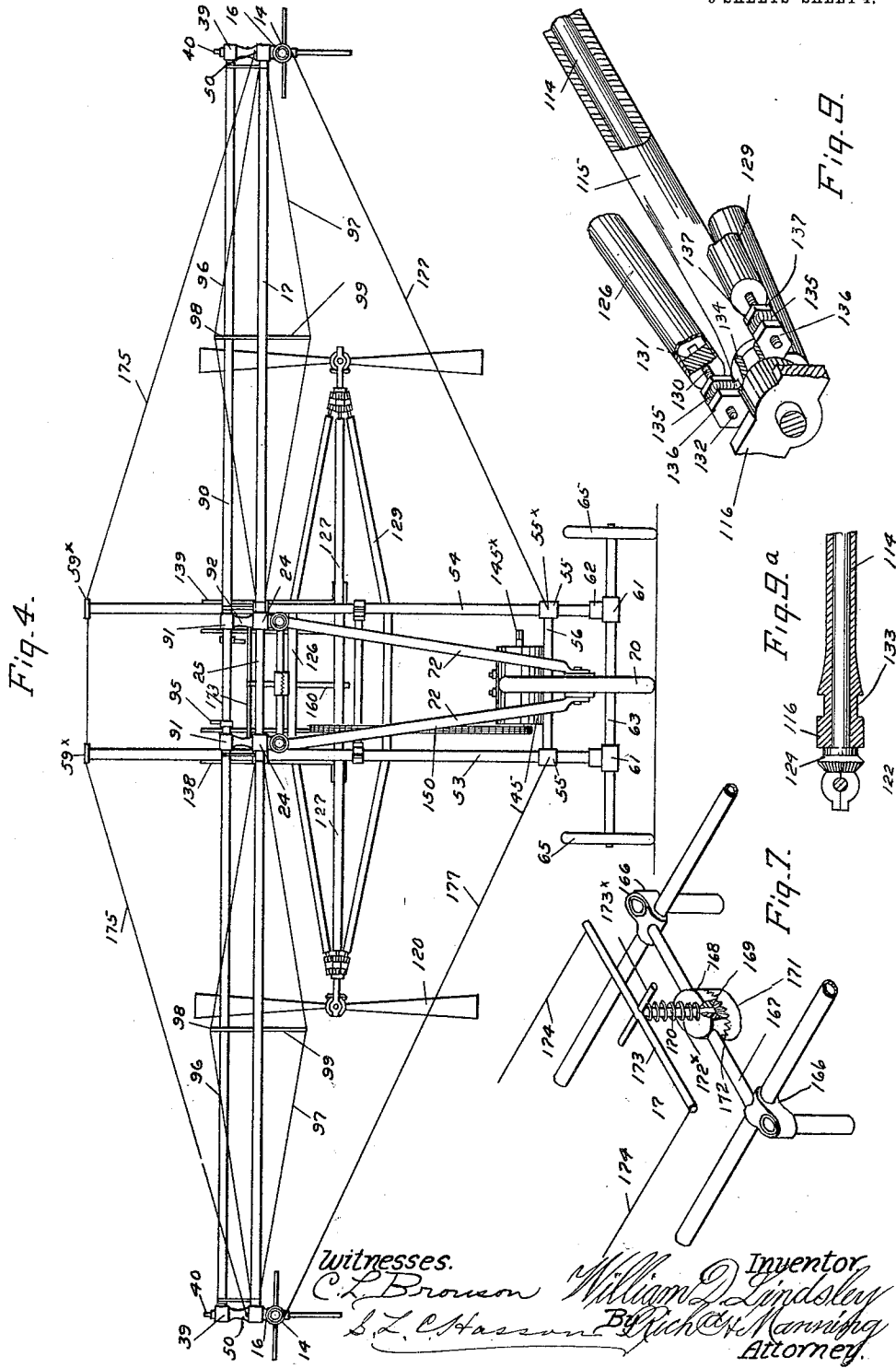


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6 SHEETS—SHEET 4.



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6 SHEETS-SHEET 5.

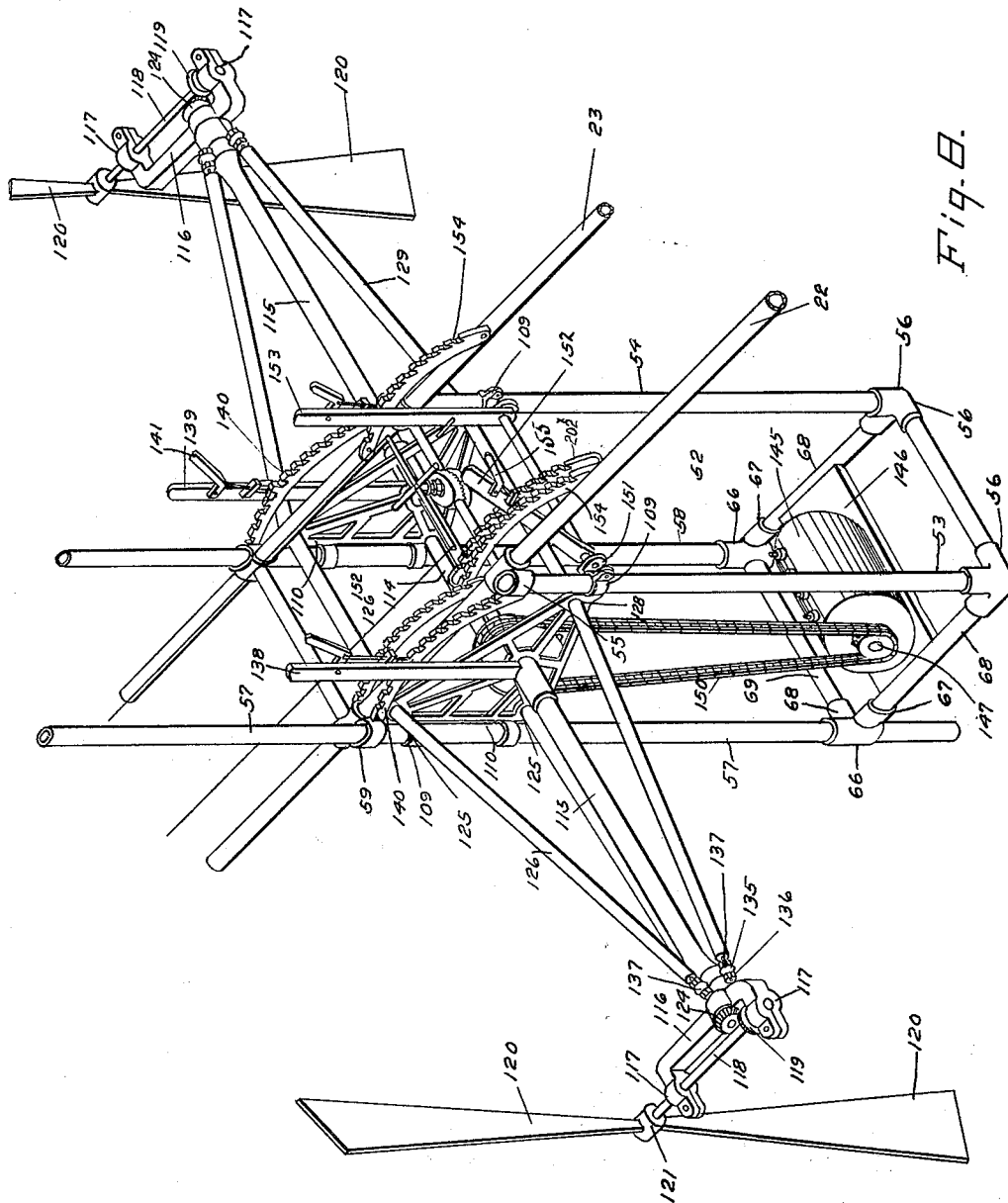


Fig. B.

Witnesses
C. L. Brown
S. L. C. Hasen

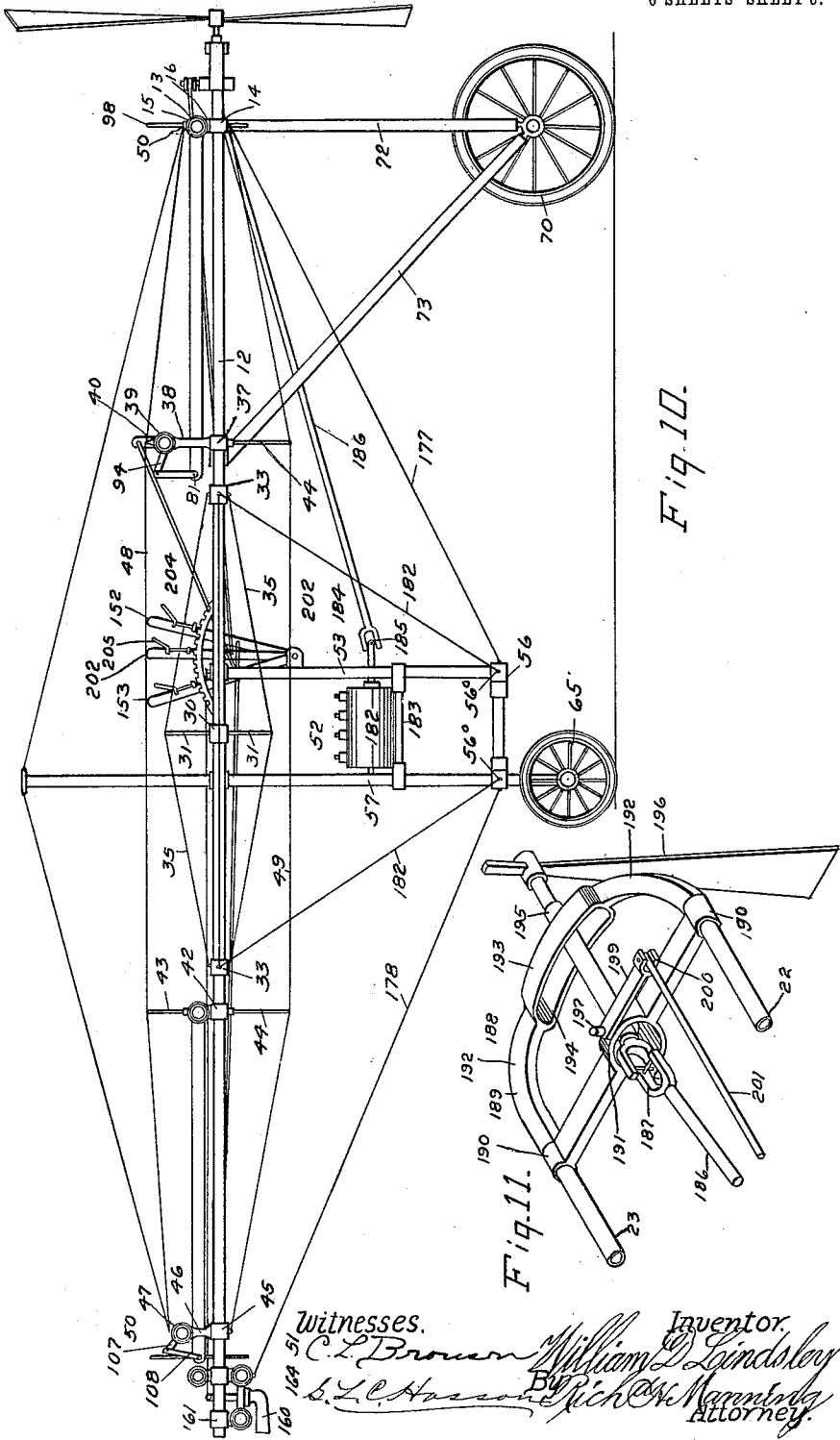
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6 SHEETS—SHEET 6.



UNITED STATES PATENT OFFICE.

WILLIAM D. LINDSLEY, OF WAYNOKA, OKLAHOMA.

FLYING-MACHINE.

1,002,532.

Specification of Letters Patent.

Patented Sept. 5, 1911.

Application filed January 26, 1910. Serial No. 540,263.

To all whom it may concern:

Be it known that I, WILLIAM D. LINDSLEY, a citizen of the United States of America, residing at Waynoka, in the county of Wood and State of Oklahoma, 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, such as will enable others to make and use the same, reference being had to the accompanying drawings, forming a part of this specification.

In the art of aviation aeroplanes which obtain momentum in ascending into the air from the propulsion of a propeller are known and classed as monoplanes and bi-monoplanes, the former having ordinarily planes which are parallel with each other, and the latter having forward and rear planes, substantially in line horizontally with each other.

This invention relates to the latter class, and it has for its objects: First: An aeroplane whose equilibrium in mid-air is capable of being maintained at all times, and in which danger from overturning in flight is avoided. Second: An aeroplane in which the planes are feathered to the angles of least resistance, when forcibly propelled into the air. Third: An aeroplane in which the impact of the air upon the planes in initial flight under power may be controlled and the aeroplane navigated in ascent and descent, and in change of direction to meet the force and direction of movement of the air currents. Fourth: An aeroplane whose ascent and descent is facilitated by its propellers. Fifth: A bi-monoplane whose planes are afforded safety from wind impact in tacking during aerial flight.

The invention consists in the novel construction and combination of parts, such as will be first fully described and then specifically pointed out in the claims.

In the drawings: Figure 1 is an isometric view of the invention, as seen upon the ground and in readiness for aerial flight. Fig. 2 is a plan view, as seen in Fig. 1. Fig. 3 is a side view of the machine. Fig. 4 is a view from the forward end of the machine, as seen in Fig. 1. Fig. 5 is an enlarged, detail view, in perspective, of a portion of the main frame and feathering

plane, showing its connection and means of control. Fig. 6 is an enlarged side view, in detail, of a portion of the main frame, showing in dotted lines the various angles of position in which the plane may be adjusted in relation to the frame. Fig. 7 is a detail view of the adjusting device for changing the direction of the rudder. Fig. 8 is an enlarged view, in perspective, of a central portion of the frame of the machine, showing the vertical frame and the mechanism actuating the propellers, the planes and the steering rudder blade. Fig. 9^a is a detail view of the outward end of the transverse power-transmitting shaft, showing the connection of the header bar carrying the propeller shaft with the sleeve. Fig. 9 is a detail view, in perspective, of the outer end-portion of the propeller shaft, showing the shaft adjusting and blade-balancing mechanism. Fig. 10 is a side view of the machine, showing a modification for high speed propulsion. Fig. 11 is a detail view, in perspective, of the shaft hanger for the forward end of the high-speed shaft, as seen in Fig. 10.

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

Referring to the drawings, the body of the aeroplane consists in detail of a rectangular-shaped, horizontally extended outer or main frame, sufficiently rigid and secure from distortion, as further explained. This frame consists of the longitudinal side beams or tubes 12, 12, which extend the full length of the machine, and for the purpose extended and made preferably from aluminum, and this may be instanced in the description of the other parts of the frame of the machine, which are of tube construction. To the outer surface and respective ends of the tubes or beams 12, are secured rigidly the two-way end joints 13, to the main frame, which consist of lower sleeve 14, rigidly secured to the side beams and the upper sleeves 15, the openings in which are at right angles to the beams 12, and secured to the upper surface of the sleeve 14, by means of a rigid connection or neck 16. Within these sleeves 16 are secured rigidly the ends of the respective forward and rear transverse beams 17 and 18, respectively, of

the main frame of the machine. Upon these transverse beams 17 and 18 are the two-way jointed sleeves 20 and 21, respectively, which are precisely the same as the jointed sleeves 13, and arranged in pairs upon the respective beams 17 and 18, in a similar manner. The pairs of sleeves 20 and 21 are arranged at proper distances apart upon each side of a line extending longitudinally of the main frame and equi-distant from the side beams 12, and through the lower sleeves 20 and 21 extend the longitudinal, centrally located beams 22 and 23, the forward and rear ends of which beams extending beneath the transverse beams 17 and 18, also extend a considerable distance forwardly and rearwardly of a vertical line extending through said beams, and upon said extended ends of beams 22 and 23 are secured the lower sleeve of the two-way joints 24, and with the upper sleeve of said joints are connected respectively short, transverse connecting members or tubes 25 and 26.

With the lower sleeve of the angle joints 24, are connected the eyes or staples 27, with which are connected the outer ends of the truss wires 28, these wires extending to like eyes or staples 29, upon the upper sleeves 15, of the joints 13, at the respective ends of the side beams or pipes 12, of the main frame. In order to increase the rigidity of the side beams 12, they are trussed horizontally and vertically as follows: Upon the beams or tubes 12, at a point intermediate the ends of said beams, are secured fixedly the sleeves 30, from each of which extend radially the vertical struts 31 and the horizontal struts 32. Upon these beams 12, a little less than one-half the distance from the sleeves 30 to the ends of beams 12, are secured fixedly the sleeves 33, upon which are perforated ears 34, extending in the same directions as the struts 31 and 32. With the ears on sleeves 34, in the direction of the forward end of the main frame are connected the forward ends of truss wires 35, which are extended rearwardly over the ends of struts 31 and 32, and secured at their rear ends to the respective ears on the sleeves 33, in the direction of the rear end of the main frame.

The side beams 12 are further trussed lengthwise, and as follows. Upon the beams or tubes 12, a short distance forwardly of the sleeves 33, in the direction of the forward end of the main frame are fixed the sleeves 37. With the upper surface of the sleeve 37 are connected the lower ends of the vertical bars 38, which extend upwardly the requisite distance, as further explained, and with the upper ends of said bars 38, are connected the lower surfaces of the sleeves 39, the openings in which extend transversely to the direction of the opening of sleeves 35. With the upper surface of

the sleeves 39 are connected the short struts 40, which are projected at their upper ends. With the lower surfaces of the sleeves 37 are connected the long, perforate struts 41, which extend downwardly a distance corresponding to that from beams 12, to the upper end of strut 40. Upon the beams or tubes 12, a short distance in rear of the sleeves 33, in the direction of the rear end of the machine, are secured the two-way sleeve joints 42, which are precisely the same as sleeve joints 13. With the upper surface of the upper sleeve of the sleeve joint 42 is secured a strut 43, which is perforated at its upper end, and with the lower surface of the sleeve joint on the beams 12 extend downwardly the struts 44. Upon the rear end portions of the beams 12, a short distance forwardly of the rear sleeve joints 13, of the main frame, is fixed the sleeves 45. With the upper surface of the sleeves 45 is connected the lower end of a short bar 46, the upper end of which bars extends upwardly about one-half the distance of the bars 38, on the sleeves 37, at the forward end of the main frame. Upon the upper end of the bars 46 are the sleeves 47, the openings in which extend transversely to the sleeves 45, and for the purpose further described.

The truss bars 48 and 49 are connected at one end with eyes 50, on the upper sleeves 15, of the two-way joints 13, at the forward end of the main frame, and the eyes 50, on the lower sleeves of said joint, the truss wires passing through the perforate ends of the struts 46, and 43, above the beams 12, and the struts 40 and 44, beneath said beams, and are secured at the other ends to eyes 50 and 51, on the respective sleeves 47 and 45, at the rear end of the main frame. At a point on the centrally located beams 22 and 23 equi-distant from vertical lines extending through the forward and rear transverse beams 17 and 18, of the main frame of the machine is located the vertical suspensory frame 52. This frame, which has a rigid connection with the main frame, forwardly and rearwardly of its transverse axis, consists of the forward vertical strips or tubes 53 and 54, the upper ends of which tubes extend within the vertically disposed sleeves of the two-way sleeve joints 55, on the longitudinal beams 22 and 23, which joints are precisely the same as the two-way joints 13, at the ends of the main frame, the vertical sleeves of which are positioned on the inner sides of beams 22 and 23. The lower ends of the tubes 53 and 54 extend downwardly a considerable distance, and upon their lower ends are the three-way tube joints 56, on the opposing openings in which extend a transverse tube connection 56. A short distance rearwardly of the transverse axis of the main frame are the vertical

strips or tubes 57 and 58, of the frame 52. These tubes are secured within the two-way sleeve joints 59, on the beams 22 and 23, which are the same as the sleeve joints 13, above referred to, the sleeves on said joints being on the inner side of beams 22 and 23. The upper ends of the tubes or strips 57 and 58 extend forwardly the requisite distance above the horizontal line of beams 22 and 23, to constitute the suspension struts for the entire main frame of the machine, upon which ends are the caps 59, which carry eyes or staples 60. The lower ends of the tubes or strips 57 and 58 extend downwardly past a line horizontal with the lower ends of the tubes or strips 53 and 54, and upon the said ends are tube joints 61, having horizontal tube openings 62, through which extends an axle 63, rigidly secured thereto, upon the ends of which axle are the wheels 65, which support the machine on the ground. Upon the strips or tubes 57 and 58, in line horizontally with the three-way tube joints 56, are the sleeves 66, having branch extensions 67, in which are fitted the connecting tubes 68, which extend within the opposing openings on the three-way joints 56, and the connecting strip or tube 69, which connects the vertical tubes or strips 57 and 58 with each other (see Figs. 1 and 8).

The forward support for the machine upon the ground consists of the single wheel 70, which is larger in circumference than the wheel 65, and is provided with a short axis 71, similar to the axis of a bi-cycle, over each end of which extend the perforate, flattened, lower ends of the rods 72, the upper ends of which rods extend upwardly and are connected rigidly with the lower sleeve of the two-way tube joints 20. (See Fig. 1). With said axle are connected the perforate flat, forward ends of the thrust rods 73, the upper ends of which rods extend rearwardly and upwardly, and are connected rigidly with the two-way tube joints 74 and 75, connected with the longitudinal, central beams 22 and 23. (See Figs. 1 and 2).

The independent, adjustable wind feathering planes which support the aeroplane in mid-flight, occupy a space equal nearly to two-thirds the area of the main frame of the machine. As illustrated, the forward and rear planes 76 and 77 are each composed of two sections or independent rectangular shaped frames, the forward frames being constructed arranged upon the main frame of the machine, as follows: The frames of the plane 76 each consist of a strip or tube 78, which extends parallel with the forward, transverse tube 17, of the main frame and in length is nearly equal to that portion of the beam 17, between the two-way joints 13 and the centrally located two-way joints 20, supporting the longitudinal beams 22 and

23. The tubes 78, of the separate plane 76 are in line with each other, and are located a short distance in rear of a line extending transversely through bars 38, in the sleeves 37, on the side beams 12, of the main frame. Upon the ends of the tubes or strips 78 are loosely mounted the sleeves 79, with which are connected rigidly the short arms 80, which extend upwardly in position. At each end of the strips or tubes 78, adjacent to and within the sleeves 79, are sleeves 81, rigidly connected with the strip or tubes 78, having lateral tube joints 82, (see Fig. 6) with which are connected the outer ends of the side tubes 83 to the frames, which are nearly of the same size as the tubes 78. The forward ends of the strips or tubes 83 are secured within lateral tube joints 84, on the sleeve 85, which sleeves 85 are loosely mounted on the forward, transverse beams 17, of the main frame of the machine. Between the side tubes 83, to the frames, are a number of tubes 86, of the same length but smaller in circumference than tubes 83, and extending parallel therewith. The ends of these smaller tubes are connected with sleeves 87, rigidly connected with the tube 78 and with sleeves 88, loosely mounted on the transverse beam or tube 17, in like manner to the side tubes 83. Over the upper and lower surfaces of the tubes composing the frames are stretched water-proof fabric 89, such as cloth saturated with oil; the cloth being stitched carefully around the tubes, as seen in Figs. 1 and 2.

In the upper sleeves 39, supported by the vertical bars 38, in the sleeves 37, on the sides 12, of the main frame, are mounted the ends of a rock shaft 90, the central portion of the shaft being supported in the elevated sleeve 91, which are supported the same height as sleeves 39, by the bars 92, (see Fig. 4), which are connected with sleeves 93, on the longitudinal, centrally located tubes or beams 22 and 23. (See Fig. 1). With the rock shaft 90, are connected the radial arms 94, the outer ends of which arms are pivotally connected with the upper ends of the arms 80, on the respective ends of the tubes of the frames of planes 76. With the upper surface of the rock shaft 90, at a point adjacent to the sleeves 91, supporting the central portion of the rock shaft are connected rigidly the vertically-extended crank arms 95.

The portions of the forward beam 17, of the main frame supporting the frames of the planes 76, are trussed by the upper and lower truss wires 96 and 97, which pass through the perforate, outer ends of struts 98 and 99, on the respective upper and lower surfaces of one of the centrally located sleeves 88, of the frame, the ends of the arms being secured to the eyes 100, on the upper and lower surfaces of the respective

sleeves 85, to which the side tubes of the respective frames are connected.

Each frame is trussed diagonally by the truss wires 101 and 102, which are connected with eyes or loops on the upper surfaces of the intermediate sleeves 87 and 88, of the frames, and these wires are crossed and connected with eyes or loops on the sleeves 81 and 85, on the inner side tubes to the frames, thus distortion is effectually prevented of the frame.

The frames of the rear planes 77 are made precisely the same as the frames for the planes 76, and of the same proportions, the sleeves which support the forward portions of the frames being loosely mounted on the transverse tube 103, which is supported at its ends within the sleeves 42, on the sides 12, of the main frame of the machine. The shaft or tube 103 is supported midway its ends within the two-way sleeves 104, in the longitudinal beams or tubes 22 and 23.

The rock shaft 105, operating the rear planes 77, is journaled at its ends within the sleeves 47, upon the sides 12, and at the rear end of the frame the shaft or tube being also supported above the longitudinal beams 22 and 23, by the elevated sleeves 106, which are secured to said beams in like manner as the sleeves 47, in elevation, on the sides 12, of the main frame. With the rock shaft 105 are connected the arms 107, which are pivotally connected with the arms 108, on the transverse tubes of the vertically movable rear ends of the planes, in like manner as the vertically movable rear ends of the forward planes 76, of the machine, the upward movement of the rear ends of the planes 77 being less in height than that of the rear ends of the forward planes.

Upon the rock shaft 105 are crank arms 108, which extend downwardly, as seen in Fig. 1. Directly beneath the longitudinal beams 22 and 23 and secured to the forward and rear vertical tubes 53 and 57, by the collars 109, are the vertically disposed spiders 110, in the central portion of which spiders are shaft openings 112, and through which openings extend transversely the power shaft 114, the ends of which shaft extend as shown about one-half the distance outwardly to vertical lines extending through the side beams 12, of the main frame. Upon the outer portions of the shaft 114 are hollow tubes or sleeves 115, extending from the line of the outer surface of the spiders and nearly to the outer ends of shaft 114. With the outer ends of the sleeves 115, which are slightly increased in circumference, are cast or formed integral therewith the transverse bars or heads 116, which have their main portions extended in length, and as shown rearwardly, to overbalance the shorter portion of the bars or heads, and upon the ends of which bar are outwardly-extended

shaft bearings 117, in which are journaled transversely to shaft 114 the propeller shafts 118, upon which latter shaft, adjacent to the shaft bearing nearest in position to the sleeve 115, are the bevel gear wheels 119. The ends of the propeller shafts 118 extend a short distance from the line of the outer surface of the bearings 117, on the larger portion of the bar 116, and upon said ends are the propeller blades 120, the inner ends of the blades being secured to the sleeves 21, fixed to said shafts. Through the portion of the transverse bars 116, integral with the outer ends of the sleeves 115, are openings 122 (see Fig. 9^a), through which extend the ends of the shaft 114, and upon which ends of the shaft are bevel gear wheels 124, which mesh with the bevel gear wheels 119, on the propeller shaft 118, and impart rotation thereto.

For the purpose of supporting and aligning the power shaft 114, in the upper and lower rear corners of the spiders 110, are transverse openings 125, through which are extended the upper and lower tubes 126 and 127, respectively, and in the lower, forward corners of the spiders are transverse openings 128, through which extend transversely the tube 129. The outer ends of the several tubes 126, 127 and 129 are extended in opposite directions and bent at a point adjacent to the outer surfaces of the spiders 110, at an angle to the spiders, the upper and lower tubes 126 and 129 being bent downwardly and upwardly, respectively, and extended forwardly to a point above and below, respectively, the upper and lower surfaces of the sleeves 115, and to a point a short distance in rear of the point of union of said sleeves with the transverse bar 116, and the ends of the tube 129 are extended upwardly and rearwardly and adjacent to the forward surfaces of the sleeves 115, and to a point transversely in line with the outer ends of the tubes 126 and 127 thus forming tripods within which to center the shaft 114. The outer ends of the tubes are plugged at 130 (see Fig. 9), and within the tubes are the flat heads of the screws 131, bearing on the inner surface of the plugs, the screw-threaded stems 132 extending through these plugs 130. In the outer surface of the sleeve 115, a slight distance in rear of the bar 116, is an annular groove 133, (see Fig. 9^a), in which is fitted loosely a collar 134, upon the outer surface of which are the perforate lugs 135, positioned on said collar opposite the screw stems 132, and which stems extend through said lugs. Upon the screw stem on opposite sides of the respective lugs 135, are adjusting and retaining nuts 136 and 137. The type of propeller blades 120 shown are the obliquely-inclined blades, of which there may be any desired number, the blades shown in rotation obtain a push upon the

air as seen in opposite direction to the path of movement, the rotation of shaft 114 being independent of the sleeve 115, and of the propeller blades carried by the propeller shaft 118, the gear 119 being moved concentrically to the bevel gear 124, while receiving power from it.

With the upper surfaces and inner ends of the respective sleeves 115 are connected the lower ends of the operating levers 138 and 139, respectively. With the outer surfaces of the beams 22 and 23 opposite these levers are connected segment plates 140, and upon the upper ends of the levers 138 and 139 are hand levers 141, which carry detents 142, engaging in the usual manner with the notched segment plates. The power derived for propulsion of the machine is from a gas engine 145, of the approved aviation type, and therefore unnecessary for further description. The engine 145 is located in the lower portion of the vertical frame 52, and mounted on a base plate 146, which base plate is secured to the upper surfaces of the connecting tubes 68, with the forward and rear vertical tubes 53 and 54 and 57 and 58, of said frame 52. Upon the shaft 147, of the engine which is parallel with the power shaft 114, is mounted a sprocket wheel 148, which as shown is upon the right hand end of shaft 147. On the power-transmitting shaft 114, directly above the sprocket wheel 148, is a sprocket wheel 149, larger in circumference than wheel 148, over which is passed an endless sprocket chain 150, which chain also extends downwardly over sprocket wheel 148. With the inner surfaces of the collars 109, connecting the lower, forward ends of spiders 110 with the forward tubes 53 and 54, of frame 52, are rigidly connected the lugs 151. With the inner surfaces of these lugs are pivotally connected the lower ends of the levers 152 and 153, operating the planes 76 and 77. With the inner surfaces of the beams 22 and 23, opposite these levers are connected the notched segment plates 154, and upon the levers 152 and 153 are the hand levers 155, with which are connected the detents 156, which engage with the notches of the segment plates 154. With the lever 152 is pivotally connected the inner end of a connecting rod 157, the forward end of which rod is pivotally connected with the crank arm 95, on the rock shaft 90, operating both sections of planes 76 simultaneously. With the lever 153 is pivotally connected one end of the rod 158, the other end of which rod extends rearwardly to and is pivotally connected with the crank arm 108, on the rock shaft 105, operating the planes 77 simultaneously.

At the rear end of the main frame of the machine and beneath the horizontal line

of the beams 22 and 23, extending beyond the line of the rear ends of said frame, is located the long flat plate or rudder-blade 160. The pivotal support for the rudder blade consists of two-way tube joints 161, on the beams 22 and 23, immediately in rear of the two-way tube joints 21, in the lower sleeves of which is a tube connection 162, parallel with the rear, transverse beam 18, upon which beam and strip or tube 162 is secured a plate 162. Upon the rear, upwardly-bent end portion of the vertically disposed rudder blade is an upwardly-extended rudder post or pivot 164, which extends through the plate 163, and upon the upper end of said pivot is a transverse rod or bar 165. Upon the beams 22 and 23, immediately forward of the two-way joints connecting the forward, vertical tubes 53 and 54 with said beams, are the collars 166. (See Figs. 2 and 7) with which collars are connected a transverse plate or bar 167, which supports centrally the upper portion of a clutch plate 168, upon the lower surface of which plate are clutch teeth 169. Through the clutch plate extends a vertical opening 169, through which extends a pin or rod 170, upon the lower end of which rod is rigidly connected a movable clutch plate 171, having clutch teeth 172, upon its upper surface and engaging normally with clutch teeth 169. Upon the upper end of the rod is connected rigidly a transverse bar or rod 173. Extending around the rod or pin 170 is a spiral spring 172^x, the upper end bearing against rod 173, and its lower end bearing on the upper surface of the clutch plate 168.

With the ends of the rod or bar 173 are connected the forward ends of the wires 174, the rear ends of which wires extend to and are connected with the ends of the transverse rod 165, on the pivot to the rudder blade 160.

Truss wires 175 are connected with the caps 59, on the upper ends of the vertical tubes 57, 58, of frame 52, and these wires extended to and connected, respectively, with the eyes 29, on the two-way joints 13, at the forward end of the main frame, and like truss wires 176, are connected with said caps 59, and also with the eyes on the upper sleeves of two-way joints 13, at the rear ends of the main frame. Truss wires 177 are also connected with the eyes on the lower surface of the sleeves 14, of the two-way joints, at the forward ends of the main frame, and the other ends inclined downwardly and connected with the eyes 56^x, on the forward surfaces of the two-way joints 56, on the tubes 53 and 54, of frame 52, and like truss wires 178, are connected with the eyes on the lower sleeves at the rear end of the main frame, and extended forwardly and downwardly, and connected with the

eyes 16*, on the rear surfaces of the three-way sleeve joints 46, on the vertical tubes 57 and 58, of the frame 52.

The space between the longitudinal beams 22 and 23 from their forward and rear extended ends inwardly to the two-way joints 104, and also to joints 74 with which the rods 72, on the wheels 70 are connected, is covered with a fabric such as is preferred for the purpose, the fabric being secured around the beams 22 and 23, which increases the air-sustaining surfaces.

Preparatory to making a flight of the machine, the engine 145 is set in motion at slow speed, and the shaft 114 alined so that in the revolution of the propeller blades 120 the impulses are in equilibrium, and the movement of the machine adapted for progressive, even movement, or timed. In this adjustment of the power-transmitting shaft, the nuts 136 and 137 are alternately loosened and tightened on the lugs 135, and the collars 134 thereby obtaining more or less tension on the respective tubes 126, 127 and 129, in perfecting the shaft alinement.

The machine being upon the ground, as in Fig. 1, in readiness for aerial flight, the operator takes a position upon the seat 180, as indicated in Fig. 1, above the power transmitting shaft 114, and grasps with the handle the levers 138 and 139, controlling the propellers 120. The engine affording the motive power, which for illustration is shown of the gas compression and ignition type, is worked by the crank lever 145*, and set in motion at its high speed transmitting power from its shaft 147 through the sprocket chain 150, to the wheel 149, on the power-transmitting shaft 114, and thence through the bevel gear 119, and imparting rotation at high speed to the propeller blades 120.

Under the rear pushing power of the blades 120, the machine moves over the surface of the ground on its supporting wheels 65 and 70, with a momentum facilitated by the evenness of the path of travel. Upon obtaining the requisite degrees of speed for said flight the operator grasps the lever 152, and releasing the detent 56 from the segment plates moves the lever forwardly, thereby imparting motion to the forward rock shaft 90, and moving the rear ends of the planes 76 upwardly at an angle to the horizontal plane of the frame of the machine, and as seen in dotted lines in Fig. 6, after which adjustment of the planes the detent on said lever is again caused to engage the notched segment plate 154. The hand lever 141, on the levers 138 and 139, are now operated to release the detents from the segment plate 140, and these levers are moved rearwardly and in gradual degree, thereby imparting a partial rotation to the shaft 114, and moving the longer portions of the bars 116, support-

ing the propeller shafts downwardly, and changing the angle of the propeller blades, which are now caused to obtain a downward beating movement, upon the air and under the propulsion of the propeller blades 120, the forward planes 76, take the air currents without retardation, and the machine obtains its ascent from the power of the propeller blades. The impact of the rapid currents of air which impede the ordinary aeroplanes in attempting to fly are, in my invention, permitted to give a parachute effect to the planes, the forward planes 76, being adjusted upon obtaining the height desired in a horizontal position with the frame of the machine, and under the downward push now afforded by the propeller blades a complete equilibrium of the machine is capable of being obtained, and with the advantages of aerial support obtained by the parachute position of both planes.

In obtaining a change of direction of the machine, or in completing a circuitous movement in flight, the hand lever, or one of the levers 138 or 139 (depending upon the direction of the movement) is moved forwardly, and the blades of the propeller actuated by the lever assume a nearly vertical position, the other blades of the propeller at the end of the shaft 114, maintaining their downward position. Upon completing this movement of one of the levers 138 or 139, the operator grasps the handle 173*, on the transverse bar 173, and at the same time imparting a downward pressure or movement to the stem or pin 170, compressing the spring 174 and releasing the lower clutch plate from the upper clutch plate 168. The handle 173* is then moved to the right or left, according to the direction of movement in circuitous descent, which action draws upon the wires 174, connected with the transverse rod 165, on the pivot 164, connected with the steering blade or rudder 160, and the steering blade is moved laterally in the descent direction. Upon the completion of the movement of the change of direction of the machine and the return of the handle 173* to its normal position, downward pressure is relieved and engagement of the clutch is effected by self action of the spring 172*.

The equilibrium of the machine is due to the fact that the center of gravity is within the suspensory frame 52, the weight of the engine, as well as the additional weight of the traveling wheeled supports tend to maintain this equilibrium, and under the moderate speed of propulsion from the propeller blades the parachute effectiveness of the planes 76 and 77 is consequently obtained. In order to obtain elevation in flight, the lever 138 is moved rearwardly in a gradual movement to the position seen in Fig. 3, upon the completion of which movement the forward planes 76 are in the lower

position seen in dotted lines in Fig. 6, the rear end of the forward planes being below the horizontal plane of the frame of the machine, and the levers 80 and 94 extended in direct lines, the currents of air striking the now inclined planes, the machine obtains the ascending in height, or elevation in air above the ground.

The rear planes 77 have, as before stated, a movement at their rear ends to the limit of the height of the rock shaft 105, and during flight the position of the planes is horizontal with a plane horizontal with the frame of the machine. In ascending from the ground, however, the operator may grasp the levers 139, and operate the rock shaft 105 by a forward movement, and thus move downwardly the rear edge of the rear planes 77, as seen in dotted lines in Fig. 3, thus aiding to effect an upwardly inclination of the machine for quick ascents, these planes 77, however, being quickly returned to their normal position. The position of the rock shafts 105 and 90, which are directly above the rear ends of the respective planes 76 and 77, afford an element of safety, especially in making a turn or tacking, when the wind impact upon the planes is sudden, and with great stress upon the planes, and under whatever circumstances the planes can rise no higher than the rock shafts to imperil the safety of the machine.

By means of the plural pivotally connected arms of the planes and rock shafts, the rear edges or free ends of the planes are made capable of being adjusted above and below the horizontal axis of the main frame. This meets the requirements which have not hitherto been attained, for the reason that the rock-shafts are adapted to afford relatively to the main frame a large arc of movement of its arms, and with the jointed connection of said arms with the arms on the free ends of the planes, a movement of these free ends is capable of affording fundamentally, a broad wind resisting breast of increasing amplitude. In a rapidly gliding descent therefore of the aeroplane from an elevation in air toward the ground an effective resistance to high speed is obtained by the extension arms.

It will be observed, that in my machine the operator has a field of observation unusual in aeroplanes, and above the planes 76 and 77, and therefore the progressive movements of the machine may be timed and the planes brought into play with facility.

The suspensory feature of the central, vertical frame with its weight, obviates all danger from overturning in changing direction of movement, especially with the usual rapidity, when under ordinary propulsion from the propeller, and the open space between the planes permits the rush of air in descent, thereby preserving its equilibrium.

In descents of the machine the propeller blades are moved from their inclined position toward a vertical position, and the forward planes 76 elevated at their rear ends, and a downward, gliding movement toward the ground is effected, or the planes may be placed in a horizontal position and the propellers slowed down and the alighting obtained with the parachute effectiveness from the buoyancy of the planes 76 and 77, the adaptability of the planes being such as to be inclined so as to obtain the funnel concentration of the air. It will be observed that the propellers 120 may be moved by the hand levers 138 and 139 to their lowest position downwardly below the horizontal axis of the main frame, and to a vertical position, or to any intermediate angle of inclination, while the engine is imparting rotation to the line shaft within the sleeves 115.

For high speed propulsion of the machine the propellers are placed forward of a vertical line extending through the forward beam 17, of the main frame and as seen in the modified form in Fig. 10. In this construction the machine is essentially the same as in Fig. 1, dispensing with the transverse shaft 114, and levers 138, 139, and having the addition of truss wires 182, which are connected with the sleeves 33, on the side beams 12, of the main frame, and extend downwardly and inwardly, and are secured to the eyes 56, on the outer surfaces of the three-way tube joints 56, and the lower portions of the vertical tubes 53 and 57, of the frame 52. The engine 182 is supported by the transverse tube connections 183, with the vertical tubes 53 and 57, at a point above the lower end of the suspensory frame 52, about one-third the distance rearwardly toward the longitudinal beams 22 and 23, and the engine placed in position with its shaft 184 directed forwardly, and to said end is connected a knuckle joint 185. With this knuckle joint is connected the inner end of the power-transmitting or line shaft 186, the outer end of said shaft extending past the supporting rods 72 and supporting the forward end of the machine on the single wheel 70, and upon said end is a knuckle joint 187.

Upon the forward ends of the centrally disposed longitudinal beams or tubes 22 and 23 is connected a shaft-hanger 188, as seen in detail in Fig. 11. This hanger consists of a transverse bar 189, having sockets 190 at the outer ends, and which receive the forward ends of the said centrally disposed tubes or beams 22 and 23. The inner ends of the bar 189 extend to and are rigidly connected with a circular casing 191. With the end portions of the bar 189 and the sockets 190 are connected the inner ends of the bars 192, the outer ends of which extend forwardly a short distance, and with said for-

ward ends is connected the outwardly curved bearing 193, in which is a transverse opening 194, the lower portion of the bearing 134 being slightly higher than the lower portion of the bearing 191.

The knuckle joint 187 extends within the casing 191, and with said joint is connected the inner end of a propeller shaft 195, the outer end of which shaft extends within the bearing 194 and to a considerable distance past the line of the outwardly-curved surface of said bearing, in which it is afforded a lateral movement to the desired extent, and upon the outer end of said shaft 195 are the propeller blades 196. Upon the inner end of the propeller shaft is a pin 197, which extends upwardly through an opening 198, in the casing 191, and with said pin is connected rigidly the inner end of a crank arm 199, the outer end being forked at 200. With the forked end 200, of said arm, is pivotally connected the inner end of an operating rod 201. Upon an outward extension of the same pivot upon which the lever 152 operating the forward planes is mounted, is also mounted the lower end of an operating lever 202, this lever being adjacent to the outer surface of the notched segment plate 202*, and its detent 204, adapted to engage therewith, the detent being operated by a hand lever 204, precisely the same as the hand lever on lever 154. With this lever 202 is pivotally connected the inner end of the rod 186, operating the propeller shaft. The propeller blades as shown are the same as the propeller blades 120, the direction of rotation, however, of the blades 196, is reversed in rotation, which action causes a suction or drawing upon the air, in a plane slightly inclined to the horizontal plane of the main frame of the machine. The advantage of the lateral movement of the propeller shaft 195 enables the direction of movement of the machine to be changed either to the right or to the left, as may be desired, the propeller blades 196 obtaining a purchase upon the air corresponding thereto.

The operator in the high speed or racing machine shown in Fig. 10, adjusts the levers 152 and 153, and manipulates the planes 76 and 77, so as to obtain all of the benefits derived from the movement and adjustment of the planes, as heretofore described, for rapid ascent and declination of the body of the machine for descent, and also for preserving the equilibrium of the machine under all conditions of the wind.

I have shown the machine made in construction from tubing, but this may be varied, and such other material employed as is suitable for the purpose.

Other modifications may be made in the invention, and are embraced comprehensively in 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 the combination with a main frame a pivoted air plane carried by the main frame, arms pivoted to said plane, a rock shaft on said main frame crank arms on said rock shaft and separate arms on the rock shaft pivotally connected with the pivoted arms on the air plane and means for operating the crank arms on the rock shaft.

2. In a flying machine the combination with a main frame a centrally disposed vertical inner frame supported by the main frame independent pivoted air planes on the main frame located forwardly and rearwardly of the vertical inner frame and pivotally connected arms on said air planes, rock shafts carried by the main frame crank arms on said shafts and separate arms on the rock shafts pivotally connected with the pivoted arms on the pivoted air planes and means for operating the crank arms on the rock shafts.

3. In a flying machine, a main frame, and air planes supported by said frame, longitudinal centrally-disposed beams supported by the main frame, a rudder and a rudder post supported by the main frame, a transverse bar on the rudder post, and steering wires connected at their rear ends with said bar, a transverse bar on the said longitudinal beams, a clutch having fixed and movable portions and the fixed portion connected with said bar, and a pivot or rod extending therethrough and connected with the other movable portion of said clutch, a transverse bar on said rod or pivot, with which the forward ends of the steering wires are connected, and a spring between said bar and the fixed portion of the clutch.

4. A flying machine, consisting of a main frame composed of longitudinal beams, and transverse end beams, longitudinal centrally disposed beams supported by the forward and rear end beams, a suspensory frame connected therewith, an engine supported by said suspensory frame, a propeller and propeller shaft, a power transmitting shaft connected with the engine and the propeller shaft, means connected with the suspensory frame and the main frame for supporting the machine in progressive movement upon the ground, pivoted air planes, located forwardly and rearwardly of the suspensory frame, and rock shafts journaled on the main frame, arms on the rock shafts, pivotally connected with the pivoted air planes, operating levers on the suspensory frame, crank arms on the rock shafts, and connecting means connecting said arms with the operating levers.

5. In a flying machine, a main outer frame, composed of longitudinal side beams,

and transverse forward and rear beams, two-way sleeve joints connecting the end beams with the side beams above the horizontal plane of the latter, forward frames 5 having air-sustained coverings pivotally connected with the forward end beams, a forward rock shaft journaled in suitable bearings adjacent to the rear ends of said forward frames, arms on said shaft connected 10 with the forward frames, a transverse shaft mounted in suitable bearings on the side beams in rear of a point intermediate the forward and rear ends of said main frame, a rear frame having suitable covering pivoted to the latter transverse shaft, 15 and a rear transverse rock shaft mounted in suitable bearings on the side beams of said frame, adjacent to the rear end of said covered rear frame, arms on said shaft connected with the rear end of said frame, crank 20 arms on the rock shafts, and means for operating said crank arms.

6. In a flying machine, the combination with a main frame of separate forward and 25 rear planes, both the forward and rear planes being pivoted at their forward edges upon transverse shafts carried in bearings upon the main frame, and said shafts located at the forward end of the main frame

and to the rear of the transverse axis of 30 the main frame, respectively, transverse rock shafts on the main frame directly above the rear vertically movable free ends of the planes, arms on said rock shafts, and separating arms pivotally connected with the 35 arms on the rock shafts and with the rear vertically movable ends of said planes, and means for operating said rock shafts.

7. In a flying machine, the combination with a main frame, and longitudinal centrally disposed beams spaced apart and extending beyond the forward and rear ends of said main frame provided with a suitable covering extending from one beam to the 40 other, forward and rear air-sustained planes comprising sectional frames, transverse beams on said main frame to which the sectional frames are pivoted, rock shafts upon said main frame above the vertically movable ends of said frames, and supports there- 45 for on the main frame, arms on said rock shafts, separate arms pivotally connected therewith and with the sectional frames, and means for operating the rock shafts. 50

WILLIAM D. LINDSLEY.

Witnesses:

ROBERT O. McLIN,
ANNIE L. GREER.