J. SKORUPA.

AEROPLANE.

APPLICATION FILED DEC. 1, 1910.

990,015.

Patented Apr. 18, 1911

6 SHEETS—SHEET 1.

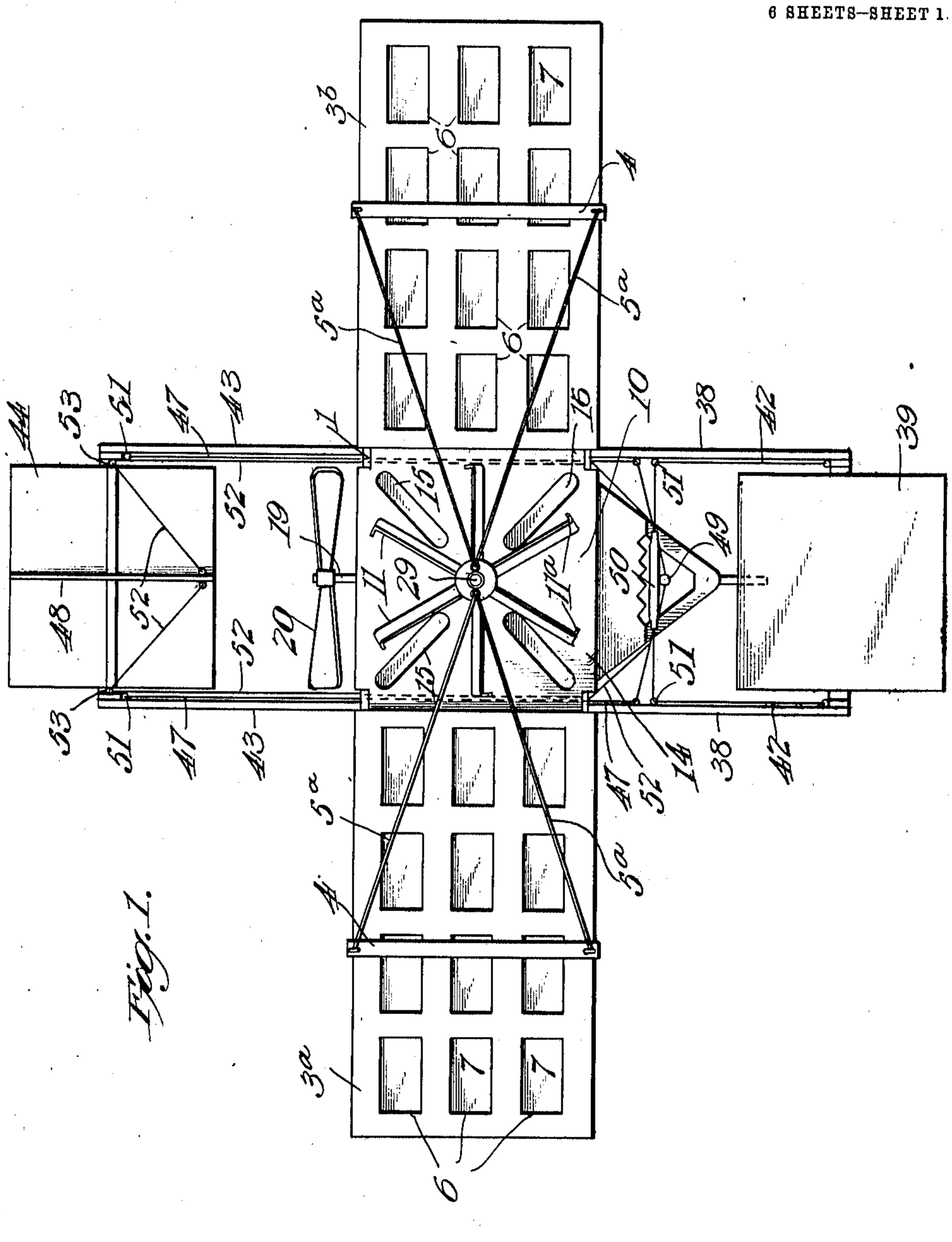

Fig. 1.

6

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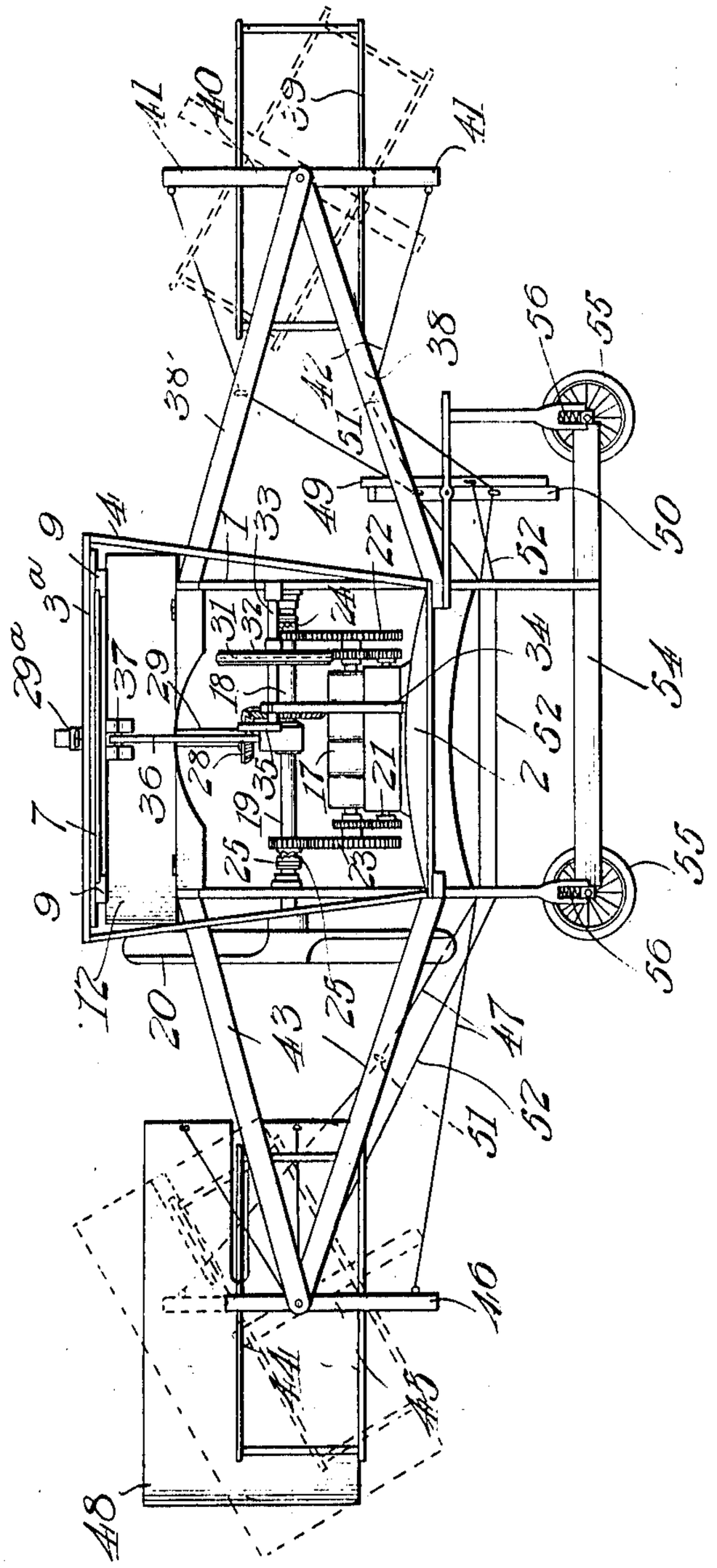
6 SHEETS—SHEET 2.

Fig. 2.



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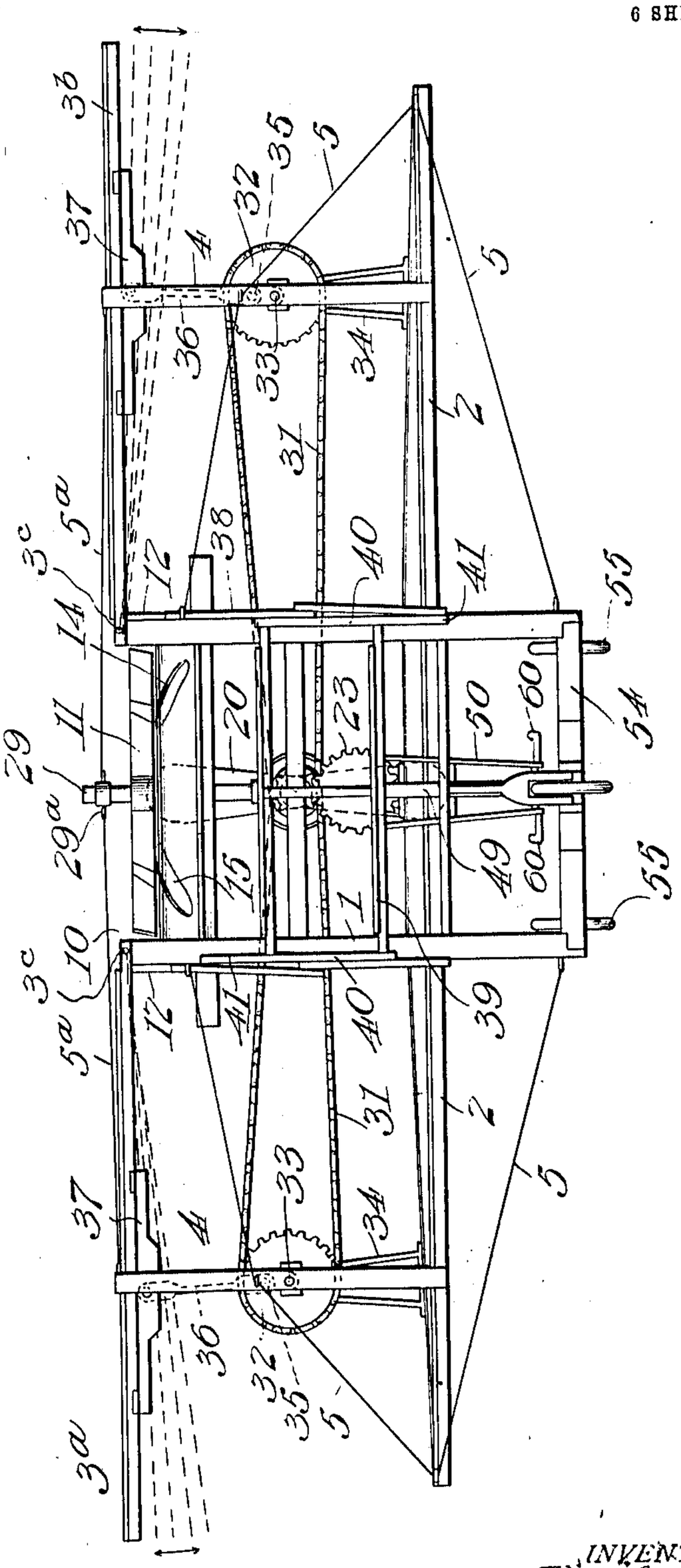
6 SHEETS—SHEET 3.

Fig. 3.



WITNESSES.

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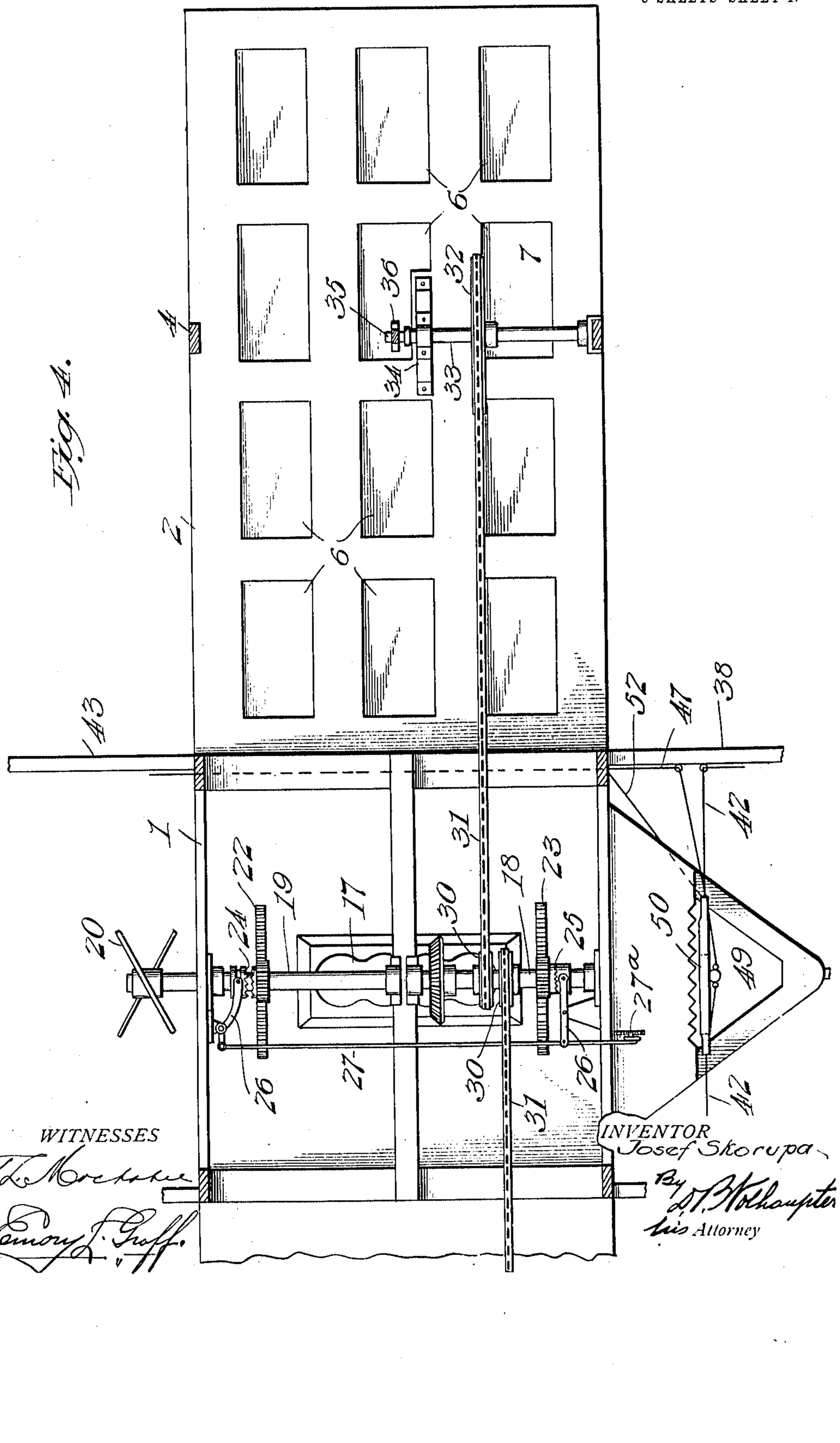
6 SHEETS—SHEET 4.

Fig. 4.



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6 SHEETS—SHEET 5.

Fig. 5.

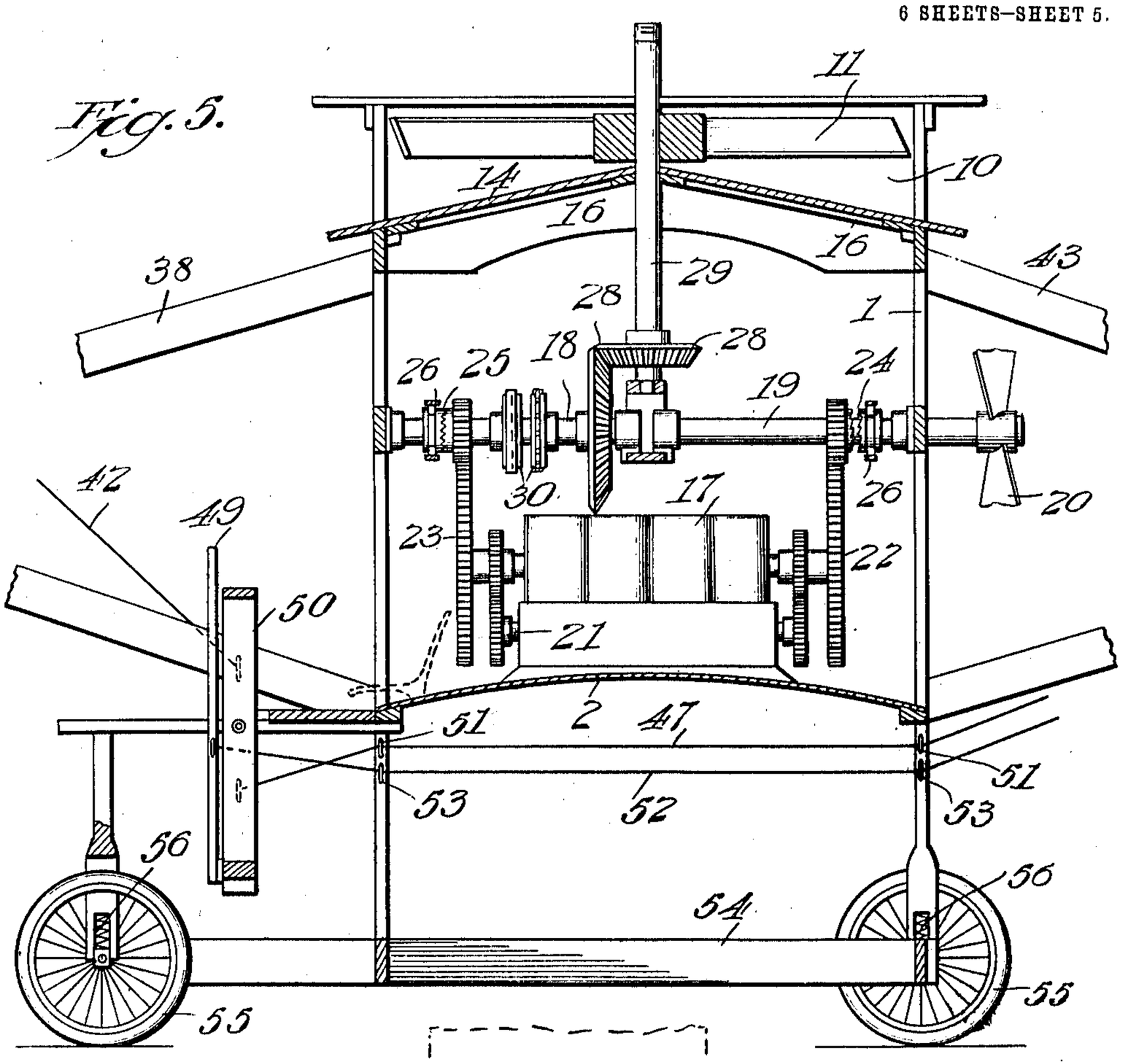
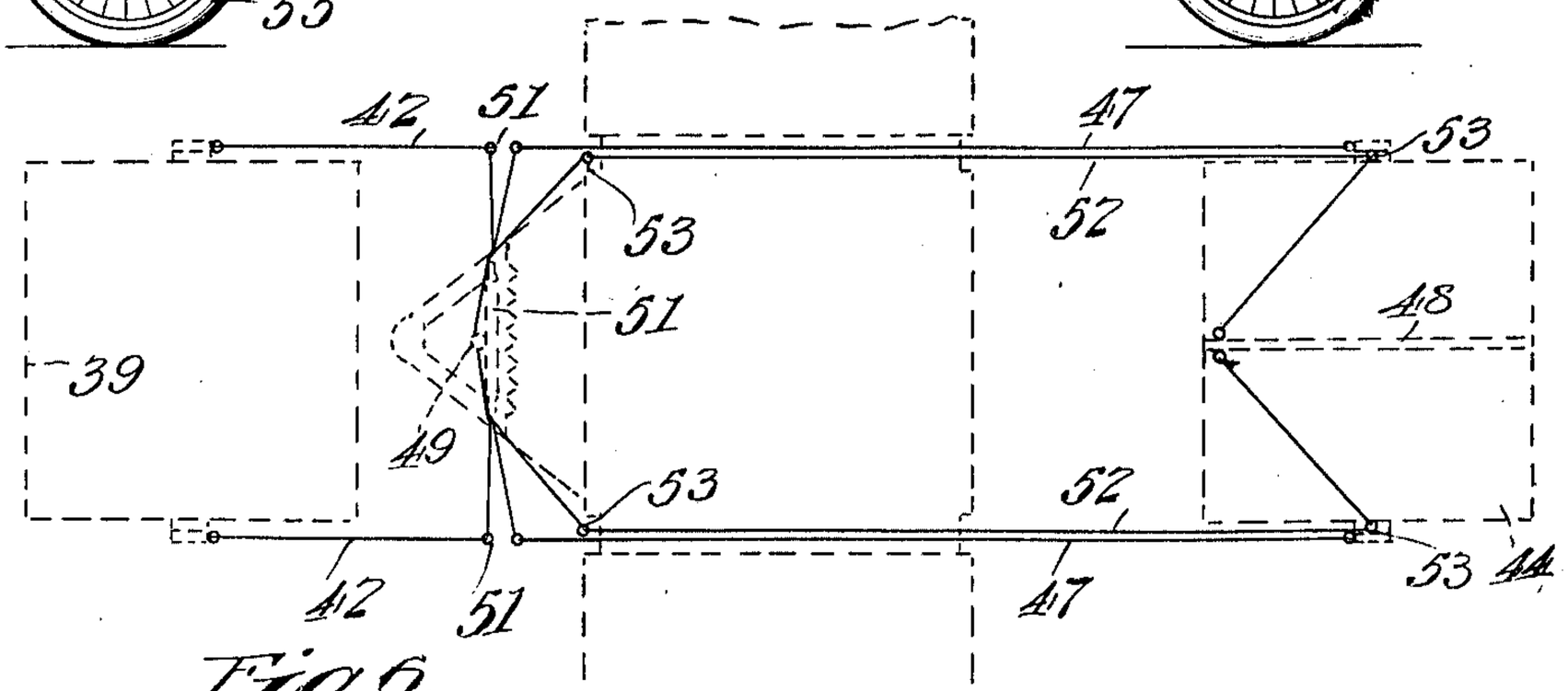


Fig. 6.



WITNESSES

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6 SHEETS—SHEET 6.

Fig. 7.

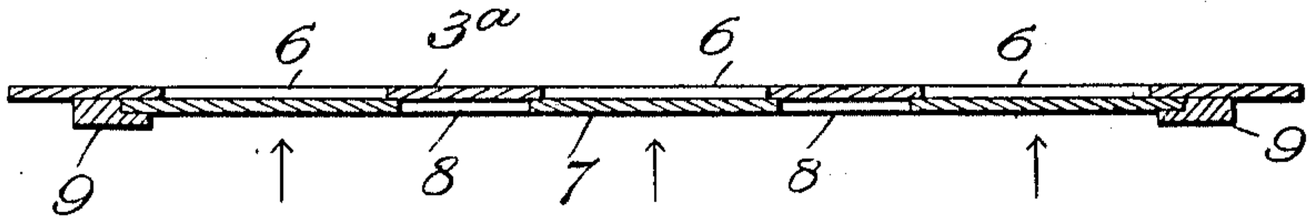


Fig. 8.

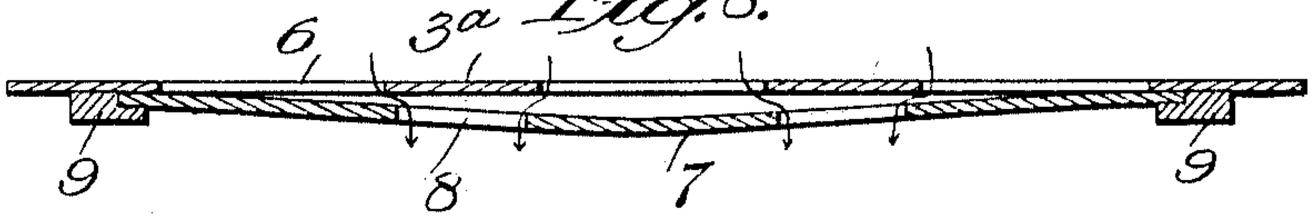
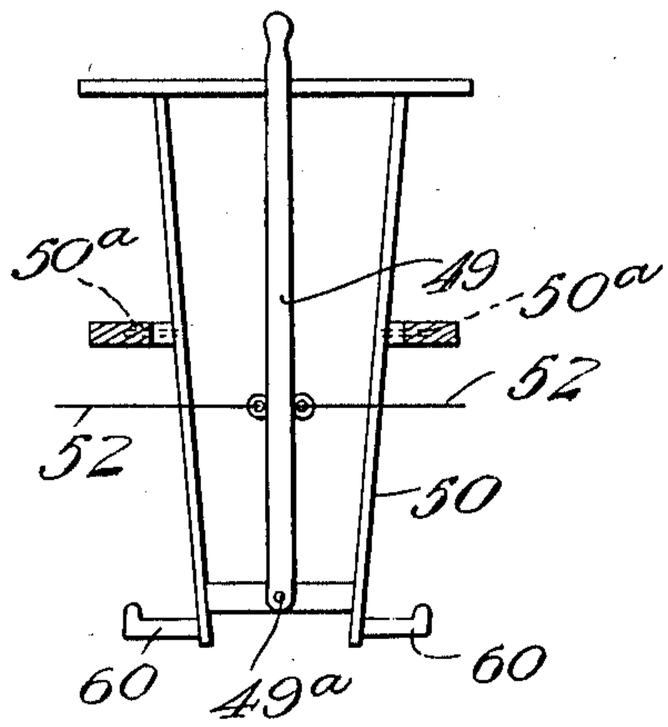


Fig. 9.



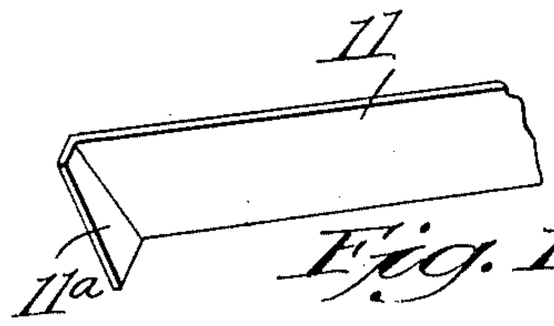


Fig. 10.

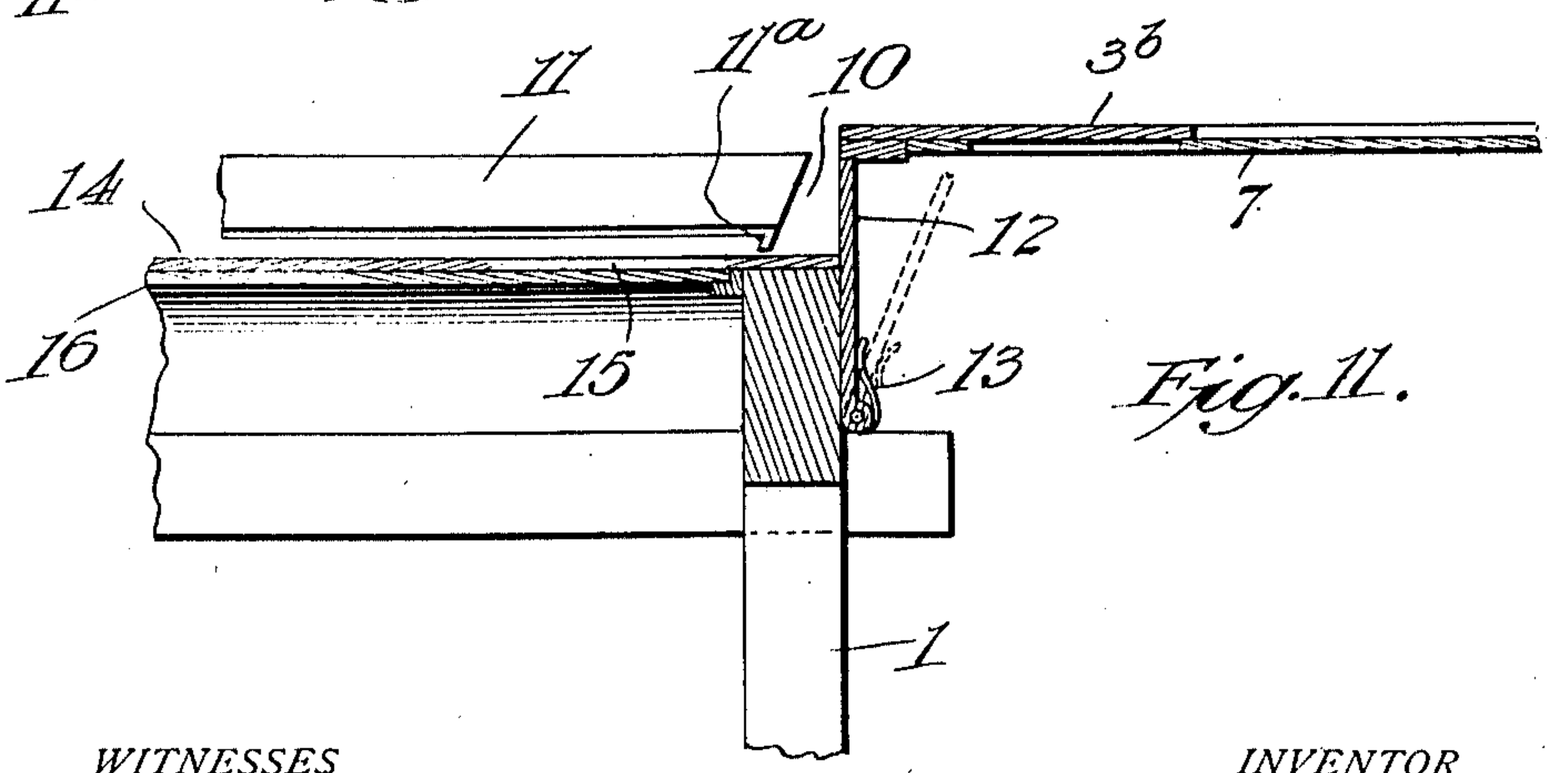


Fig. 11.

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UNITED STATES PATENT OFFICE.

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AEROPLANE.

990,015. Specification of Letters Patent. Patented Apr. 18, 1911.

Application filed December 1, 1910. Serial No. 595,161.

To all whom it may concern:

Be it known that I, JOSEF SKORUPA, a citizen of the United States, residing at Alpha, in the county of Warren and State of New Jersey, have invented certain new and useful Improvements in Aeroplanes, of which the following is a specification.

The present invention relates in general to aerial navigation, and more particularly to flying machines of that type which are heavier than air and are commonly termed aeroplanes.

One of the objects of the invention is the provision of an aeroplane embodying novel features of construction whereby it can be caused to ascend from the ground in a substantially vertical direction when starting upon a flight, and then caused to traverse the air in any direction after the desired height has been reached.

A further object of the invention is to construct an aeroplane in such a manner as to offer only a comparatively small resistance to the air when ascending, the planes being valved so that air can pass downwardly through the same when the air pressure is against the top thereof, while the valves close automatically and cause the planes to have the usual sustaining power when the air pressure is against the bottom thereof.

A still further object of the invention is the provision of novel means for controlling the guiding and stabilizing planes at the front and rear of the machine, and also for controlling the rudder which is utilized for directing the movements of the machine either to the right or to the left.

With these and other objects in view, the invention consists in certain combinations and arrangements of the parts as will more fully appear as the description proceeds, the novel features thereof being pointed out in the appended claims.

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

Figure 1 is a top plan view of an aeroplane constructed in accordance with the present invention. Fig. 2 is a side elevation of the aeroplane, the guiding and stabilizing planes at the front and rear thereof being indicated by dotted lines in the position assumed when the machine is properly adjusted for rising vertically into the air. Fig. 3 is a front view of the aeroplane. Fig. 4 is an enlarged horizontal sectional view through the aeroplane, one side thereof and the forwardly and rearwardly projecting frames being removed. Fig. 5 is a vertical longitudinal sectional view through the central portion of the aeroplane, showing the gearing for operating both the lifting propeller and driving propeller. Fig. 6 is a diagrammatic view of the connections between the controlling lever and the front and rear planes as well as the rudder which is carried by the rear planes. Fig. 7 is a transverse sectional view through one of the planes showing the valved construction thereof and the position assumed thereby when the pressure is against the under surface of the plane. Fig. 8 is a similar view showing the positions assumed by the parts when the pressure is against the upper surface of the plane. Fig. 9 is a detail view of the controlling lever and the tilting support upon which it is mounted. Fig. 10 is a detail view of the outer end of one of the blades of the lifting propeller, and Fig. 11 is a transverse sectional view through one side of the chamber in which the lifting propeller is mounted.

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

The invention is illustrated and will be described as embodied in a flying machine formed with two superposed main planes and having the general construction of those machines which are commonly termed biplanes.

The numeral 1 designates the main frame which is located at substantially the central portion of the machine and has the two supporting planes projecting upon opposite sides thereof. The lower plane 2 is shown as having the usual arched cross section, while the upper plane is formed in two sections 3^a and 3^b which are pivotally connected to the main frame at their inner ends as at 3^c and are adapted to have a limited up and down swinging movement as indicated by the dotted lines on Fig. 3. These upper plane sections 3^a and 3^b are received within arch shaped guide frames 4 which project upwardly from the end portions of the lower plane 2 and are held rigidly in position in some suitable manner as by means of the braces 5. Both the upper and lower

planes have a valved construction so as to offer a comparatively small amount of resistance to the air when the machine is moving upwardly, and by referring more particularly to Figs. 7 and 8 of the drawing, it will be observed that the planes are formed with a number of openings 6 and have flexible sheets 7 applied to the lower faces thereof, the said flexible sheets being formed in turn with openings 8 which are out of alinement with the openings in the planes. When the machine is moving upwardly into the air, the pressure upon the top of the planes will move the flexible sheets 7 downwardly away from the said planes, as indicated in Fig. 8, and air can then pass freely between the planes and the flexible sheets and through the openings 6 and 8. However, when there is air pressure against the lower surface of the planes, the flexible sheets 7 are forced closely against the same so as to close the openings and prevent the passage of air upwardly through the planes. With this construction, it will be obvious that the planes will have the usual sustaining qualities when the machine is being driven laterally through the air in the usual manner or when descending, but that when ascending, air will pass freely through the planes in a downward direction and thereby very materially reduce the resistance of the planes to the air. The flexible sheets 7 may be applied to the lower surfaces of the planes in any suitable manner, although in the present instance, the front and rear edges of the flexible sheets are shown as engaged by strips 9 applied to the planes at the front and rear thereof.

A chamber 10 within which the lifting propeller 11 is mounted is arranged at the top of the main frame 1 between the two sections 3^a and 3^b of the upper plane, the top and ends of the chamber 10 being open, while the sides thereof are normally closed by means of the outwardly opening flaps or valve members 12, the said valve members being hinged at the lower edges thereof and normally held in a closed position by means of the springs 13. When the lifting propeller 11 is in operation, the valve members 12 will open outwardly against the action of the springs 13 should there be any appreciable amount of pressure thereon, and all back pressure will thus be eliminated. In the preferred construction of the lifting propeller 11, the blades thereof are provided at their extremities with the flanges 11^a which project circumferentially in the direction of rotation and serve to prevent end slip, thereby increasing the efficiency of the propeller. The bottom 14 of the chamber 10 is arched longitudinally with respect to the machine and has a valved construction somewhat similar to that previously described in connection with the main planes so as to offer as little resistance as possible to the air when the machine is ascending. More specifically describing this valve construction, it will be seen that the bottom 14 of the chamber is formed with a number of openings 15 and has a perforated flexible sheet 16 applied to the lower face thereof, the said flexible sheet being forced upwardly against the bottom 14 so as to prevent the passage of air through the same when there is an upward air pressure against the bottom, but opening away from the said bottom so as to permit the downward passage of air through the same when the machine is rising in the air and there is a downward pressure of air against the top of the bottom.

An engine 17 is mounted over the central portion of the lower plane 2 and a pair of longitudinally disposed shafts 18 and 19 are shown as journaled upon the main frame 1 over the engine, the said two shafts 18 and 19 being in alinement with each other and the rear shaft 19 extending slightly beyond the main frame and having the driving propeller 20 applied directly thereto. One end of the engine shaft 21 is connected by a train of gearing 22 to the rear shaft 19, while the opposite end of the engine shaft is connected by a train of gearing 23 to the forward shaft 18. A clutch 24 is provided for locking the shaft 19 with the gearing 22 or permitting the gearing to turn independently of the shaft, and a similar clutch 25 is interposed between the forward shaft 18 and the gearing 23. These clutches 24 and 25 are controlled by shifting levers 26, the said shifting levers being pivotally mounted at points between their ends and being connected by a rod 27 which extends forwardly to the hand lever 27^a so as to be conveniently manipulated by the aviator. When the rod 27 is moved rearwardly to the limit of its movement, the clutch 24 is closed and the clutch 25 opened, thereby causing the engine to impart motion to the rear shaft 19 and operate the driving propeller 20, while when the rod 27 is moved forwardly to the limit of its movement, the clutch 24 is opened and the clutch 25 closed so that the shaft 18 is driven by the engine, while the shaft 19 remains stationary. The inner end of this shaft 18 is connected by the bevel gearing 28 to the lower end of a vertical shaft 29 which projects upwardly through the chamber 10 and has the lifting propeller 11 applied thereto. The upper end of the vertical shaft 29 is provided with a cap 29^a which is connected by the braces 5^a to the top of the arched guide frames 4 at opposite sides of the machine. The lifting propeller 11 revolves in a horizontal plane and tends to force the air downwardly so as to lift the aeroplane in a substantially vertical direction, while the driving propeller 20 turns in a vertical plane and is employed for producing the

usual lateral movement of the aeroplane after the machine has been lifted into the air to the desired height by the lifting propeller 11. When the rod 27 is moved in one direction, the lifting propeller 11 is thrown into operation, the driving propeller 20 remaining at a standstill, while when the rod 27 is moved in the opposite direction the lifting propeller 11 remains at a standstill and the driving propeller 20 is thrown into operation. It will also be apparent that by shifting the rod 27 into an intermediate position both of the clutches 24 and 25 could be opened so that power would be transmitted neither to the lifting propeller nor the driving propeller, should any emergency necessitate that both of the propellers be thrown out of operation.

The forward shaft 18 is also provided with a pair of sprocket wheels 30 engaging chains 31 which extend in opposite directions and pass around similar sprocket wheels 32 upon the countershafts 33, the said countershafts being parallel to the shaft 18 and being arranged between the upper and lower planes at opposite sides of the machine. In the present instance these countershafts are shown as journaled between the forward arms of the arch shaped braces 5 and brackets 34 projecting upwardly from the lower plane 2. The rear end of each of the countershafts 33 is provided with a crank 35 which is connected by a pitman 36 to a block 37 or other suitable member upon the respective section of the upper plane. With this construction, it will be obvious that when the forward shaft 18 is in motion and the lifting propeller 11 is being driven, power is also transmitted to the countershafts 33 which operate through the cranks 35 and pitman 36 to move the sections 3^a and 3^b of the upper plane up and down as indicated by the dotted lines on Fig. 3. This up and down swinging movement or flapping of the upper plane sections assists in lifting the machine, since the planes have a valved construction, as has been previously described, and offer much less resistance to the air upon their upward movement than upon their downward movement.

Projecting forwardly from the machine at opposite sides of the main frame 1 are the spaced arms 38 upon which the forward planes 39 are mounted. These forward planes are of the usual construction, having a spaced and parallel relation to each other, and are connected at their sides by the bars 40 which are pivotally mounted upon the forwardly extending arms 38 so as to turn about a substantially horizontal axis disposed at right angles to the line of flight. One of the bars 40 extends upwardly above the planes 39, while the opposite bar 40 extends downwardly below the said planes, upwardly and downwardly projecting arms 41 being thereby provided to which cables 42 are connected for tilting the planes. In a somewhat similar manner, a pair of arms 43 extend rearwardly from the machine at opposite sides of the main frame 1 and have the rear planes 44 mounted thereon. These rear planes are similar in construction to the forward planes, having a spaced and parallel relation to each other, and being connected at their sides by the bars 45 which are pivotally mounted upon the rearwardly extending arms 43 so as to turn about a horizontal axis. It will also be observed that one of the bars 45 is extended upwardly above the rear planes and the opposite bar 45 downwardly below the said planes to provide the arms 46 to which cables 47 are connected for controlling the rear planes. The rudder 48 for directing the movements of the machine either to the right or to the left while in flight is mounted upon the rear planes 44, the said rudder intersecting the said planes and being vertically disposed. The rear end of the rudder 48 is rigid with the planes 44, while the forward end of the said rudder is flexible and can be flexed to either side as may be desired.

The controlling lever 49 is carried by a swinging support 50 and is pivoted at one end thereof at 49^a to the support so as to have a lateral swinging movement independent thereof. The support 50 is shown as being in the nature of a frame which is pivotally mounted between its ends at 50^a so as to turn about a horizontal axis and swing backward and forward in the direction of the line of flight. The lever 49 is carried by this swinging frame 50 and moves therewith, but is also adapted to swing laterally upon the frame independently thereof. The cables 42 and 47 from the front and rear planes respectively pass through suitable guide members 51 and have an operative connection with the swinging lever support 50 so that by moving this supporting frame 50 to the front or to the rear the front and rear planes can be simultaneously manipulated. It will also be observed that the lever 49 is connected to cables 52 which pass through suitable guide members 53 and are connected to the forward and flexible end of the rudder 48, a pair of the said guide members 53 being carried by the rear planes at the axis thereof so that the tilting of the rear planes will not interfere in any manner with the manipulation of the rudder. It will thus be obvious that the aviator need only grasp the lever 49, and that by moving the same either to the front or to the rear the lever support 50 can be tilted to manipulate the front and rear planes, while by moving the lever laterally, the rudder 48 can be properly manipulated.

A wheel frame 54 is applied to the main frame 1 at the bottom of the machine, the

said frame being provided with wheels 55 which support the machine and enable it to be moved over the surface of the ground when not in flight. Any suitable cushioning means such as the springs 56 may be employed in connection with the wheels and wheel frame for absorbing the shocks and jars and preventing the same from being transmitted to the main frame and parts mounted thereon.

As has been previously mentioned, one of the primary objects of this invention has been the construction of an aeroplane which will rise upwardly at the beginning of a flight without the necessity of employing expensive and complicated launching mechanism or of first propelling the machine along the ground until a sufficient velocity is obtained to throw the main planes into action and lift the machine into the air. When starting upon a flight with an aeroplane constructed in accordance with the present invention, the rod 27 would be moved forwardly to open the clutch 24 and close the clutch 25, thereby causing the engine to drive the lifting propeller 11 and flap the sections 3^a and 3^b of the upper plane. The lifting propeller would tend to pull the machine vertically upward, and the flapping of the valved planes would have a like tendency, for reasons which have been previously explained. When the machine is rising vertically into the air, the front planes 39 and rear planes 44 will preferably be adjusted, as indicated by dotted lines in Fig. 2, so as to be inclined upwardly toward the center of the machine, since in this position they will offer a minimum amount of resistance to the lifting of the machine by the lifting mechanism. After the machine had reached the desired height, the aviator would suitably adjust the front and rear planes and move the rod 27 to the rear so as to close the clutch 24 and open the clutch 25 and thereby cause the engine to rotate the driving propeller 20 for driving the machine laterally through the air in the usual manner, the lifting mechanism being simultaneously thrown out of operation. The flight of the machine could then be directed either up or down or to the right or to the left through the medium of the lever 49, as has been previously described.

To assist the operator in his control of the machine, the frame 50 may be provided with the foot rests 60 as indicated, so that the operator may be seated in such a manner that he can have both a hand and foot control of his manipulating elements 49 and 50.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent, is:—

1. An aeroplane including valved superposed planes, the said planes being made up of two layers of superposed material having staggered openings therein and designed to separate to permit the passage of air through the same in one direction but to close together to prevent the passage of air through the same in the opposite direction, the upper plane being formed in transversely spaced sections, means for imparting an up and down movement to the sections of the upper plane, a lifting propeller mounted between the sections of the upper plane, and means for driving the lifting propeller.

2. An aeroplane constructed with a propeller chamber open at the top and ends thereof and formed with a valved bottom, said bottom being made up of two layers of superposed material having staggered openings therein and designed to separate to permit the passage of air through the same in one direction but to come together to prevent the passage of air through the same in the opposite direction, outwardly opening flaps at the sides of the chamber, yielding means holding the flaps normally in a closed position, and a lifting propeller mounted within the chamber.

3. An aeroplane constructed with a propeller chamber having a valved bottom made up of two layers of superposed material having staggered openings therein, the said two layers of material being designed to separate to permit the downward passage of air therethrough but to come together to prevent the upward passage of air therethrough, and a lifting propeller mounted within the chamber.

4. An aeroplane constructed with a propeller chamber open at the top and ends thereof and formed with a longitudinally arched bottom, outwardly opening flap valves yieldingly closing the sides of the chamber, and a lifting propeller mounted within the chamber.

5. An aeroplane constructed with a propeller chamber open at the top and ends thereof and formed with a longitudinally arched bottom, the said bottom being made up of two layers of superposed material having staggered openings therein and adapted to separate to permit the downward passage of air therethrough but to come together to prevent the upward passage of air therethrough, flap valves yieldingly closing the sides of the chamber, and a lifting propeller mounted within the chamber.

6. An aeroplane including a main frame, a lower plane rigid with the main frame and projecting upon opposite sides thereof, arch shaped guide members carried by the ends of the lower plane, and an upper plane formed in sections which are hinged at their inner ends to the main frame, the said sections of the upper plane being received within the arched guide members of the lower plane.

7. An aeroplate including a main frame

having a propeller chamber at the top thereof, a lower plane rigid with the main frame and projecting upon opposite sides thereof, an upper plane formed in sections which are hinged at their inner ends to the main frame at opposite sides of the propeller chamber, guide means for the sections of the upper plane carried by the lower plane, a vertical shaft projecting through the propeller chamber, a lifting propeller applied to the shaft and arranged within the propeller chamber, a cap applied to the upper end of the vertical shaft, and braces between the cap and the guide members upon the lower plane.

8. An aeroplane including a main frame formed at the top thereof with a propeller chamber, a lower plane rigid with the main frame and projecting upon opposite sides thereof, arch shaped guide members projecting upwardly from the opposite end portions of the lower plane, an upper plane formed in sections which are hinged at their inner ends to the main frame on opposite sides of the propeller chamber, the said sections of the upper plane being received within the arch shaped guide members of the lower plane, a vertical shaft projecting through the propeller chamber, a lifting propeller applied to the shaft and arranged within the propeller chamber, a cap applied to the vertical shaft, and brace members between the cap and the arch shaped guide members.

9. An aeroplane including a main frame provided at the top thereof with a propeller chamber open at the top and ends, a lower plane rigid with the main frame and projecting upon opposite sides thereof, an upper plane formed in sections which are connected at their inner ends to the main frame upon opposite sides of the propeller chamber and at the top of the said chamber, and a lifting propeller mounted within the propeller chamber.

10. An aeroplane including a steering plane mounted to turn about a horizontal axis, a rudder mounted upon the steering plane and adapted to be swung laterally, guide members applied to the steering plane at the axis thereof, means for moving the steering plane, cables passing around the guide members and connected to the rudder, and means for manipulating the cables to move the rudder.

11. An aeroplane including a steering plane mounted to swing about a horizontal axis, a rudder mounted upon the steering plane and adapted to be moved laterally, an upright lever supporting frame pivotally mounted to swing about a horizontal axis, a lever pivotally mounted upon the said frame to turn about an axis at right angles thereto, cables connecting the lever supporting frame to the steering plane, guide members upon the steering plane at the axis thereof, and cables connecting the lever to the rudder, the said cables passing around the before mentioned guide members.

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

JOSEF SKORUPA.

Witnesses:
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EMORY L. GROFF.