M. B. DUNKLE.

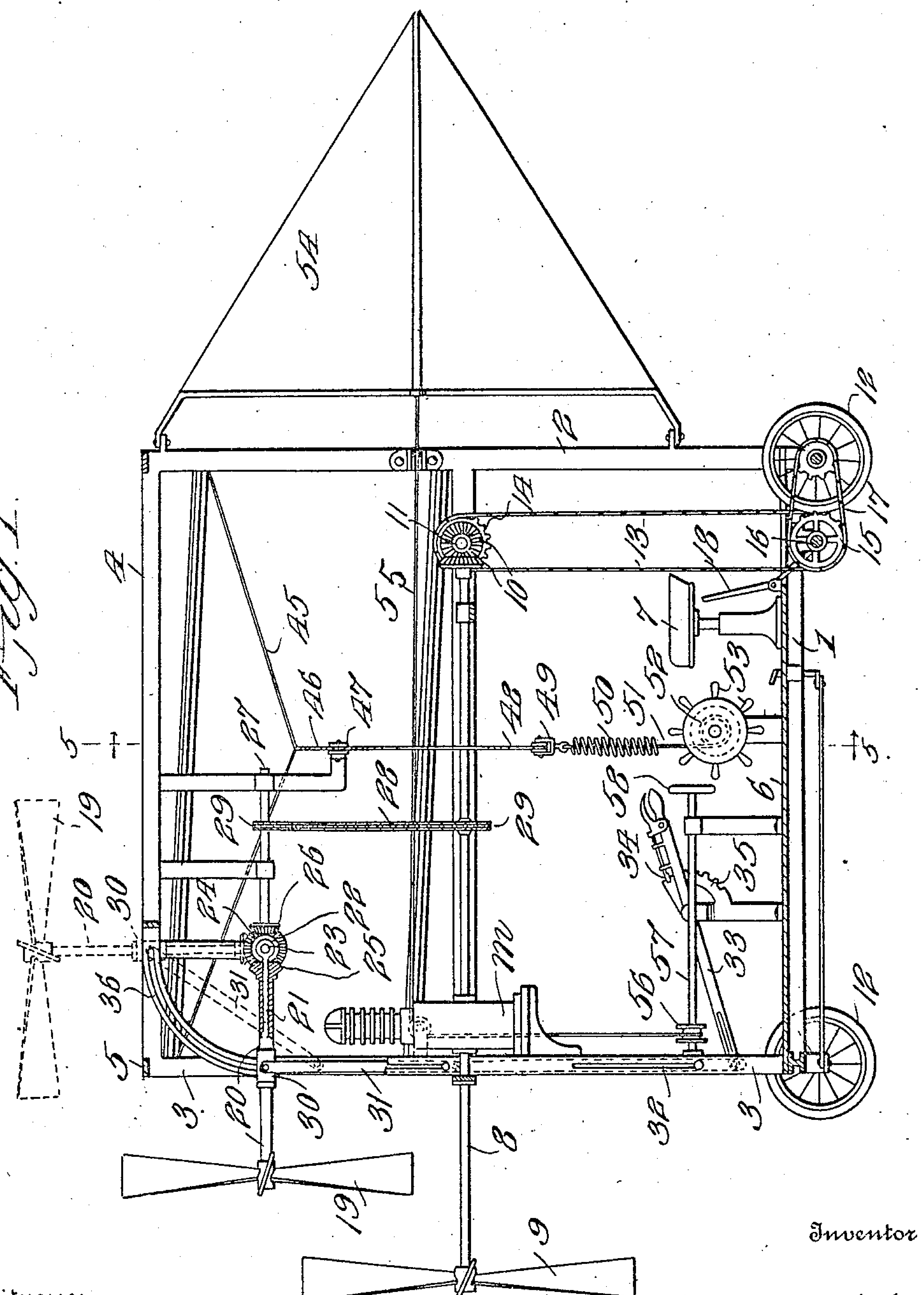
AEROPLANE.

APPLICATION FILED FEB. 1, 1910.

985,665. Patented Feb. 28, 1911.

4 SHEETS—SHEET 1.

Fig. 1



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4 SHEETS—SHEET 2.

FIG. 2.

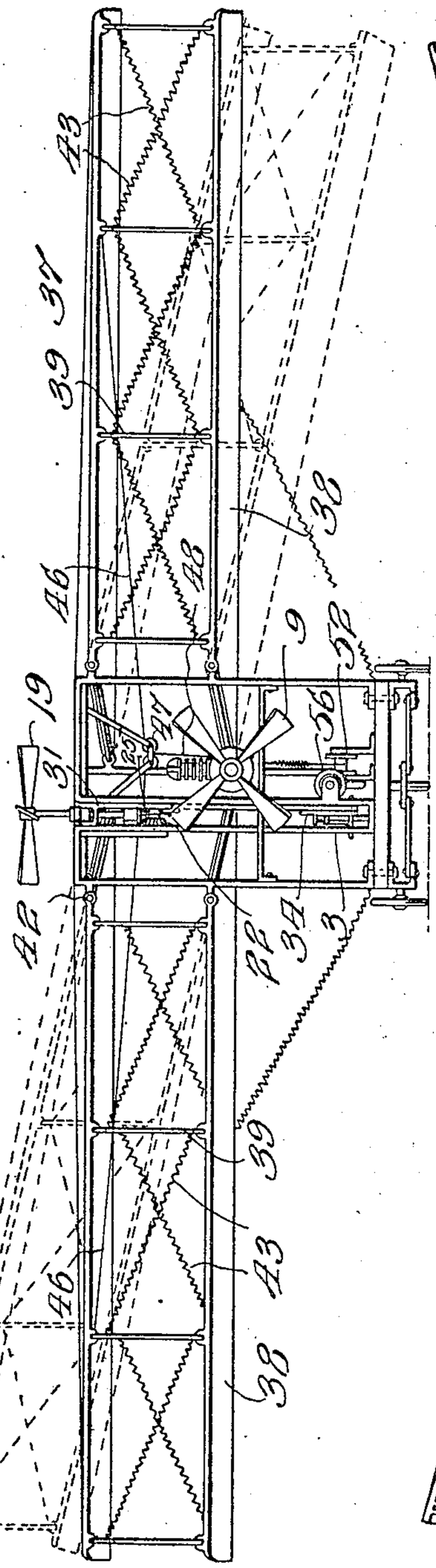
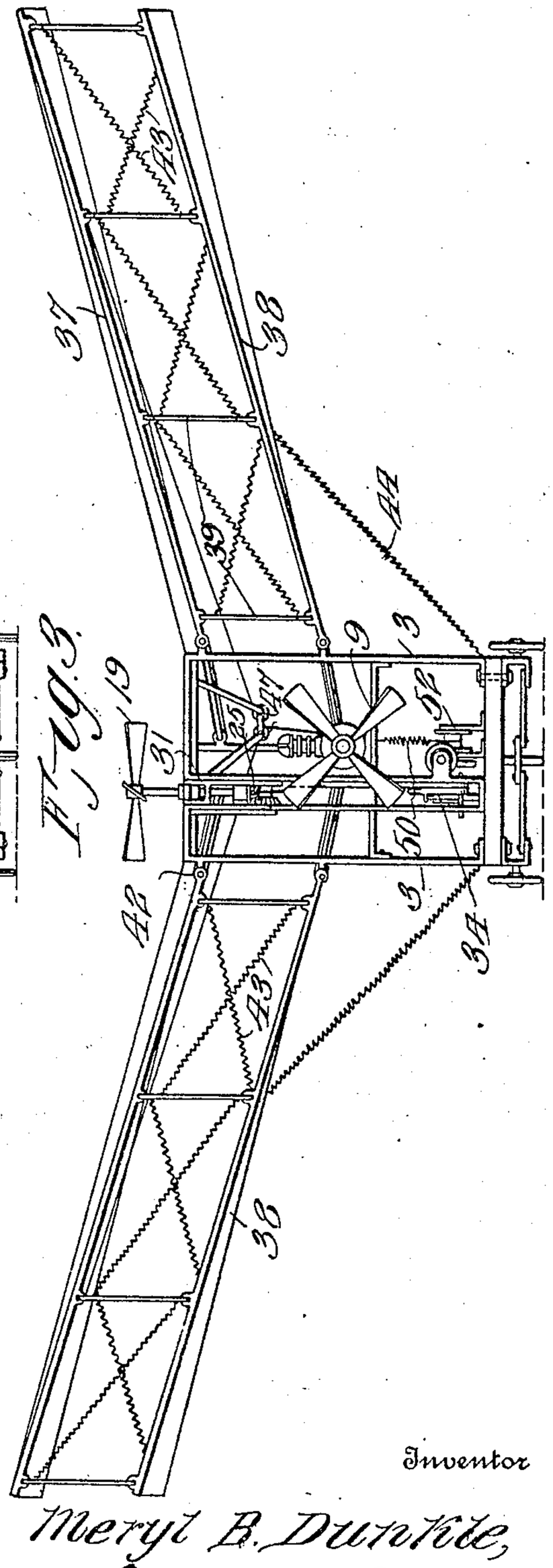


FIG. 3.



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4 SHEETS—SHEET 3.

Fig. 4.

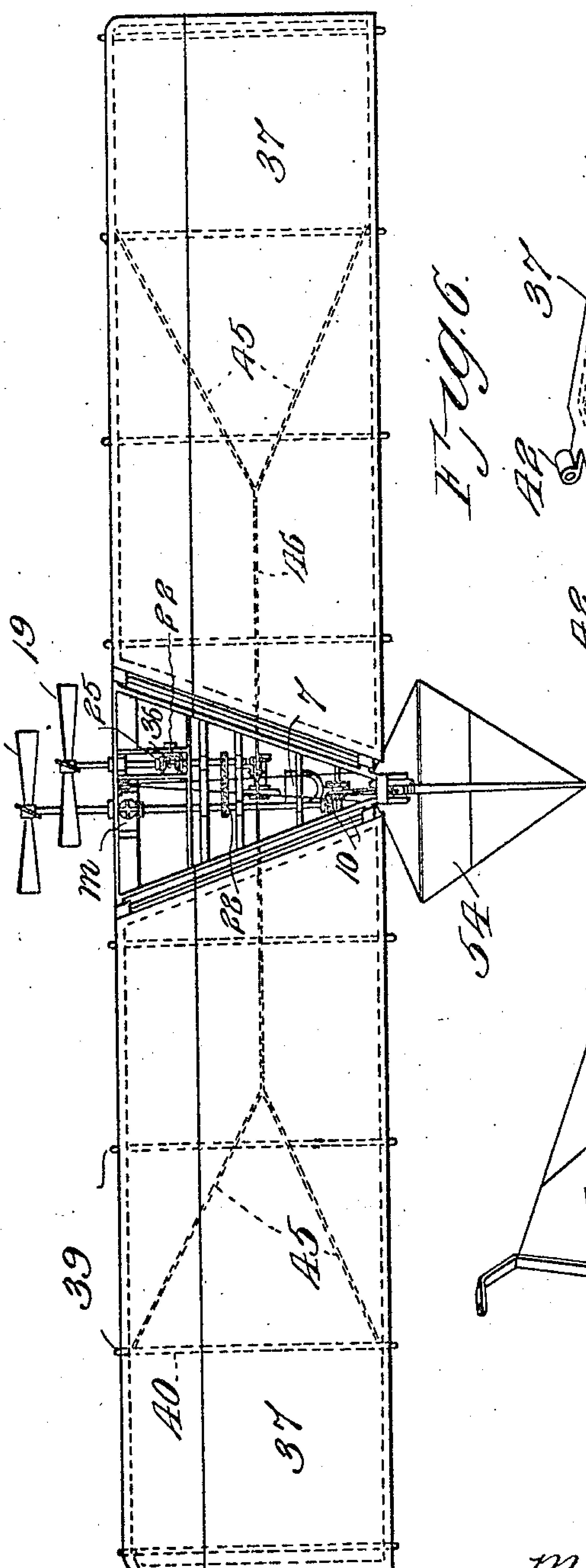


Fig. 6.

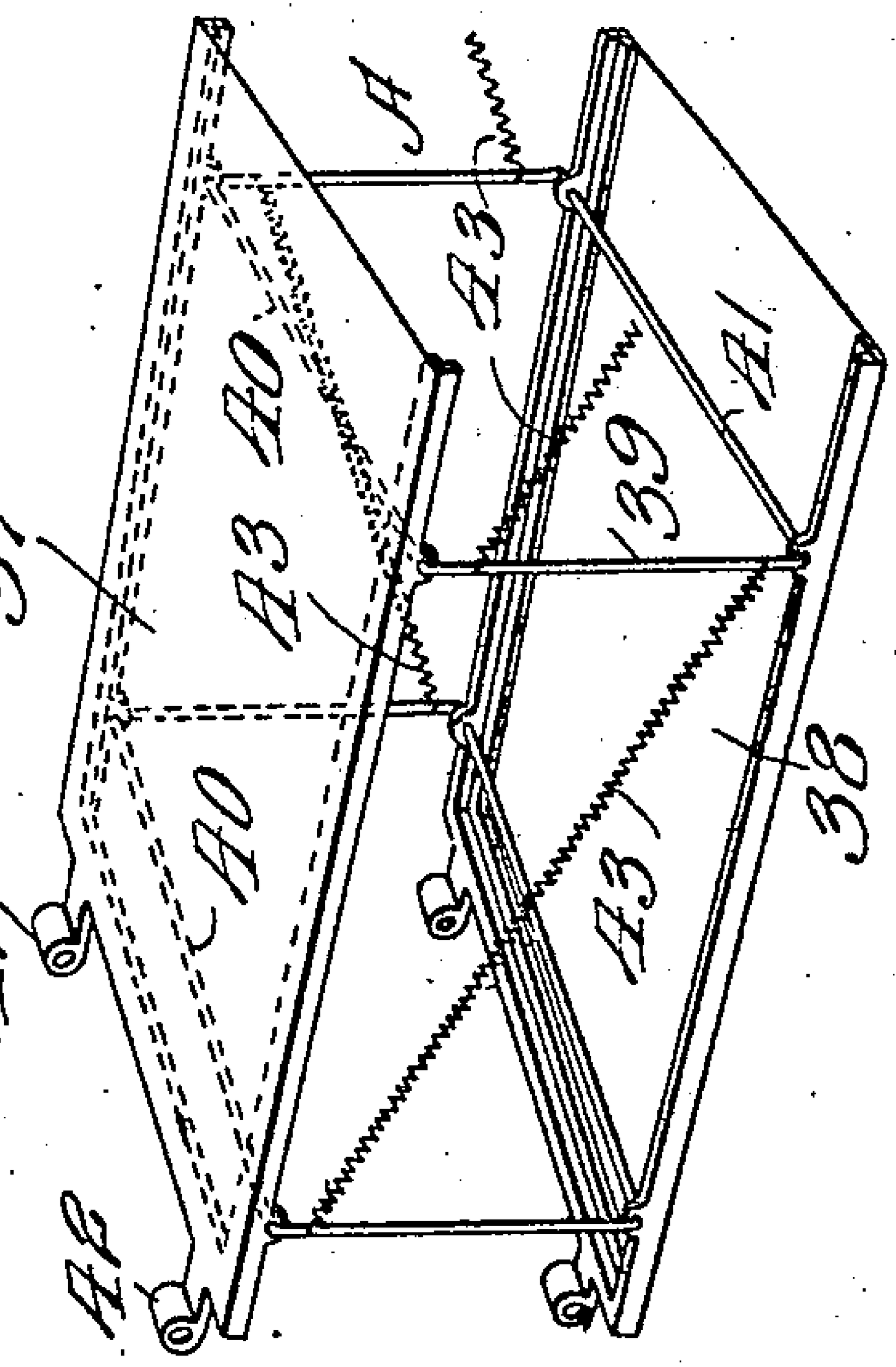
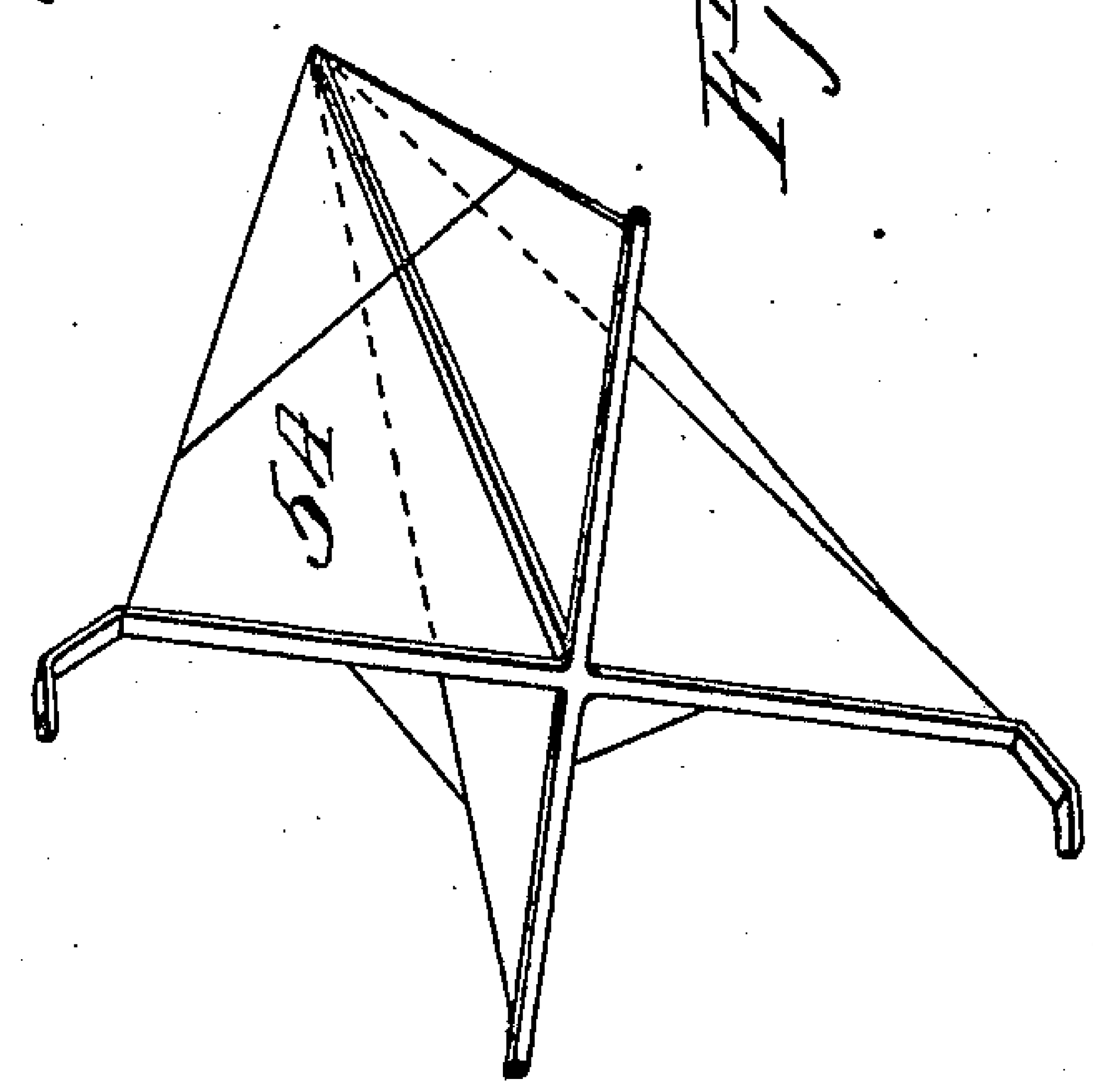


Fig. 7.



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4 SHEETS—SHEET 4.

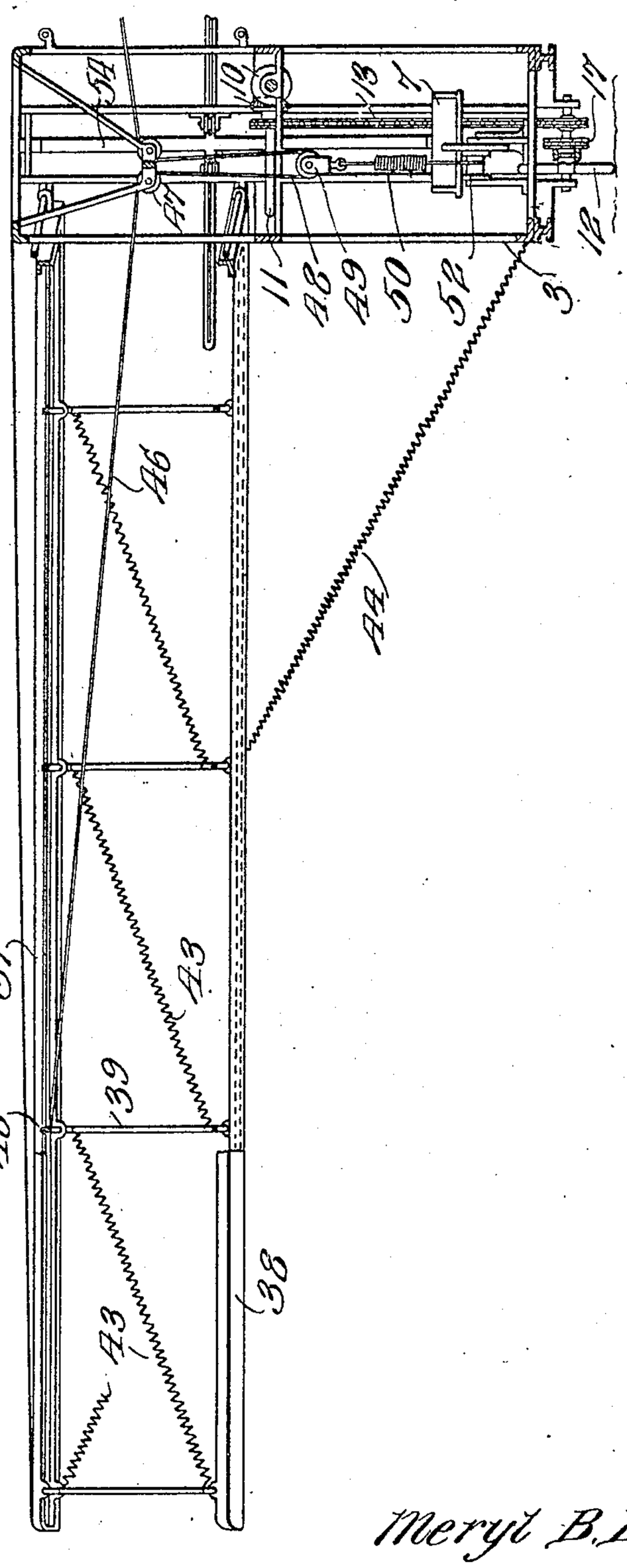

Fig. 5.

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UNITED STATES PATENT OFFICE.

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AEROPLANE.

985,665. Specification of Letters Patent. **Patented Feb. 28, 1911.**

Application filed February 1, 1910. Serial No. 541,314.

To all whom it may concern:

Be it known that I, MERYL B. DUNKLE, a citizen of the United States of America, residing at Moscow, in the county of Latah and State of Idaho, have invented new and useful Improvements in Aeroplanes, of which the following is a specification.

This invention relates to flying machines of the aeroplane type, and the principal objects of the invention are to construct a machine of this class which will be readily and safely supported while in flight and which may be conveniently and efficiently steered.

A further object of the invention is to provide an improved machine of the class described having propellers, one or more of which may be adjusted to operate in an approximately vertical or in an approximately horizontal plane, at will, thus tending to propel the machine in a forward or an upward direction, according to its disposition.

A still further object of the invention is to construct a machine of the character described, in which the supporting planes may be simultaneously adjusted; in which said planes shall be resiliently supported against the pressure caused by the impact of air currents, and in which the spring resistance shall be capable of regulation.

A still further object of the invention is to construct a machine of the character described in which power supplied by a suitable motor may be applied to the operation of the propelling means when the machine is in flight and in which power supplied by the motor may be applied to means for propelling the machine along the ground, thus enabling the machine to gather headway previous to making an ascent.

Still further objects of the invention are to simplify and improve the general construction and operation of a machine of the character outlined above.

With these and other ends in view which will readily appear as the nature of the invention is better understood, the same consists in the improved construction and novel arrangement and combination of parts which will be hereinafter fully described and particularly pointed out in the claims.

In the accompanying drawings has been illustrated a simple and preferred form of the invention, it being, however, understood that no limitation is necessarily made to the precise structural details therein exhibited, but that changes, alterations and modifications within the scope of the invention may be resorted to when desired.

In the drawings, Figure 1 is a sectional elevation of a flying machine constructed in accordance with the invention. Figs. 2 and 3 are diagrammatic front views of the machine, showing the supporting planes in various positions which may be assumed when the machine is in flight. Fig. 4 is a top plan view. Fig. 5 is a vertical transverse sectional view taken on the line 5—5 in Fig. 1. Fig. 6 is a perspective detail view illustrating the construction of the supporting planes. Fig. 7 is a perspective detail view, showing the rudder detached.

Corresponding parts in the several figures are denoted by like characters of reference.

The framework of the improved aeroplane is of the general shape and outline of a triangular prism, one side of which is presented in a forward direction, and said frame structure comprising the bottom members 1, the rear upright 2, the front uprights or corner posts 3, 3, the side members 4, 4 and the top front member 5. This frame structure may be braced and reinforced in any suitable and convenient manner, and a flooring 6 is provided upon which the aviator's seat 7 is suitably supported, said flooring affording also supporting and attaching means for various operating parts of the machine. A suitable motor M is provided having a driven shaft 8 which, in the example illustrated in the drawings, has been shown as carrying a propeller 9 at its forward end, said shaft being connected at its rear end by beveled gearing 10 with the transverse shaft 11.

The entire frame structure is supported upon wheels 12, one or more of which may be driven by power derived from the shaft 11, said motion being transmitted through the medium of a link belt 13 passing over sprocket wheels 14, 15 upon the shaft 11 and upon a counter shaft 16 from which motion is in turn transmitted to one or more of the wheels 12, as by means of a chain 17. The transmission means between the shafts 11 and 16 includes a clutch of ordinary construction, said clutch being operable by a lever 18 for the purpose of enabling the mo-

tion transmitting means to be thrown into or out of gear. This transmission means is used only when the machine is upon the ground for the purpose of gaining the velocity necessary to make an ascent. An auxiliary propeller 19 is carried by a sleeve 20 supported for rotation upon a shaft 21 having a terminal eye 22 pivotally engaging the stud 23 upon which a bevel gear 24 is mounted for rotation, said bevel gear meshing with a pinion 25 upon the propeller-carrying sleeve 20 and with a pinion 26 upon a counter shaft 27 deriving motion from the main driven shaft 8 by means of a chain 28 and sprockets 29. The propeller-carrying sleeve 21 is revoluble in a bearing sleeve 30 which is connected by a link 31 with a slide 32, said slide being vertically adjustable by means of a hand lever 33 equipped with a stop member 34 engaging a quadrant 35, whereby said lever and the parts connected therewith may be retained at various adjustments. The bearing sleeve 30 is guided by a curved slot or guide 36 which is concentric with the gear wheel-carrying stud 23. It will be readily seen that by manipulating the hand lever 33, the shaft 21 with the propeller-carrying sleeve may be adjusted from an approximately vertical to an approximately horizontal position, the latter being indicated in dotted lines in Fig. 1 of the drawings, thereby enabling the propeller 19 to operate in an approximately vertical or in an approximately horizontal plane as well as in various intermediate positions, motion being transmitted to the said propeller in any position occupied thereby by the means provided for the purpose.

Upper and lower planes 37 and 38 are hingedly connected with the sides of the frame structure, said planes being suitably spaced apart. The planes 37 and 38 each comprises a suitable frame structure which may be covered with textile or other suitable material, and the frame structures of said planes are connected and spaced apart by means of struts consisting of the end members 39 of rectangular frames A, best seen in Fig. 6 of the drawings, the top and bottom members 40 and 41 of said frames being hingedly connected with the frame structures of the upper and lower planes, respectively. These spacing and connecting members serve to maintain parallel relation between the upper and lower planes when the said planes are tilted upon the hinges 42 by which they are connected with the frame structure of the machine. Obliquely arranged connecting springs 43 are also provided, said connecting springs serving to establish connection between the spacing and connecting members, and said connecting springs being obliquely disposed in opposite directions. Springs 44 are also provided by means of which the pair of planes at each side of the machine are connected with the frame structure, said springs being disposed to resist the pressure in an upward direction against the undersides or surfaces of the planes.

Suitably connected with the pair of planes at either side of the machine is a loop 45, the bights of said loops being connected with the end of a flexible element 46 which is guided over suitably supported stationary guide members, such as pulleys 47 to form a loop 48 upon which a pulley-carrying block 49 is movably supported, said block being connected with a tension spring 50, said spring being connected at its lower end with a flexible element 51 wound upon a drum 52 which may be rotated by means of a hand wheel 53 for the purpose of effecting vertical adjustment of the spring. It will be readily seen that by elevating the spring the tension thereof with reference to the supporting planes does not become effective until said planes have swung or moved to some extent in an upward direction, while by lowering the spring its tension will be exerted to move the supporting planes downwardly.

A suitably constructed rudder 54 is hingedly connected with the rear post or upright of the frame structure, said rudder being adjustable by means of a steering gear including a flexible element 55 guided over a drum 56 upon a shaft 57 having a hand wheel 58, whereby it may be rotated for the purpose of swinging the rudder to either side, as may be required.

From the foregoing description, taken in connection with the drawings hereto annexed, the operation and advantages of this invention will be readily understood by those skilled in the art to which it appertains. It will be seen that power for propelling the machine over ground for the purpose of gathering headway may be obtained from the motor M; although in the drawings hereto annexed, only two propellers have been shown, it is to be understood that any desired number of propellers of any preferred dimensions may be used and that one or more of such propellers may be made capable of adjustment in the manner illustrated in the drawings with reference to the propeller 19. When the machine gathers headway, it will ascend in flight by the impact of the air upon the undersides or surfaces of the planes. Now, as the sides of the main frame converge rearwardly, the line of attachment of the planes will be diagonal to their front edges, and the rear edges of the planes will be longer than their front edges. As these planes are attached by hinges, they allow movement up and down, and it is evident that to swing a plane down will be to increase its angle of inci-

dence to the horizontal line of advance, while raising the planes will decrease this angle. When an ordinary aeroplane is in motion, if extra pressure, such as a current of air, is applied at one side of the machine, it will tend to tip the machine and to destroy its equilibrium. Under the arrangement herein shown and described, as a plane swings upward the angle of incidence decreases, lessening the pressure due to the horizontal element in the air current, and the tendency to tip is overcome; again, as the planes on one side are swung up, the planes at the opposite side will swing downwardly, owing to the presence of the flexible connecting member, increasing the angles of incidence of the downwardly moving planes, and consequently the pressure of their surfaces counterbalancing the extra pressure on the other side of the machine, thus causing the central frame structure to remain practically vertical and stable.

An ordinary aeroplane in meeting a strong head wind, or when the speed is increased, tends to tip back, owing to the increased pressure on both sides; by the arrangement herein shown and described, as the pressure is increased equally on the planes at both sides of the machine, the stationary connecting springs 44, as well as the spring 50 are placed under tension; the planes swing upwardly; their angles of incidence will be decreased, and consequently the resistance offered by the planes is decreased, and a comparatively even line of flight is maintained.

When speed is slackened, the springs will contract and swing the planes downward thus increasing their angles of incidence and tending to preserve the upward pressure necessary for successful flight. It may here be stated, that in order to prevent the planes from striking the ground in alighting, wires, cords or other obstructing means may be arranged to support the planes at a certain predetermined angle to prevent them from contacting with the ground.

While the control of the machine in flight is practically automatic, it is obvious that if the operator wishes to increase or decrease the angles of incidence of the planes he can do so by raising or lowering the spring 50 to which the flexible connecting element is connected by means of the pulley-carrying block 49. Again, if it is wished to tip or tilt the central frame at any time, such as in turning, the connecting cord may be pulled to one side by the hand of the operator or by a special lever provided for the purpose, this lowering the planes at one side of the machine and lessening the resisfance to the upward movement of the planes at the opposite side, thus permitting the machine to tilt in the desired direction to insure a successful turning movement.

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

1. A machine of the character described, a frame structure of the general outline of a triangular prism having one side presented in a forward direction, and supporting planes hingedly connected with the rearwardly converging sides.

2. In a machine of the character described, a frame structure of the general outline of a triangular prism having rearwardly converging sides, and suitably connected upper and lower planes hingedly connected with said rearwardly converging sides.

3. In an areoplane, a frame structure of the general outline of a triangular prism having rearwardly converging sides, supporting planes connected with the two rearwardly converging sides of the frame structure, and suitably guided flexible connecting means between the planes of the two sides.

4. In an aeroplane, a frame structure having rearwardly converging sides, supporting planes hingedly connected with each of said converging sides, and resilient connecting means between the planes and the frame structure to resist movement of the planes in an upward direction.

5. In an aeroplane, a frame structure having rearwardly converging sides, supporting planes hingedly connected with each of the converging sides of the frame structure, and connecting means between the planes and the two sides including a suitably guided flexible element and a tension spring connected therewith,

6. In an aeroplane, a frame structure having rearwardly converging sides, supporting planes hingedly connected with the sides of the frame structure, and connecting means between the planes of the two sides including a suitably guided flexible element, a tension spring connected therewith and means for effecting vertical adjustment of said spring

7. In an aeroplane, a frame structure having rearwardly converging sides, supporting planes hingedly connected with the two sides of the frame structure, resilient connecting means for resisting upward movement of the planes, and connecting means between the planes and the two sides including a suitably guided flexible element, a tension spring connected therewith and means for effecting vertical adjustment of said spring.

8. In an aeroplane, a frame structure having rearwardly converging sides, and supporting planes hingedly mounted in pairs adjacent to each side, each pair including an upper and a lower frame structure, struts movably connected with said frame structures to connect them together, to space them apart and to maintain parallel relation there-

between, and obliquely disposed connecting springs.

9. In an aeroplane, a frame structure, supporting planes hingedly connected with the sides thereof, and connecting means for said supporting planes including a suitably guided flexible element, a block supported upon a loop formed by said flexible element, a tension spring connected with said block, a winding drum, and a flexible element wound upon said drum and connected with the tension spring.

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

MERYL B. DUNKLE.

Witnesses:

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GUSTAVE KROEGER.