J. W. WEBB.

FLYING MACHINE.

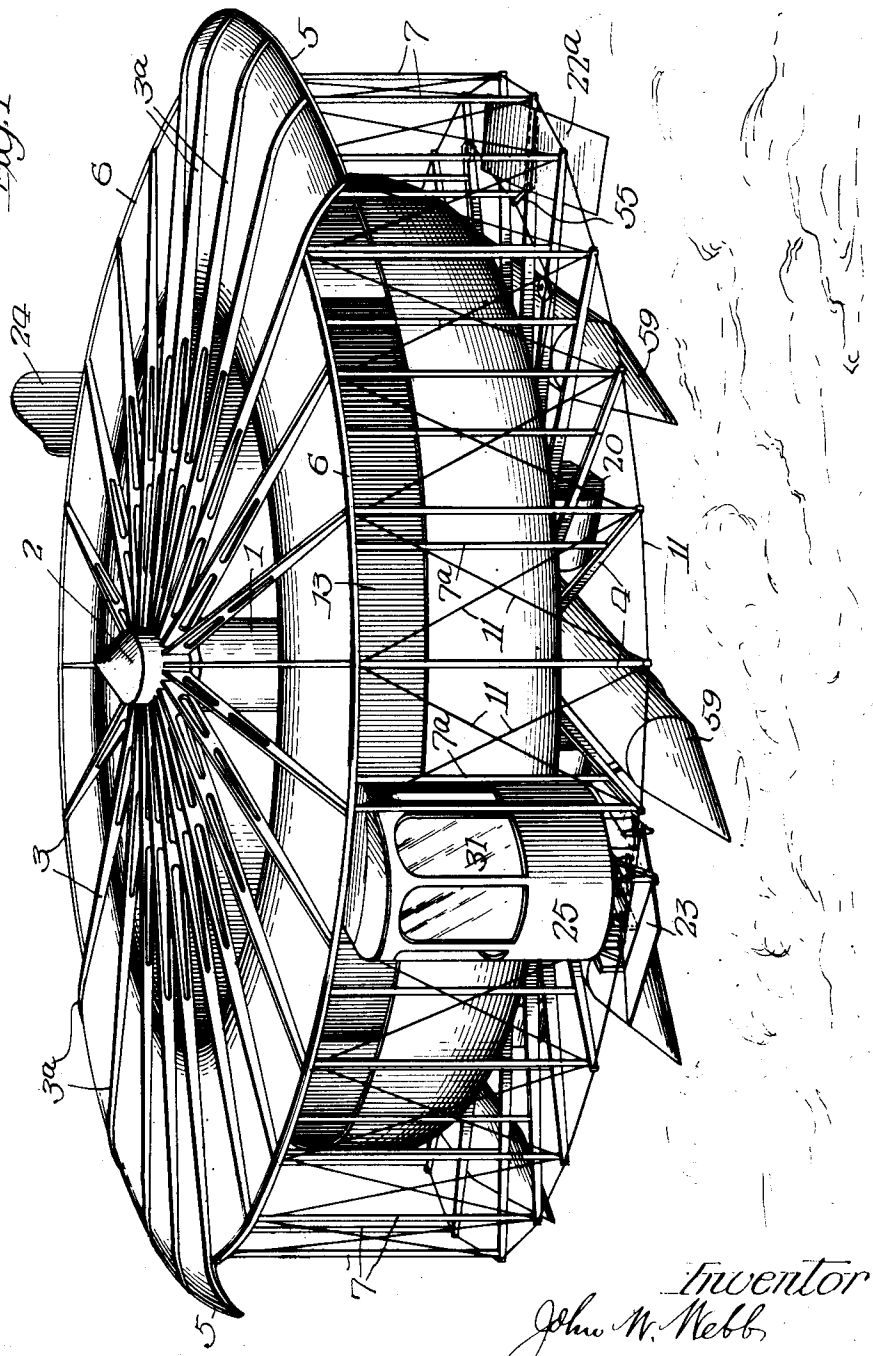
APPLICATION FILED OCT. 22, 1918.

1,344,283.

Patented June 22, 1920.

6 SHEETS—SHEET 1.

Fig. 1



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6 SHEETS—SHEET 2.

Fig 2

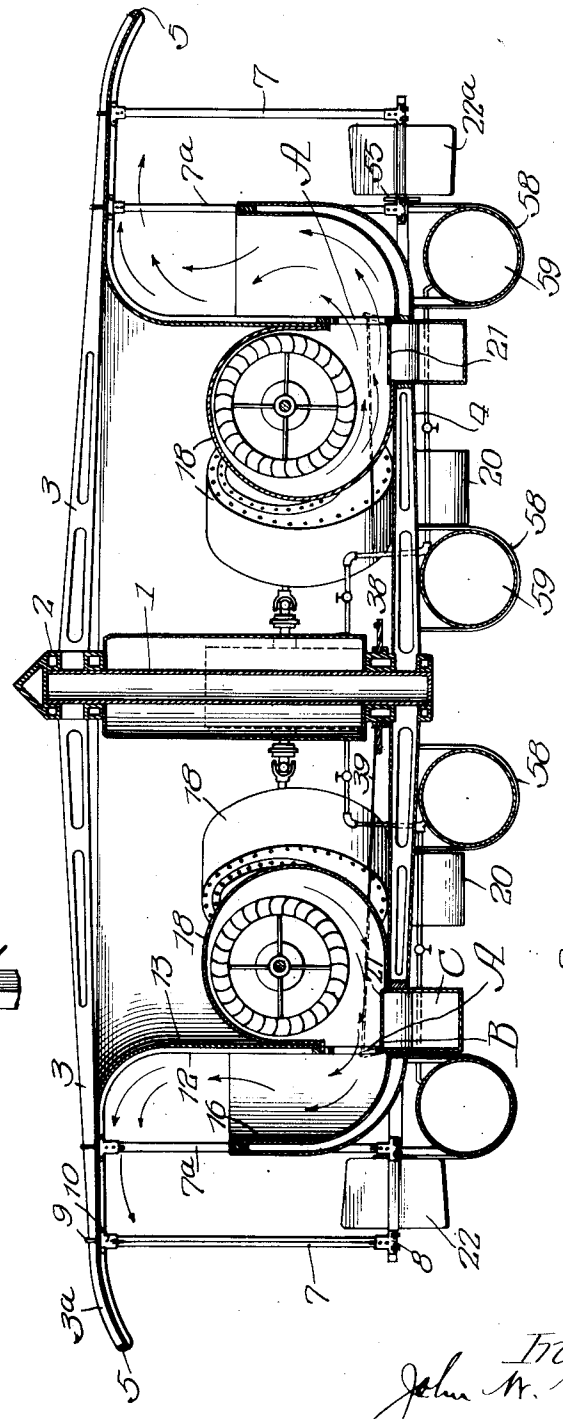


Fig. 6

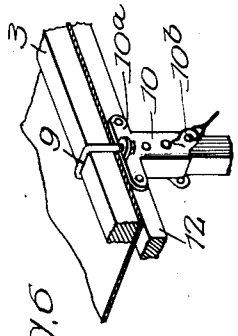
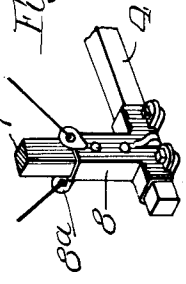


Fig. 7



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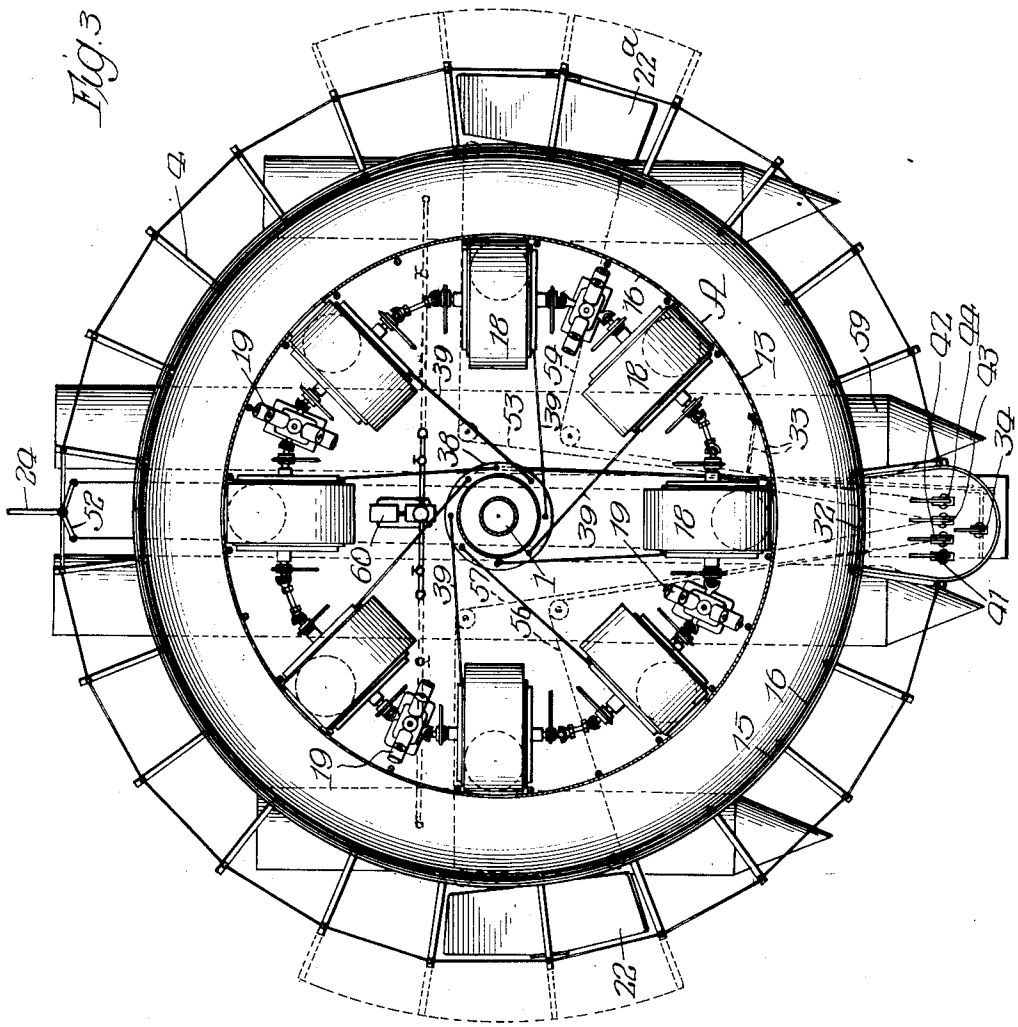
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6 SHEETS—SHEET 3.

Fig. 3



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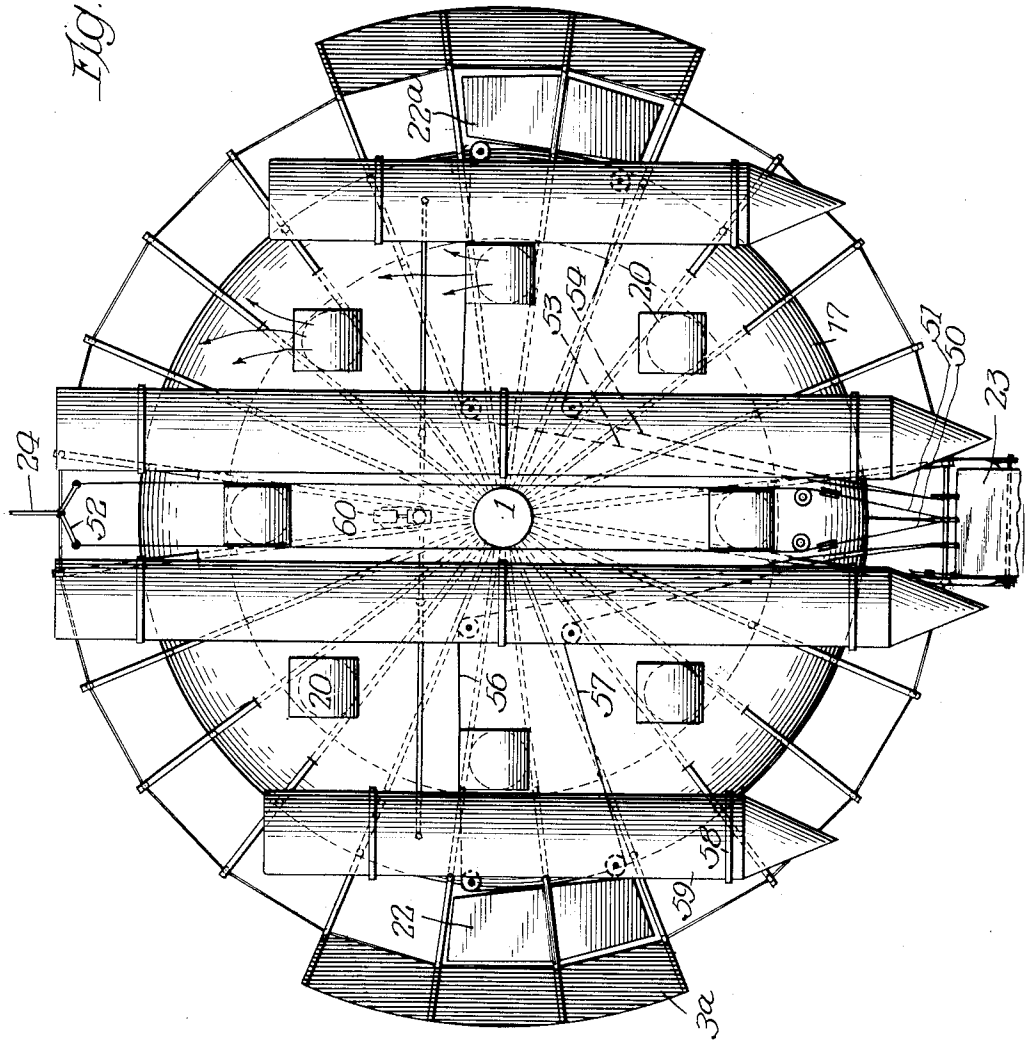
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6 SHEETS—SHEET 4.

Fig. 4.



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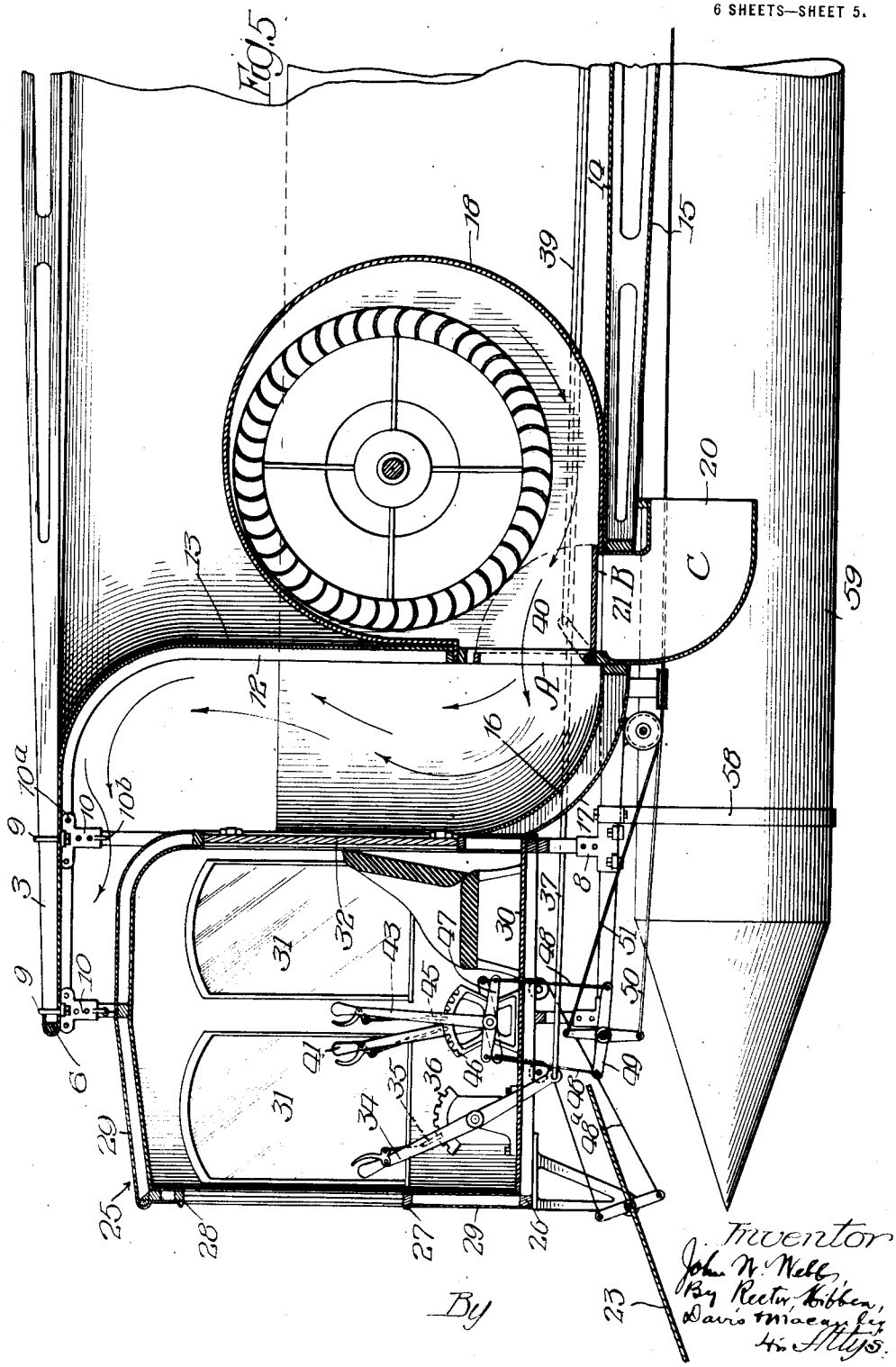
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6 SHEETS—SHEET 5.

Fig. 5.



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Fig. 8

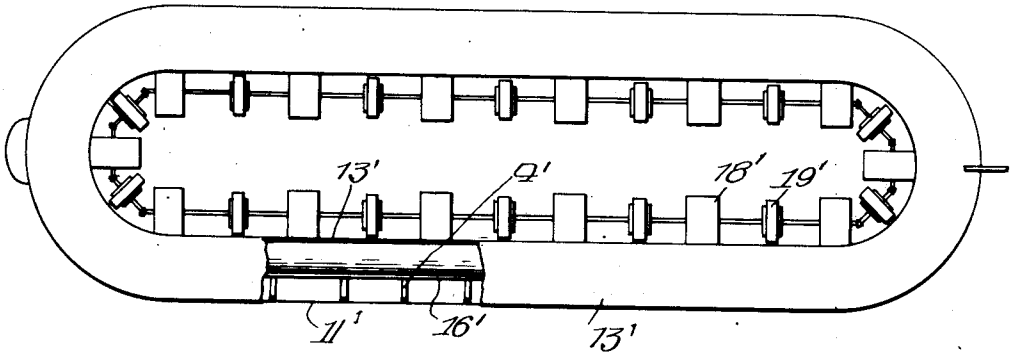
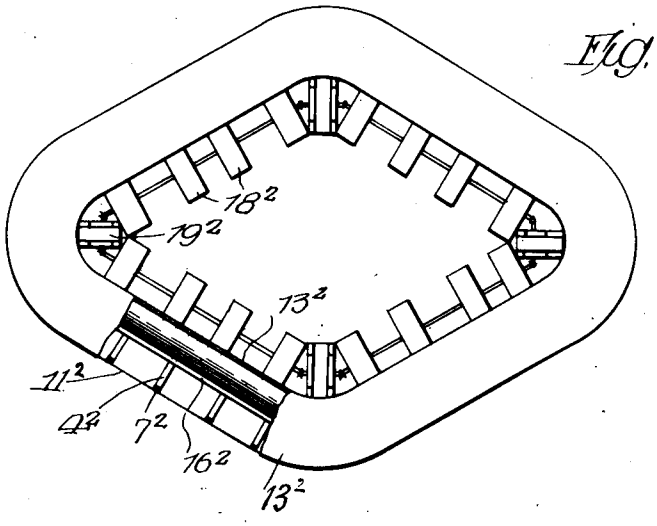


Fig. 9



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UNITED STATES PATENT OFFICE.

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FLYING-MACHINE.

1,344,283. Specification of Letters Patent. Patented June 22, 1920.

Application filed October 22, 1918. Serial No. 259,193.

To all whom it may concern:

Be it known that I, JOHN W. WEBB, a citizen of the United States, and resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Flying-Machines, of which the following is a specification.

It is well known that aeroplanes of the various nearly related types developed in recent years to a wonderful extent and now indispensable in military operations are unable to rise from the ground in a directly vertical direction but must attain considerable horizontal speed before the lifting action of the planes upon the air beneath them is sufficient to raise them from the ground, and likewise that in alighting their wheels come into contact with the ground while the machine is still traveling forward at considerable speed, for which reason an extended level space is needed for rising and alighting. It is also impossible for such machines to remain stationary in the air, for which reason bombs or other projectiles cannot be dropped with accuracy, and observations cannot be made as effectively as if the observer were able to come to a stationary position at any desired point. It is further well known that a large proportion of the energy developed by the motor is wasted in setting the column of air acted upon by the propeller in movement in a rearward direction. It is the object of my invention to provide an efficient heavier-than-air flying machine for military and other purposes which shall be able to sustain a considerable load and ascend vertically to any desired height, maneuver laterally at any desired angle with or against the wind and hover in a stationary position over any desired point, ascending or descending as may be necessary to avoid air currents or take advantage of them. Flying machines constructed in accordance with my invention should be of great value in military operations, for observation and bombing and service as a wireless station, and for naval operations in effectively observing and destroying enemy submarines or other craft, and also for various other uses where lifting power and the capacity of assuming a stationary position in the air at a given point are of more importance than the highest speed.

In my invention I attain the objects in view by means of a new distribution of the energy developed by the motor through a novel organization and combination of elements in which a set of powerful motor-driven fans produce a blast of air which is drawn in from above the machine and are directed against wing or plane surfaces and deflected in a lateral, somewhat downwardly inclined direction to produce a lifting force, or which by suitable controlling valves may be directed in part or in whole rearwardly to produce a forward horizontal movement of the machine, suitable guiding and controlling planes being provided to govern the direction of its movement. My invention, therefore, broadly consists in the organization of structural elements by which the novel distribution of forces is effected, and also includes as subsidiary features the novel arrangement and construction of particular parts which are desirable and useful in organizing the machine as a whole. In the appended claims the essential elements of my invention are more particularly recited, it being understood, however, that modifications and variations of the specific structure illustrated in the drawings and hereinafter described may be made within the scope of the claims and without departure from the spirit of my invention.

Of the drawings, Figure 1 is a perspective of a flying machine embodying my invention in a preferred form; Fig. 2 is a central vertical cross-section of the same; Fig. 3 is a top plan view; Fig. 4 is a bottom plan view; Fig. 5 is a vertical section of the front part of the machine in a fore-and-aft direction, or at right angles to the direction of the plane shown in Fig. 2; Figs. 6 and 7 are details illustrating suitable fittings or connections for connecting the frame members; Fig. 8 is a diagrammatic plan view illustrating a machine of different shape than that illustrated in Figs. 1 to 5; and Fig. 9 is a similar diagrammatic view of another differently shaped machine.

The same reference characters refer to the same parts in all the figures of the drawing.

The framework of the machine illustrated in the drawings and constituting an embodiment of my invention in a preferred form includes a central post 1, which for the sake of lightness is preferably made hollow and may be conveniently formed of spruce or other light and strong wood. Radiating from the top portion of the post,

and secured thereto in a suitable manner, as by means of a sheet metal fitting 2, are the upper spars 3 and 3^a, and from the lower end of the posts extend a corresponding set of lower spars 4, similarly secured.

In the present instances the sets of spars are each twenty-four in number and four of the upper spars on each side, marked 3^a, are somewhat longer than the others and are preferably bent slightly down at their ends, as shown. The ends of the longer upper spars are connected by curved rails 5, and the ends of the shorter upper spars by curved rails 6. The upper and lower spars are connected by outer struts 7 and inner struts 7^a secured to the lower spars in any suitable manner, as by means of the T-shaped hollow sheet metal fittings 8 shown in Fig. 7, and to the upper rails by the straps 9 of the somewhat similar fittings 10 shown in Fig. 6. Suitable stay wires 11 anchored to eyelets 8^a formed on the fittings 8 and eyelets 10^b on the fittings 10 are provided to strengthen and brace the framework. The upper and lower spars are further connected by a set of curved frame bars 12 arranged inside the line of the inner struts 7^a, which frame-bars along their upper outer ends lie adjacent and below the upper spars 3 and are secured against and below the upper spars 3 and are secured against displacement by ears 10^a of the fittings 10. The lower ends of these frame-bars are secured to the lower spars 4.

Interposed between the upper spars and upper horizontal portion of the frame-bars 12 and extending downwardly over the inside of such bars to the lower spars 4 is arranged a partition or wall structure 13 of any suitable thin, impervious, light and strong material, such as the woven or "doped" fabric used for the planes of aeroplanes of ordinary construction. Within the boundary of the partition 13 the lower spars 4 are covered with an impervious floor 14, which may conveniently be formed of the same material as the partition, though if desired it may be of a more unyielding material, such as veneering, or fiber board. Preferably a sheet of similar material 15 is secured to the underside of the lower spars. This partition 13 and floor 14—15 together inclose a central compartment which is open at the top and closed at the bottom, the vertical side wall of the partition being continuous with the over-hanging horizontal wall of fabric lying between the upper spars and upper parts of the curved frame-bars 12.

As shown, the length of the longer upper spars 3^a results in a pair of side extensions of the over-hanging horizontal portion of the partition or wall structure 13.

Outside the lower portion of the vertical wall of the partition 13 is arranged an annular deflecting wall or partition curved inwardly at its bottom in radial section, which preferably, as shown, is of double-walled construction, the inner wall 16 being secured to the inside of the inner struts 7^a and the top of the long spars 4, and the outer wall 17 being secured to the outside of such struts and the bottom of the spars, the material of the partition being cut in the path of the struts and bar and the edges of the openings secured to such members. The partition 13 and double floor 14—15 both have large valve-governed openings adjacent the outlet of the blowers next to be described, for purposes which will be later explained.

Resting upon the floor of the machine and suitably secured to and supported by the lower spars 4 are a number of powerful fans 18, which may be of the well-known "sirocco" or "multivane" centrifugal type. These fans in the present instance eight in number, are arranged with the tangential outlets of their discharge chambers directed outward radially of the machine, and they are coupled together in a continuous line by universal couplings so as to be driven in unison by the motors 19. In the present instance I have illustrated diagrammatically four motors of a rotary cylinder type, though a greater or less number may be employed, depending upon their power and the dimensions of the machine, and the type of engine is not material to the present invention. The connections for controlling the engine, of course, depend on the construction of the particular engine, and may be made in accordance with well-known practice which it is deemed unnecessary to illustrate. The gasolene tank may be conveniently constructed as illustrated in the form of a hollow cylindrical tank surrounding the center post 1 of the machine.

As before stated, the fans are arranged with their outlets directed radially outwardly, and the side partition wall 13 is formed with openings A which communicate directly with the discharge chambers of the fans. The floor of the machine is also formed with openings B adjacent the openings A, each such opening B affording direct communication between the discharge chamber of a fan and a short rearwardly-opening passage C through a curved deflector box 20 in which the current of air from the fan is directed horizontally beneath the floor toward the rear of the machine. Within the discharge chamber of each fan is arranged a valve 21 arranged to alternatively close or open the openings A and B, and acting to open one proportionately as the other is closed. These valves are arranged to operate in unison through connections to be later described.

For the purpose of directing and controlling the movements of the machine when flying forwardly under the influence of air driven through the deflector boxes, I pro-

vide the pivoted ailerons 22 and 22ª, an elevating and depressing plane 23 pivoted on a transverse horizontal axis at the front of the machine, and a rudder 24 pivoted on a vertical axis at the rear of the machine.

The connections for operating the ailerons, elevating plane and rudder, and also the valves 21 before mentioned are controlled by operating levers arranged in the pilot's cab 25 which is secured between and supported by two pairs of outer and inner struts at the front of the machine and which is constructed in any suitable manner affording strength and lightness. In the present instance, I have illustrated a suitable cab structure which includes U-shaped horizontal frame members 26, 27 and 28 secured to the struts, and a shell or covering of sheet material 29 secured to the frame members, and a suitable flooring 30, windows 31 being provided to permit observation ahead of the machine and at both sides. A door 32 is also provided at the rear of the cab, and a door 33 in the partition 13 to enable the pilot to enter the central compartment in which the motors and fans are arranged.

The connections for simultaneously operating the valves 21 comprise an intermediately pivoted hand lever 34 equipped with a latch 35 adapted to coöperate with a notched quadrant 36, a rod 37 pivoted at one end to the lower end of said lever and at the other end to a wheel 38 rotatably mounted on the center post 1, and a set of connecting rods 39, each pivoted at its inner end to the wheel and at its outer end to a crank 40 connected to the particular valve operated by such rod,—see Figs. 2, 3 and 5.

The hand levers for operating the two ailerons, the elevating plane and rudder may be conveniently arranged in a row in front of the pilot's seat, as shown in Figs. 3 and 5, the lever 41 controlling the elevating plane, the lever 42 the aileron 22, the lever 43 the rudder 24, and the lever 44 the aileron 22ª. These levers in the present instance, though not necessarily, are all pivotally mounted in the same manner, and the levers 42, 43 and 44 are connected to the cables associated with them through identical connecting mechanisms. In Fig. 5 the connections for operating the rudder 24 through the lever 43 are shown, and a description of the connecting mechanism there illustrated will suffice for the similar mechanisms operated by the levers 42 and 44. This lever 43, which is equipped with a latch 45 arranged to coöperate with a notched quadrant 46 to hold it in any set position, is formed integral with a bar 47 extending diametrically of the axis of the pivot of the lever, and the ends of such bar are connected by two opposite rods 48—48 with the horizontal members of a pivoted four-arm lever 49, the vertical members of such lever being connected by a pair of cables 50—51, running over suitable guide pulleys, with a tiller bar 52 fast to the rudder. Through a similar connection the cables 53—54, operated by the lever 44, are connected to a rock arm 55 rigidly secured to the aileron 22ª, and in the same manner the cables 56—57, operated by the lever 42 are connected to the aileron 22. As shown in Fig. 5 the elevating plane 23 is operated through a pair of cables 48ª—48ª directly connected with it, and operated by the lever 41 in the same manner as the rods 48—48 of the connecting mechanism above described. It will be understood, however, that other and different trains of mechanical connections for operating the various parts controlled by the hand levers may be substituted for those above described without departing from the broader scope of my invention.

Secured by flexible straps 58 to the bottom of the machine frame are several cylindrical air cushions 59, in the present instance four in number, which are constructed of strong rubber cloth or other suitable fabric and which are preferably cone-shaped at their front end. These cylinders serve the threefold purpose of providing a soft cushion bearing for the machine when alighting from a flight, furnishing keels which assist in keeping the machine in a true course, and serving as floats in case the machine, for any reason, should be obliged to descend on a body of water. For the purpose of keeping the cylinders inflated I provide an air pump 60, which may be of any suitable or known construction and which is arranged to be driven by the motors of the machine.

From the description which has been given the manner in which the machine is operated will be readily understood. In preparing to ascend to make a flight, the valve-controlling lever 34 is first adjusted to move the valves 21 into position to close the openings B in the floor of the machine and open the openings A in the partition 13, and one or more of the motors (which, if more than one is used, are preferably arranged to be separately connected and disconnected from the universally connected train of fan shafts) is then started to rotate the fans. The air which enters the fans is taken in from above through the central compartment of the machine within the partition 13 and above the floor 14, tending to create a vacuum which produces a lifting effect through the normal atmospheric pressure on the under side of the floor. The blasts of air driven at high velocity through the fan outlets and the openings A are deflected by the curved partition wall 16 and directed against the over-hanging horizontal portion of the partition 13, imparting

to it an upward stress measured by the momentum or *vis viva* of the air stream and the reaction due to displacement of the body of air below such portion of the partition.

It may here be explained by way of example that in a flying machine constructed in accordance with my invention and thirty-two feet in diameter, the intake zone, within the vertical portion of the partition 13 will have an area of about two hundred and seventy feet, and the zones occupied by the upward current of air and by the laterally deflected air underneath the outer overhanging portion of the partition 13 each approximately the same area, in vertical projection. I propose in such a machine to employ a motor or motors having a total energy of about four hundred horse power which will drive eight fans of a capacity sufficient to deliver together about 280,000 cubic feet of air per minute at a velocity of 55 miles per hour. The power thus exerted is necessarily balanced by the suction lift of the air drawn in from above the machine and expelled against the overhanging portion of the partition 13 and thence deflected downwardly, producing an upward lift by reaction against the underlying atmosphere, for which reason it will be seen that I obtain a highly effective lifting action in a directly vertical direction.

When the machine has attained any desired height the valves 21 may be shifted to divert part of the air through the curved deflector boxes 20, and through reaction against the outside atmosphere cause the machine to be driven forwardly and the controls may be manipulated to maneuver it in any manner desired. At any time the suction may be throttled down with the blast through the boxes 20 shut off to maintain the machine in a stationary position.

As diagrammatically shown in Fig. 8, my invention may be embodied in a machine of elongated outline as well as the circular form above described, the parts of the modified structure shown in said figure being marked the same as corresponding parts in the preferred construction, with the addition of the exponent Fig. 1. In Fig. 9 I have illustrated a second modification in which corresponding parts are indicated by the reference numeral applied to the parts in the preferred form of construction with the addition of the exponent Fig. 2.

I claim:

1. A flying machine formed with a bottom floor and a partition having a vertical side wall inclosing a central compartment open at the top, said side wall being continuous at its top with an outwardly projecting horizontal wall, a deflecting wall arranged outside of and connected to said side wall adjacent its bottom, and air blast apparatus within said compartment having the walls of its discharge chamber connected to said side wall and said chamber communicating with the space within said deflecting wall.

2. A flying machine formed with a bottom floor and a partition having a vertical side wall inclosing a central compartment open at the top, said side wall being formed with openings adjacent its bottom and being continuous at its top with an outwardly projecting horizontal wall, a deflecting wall arranged outside of and connected to said side wall adjacent its bottom, an air blast apparatus arranged within said compartment arranged to drive a current of air through said openings against said deflecting wall.

3. A flying machine formed with a bottom floor and a partition having a vertical side wall inclosing a central compartment open at the top, said side wall at its top extending horizontally to form a continuous outwardly projecting wall, air blast apparatus in said compartment having its discharge chamber between the lower part of said side wall and the adjacent part of the floor, a deflecting wall around outside of the lower portion of said side wall and at its bottom curving inwardly and connected with the lower edge of said side wall, a deflector box arranged below said discharge chamber of the blast apparatus and arranged to discharge air passing therethrough in a rearward direction, said deflector box and the space between said side walls and said deflecting wall being arranged to be placed alternatively in communication with such discharge chamber, and means for establishing and disestablishing such alternative communication at will.

4. A flying machine formed with a bottom floor and partition having a vertical side wall inclosing a central compartment open at the top, said side wall at its top extending horizontally to form a continuous outwardly projecting wall, air blast apparatus in said compartment having its discharge chamber between the lower part of said side wall and the adjacent part of the floor, a deflecting wall arranged outside of the lower portion of said side wall and at its bottom curving inwardly and connected with the lower edge of said side wall, a deflector box arranged below said discharge chamber of the blast apparatus and arranged to discharge air passing therethrough in a rearward direction, and means for directing the air current from such discharge chamber through said deflector box and into and through the space between said side wall and said deflecting wall at will.

5. A flying machine according to claim 1 in which the air blast apparatus consists of a plurality of centrifugal fans having an outwardly directed bottom discharge.

6. A flying machine according to claim

3 in which the means for establishing and disestablishing communication between the discharge chamber of the blast apparatus and the deflector box and space between the vertical side wall and deflecting wall of the machine consists of a valve arranged in said discharge chamber and arranged to cover an opening between said discharge chamber and deflector box as it opens, an opening between such chamber and the space between said vertical side wall and deflecting wall of the machine.

7. A flying machine according to claim 3 in which the means for establishing and dis-establishing communication between the discharge chamber of the blast apparatus and the deflector box and space between the vertical side wall and deflecting wall of the machine consists of a plate hinged at the lower outer part of said discharge chamber and arranged to play between an opening into the deflector box and an opening into the space between the vertical side wall and deflecting wall of the machine.

8. In a flying machine of the character described, a center post, a set of upper spars secured to said post, a set of lower spars secured to said post, a set of frame bars secured and connecting said upper and lower spars intermediate their length, a sheet of impervious material secured to said frame bars to form a vertical side wall and also secured to the outer portion of said upper spars to form a continuous horizontally extending wall, a floor secured to said lower spars, a set of struts connecting said upper and lower spars outside the line of said frame bars, and a sheet of impervious material forming a deflecting wall secured to said struts and curved in at its bottom to meet said vertical side wall.

9. In a flying machine of the character described, a frame and wall structure according to claim 8 in which the upper spars and sheet of impervious material secured thereto extend laterally on opposite sides to form side extensions of the horizontally extending wall.

10. In a flying machine of the character described and having a frame and wall structure according to claim 8, a set of centrifugal fans within the space inclosed by said vertical side wall arranged to force currents of air through openings in such wall into the space within said deflecting wall.

11. In a flying machine of the character described and having a center post and a plurality of fans and a corresponding plurality of hinged valves for distributing air passing through the discharge chambers of the fans, means for simultaneously operating said valves consisting of a wheel rotatably mounted on said post, connecting rods pivoted to said wheel and individually having crank connections with the valves, and a manually operable connection for rotating said wheel.

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