W. HAUPT.

FLYING MACHINE.

APPLICATION FILED OCT 8, 1920.

1,388,642.

Patented Aug. 23, 1921.

3 SHEETS—SHEET 1.

Fig. 1.

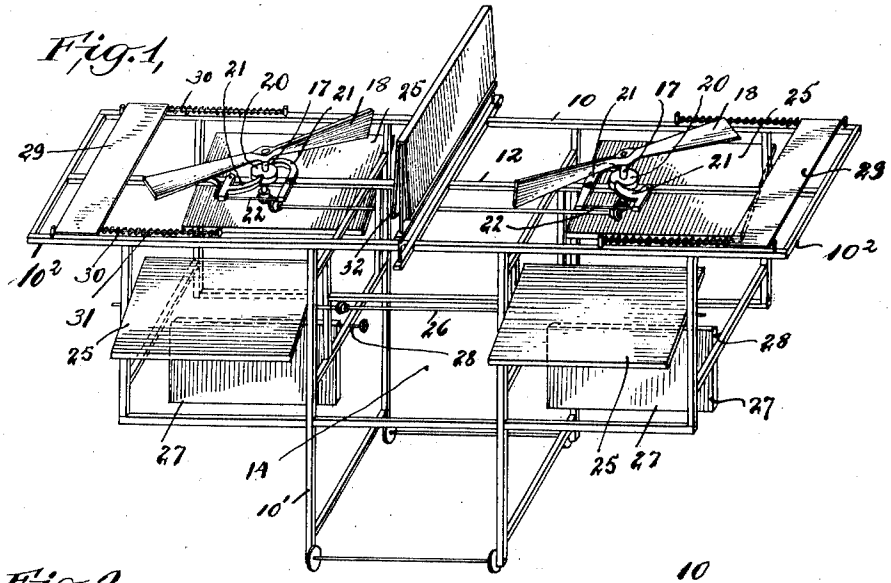
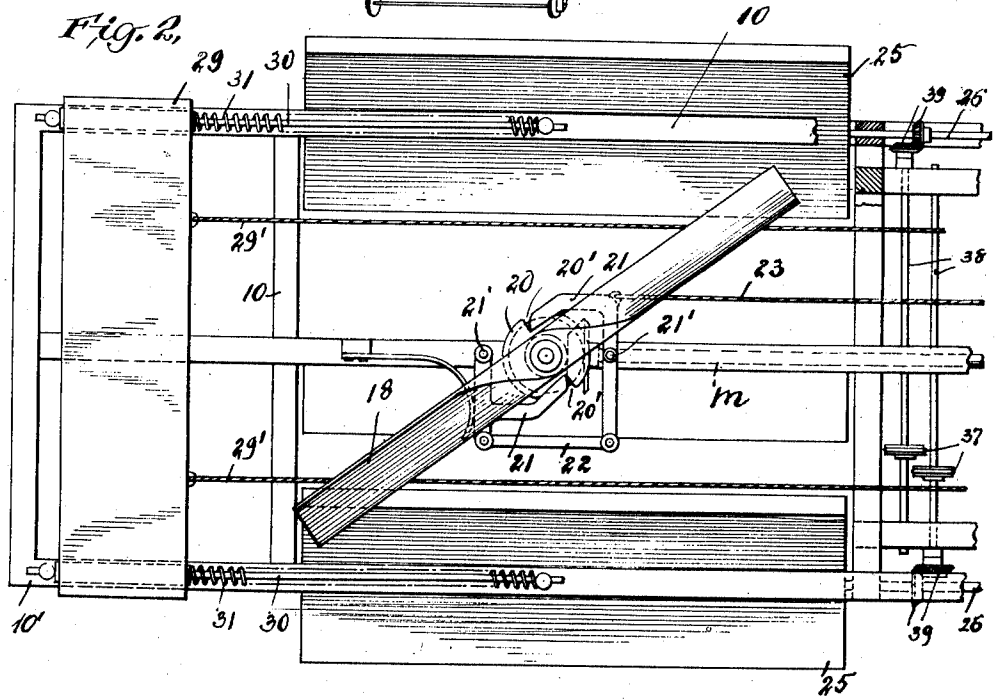


Fig. 2.



INVENTOR

Wenzel Haupt

BY

Mus & Drummann

ATTORNEYS

W. HAUPT.

FLYING MACHINE.

APPLICATION FILED OCT 8, 1920.

1,388,642.

Patented Aug. 23, 1921.

3 SHEETS—SHEET 2.

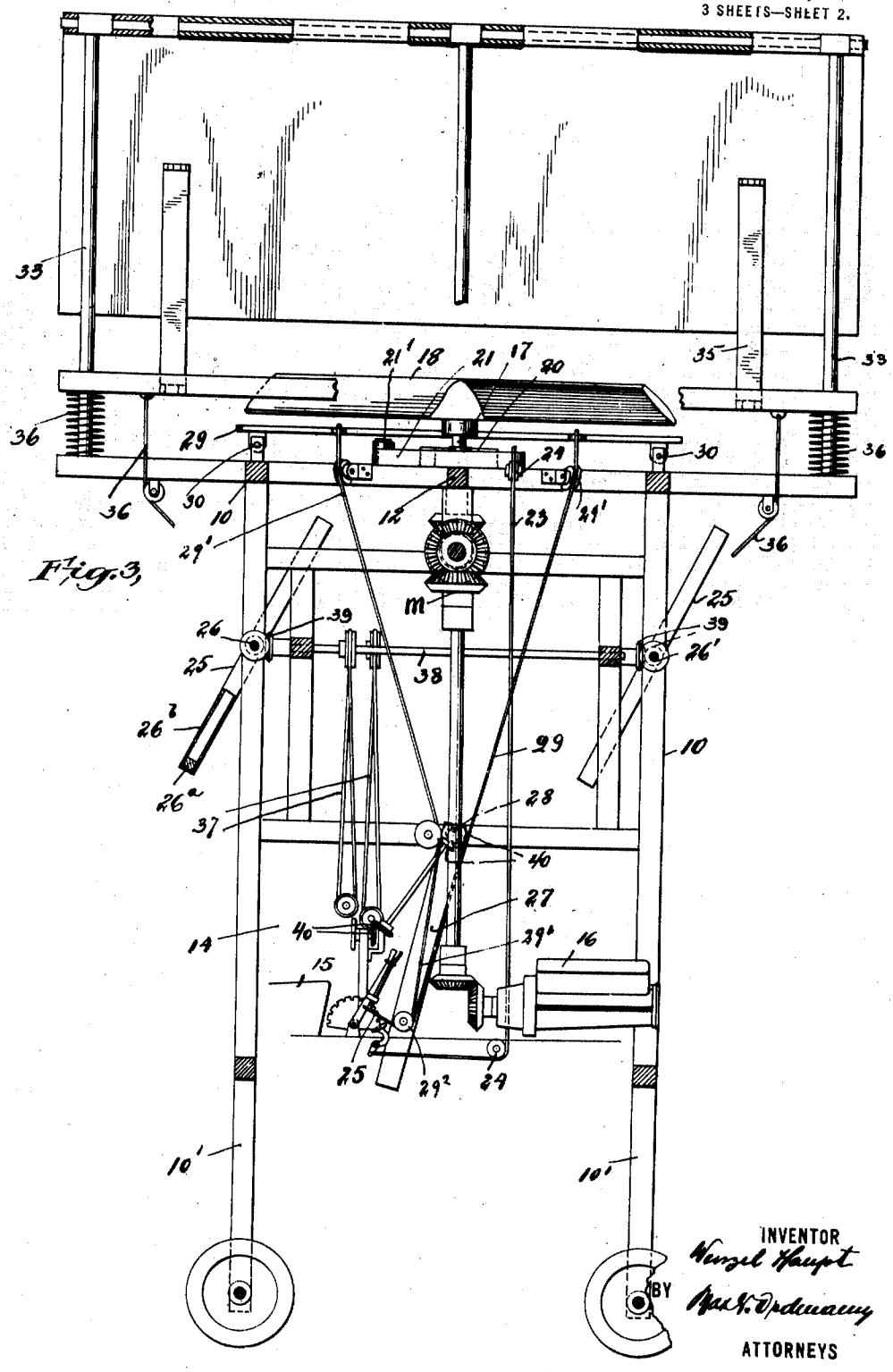


Fig. 3.

INVENTOR

Wenzel Haupt

BY

ATTORNEYS

W. HAUPT.

FLYING MACHINE.

APPLICATION FILED OCT 8, 1920.

1,388,642.

Patented Aug. 23, 1921.

3 SHEETS—SHEET 3.

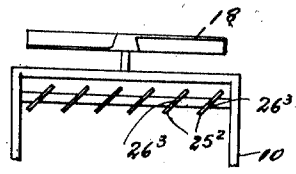


Fig. 9,

Fig. 10

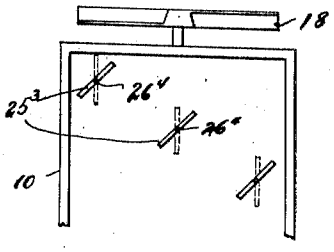


Fig. 4,

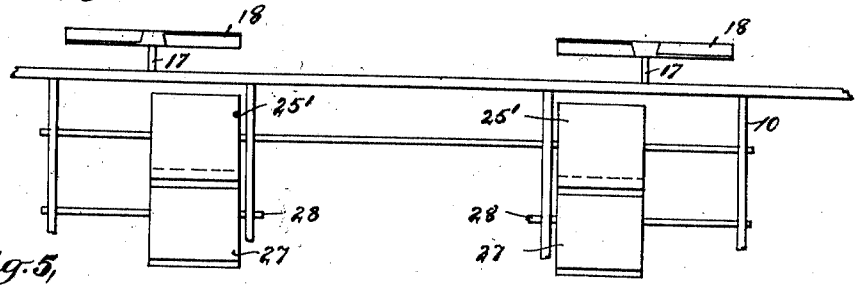


Fig. 5,

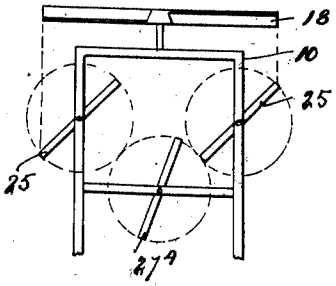


Fig. 6,

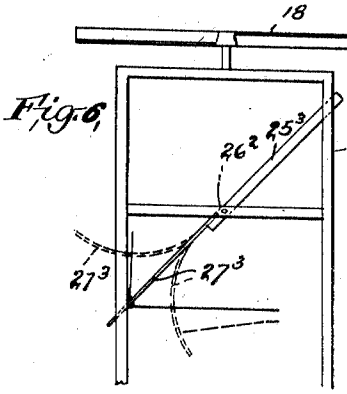


Fig. 7,

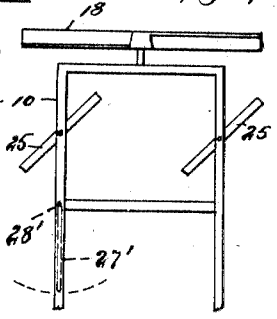
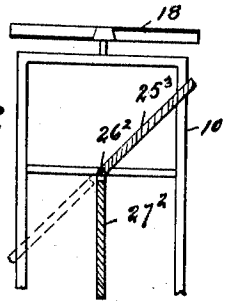


Fig. 8,



INVENTOR

Wenzel Haupt

BY

Mack & Drohmann

ATTORNEYS

UNITED STATES PATENT OFFICE.

WENZEL HAUPT, OF NEW YORK, N. Y.

FLYING-MACHINE.

1,388,642. Specification of Letters Patent. Patented Aug. 23, 1921.

Application filed October 8, 1920. Serial No. 415,526.

To all whom it may concern:

Be it known that I, WENZEL HAUPT, citizen of the Republic of Czechoslovakia, residing at city of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Flying-Machines, of which the following is a specification.

The present invention relates to flying machines of the helicopter type and has for its principal object to provide a construction in which the action of the volume of air displaced by propellers on planes arranged at an angle below the propellers is effectively utilized for propelling, supporting and steering the machine.

Another object is to so construct and arrange the planes and propellers in relation to each other and to the machine as to enable the latter to start its horizontal or vertical flight without first taking a run on the ground; to carry out its horizontal flight close to the ground at moderate speed and a safe landing.

The principle on which my invention is based is that when below and coaxially with a revolving propeller a second independently movable propeller is arranged then the volume of air displaced by the upper propeller will cause the lower one also to revolve. If the two propellers are of the same kind, that is to say, both right hand propellers or left hand propellers, then the lower propeller will revolve with the upper one in the same direction and approximately the same speed. But when the two superposed propellers are of different kind, one a right propeller and the other a left propeller, then the lower propeller upon the rotation of the upper one will be caused to revolve in opposite direction to the upper one and with a somewhat reduced speed.

If, now, an inclined plane is substituted for the lower propeller, then this plane will be influenced by the rotation of the upper propeller in two ways, to wit, one half of said plane under the influence of one of the blades of the upper propeller will tend to revolve in the same direction and with the same speed as the upper propeller and the other half of said plane under the influence of the opposite blade of the upper propeller will tend to revolve in opposite direction and with a somewhat reduced speed. The result of such double influence will be that the plane will tend to carry out a lateral movement with a speed equal to the difference between the speeds of the two halves of the plane. This tendency of the plane to move laterally is utilized to effect horizontal propulsion, by providing two propellers revolving in opposite direction and each cooperating with an inclined plane arranged below the same.

In accordance with this principle my invention consists in the construction of a flying machine in which at least two horizontal and oppositely revolving propellers coöperate with planes suspended below the same so as to be adjustable vertically under various angles, so that on proper adjustment, these planes will be acted upon by the air pressure or air volumes displaced by the revolving propellers to cause the flying machine, according to the heretofore explained principle, to carry out a horizontal flight.

Upon adjusting the planes into a vertical position they will offer no resistance and the propellers themselves will produce a vertical flight.

My invention also consists in the provision of additional planes, for balancing, and steering, as will be hereinafter more fully described and defined in the appended claims.

In the accompanying drawings in which similar reference characters denote corresponding parts, Figure 1 is a more or less diagrammatic perspective view of my improved machine; Fig. 2 is an enlarged top plan view of one end of the flying machine; Fig. 3 is an enlarged vertical cross section thereof; Fig. 4 is a digrammatic front view of the machine showing modified driving planes; Fig. 5 is a diagrammatic end view of the machine illustrating the relative arrangement of the propeller, driving planes and steering or balancing planes; Fig. 6 is a similar end view showing a modified arrangement of the driving planes and the steering or balancing planes; and Figs. 7, 8, 9 and 10 are similar end views showing other modifications of said planes.

10 denotes a skeleton substantially rectangular frame composed of wooden rods, metal tubes, or other suitable material with central vertical extensions 10′ to form legs which preferably are provided with wheels.

Extending longitudinally and centrally relative and fixed to the upper face of the frame is a supporting beam 12 carrying the bearings for the propeller shafts 17 as will

be hereinafter described. The central space 14 of the frame serves for the accommodation of the drivers seat 15, motor or motors 16 and all mechanism for controlling the operation of the different planes and devices to be presently described (Fig. 3).

For the proper operation of the machine at least two propellers are required, one on each side of the central compartment or space 14. The propellers may be of any known construction, but I have found that a propeller with a plurality of wings or blades, preferably, one of the type described and shown in my copending application, serial #368204 is more advantageous because of the more effective distribution of air in the circular area described by the revolving propeller and because the tendency of bending or breaking of the latter is considerably lessened.

Coöperating with the vertical spindles 17 of the propellers 18, which spindles are rotatively and suitably mounted in bearings provided in the beam 12, are means for braking and locking said spindles, whose object is to prevent a sudden and rapid fall of the flying machine when the motor fails to operate. Without this braking and locking means, when the motor or other driving power ceases to operate, the propeller by its own inertia, will first continue to revolve in the driven direction, then, owing to the air pressure acting on it from below, as the machine is sinking, will gradually come to a standstill and thereupon begin to revolve in the direction opposite to the driven direction, thereby causing the machine to sink more rapidly. By the use of the braking and locking means, whereby, at the instant the motor ceases to operate, a braking action is first applied to the propeller shafts thereby speedily bringing them to a standstill and then locking the propellers the sinking of the machine will be retarded.

Various means may be employed to accomplish this object. In the present embodiment of my invention I have shown these means to consist of a disk 20 mounted on and fixed to each of the propeller shafts 17 below the propellers 18, and provided with diametrically opposed notches 20′, and of two spring actuated pawls or dogs 21 adapted to coöperate with said disk and pivotally supported at $21\frac{1}{4}$ on the supporting beam 12. These dogs or pawls are arranged at opposite sides of the disk and are linked together by a member 22, so that the pawls of each pair will move together. The manipulation of these pawls may be effected by means of wires, cables 23, or the like guided over pulleys 24 supported in the frame 10, and leading to the driver's seat to be manipulated there by a pedal 25 or the like. The shaft 17 of each propeller is equipped with the aforesaid device and the two devices may be suitably connected to allow of their simultaneous operation or each may be operated separately.

Normally, that is when the motor is in operation the pawls 21 are held against the action of their springs out of engagement with the notched disks 20, so that the disks while revolving will be free of friction.

A further effect of the locking of the propellers will be that the latter when arrested will act as supporting planes and as such will be more or less effective according to the size and the number of blades composing the propeller. Multiple blade propellers naturally will have a greater supporting effect.

Owing to the fact that the braking and locking of the propeller produces a torque or turning moment which will tend to swing the flying machine around its own axis, it is obvious that this device can be used only when at least two propellers are employed each equipped with such device.

Arranged immediately below each of the propellers 18 are the driving planes 25. These planes are supported in the lateral parts of the frame to be adjustable on horizontal axes. The driving planes may be of any suitable construction and shape, and their arrangement in the frame and the manner of their suspension may vary according to requirements. In the case, when it is desired to utilize the driving planes both for driving and supporting, four planes may be provided, two for each propeller arranged in pairs, one pair in front and the other pair at the rear of the machine. Each of said pairs of planes is supported on a common horizontal spindle 26, 26′, (Figs. 1 and 3).

The planes may each be equal in length to the diameter and in width may range between the width of the propeller blade and the length of a line drawn from one end of a propeller at an inclination of 45° toward the vertical axis of the propeller. The spindles 26, 26′ are arranged parallel to one another and at the same elevation below the propellers.

The planes may be made of any suitable material. I prefer to construct each of a wooden frame 26^a covered on both sides with canvas 26^2 or the like. (Fig. 3).

Instead of using planes extending throughout the entire length of the propellers it is possible to use planes 25′ of half the size, that is to say, planes of the length of a propeller blade. In such case I prefer to arrange the planes on the inside of the machine or in other words on the sides near the central part of the frame, as shown in Fig. 4.

According to the principle described on page 1, this arrangement of the driving

planes will produce the best driving results when the driving planes are adjusted to the same direction as that of the propeller blades located above them.

Instead of using two planes for each propeller, a single plane, preferably the front plane may be used and this applies both to the full length planes and to the half length planes. In this case the machine will be inclined forwardly while in horizontal flight and develop a greater speed. It may be also advantageous to support the planes on a central spindle 26^2, (Figs. 6, 8) or to provide several planes 25^2 on separate spindles 26^3 located at the same elevation below the propeller shaft (Fig. 9) or planes 25^3 on spindles 26^4 located at different elevations (Fig. 10).

As heretofore explained the driving planes 25, 25′, 25^2, or 25^3, when adjusted to an inclined position, will, when the propellers are revolved, propel the machine horizontally. Owing to the air pressure acting against the lower sides of the driving planes a tendency of the machine to tip will be created. In order to counteract this tendency I provide additional planes which I shall call balancing planes. These additional planes I prefer to arrange below the driving planes and preferably in the middle between the two planes 25 or 25′ used for each propeller, as shown in Figs. 1 and 2. The balancing planes 27, of which there is one on each side, and which may be constructed similar to the driving planes, are supported on a common longitudinally extending rotary spindle 28 extending parallel to, but somewhat below the spindles 26, 26′, and suitably supported in the frame 10. These planes 27 approximately may be of the same size as the driving planes 25 or 25′. By turning the spindle 28 the balancing planes 27 may be adjusted at a suitable angle of inclination, which for the horizontal flight, should be somewhat smaller than the angle of inclination of the driving planes. But the angle of inclination of the balancing planes also depends upon various other influences, such as an unequal distribution of the load, etc.

While I prefer to arrange these balancing planes centrally between these driving planes, other arrangements, may be found advantageous. Thus the balancing planes 27′ may be suspended from a spindle 28′ extending over the front or rear faces of the frame (Fig. 7) or the balancing plane 27^2 may be suspended from the same central spindle 26^2 carrying the driving planes 25^3, when a single plane is used for each propeller. In this latter case the balancing planes must of course be capable of independent control and therefore must be independently movable, (Fig. 8).

The balancing plane may also be fixed to the driving plane 25^3 to form an extension thereof. In such case the said balancing planes 27^3 must be made wholly or partly flexible, yielding or elastic, so that they may be bent or curved into the desired inclined positions occupied by the driving planes as indicated by dotted lines in Fig. 6.

The balancing planes may also serve for steering the machine laterally, as will be hereinafter more fully described.

The balancing planes 27^4 (as shown in Fig. 5) may be suspended centrally instead of at their edges, so as to extend on opposite sides of their spindles similar to the driving planes shown in Fig. 1.

In addition to the driving planes and balancing planes I provide longitudinally adjustable planes 29, one at each side of the machine, which serve for the balancing of the machine laterally. These planes are slidably mounted on lateral projections 10^2 extending from the upper part of the frame along longitudinal guide rods 30 supported on the frame and are actuated by springs 31, the tendency of which is to normally press said planes into their extreme outer position away from the revolving propellers so as to be inoperative. When the machine has the tendency to tip on any one of its sides, then the plane 29 on the opposite side is, against the action of its springs, pulled inwardly or toward the center of the machine until it assumes a position directly below the corresponding revolving propeller, so that the volume of air displaced by the latter will be caused to act against it, as a result of which the equilibrium of the machine will be reëstablished. These steering planes 29 may be controlled from the driver's seat by wires 29′ or the like running over pulleys 29^2.

These planes 29 may also be used for steering the machine laterally. For, by adjusting one of these planes 29 into operative position to be acted upon by the propeller above it, the machine will be lowered on the corresponding side, in consequence of which the speed on that side will be somewhat reduced, causing the machine to turn toward the inclined side.

For assisting in rapid steering in addition to the above planes vertical rudders (not shown) of well known construction may be used.

The lateral steering may also be assisted by the heretofore described driving planes, when the driving planes on the two sides are arranged to be adjustable independently of one another, so that the planes on one side of the machine may receive a greater or smaller inclination than on the opposite side, or may be brought into a vertical position, while the planes on the opposite side are retained in their inclined position. Owing to the greater resistance on the side of the greater inclination of the planes, then

on the opposite side the machine will be caused to turn toward the latter side.

The propeller shafts 17 are driven from the motor 16 in opposite directions through the medium of a suitable transmission mechanism M.

The control of the adjustment of the driving planes from the driver's seat according to the present example is accomplished through chains 37 or the like transmitting motion to cross spindles 38 which in their turn transmit motion by bevel gears 39 or the like to the shafts of the planes. The shafts of the balancing planes may be operated through gears 40 or the like.

The mode of operation of my machine is as follows:

Assuming the balancing planes and the driving planes to be adjusted in vertical position, and the lateral steering planes 29 at the extreme end positions, then the propellers, when set in motion to revolve in opposite direction, will bring about a vertical flight. By adjusting the driving plane or planes for each propeller at a suitable angle of inclination, preferably 45°, and the balancing planes at an angle somewhat smaller, preferably 23° while leaving the lateral steering planes in their extreme end positions, the machine will carry out a horizontal flight.

If it is desired to stop the machine in the air the front and rear driving planes when using the construction shown in Figs. 1 or 5 are adjusted to extend in opposite directions to one another, until such strong resistance is created, that the machine will stop.

When the motor ceases to operate, the propeller shafts are locked in the above described manner, the driving planes brought into horizontal position. The planes 29 in this case may be used for lateral steering, while the driving planes and balancing planes, for horizontal steering.

Landing in vertical direction may be effected by lessening the driving power or the angle of inclination of the driving planes, or both.

Landing in horizontal direction may be effected by proper adjustment of the steering planes.

To start a horizontal flight directly from the ground without first taking a run can be effected by adjusting the driving planes at an angle of about 45°.

When employing the plane arrangement shown in Figs. 1 and 5 it may be advantageous to adjust the rear pair of planes at an angle somewhat smaller than that of the front planes.

In case two motors are provided, it is preferable to arrange these motors at the sides of the driver's seat, one on each side.

If, during the horizontal flight, it is desired to also rise gradually, then the angle of inclination of the balancing planes from the vertical is somewhat reduced or that of the rear driving planes increased relative to the propellers, in consequence of which the air pressure acting against said planes will cause the flying machine at the front to assume an upwardly inclined position, which will result in a gradual ascent.

While I have described details of construction it is understood that various modifications may be made without departing from the spirit of my invention and I, therefore, do not wish to limit myself to the construction shown and described.

What I claim and desire to secure by Letters Patent is:—

1. In a flying machine of the helicopter type, oppositely and horizontally revolving propellers, driving planes arranged below said propellers and capable of adjustment to different angles of inclination relative to said propellers and balancing planes arranged below said driving planes and capable of adjustment to different angles of inclination relative to said driving planes.

2. In a flying machine of helicopter type, oppositely and horizontally revolving propellers, a pair of vertically tiltable driving planes arranged below each propeller, the planes of each pair being capable of independent adjustment to different angles of inclination relative to said propellers and vertically tiltable balancing planes arranged below said driving planes.

3. In a flying machine of the helicopter type, oppositely and horizontally revolving propellers, a pair of vertically tiltable driving planes arranged below each propeller, the planes of each pair being capable of independent adjustment to different angles of inclination relative to said propellers and the planes of the opposite pairs being connected to be capable of simultaneous adjustment, and a vertically tiltable balancing plane below each pair of driving planes.

4. In a flying machine of the helicopter type, oppositely and horizontally revolving propellers, a pair of vertically tiltable driving planes arranged below each propeller, a common rotary spindle for the planes of opposite pairs to permit simultaneous adjustment thereof and a vertically tiltable balancing plane below each pair of driving planes, the said balancing planes being connected to be capable of simultaneous adjustment.

5. In a flying machine of the helicopter type, oppositely and horizontally revolving propellers, vertically tiltable driving planes arranged below said propellers and capable of adjustment to different angles of inclination relative to said propellers, vertically tiltable balancing planes below said driving planes and horizontally movable steering

planes interposed between said propellers and said driving planes.

6. In a flying machine of the helicopter type, oppositely and horizontally revolving propellers, vertically tiltable planes below said propellers and horizontally slidable steering planes interposed between said propellers and said driving planes, said steering planes being adapted normally to lie out of the path of the air currents produced by the said propellers.

7. In a flying machine of the helicopter type, the combination with driving means, of at least two horizontal propellers, one on each side of the machine, driven from said driving machine in opposite directions, vertically tiltable driving planes below said propellers, vertically tiltable balancing planes arranged below said driving planes, a device for braking and locking each propeller when the driving power fails and the machine tends to sink and means for controlling said device from the driver's seat.

8. In a flying machine of the helicopter type, the combination with driving means, of at least two horizontal propellers, one on each side of the machine driven in opposite directions from said driving means, vertically tiltable driving planes below said propellers, vertically tiltable balancing planes arranged below said driving planes, and automatically actuated braking and locking means for each propeller to lock the same when said driving means ceases to operate, and the machine tends to sink.

9. In a flying machine of the helicopter type, the combination of at least two horizontally and oppositely revolving propellers, one on each side of the machine, vertically tiltable driving planes arranged below said propellers, horizontally slidable balancing or steering planes interposed between said propellers and said driving planes and means for braking and locking said propellers.

10. In a flying machine of the helicopter type, the combination with driving means, of at least two horizontal propellers, one on each side of the machine, driven in opposite directions from said driving means, vertically tiltable driving planes below said propellers, horizontally movable steering planes interposed between said driving planes and said propellers and vertically tiltable balancing planes below said driving planes.

11. In a flying machine of the helicopter type, oppositely and horizontally revolving propellers, a pair of vertically tiltable driving planes arranged below each propeller, a common rotary spindle for the planes of opposite pairs to permit simultaneous adjustment thereof and a vertically tiltable balancing plane below each pair of driving planes, the said balancing planes being connected so as to be capable of simultaneous adjustment, and means for controlling the inclination of said driving and balancing planes from the driver's seat.

12. In a flying machine of the helicopter type, a frame, horizontally and oppositely revolving propellers, horizontal spindles extending below said propellers and rotatively borne in said frame, planes supported on said spindles and a spindle rotatively supported in said frame parallel to and below said first named spindles, balancing planes supported on last named spindle, the first named planes being adapted at a certain inclination to be acted upon by the air volume displaced by said propellers to effect a horizontal propulsion of the machine, at another inclination to act as supporting planes and a still other inclination to act as braking planes.

13. In a flying machine of the helicopter type, a frame, horizontal oppositely driven propellers, horizontal spindles extending longitudinally of and rotatively borne in said frame below said propellers, planes supported on said spindles and adapted to be acted upon by the air currents displaced by said propellers to effect a horizontal propulsion, a spindle rotatively supported in said frame parallel to and below said first named spindles, planes supported on said last named spindle and serving for balancing the machine during its horizontal flight, and steering or balancing planes horizontally and movably supported on said frame.

14. In a flying machine of the helicopter type, horizontally and oppositely revolving propellers, and vertically tiltable driving planes arranged below said propellers, each of said driving planes being arranged below only one side of each of said propellers and vertically tiltable balancing planes arranged below said driving planes.

15. In a flying machine of the helicopter type, horizontally and oppositely revolving propellers, and vertically tiltable driving planes arranged below said propellers, said driving planes being arranged below only one side of said propellers and in front of the machine, and vertically tiltable balancing planes arranged below said driving planes.

16. In a flying machine of the helicopter type, oppositely and horizontally revolving propellers, vertically tiltable driving planes, said driving planes being arranged below only one side of each of said propellers, and horizontally movable steering or balancing planes below said propellers, said last named planes being adapted to normally lie out of the path of air currents produced by said propellers.

17. In a flying machine of the helicopter type, horizontally and oppositely revolving propellers, vertically tiltable driving planes and vertically tiltable balancing planes, said

driving planes and balancing planes being each arranged below a propeller blade and in length equal thereto.

18. In a flying machine of the helicopter type, horizontally and oppositely revolving propellers, one on each side of the machine, vertically tiltable driving planes, each equal in length to that of a propeller blade and arranged below the propeller blade located near the central space of the machine, and balancing planes arranged below said driving planes and corresponding in length thereto.

19. In a flying machine, oppositely and horizontally revolving propellers, inclined driving planes below said propellers, and balancing planes arranged below said driving planes inclined at a different angle relative to said driving planes.

20. In a flying machine, oppositely and horizontally revolving propellers, means to rotate the same, inclined driving planes below said propellers, and horizontally slidable steering or balancing planes interposed between said propellers and said driving planes, said steering planes being adapted normally to lie out of the path of the air currents produced by said propellers.

21. In a flying machine, oppositely and horizontally revolving propellers, inclined driving planes below said propellers and vertically tiltable balancing planes arranged below said inclined driving planes.

22. In a flying machine, oppositely and horizontally revolving propellers, vertically tiltable driving planes, said driving planes being arranged below said propellers, and inclined balancing planes arranged below said tiltable driving planes.

23. In a flying machine, oppositely and horizontally revolving propellers, inclined driving planes arranged below said propellers, horizontally movable steering or balancing planes interposed between said driving planes and said propellers, and vertically tiltable balancing planes arranged below said driving planes.

24. In a flying machine of the helicopter type, oppositely and horizontally revolving propellers and horizontally slidable steering planes below said propellers, said steering planes being adapted normally to lie out of the path of the air currents produced by the said propellers, and means for operating said steering planes from the drivers' seat.

25. In a flying machine of the helicopter type, the combination with driving means, of at least two horizontal prepellers, one on each side of the machine, driven in opposite directions from said driving means, slidable steering or balancing planes below said propellers, means for operating said steering or balancing planes, means for locking said propellers when the driving power fails and the machine tends to sink, and means for controlling said locking means from the driver's seat.

26. In a flying machine of the helicopter type, horizontally and oppositely revolving propellers, a vertically tiltable driving plane below each of said propellers and a vertically tiltable balancing plane below each of said driving planes.

27. In a flying machine of the helicopter type, two horizontally and oppositely revolving propellers, one on each side of the machine, a vertically tiltable driving plane below each of said propellers, said driving planes being arranged in front of the machine, and a vertically tiltable balancing plane below said driving planes.

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

WENZEL HAUPT.

Witnesses:
Max D. Ordmann,
Joseph T. McMahon.