E. BERTHOLF.

FLYING MACHINE.

APPLICATION FILED JULY 6, 1909.

977,997.

Patented Dec. 6, 1910

3 SHEETS—SHEET 1.

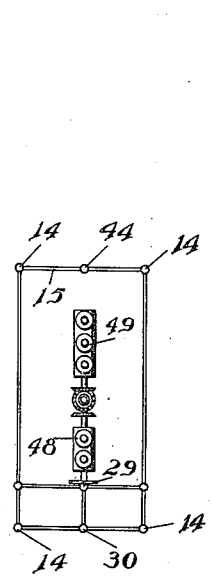



Fig. 8.




Fig. 1.

Witnesses

J. S. Tuckman.

John D. Finegan.

Inventor

Edward Bertholf.

By Bowles & Bowles

Attorneys

E. BERTHOLF.

FLYING MACHINE.

APPLICATION FILED JULY 6, 1909.

977,997.

Patented Dec. 6, 1910.

3 SHEETS—SHEET 2.

Fig. 2.

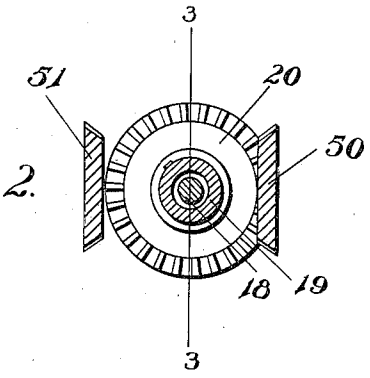



Fig. 3.

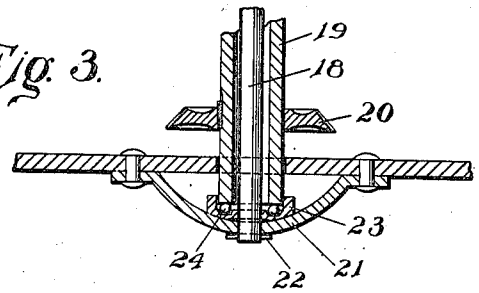



Fig. 4.

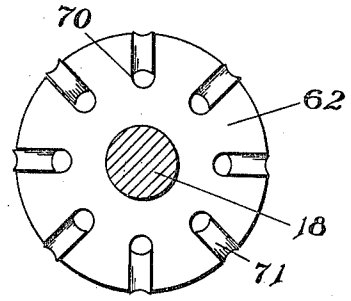
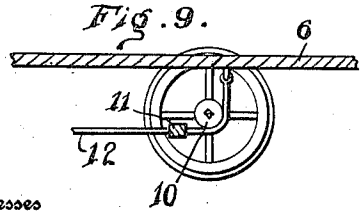



Fig. 9.




Witnesses

J. S. Freeman.

John A. Donegan.

Inventor

Edward Bertholf.

By Bandles & Bandles

Attorneys

E. BERTHOLF.

FLYING MACHINE.

APPLICATION FILED JULY 6, 1909.

977,997.

Patented Dec. 6, 1910.

3 SHEETS—SHEET 3.

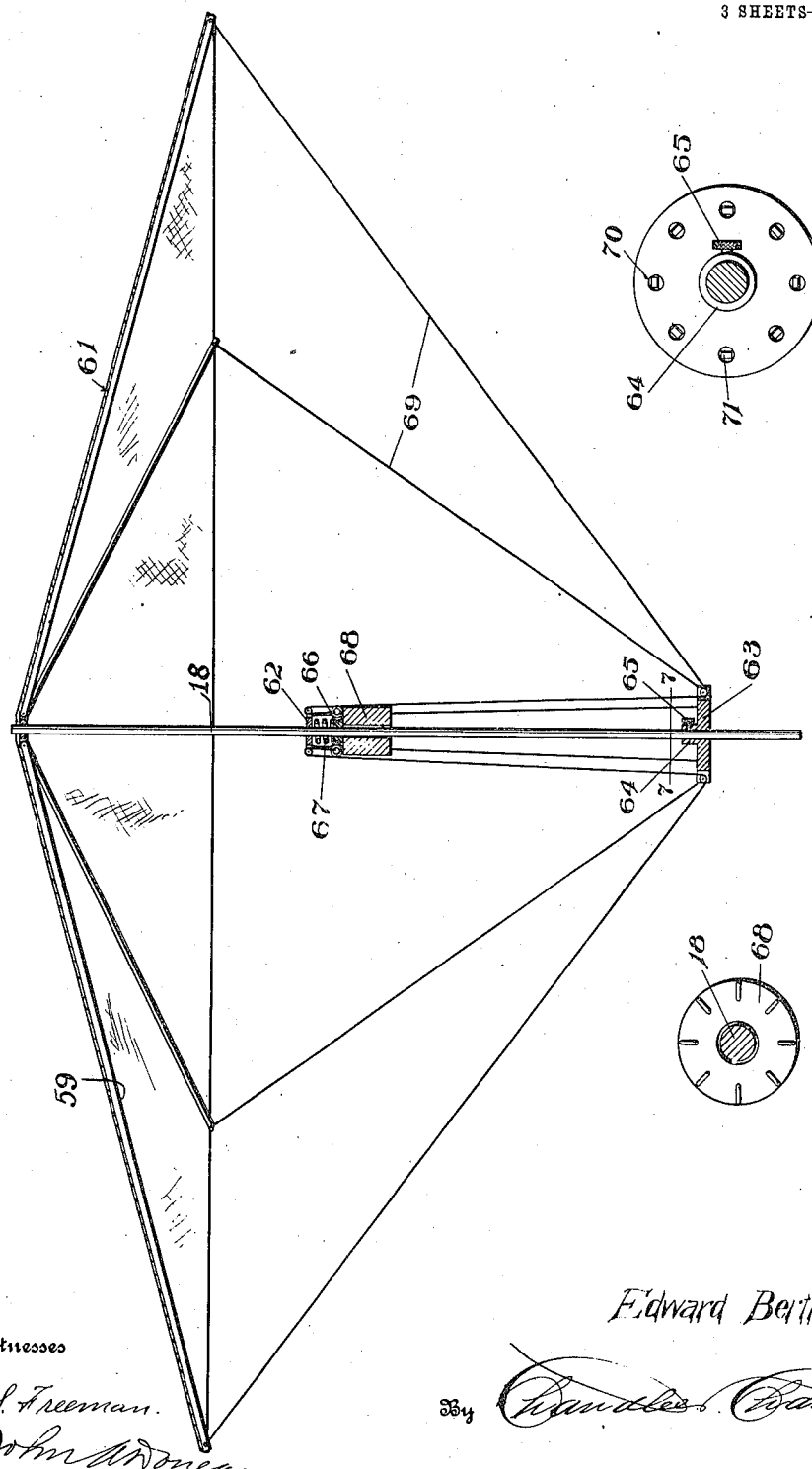



Fig. 5.




Fig. 7.




Fig. 6.

Witnesses

J. S. Freeman.

John A. Donegan.

Inventor

Edward Bertholf.

By Dannbes & Dannbes

Attorneys.

# UNITED STATES PATENT OFFICE.

EDWARD BERTHOLF, OF WATKINS, NEW YORK.

## FLYING-MACHINE.

977,997. Specification of Letters Patent. Patented Dec. 6, 1910.

Application filed July 6, 1909. Serial No. 506,182.

*To all whom it may concern:*

Be it known that I, EDWARD BERTHOLF, a citizen of the United States, residing at Watkins, in the county of Schuyler, State of New York, have invented certain new and useful Improvements in Flying-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in flying machines and has for its object the provision of a device of that kind having a motor to actuate a lifting wheel and another motor to actuate the driving propeller and a connection whereby one motor may actuate both the lifting wheel and driving propeller when the other motor becomes disabled.

Another object is the provision of a parachute adapted to automatically open when the device is in the air and the motors or the parts which they drive become inoperative.

With these and other objects in view as will more fully hereinafter appear, the present invention consists in certain novel details of construction and arrangement of parts, hereinafter fully described, illustrated in the accompanying drawings and more particularly pointed out in the appended claims; it being understood that various changes in the form, proportion, size and minor details of the device may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings forming part of the specification:—Figure 1 is a side elevation of the device. Fig. 2 is a sectional plan view on the line 2—2 of Fig. 1. Fig. 3 is a vertical sectional view on the line 3—3 of Fig. 2. Fig. 4 is a sectional plan view on the line 4—4 of Fig. 1. Fig. 5 is a detailed side elevation of the upper portion of the parachute and showing the same in open position. Fig. 6 is a detailed plan view on the line 6—6 of Fig. 1. Fig. 7 is a similar view on the line 7—7 of Fig. 5. Fig. 8 is a sectional plan view of the cage on the line 8—8 of Fig. 1. Fig. 9 is a detail elevation of one of the supporting wheels, showing its friction hub in connection with the friction band which coacts therewith to form a brake.

Similar numerals of reference are employed to designate corresponding parts throughout.

The cage or body of the machine is designated in general by the numeral 5 and is provided with a bottom or floor 6 having bolsters 7 on its lower face and adjacent its opposite ends to which are secured axles 8. Bearing wheels 9 are journaled on the opposite ends of the axles 8 and provide a means for transporting the device after the latter is on the ground. Friction bands 10 surround the hubs of the rear wheels and have one end fixedly secured to the lower face of the bottom 6 while their opposite ends are secured to a cross piece 11, the intermediate portion of which is pivoted to one end of a connecting rod 12, the opposite end of which terminates at a point adjacent the front wheels and is pivotally connected to the lower end of a lever 13. The latter is fulcrumed in the floor 6 and its upper end within easy reach of the operator. Thus it will be seen when the wheels are running on the ground after the device has come to earth it may be brought to a stop by moving the lever so as to bring the friction bands 10 into engagement with the hubs.

Rising from the four corners of the bottom 6 are standards 14, the upper ends of which are connected by stringers 15 disposed parallel with the sides and ends of the bottom, and inclining upwardly and inwardly and terminating adjacent the center of the device are struts or braces 16, the outer ends of which are secured to the upper ends of the standards 14 while the inner ends of which are secured to the outer face of a boxing 17.

Rising from the center of the frame is a standard 18 which extends through the boxing 17 and considerably above the latter, and encircling the standard 18 is a hollow shaft 19. The shaft 19 is considerably less in length than the standard 18 and adjacent its lower end is provided with a bevel gear 20. It might here be stated, that the lower end of the standard 18 extends through the floor 6 and surrounding the lower end of the standard is a cup-shaped boxing 21, having a central opening through which the lower end of the standard projects, the said lower end being provided with a head or cap 22 which bears on the outer face of the boxing. Surrounding the lower end portion of the standard and bearing on the inner face of the boxing 21 is a cone 23, having a ball recess in

which is disposed ball bearings 24 and bearing on these ball bearings 24 is the lower end of the hollow shaft 19. The upper end of the hollow shaft 19 extends beyond the upper boxing 17 and has keyed thereto a lifting wheel 25; the latter consists of a hub 26, which is keyed to the outer end of the hollow shaft and from which extend the radial blades 27 having the requisite pitch to lift the device from the ground when the wheel rotates.

Extending longitudinally of the cage and having its opposite ends secured to the intermediate portions of the end cross pieces is a stringer 28, the intermediate portion of which is provided with an eye or opening for the loose reception of the hollow shaft 19 and rising from the rear end portion of the floor 6 and at the longitudinal central line thereof is a brace 29, the upper end of which is secured to the rear end portion of the stringer 28. A second brace 30 rises from the central portion of the rear end of the floor 6 and is in direct alinement with the first-named brace 29 having it supper end secured to the rear end cross piece. The upper end portions of the braces 29 and 30 are provided with boxings 31 and 32 and journaled in these boxings is a propeller shaft 33, one end of which extends beyond the rear of the cage and is provided with a propeller 34. The latter has the usual hub 35 which is keyed to the outer end of the shaft and from which project the radial blades 36 having the requisite pitch to drive the machine when the latter is lifted from the ground. The inner end of the propeller shaft 33 projects in advance of the innermost brace 29 and terminates in a sprocket wheel 37, and connection between the braces 29 and 30 is established by means of an upwardly inclined strut 38, the opposite ends of which are secured to the intermediate portion of the outer brace 30 and boxing 32 of the inner brace 29.

A rudder is arranged at the central portion of the forward end of the cage and is designated by the numeral 39. The inner end of the rudder is provided with eyes 40 and 41 which engage with similar eyes 42 and 43, which are arranged in a vertical plane and secured to a brace 44, the latter is arranged at the intermediate portion of the forward end of the floor 6 and has its opposite ends secured to the floor and front cross piece 15. Disposed on the upper side and adjacent the forward end of the rudder 39 is an arcuate rack 45 which is disposed in a horizontal plane with its opposite ends lying equal distances from the opposite faces of the rudder and journaled in the brace 44 is a shaft 46, the outer end of which is provided with a pinion 47 which meshes with the teeth on the upper face of the rack 45 while its inner end terminates at a point adjacent the vertical hollow shaft 19 and has keyed or otherwise secured thereto a hand wheel 47. Thus it will be seen by turning the hand wheel 47 rotary movement will be imparted to the shaft 36, whereby the rudder 39 will be swung to either side of the central line of the cage.

The motors employed for driving, lifting and propelling means are preferably of the hydro-carbon type and each may possess any number of cylinders required. In the present instance two of these motors are employed and are designated by the numerals 48 and 49. The motors are arranged on opposite sides of the shaft 19 and adjacent the opposite ends of the floor 6. The opposed inner ends of the driving shaft 49′ of the motors terminate at points adjacent the bevel gear 20 of the hollow shaft and slidingly fitted on these opposed inner ends are a pair of bevel gears 50 and 51. The bevel gears 50 and 51 are provided with the usual hubs 52, the outer surfaces of which have annular grooves and fulcrumed on the floor 6 are the lower ends of a pair of levers 53 and 54 which are provided with lateral studs, (not shown,) the latter engaging with the grooves and operating to slide the gears 50 and 51 longitudinally of the shafts 49′ so as to bring the teeth of the gears 50 and 51 into engagement with the teeth of the bevel gear 20, it being understood that the hubs of the gears 50 and 51 have tongues which slidingly fit in recesses in the driving shafts 49′. Thus it will be seen when the levers 53 and 54 are moved inwardly or toward each other that the teeth of the gears 50 and 51 will engage with the teeth of the bevel gear 20 on the hollow shaft 19, whereby rotary movement will be imparted to the lifting wheel 25, it being understood that the gears 50 and 51 will be rotated in opposite directions and when either of the gears 50 and 51 are moved out of engagement with the bevel gear 20, one of the motors will operate the lifting wheel.

It will be observed now by referring to Fig. 1 that the rearmost motor 48 has that end of its driving shaft 49′ remote from the bevel gear 51, extending to a point adjacent the rear end of the floor 6 and keyed to this portion of the shaft is a sprocket wheel 55 in direct alinement with the sprocket wheel 37 on the inner end of the propeller shaft 33, connection between the sprockets being established by means of the usual sprocket chain 56. If desired, a clutch connection operated by a lever 57 may be established between the sprocket wheel and driving shaft 49′ so that the sprocket wheel 55 may be thrown out of connection with the motor 48 whenever desired and without interfering with the operation of the lifting wheel 25.

Disposed on that end portion of the standard 18 projecting above the upper end of

the hollow shaft 19 is a parachute designated in general by the numeral 58. This member is provided with the usual ribs 59, the inner ends of which are pivoted to a toothed collar 60, rigidly secured to the upper extremity of the standard 18. The ribs are covered with the usual cover 61, which is fixedly secured to the ribs.

By referring now to Figs. 1 and 5 it will be seen that disposed on the standard 18 and at points adjacent the upper and lower ends of the ribs 58, when the latter are perpendicular with the standards, are a pair of disks 62 and 63, the lower of these disks is provided on one face with a sleeve 64 which loosely receives the standard 18, said sleeve having a radial opening for a set screw 65 by means of which the disk is adjustably secured to the standard. The upper disk 62 is secured to the standard 18 and arranged below the upper disk 62 is a bumper 66, the latter is in the form of a disk and slidingly fits on the standard 18 and is connected to the upper disk 62 by means of a helical compression spring 67 which encircles the standard 18, the opposite ends of which are secured to the opposed faces of the disk 62 and bumper 66.

Slidingly fitted on the standard 18 and below and in the space between the bumper and lower disk 63 is a weight 68 and connection of the weight 68 and outer ends of the ribs 61 is established by means of cords or wires 69.

By referring now to Figs. 4 and 7 it will be seen that the upper and lower disks are provided with a series of spaced openings 70 and journaled in the openings 70, are the opposite ends of rollers 71. The bumper disk 66 is likewise provided with a plurality of openings which are in direct alinement with the openings of the upper and lower disks.

In establishing the connection between the weight 68 and outer ends of the ribs 59 one end of the wires or cords 69 is fixedly secured to the upper end of the weight, the opposite ends of the cords are then trained over the rollers in upper disk 62 and thence directed downwardly and trained over the rollers in the lower disk 63 after which they are secured to the terminals of the ribs 59. The weight is considerably heavier than the combined weight of the ribs and cover and is adapted by means of the wires or cords 69 to hold the parachute in closed position when in the air; however when the lifting wheel or its driving mechanism becomes inoperative and the device begins to fall this falling movement will cause the air to enter beneath the cover and raise the latter to the position shown in Fig. 5. During the opening movement of the ribs it will be seen that the weight 68 will ascend on the standard 18 until its upper side abuts against the bumper 66, whereby the spring will be compressed and the sudden shock to the cover which would otherwise result, will now be reduced.

From the foregoing it can be seen that I have provided a device which is exceedingly simple in structure and comparatively inexpensive to manufacture, embodying few parts and these so arranged that the danger of derangement will be reduced to a minimum.

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

1. In a flying machine, the combination with a lifting wheel having a vertical shaft and a gear on said shaft, a propeller, a pair of motors on opposite sides of said vertical shaft and each having a horizontal drive shaft, connections between the drive shaft of one of the motors and the said propeller to operate the latter, gears on the said motor drive shafts, and means to engage either or both of said gears with the gear of the said vertical lifting wheel shaft.

2. In a flying machine, the combination of a vertical rod, a parachute at the upper end thereof and having ribs movable angularly in a vertical plane, a lower disk secured to said rod and having direction elements, an upper disk secured to the said rod and having direction elements, a weight guided on said rod and cords connecting said weight and the ribs of the parachute and engaging the direction elements of the said disks.

3. A flying machine having a parachute, a vertical rod to which the parachute is connected, a weight movable vertically on said rod and connected to the parachute to normally close the latter and a spring pressed element on said rod to yieldably check the ascent of the weight when the parachute opens.

4. In a flying machine, a standard, a pair of spaced perforated disks secured to said standard, a parachute frame pivoted to said standard above said disks, a weight, and flexible connecting elements extending through the perforations of said disks and having their opposite ends secured to said weight and the outer ends of said parachute frame.

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

EDWARD BERTHOLF.

Witnesses:
GEO. C. WAIT,
G. M. STILWELL.