

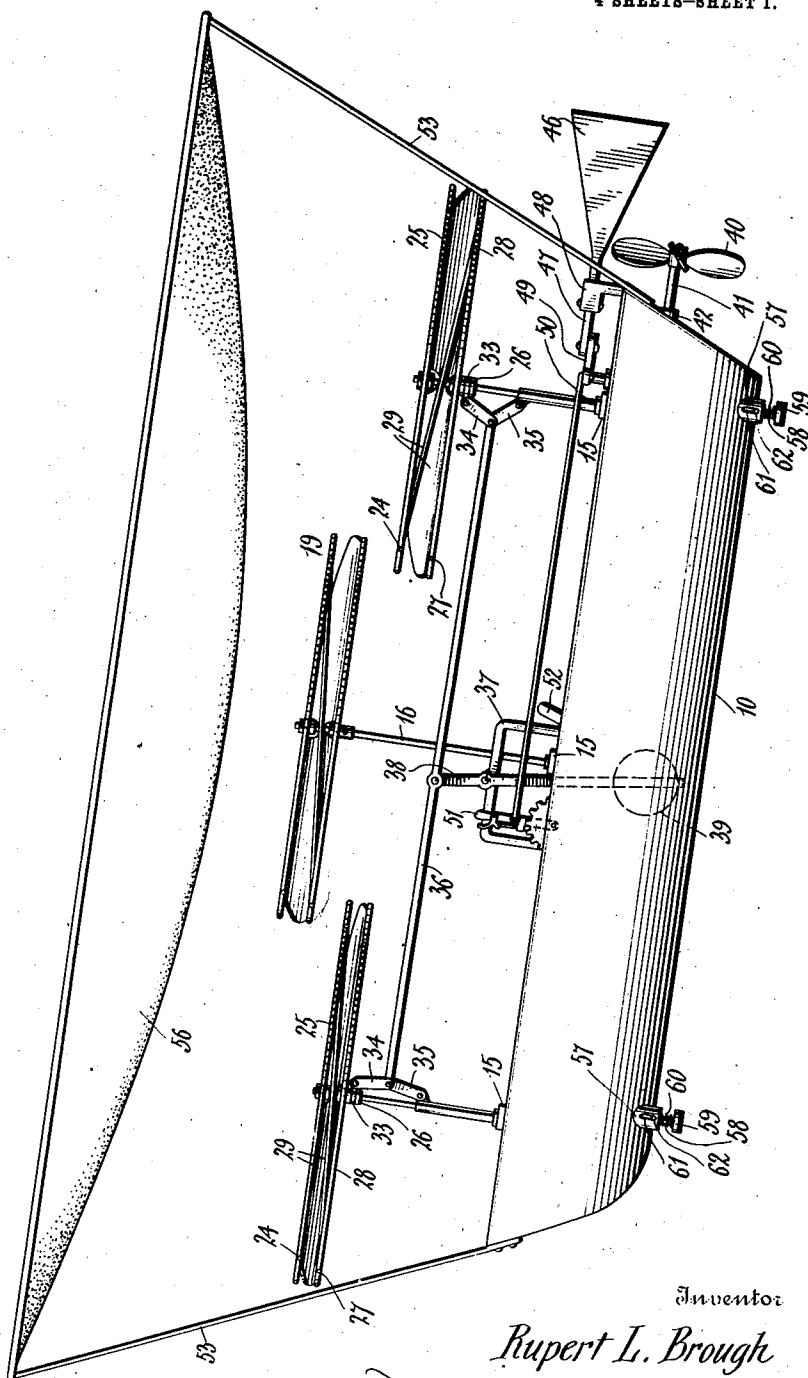
1,022,018.

R. L. BROUGH.
FLYING MACHINE.
APPLICATION FILED JULY 7, 1910.

Patented Apr. 2, 1912.

4 SHEETS—SHEET 1.

FIG. 1



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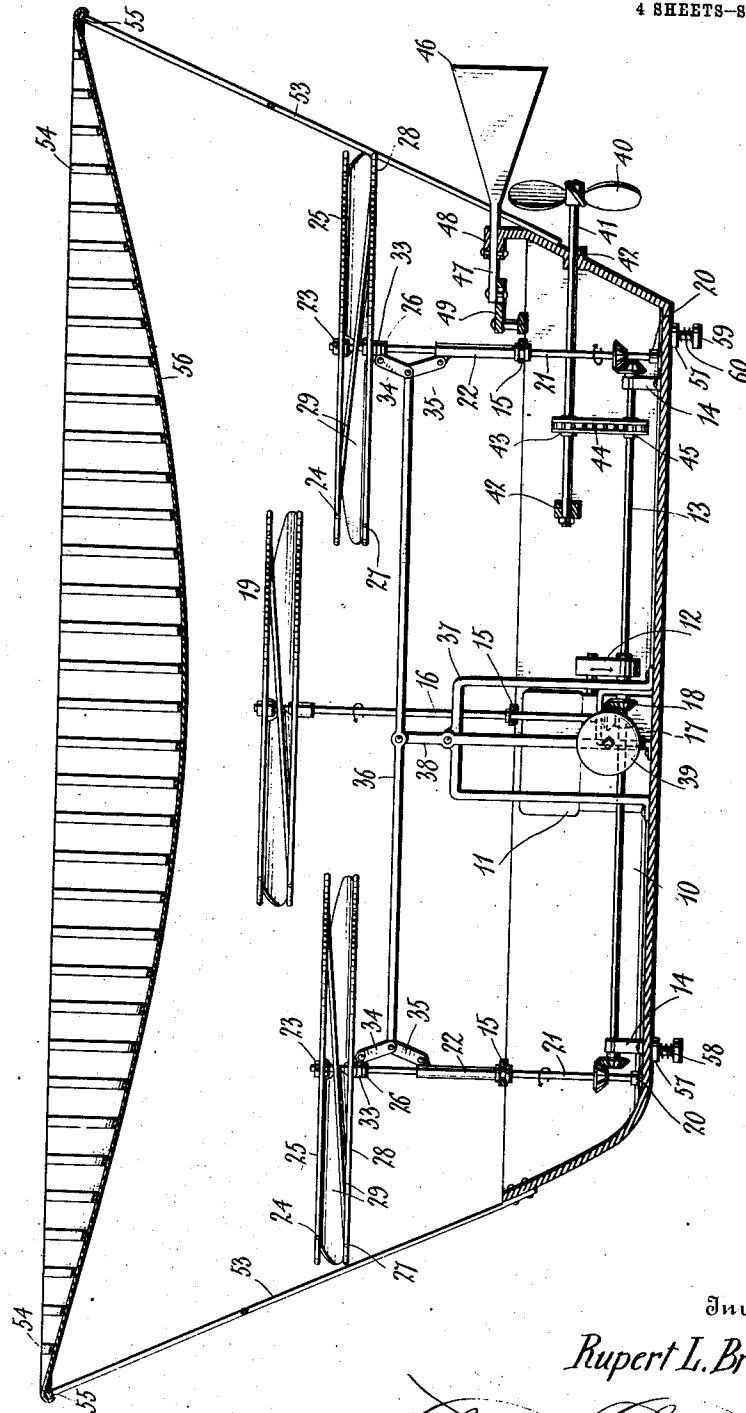
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4 SHEETS—SHEET 2.

FIG. 2



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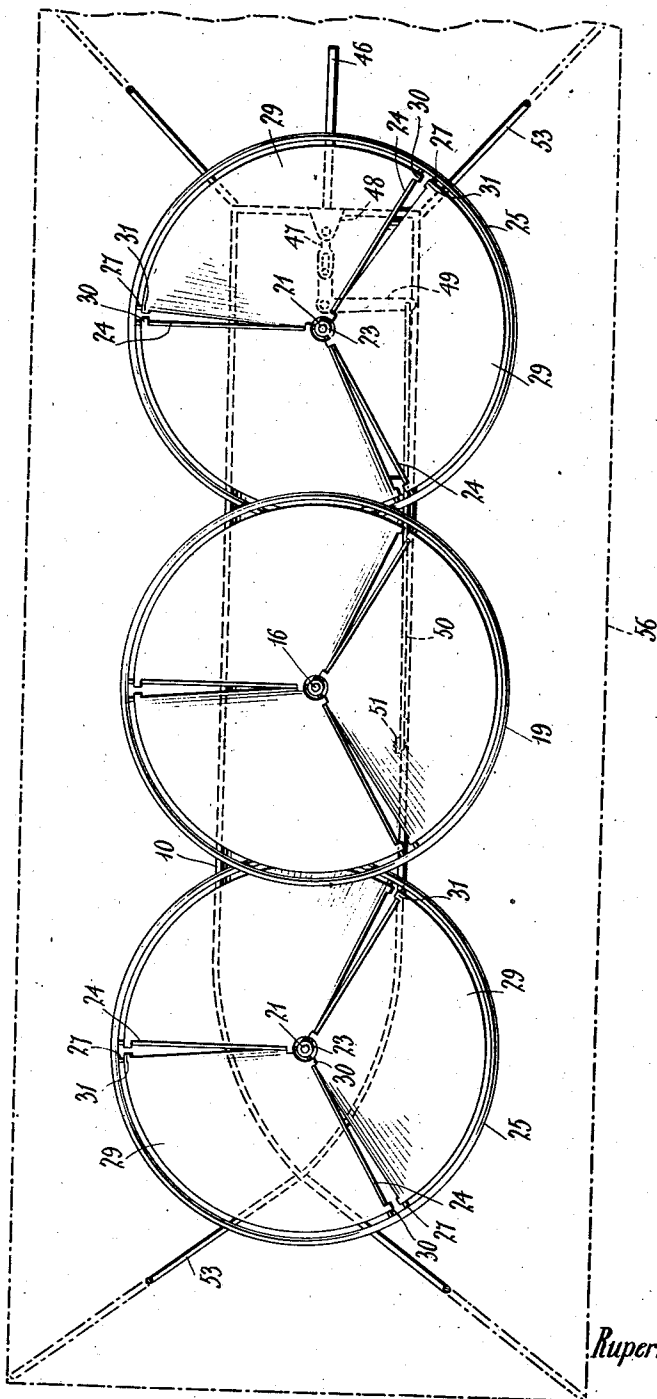
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4 SHEETS—SHEET 3.

FIG. 3



Witnesses
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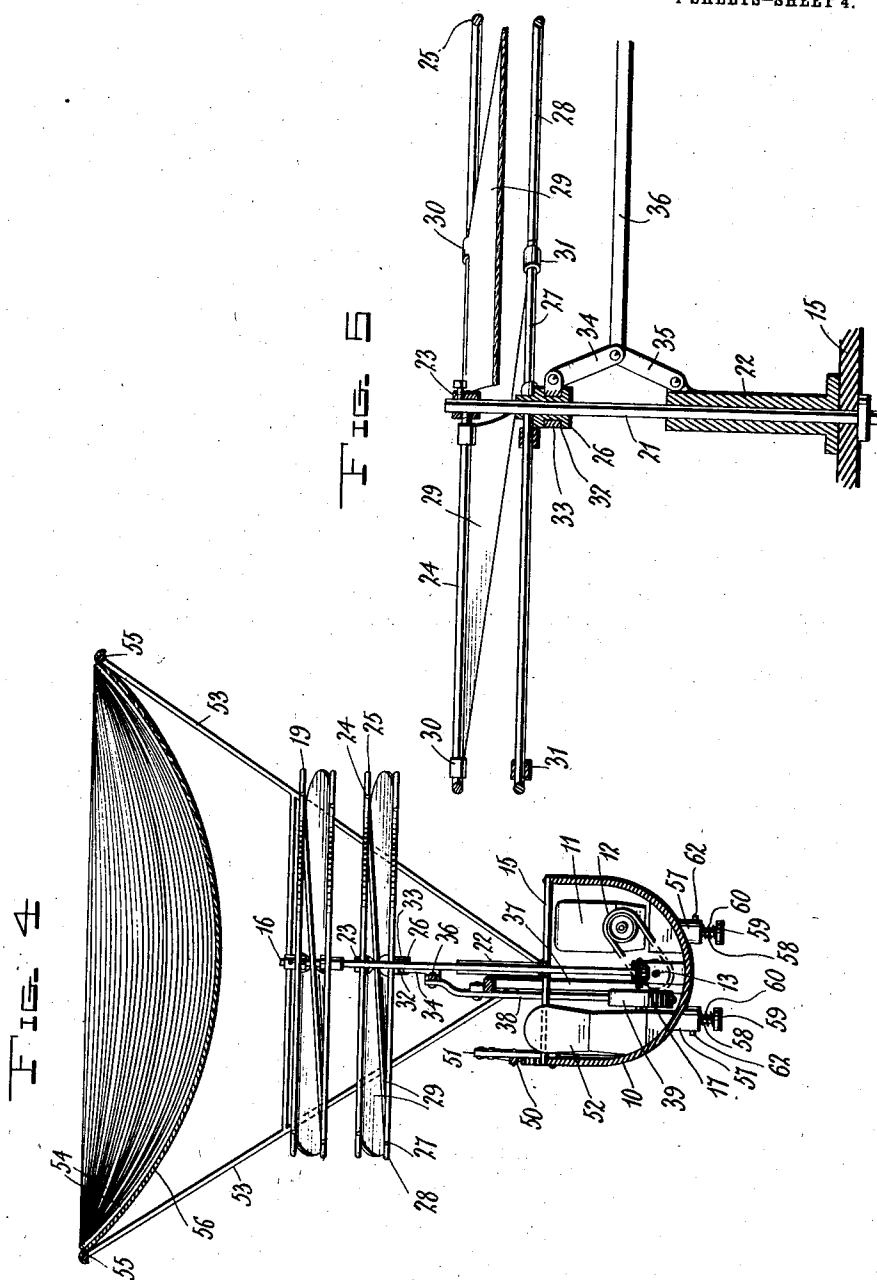
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4 SHEETS—SHEET 4.



Witnesses
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UNITED STATES PATENT OFFICE.

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FLYING-MACHINE.

1,022,018.

Specification of Letters Patent.

Patented Apr. 2, 1912.

Application filed July 7, 1910. Serial No. 570,807.

To all whom it may concern:

Be it known that I, RUFERT L. BROUGH, a citizen of the United States, residing at Middlebury, in the county of Addison, State of Vermont, 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 flying machines and has special reference to a flying machine wherein helicopters are used for the purpose of lifting the machine in the air.

One object of the invention is to provide a device of this kind with improved means for maintaining the stability of the machine when in the air.

Another object of the invention is to provide a device of this character with a combined lifting plane and parachute so that in the event of the machinery failing the device will come to the ground without injury to either machine or aeronaut.

A third object of the invention is to provide a machine with lifting helicopters arranged in combination with a plane so that the plane will aid the helicopters in their lifting effect.

With the above and other objects in view, the invention consists in general in a machine having a novel arrangement of helicopters and lifting plane.

The invention further consists in certain novel details of construction and combinations of parts hereinafter fully described, illustrated in the accompanying drawings, and specifically set forth in the claims.

In the accompanying drawings, like characters of reference indicate like parts in the several views, and Figure 1 is a side elevation of a flying machine constructed in accordance with this invention, the machine being shown with the parts in the position assumed when stability has been temporarily lost. Fig. 2 is a longitudinal section through such a machine in its stable position. Fig. 3 is a horizontal section of such a machine, the section being taken just above the helicopters. Fig. 4 is a transverse section through the machine. Fig. 5 is an enlarged detail view showing the arrangement for varying the angles of incidence of the helicopter blades with the atmosphere.

The body or hull of this invention is pref-

erably in the form of a boat as indicated at 10 so that if the device descends upon water it will not sink. Carried in this body is an engine 11 of any suitable type and this engine is connected by means of a belt 12 to a longitudinal shaft 13 which runs lengthwise of the boat, being supported in suitable bearings 14. Extending across between what may be termed the gunwales of the hull are members 15 one of which is disposed centrally of the length of said hull while the other two are equidistant from said central member. Through the central member 15 passes a vertical shaft 16 which has upon its lower end a bevel gear 17, the latter meshing with a bevel gear 18 fixed upon the shaft 13. On the upper end of the shaft 16 there is provided a helicopter 19 having fixed blades. By reason of these blades being fixed their angles of incidence to the atmosphere always remain the same and it is to be noted that the helicopter 19 is immediately above the center of gravity of the machine.

Extending through the end members 15 and carried in foot-step bearings 20 are shafts 21. These shafts 21 pass through sleeves 22 which are fixed in the members 15, the sleeves 22 constituting the upper bearings for the shafts 21. On the upper end of each of the shafts 21 there is fixed a hub 23 wherefrom radiate arms 24 which carry on their outer ends a brace ring 25. Slidably mounted on each of the shafts 21 is a hub 26 from which radiate arms 27 which are connected at their outer ends by a suitable brace ring 28. It is preferred that there should be three of the arms 24 and three of the arms 27, these arms 24 and 27 lying in pairs, the arms 27 being almost vertically below the arms 24. Secured to each of the arms 24 is a blade 29, the blade being attached to its respective arm by means of journals 30. Each of these blades is of helical form and is carried around the helicopter and carried to the arm 27 lying below the next arm 24, the connection being by journals 31. One of the helicopters thus constructed has the blades arranged for lifting when revolved in one direction and the other helicopter has its blades arranged for lifting when revolved in the opposite direction. By means of the arrangement of the sliding hub 26 and the fixed hub 23 the two hubs may be brought closer together or moved farther apart. In the first instance

the angles of incidence of the blades 29 with respect to the atmosphere will be decreased while when the hubs are moved apart said angles will be increased. For the purpose of regulating this movement each of the hubs 26 is provided with a groove 32 wherein is held a shipper ring 33. To this shipper ring is connected a link 34 the opposite end of which is connected to a similar link 35 which has its remaining end connected to the respective sleeve 22. These two links, as thus arranged, constitute an elbow joint and the connected ends of the links of one helicopter are joined to the connected ends of the links of the other helicopter by means of a bar 36. It is to be noted that the links of the two helicopters face toward each other so that the movement of the bar in one direction spreads the ends of the links of one helicopter apart and draws the ends of the links of the other helicopter together. By this arrangement one of the helicopters has its blades moved to increase their angle of incidence with the atmosphere at the same time that the angles of incidence of the blades of the other helicopter are decreased. In order to automatically control this movement there is provided a frame 37 where to is pivoted a lever 38 the upper end of which is connected to the bar 36. On the lower end of the lever 38 is a weight 39, the lever thus constituting a species of pendulum. If now the machine tilt as indicated in Fig. 1 it will be seen that the weight swings toward the rear of the machine and that the forward helicopter is closed up while the rear helicopter is opened. By means of this action the lifting effect of the rear helicopter is increased while that of the forward helicopter is diminished and the machine is brought back to its stable position. It will be obvious that in the event of the rear of the machine rising above the horizontal the reverse of this operation will take place and the forward helicopter be opened and the rear be closed with a corresponding reversal of the lifting effect. The machine will thus be maintained at all times on an even keel, any variation being instantly compensated for by the change of the lifting effect of the respective helicopters. For the purpose of driving the machine forward there is provided a propeller 40 which is carried on a shaft 41 extending longitudinally of the hull and supported in suitable bearings 42. On this shaft 41 is a sprocket 43 which is connected by a chain 44 with a sprocket 45. For the purpose of steering the device there is provided a rudder 46 which extends rearwardly of the machine. This rudder is provided with a tiller 47 which passes through a suitable guide 48 wherein it is pivoted and to this tiller is connected one arm of a bell crank lever 49, the other arm being connected by means of a

reach rod 50 to a steering lever 51 located near the operator's seat 52. This operator's seat is positioned adjacent the engine so that the operator may control both engine and rudder without moving.

Extending upward from each end of the hull are bars 53 to the upper ends of which is secured a plane. This plane is of peculiar character, being so constructed that its peripheral edges all lie in the same horizontal plane while its central portion is bowed downward. The plane consists of a series of arcuate braces 54 having their ends connected securely to longitudinal members 55 extending from the forward to the after brace on each side of the machine. The members 54 gradually decrease in radius from each end of the machine to the center so that the under sides of these members bend farther and farther downward from both ends of the machine to the center. Over the under sides of said members 54 is stretched a covering 56. The members 54 are preferably constructed of light but strong wood while the covering 56 is of suitable canvas or other fabric as may be deemed best adapted for the purpose. By reason of this peculiar arrangement of the plane and its position above the helicopters the rotation of these helicopters will draw air in both from the ends and sides of the plane. Now this air will tend to flow in horizontal planes or nearly so with the result that it will react on the covering 56 as it is drawn in and will thus materially assist the helicopters in lifting the machine. For the purpose of insuring that the plane either land without jar or shock certain buffers are provided. Each of these buffers consists of a cylinder 57 wherein moves a plunger 58 having a foot 59 on its lower end. Between this foot and the cylinder 57 is a compression spring 60. These cylinders 57 are firmly fixed to the framework of the hull and are preferably four in number, two being located at each end. For the purpose of retaining the plunger 58 in the cylinder 57 the cylinder is slotted as at 61 and a pin 62 passes through the slot and engages the stem 58.

In the operation of the device, let it be supposed that the machine is resting on the ground. The operator starts the engine which immediately starts the helicopters. This lifts the machine into the air while at the same time the propeller drives it forward. In the event of the machine tilting the action of the pendulum immediately rectifies the tilting by controlling the angles of incidence of the helicopter blades with the atmosphere. If the machinery breaks down and the machine stops the plane serves to support the machine in such manner that great resistance is offered to the air and the device will drop to the ground gradually

and without shock. In descending to the ground by the operator assuming slight changes of position the descent may be made by gliding so that a proper landing place may be selected, the operator moving forward to increase the forward velocity of the glide or backward to check such movement.

There has thus been provided a simple and efficient device of the kind described and for the purpose specified.

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

1. In a flying machine, a body, vertical shafts respectively arranged within the body at either end thereof, a stationary sleeve disposed around each shaft intermediate its ends, a hub fixedly mounted upon the upper end of each shaft, radiating arms connected to said hub, a hub slidably mounted on each shaft below the first mentioned hub, radiating arms connected with each second mentioned hub, blades respectively connected to one arm of one of the hubs and to another arm of the other hub, links pivotally con-

nected to the second mentioned hubs and the sleeves, a rod pivotally connected at its ends to the free ends of the links and a weight connected to the rod for operating the latter to vary the angle of the respective blades.

2. In a flying machine, a body, helicopters having adjustable blades and disposed above the respective ends of the body, each helicopter consisting of a normally stationary hub and a movable hub, arms respectively radiating from said hubs and blades each pivotally connected to one arm of one of the hubs and to another arm of the other hub, regulating means for varying the angle of incidence of the helicopter blades with the atmosphere and a gravity actuated control for said regulating means operable by the tilting of the machine.

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

RUPERT L. BROUGH.

Witnesses:

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