J. J. DONNELLY.

AERIAL VESSEL.

APPLICATION FILED JAN. 18, 1909.

1,014,643.

Patented Jan. 16, 1912.

2 SHEETS—SHEET 1.

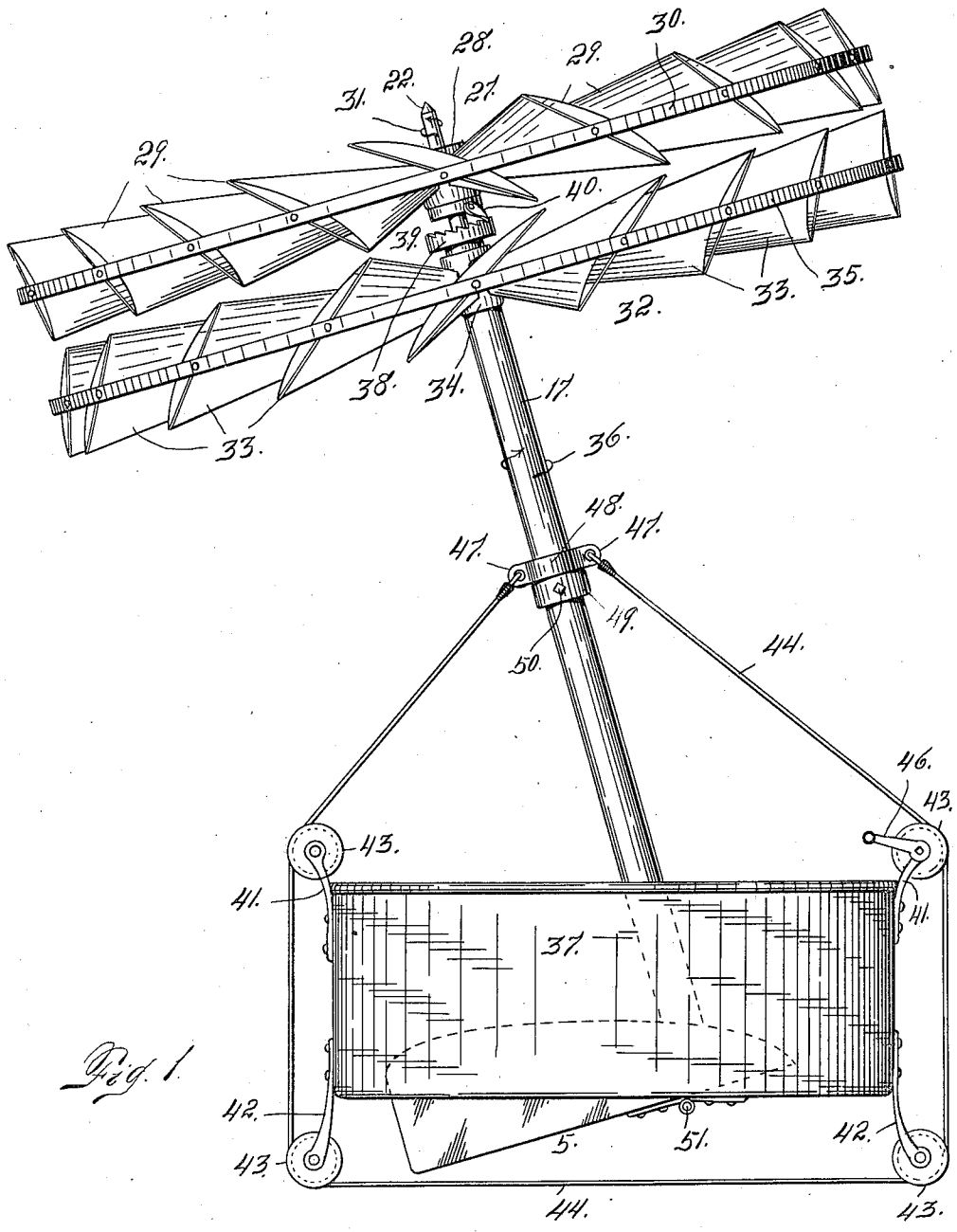

Fig. 1.

Witnesses

Otto E. Hoodwick.

I. D. Thornburgh.

Inventor

J. J. Donnelly.

By [illegible]

Attorney

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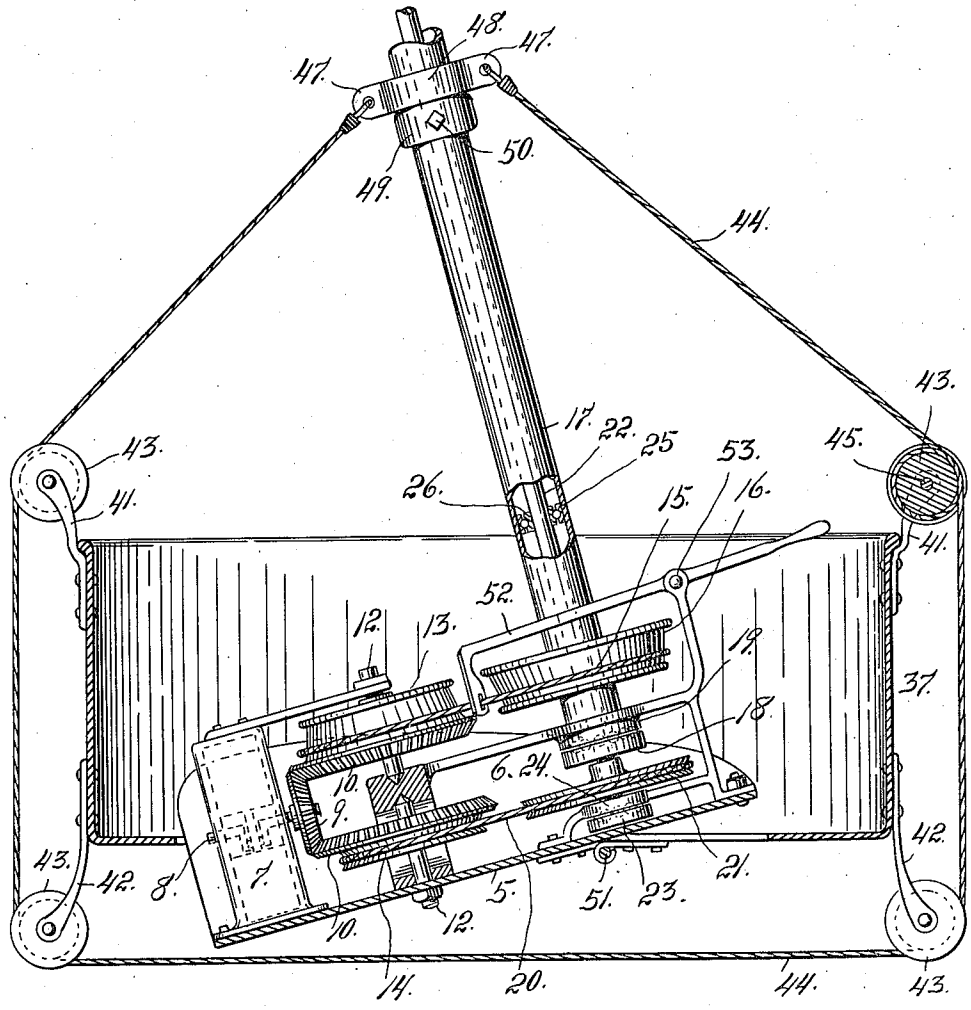

Fig. 2.

Witnesses

Otto E. Hoddick.

I. D. Thornburgh.

Inventor

J. J. Donnelly.

By N. C. Brien

Attorney

UNITED STATES PATENT OFFICE.

JOHN J. DONNELLY, OF DENVER, COLORADO.

AERIAL VESSEL.

1,014,643. Specification of Letters Patent. Patented Jan. 16, 1912.

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To all whom it may concern:

Be it known that I, JOHN J. DONNELLY, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Aerial Vessels; and I do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in aerial vessels of the heavier-than-air class.

My improved construction comprises a basket or receptacle having a hinged connection with the propelling mechanism. This mechanism consists of a suitable motor, a pair of shafts, one passing axially through the center of the other, the said shafts being upwardly directed and each equipped with a propelling wheel. The gear connection between the motor and the shafts is such that when the apparatus is in use the propellers rotate in opposite directions, thus neutralizing the tendency of the basket to rotate, which condition would obtain if either a single shaft were used or if the two shafts rotated in the same direction. The propellers are so constructed that they can be used to propel the vessel both upwardly and forwardly while rotating in reverse directions. This, of course, is accomplished by setting the blades of the two propeller wheels in reverse positions. When the apparatus is in use the propeller shafts should occupy a position forming a moderate angle with the vertical, in order that the power of the propellers shall be utilized to move the vessel simultaneously both upwardly and forwardly. In other words, the direction in which the vessel travels is approximately indicated by the position of the rotary shafts. The angle of these shafts, or their inclination is maintained by so arranging the mechanism that the shafts shall be connected therewith beyond or outside of the center of gravity, the equilibrium of the apparatus being destroyed to such an extent that when the propellers are in motion the tendency of the shafts to assume the vertical position shall be sufficiently overcome by the weight of the motor, and other mechanism, to maintain the shafts in the desired position to produce the result aforesaid, namely, the movement of the vessel simultaneously upwardly and forwardly.

In assembling the mechanism the bottom of the basket is hinged to the base plate of the operating mechanism; and the basket bottom is cut away to allow the mechanism to swing downwardly therethrough in order to allow the shafts to occupy the desired inclination. As shown in the drawing, the basket is equipped with four pulleys journaled in bracket arms. A cable engages these pulleys, its extremities being connected with a collar loosely mounted upon the hollow shaft of the propelling mechanism. This cable is given a complete turn around one of the pulleys in order to prevent the basket from shifting its position when properly adjusted. Upon the spindle, around which the cable is given a complete turn, is mounted a hand crank which is accessible to the person in the basket. If, under the influence of the weight of the person or other ballast employed, the position of the basket should not be horizontal, the operator by turning the crank may change the relative position of the basket to cause it to occupy the desired or horizontal relation.

Whenever it is desired to change the course of the apparatus, requiring that the basket shall be turned or partially rotated, the relative speed of the two propellers is changed, whereby one shall be caused to rotate faster than the other. The basket will then make the desired turning movement in a direction the reverse of the rotation of the shaft having the higher speed. As soon as the desired movement of the basket is effected, the speed of the two shafts may be equalized, which is the normal condition of the apparatus.

Having briefly outlined my improved construction, I will proceed to describe the same in detail, reference being made to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing, Figure 1 is a side elevation of my improved aerial apparatus. Fig. 2 is a section taken through the basket of the same, the propelling mechanism being shown partly in section and partly broken away and on a larger scale than Fig. 1.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate a base plate

upon which is mounted a suitable framework 6. Upon one extremity of this base plate is mounted a motor 7, whose crank shaft 8 is equipped with a beveled gear 9 meshing with the two larger gears 10 engaging the same on opposite sides thereof, whereby they are rotated in reverse directions. These gears are loose on shafts 12 which are suitably supported on the framework. To one gear is attached a cone pulley or drum 13, while the other is equipped with a groove pulley 14. An endless belt or cable 15 connects the pulley 13 with a similarly but oppositely arranged pulley 16 fast on a hollow shaft 17 whose lower extremity is equipped with a collar 18 having a circular groove to accommodate ball bearings which engage the ball race which is a stationary coöperating collar 19 fast on the framework 6. The pulley 14 is connected by means of a belt 20 with a similar pulley 21 fast on the inner shaft 22, whose lower extremity is provided with a collar 23 having a circumferential groove forming a half race for bearing balls, which also engage a similar groove formed in a stationary collar 24 which is fast on the framework. The inner shaft 22 passes through the outer hollow shaft 17 and occupies a central position therein, being spaced by means of ball bearing collars 25 and 26 with which the two shafts are provided, one surrounding the shaft exteriorly and the other interiorly. The upper extremity of the central shaft is equipped with a propeller 27 composed of a hub 28, inclined blades 29, and an exterior rim or ring 30, which engages the outer extremities of all of the said blades. These blades are suitably inclined, whereby when the propeller is rotated in a given direction, namely, that indicated by arrow 31, the tendency will be for the apparatus connected with the propeller to move upwardly.

Located below the propeller 27 is a second propeller 32 mounted on the upper extremity of the hollow shaft 17 and provided with inclined blades 33 extending outwardly from a hub 34, the outer extremities of the blades being connected by a ring 35. The blades of the propeller 32 are inclined in a direction opposite the inclination of the blades 29 of the propeller 27. By virtue of the operating gears and belts interposed between the motor and the shafts, as heretofore explained, the propellers 27 and 32 are caused to rotate in opposite directions, the propeller 27 rotating in the direction indicated by the arrow 31 and the propeller 32 rotating in the direction indicated by the arrow 36. By virtue of the reverse movements of the two propellers, these instrumentalities coöperate to lift the apparatus and cause it to travel through the air. Normally these two propellers are caused to travel at the same speed whereby any tendency of the basket or car 37 to rotate is neutralized or overcome, as hereinafter more fully explained.

The upper extremity of the shaft 17 is provided with a collar 38 having ratchet teeth 39 on its upper face, the said teeth being engaged by a pawl 40, attached to the lower portion of the hub 28. During the radial movement of the propellers, the pawl 40 passes freely over the teeth of the ratchet, since, when the two propellers are in motion, they both turn in such a direction as to produce this result.

The basket or car 37 is provided on two opposite sides with upper bracket arms 41 and lower bracket arms 42. Upon each of these arms is journaled a grooved pulley 43 engaged by a cable 44 which engages three of the pulleys without passing around the same. The fourth pulley, however, being one of the upper pulleys of the car, is completely encircled by the cable. This pulley is also fast upon its spindle or shaft 45, one extremity of which is provided with a hand crank 46. The opposite extremities of the cable 44 are connected with ears 47 of a collar 48 located above a collar 49 secured to the shaft 17 by a fastening device 50. When the apparatus is in operation, I shall assume that the basket or car occupies a horizontal position, while the propeller shafts are inclined at a suitable angle, being preferably approximately that indicated in Figs. 1 and 2. By virtue of the fact that the greater weight of the apparatus mounted above the platform 5 is at the left thereof, there is a tendency for the platform to tilt, as indicated in the drawing, whereby the two shafts are given the inclination illustrated. This tendency should be sufficient to prevent the shafts from assuming the vertical position as the vessel rises in the atmosphere. In other words, the non-equilibrium of the structure must be such as to maintain the desired or necessary inclination of the propeller shafts in order to cause a forward as well as an upward travel of the apparatus.

The car or basket 37 is hinged to the base 5 of the propelling mechanism, as shown at 51. Of course the car may be equipped with ballast in such a manner as to regulate the relative position of the car or basket, and the inclination of the shafts. The weight of the operator must also be considered, it being possible for him to so adjust his position so as to change the inclination of the shafts according to his will and therefore to guide the machine in any given direction. After everything is in the car and suitably arranged, the person in charge, by proper manipulation of the pulley 43 whose spindle is provided with a crank arm, may adjust the car to occupy the horizontal position re-

gardless of the inclination of the propeller shafts. It will be understood that if the basket or car is in a position inclined to the horizontal, if the pulley 43 be turned, the basket or car, which is lighter than the operating mechanism, will have its position changed accordingly. In other words, the pulley 43, around which the cable makes a complete revolution, will travel either upwardly or downwardly upon the cable, according to the direction of the crank's rotation, thus changing the position of the car or basket accordingly. If we assume that the car is in such position that the upper right hand pulley 43 is higher than the corresponding left hand pulley, the turning of the shaft provided with the crank arm, in the proper direction will cause the pulley to move downwardly upon the cable, whereby the distance between the said pulley and the point where the cable above the pulley is connected with the collar 48, is increased. Again, if the basket occupy the reverse position, so that the upper right hand pulley occupy a lower position than it should occupy, the movement of the crank would be in the opposite direction, whereby the last named pulley is caused to move upwardly upon the cable, imparting a corresponding movement to the portion of the basket with which the said pulley is connected.

The function of the ratchet 38, and the pawl 40, is to cause the propellers to interlock during the descent of the apparatus, whereby the propellers will present sufficient resistance to the atmosphere during the downward movement of the apparatus, to cause the latter to gradually descend in the event of accident, or when for any reason it may be necessary to utilize the resisting power of the propellers.

When it is desired to vary the relative speed of the shafts 17 and 22, the belt 15 may be shifted on the cone pulleys 13 and 16 by the use of a lever 52 fulcrumed on the framework, as shown at 53. This lever is within convenient reach in the car and may be manipulated at will.

From the foregoing description the use and operation of my improved aerial device will be readily understood. Assuming that the mechanism is arranged as illustrated in the drawing, it will be understood that when the two shafts, together with their propellers, are rotated in reverse directions with sufficient speed, they will develop the necessary power for raising the apparatus in the atmosphere. By reason of the change of movement of the occupant or occupants of the car, or by shifting ballast of any kind therein, the position of the apparatus may be changed to vary the inclination of the shafts, or indeed to cause them to occupy a vertical position. During this change it is evident that the position of the car may be changed from the horizontal to an inclined position. This, however, may be quickly remedied by the adjustment of the cable-circumscribed pulley, whereby the car will be returned to its normal position. The greater the inclination of the shafts, the greater will be the tendency of the car to travel in a horizontal plane.

Having thus described my invention, what I claim is:

1. Aerial apparatus, comprising a car, a framework hinged to the car so that the same may be tilted below the bottom of the car, the car having rollers mounted thereon at the top and bottom, flexible devices passing around the car and over the rollers, the extremities of the flexible devices being connected in operative relation with the framework, and means for tilting the framework, substantially as described.

2. Aerial apparatus, comprising a car, a framework arranged within the car, and hinged thereon so that the framework may be tilted below the bottom of the car, the car having a flexible device passing entirely around the car and connected at its opposite extremity in operative relation with the framework, and means for operating the flexible device for tilting the framework, substantially as described.

3. Aerial apparatus comprising a car, a framework hinged to the car so that the same may be tilted below the bottom of the car, and a flexible device passing around the car and connected at its opposite extremities in operative relation with the framework, substantially as described.

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

JOHN J. DONNELLY.

Witnesses:
A. J. O'BRIEN,
A. EBERT O'BRIEN.