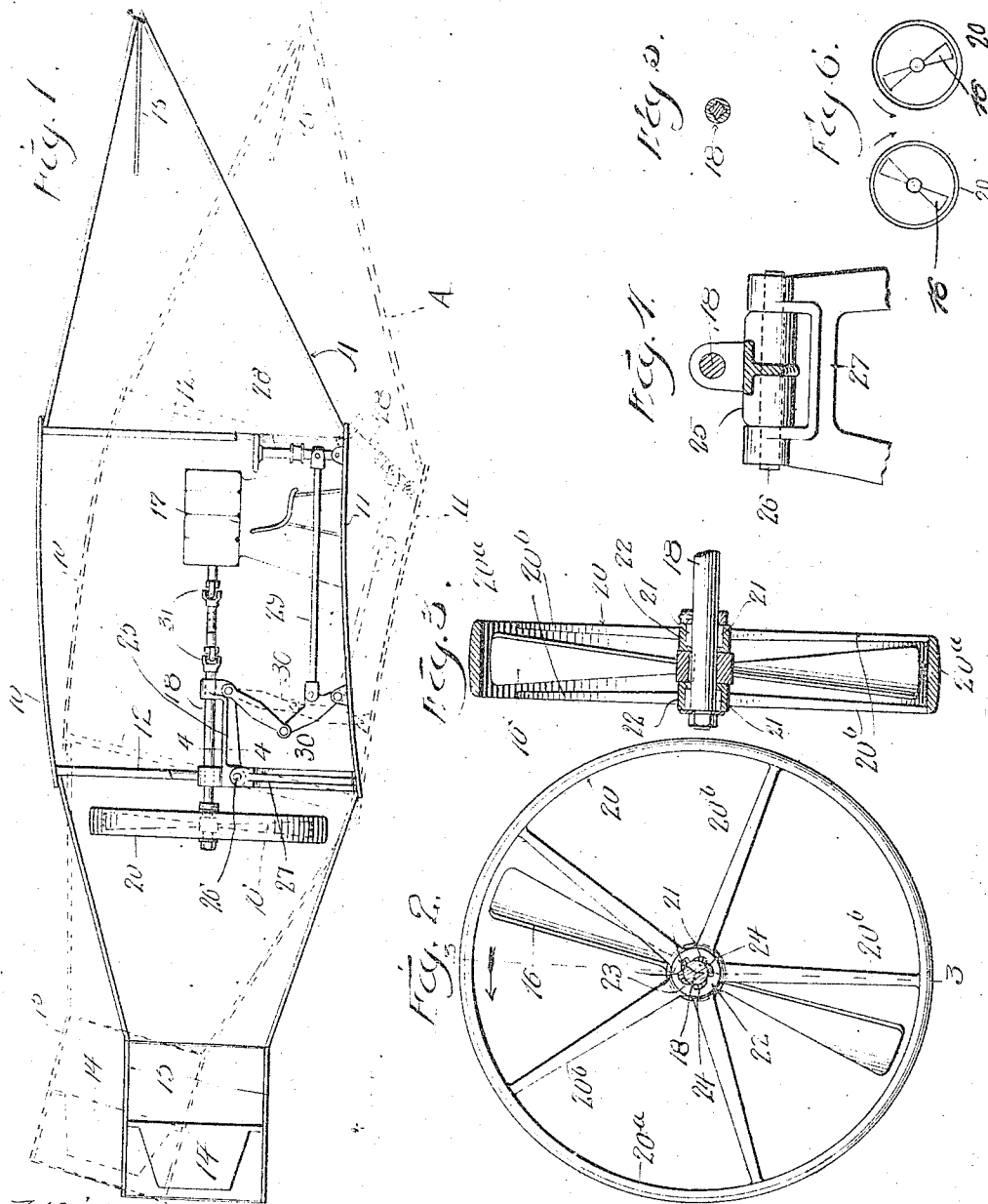


E. D. GREEN.
FLYING MACHINE.
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1,063,432.

Patented June 3, 1913.



Witnesses:
James F. Richards
Charles A. Sherway

Inventor:
Edward D. Green,
Charles O. Sherway
attorney.

UNITED STATES PATENT OFFICE.

EDWARD D. GREEN, OF CHICAGO, ILLINOIS.

FLYING-MACHINE.

1,063,432.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, EDWARD D. GREEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Flying-Machines, of which the following is a specification.

This invention relates to flying machines of the aeroplane type, the object being to provide improved means for maintaining the machine in a state of balance or equilibrium while in flight, whereby the danger of toppling over when the momentum is lost, may be partially if not wholly avoided. It is well known that considerable momentum must be attained to enable an aeroplane to be sustained in the air, and that when such momentum is lost the machine is in imminent danger of a fall.

This invention designs to maintain the machine in perfect balance, either while flying in a horizontal direction or in inclined directions, while in flight and in fact when its momentum is sped while in the air.

To these ends this invention consists in an aeroplane having one or more gyroscopes or gyroscopic wheels mounted thereon, and arranged to hold the machine in a balanced condition, said gyroscopic wheel or wheels being driven from the motor but capable of independent relative rotation.

It further consists in shifting mechanism, operatively connected with the gyroscope for changing the angle of inclination of the planes with respect to the plane of rotation of the gyroscope, whereby the direction of movement of the machine may be controlled independently of other steering mechanism.

The invention further consists in the novel features of construction, combinations and arrangements of parts hereafter described and claimed.

In the drawings furnished herewith:— Figure 1 is a side elevation of an aeroplane embodying my invention, Fig. 2 is a face view of a gyroscopic wheel and propeller employed, Fig. 3 is a detail cross section taken on line 3—3 Fig. 2, Fig. 4 is a detail vertical cross section taken on line 4—4 Fig. 1, Fig. 5 is a detail cross section through a shaft and Fig. 6 is a diagrammatic view showing a pair of gyroscopes and propellers.

Referring to said drawings, an aeroplane of ordinary construction will be seen at A, the same being illustrated, for the sake of convenience, in the form of a bi-plane hav-

ing upper and lower horizontal planes 10, 11, connected by uprights 12. If desired, steering mechanism, comprising vertical and horizontal rudders 14, 15, may be employed as usual. One or more propellers 16, are employed for driving the machine, which propellers may be driven from a suitable motor 17, through operative connections, as for instance, a shaft 18, upon which the propeller is keyed.

Operatively connected with the motor, is a gyroscopic wheel 20, which preferably rotates on a horizontal axis and is here shown as mounted upon the shaft 18, and connected thereto by clutch mechanism, whereby it may revolve with the shaft 18, but be capable of revolution independent thereof. The clutch mechanism is shown as comprising rolls 21, circumferentially arranged around the propeller shaft and lying in notches 23, formed in the wall of the bearing aperture of the gyroscopic wheel hub 22. The notches have tapered faces 24, which wedge the rolls against the face of the shaft when the latter is rotated in the proper direction to drive the propeller. The wide portions of the notches receive the rolls and permit them to run freely between the relatively movable parts when the gyroscopic wheel revolves independently of the shaft and in the same direction as its proper direction of movement. It is preferable to make the wheel 20, of large diameter and I have shown it as encircling the propeller and comprising a heavy rim 20^a, connected to the hub by two sets of spokes 20^b.

For effecting the tilting of the whole machine with respect to the plane of rotation of the gyroscope, the shaft thereof is journaled in a long rocking bearing 25, capable of being tilted either upward or downward, or rather the base or plane upon which the bearing is mounted may be tilted with respect to the axis of the shaft. To produce this result the bearing 25, is fulcrumed upon a transverse horizontal axis at 26, a cradle block 27, being supported on the lower plane 11, and pivotally sustaining the bearing 25, as by the pivot pin 26. The tilting of the bearing may be effected from a steering post 28, by a link 29, running from the steering post to a toggle lever 30, arranged between the bearing 25, and base or plane 11, of the machine.

To permit the change of position of the motor with respect to the gyroscope, the

shaft is shown as having unusual joints 31, therein between which joints the shaft is divided and each half slidably secured upon the other, so as to rotate therewith. For instance one shaft may be squared as seen in Fig. 5, and fitted in a square hole in the other. Obviously, many other forms of devices for changing the angular relation of the planes with respect to the plane of revolution of the gyroscope, may be substituted for the simple form shown and described.

In operation, the motor drives the propeller as usual, and the machine is manipulated and controlled as is well known to those skilled in the art. Rapid rotation of the shaft 18, causes a consequent rapid rotation of the gyroscope. By reason, on the part of the gyroscope, to resist any effort to change its plane of rotation from one angle to another, the machine tends to travel in a horizontal line. If now the motor breaks down, or the propeller ceases to revolve from any cause, the gyroscopic wheel, on account of its momentum, will continue to revolve independently of the propeller, thereby resisting any effort on the part of the machine to topple over and by changing its course of movement to a downward one, the momentum (which is usually lost when the propeller stops) may be reacquired and the machine safely landed by allowing it to glide down to the ground. In Fig. 6 two gyroscopes 20, and propellers 16, are illustrated graphically, which arrangement may be substituted for the single gyroscope and propeller. In this case the two run in opposite directions, as shown by the arrows.

I realize that various alterations and modifications of this device are possible, without departing from the spirit of my invention, and I do not therefore desire to limit myself to the exact form of construction shown and described.

I claim as new and desire to secure by Letters Patent:

1. In a flying machine, the combination with a body to be sustained in the air, of a motor driven propeller, a gyroscopic wheel

rotatively mounted on an axis coincident with the axis of said propeller and having a rim encircling said propeller, and a unidirectional clutch mechanism coupling said gyroscopic wheel and propeller.

2. In a flying machine, a propeller, a motor driven shaft secured directly to said propeller, a gyroscopic wheel, rotatively mounted on said shaft, and having a rim encircling said propeller and unidirectional clutch mechanism directly coupling said gyroscopic wheel to said shaft but permitting said wheel to revolve independently thereof.

3. In a flying machine, the combination with an aeroplane, of a motor, a flexible motor shaft, a propeller rigidly mounted on said shaft, a gyroscopic wheel driven by said motor shaft but capable of independent, relative revolution in the same direction, a bearing supporting one end of said motor shaft and capable of a rocking movement, and a controlling device, including mechanism for changing the angular relation between the aeroplane body and one section of said motor shaft.

4. In a flying machine, the combination with an aeroplane, of a motor, a flexible motor shaft, a propeller driven thereby, a gyroscopic wheel driven by said motor shaft but capable of independent, relative revolution in the same direction, a bearing supporting one end of said motor shaft and capable of a rocking movement, a fixed support on the aeroplane upon which said bearing is fulcrumed, a movable support on the aeroplane secured to the free end of the bearing, and a controlling device for shifting said movable support to vary the angular relation between the aeroplane body and one section of said motor shaft.

In witness whereof, I have hereunto signed my name at Chicago, Cook county, Illinois, this 9th day of January, 1911.

EDWARD D. GREEN.

Witnesses:

THOS. J. FLANAGAN,
A. J. BROWN.