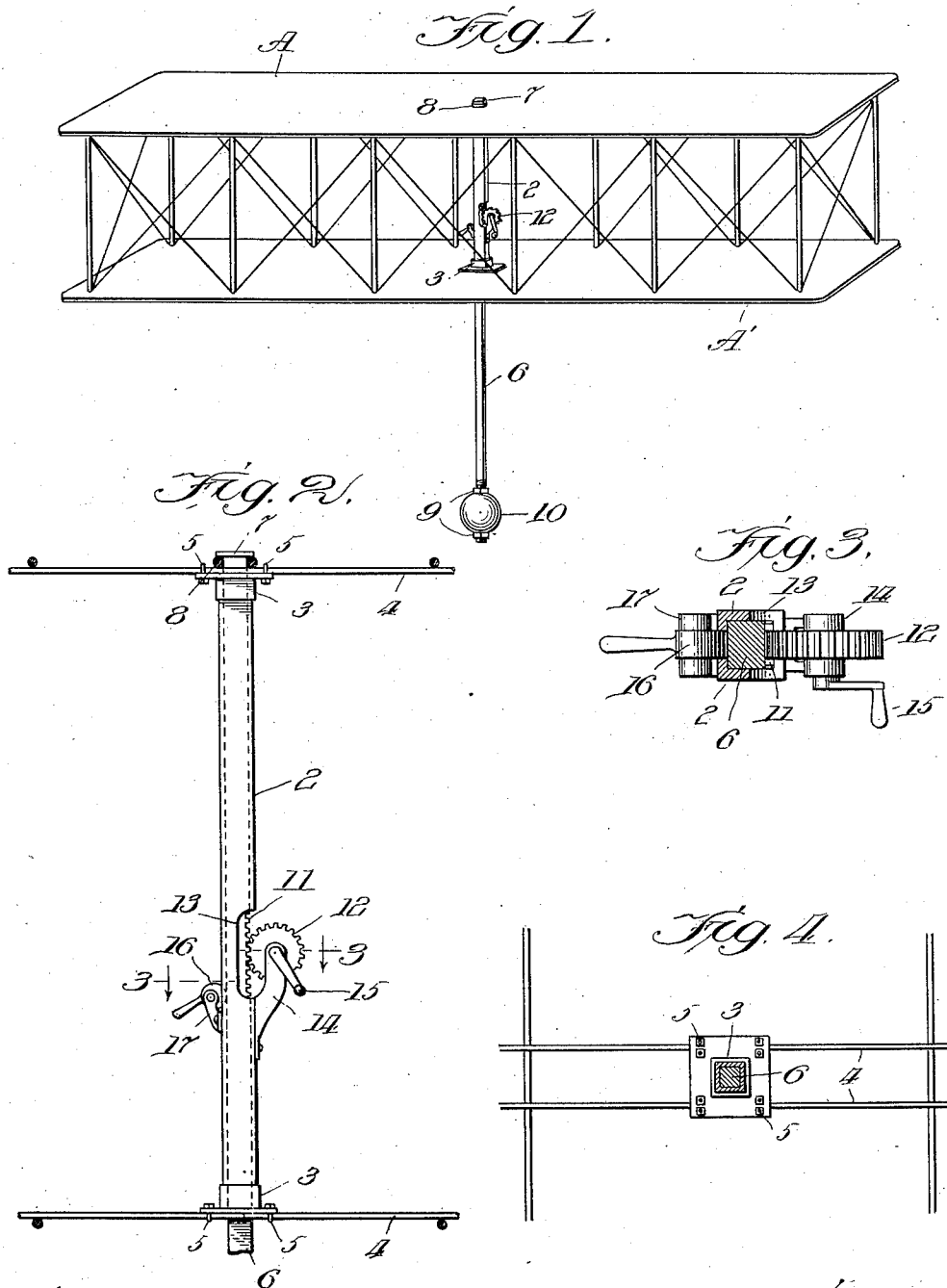


J. L. ROCHE.
 MEANS FOR MAINTAINING EQUILIBRIUM OF AIRSHIPS AND THE LIKE.
 APPLICATION FILED SEPT. 17, 1909.

1,016,363.

Patented Feb. 6, 1912.



Witnesses:

Harry S. Gaither
 E. H. Lundy.

Inventor:

John L. Roche
 by Frank D. Thomson
 atty

UNITED STATES PATENT OFFICE.

JOHN L. ROCHE, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-FOURTH TO LOUIS W. FELT,
OF CHICAGO, ILLINOIS.

MEANS FOR MAINTAINING EQUILIBRIUM OF AIRSHIPS AND THE LIKE.

1,016,363.

Specification of Letters Patent.

Patented Feb. 6, 1912.

Application filed September 17, 1909. Serial No. 518,157.

To all whom it may concern:

Be it known that I, JOHN L. ROCHE, 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 Means for Maintaining Equilibrium of Airships and the Like, of which the following is a full, clear, and exact description.

My invention relates to aerial navigation and particularly the "heavier-than-air" flying machines of the kind known as aeroplanes.

The object of my invention is to provide a safety ballasting device at about the center of gravity of said machine, which, first, can be manipulated easily and quickly, according to the spread or area of the plane or planes to be balanced, and atmospheric conditions; second, will positively prevent any pitching or rocking or careening while in flight, and, when describing a curve, will prevent the presentation of too great a surface of the planes to the opposing air currents, and avoid the possibility of the machine "turning-turtle", and third, will, in the event of the engine or propellers refusing to work, or other accident happening that would affect the propulsion of the machine, cause it to drop or glide downward in the same manner as a parachute and settle to the earth in a horizontal position, without the possibility of its upsetting or alighting with such force as to throw out and injure or kill its occupants. This I accomplish by the means and in the manner hereinafter fully described, and is more particularly pointed out in the claims, reference being had to the accompanying drawings forming a part hereof, wherein:

Figure 1 is a vertical front elevation, slightly in perspective, of an aeroplane of the bi-plane, "heavier-than-air", type; the propeller, motor and rudders being omitted, to better permit the showing of the preferred form of my invention which is applied thereto. Fig. 2 is an enlarged detail view of a fragmental portion of my improved vertical ballast-rod, illustrating the mechanism for adjusting and locking the same. Fig. 3 is a transverse section thereof on line 3-3, Fig. 2. Fig. 4 is a detail plan view of the central portion of the frame of the lower plane.

Referring to the drawings, A, A', repre-

sent, respectively, the upper and lower planes of a "heavier-than-air" type of flying machine, in which, for the purpose of clearly illustrating my invention, the fore and aft steering rudders, the motor and the propellers have been omitted. These planes are of any well-known or preferred construction and do not form any part of my invention. Mounted between these planes, in a vertical upright position, at a point between their ends indicating the center of gravity of the apparatus, is a suitable tube or hollow column 2 of comparatively small diameter, that extends from the lower to the upper plane, and has its ends secured in suitable bosses 3. These bosses have suitable plates, that are rigidly fastened to cross bars 4, 4, of the framework of said planes, by means of clips 5, or otherwise.

The material of which the upper and lower planes are constructed is perforated, in alinement with the ends of this column, 2, to permit of the free longitudinal vertical movement of a vertical rod, 6, whose upper end, when at its lowermost position, is slightly above the horizontal plane of the upper plane of the aeroplane, and is flanged outwardly or provided with a head, 7, which, preferably, has a rubber gasket, 8, just below it, that engages and rests upon the plate of the upper boss, 3, to cushion and limit its downward movement. When at the limit of its downward movement the lower end of rod 6, depends below the lower plane of the machine a distance of from 5 to 10 feet, and its lower portion is screw-threaded and adapted to carry, by means of nuts, 9, a vertically adjustable weight or ballast 10, that can be removed, whenever desired, and replaced by a heavier or lighter one, according as may be required by atmospheric conditions. One side of the portion of the rod that passes through the column is provided with a vertical rack 11, which latter is engaged by a pinion, 12, that enters the column through a suitable opening 13 cut in the side thereof. This pinion is journaled in a bracket, 14, secured to and arising from the side of the column below said opening, and one end of its journal is extended beyond its bearings and provided with a hand-crank, 15, the turning of which in one direction or the other elevates or lowers the rod. When said rod has been adjusted to its desired position, it is secured

in place by means of a suitable eccentric cam, 16, pivoted between bearing lugs, 17, projecting from the opposite side of the column; which latter is provided with a
 5 suitable opening whereby such engagement can take place. This adjustable ballast may be raised or lowered, or may be removed altogether from the aeroplanes, as desired, and its adjustment is regulated ac-
 10 cording to the velocity of the wind and atmospheric conditions, and the normal speed at which the machine is moving. When pendent at the center of gravity of the machine, and the latter is tilted slightly in de-
 15 scribing a curve or from other causes, the ballast operates on the principle of a pendulum, and will seek its lowermost level and right the machine and resist the influence of the conflicting elements. As the center
 20 of gravity in a "heavier-than-air" machine is usually conveniently close to the aviator, he will find little or no difficulty in regulating this ballast.

While I have described this device, in
 25 connection with a bi-plane aeroplane, I do not wish to be understood as limiting myself to such a machine, for it is quite obvious it may be advantageously employed in connection with a mono-plane machine, dirigible
 30 balloon, or other flying machine, and such application is included within the scope of my invention.

What I claim as new is:—

1. An aeroplane comprising upper and
 35 lower planes, a pair of parallel rods connecting the front and rear edges of each of said planes, a plate carried by each pair of rods mediate their ends, rectangular sockets projecting from the opposing faces of said
 40 plates, a rectangular-shaped tubular mem-

ber having its ends secured to said sockets, and an equilibrator consisting of an elongated rigid member rectangular in cross section slidably mounted in said tubular member and extending below said lower plane. 45

2. An aeroplane comprising upper and lower planes, a pair of parallel rods connecting the front and rear edges of each of said planes, a plate carried by each pair of rods mediate their ends, rectangular sockets
 50 projecting from the opposing faces of said plates, a rectangular-shaped tubular member having its ends secured to said sockets, an equilibrator consisting of an elongated rigid member rectangular in cross section
 55 slidably mounted in said tubular member and extending below said lower plane, and means for adjusting the length of said equilibrator below said plane.

3. An aeroplane comprising upper and
 60 lower planes, a pair of parallel rods connecting the front and rear edges of each of said planes, a plate carried by each pair of rods mediate their ends, rectangular sockets projecting from the opposing faces of said
 65 plates, a rectangular-shaped tubular member having its ends secured to said sockets, an equilibrator consisting of an elongated rod rectangular in cross section slidably mounted in said tubular member and ex-
 70 tending below said lower plane and having a rack on one side thereof, and a manually operated gear engaging and actuating said rack.

In witness whereof I have hereunto set my
 hand this 14th day of September, 1909. 75

JOHN L. ROCHE.

Witnesses:

FRANK D. THOMASON,
 E. K. LUNDY.