

M. FERRERO.
 APPARATUS FOR AERIAL NAVIGATION.
 APPLICATION FILED JAN. 17, 1908.

1,023,369.

Patented Apr. 16, 1912.

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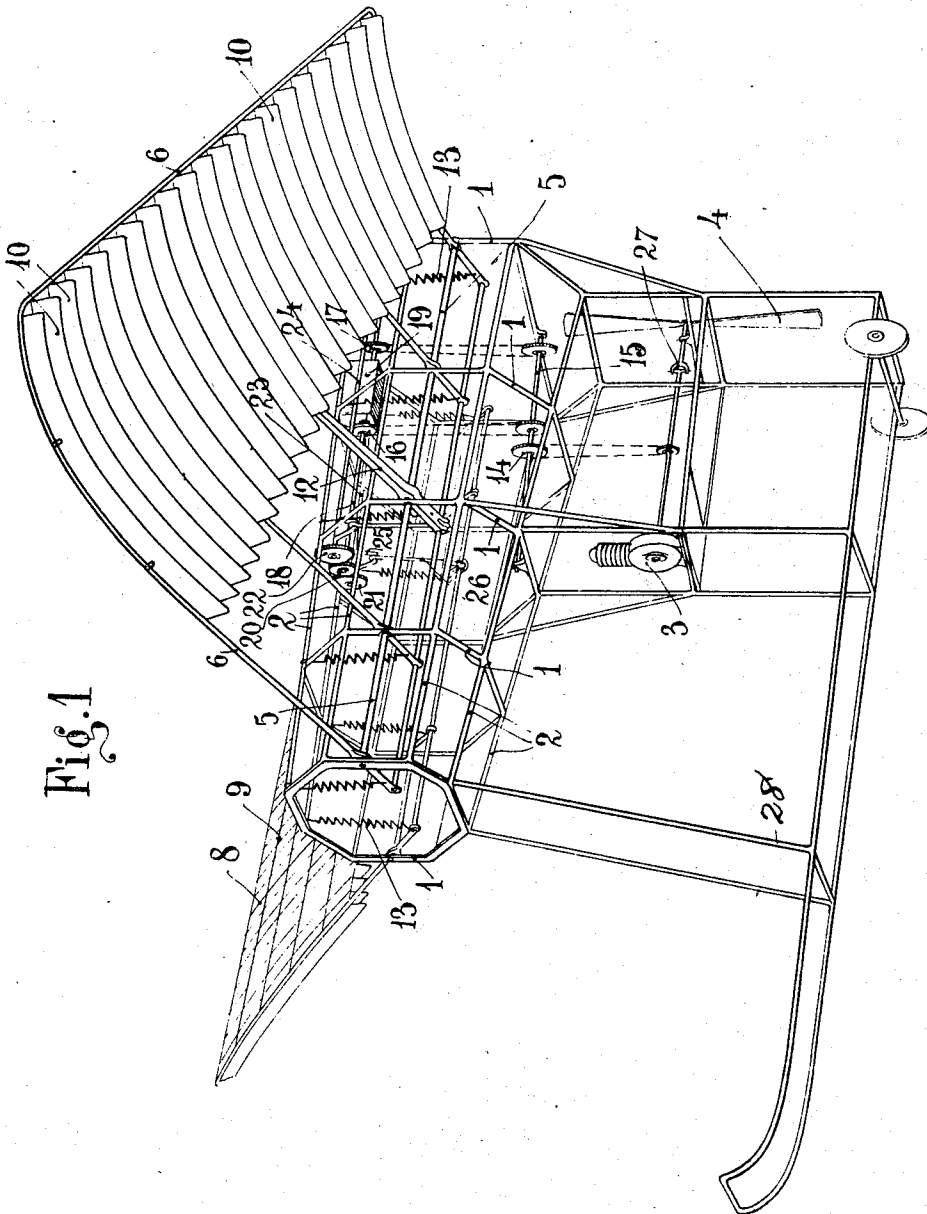


Fig. 1

Witnesses
 M. H. Darg
 L. A. Price

Inventor
 Manfredo Ferrero
 By H. E. Boulter,
 Attorney

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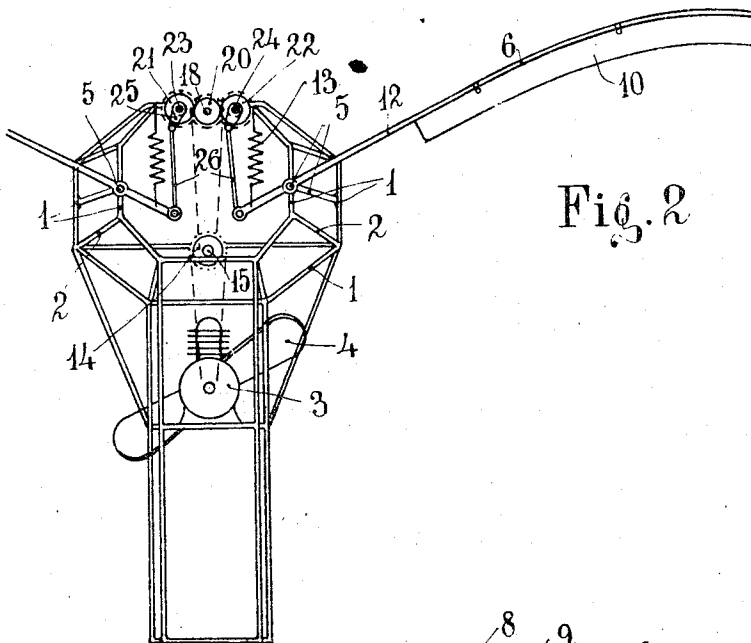


Fig. 2

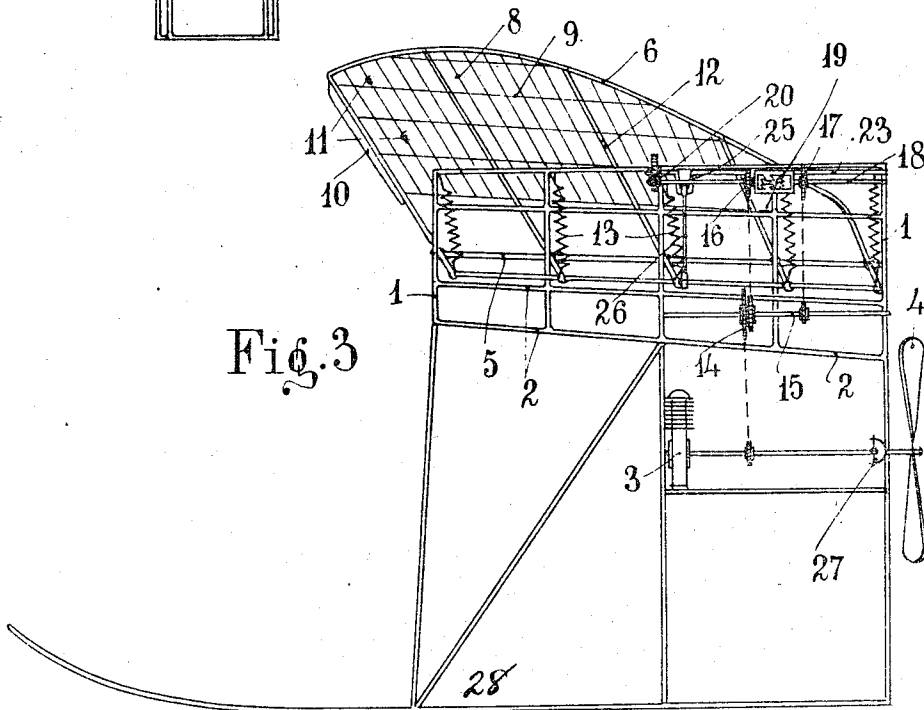


Fig. 3

Witnesses
 M. H. Darg
 L. C. Price.

Inventor
 Manfredo Ferrero,
 By W. E. Boulter
 attorney

Patented Apr. 16, 1912.

3 SHEETS—SHEET 3.

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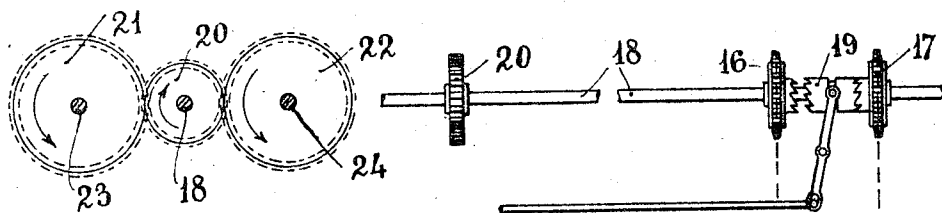


Fig. 4.

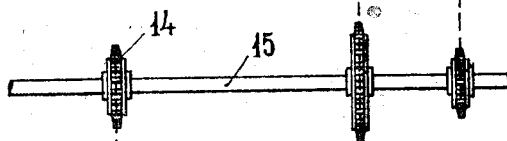


Fig. 5.

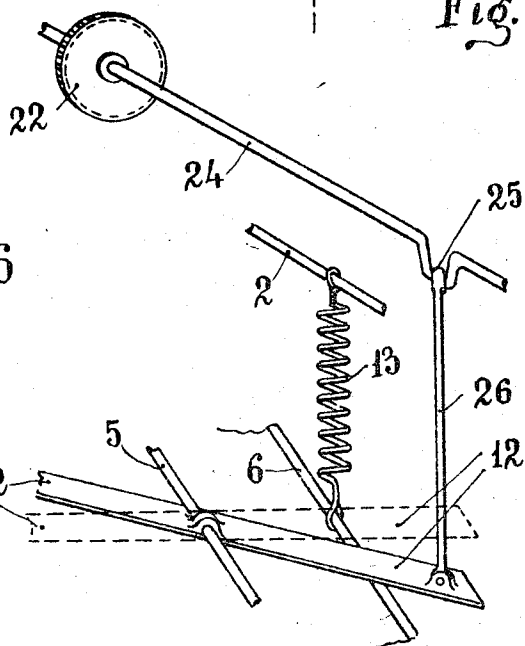


Fig. 6

Fig. 7

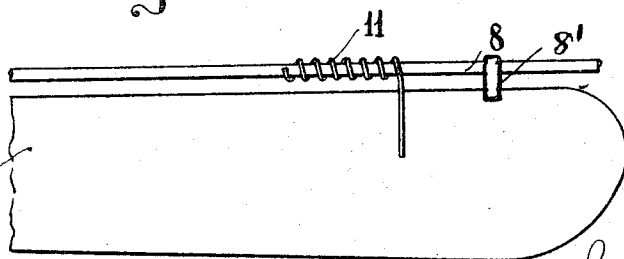
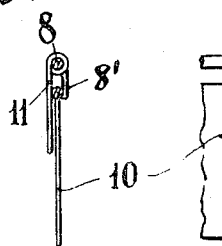


Fig. 8.



Witnesses
 M. H. Darg
 L. A. Pute.

Inventor
 Manfredo Ferrero
 By *Wm. E. Boulter*
 attorney

UNITED STATES PATENT OFFICE.

MANFREDO FERRERO, OF TURIN, ITALY.

APPARATUS FOR AERIAL NAVIGATION.

1,023,369.

Specification of Letters Patent.

Patented Apr. 16, 1912.

Application filed January 17, 1908. Serial No. 411,294.

To all whom it may concern:

Be it known that I, MANFREDO FERRERO, a subject of the King of Italy, residing at Turin, in Italy, have invented certain new and useful Improvements in or Relating to Apparatus for Aerial Navigation, of which the following is a specification.

This invention relates to apparatus for aerial navigation in which the ascending movement as well as the balancing are obtained by means of surfaces having a reciprocating movement similar to that of wings, while the propulsion or advance is obtained by means of a screw propeller.

A construction of apparatus according to this invention is illustrated, by way of example, in the accompanying drawing, in which—

Figure 1 is a general perspective view of the apparatus. Fig. 2 is a cross section in a vertical plane. Fig. 3 is a longitudinal section in a vertical plane. Fig. 4 is a front elevation, and Fig. 5 is a side elevation of the driving spindles and gear. Fig. 6 shows in perspective the method of transmitting movement to the wings. Fig. 7 is a side view of the shutters of the wings with the springs for keeping them closed. Fig. 8 is a vertical section through the shutters of the wings.

The framework of the central part of the apparatus is constituted by transverse frames 1, the width of which increases toward the rear end of the apparatus, the said frames being connected by longitudinal members 2. At the back of the said body descend vertical bars intended to connect the apparatus to a bottom platform and having mounted thereon the motor 3 and the bracket or support for the propeller 4. Between the two lateral bars of the central body are mounted, so as to be able to oscillate about rods 5, the frames 6 of the wings. Each wing (Figs. 1 and 2) consists of a frame 6 pivoted about a rod 5 and having passing through it a number of metal or wooden bars crossing each other. The portion of the frame which is outside the central body, is completed by a double system of wires 8 and 9 intersecting each other at a right or other angle, the wires 8 serving as suspension means for louvers or shutters 10 and the wires 9 preventing the shutters from turning over. These shutters are constituted by canvas or silk bands which

can either be arranged as shown in Fig. 1, or substantially parallel to the axis of the apparatus. They are suspended as at 8' from the wires 8 and connected to them by springs 11 having the tendency to keep them in the plane of the frame of the wing, that is to say, so that the wing should form one continuous surface.

Movement is communicated to the wings, for the purpose of giving a certain elasticity to the wing strokes, by means of bars 12 controlling on the one hand, the frames 6 and connected on the other hand to a connecting rod or lever operated by the engine. The side of the frame 6 nearest to the axis of the apparatus is connected to the top longitudinal member 2, by means of helical springs 13 for the purpose of balancing the work of the engine and of keeping the wings with their ends downward in the position of rest. The springs 13, are connected, on the one hand, to the longitudinal girder 2, of the framework of the apparatus, and at the other end to the inner side 6 of the framework of the wing, or to the rods secured to the framework of the wing, but always at a point near the side of the said frame which is in the interior of the framework of the apparatus, that is to say, connected so that the spindle 5, about which the wing oscillates, is between the point of application of the springs and the shutters 10. The power of the engine is transmitted by a pulley 14 to a spindle 15, and from the latter, by means of chains, to the pulleys or wheels 16 and 17, one or the other of which can be coupled to the spindle 18 by means of a clutch 19. The rotation of the shaft 18 is transmitted by the wheels 20, 21, and 22 to the shafts 23 and 24 which are arranged at an angle relatively to each other. The spindles 23 and 24 are provided with cranks 25 operating connecting rods 26, and through them the bars 12 operating the frames 6 of the wings. The engine drives, directly or otherwise, the propeller 4 by means of a universal joint 27, so as to enable the direction of the propeller to be changed, and a rudder to be dispensed with. The machine is finally mounted on a frame 28 raised in front and provided at the back with two wheels 29.

The driver is in front, below the framework, and consequently in the best conditions for operating and balancing the appa-

ratus, in which the heaviest weight, represented by the mechanisms, is arranged at the back half.

The working of the apparatus is as follows:—When it is desired to rise in the air, the engine 3 is coupled by means of the clutch 19 to the spindle 18 operating the wings. At the beginning of the upward course of the wings, the shutters 10, owing to the resistance of the air, take an oblique position relatively to the plane of the wings, so that the resistance to the movement during the whole of this ascent of the wings, is the minimum, and the working of the engine is almost completely absorbed by the tension of the springs 13. On the contrary, as soon as the descending or active motion of the wings begins, the springs 11 bring back the shutters 10 into the plane of the frame 6 of the wings, against the wires 9, and the resistance of the air keeps them in such manner that the wings strike the air with the whole of their surface under the action of the engine and of the springs 13 which contract. When the desired height has been attained, the number of strokes of the wings can be reduced or stopped altogether, in which case the springs 13 prevent them from becoming reversed, while the springs 11 keep the shutters 10 in the plane of the frames 6 of the wings, so that the latter form a continuous horizontal surface acting as a parachute or poise, so that in that way a quick fall is avoided, even in

case of an accident to the engine or to any other part of the vessel. Propulsion in the horizontal direction is given by the propeller 4, and steering is effected by the inclination which can be given to it by means of the Cardan joint 27.

Shutters similar to those of the wings, can be used on the central body of the apparatus and arranged, of course, in such manner that when it advances or rises, they should be open.

What I claim as my invention and desire to secure by Letters Patent is—

In apparatus for aerial navigation the combination of wings for rising, shutters in said wings, a rigid frame for the wings, a propeller for propulsion, means for pivoting the wings about two axes which converge toward the front end of the apparatus, a motor for operating the wings and propeller, a bar on the lower part of the frame of the wings, means for connecting the bar to the motor, and springs for connecting the frame of the wings to the body of the apparatus, and adapted to balance the operating effort of the motor and to keep the wings pointing downward.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MANFREDO FERRERO.

Witnesses:

CARLO TOSTA,
LOUIS ALLEN.