(No Model.)

JULIO CEZAR RIBEIRO DE SOUZA.

APPARATUS FOR AERIAL NAVIGATION.

No. 280,914. Patented July 10, 1883.

FIG. 1.

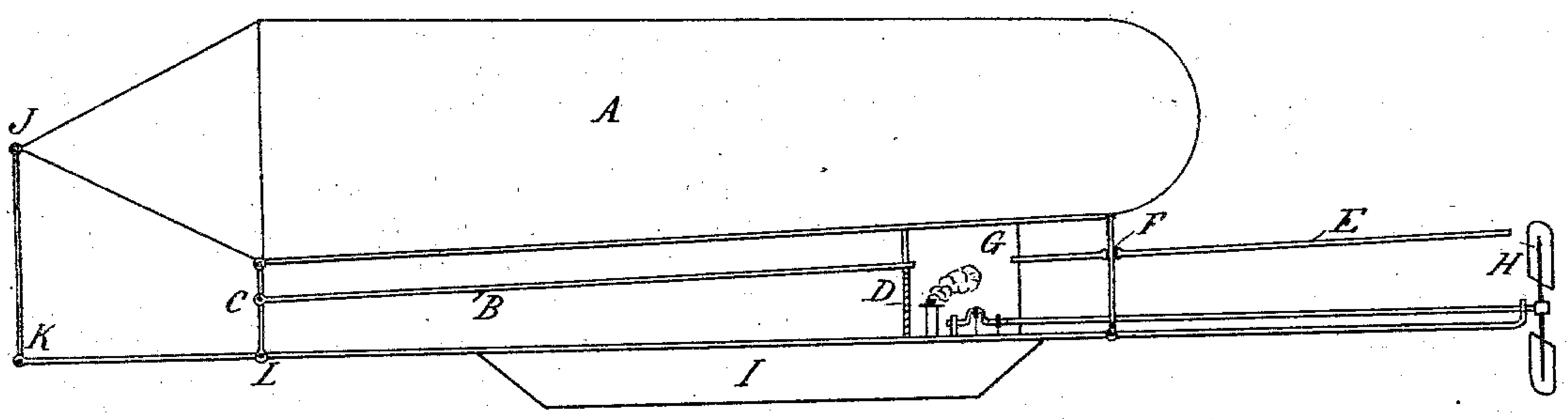
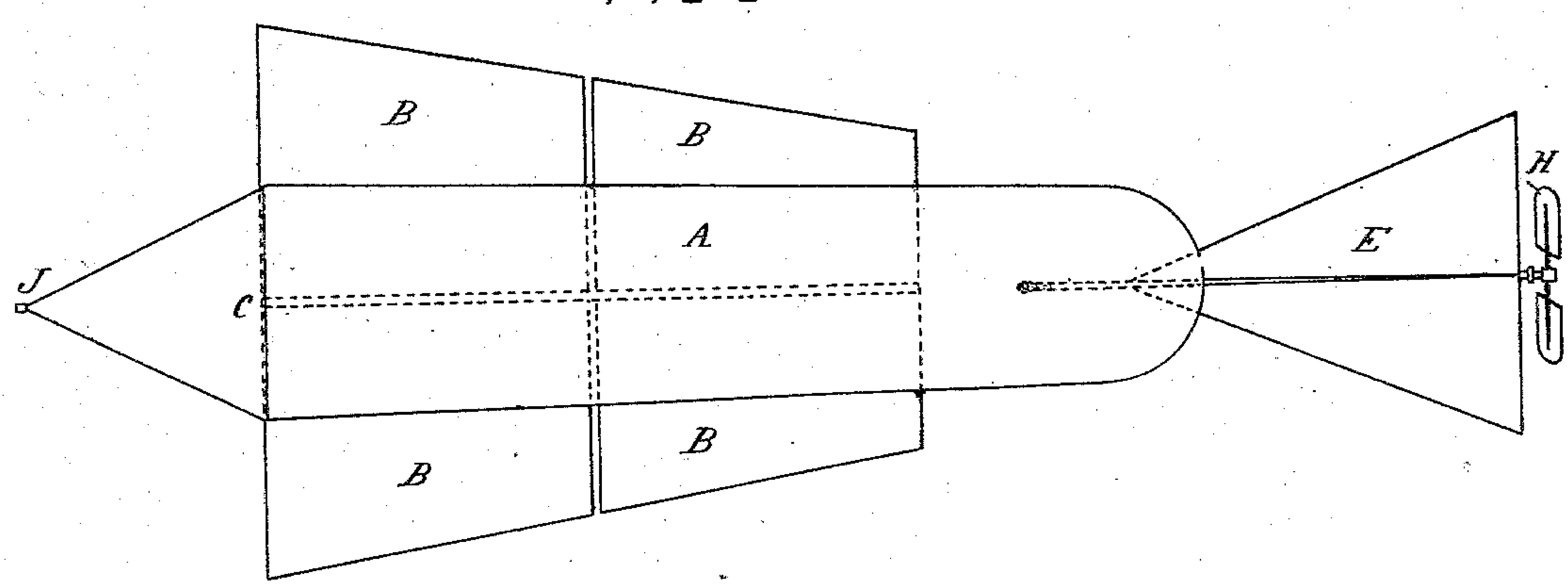


FIG. 2



Witnesses:

Inventor:

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UNITED STATES PATENT OFFICE.

JULIO CEZAR RIBEIRO DE SOUZA, OF PARA, BRAZIL.

APPARATUS FOR AERIAL NAVIGATION.

SPECIFICATION forming part of Letters Patent No. 280,914, dated July 10, 1883.

Application filed December 20, 1881. (No model.) Patented in France October 25, 1881, No. 145,512; in Germany October 29, 1881; in England November 8, 1881, No. 4,887; in Belgium November 15, 1881, No. 56,240; in Austria November 23, 1881; in Spain December 1, 1881, No. 2,038; in Portugal December 6, 1881, No. 724, and in Italy December 7, 1881, No. 13,647.

To all whom it may concern:

Be it known that I, JULIO CEZAR RIBEIRO DE SOUZA, a subject of the Emperor of Brazil, of Para, in the Empire of Brazil, have invented new and useful Improved Apparatus for Aerial Navigation, of which the following is a specification.

My invention relates to improvements in apparatus for aerial navigation by means of balloons; and it has for its object a novel method of applying to such apparatus the principle upon which birds fly upon extended wings, but in an inverse sense—that is to say, the ascensional force of the gas in the balloon being substituted for the tendency to fall resulting from the weight of the bird. In the flight of a bird so flying very little muscular effort is used, its own weight being utilized to provide resistance to the air which supports it by the resistance it meets under the wings and tail, in a manner analogous to that by which a kite is supported in the air, the tension of a string being substituted for the weight of the bird.

The accompanying drawings are in illustration of my present invention, Figure 1 being a side view, and Fig. 2 a plan, of a balloon and its dependent apparatus and appliances.

A is the body of the balloon, containing hydrogen or other sufficiently light gas, and the length of which is about five times its greatest diameter. Its front end is formed of a cone, the length of which is not less than the greatest diameter of the balloon, which joins the base of the cone. The body of the balloon itself is also formed as a truncated cone, terminating in an ovoid shape at the back end. The object of this arrangement of the shape of the balloon is to maintain the center of the ascensional force in its front part, and in this respect it resembles in shape not only a bird, but also every moving body having the center of gravity in its forward part.

B represents wings or planes, which are arranged laterally upon a longitudinal axis capable itself of being raised or lowered round the jointed extremity C by means of a screw at D, or other equivalent mechanical device.

E is a rudder arranged in a horizontal plane, and capable of being raised or lowered round the joint F by means of a lever, G. The rudder E is also capable of turning upon its longitudinal axis when desired.

H is a helical screw or fan, which can be made to revolve by steam or other convenient power in the car I, which is attached to the balloon.

The frame of the apparatus is made as light as possible, and preferably of metallic or other tubes, and it is provided with joints or articulations, as shown at J K L, wherever it is desirable that rigidity should be avoided.

In order to render more clear the method in which the flight of a bird as above described is imitated in an inverse sense by my novel apparatus, I will proceed to explain in greater detail the method of flight of birds floating in the air on extended wings.

A body—such as a bird—can only support itself on or in the air by means of two mutually dependent forces—that is to say, first, the force—such as weight—pressing upon the air; and, secondly, a force opposed to the first, and so acting upon the surface of the body as to tend to raise it. The one force is proportioned to the dimensions of the surface and the other to the resistance of the medium. These two forces—weight and the resistance of the air from below upward are the sole agents by means of which a bird floats upon extended wings—a kind of flight the simplest and most easy to imitate, and upon which is founded my present invention. A bird so flying has its center of gravity forward, its head being extended and its feet drawn up, and the resultant of the two opposing forces—weight and the resistance of the air against the wings and tail—is a movement more or less horizontal, according to the proportion of the parallelogram of forces constructed upon lines representing them.

In my novel apparatus the position of the several parts which imitate those of the bird is wholly reversed, the downward action of the weight of the latter being replaced by the ascensional or upward force of the balloon, and as in the bird the extent of the wings is proportioned to its weight and to the resistance of the air, and the weight is also pro-

portioned to the volume, so when the same conditions are observed in my apparatus, so that its volume, its ascensional force, and the dimensions of its surface of resistance have similar proportions, it will fly almost like the bird. Ascensional force being substituted for weight, the wings B and rudder E must be arranged in relation to the lightness of the balloon as the wings and tail are to the weight of the bird, so that the entire apparatus will somewhat resemble a bird flying horizontally, but upon its back. The wings B, in order to obtain stable equilibrium, should be placed, as shown, below the center of the ascensional force acting from below upward, as the wings of the bird are placed above the center of gravity or force acting downward, and when thus arranged the movement of the balloon will resemble that of the bird, ascending in the way the bird descends, and vice versa, without it being necessary to throw out ballast to ascend or to discharge gas to descend. As, however, the bird flying in the way described requires occasionally to move its wings, especially to ascend, I provide a helical propeller, as shown at D, in order to obtain analogous propulsive force. The wings B themselves never strike the air, their movement being confined, first, to a slight lateral inclination, for the purpose hereinafter explained; and, secondly, to a longitudinal inclination at the back end, which is made movable, as already described, in order to change the horizontal direction or to vary the speed.

The tail is made horizontal and corresponding with that of a bird, no change being required in my system of apparatus, since the upward force of the balloon and the analogous weight of the bird both act vertically, though in opposite directions. The object of the tail is not essentially to steer with. The direction of flight is governed by a bird by the alteration of its center of gravity to the side to which it desires to turn. To turn to the right, it lowers its right wing and slightly inclines its tail in a corresponding way. To turn to the left, it lowers its left and raises its right wing, inclining its tail in a similar manner. In order to produce a corresponding result with my apparatus, it is only necessary to do exactly the reverse of that which the bird does—that is to say, to raise the wing on the side to which it is desired to turn, and to lower that upon the opposite side. By doing this the resistance of the air on the side upon which the wing has been raised will be lessened, and as such resistance will be increased on the other side, upon which the wing has been lowered, the balloon will be naturally turned to the side of the raised wing.

A vertical rudder is unnecessary in my improved apparatus, the movement of the wings and tail, as described, being all that is necessary to alter the direction of movement.

When the balloon is large and has great ascensional force, two or more wings, as described, and shown at B, may be arranged above each other, so as to be of less size, as in the sails of a ship. The extent of surface of these wings may be varied as desired by opening or closing them as the variation of the wind may from time to time require, as the bird does by extending or drawing in its wings; and in large balloons the wings may be made in sections divided longitudinally or laterally, or both.

The several novel devices and methods of arrangement and operation hereinbefore described and shown are mutually dependent, and their combination constitutes an entirely new system of aerial navigation.

I am aware that prior to my invention it has been proposed to make apparatus for aerial navigation in which a balloon having wings and rudder and propelling apparatus is used, and I do not claim such a combination, broadly; but

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

The combination, in apparatus for aerial navigation, of a conical balloon, A, having a conical front and ovoid back, with the wings B, arranged below the center of ascensional force of the balloon and turning upon a longitudinal axis, and also capable of being raised or lowered around the joint C by means of the screw D, the horizontal tail or rudder E, turning upon the joint F, and also around its longitudinal axis, and the propelling-fan H, set in motion from the car, all substantially as set forth.

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

JULIO CEZAR RIBEIRO DE SOUZA.

Witnesses:

E. DIENAIDE,

ROBT. M. HOOPER.