F. H. WALES.

FLYING MACHINE.

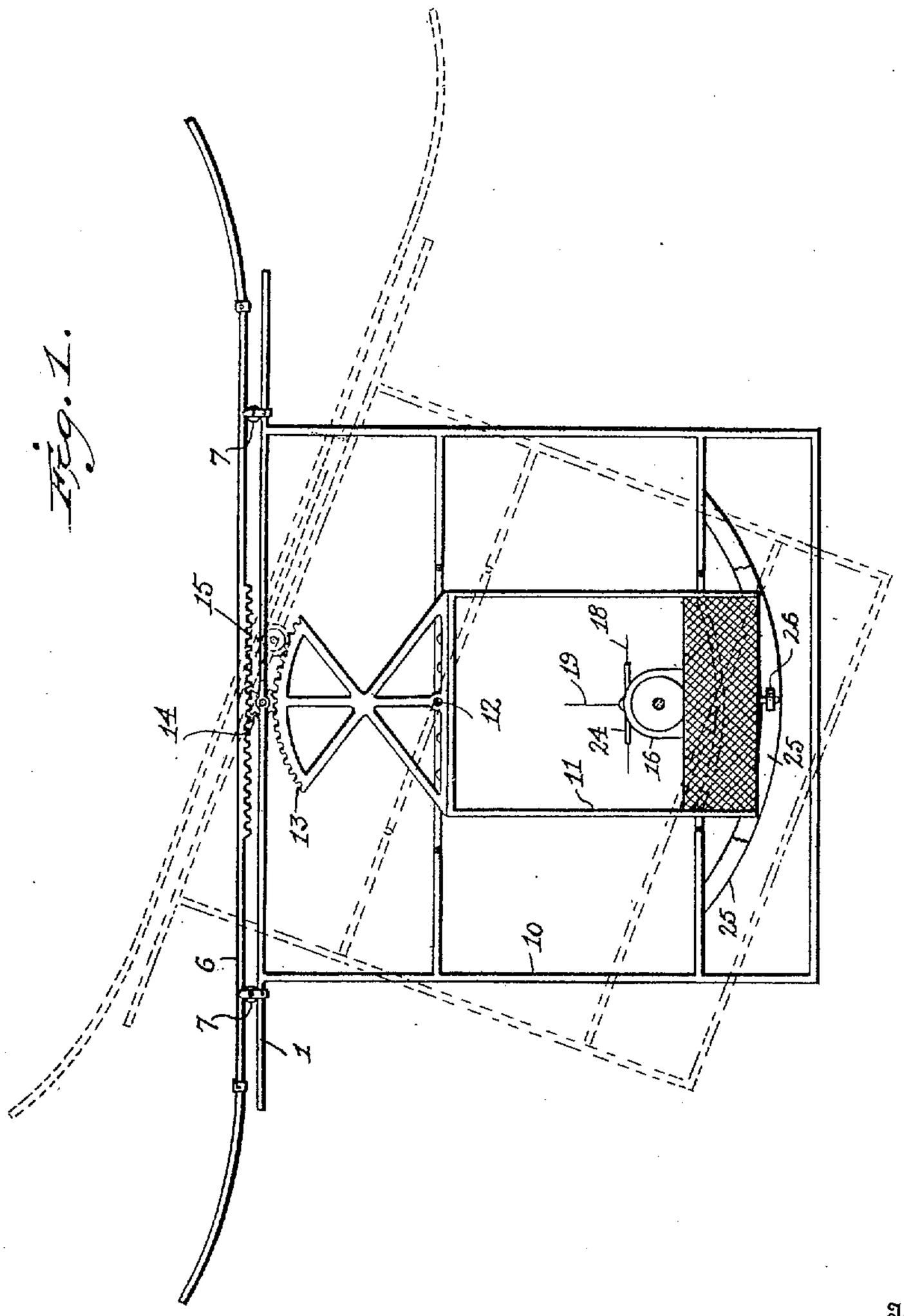
APPLICATION FILED NOV. 4, 1909.

965,969.

Patented Aug. 2, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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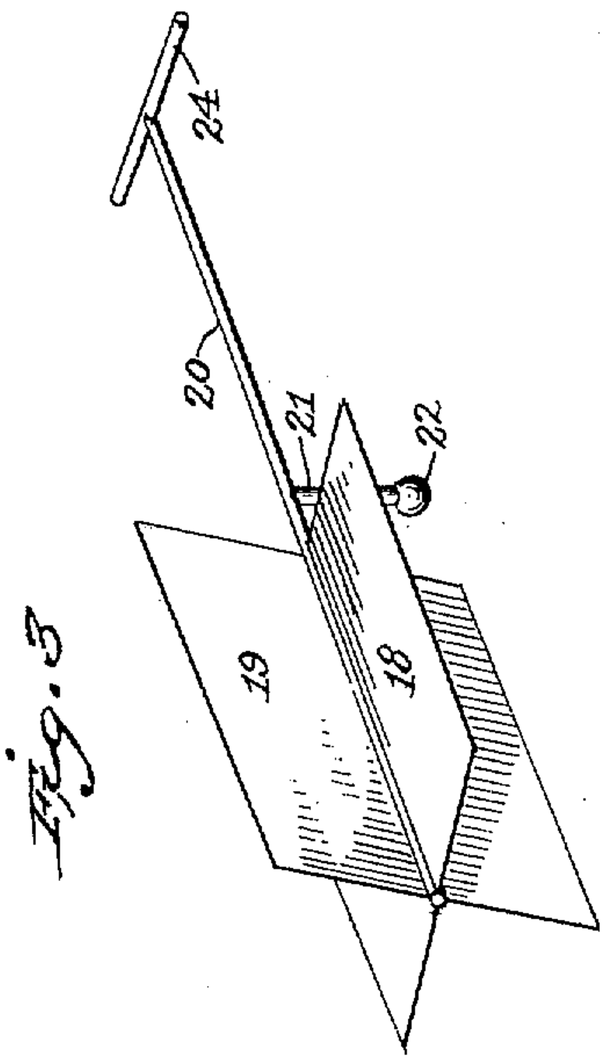

Fig. 3.

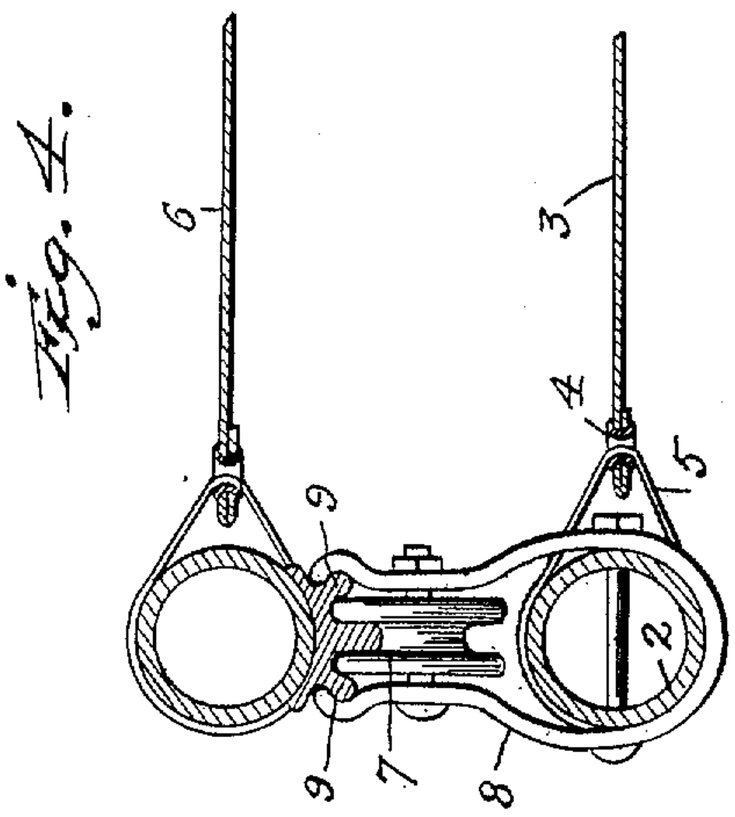

Fig. 4.

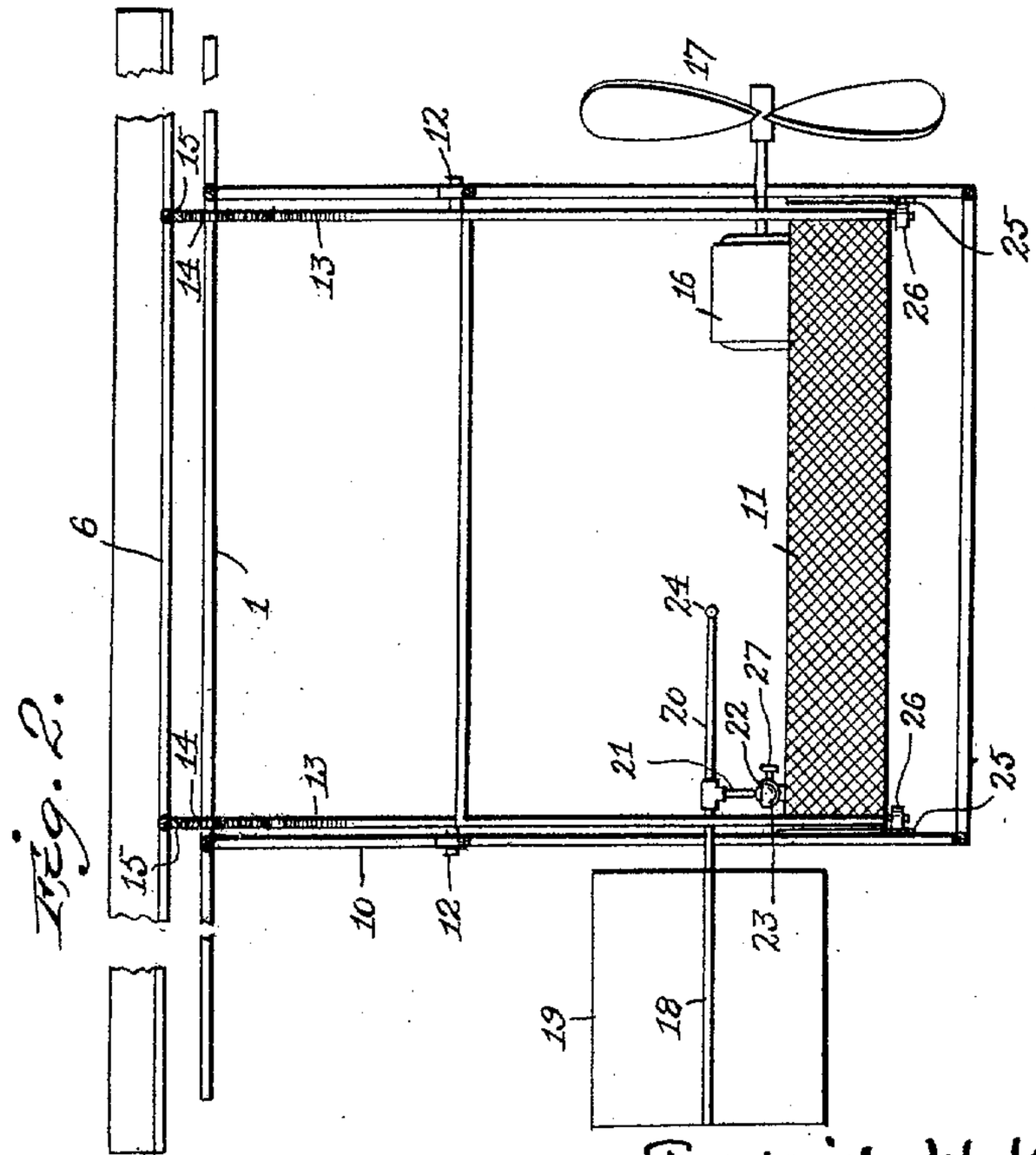

Fig. 2.

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UNITED STATES PATENT OFFICE.

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FLYING-MACHINE.

965,969. Specification of Letters Patent. **Patented Aug. 2, 1910.**

Application filed November 4, 1909. Serial No. 526,301.

To all whom it may concern:

Be it known that I, FREDERICK H. WALES, a citizen of the United States, residing at Imperial, in the county of Imperial and State of California, have invented new and useful Improvements in Flying-Machines, of which the following is a specification.

This invention relates to aerial navigation, and especially to heavier-than-air machines. Its objects are to provide means for automatically maintaining the equilibrium of an aeroplane, and to facilitate the steering and control of the same.

The invention consists of two superposed planes, the upper one movable laterally with respect to the lower one, and a car hung like a pendulum below the two planes and connected by gearing with the upper one, in such a manner that when the machine tilts sidewise, the car, tending to maintain a vertical position, will cause the upper plane to slide laterally toward the lower side of the machine, and thus present an increased surface for the air to react upon, while at the same time the surface on the higher side is reduced; the result of which is to quickly restore the planes to a level position. The steering rudder comprises a horizontal and a vertical plane extending lengthwise of the machine and mounted on a bar which is supported on a universal joint so that the rudder can be moved in any direction to steer the machine either up or down or sidewise, or obliquely up or down.

In the accompanying drawings, Figure 1 is an end elevation of my improved aeroplane. Fig. 2 is a side elevation partly broken away. Fig. 3 is a perspective view of the rudder, and Fig. 4 is a cross section, on a larger scale, of the framework supporting the two planes.

The lower plane 1 is somewhat longer than it is wide, its ends being broken off in Fig. 2. It is preferably composed of a light tubular framework 2 inside of which is tightly stretched a sheet 3 of canvas, silk, aluminum or other light material. This may be provided with eyelets 4 to receive lashings 5 which secure it to the framework. The upper plane 6 is similarly built, but it is considerably wider than the lower plane, and its side edges are preferably curved upwardly, as shown in Fig. 1. The two frames are separated by grooved antifriction rollers 7 placed between the transverse members of said frames. Suitable fastenings hold the frames together, such as the clips 8 attached to one frame and engaging slidably with ribs 9 on the other: the rollers 7 being preferably pivoted between the arms of said clips. This construction permits the upper plane to move easily to one side or the other of the lower plane.

Any suitable mechanism may be resorted to to effect the shifting of the upper plane, but I prefer to make this operation take place automatically, utilizing for that purpose, preferably, the car in which the aviator and the propelling and steering mechanism are located. As shown in the drawings, a rigid light cage 10 is attached to the under side of the lower plane and affords a means of support for the car 11, which is built of light material, such as paper or wickerwork. The car is hung from pivots 12 in the front and rear members of the cage, so that it is free to swing laterally. Rising from each end of the car is a segment gear 13, concentric with the pivots 12, and meshing with pinions 14 journaled on studs secured to the upper members of the cage or to the framework of the lower plane. The pinions mesh also with racks 15 secured to the adjacent transverse members of the upper framework.

At the rear of the car is mounted a suitable motor 16, which drives the propeller 17 by suitable gearing. At the front of the car is located the rudder, which consists of a horizontal plane 18 and a vertical plane 19, arranged lengthwise of the machine and intersecting each other on their median lines, where they are secured to the longitudinal bar 20. A post 21 supports this bar, having at its lower end a universal joint, preferably a ball 22 which is received in a suitable spherical socket 23 on the floor of the car. The rear end of the bar has a cross handle 24.

In operation, the aviator sits or stands just behind the cross handle with the controlling devices for the motor (not shown) within easy reach. If the machine tilts to one side or the other, the car tends to maintain a vertical position below the lower plane, and its swinging movement with reference to said plane causes the segment gears and pinions to slide the upper plane toward the depressed side, as indicated by the dotted lines in Fig. 1. This produces an increase of surface on that side, and at the

same time a reduction of surface on the higher side. The curvature of the side edges of the upper plane causes the extended side to present itself more nearly horizontal, while the higher side is rendered still less effective by the upward curvature of the plane. The result of this shifting of the upper plane causes a greater reaction of the air upon the depressed side of the machine which tends to restore it quickly to an even keel. This tendency can be counteracted, if necessary, to a certain extent, when making turns, by the aviator stepping to that side of the car which is on the inside of the turn, thus shifting the center of gravity laterally. To prevent him from destroying his balance, the floor of the car may be curved concentric with its pivots, as indicated in Fig. 1. The car plays between curved rails 25 on the front and rear ends of the cage, with anti-friction wheels 26 to prevent its binding when the machine pitches.

It is evident that any other form of gearing which would effect the lateral and automatic shifting of the upper plane toward the depressed side of the machine would fall within the scope of my invention. It will be observed that the greater the inclination, the further the plane is extended, within the limits of the movement, and this extension takes place instantly, being simultaneous with the tilting of the machine, because of the pendulum-like action of the swinging car. I have limited my drawings to a plane which shifts laterally, but I wish it to be understood that my invention contemplates the automatic shifting of the plane either laterally or longitudinally or both, as will be evident to persons skilled in the art.

The rudder moves freely in any direction on its universal joint, but it can be clamped in any desired position by means of a set screw 27 or its equivalent.

What I claim as my invention is:—

1. A heavier-than-air flying machine, provided with two superposed planes, the upper one extending beyond the edges of the lower one, a car pivotally suspended from the lower plane, and means actuated by said car, when the machine tilts, for automatically sliding the upper plane toward the lower side of the machine.

2. A heavier-than-air flying machine, provided with two superposed planes, a car suspended from the lower plane, and gearing between said car and the upper plane whereby said upper plane will be shifted with respect to the lower one when the machine tilts.

3. A heavier-than-air flying machine, provided with two superposed planes, a car suspended from the lower plane and free to swing laterally, and gearing whereby the swinging of said car will effect a shifting of the upper plane to counteract tilting.

4. A heavier-than-air flying machine, provided with two superposed planes, a cage depending from the lower plane, a car pivoted in said cage, and gearing between said car and the upper plane.

5. A heavier-than-air flying machine, provided with two superposed planes, a rigid cage depending from the lower plane, a car pivoted in said cage, segment gears rising from said car concentric with said pivots, pinions meshing with said gears, and racks on the upper plane engaging with said pinions.

6. A heavier-than-air flying machine, provided with two superposed planes, and means for automatically moving said upper plane laterally with reference to the lower one, said upper plane having upwardly curved edge portions.

7. An aeroplane having a rudder composed of horizontal and vertical planes, a longitudinal bar to which said planes are secured, a post supporting said bar, a ball and socket joint at the lower end of said post and means for clamping the parts of said joint in any given position.

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

FREDERICK H. WALES.

Witnesses:

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E. E. PATTEN.