

J. MEANS.  
AERIAL NAVIGATION.  
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984,147.

Patented Feb. 14, 1911.

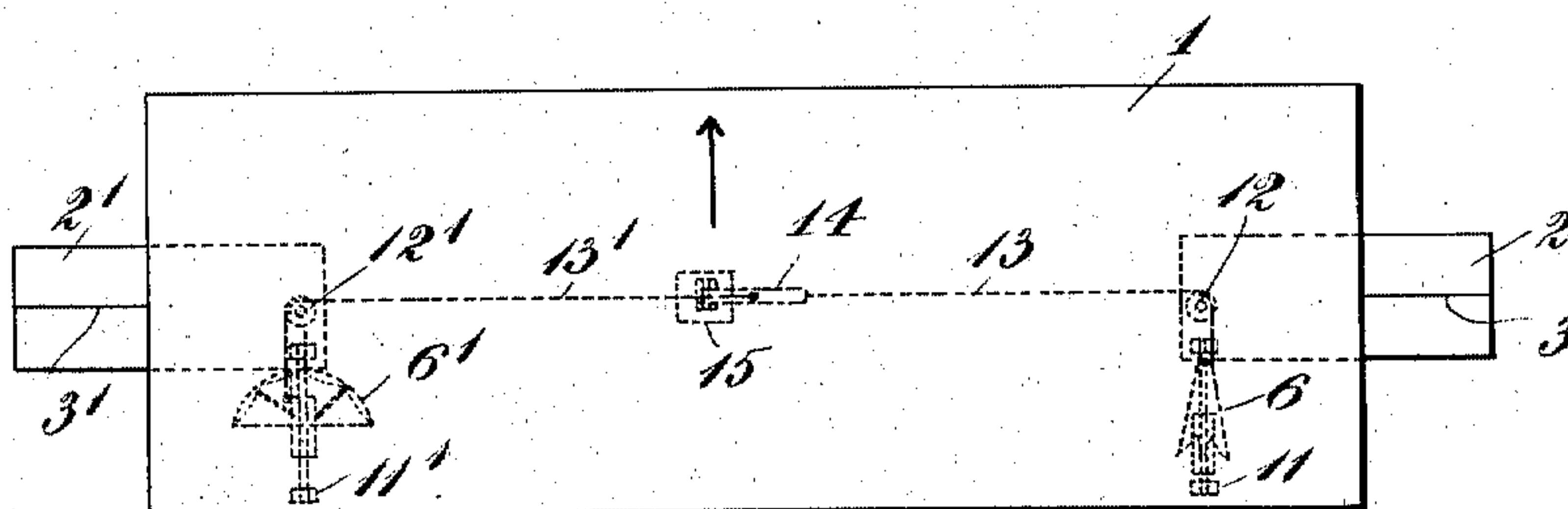


Fig. 1.

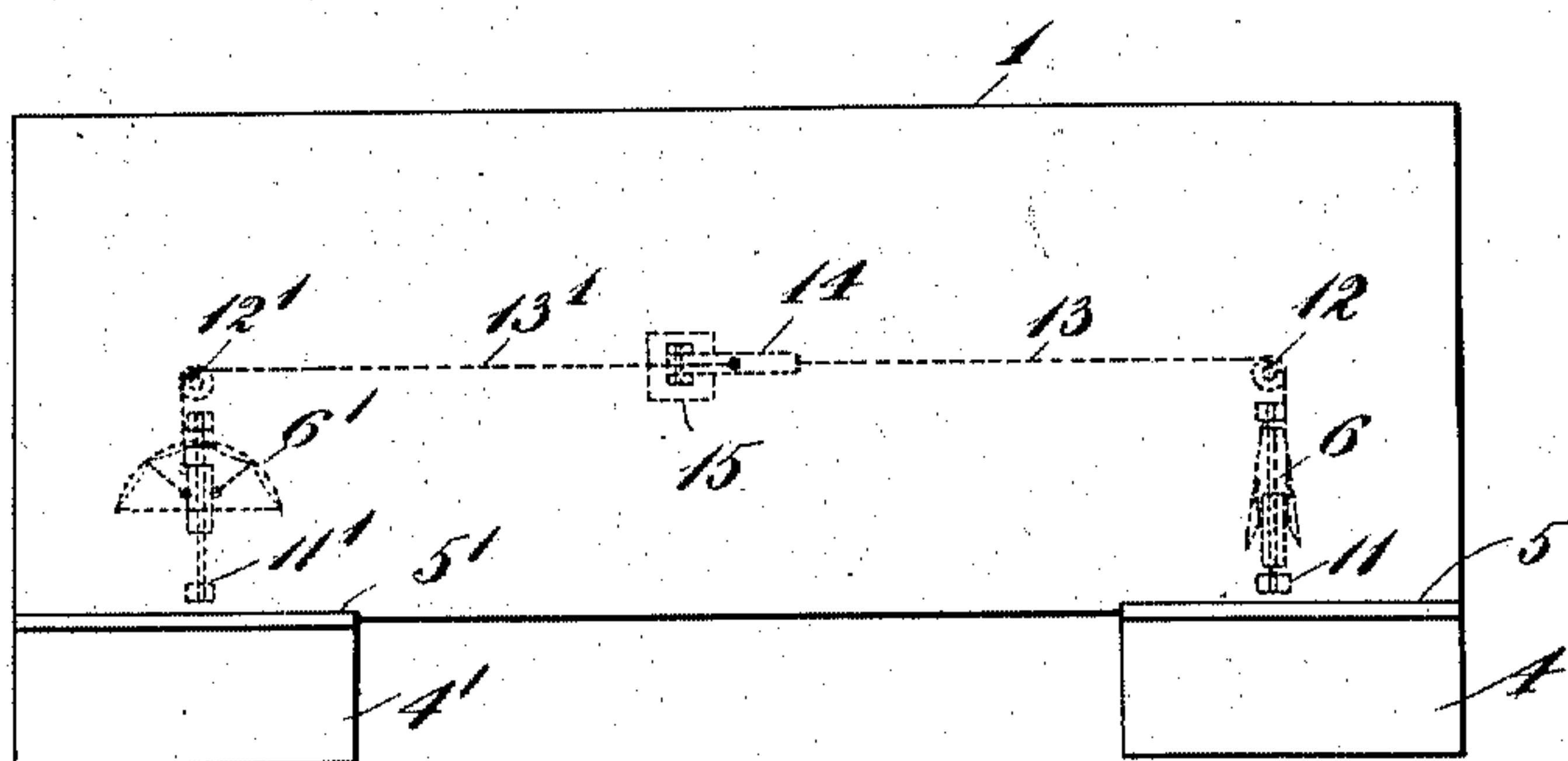


Fig. 2.

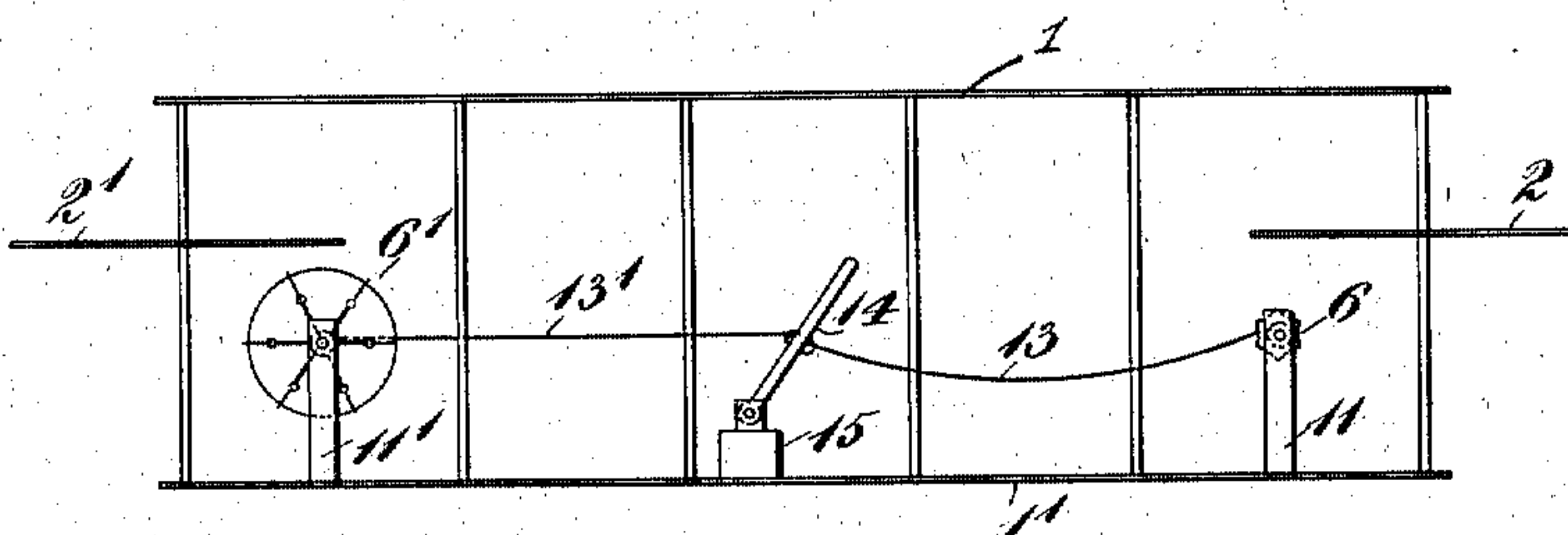


Fig. 3.

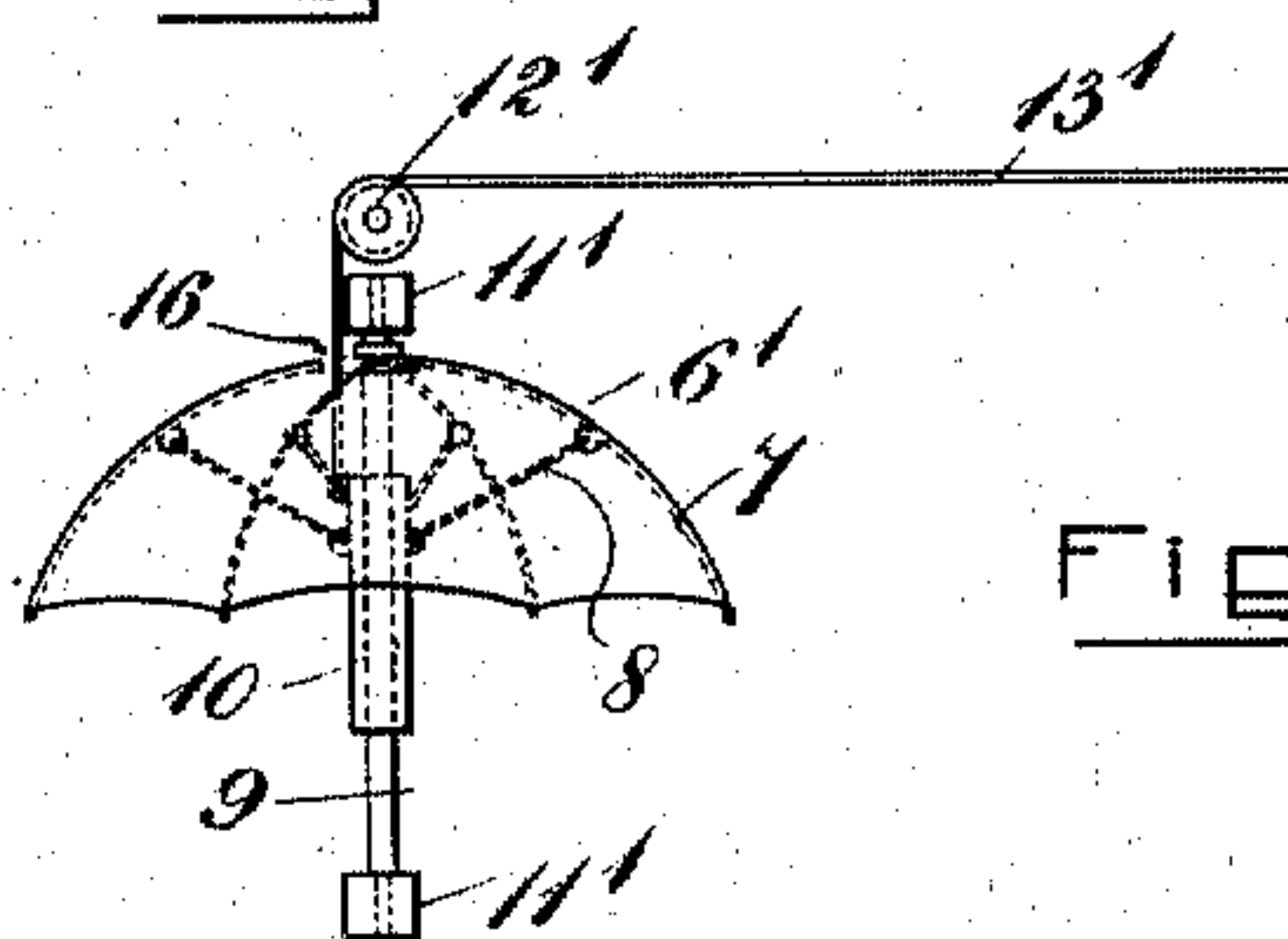


Fig. 4.

WITNESSES:  
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# UNITED STATES PATENT OFFICE.

JAMES MEANS, OF BOSTON, MASSACHUSETTS.

## AERIAL NAVIGATION.

984,147.

Specification of Letters Patent.

Patented Feb. 14, 1911.

Application filed April 6, 1910. Serial No. 553,755.

*To all whom it may concern:*

Be it known that I, JAMES MEANS, a citizen of the United States, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Aerial Navigation, of which the following is a specification.

In flying machines of the aeroplane type it is in general desirable to provide means under the control of the operator for steering the machine to port or starboard and for counteracting such effect as may be produced by the operation of the devices employed for maintaining lateral stability. Heretofore a vertical rudder consisting of a plane surface pivoted to swing about a vertical post has been employed for these purposes and such vertical rudder has been arranged either in front or in the rear of the machine in line with the longitudinal axis thereof, so that like the rudder of a ship, it may perform its function with a minimum speed retardation.

The object of the present invention is to provide an improved apparatus under the control of the operator for turning or for tending to turn the machine to port or to starboard, said apparatus accomplishing substantially the same result as the vertical rudder of the prior art, but accomplishing it in a radically-different, more positive and more effective manner.

For effecting the foregoing object I employ a pair of brakes or speed-retarding devices disposed preferably near the lateral extremities of the machine and preferably arranged symmetrically with respect to the longitudinal axis thereof. Each member of the pair of brakes is normally in inoperative position and is arranged to be put into operative or braking position by a suitable controlling device which may be manually operated and which preferably is so constructed that only one of said brakes is brought into braking position at a given instant of time. The effect of bringing one of said brakes into operative position is to retard that side of the machine on which said brake is located, so that the machine as a whole will turn or tend to turn in a substantially horizontal plane toward that side.

The drawings which accompany and form a part of this specification illustrate the principle of my invention; but it will be understood that many modifications may be

made in the apparatus selected for illustration without departing from said principle.

In the drawings,—Figure 1 represents a plan view of an aeroplane embodying my improvements. Fig. 2 is a plan view of a modification. Fig. 3 is an elevation of the machine shown in Fig. 1. Fig. 4 is a plan view of one form of brake or speed-retarding device.

In the drawings which I have selected for illustrating my invention, 1 1' represent respectively the upper and lower supporting planes of an aeroplane flying machine which may be provided with any suitable means for maintaining lateral stability, such for example as the lateral rudders 2 2', which by suitable mechanism may be rotated in opposite directions about the axes 3 3', as more fully described in the British patent to Boulton No. 392, dated August 4, 1868, or the little wings or "ailerons" 4 4' which by suitable mechanism may be rotated downward about the axes 5, 5' at the rear of the machine, as more fully explained in the British patent to Harte No. 1469, dated May 21, 1870.

Mounted on suitable standards 11, 11', secured to some appropriate part of the machine and located preferably near the lateral extremities thereof, are the braking members or speed-retarding devices 6 6'. These devices which, as shown, are preferably arranged symmetrically with respect to the longitudinal axis of the machine are represented in the present instance as umbrella-like arrangements consisting of a suitable fabric 6' secured to the frame-work 7, which in turn is connected by the ribs 8 to the barrel 10 surrounding the rod 9. The cords 13, 13' pass around the pulleys or guides 12, 12' through an opening 16 in the fabric 6' and are secured, respectively, to the barrel 10. The inner ends of the cords are attached to some suitable controlling device, such for example as the lever 14 mounted on the standard 15, and they are so arranged that when the lever is in its vertical position, both are taut and each member of the pair of brakes is closed.

I do not limit myself to the shape of the braking devices or to the particular control device herein described.

The operation is as follows:—Assuming that the machine is traveling in the direction of the arrow and that it is desired to



turn the machine in a substantially horizontal plane toward the left,—in other words, to steer the machine to port,—the operator will throw the lever 14 to the position shown in Fig. 3, so that the brake 6' is opened, (the wind pressure meanwhile keeping the brake 6 closed) and the retarding effect of the exposed surface of the brake 6', which is in operative or braking position, will then cause the lefthand side of the machine to travel more slowly than the righthand side, so that the machine as a whole will turn toward the left, provided there be no other forces operating on the machine to prevent such turning. During the operation of the lateral rudder 2, 2' or the ailerons 4, 4' for the purpose of correcting sidewise rolling, it is sometimes necessary to offset the effect on the direction of travel of the machine of the altered angles of incidence of said rudders or ailerons because such alteration in said angles of incidence, if not compensated for, will cause the machine to turn about its vertical axis. Under such conditions the desired compensation can be effected by slightly moving the lever 14 in the proper direction.

While I have illustrated my invention as applied to aeroplanes with two old and well

known types of lateral stability-maintaining devices, it will be understood of course that I do not limit myself to the use of my improvement with such devices, and that I may use the same in connection with any suitable arrangement for controlling either lateral or longitudinal stability.

I claim:

In a flying machine, a pair of normally inoperative brakes or speed-retarding devices arranged symmetrically with respect to the longitudinal axis of the machine, said devices each comprising a stationary rod, a barrel surrounding said rod and movable thereon, a fabric-covered frame-work, and ribs connecting said frame-work to said barrel; a lever under the control of the operator, and cords connecting said barrels respectively with said lever, whereby the operator may bring either member of said pair into operative or braking position.

In testimony whereof, I have hereunto subscribed my name this 5th day of April 1910.

JAMES MEANS.

Witnesses:

E. B. TOMLINSON,

GEO. K. WOODWORTH.