

J. S. VOGT.
 AUTOMATIC BALANCING MECHANISM FOR AEROPLANES.
 APPLICATION FILED FEB. 14, 1912.

1,039,228.

Patented Sept. 24, 1912.

3 SHEETS—SHEET 1.

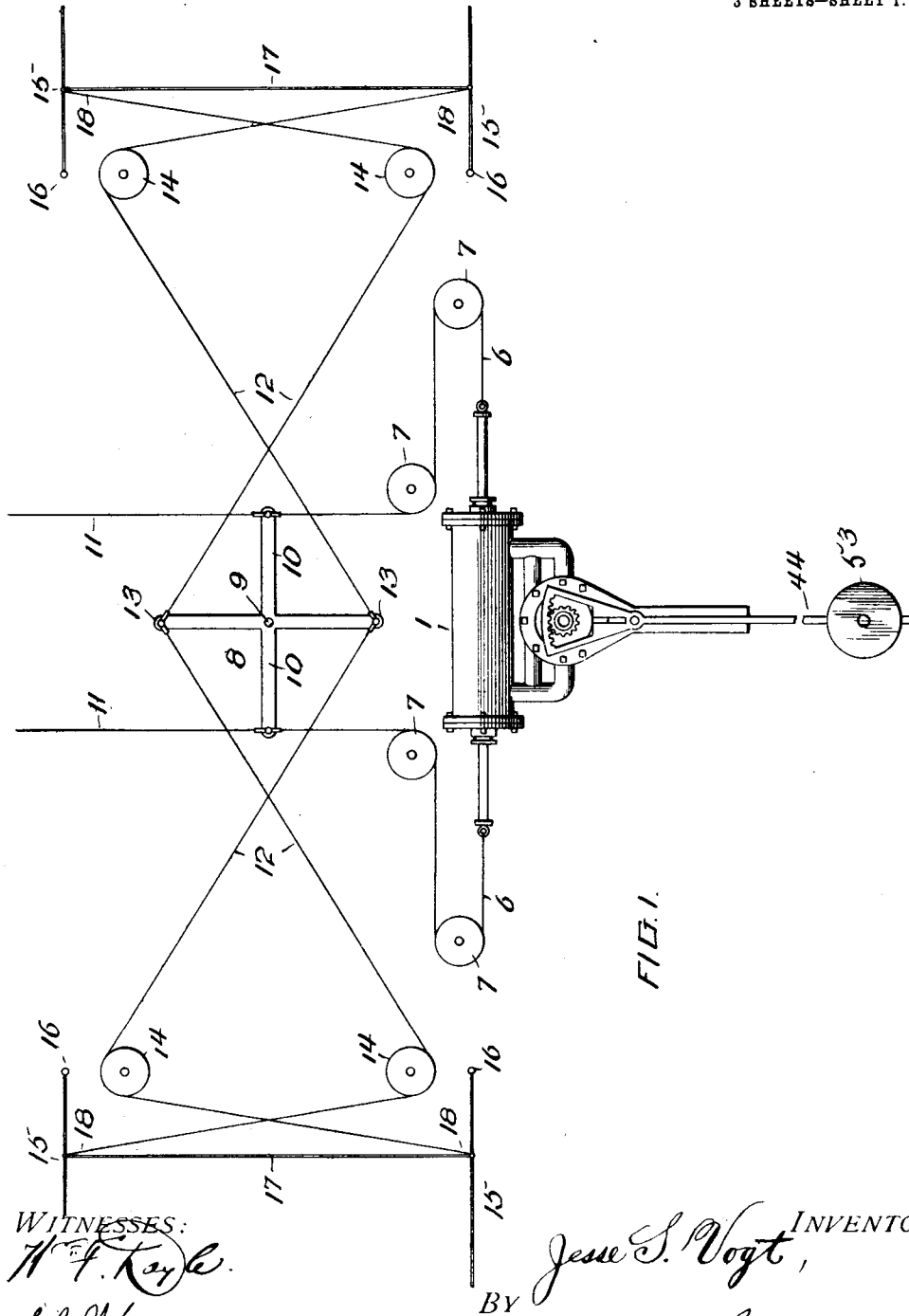


FIG. 1.

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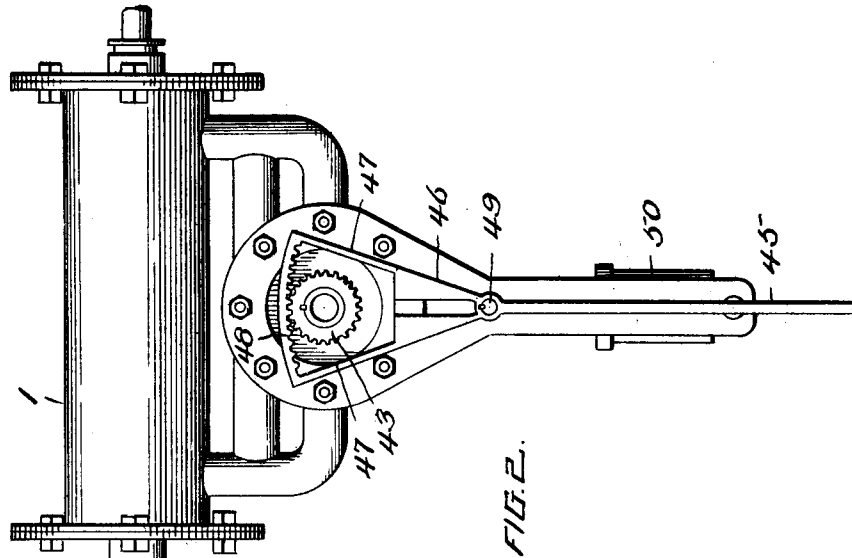


FIG. 2.

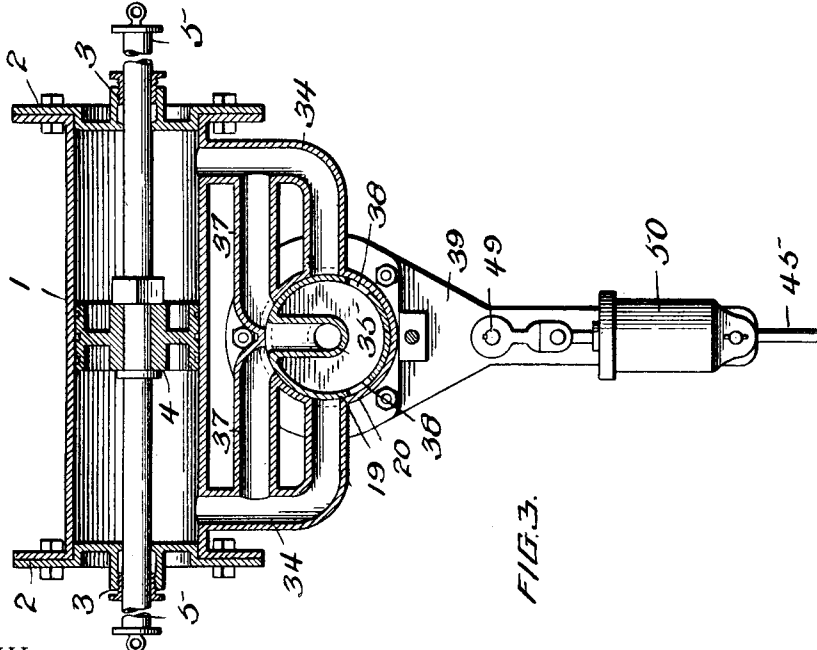


FIG. 3.

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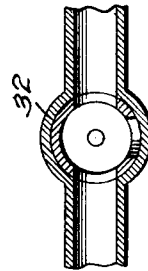
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC BALANCING MECHANISM FOR AEROPLANES.

1,039,228.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JESSE S. VOGT, a citizen of the United States, residing at Long Green, in the county of Baltimore and State of Maryland, have invented certain new and useful Improvements in Automatic Balancing Mechanism for Aeroplanes, of which the following is a specification.

The main object of my invention is the provision of automatic means for operating the ailerons of aeroplanes and balancing the same, said means to be of simple construction, light in weight, and relatively cheap in first cost.

A further object is the provision of means in connection with the mechanism for rendering the automatic means inoperative when it is desired to operate the ailerons by manual power.

With these ends in view, my invention consists in certain novelties of construction and combinations of parts and elements as hereinafter set forth and claimed.

The accompanying drawings illustrate an example of the physical embodiment of the improvements constructed according to the best mode of procedure I have so far devised for the purpose.

Figure 1 is a view in side elevation of the main elements of the automatic balancing means, including the cylinder, valve, pendulum, piston rods, pulleys, levers, warping wires, and ailerons. Fig. 2 is an enlarged view in elevation of the cylinder, pipes and valve. Fig. 3 is a vertical section in elevation of Fig. 2, showing the interior construction of the cylinder and valve mechanism, and the opposite side of the lower part of Fig. 2 in elevation. Fig. 4 is a cross section of the cylinder casing, valve, compressed air tank and pipe, and a partial section of the mechanism for closing the passage from an air compressor to the tank when a determinate pressure within the tank has been attained. Fig. 5 is a vertical section of the cut off valve. Fig. 6 is an enlarged bottom view in elevation of the means for locking the pendulum in an inoperative position.

Referring to the several figures, the numeral 1 designates a cylinder; 2, the cylinder heads; 3, stuffing boxes; 4, the piston; 5, the ends of the piston rods each movable in a stuffing box and having eyes at the ends;

6, primary warping wires secured to the eyes; 7, pulleys over which the wires pass; 8, a four armed warping lever device; 9, the pivotal point of the device; 10, arms to which the primary wires are attached; 11, extensions of the wires to a shoulder yoke or other device (not shown) for operating the lever device when the automatic means is not in use; 12, secondary warping wires; 13, lever arms to which the wires are attached; 14, pulleys over which the secondary wires pass; 15, ailerons of any suitable construction; 16, the pivotal points about which the ailerons turn; 17, bars pivoted to the ailerons; 18, the ends of the secondary warping wires attached to the ailerons; 19, the main rotary valve, of a cylindrical shape and hollow, as shown; 20, the valve shell or casing forming a chest for compressed air; 21, an air tank; 22, a pipe from the tank to the valve chest; 23, a pipe leading to an air pump (not shown); 24, a check valve of common construction; 25, a cylinder; 26, a piston; 27, a cylinder head; 28, a piston rod; 29, a spring on the rod bearing against the end of the stuffing box and a nut on the rod; 30, a closed slot in the rod; 31, a lever located and movable within the slot in the rod; 32, a rotary valve with three ports in pipe 23 operated by the lever; 33, a pipe connecting the interior of the cylinder back of the piston with the pipe 23 in front of the check valve; 34, pipes connecting the interior of the valve casing or chest with the cylinder 1 at opposite ends; 35, an exhaust pipe within and movable with the rotary valve 19, as shown; 36, the exhaust outlet to the atmosphere; 37, two pipes or passages from the inlet pipes 34 to the exhaust pipe 35 with the opening to which pipe 35 they are adapted to alternately register when the valve is rotated; 38, ports in the rotary valve adapted to alternately register with the openings to the pipes 34 when the valve is rotated; 39, a plate fashioned at the upper end to form a head and closing the end of the valve casing; 41, a circular opening in the head forming a bearing; 42, the projecting end of the exhaust pipe 35 seated within the opening and adapted to be rotated therein and at the same time rotate the valve; 43, a pinion keyed on the projecting end of the exhaust pipe; 44, a pendulum; 45, the long

arm of the pendulum; 46, the short arm of the pendulum having two branches 47 united at their extreme ends by a toothed segment 48 engaging the pinion; 49, a shaft or pin rigid with the pendulum by which the pendulum is journaled in and supported by the plate; 50, a dash pot of well known construction pivoted at the lower end by a journal 51 to the plate and provided with a perforated piston and a piston stem, the end of said stem being pivotally connected to a link 52, which link at its end is keyed to the extended end of the shaft or pin 49, as shown; 53, a weight adjustably secured upon the long arm of the pendulum; 54, a V-shaped opening between the branches of the short arm of the pendulum; 55, a slot in the plate; 56, a perforated bearing at the lower edge or surface of the valve casing; 57, a rod reciprocating within the bearing 56 and with a wedge-shaped head 58 located within the slot in the plate; 59, a spring on the rod confined by a nut 60 and engaging the bearing 56 for the rod; 61, a pulley supported by the valve casing; 62, an eye on the rod 57 located at one side of the pulley; and 63 is a wire secured to the eye 62, passed over the pulley, and its extended end (not shown) connected with a foot lever or pedal.

The frame of the aeroplane, motor, motor support, air pump, and support for the balancing mechanism are not illustrated by the drawings, inasmuch as they do not constitute essential parts of my invention.

The operation of the mechanism is as follows: When air delivered from the pump passes to the tank the check valve 24 prevents its backward flow should the pump cease its operation. A determinate pressure of air in the tank and back of the piston 26 moves the piston 26, piston rod 28, and lever 31, rotating the valve 32, thus closing the passage in the pipe and opening a passage from the pump to the atmosphere. Obviously, a reduction of air pressure in the tank will allow the spring to expand and open the passage from the pump to the tank. The parts being in the relative positions shown by Fig. 3, when the aeroplane is on an even keel and the pendulum vertical, obviously a tilting of the aeroplane to the right or left, the pendulum hanging vertically, will rotate the main valve 19 and admit air under pressure from the valve chest to the right or left ends of the cylinder, and at the same time the exhaust pipe 35 will open a passage to the atmosphere from the side of the piston opposite that to which the air under pressure is admitted. The movement of the piston and piston rods to the right or left draws upon one of the primary warping wires and releases the other, causing the lever arms 10, 10 to move about the pivotal point 9 of the warping

lever device. At the same time the lever arms 13 are moved and the ailerons at one side shifted downwardly and at the other side upwardly through the medium of the secondary warping wires. I have shown a dash pot mechanism in connection with the plate and pendulum journal to prevent a sudden movement of the cylinder and valve relative to the pendulum, or vice versa, but this may be omitted, if desired, especially as the movement of the pendulum is limited by the disposition of the two branches 47, 47 of the short arm 46 relative to the pinion. When either of the ports is fully opened the branch 47 adjacent the opened port will engage the pinion and prevent further motion of the pendulum in one direction. The specific operation of all the parts simultaneously will readily be understood by those skilled in the art. It will be noted that should the air pump at any time fail to work, sufficient air will be stored in the tank to operate the balancing mechanism till the operator can assume control through the medium of the shoulder yoke or other means. Under the conditions named, as well as in turning, it is desirable that the pendulum should be locked against movement, and for that purpose the means therefor shown in Fig. 6 is provided. A pedal (not shown) operated by the foot draws on the wire 63, forcing the wedge 58 into the V-shaped opening 54 which prevents the oscillation of the pendulum. When the pendulum is in such locked position obviously the exhaust pipe is in communication with opposite ends of the cylinder (see Fig. 3) so the piston can move freely in either direction.

While I have illustrated one example of the disposition of warping wires, levers, and ailerons, the balancing mechanism may be used in connection with any other desired disposition of all or part of the same or analogous means for changing the position of a moving aeroplane.

What I claim is:

1. Automatic balancing means for aeroplanes comprising in combination a cylinder, a piston within the cylinder, two piston rods movable with the piston, a valve casing, a rotary valve within the casing having ports in the wall and an exhaust passage, means having passages connecting opposite ends of the cylinder with the interior of the casing and the exhaust passage in the valve, a pipe for introducing fluid under pressure to the interior of the valve and casing, an air tank, a pipe for delivering air under pressure to the tank, valve mechanism in connection with the said delivery pipe actuated by the air under pressure in the tank and pipe to close the delivery pipe when a determinate pressure exists within the tank, a weighted pendulum,

means for pivotally supporting the pendulum intermediate its ends, means carried by the short arm of the pendulum and engaging the rotary valve for actuating the said valve and simultaneously admitting fluid under pressure to one side of the piston and allowing it to escape from the opposite side thereof, and means for locking the pendulum so it cannot move about its pivotal point.

2. The combination in balancing means for aeroplanes, of a cylinder, a piston having two piston rods, a rotary valve for controlling the admission to and discharge of fluid under pressure from opposite sides of the piston, a pinion in connection with the valve, a pendulum having relatively short and long lever arms, said short arms comprising two branches united by a rack engaging the said pinion, and means for pivotally supporting the pendulum intermediate its ends.

3. The combination in balancing means for aeroplanes, of a cylinder, a piston having two piston rods, a rotary valve for controlling the admission to and discharge of fluid under pressure from opposite sides of the piston, a pinion in connection with the valve, a pendulum having relatively short and long arms, said short arm comprising two branches united by a rack engaging the said pinion, means for pivotally supporting the pendulum intermediate its ends, and means for locking the pendulum so it cannot move about its pivotal point.

4. The combination in balancing means for aeroplanes, of a cylinder, a piston having two piston rods, a rotary valve for controlling the admission to and discharge of

fluid under pressure from opposite sides of the piston, a pinion in connection with the valve, a weighted pendulum having relatively short and long lever arms, said short arm comprising two branches united by a rack engaging the said pinion, means for pivotally supporting the pendulum intermediate its ends, and means for locking the pendulum against movement consisting of a spring retracted reciprocating rod and a wire connected therewith for moving the same into engagement with the pendulum.

5. The combination in balancing means for aeroplanes, of a cylinder, a piston having two piston rods, a rotary valve for controlling the admission to and discharge of fluid under pressure from opposite sides of the piston, a pinion in connection with the valve, a pendulum pivoted intermediate its ends, one end of said pendulum having a rack engaging the said pinion, and a dash pot mechanism operated by the pendulum for retarding its movement.

6. The combination in balancing means for aeroplanes, of a cylinder, a piston having two piston rods, a rotary valve, a pinion in connection with the valve, a pendulum having a long arm and a short arm comprising two branches located at opposite sides of the said pinion and the ends united by a rack engaging the pinion, and means for pivotally supporting the pendulum.

In testimony whereof I affix my signature in presence of two witnesses.

JESSE S. VOGT.

Witnesses:

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