W. O. AND H. A. KEELING.

AUTOMATIC SAFETY AEROPLANE CONTROLLER.

APPLICATION FILED NOV. 25, 1919.

1,360,756.

Patented Nov. 30, 1920.

2 SHEETS—SHEET 1.

Fig. 1.

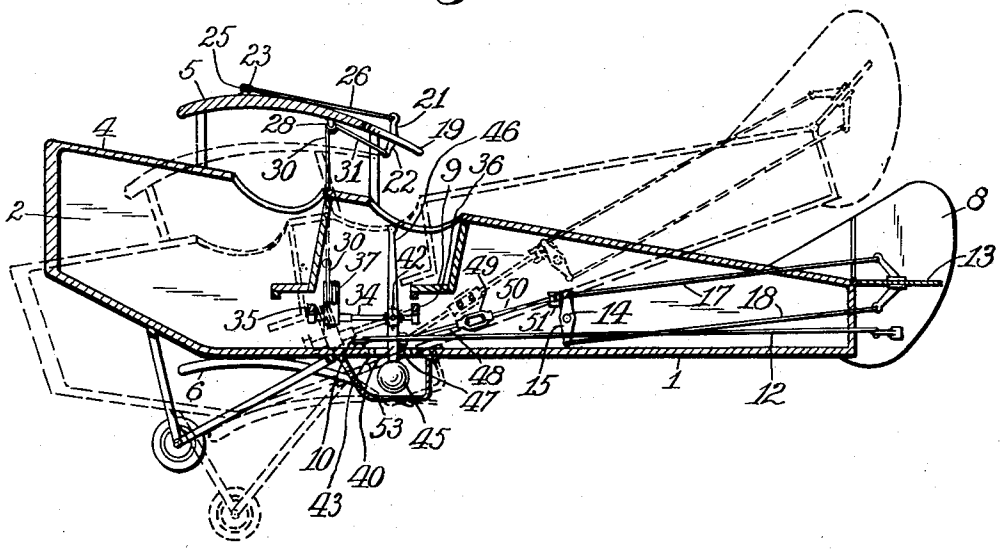
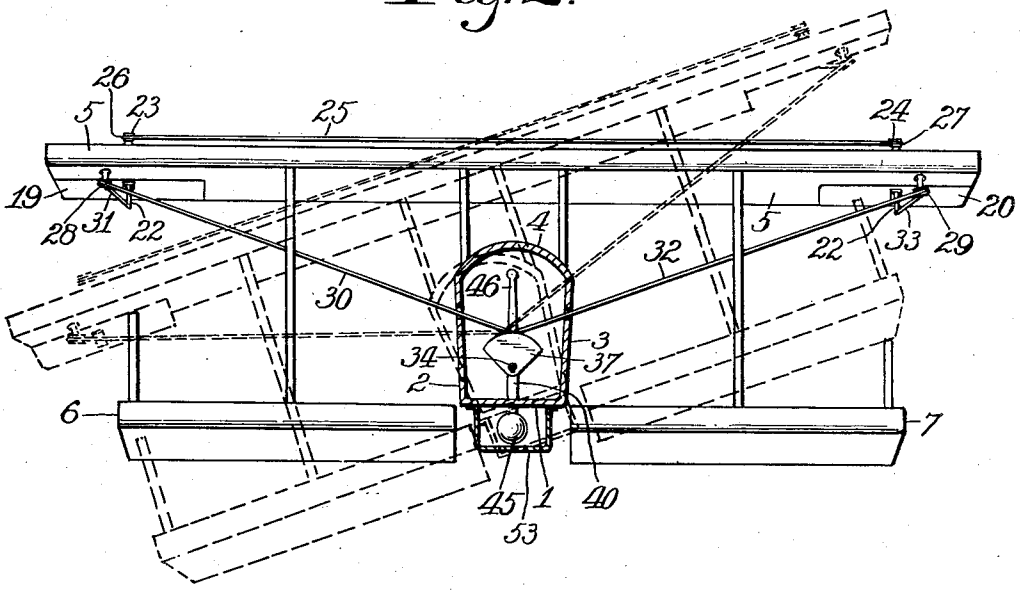


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

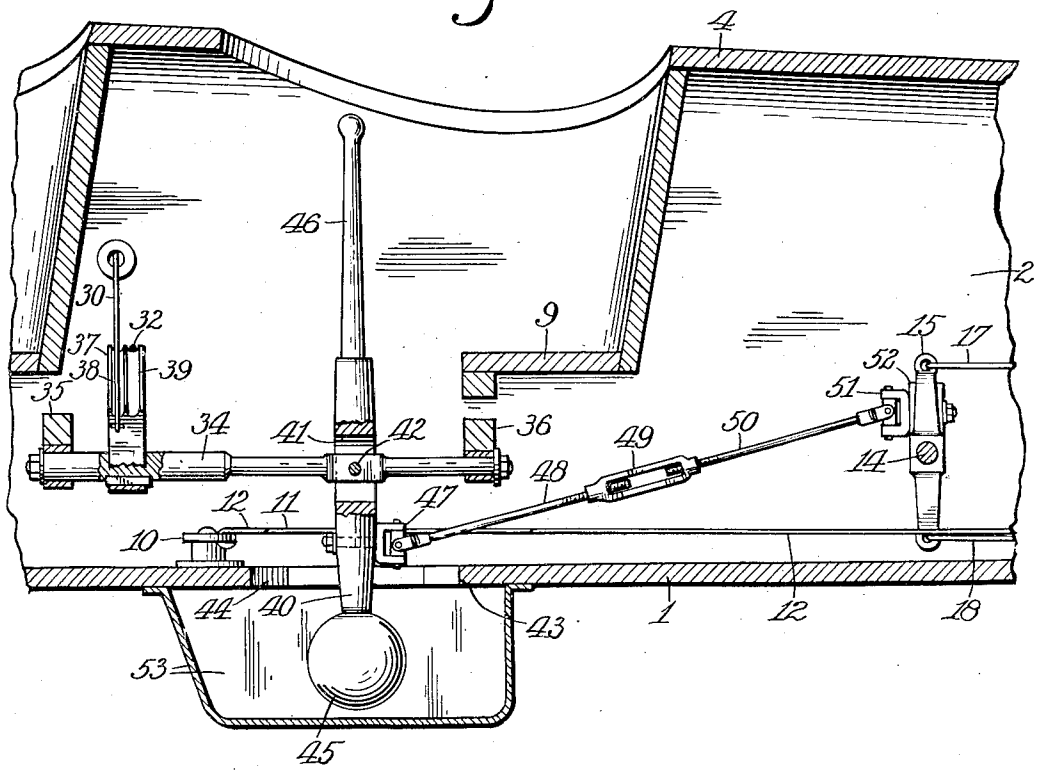
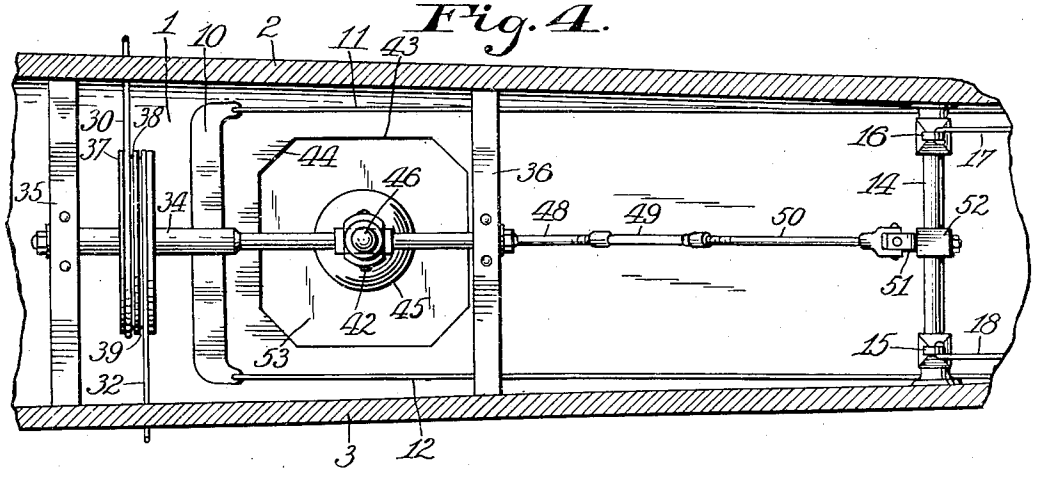


Fig. 4.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC SAFETY AEROPLANE-CONTROLLER.

1,360,756. Specification of Letters Patent. Patented Nov. 30, 1920.

Application filed November 25, 1919. Serial No. 340,667.

To all whom it may concern:

Be it known that we, WILLIAM OREN KEELING and HARVEY A. KEELING, citizens of the United States, residing at Franklin, in the county of Johnson and State of Indiana, have invented a new and useful Automatic Safety Aeroplane-Controller, of which the following is a specification, reference being had to the accompanying drawings and to the letters and figures of reference marked thereon.

This invention relates to a safety appliance that is designed to automatically operate to safeguard aviators when flying in windstorms or through fog banks, or in dense clouds when the aviator may have no fixed objects in view whereby to determine whether the aeroplane is overturning or dangerously tilting so as to be liable to plunge to the earth.

An object of the invention is to provide a safety appliance for the protection of aviators when operating under difficult conditions, and which shall be so constructed as to automatically operate to save life in case the aviator loses control or becomes physically incapable of controlling the aeroplane.

Another object is to provide an automatic safety aeroplane controller which shall be so constructed as to positively operate automatically for the above-mentioned purposes and also permit manual operation of the controller to guide and change the course of the aeroplane in the operation thereof.

A further object is to provide an automatic safety aeroplane controller of reliable and simple construction, which shall be adapted to be applied to not only new but to old aeroplanes inexpensively, and which shall be durable and economical in use.

With the above-mentioned and other objects in view, the invention consists in a gravity-controlled power device, and movable means on an aeroplane connected with and controllable either by the power device or arbitrarily by hand, to control the aeroplane and prevent it from plunging to earth either forwardly or sidewise; and, the invention consists also further in the parts and combinations and arrangements of parts as hereinafter particularly described and further defined in the appended claims.

Referring to the drawings,—Figure 1 is a longitudinal vertical sectional elevation showing the principal portions of an aeroplane having the invention applied thereto, the aeroplane and the safety appliances being shown by broken lines approximately as they would appear when the aeroplane is about to be righted or leveled after having been tilted forward by a violent wind, or from other cause; Fig. 2 is a front view, partially in cross section, showing the principal structural features of the aeroplane having the invention applied thereto; the aeroplane and the safety appliance being shown by broken lines approximately as they would appear when the aeroplane is about to be righted or leveled after having been partially turned over sidewise; Fig. 3 is a fragmentary vertical longitudinal sectional elevation of the aeroplane and the safety appliance connected therewith; and, Fig. 4 is a fragmentary horizontal section of the aeroplane fuselage and plan of the safety appliance therein.

Similar reference characters in the different figures of the drawings indicate corresponding elements or features of construction herein referred to in detail.

For descriptive purposes the invention is illustrated as applied to an aeroplane of familiar type, and in connection with hand-operated controlling apparatus comprised in such aeroplane.

In the aeroplane above-mentioned is a fuselage having a bottom 1, sides 2 and 3 and a top 4. The aeroplane has a top plane 5, more technically described as top wing panels or sections, and lower planes or wings 6 and 7. The fuselage has a rudder 8 hinged on its rear end, and the interior of the fuselage has an operator's seat 9 arranged in a suitable position. A steering lever 10 is pivotally supported between its ends in proximity to the operator's seat and has cables 11 and 12 connected thereto and with arms or horns on opposite sides respectively of the rudder. The rear end of the fuselage has also a pair of elevator flaps 13, that are hinged so as to swing relatively upward or downward, to guide the aeroplane upwardly or downwardly. Inside the fuselage a shaft 14 is rotatably supported and has levers 15 and 16 secured between their ends to the shaft so as to constitute upper arms and lower arms, cables 17 being connected with the upper arms and with suitable arms or

horns on the upper side of the elevator flaps, other cables 18 being connected with the lower arms of the levers and also with suitable arms or horns on the lower sides of the flaps, to control the flaps.

For the purpose of preventing the aeroplane from turning over sidewise, or to control sidewise tilting, the top plane is provided with two hinged ailerons 19 and 20, as is well known, and in the present case the ailerons are adopted as portions of the automatic controller. Each aileron has an arm or horn 21 on its upper side and an arm or horn 22 fixed on its lower side for its control. Guide sheaves 23 and 24 are mounted upon the plane 5 in proximity to the ailerons respectively and they guide a cable having a portion 25 extending from one to the other of the sheaves, and portions 26 and 27 extending from the sheaves to the arms or horns 21 on the ailerons respectively, so that when either aileron is moved downwardly, the opposite one is pulled upwardly. Other guide sheaves 28 and 29 are mounted on the under side of the plane 5 in proximity to the ailerons respectively, a controlling cable 30 leads to the sheave 28 and has a portion 31 connected with the arm or horn 22, and another controlling cable 32 leads to the sheave 29 and has a portion 33 connected to the arm or horn 22 on the under side of the other aileron 20.

A rock shaft 34 is longitudinally arranged in the fuselage and supported by suitable bearing members 35 and 36 and it has a pulley segment 37 secured thereto which preferably has grooves 38 and 39 in its peripheral portion. The cable 30 extends into one of the grooves and is secured to the segment, the cable 32 extending into the other groove and being secured to the opposite side of the segment, so that when the rock-shaft is turned in one direction one of the controlling cables is drawn over the segment to swing one of the ailerons, and when turned in the opposite direction the other controlling cable is drawn over the segment to swing the opposite one of the ailerons downwardly and permit the other one to be swung upwardly by the connecting cable on the top of the upper plane.

An important feature of the invention comprises a pendulum arm or lever 40 which has an aperture 41 therein through which the rock-shaft 34 extends, and a pivot 42 extending through the aperture and transversely through the rock-shaft, whereby the pendulum arm or lever is permitted to swing on the rock-shaft and also enable it to prevent rotary movement of the rock-shaft. In the present case the bottom 1 of the fuselage has an aperture 43 therein which has angled corner portions 44, and the arm or lever 40 is arranged so as to extend through the aperture and to be limited in its movements by contact with the edge portions of the aperture. The lower end of the pendulum arm or lever has a weight element 45 thereon designed to insure constant vertical or plumb position of the pendulum arm or lever when not manually controlled. The upper portion of the arm or lever 40 has a handle or lever portion 46 rigid thereon whereby the pendulum arm or lever may be swung or controlled when desired to purposely change the aeroplane course in operation. The rearward side of the arm or lever 40 has a universal coupling 47 mounted thereon, so as to be below the rock-shaft 34 and a connecting rod is connected therewith which preferably comprises a section 48 to which a turn-buckle 49 is connected and a section 50 connected with the turn-buckle, the section 50 being connected with a universal coupling 51 that is mounted on the forward side of an arm or boss 52 fixed on the upper portion of the shaft 14, so that the pendulum arm or lever shall have control of the elevator flaps.

In order to guard and protect the pendulum or gravity device, which is the prime controller element of the safety device, the fuselage has a drop bottom portion to inclose the weight and lower portion of the arm or lever 40, and may comprise a separate box or casing 53 secured to the bottom 1 and inclosing the lower portion of the gravity elements, especially so as to protect them when the aeroplane is on or near to the ground.

In practical use the aeroplane is steered to the right or to the left as is usual and may be guided upwardly or downwardly by means of the handle or lever arm 46 in the customary manner. When the handle or lever 46 is released the aeroplane may fly on a level course and if slightly tilted forwardly or sidewise will be automatically righted by the automatic controller which will remain plumb while the fuselage is tilted, resulting in the elevator flaps being swung upwardly in case the aeroplane starts on a nose dive, the flaps causing the forward end of the aeroplane to be directed upwardly; and in case the aeroplane is turned over sidewise from level position the automatic controller will cause the operation of the ailerons so that the same result will be obtained as when the controlling cables 30 and 32 are intelligently controlled through the means of the hand lever customarily provided for manual operation of the ailerons. The automatic controller operates sensitively so that when the aeroplane slightly turns sidewise the ailerons are swung so as to be affected by their contact with the atmospheric air in a manner to automatically right the aeroplane or prevent it from tilt-

ing sufficiently to cause a side plunge to earth.

Having thus described the invention, what is claimed as new is:—

1. In an automatic safety aeroplane controller, the combination with a rotatively-supported longitudinal rock-shaft, and a rotatively-supported transverse rock-shaft with upper and lower arms thereon and cables connected to the arms respectively, of a boss fixed on the uppermost portion of the transverse rock-shaft, a pendulum lever pivoted to the longitudinal rock-shaft with a hand-lever fixed on the pendulum lever, a weight element fixed on the pendulum lever, and a connecting rod pivotally connected with the pendulum lever between the longitudinal rock-shaft and the weight element and connected also to said boss.

2. In an automatic safety aeroplane controller, the combination with a rotatively-supported longitudinal rock-shaft with a pulley segment fixed thereon and cables connected to the segment to operate ailerons, and a rotatively-supported transverse rock-shaft with upper and lower arms thereon and cables connected to the arms respectively to operate elevator flaps, of an arm-boss fixed on the uppermost portion of said transverse rock-shaft, a universal coupling connected to said arm-boss, a connecting rod section connected to said coupling, a pendulum lever pivotally suspended on said longitudinal rock-shaft with a hand-lever fixed to the pendulum lever and extending upward, a weight element fixed on the end of said pendulum lever, a universal coupling connected to said pendulum lever between said longitudinal shaft and said weight element, a connecting rod section connected to said coupling last-mentioned, and a turnbuckle connected to said rod sections.

In testimony whereof we affix our signatures in presence of two witnesses.

WILLIAM OREN KEELING
HARVEY A. KEELING.

Witnesses:
E. T. SILVIUS,
F. M. ROEDER.