J. WETTERWALD.

AUTOMATIC SAFETY CONTROLLING DEVICE FOR AERIAL MACHINES, ESPECIALLY AEROPLANES.

APPLICATION FILED NOV. 23, 1910.

1,020,671.

Patented Mar. 19, 1912.

2 SHEETS—SHEET 1.

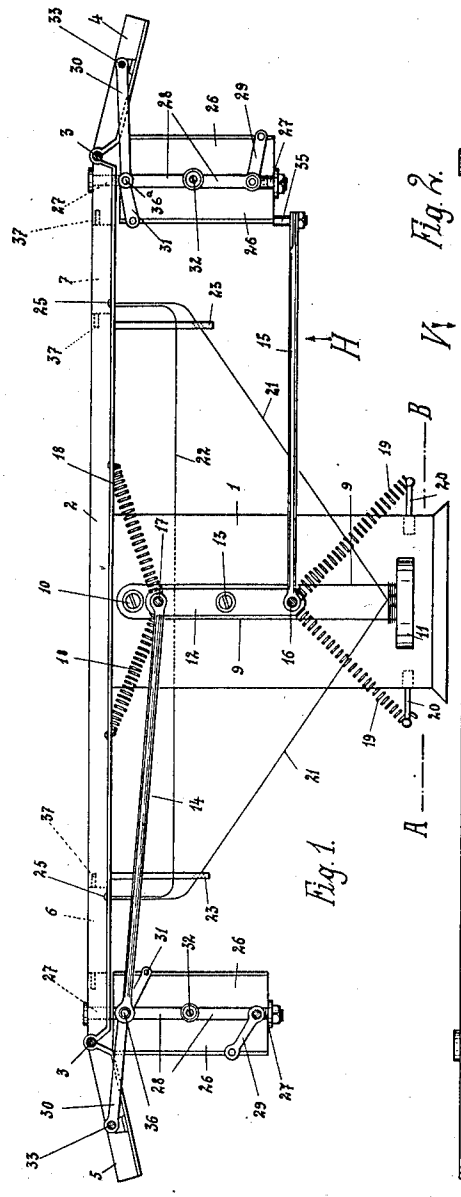

Fig. 1.

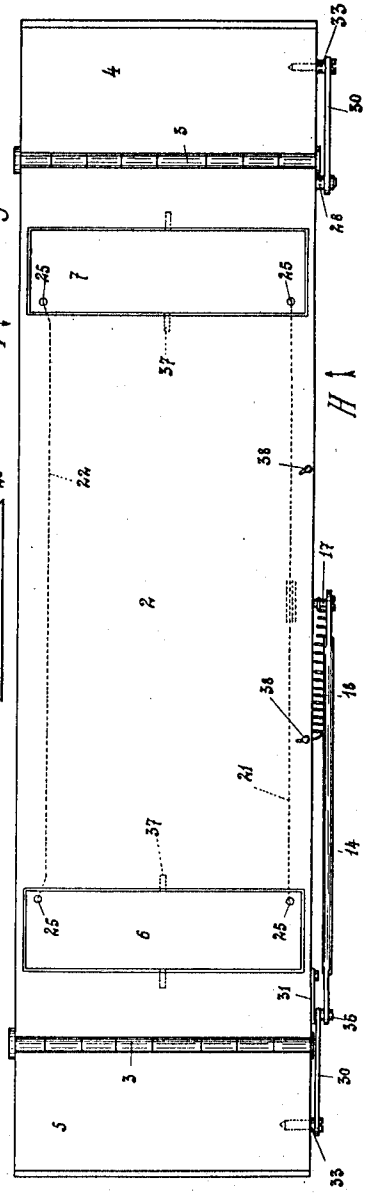

Fig. 2.

Witnesses:

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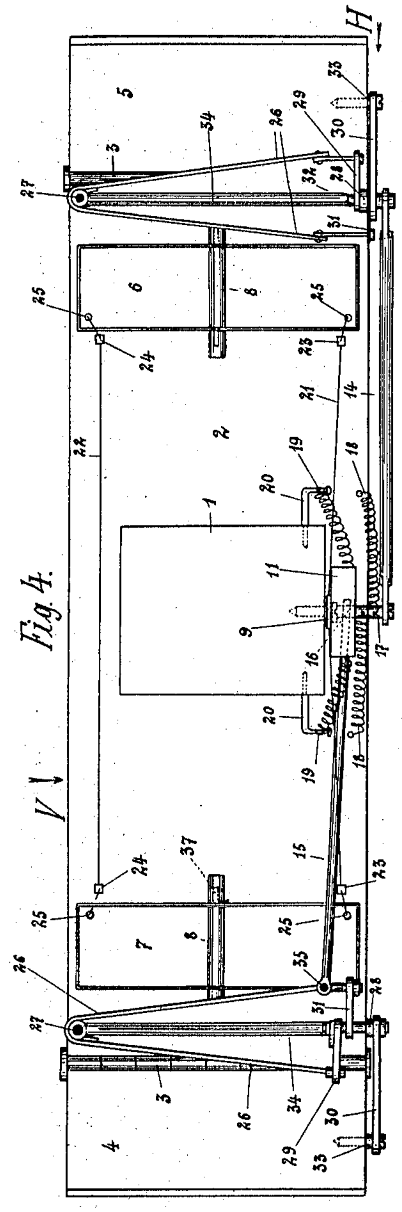

Fig. 4.

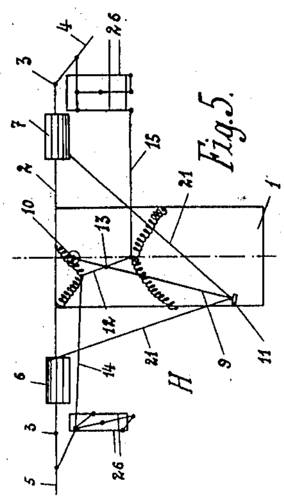

Fig. 5.

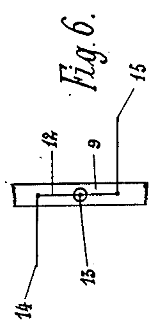

Fig. 6.

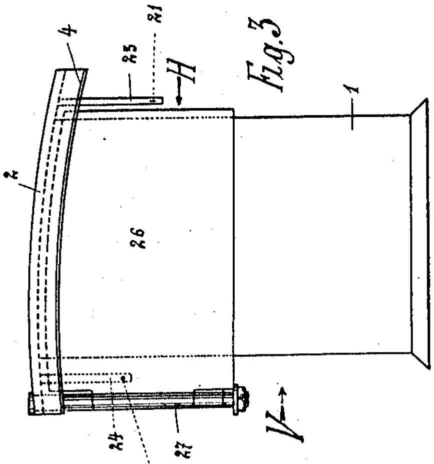

Fig. 3.

Witnesses:

Inventor:
Joseph Wetterwald
per
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UNITED STATES PATENT OFFICE.

JOSEPH WETTERWALD, OF LUCERNE, SWITZERLAND.

AUTOMATIC SAFETY CONTROLLING DEVICE FOR AERIAL MACHINES, ESPECIALLY AEROPLANES.

1,020,671. Specification of Letters Patent. **Patented Mar. 19, 1912.**

Application filed November 23, 1910. Serial No. 593,850.

To all whom it may concern:

Be it known that I, JOSEPH WETTERWALD, a citizen of Switzerland, and resident of Lucerne, Switzerland, have invented an Automatic Safety Controlling Device for Aerial Machines, Especially Aeroplanes, of which the following is a specification.

The present invention relates to an automatic safety controlling device for aerial craft and is intended especially for aeroplanes.

The accompanying drawing illustrates an example of the form the object of the invention may take when fitted to a monoplane. The front main supporting surface alone is shown with its lower construction, the tail is omitted entirely. The rear of the monoplane is marked H, the forward portion or direction is marked V.

Figure 1 is a rear view of the main supporting surface with the automatic controlling device, the latter being shown in its normal position. Fig. 2 is a plan of Fig. 1; Fig. 3 is a side view of Fig. 1; Fig. 4 is a view of Fig. 1 from below, the lower portion of the pedestal, along A—B being removed and the entire body turned through 180° so as to stand on its head. Fig. 5 is a diagrammatic view showing the automatic controlling gear moved out of the normal position. Fig. 6 is a view of a detail.

In the drawings little or no attention has been given to the known parts of an aeroplane and I have restricted the description to the characteristics of the invention. The pedestal 1 as shown does not correspond to current practice, it has merely been selected as best adapted to render the understanding of the invention easier. In practice this pedestal would be constructed as a frame having cross-stays and carrying the two front wheels. It will be understood that in practice the pivots, etc., would be otherwise constructed, the other parts would be made of wood frames covered with canvas and the like. In the drawing the entire apparatus looks rather clumsy, as if everything were made of metal, but it has been represented thus merely in order to facilitate understanding of the invention. These remarks are made in order to prevent misunderstandings as to the nature of the invention.

The front main supporting surface 2 rests on the pedestal 1. At the outer ends of the supporting surface 2 are fitted horizontal movable rudders 4 and 5. These rudders 4 and 5 which are curved to correspond to the shape of the surface 2, are connected to the latter by pivots 3. The rudders 4 and 5 are positively held in position by levers 30 pivoted to them by means of bolts 33. Below each end of the supporting surface 2 and toward the middle of the aeroplane are provided two vertical rudders 26 which meet in front and are pivoted together at this point by means of pivots 27. The rudders 26 diverge toward the rear and can move relative to each other. Farther toward the middle of the apparatus are provided transverse rudders 6 and 7 near the ends of the supporting surface 2, which (6 and 7) are pivoted on bolts 37 in bearings 8. It will be understood that the rest of the surface 2 should be greater and broader than the parts 4, 5, 6 and 7 but in this case they have been shown as being of the same width to save space. By means of suitable levers, rods, wires, springs, etc., the rudder-mechanisms are so connected to each other and to a pendulum 9 that when the wind acts on the apparatus, the rudders provided near one end of the supporting surfaces are positively moved. For instance, supposing the outer, almost horizontal rudder 5 moves upward, the vertical rudders 26 at this end move relatively to one another around pivot 27 and approach each other (see Fig. 5). If on the other hand this rudder moves downwardly, the rear ends of the vertical rudders 26 separate. The transverse rudders 6 and 7 are simultaneously actuated hereby. The following is a description of mechanism which may be used for the purpose: The pendulum 9 has a weight 11 and is pivoted on shaft 10 which is mounted on a cross-beam below the supporting surface in the center of the aeroplane. The pendulum can therefore swing to right and left of shaft 10. On a pivot 13 carried by the pendulum is mounted a vertical double armed lever or connecting link 12. The two arms of this lever are of equal length and are provided at their outer ends with pivots 16 and 17. A rod 15 is mounted on the lower pivot 16 and a rod 14 is mounted on the upper pivot 17, the other end of which is pivotally connected to the lever 30 by a bolt 36. Lever 30 acts to adjust the rudder 5. The other end of rod 15 is pivotally connected to a bolt 35 which is fastened to the right-hand

inner vertical rudder 26. On the bolt 36 (on the left in the drawing) is also mounted a vertical double lever 28, having equal arms and having a pin 32 as fixed pivot. This lever is pivotally connected at its lower end by means of a lever 29 with the left hand, outer vertical rudder 26. Finally bolt 36 also supports a lever 31 which is pivotally connected to the left hand inner vertical rudder 26. "Left" and "right" in this description refer only to Figs. 1, 2, 3, and 5 of the drawing. The fixed support for pivot 32 is provided by a bracket 34 which can be fixed to the top of the frame-work for the supporting surface 2. On the right is provided a similar bracket 34 carrying a pivot 32 on which a similar lever 28 can swing. This lever is also pivotally connected to the vertical rudder 26 by levers 29 and 31 as on the left hand side, while the lever 30 mounted on the bolt 36^a is positively connected to rudder element 4. The pendulum 9 is also connected at 25 to the two transverse rudders 6 and 7 by wires 21. These wires are however also connected together by a wire 22 which also is attached to them on each side at 25. Rods 23 and 24 act as guides for the wires.

In order to control the swinging of the pendulum as favorably as possible, and consequently the action of the rudder elements, springs 18 and 19 are fitted. Springs 18 are attached by one end to the frame of the supporting surface 2 at 38 and their other ends to the pin 27. The lower springs are connected by one end to the pedestal 1 by hooks 20 and their other ends to the bolt 16.

The rudder-elements described above can be actuated together as described but they can also be moved quite independently of each other. Their movements are communicated by the rods 14 and 15 (Fig. 6) to the lever 12 which is revoluble about pin 13 on the pendulum 9. For instance supposing the rudders 4 and 5 to be slightly inclined to the horizontal and to move downward to an equal extent, the rods 14 and 15 will move also to the same extent, the consequence of which is that the pin 13 of lever 12 remains in the same position. Lever 12 therefore rotates about pin 13. The pendulum 9 therefore remains stationary. If therefore the rudders on the left and right are moved equally, that is if the velocity of the apparatus is increased or diminished at will, which operation acts on the vertical rudders, the transverse rudders 6 and 7 will not be affected at all. But as soon as a gust of wind comes on one side, that is, when the two vertical rudders 26 on each side of the aeroplane separate or approach each other unequally, there is consequently a difference in the motion of the two rods 14 and 15, the result of which is that the pin 13 of lever 12 is moved laterally. The pendulum 9 is moved therewith and to the latter are attached the wires 21 which lead to the transverse rudders 6 and 7 (Fig. 5).

From the foregoing it will be evident that as soon as irregularities appear, that is when the apparatus is raised more on one side than the other, the controlling device comes into action automatically to correct this tendency and the transverse rudders 6 and 7 are actuated accordingly, that is, they are turned about pins 37 out of the path of the supporting surfaces 2. The transverse rudders 6 and 7 of course, in this case move in opposite directions (see Fig. 5). If therefore a sudden gust of wind tends to depress the apparatus on one side, the corresponding movable and almost horizontal rudder-member (4 or 5) gives way and the transverse rudders 6 or 7 so adjust themselves that on this particular side the apparatus is raised, and vice versa. The springs 18 and 19 also have the effect of keeping the whole mechanism in its normal central position. Since the gusts of wind may come from below or from above, it is necessary that the lateral movable rudders 4 or 5 must be capable of being actuated from above or below. They must therefore have a certain central position, which they occupy under normal conditions. The inner vertical rudder members only register the conditions of pressure under the supporting surface 2. The outer vertical rudder 26 acts in response to side winds while the horizontal rudder is influenced by upward and downward air currents. All possible kinds of gusts of wind are therefore taken into account. Supposing a lateral wind strikes the aeroplane from the right, the automatic control insures that the apparatus inclines a little toward that side, the consequence of which is that the aeroplane, even if it does not describe a curve against the wind, is nevertheless not driven out of its course by the wind. If it is desired to describe a curve, the apparatus will not sink, since when circling, a small air-pressure exists beneath the side nearest the center of the curve. The apparatus would therefore incline toward the opposite side. In order therefore that the aeroplane may not sink too much in the case of a side-wind, and shall incline toward the proper side when describing a curve, a small hand wheel, which cannot be locked, may be arranged near the pilot, by means of which the transverse rudders connected thereto may be adjusted in the required direction. This device is not shown since it does not form part of the invention. If the automatic control then acts to correct the conditions of the rudders during a straight flight, the hand-wheel turns also but idly. If it is desired to describe a curve the hand-wheel must be correspondingly rotated in

order to incline the aeroplane toward the desired side. The automatic safety-transverse control mechanism is of course only in action during flight, that is, as long as the transverse rudders have any influence, which of course is quite sufficient. An aeroplane must, as is well known, be built in such a manner that, under normal conditions it is level, that is, does not incline to either side. If this preliminary condition is fulfilled the herein described automatic control acts excellently since lateral inclination is merely due to gusts of wind. The number of accidents is therefore reduced to a minimum by the use of this apparatus. The elevating rudder of an aeroplane could be actuated in a similar manner. Two points at the front and rear should be chosen having similar conditions of wind, since the whole apparatus is only influenced by differences. It is true that it has not yet happened that an aeroplane has fallen owing to the front being raised or lowered too much. If however it is desired to have the elevating controlled automatically, this could also be done by means of a pendulum or if two points can be found, forward and aft where like conditions of wind exist, in the manner described. For instance, in the center under the supporting surface a pair of vertical rudders could be fitted approaching each other to a point, and also a pair of this kind could be arranged beneath the tail, these being then connected together as described for the transverse rudders in this case. In this way the elevating controlling gear would be similarly automatically actuated and the aeroplane would be perfect.

Having now fully described my said invention, what I claim and desire to secure by Letters Patent is:—

Automatic safety controlling mechanism for aerial craft comprising in combination, supporting surfaces, horizontal rudder members at their ends adapted to move according to the conditions of wind, said members being connected to similar vertical members arranged beneath the supporting surface, a pendulum connected to the frame, means for connecting said rudder-elements to said pendulum, a transverse rudder member connected to said pendulum, all said members adapted to act dependently of the wind conditions and automatically, substantially as described and shown and for the purpose specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOSEPH WETTERWALD.

Witnesses:
OTTO REUGGE,
FRANZ WIDMER.