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2,454,598

STABILIZING CONTROL MECHANISMS FOR MODEL AIRPLANES

Filed June 26, 1946

2 Sheets-Sheet 1

FIG. 1.

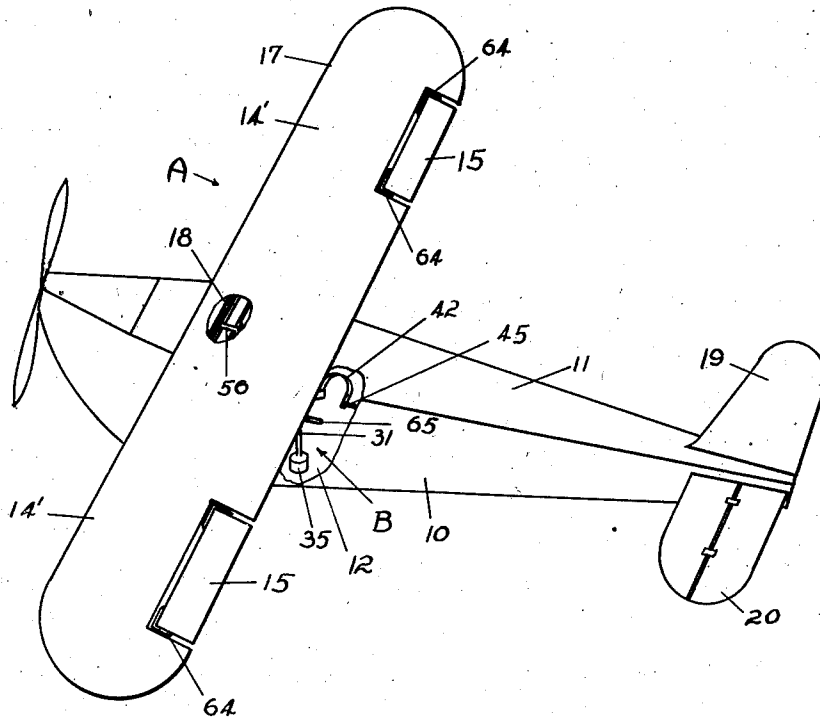
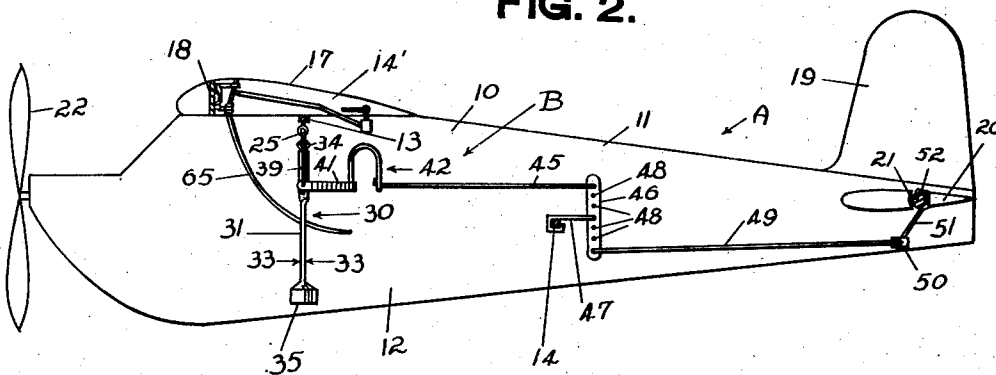


FIG. 2.



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2 Sheets-Sheet 2

FIG. 3.

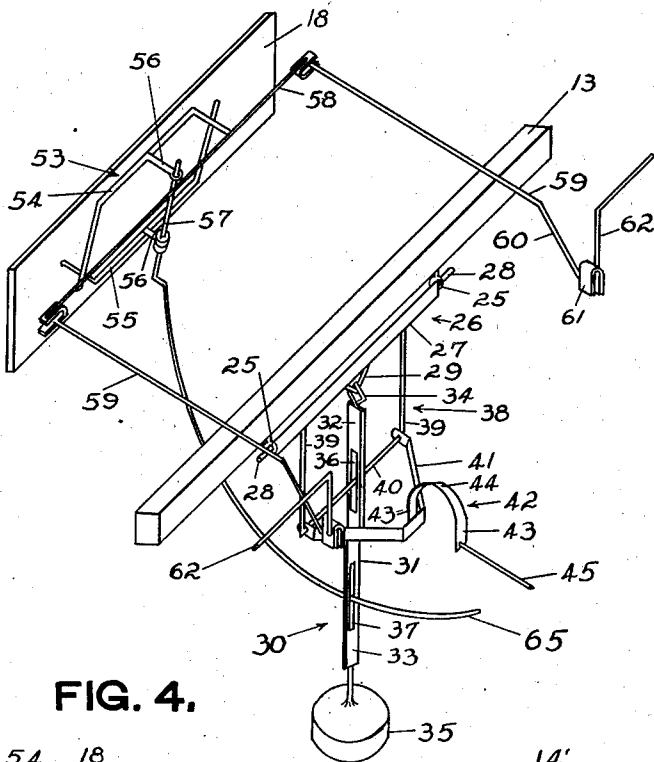
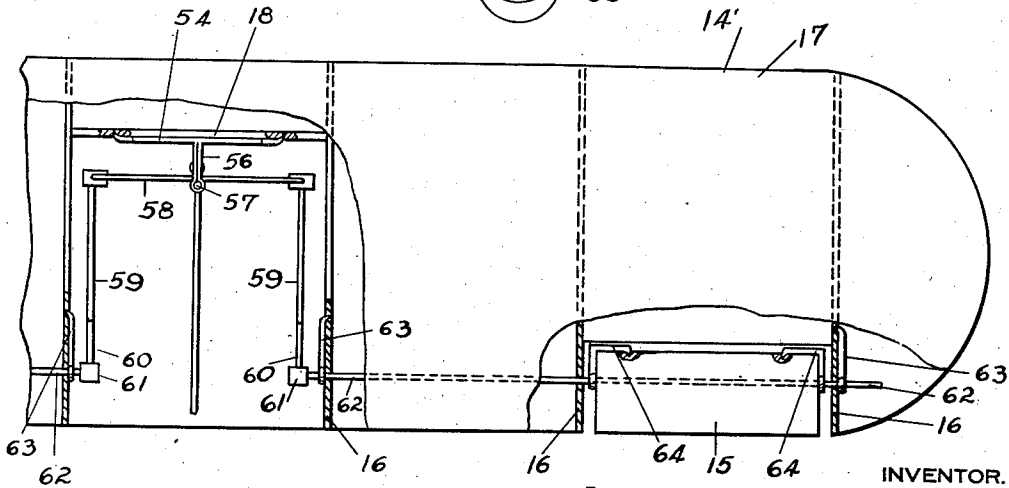


FIG. 4.



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STABILIZING CONTROL MECHANISM FOR
MODEL AIRPLANES

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10 Claims. (Cl. 46—76)

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This invention relates to automatic stabilizing control for vehicles such as toy and model aeroplanes.

An important object of the invention is to provide a dependable pendulum-type stabilizing control embodying, in one unit, both lateral and longitudinal control for small aeroplanes, such as flying-model aeroplanes, adapted for free flight.

Another important object is to provide a mechanism as described which mechanism is adjustable in order to meet varying conditions such as size of model, including length of fuselage from wings to elevators, wing spread and aileron length, as well as conditions where it is desirable or not desirable to include operation of the elevators of a model aeroplane.

Still another important object is to provide a novel stabilizing control for model aeroplanes which is light in weight, but sturdy, and entails no complicated manipulations for installing it in a model aeroplane.

Another important object is to provide a stabilizing control for model aeroplanes which is relatively compact, so that much of the mechanism is confined to a small space in the body of the aeroplane, with branches to and through the wings, for lateral control of the model, and through the bodies to the elevators, for longitudinal control thereof.

Other objects and advantages of the invention will be apparent during the following detailed description of the invention, taken in connection with the accompanying drawings, forming a part of this specification, and in which drawings:

Fig. 1 is a perspective view of a model aeroplane with the novel control installed therein, parts of the wings and fuselage being broken away to reveal portions of the control mechanism.

Fig. 2 is a view of a model aeroplane mostly in vertical outline but with several portions (struts and braces) in vertical section, and the novel control mechanism in side elevation, disposed therein so as to show the relative location of parts thereof.

Fig. 3 is a perspective view of the major portion of the novel control mechanism.

Fig. 4 is a top plan of one wing of a model aeroplane, with parts broken away to show portions of the stabilizing control mechanism.

In the drawings wherein for the purpose of illustration is shown a preferred embodiment of the invention and wherein similar reference characters designate corresponding parts throughout the several views, the letter A designates a vehicle in which is installed the novel control mechanism B.

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The vehicle A is shown, by way of example, as a model aeroplane, provided with a fuselage 10, having outer walls or covering 11 defining a compartment 12 across which extend, transversely and substantially horizontally, struts or braces 13 and 14. Suitably connected with and extending from each side of the fuselage 10 are wings 14' each having a control surface, represented by an aileron 15 and being provided with spaced-apart ribs 16, as for example, shown in Fig. 4, supporting the wing covering 17 and a short spar or brace 18, with its center on substantially the longitudinal medial line of the fuselage 10. At the rearward end of the fuselage 10 are a conventional rudder 19 and additional control surfaces represented by a pair of conventional elevators 20 connected together at their inner ends as by a substantially horizontally-disposed bridge 21 which may be a short rod suitably pivoted to the fuselage, so that the elevators may oscillate. Forwardly, is a conventional propeller 22. It should be noted that, differing from many model aeroplanes, the wings 14' are not disposed excessively high nor is there any appreciable dihedral. However, it is of course possible to employ the novel control mechanism B, next to be described, with a model aeroplane having wings disposed at various heights, and dihedral does not enter into the employment of the control mechanism B. The struts or braces 13 and 14 and spar or brace 18 provide supports for portions of the mechanism to be subsequently described.

As for the novel control mechanism B, the same includes a pair of spaced-apart bearings 25 (which may be conventional screw eyes) extending downwardly from the strut 13, rotatably carrying a pendulum and bracket support means 26, which means preferably comprises a rod or bar 27, having its ends 28 reduced in diameter forming shoulders, with these ends extending into the bearings 25 and the shoulders abutting the bearings, so that there is no appreciable longitudinal shifting of the bar 27. Extending downward from substantially the center of the bar 27 may be an eye 29, oscillatingly supporting a pendulum means 30.

The pendulum means 30 includes an arm 31, which may be a rigid strip of metal, twisted intermediate its ends so that there are two upper faces 32, with the vertical planes thereof forming substantially right angles with the vertical planes of two lower faces 33. This means 30 also includes an eyed portion 34 at the upper end of the arm 31 and a weight portion 35 at the lower end of the arm 31. As may be seen in Fig. 3,

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the axis of the eyed portion substantially parallels a horizontal line which may extend from one upper face 32 to the other upper face 32 of the arm 31 and this axis is substantially normal to a horizontal line extending from one lower face 33 to the other lower face 33. Extending from one face 32 to the other face 32 is a longitudinally-extending yoke-supporting extension slot 36 in the arm 31 and extending from one face 33 to the other face 33 is a longitudinally extending, lateral control lever-receiving slot 37.

Rigidly supported by the means 26 is a bracket 38, including a pair of downwardly-extending arms 39 carrying an elongated yoke-supporting extension or member 40, extending substantially normal thereto, with this extension substantially paralleling the rod 27 and extending through the slot 36. The bracket 38 may be of rigid wire.

A yoke 41 rigidly supported by the extension 40 of the bracket 38, extends forwardly therefrom and supports, in part, an elevator control-adjusting means 42 to be next described. The yoke 41 is preferably of strip metal, bent to shape.

The elevator control adjusting means 42 preferably comprises a strip of metal initially bent to form an inverted U, but the arms 43 and bight 44 of which may be manually adjusted or manipulated so that the free ends of the arms 43 extends nearer together or farther apart and will remain in such adjusted positions, until manually re-adjusted. One arm 43 is rigidly secured to the yoke 41, as in Fig. 3 and the other arm 43 is secured to one end of a substantially horizontally-extending rod 45 which extends toward the elevators 20, for adjustable connection with a normally vertically-disposed fraction bar 46 (shown in Fig. 2) pivotally supported intermediate its length by an extension 47 carried by the strut 14 as in Fig. 2. The fraction bar 46 may be provided with a row of perforations 48, with their axes extending transversely of the fuselage 10, through one of which perforations 48 extends the extension 47 and through any one of which extends the rear end of the rod 45, which end may be bent to form a right angle with the remainder of the rod 45.

Through another of the perforations 48 extends the forward end of a second rod 49 (with this end disposed as is the rear end of the rod 45). The rod 49 extends toward the elevators 20 and is provided at its rear end with a bearing 50 for the pivot of an upwardly-extending, short rod 51 provided with means 52 at its free end for rigid attachment to the central portion of the bridge 21 connecting the elevators 20. Such means may be provided by bending or otherwise forming the free end portion of the short rod 51 to extend about this central portion, and pointing the extremity of this portion to be embedded in the bridge, whereby movements of the short rod 51 will be imparted to the bridge 21 and, consequently, to the elevators 20.

Referring now to the means for operating the ailerons, in cooperation with the pendulum means 30, the same includes a bracket 53 which may be of bent wire, with sharpened ends, imbedded in the strut 18 so that the bracket faces rearwardly. This bracket 53 preferably includes two substantially horizontal, spaced apart portions 54 and 55 and from the central section of each extends a pivot-carrying arm 56 for a vertically-disposed pivot 57. Rigidly secured to the pivot 57, intermediate its ends, is an elongate horizontal rod 58, with half disposed to either side of this pivot and preferably at the ends of this rod 58 are

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bearings for pivotal connection thereto of a pair of connecting rods 59, which extend rearwardly of the fuselage and may be downturned, as at 59, at their rear end portions. The ends of these portions are provided with bearings 61 to pivotally support torque thrust rods 62.

Each of these torque thrust rods 62 is crank-shaped, with one end portion engaged by its bearing 61, the rod then extends upwardly and then, substantially paralleling the end portion mentioned, the rod 62 extends through the ribs 16 of one wing 14 and the aileron 15 associated therewith, as shown in Fig. 4, thus providing pivots for the ailerons as well as means, cooperating with the structure previously mentioned, for oscillating the ailerons.

In order to both steady the rods 62 and secure the ailerons 15 thereto, there are provided attaching means 63 and 64. The means 63 may be short rods each having one eyed end, embracing its rod 62 and a pointed and inturned opposite end for imbedding in the ribs 16, as shown in Fig. 4. The means 64 also may be short rods, each having one eyed end, embracing its rod 62 and, extending therefrom, a right-angled portion, terminating in an inturned point. This right angled portion extends about portions of the side and rear edges of the aileron 15, as in Fig. 4 with the inturned point imbedded in the aileron body, at its rear edge. Preferably the means 63 and 64 are slidable along the respective rods 62.

An important portion of the means for operating the ailerons is an elongated, lateral control lever or member 65 extending from the lower end of the vertically disposed pivot 57. In fact, the pivot 57 and lever 65 may be integral. This lever is, preferably, a suitable length of rod, bowed or arcuate, and extends through the lower slot 37 in the pendulum arm 31 being slidable longitudinally of the slot and also constructed and arranged to slide freely through the slot.

While the term "rod" has been employed herein, it should be pointed out that the same may be of various gauges of wire.

The construction of the control mechanism B is such that it may be readily adjusted, by bending the wire portions thereof, as required, by bending the metallic strip constituting the elevator control adjusting means 42, and by making adjustments by the well-known use of the fraction bar 46. The construction is such that it may be readily installed in a vehicle A such as a model aeroplane, employing conventional supporting means therein, as the struts 13 and 14, spar or brace 18 and ribs 16, or installing necessary supporting means.

The operation of the novel control mechanism B is as follows: Obviously, when flying on a level course the pendulum arm 31 will have its longitudinal axis normal to and substantially intersecting the longitudinal axis of the model aeroplane A and the elevators and ailerons will be in their normal positions. When the aeroplane becomes displaced and noses downwardly, the longitudinal axis of the pendulum arm 31 will still substantially intersect the longitudinal axis of the aeroplane but, this latter axis will be oblique to the longitudinal axis of the arm 31. The struts 13 and 14 will have moved from their former positions with respect to the pendulum means 30 and their changed positions as is now obvious, will cause the rod 45 to reciprocate forwardly, rocking the fraction bar 46, causing the rod 49 to reciprocate rearwardly and, through the connection 51,

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elevate the elevators 20 on their pivots, with the well-known result that the aeroplane will right. Nosing upwardly, the reverse movement of the parts mentioned will take place and again right the aeroplane.

Since there is the sliding connection of pendulum arm 31 with the lateral control lever 65, during nosing and righting, the lever 65 will not be affected but will simply move up or down the slot 37 and there will be, consequently, no operation of the ailerons 15. However, in the event the aeroplane becomes displaced with one wing too low, the longitudinal axis of the aeroplane and that of the pendulum arm 31 will no longer intersect and the longitudinal axis of the brace 18, which was horizontal, is now inclined therefrom, and has changed its position with respect to the pendulum weight 35 as has also the strut 13. As a result the lateral control lever 65 will bear against one or the other longitudinal walls of the slot 37 and be oscillated thereby, which will result in a pivotal movement of the pivot 57 and consequent obvious movements of the rods 58, 59 and 62 and of the ailerons 15. As may be seen, since the rod 58, in its movement, traces, in opposite directions, arcs of a circle, when one aileron 15 is tipped upwardly, the other aileron is tipped downwardly, resulting in the well-known effect of laterally righting the aeroplane. Restoration of the aeroplane to level flight will, of course, cause righting of the brace 18.

In the event it is desired to dispense with longitudinal control of the aeroplane, the rod 49 may be uncoupled from the fraction bar 46.

By manipulating the means 42 so that the strip is bent to draw the arms 43 closer together, the distance from the yoke 41 to the elevators 28 or to the fraction bar 46 may be shortened, for obvious reasons.

Various changes may be made to the form of the invention herein shown and described without departing from the spirit of the invention or scope of the claims.

What is claimed is:

1. In combination with a model aeroplane having a fuselage defining a compartment, wings, two normally horizontally-disposed, spaced-apart supports, one extending transversely across said compartment and the other carried by said wings, and ailerons for said wings; a stabilizing control mechanism for said aeroplane including a pendulum means having a weight-supporting arm provided with a longitudinally-extending slot, means suspending said arm from one of said supports for oscillation of the arm, an elongated control lever with one end portion thereof disposed within said slot, means supporting said lever at the other end portion thereof for swinging movement transversely of said compartment, while within said slot, including a substantially vertically-disposed pivot, operatively carried by the other of said supports, and means operatively connecting said pivot and ailerons, operatively connected with said lever and arm, for operation of said ailerons upon tilting of said supports out of their horizontal positions.

2. In combination with a model aeroplane having a fuselage defining a compartment, wings, two normally horizontally-disposed, spaced-apart supports, one extending transversely across said compartment and the other carried by said wings, and ailerons for said wings; a stabilizing control mechanism for said aeroplane including a pendulum means, having a weight-supporting arm provided with a longitudinally-extending slot, means

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suspending said arm from one of said supports for oscillation of the arm, an elongated control lever with one end portion thereof disposed within said slot and being constructed and arranged to slide longitudinally of and through said slot, means supporting said lever at the other end portion thereof for swinging movement transversely of said compartment, while within said slot, including a substantially vertically-disposed pivot, operatively carried by the other of said supports, and means operatively connecting said pivot and ailerons, operatively connected with said lever and arm, for operation of said ailerons upon tilting of said supports out of their horizontal positions.

3. In combination with a model aeroplane having a fuselage defining a compartment, wings, two normally horizontally-disposed, spaced-apart supports, one extending transversely across said compartment and the other carried by said wings, and ailerons for said wings; a stabilizing control mechanism for said aeroplane including a pendulum means, having a weight-supporting arm provided with a longitudinally-extending slot, means suspending said arm from one of said supports for oscillation of the arm, an elongated arcuate control lever with one end portion thereof disposed within said slot and being constructed and arranged to slide longitudinally of and through said slot, means supporting said lever at the other end portion thereof for swinging movement transversely of said compartment, while within said slot, including a substantially vertically-disposed pivot, operatively carried by the other of said supports, and means operatively connecting said pivot and ailerons, operatively connected with said lever and arm, for operation of said ailerons upon tilting of said supports out of their horizontal positions.

4. In combination with a model aeroplane having a fuselage defining a compartment, wings, two normally horizontally-disposed, spaced-apart supports, one extending transversely across said compartment, and another carried by said wings and ailerons for said wings; a stabilizing control mechanism for said aeroplane including a pendulum means, having a weight-supporting arm provided with a longitudinally-extending slot, means suspending said arm from one of said supports for oscillation of the arm, an elongated control lever with one end portion thereof disposed within said slot, means supporting said lever at the other end portion thereof for swinging movement transversely of said compartment, while within said slot, including a substantially vertically-disposed pivot, operatively carried by the other of said supports, and means operatively connecting said pivot and ailerons, operatively connected with said lever and arm, for operation of said ailerons upon tilting of said supports out of their horizontal positions; including a normally horizontally-disposed rod rigidly connected intermediate its ends to the intermediate portion of said lever and extending transversely of said aeroplane, a torque thrust rod operatively connected with each end of said horizontally-disposed rod, having pivotal portions extending through said wings and ailerons.

5. In combination with a model aeroplane having a fuselage defining a compartment, wings, two normally horizontally-disposed, spaced-apart supports, one extending transversely across said compartment and the other carried by said wings, and ailerons for said wings; a stabilizing control mechanism for said aeroplane including a

pendulum means, having a weight-supporting arm provided with a longitudinally-extending slot, means suspending said arm from one of said supports for oscillation of the arm, an elongated control lever with one end portion thereof disposed within said slot, means supporting said lever at the other end portion thereof for swinging movement transversely of said compartment, while within said slot, including a substantially vertically-disposed pivot, operatively carried by the other of said supports, and means operatively connecting said pivot and ailerons, connected with said lever and arm, for operation of said ailerons upon tilting of said supports out of their horizontal positions, including a normally horizontally-disposed rod rigidly connected intermediate its ends to the intermediate portion of said lever and extending transversely of said aeroplane, and a torque thrust rod operatively connected with each end of said horizontally-disposed rod, having pivotal portions extending through said wings and ailerons and being provided with arms, each having an eyed portion at one end disposed about said torque thrust rod, and a point at its other end, constructed and arranged for imbedding into said ailerons.

6. In combination with a model aeroplane having a fuselage defining a compartment, wings, two normally horizontally-disposed, spaced-apart supports, one extending transversely across said compartment and the other carried by said wings, and ailerons and spaced apart ribs for said wings; a stabilizing control mechanism for said aeroplane including a pendulum means, having a weight-supporting arm provided with a longitudinally-extending slot, means suspending said arm from one of said supports for oscillation of the arm, an elongated control lever with one end portion thereof disposed within said slot, means supporting said lever at the other end portion thereof for swinging movement transversely of said compartment, while within said slot, including a substantially vertically-disposed pivot, operatively carried by the other of said supports, and means operatively connecting said pivot and ailerons, connected with said lever and arm, for operation of said ailerons upon tilting of said supports out of their horizontal positions, including a normally horizontally-disposed rod rigidly connected intermediate its ends to the intermediate portion of said lever and extending transversely of said aeroplane, and a torque thrust rod operatively connected with each end of said horizontally-disposed rod, having pivotal portions extending through said wings and ailerons and being provided with arms each having an eyed portion at one end disposed about said torque thrust rod, and a point at its other end, constructed and arranged for selective imbedding into said ailerons and ribs.

7. In combination with a model aeroplane having a fuselage defining a compartment, wings, two normally horizontally-disposed spaced-apart supports extending transversely across said compartment, and elevators adjacent the rear end of said fuselage; a stabilizing control mechanism for said aeroplane including a pendulum means having a weight-supporting arm provided with a longitudinally-extending slot, means suspending said arm from one of said supports for oscillation of the arm, including a rotatable bar, a bracket rigidly secured to and depending from said bar, having a normally substantially horizontally-disposed extension, extending through said slot, a first rod, operatively connected with

said extension, at the front end of said first rod, a normally vertically-disposed fraction bar, with the other end of said first rod pivotally coupled thereto, a second rod operatively connected with said elevators at its rear end and pivotally connected with said fraction bar at its front end, and a pivot for said fraction bar, said pivot being carried by the other of said supports.

8. In combination with a model aeroplane having a fuselage defining a compartment, wings, two normally horizontally-disposed spaced-apart supports extending transversely across said compartment, and elevators adjacent the aft end of said fuselage; a stabilizing control mechanism for said aeroplane including a pendulum means having a weight-supporting arm provided with a longitudinally-extending slot, means suspending said arm from one of said supports for oscillation of the arm, including a rotatable bar, a bracket rigidly secured to and depending from said bar, having a normally substantially horizontally-disposed extension, extending through said slot, a normally substantially horizontally-disposed yoke carried by said extension and extending rearwardly about and spaced from said arm, a first rod carried by the rear end of said yoke at the front end of said first rod, a normally vertically-disposed fraction bar, with the other end of said first rod pivotally coupled thereto, a second rod operatively connected with said elevators at its rear end and pivotally connected with said fraction bar at its front end, and a pivot for said fraction bar, said pivot being carried by the other of said supports.

9. In combination with a model aeroplane having a fuselage defining a compartment, wings, normally horizontally-disposed spaced-apart supports extending transversely across said compartment, and elevators adjacent the rear end of said fuselage; a stabilizing control mechanism for said aeroplane including a pendulum means having a weight-supporting arm provided with a longitudinally-extending slot, means suspending said arm from one of said supports for oscillation of the arm, including a rotatable bar, a bracket rigidly secured to and depending from said bar, having a normally substantially horizontally-disposed extension, extending through said slot, an elongated, reciprocating rod, an operative connection between the forward end of said rod and said extension and an operative connection between the rear end of said elongated rod and said elevators.

10. In combination with a model aeroplane having a fuselage defining a compartment, wings, three normally horizontally-disposed supports, the first and third being within said compartment, extending transversely thereof and fixedly secured to the walls of said compartment, ailerons for said wings and elevators; a stabilizing control mechanism for said aeroplane including a pendulum means, having a depending, weight-supporting arm provided with a pair of spaced-apart, longitudinally-extending slots, the first slot opening forwardly and rearwardly of the aeroplane and the second slot opening in a direction normal to that of the first slot, means suspending said arm from one of said supports for oscillation of the arm including a rotatable bar and an eyed member depending from said bar with the upper end of the arm swingably supported thereby, an elongated control lever with one end portion thereof disposed within the first slot for movement through said first slot and longitudinally thereof, means supporting said lever at the other end portion thereof for swinging movement transversely of said compartment while within said slot,

including a substantially vertically-disposed pivot, operatively carried by the second of said supports and being disposed forwardly of said arm, means operatively connecting said pivot and ailerons, operatively connected with said lever and arm for operation of said ailerons upon lateral tilting of said compartment and tilting of said supports out of their horizontal positions, and means operatively connecting said arm and elevators for operation of said elevators upon longitudinal tipping of said compartment and tilting of said supports, including a bracket rigidly secured to and depending from said bar, having a normally substantially horizontally-disposed extension, extending through the second of said slots, a first rod, operatively connected with said extension at the front end of said first rod, a normally vertically-disposed fraction bar, with the other end

of said first rod pivotally coupled thereto, a second rod operatively connected with said elevators at its rear end and pivotally connected with said fraction bar at its front end, and a pivot for said fraction bar, said pivot being carried by the third of said supports.

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