J. T. HUGHES.

AEROPLANE CONTROL.

APPLICATION FILED JUNE 4, 1921.

1,415,176.

Patented May 9, 1922.

3 SHEETS—SHEET 1.

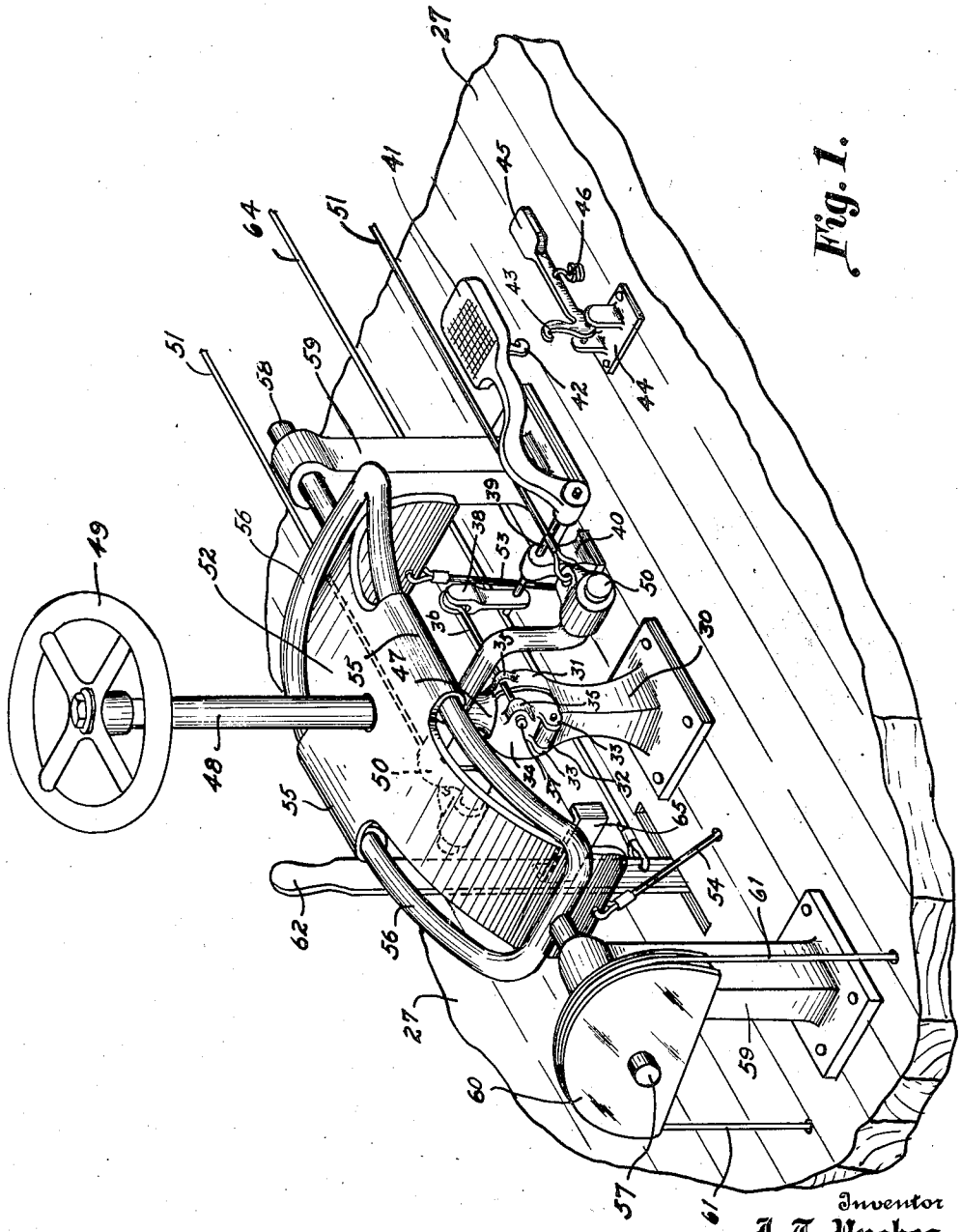


Fig. 1.

Witness

E. R. Morris

Inventor

J. T. Hughes.

By Arthur H. Sturges.

Attorney

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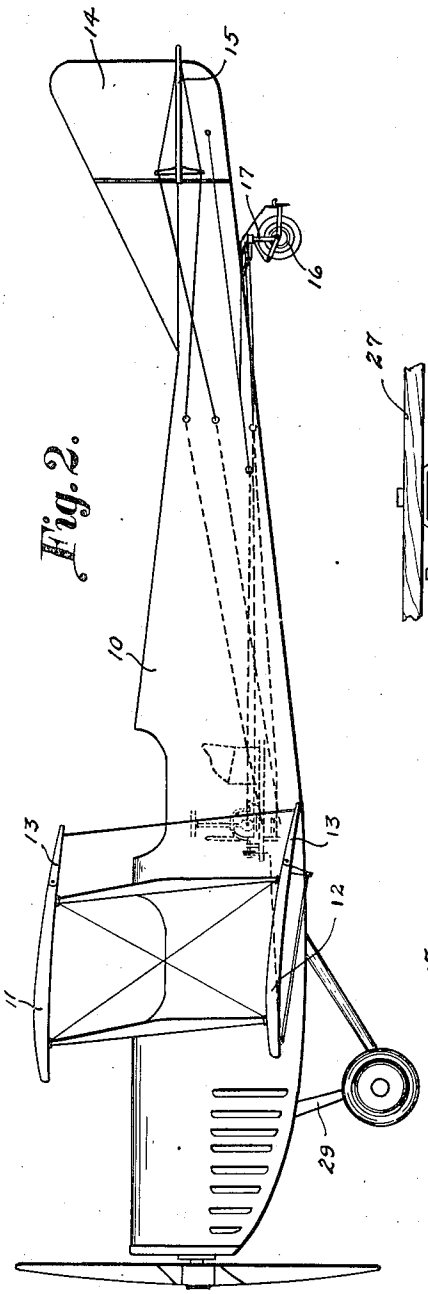


Fig. 2.

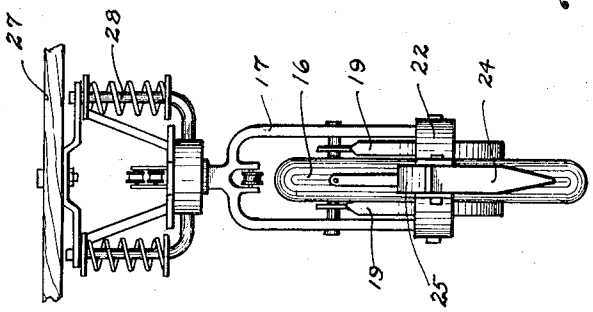


Fig. 4.

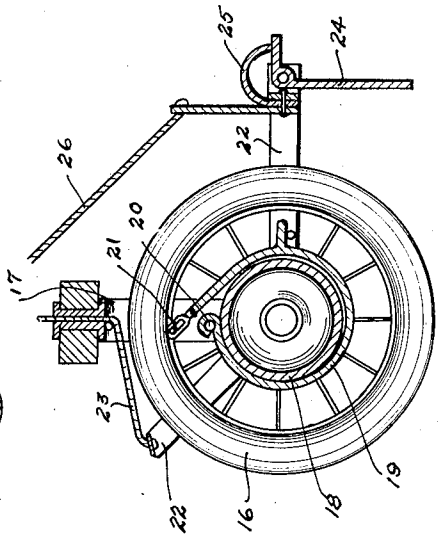


Fig. 3.

Inventor

J. T. Hughes.

Witness

E. R. Morris

By Arthur H. Sturges.

Attorney

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3 SHEETS—SHEET 3.

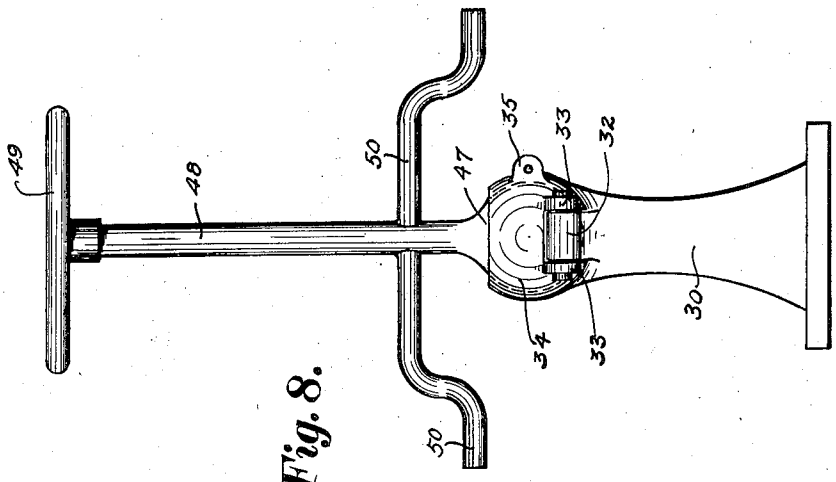


Fig. 8.

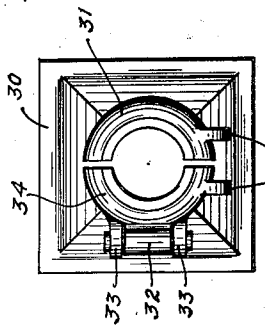


Fig. 7.

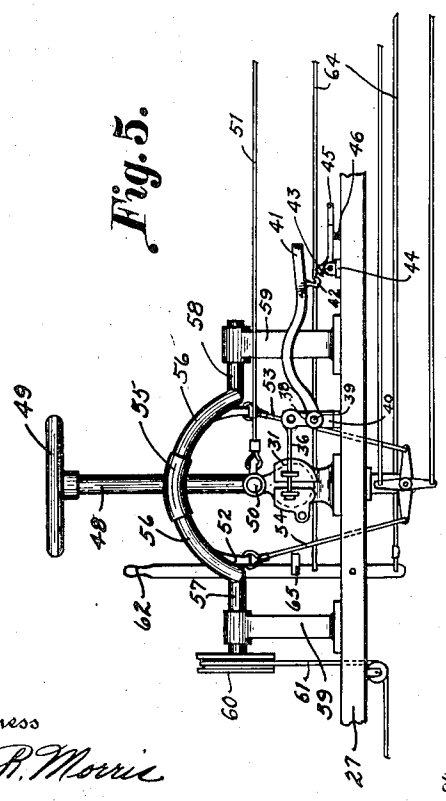


Fig. 5.

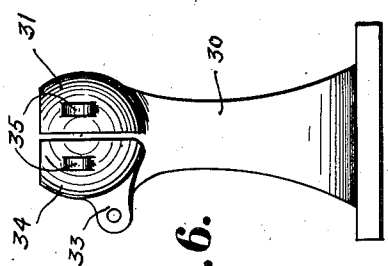


Fig. 6.

Witness

E. R. Morris

Inventor

J. T. Hughes.

By Arthur H. Sturges.

Attorney

UNITED STATES PATENT OFFICE.

JOHN T. HUGHES, OF CASPER, WYOMING.

AEROPLANE CONTROL.

1,415,176. Specification of Letters Patent. Patented May 9, 1922.

Application filed June 4, 1921. Serial No. 475,029.

To all whom it may concern:

Be it known that I, JOHN T. HUGHES, a citizen of the United States, residing at Casper, in the county of Natrona and State of Wyoming, have invented certain new and useful Improvements in Aeroplane Controls, of which the following is a specification.

The present invention relates to aeroplane controls and has particular reference to an improvement in that type of control wherein a single mast or steering column is employed for operating by various angular movements the several steering devices used in aeroplane construction.

An object of the present invention is to provide a steering mast of this type with an improved locking means adapted to secure the mast in any one of its several adjusted positions by pedal means and to provide releasing means for the lock which may also be operated by the foot.

Another object of the invention is to provide an improved mounting for the mast admitting of the universal movement of the mast and which locks or maintains the mast at its pivotal support against further movement when adjusted, the locking means embodying an integral part of the support and being common to all of the various adjustments of which the mast is capable.

Another object of the invention is to provide an improved type of mast and an improved group of connections between the mast and rudder, the elevator, and the ailerons which control the various movements and balancing of the aeroplane during flight and which adjustments are at times desired to be fixed as is well understood by those skilled in piloting air craft.

The above and various other objects and advantages of this invention will in part be understood from and in part be described in the following detailed description of the present preferred embodiment, the same being illustrated in the accompanying drawings, wherein:

Fig. 1 is a fragmentary perspective view of the interior of the fuselage of an aeroplane showing the improved mast and control connections mounted therein.

Fig. 2 is a side elevation of an aeroplane of the biplane type having the improvements of this invention installed therein.

Fig. 3 is a detail side elevation partly in section of the tail or guiding wheel employed.

Fig. 4 is a rear elevation of the same.

Fig. 5 is a side elevation of the steering-mast and its associated parts mounted on the floor or base board of the air craft.

Fig. 6 is a detail side elevation of the standard and socket for the steering mast.

Fig. 7 is a top plan view thereof and

Fig. 8 is a front elevation of the standard having the steering mast mounted therein.

Referring to the drawings 10 designates the body or fuselage of an aeroplane of the biplane type and having the superposed main planes 11 and 12 equipped with the usual ailerons 13 at the rear edges thereof. The body 10 is provided at its rear end with a vertical rudder 14 and horizontal elevators 15, and said rear end of the body is supported upon a trailer or guide wheel 16 mounted in a suitable bracket 17.

The wheel 16 may be provided with brake drums 18 about which are contractible brake bands 19 anchored upon hinge 20 at one end and pivoted at 21 at their other ends to a fork 22 pivoted upon the bracket 17 concentric with the wheel 16. The fork 22 is connected to one end of a cable 23 which is carried upwardly through the fork 17 and forwardly for operation of the brake when it is desired to check the rate of travel of the aeroplane when on land. The bracket or fork 22 extends rearwardly from the fork 17 and carries an anchor 24 yieldingly urged downwardly by spring 25 and adapted to be lifted by the cable 26 when the brake is released. The fork 17 is connected to the floor 27 of the aeroplane in any suitable manner as by the resilient mounting 28 of any desired construction.

The forward end of the body 10 is provided with the usual landing gear 29 of any approved construction.

In the fore part of the body 10 and adjacent to the seat for the pilot there is provided a standard 30 riveted or otherwise suitably secured to the floor 27 and having upon its upper end a spherical socket composed of an integral semi-spherical section 31 on the rear side of the standard and opening in a forward direction. The forward side of the standard is provided with an apertured lug 32 adapted to engage between a pair of ears 33 projecting from the lower end of a hinged

socket portion 34 and the latter is of semi-spherical configuration and complemental to the fixed socket section 31. Each of the socket sections 31 and 34 is provided with a laterally extending eye 35 and the eyes are adapted to align at one side of the standard for receiving a contracting rod 36 therethrough. The rod 36 is headed at 37 at its forward end for drawing the hinged socket section 34 toward the fixed socket section to contract the socket upon the rearward pull of the rod. The rod 36 is hinged in the upper end of an arm 38 which is mounted on a rock shaft 39 supported in a bearing bracket 40 rising from the floor 27 and which is adapted to be rocked by a pedal 41 extending rearwardly from the shaft 39. The pedal 41 is provided with a depending rearwardly facing hook 42 adapted to interlock with a locking dog 43 pivoted in a fork bracket 44 rising from the floor 27. The dog 43 has a rearwardly projecting pedal 45 normally urged into a raised position by spring 46 for interlocking the hook 42 with the dog 43 upon depression of the pedal 41.

Seated in the split or contractible socket of the standard 30 is a spherical head 47 formed upon the lower end of a mast or steering column 48, the latter having a steering wheel 49 upon its upper end by means of which the column may be turned axially or may be swung longitudinally and transversely of the air craft. The mast 48 is provided near its lower end with a pair of oppositely and laterally extending arms 50 upon the free ends of which are connected cables 51 which project rearwardly and are connected to the rudder 14 so that the latter may be turned in either direction by axial rotation of the steering mast.

Fitted about an intermediate portion of the steering mast is a guide plate 52. This guide plate is substantially cruciform in contour and is arcuated on its major axis on a radius whose center is substantially co-incident with the center of the ball and socket joint between the standard and the mast. The plate 52 is adapted to slide lengthwise of the mast but is adapted to be moved in the direction of its arc upon the longitudinal swinging of the mast for alternately drawing and slackening cables 53 and 54 attached to opposite forward and rear ends of the plate 52 and extending rearwardly to the elevators 15 whereby to raise and deflect the latter as is required in the vertical steering of the air craft.

The lateral extensions of the plate 52 are rolled over in a downward direction to form sleeves 55 arranged to slidably receive therein the opposite side portions of an arcuate guide yoke or frame 56 which is elongated and curved substantially concentric to and co-incident with the plate 52. This yoke or frame 56 has forward and rear axial trunnions 57 and 58 mounted to turn in the upper ends of standards 59 rising from the floor 27 and which are adapted to permit the transverse or lateral swinging of the mast 48. This yoke 56 is adapted to control the positions of the ailerons 13 and to this effect the forward trunnion 57 is provided with a grooved sector 60 over which is trained a cable 61, the ends of which are passed downwardly through the floor 27 and connected in the usual manner to the ailerons 13 for alternately depressing or warping same as is required in the lateral balancing of the plane.

For convenience of operation a brake lever 62 may be rotated at one side of the steering mechanism with its lower end projecting through the floor 27 and pivoted substantially in the plane, thereof, as at 63, and connected above and below such pivot point by means of cables 64 with the brake bands 19 of the guiding wheel 16. The brake lever 62 may be provided with a laterally and inwardly extending foot piece 65 by means of which the operator may readily operate the brake with his foot while manipulating the steering mechanism with his hands.

The laterally extending arms 50 of the steering mast have their outer ends offset downwardly to approach the horizontal plane of the ball and socket support so as to render substantially negligible the tension on the cables 51 during the various movements and adjustments of the steering mast.

From the above description it is believed that the operation will be readily understood for when it is desired to change the path of the aeroplane in a horizontal direction it is only necessary to turn the steering mast for swinging the arms 50 and operating the cables 51. When it is desired to direct the air craft upwardly or downwardly it is only necessary to swing the mast 48 either forwardly or rearwardly to slide the plate 52 on the yoke 56 and consequently change the positions of the cables 53 and 54. Such operation changes the positions of the elevators 15 with respect to the normal horizontal axis of the aeroplane.

For balancing the opposite ends of the main sustaining planes it is only necessary to swing the steering mast transversely in the desired direction when the yoke 56 is turned on its trunnions 57 and 58 and the sector 60 is caused to turn and change the relative positions of the cables 61 for alternately raising and lowering the ailerons 13.

It is of course understood that various changes and modifications may be made in the details of construction and design and in the size and proportion of the various parts of the above specifically described embodiment without departing from the spirit

thereof, such changes and modifications being restricted only by the scope of the following claims.

What is claimed is:

1. In an aeroplane, the combination with steering devices, a steering mast, a plate carried by the mast, a guiding frame slidably mounted on the plate, said plate, mast and frame being independently connected to said steering devices, and means for rotatably holding the frame for swinging in a transverse direction only and adapted to direct said plate and mast in their forward and rearward swinging movements.

2. In an aeroplane, the combination with steering devices, a universally mounted steering mast, a connection between the mast and one of the steering devices for actuating the latter upon the turning of the mast, a plate carried by the mast and connected to a second steering device for operating the latter upon the swinging of the mast in a predetermined direction, and a yoke pivotally mounted about the mast and slidably connected to the plate for supporting and guiding the same and adapted to be rocked upon the swinging of the mast in a direction substantially at right angles to said first swinging movements, said yoke having connection with a third steering device for operating the same when the yoke is swung by the mast.

3. In an aeroplane, a split spherical socket, a mast having a ball upon its lower end fitting in the socket whereby to support the socket for turning and universal movement, a steering device connected to the mast for operation upon the turning of the mast, a yoke surrounding the mast, means for pivotally supporting the forward and rear ends of the yoke to permit rocking of the same in a transverse direction, a plate slidable on the yoke and connected to the mast for swinging movement therewith, said yoke being adapted to guide the plate and mast when swung longitudinally and said plate being adapted to swing the yoke when the mast is swung transversely, and independent connections between the plate and the yoke for selectively operating independent steering devices in said connections.

4. In an aeroplane the combination of steering devices, a mast, independent connections between the mast and steering devices for selectively operating the latter when the mast is swung and turned, a split socket supporting the mast for universal movement, contracting means connected to the socket and including a foot pedal, and locking means for the contracting means adapted to automatically lock the latter when contracted for holding the mast in adjusted position, said locking means including a pedal adapted to be operated for releasing the contracting means.

5. In an aeroplane, the combination with steering devices, a steering mast connected to said devices for operating the same, a contractible socket supporting said steering mast for universal movement, a rock shaft, a contracting rod connected to the rock shaft and to said socket for contracting the latter, a pedal mounted on the rock shaft for operating the same and provided with a depending hook, a dog pivoted in line with the hook for interlocking engagement therewith when said pedal is depressed, and a second pedal connected to the dog for releasing the same from the hook whereby said socket may be released from the mast.

In testimony whereof, I have affixed my signature in presence of two witnesses.

JOHN T. HUGHES.

Witnesses:

LAMBERT J. KNIEST,

THOS. C. SPEERS.