B. J. PRESSEY.

AEROPLANE.

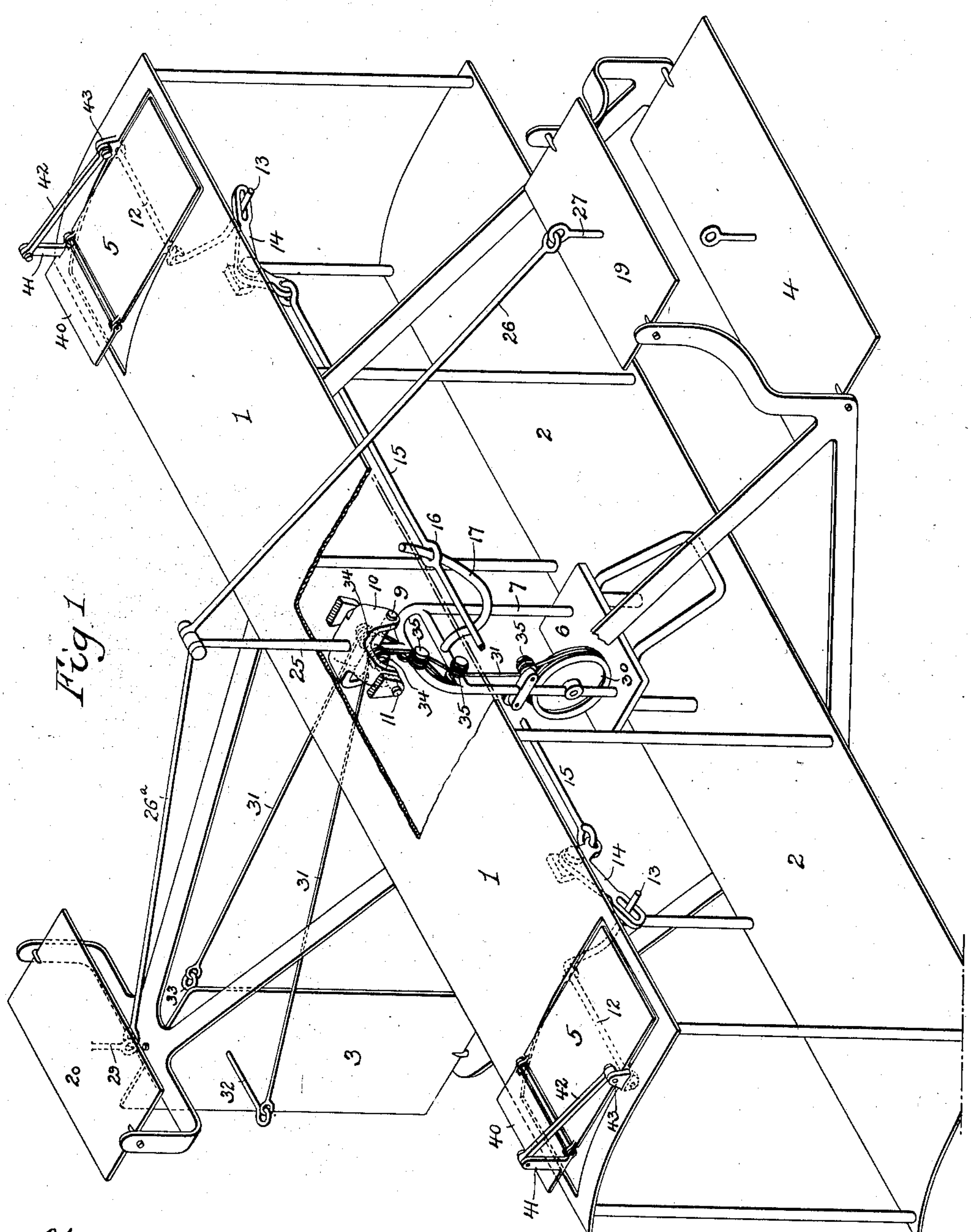
APPLICATION FILED OCT. 25, 1909.

1,038,435.

Patented Sept. 10, 1912.

5 SHEETS—SHEET 1.

Fig. 1



Witnesses
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Harry L. Smith

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5 SHEETS—SHEET 2.

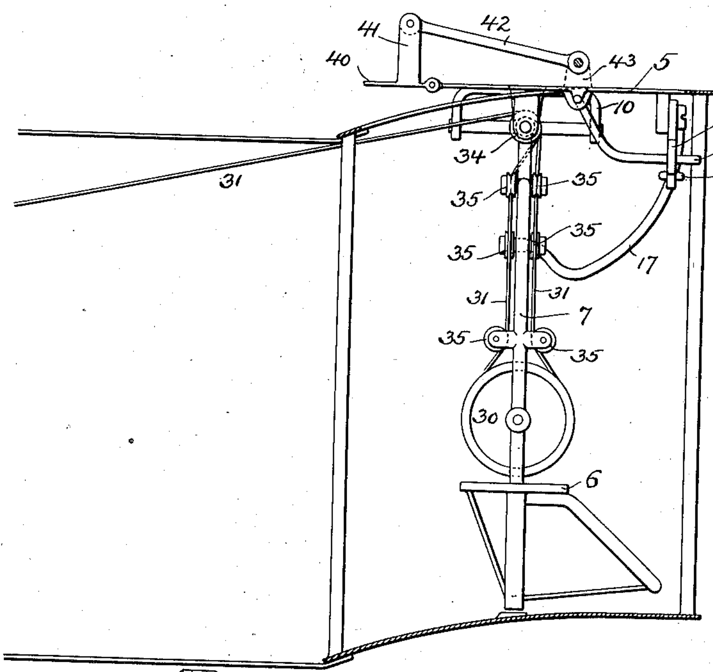

Fig. 2.

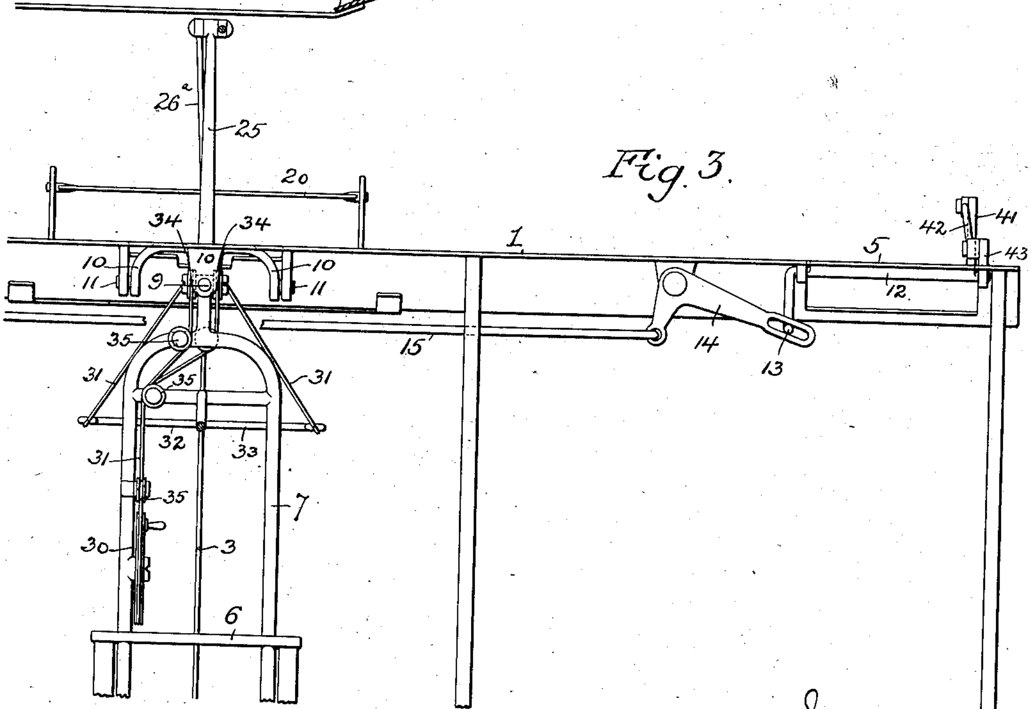

Fig. 3.

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5 SHEETS—SHEET 3.

Fig. 4.

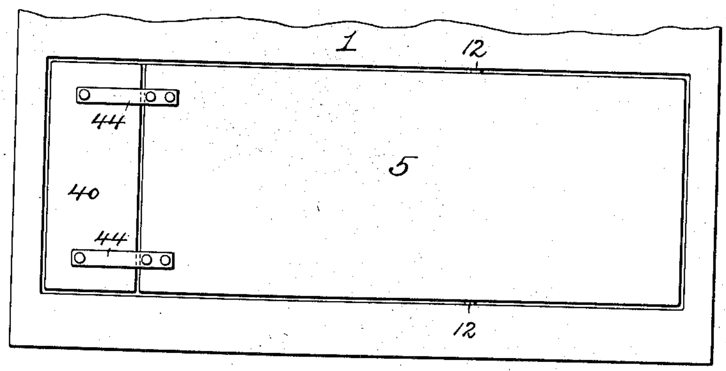


Fig. 5.

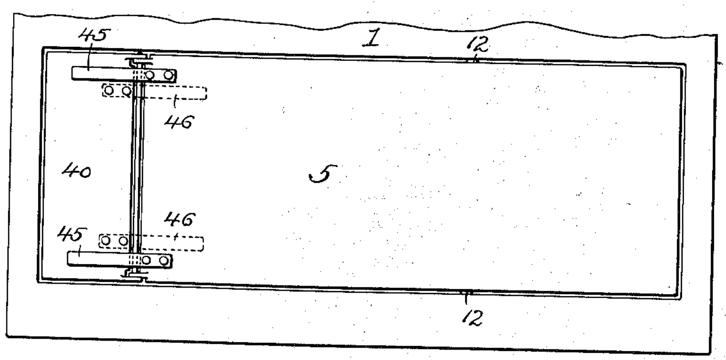


Fig. 7.

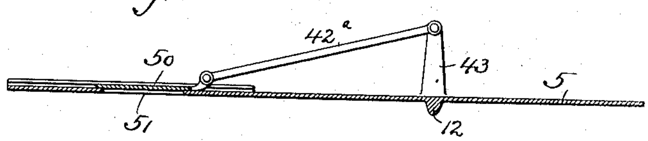


Fig. 9.

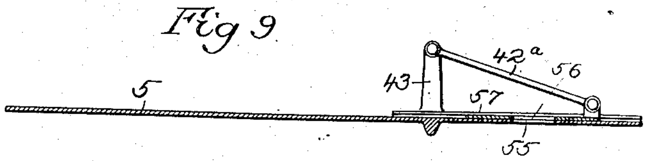
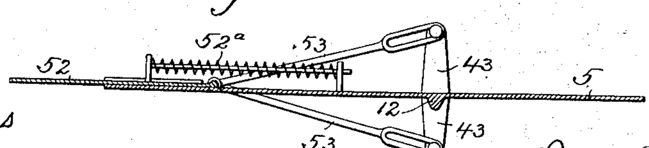


Fig. 8.



Witnesses

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5 SHEETS—SHEET 4.

Fig. 6

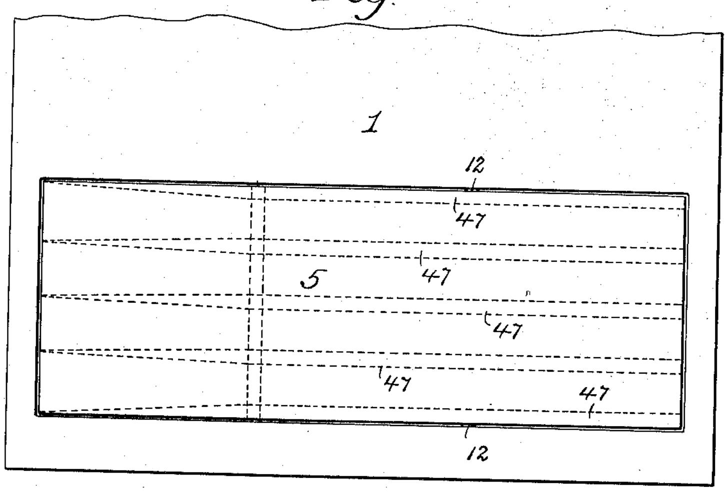
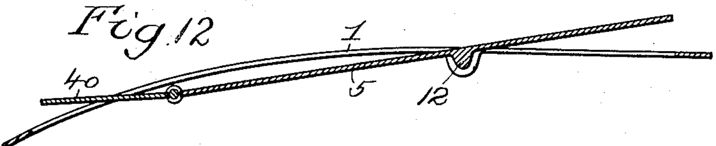


Fig. 12



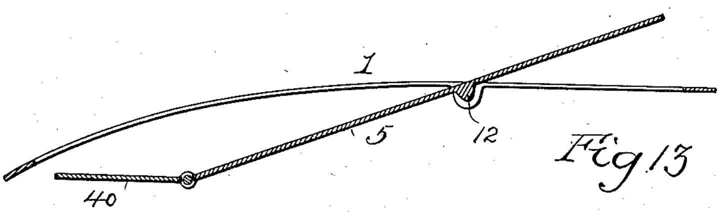


Fig. 13

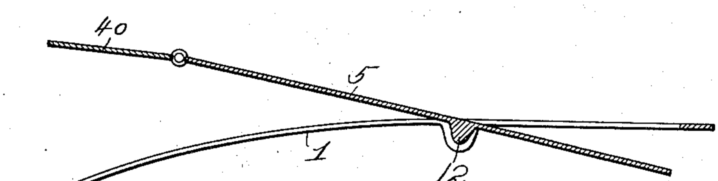


Fig. 14

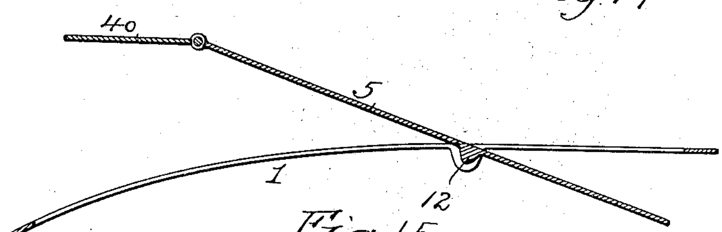


Fig. 15

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5 SHEETS—SHEET 5.

Fig. 10.

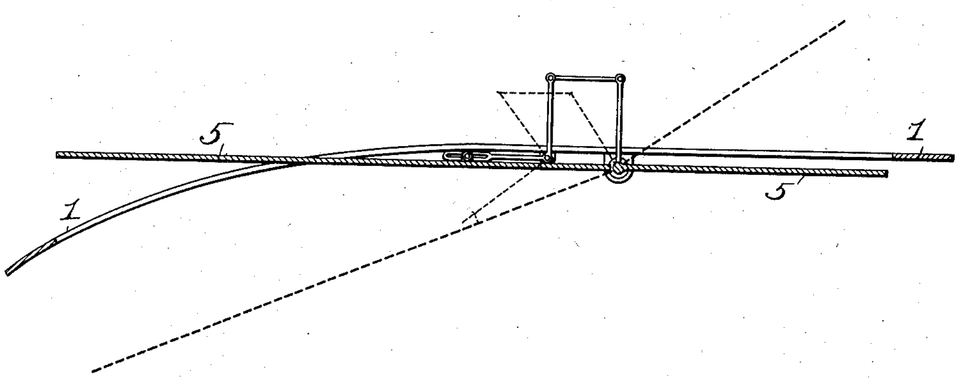
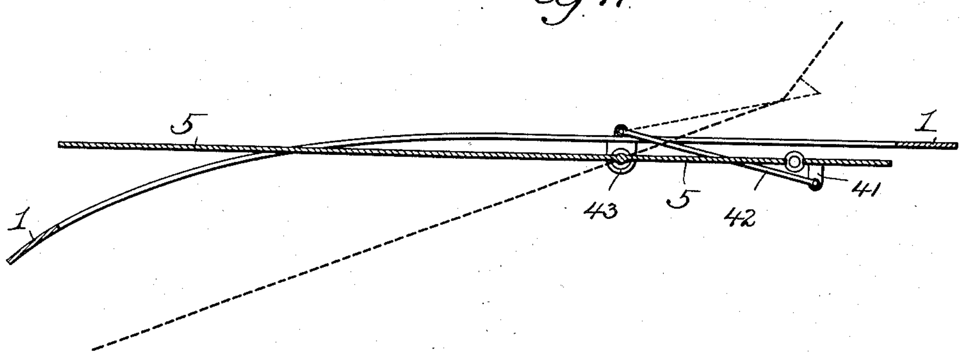


Fig. 11.



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UNITED STATES PATENT OFFICE.

BURT J. PRESSEY, OF NEWPORT NEWS, VIRGINIA.

AEROPLANE.

1,038,435. Specification of Letters Patent. Patented Sept. 10, 1912.

Application filed October 25, 1909. Serial No. 524,531.

To all whom it may concern:

Be it known that I, Burt J. Pressey, a citizen of the United States, residing in Newport News, Virginia, have invented certain Improvements in Aeroplanes, of which the following is a specification.

My invention consists of certain improvements in or additions to the aeroplane forming the subject of my previous applications for patent filed October 17, 1908, Serial No. 458,234, and November 19, 1908, Serial No. 463,460. One of the features of said prior aeroplanes was the control of the forward and aft steering planes or rudders by manually operated devices and one of the objects of my present invention is to so connect such manually operated devices with either or both of said steering planes or rudders that they may be carried by the aviator's seat, without, on the one hand, causing deflection of said steering plane or planes, when there is a change in the relation of the seat and main plane, and, on the other hand, the swinging of either of said steering planes by hand will not cause swinging movement of the aviator's seat.

A further object of my present invention is to maintain the center of air pressure at or near the axis of a transversely pivoted dip-correcting, dip-controlling or steering plane or rudder (hereinafter, for convenience, referred to as a "deflecting plane") thereby permitting the angular adjustment of said planes with the exercise of the minimum amount of power, and preventing the pressure of the air upon the planes from accidentally deflecting the same from the position to which they may have been adjusted.

These objects I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which my invention is illustrated in connection with an aeroplane of a character similar to that shown and described in my application Serial No. 463,460, before referred to, Figure 1 being a perspective view of the plane, with portions of the same broken away in order to illustrate other portions which would be normally hidden thereby; Fig. 2 a transverse section of part of the plane; Fig. 3 a front view of part of the same; Figs. 4, 5 and 6 plan views of different types of pivoted deflecting planes in accordance with my invention; Figs. 7, 8, 9, 10 and 11 sectional views of other types of pivoted deflecting planes also embodying the invention, and Figs. 12, 13, 14 and 15 sectional views of the type of plane illustrated in Fig. 1, but in different positions from that there represented.

As in my former applications I have, for the purpose of illustrating my invention, selected an aeroplane having upper and lower main planes 1 and 2, a manually-operated vertical steering plane 3 at the stern and a manually-operated horizontal deflecting plane 4 at the bow, but it should be understood that the main features of my invention are not limited to aeroplanes of this type but may be applied to aeroplanes generally, whether provided with a single main plane or with a plurality of such planes, and I will hereinafter, for convenience, refer to this element as a "main plane."

I have not considered it necessary to show the means for propelling the aeroplane as these form no part of my present invention, but the latter is intended for use in connection with that type of aeroplane in which the propelling mechanism is carried by the main plane.

The plane is provided with means for correcting lateral and longitudinal dip of the main plane when the latter is in flight. For the purpose of correcting lateral dip the upper plane 1 is provided near each end with a supplemental plane 5 of such surface area as experience may prove to be necessary. In connection with these planes 5 I employ a gravity-influenced aviator's seat 6, which is carried by a yoke 7 pivotally mounted in the fore and aft members of a cruciform frame 10, the side members of the latter having projecting studs 11 which are pivotally mounted in bearings depending from the main plane 1, thus providing a gimbal joint which permits free tipping movement of the main plane both in a lateral direction and in a fore and aft direction in respect to the aviator's seat, when not otherwise restrained, the seat having a normal tendency to hang vertically from its supports by reason of the effect of gravitation upon the weight represented by the seat and its occupant.

Lateral tipping of the main plane is caused to effect corrective movement of the supplemental planes 5 in the following manner. Each of said supplemental planes is carried by a transverse rock shaft 12 suitably pivoted in bearings depending from the main plane 1, and having at its inner end an arm 13 bent forwardly at its lower end and entering a slot in one arm of a bell crank lever 14, the latter being pivotally mounted upon a fore-and-aft pivot on the main plane 1, and the other arms of the port and starboard levers 14 being connected together by a rod 15 which has an eye 16 for the reception of a segmental rod 17 secured to and projecting forwardly from a cross bar on the seat-suspending yoke 7, the forward portion of this rod being bent on a curve which is concentric with the transverse axis of the frame 10, whereby fore and aft swing of the seat 6 will be freely permitted without any transverse movement of the rod 15.

Longitudinal dip of the main plane is corrected by fore and aft supplemental planes 19 and 20 suitably mounted in structures projecting from the main plane. Projecting upwardly from the frame 10 is an arm 25 connected by a rod or link 26 to an arm 27 projecting upwardly from the forward supplemental plane 19 and by another rod or link 26^a to an arm 29 projecting downwardly from the after supplemental plane 20.

The action of the swinging seat 6 in imparting movement to the port and starboard supplemental planes 5 and to the forward and aft supplemental planes 19 and 20 and the action of these planes in correcting lateral and longitudinal dip of the main plane during the flight of the latter is fully described in my former application Serial No. 463,460 and need not be here repeated.

The devices for manually operating the steering planes 3 and 4 or either of them are intended to be carried by the aviator's seat 6, and it is therefore necessary to so dispose the connections between the manually-operated device and each steering plane that change in the relations of the seat and the main plane will not cause deflection of said steering plane, and intentional deflection of the latter by the manually-operated devices will not exert any fore or aft pull upon the seat. For this reason I construct and dispose the manually-operated device and its connections in a peculiar manner, and in Figs. 1, 2 and 3, I have illustrated the same in connection with the vertical rear steering plane 3, a duplicate of the devices being employed in connection with the forward horizontal steering plane, if desired. The manually-operated device on the aviator's seat consists of a wheel or disk 30 which is rotatably mounted upon a stud or short shaft on the seat-carrying yoke 7, and has a grooved periphery for the reception of a belt 31, one run of this belt being connected to a laterally projecting arm 32 on the starboard side of the steering plane 3 and the other run of the belt being connected to a correspondingly projecting arm 33 on the port side of said steering plane. In the case of the forward steering plane 4 the disk would be mounted on the other leg of the yoke 7, and the belt connections would lead to upwardly and downwardly projecting arms on said plane 4. Each run of the belt extends from its respective arm on the steering plane to a sheave 34, the axes of these sheaves being concentric with the transverse pivotal axis 11 of the swinging frame 10, and said sheaves being disposed as closely as possible to the longitudinal axis 9 of said frame, whereby change of relative position of the aviator's seat and main plane, in either direction, will not cause slackening or tightening of either run of the belt 31, and consequently will not deflect the steering plane in either direction. On the other hand, rotation of the wheel or disk 30, so as to cause pull upon either run of the belt, attended by corresponding slackening of the other run of the same will have no tendency to cause fore or aft swing of the seat 6. From the sheaves 34 the runs of the belt 31 pass around suitably disposed idler sheaves 35 respectively to the front and rear of the wheel or disk 30.

If a deflecting plane has a transverse pivotal axis (either horizontal or vertical) midway between its fore and aft edges, the adjustment of said deflecting plane to different angles of incidence to the air flowing past it causes a shifting of the center of pressure in respect to said transverse pivotal axis. Theoretically, a deflecting plane thus pivoted should maintain the center of pressure at or about the pivotal axis in view of the fact that the same area of surface is presented on each side of such pivotal axis, but it has been found in practice that the current of air flowing across the face of the plane has the effect of reducing the effective pressure upon the rear portion of the plane. This difficulty can be overcome, in some measure, by disposing the transverse pivotal axis of the plane closer to the forward than to the rear edge of the plane, but this is not sufficient to correct the difficulty since the center of pressure shifts in accordance with the angle of incidence of the plane, moving gradually rearward as the angle of incidence increases. In order to overcome this objection and maintain the center of pressure constantly at or about the transverse pivotal axis of the plane, I provide for varying the relative effect of the air upon the fore and aft members of the plane (that is to say, the portions respectively forward and aft of the transverse pivotal axis) in accordance with the angle of incidence to which the plane is adjusted. One method of accomplishing this result is that illustrated in Figs. 1, 2 and 3, in connection with the lateral dip-correcting planes 5, and consists in providing the rear member of each of said planes with a transversely pivoted tail 40, having a projecting arm 41, which is connected by a rod or link 42 to a fixed point, preferably in line with the transverse pivotal axis of the plane, such fixed point being, in the case of the plane shown in Fig. 1, provided by means of an upstanding lug 43 on the top of the upper main plane 1. When the plane 5 occupies its normal or horizontal position the tail 40 is in line therewith, but as said plane is tilted so as to either raise or lower its forward edge and thus cause it to assume an angle of incidence to the air flowing past it, the tail 40 will be tilted so that its angle of incidence decreases in proportion to the increase of the angle of incidence of the plane itself, as will be understood on reference to Figs. 12, 13, 14 and 15, Figs. 12 and 13 illustrating the effect upon the tail when the forward edge of the plane is raised, and Figs. 14 and 15 illustrating the effect when the forward edge of the plane is depressed. In consequence of this construction, any tendency of the change in the angle of incidence of the plane to cause its rear member to become the dominating one, because of a shifting of the center of pressure to the rear of the pivotal axis of the plane, is corrected by a lessening of the angle of incidence of a portion of said rear member of the plane.

Instead of providing for the positive movement of the tail 40 in the manner described a similar result may be attained by rendering said tail portion of the plane more susceptible to deflection than the remaining portion, as for instance, by connecting it to the rear member of the plane by means of flexible strips 44 which are sufficiently rigid to maintain the tail normally in line with the body of the plane when said tail is not subjected to pressure but permit it to yield and gradually change its angle in respect to the body of the plane in accordance with the degree of pressure exerted upon it. The position of a pivoted tail 40 may be likewise influenced by means of springs, one instance of such construction being shown in Fig. 5, in which springs 45, secured to the rear member of the plane and bearing upon the top of the tail, are used in conjunction with other springs 46 secured to the tail and bearing upon the under side of the rear member of the plane, the tail in this case being hung to the rear member of the plane by a transverse pivot rod, as shown in Fig. 1. It is not necessary, moreover, that the tail should be separated from the plane, for instance, in Fig. 6 I have illustrated a deflecting plane which owes its longitudinal rigidity to longitudinal stiffening bars 47 combined therewith, or secured thereto, these stiffening bars being reduced in size or otherwise weakened toward the tail portion of the plane in order to render this tail portion more flexible than the remaining portion.

The entire rear member of the plane may, if desired, be so constructed that as the plane changes its angle of incidence, there will be a change in the angular relation of the rear member of the plane in respect to the forward member. Such change may be controlled by springs in the manner just described or by positive means such as are employed in connection with the swinging tail of the plane shown in Fig. 1. In Fig. 10, I have illustrated a plane of this character, the forward member of the plane being rigidly connected to the transverse pivot rod 12, and the rear member of the plane being pivotally mounted thereon.

Instead of changing the angle of part or all of one member of the plane in respect to the other, I may effect decrease in the effective area of either member of the plane by uncovering an opening in said member, as for instance, by the employment of a sliding plate 50 which, when the deflecting plane is in its normal or horizontal position closes the opening 51, as shown in Fig. 7, but, as the deflecting plane assumes an angle of incidence in either direction in respect to the air flowing past the plane, gradually uncovers said opening and thereby reduces the effective area of the rear member of the plane to the extent of the uncovered area of said opening, such uncovered area increasing as the angle of incidence of the plane increases. This sliding movement of the plate 50 may be effected by connecting the same by means of a rod or link 42^a to a fixed projecting stud 43, as shown in Fig. 7. I may also effect the desired result by a sliding tail, such for instance, as that represented at 52 in Fig. 8, this tail being normally projected by a spring 52^a or equivalent device, and being connected by slotted links 53 to upper and lower fixed studs 43, the upper stud and link acting to cause retraction of the tail when the forward edge of the deflecting plane is raised and the lower stud and link acting to cause retraction of the tail when the forward edge of the deflecting plane is depressed, the tail being fully projected when the plane occupies its normal or horizontal position and being gradually retracted as the plane increases its angle of incidence in either direction. I may also, instead of decreasing the effective area of the rear member of the deflecting plane, attain the desired result by providing the forward member of said plane with a swinging or sliding member, so as to vary its effective area in accordance with the change in the angle of incidence of the plane, thus, as shown in Fig. 9, the forward member of the plane has therein an opening 55, which, when the plane is in its horizontal or normal position, registers with an opening 56 in a sliding plate 57, the latter having operating devices similar to those employed in connection with the plate 50 in Fig. 7, whereby it is operated to cause gradual closing of the opening 55 as the angle of incidence of the plane in either direction increases, or a sliding end plate similar to the end plate 52 in Fig. 8, can be used in connection with the forward member of the plane if desired, this end plate being projected as the plane increases its angle of incidence and retracted as such angle decreases.

The forward member of the plane may be pivotally mounted in whole or in part or may have a flexible tip, and the forward member thus constructed may be used either in combination with a rear member having like capabilities, or with a rigid rear member, a plane of the latter construction being shown in Fig. 11.

My invention may be used in connection with a centrally pivoted deflecting plane, although I prefer in all cases to dispose the transverse pivotal axis of the plane closer to the forward than to the rear edge of the same.

I am aware that it has been proposed to effect differential deflection of the fore and aft members of a transversely pivoted plane by flexing the rear member to a greater extent than the forward member, but this is essentially different from my invention, its purpose being to effect shifting of the center of pressure more and more toward the rear, as the plane is flexed, whereas the purpose of my invention is to lessen the influence of the rear member of the plane as the angle of incidence increases, and thus maintain the center of pressure, as nearly as may be, coincident with the transverse pivotal axis of the deflecting plane.

I claim:

1. The combination of an aeroplane having dip-controlling means and a universally-swinging aviator's seat for operating the same, a steering plane, manually-operated devices swinging with the seat and controlling the position of said plane, and connecting devices having guides which are substantially coincident with the fore and aft and transverse axes of the swinging seat.

2. An aeroplane having a transversely pivoted deflecting plane composed of parts adjustable in respect to one another, whereby it is possible to vary the relative effect of the air upon the members of said plane as its angle of incidence varies and thereby maintain the center of pressure in proximity to the transverse axis of the plane.

3. An aeroplane having a transversely pivoted deflecting plane, composed of parts adjustable in respect to one another and means whereby one portion of the same is caused to change its angle in respect to another portion, in such manner as to maintain the center of pressure in proximity to the transverse axis of the plane in the different angles of incidence assumed by said plane.

4. An aeroplane having a transversely pivoted deflecting plane composed of parts adjustable in respect to one another and means whereby, as the angle of incidence of the plane changes, the effective area of one member of the plane in respect to the other, changes in such manner as to maintain the center of pressure in proximity to the transverse axis of the plane.

5. An aeroplane having a transversely pivoted deflecting plane composed of parts adjustable in respect to one another, and means whereby a terminal portion of a member of said deflecting plane is permitted to change its angle in respect to said member in such manner as to maintain the center of pressure in proximity to the transverse axis as the angle of incidence of the plane varies.

6. An aeroplane having a transversely pivoted deflecting plane composed of parts adjustable in respect to one another and means whereby a terminal portion of said plane is normally maintained in line with the plane, but is permitted to assume an angular relation thereto in such manner as to maintain the center of pressure in proximity to the transverse axis as the angle of incidence of the plane varies.

7. An aeroplane having a transversely pivoted deflecting plane, with a transversely pivoted terminal on a member of said plane, and means whereby said terminal is normally maintained in line with said member but is permitted to assume an angular relation thereto in such manner as to maintain the center of pressure in proximity to the transverse axis as the angle of incidence of the plane varies.

8. An aeroplane having a transversely pivoted deflecting plane, a swinging terminal on a member of said deflecting plane, and means whereby said terminal is positively deflected in respect to the plane in such manner as to maintain the center of pressure in proximity to the transverse axis as the angle of incidence of the plane varies.

9. An aeroplane having a transversely pivoted deflecting plane, a transversely pivoted terminal on a member of said plane, and means for effecting a positive swing of said terminal in respect to the plane in such manner as to maintain the center of pressure in proximity to the transverse axis as the angle of incidence of the plane varies.

10. An aeroplane having a deflecting plane with transverse pivotal axis closer to

the forward than to the rear edge of the plane, and means for varying the relative effect of the air upon the members of said plane, as its angle of incidence varies, whereby the effective center of pressure is maintained in proximity to the transverse axis of the plane.

11. An aeroplane having a deflecting plane with transverse pivotal axis closer to the forward than to the rear edge of the plane, said deflecting plane being provided with means whereby one portion of the same is caused to change its angle in respect to another portion in such manner as to maintain the center of pressure in proximity to the transverse axis of the plane in the different angles of incidence assumed by said plane.

12. An aeroplane having a deflecting plane with transverse pivotal axis closer to the forward than to the rear edge of the plane, said deflecting plane being provided with means whereby, as the angle of incidence of the plane changes, the effective area of one member of the plane in respect to the other changes in such manner as to maintain the center of pressure in proximity to the transverse axis of the plane.

13. An aeroplane having a deflecting plane with transverse pivotal axis closer to the forward than to the rear edge of the plane, and means whereby a terminal portion of a member of said deflecting plane is permitted to change its angle in respect to said member in such manner as to maintain the center of pressure in proximity to the transverse axis as the angle of incidence of the plane varies.

14. An aeroplane having a deflecting plane with transverse pivotal axis closer to the forward than to the rear edge of the plane, and a transversely swinging terminal on a member of said plane, with means whereby said terminal is normally maintained in line with said member but is permitted to assume an angular relation thereto in such manner as to maintain the center of pressure in proximity to the transverse axis as the angle of incidence of the plane varies.

15. An aeroplane having a deflecting plane with transverse pivotal axis closer to the forward than to the rear edge of the plane, a swinging terminal on a member of said deflecting plane, and means whereby said terminal is positively deflected in respect to the plane in such manner as to maintain the center of pressure in proximity to the transverse axis as the angle of incidence of the plane varies.

16. An aeroplane having a deflecting plane with transverse pivotal axis closer to the forward than to the rear edge of the plane, a transversely pivoted terminal on a member of said plane, and means for effecting a positive swing of said terminal in respect to the plane in such manner as to maintain the center of pressure in proximity to the transverse axis as the angle of incidence of the plane varies.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

BURT J. PRESSEY.

Witnesses:

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KATE A. BEADLE.