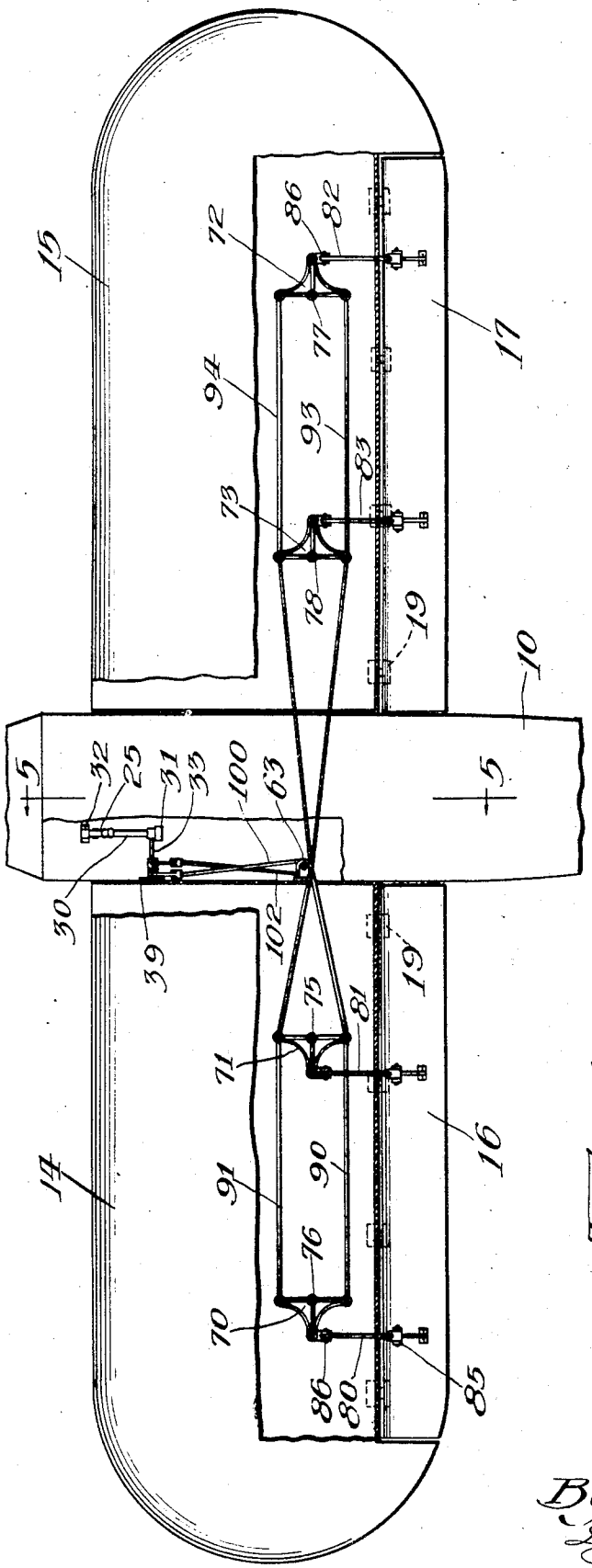
Dec. 20, 1932. R. E. GUTHIER 1,891,812

AIRPLANE

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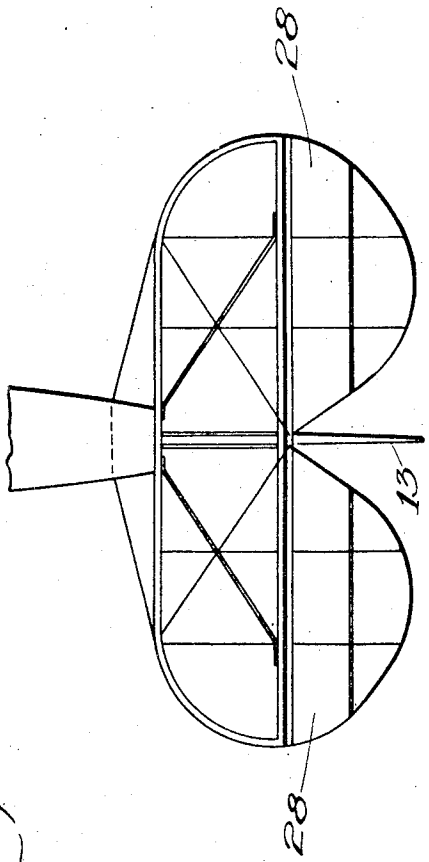


Fig. 1.

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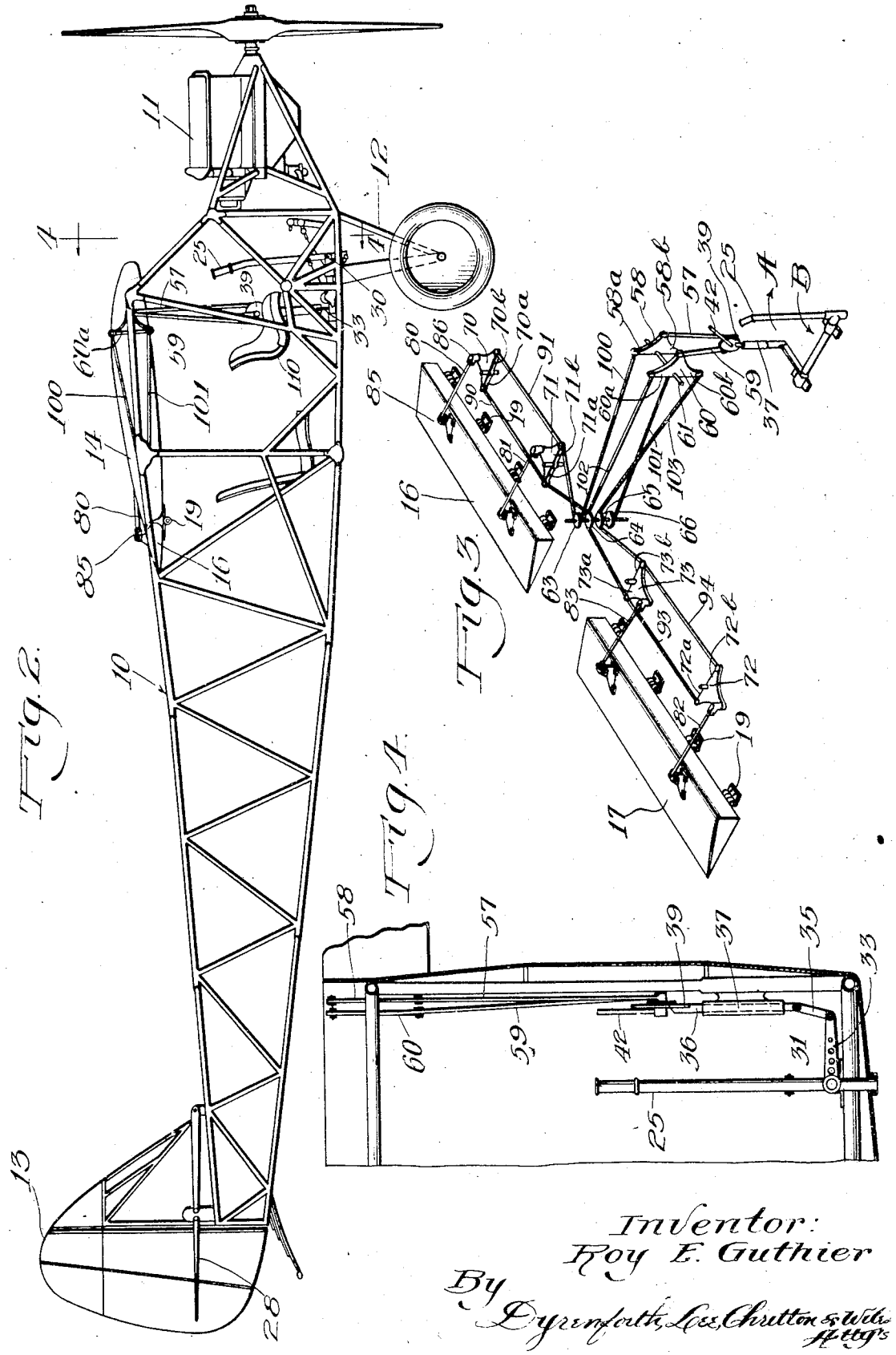


Fig. 2.

Fig. 3.

Fig. 4.

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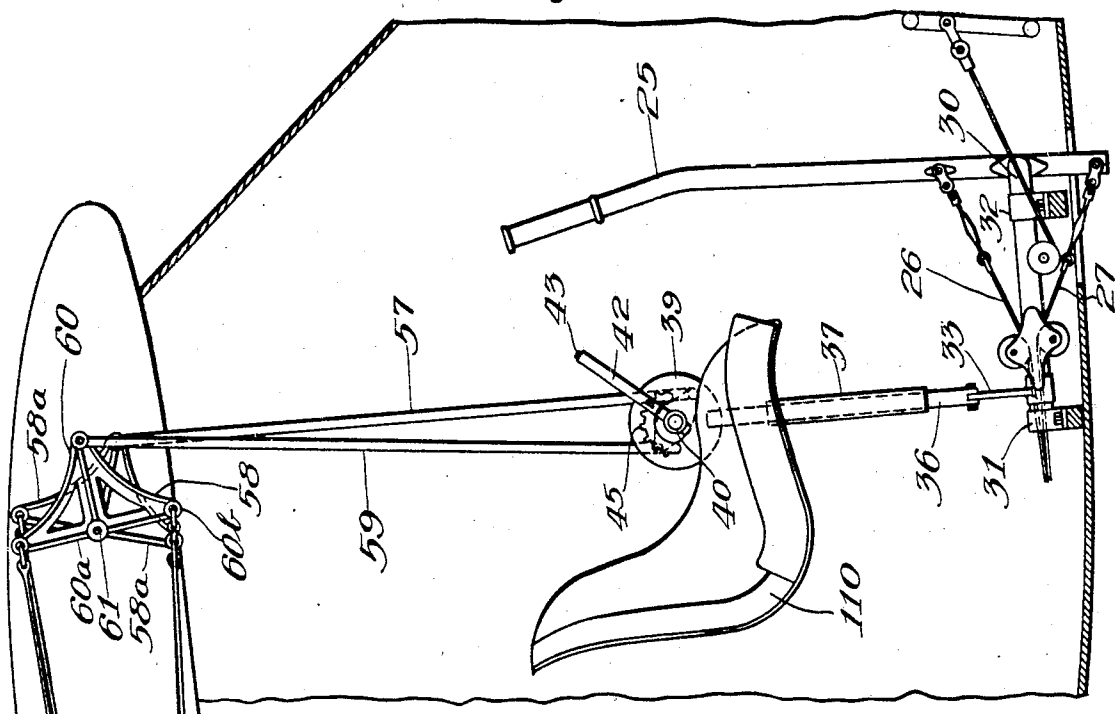


Fig. 5.

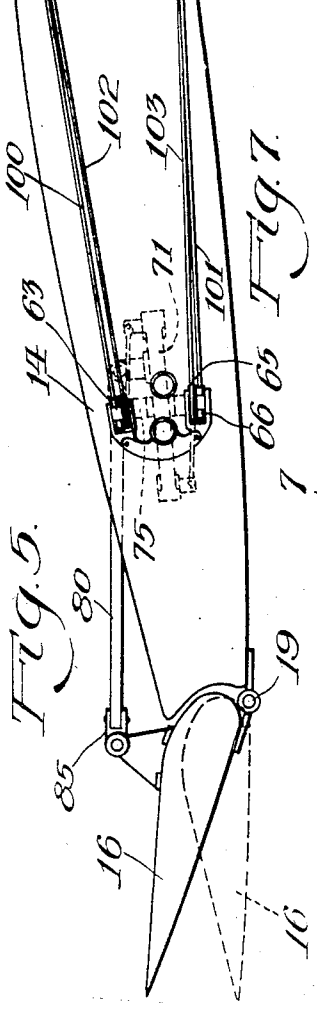


Fig. 7.

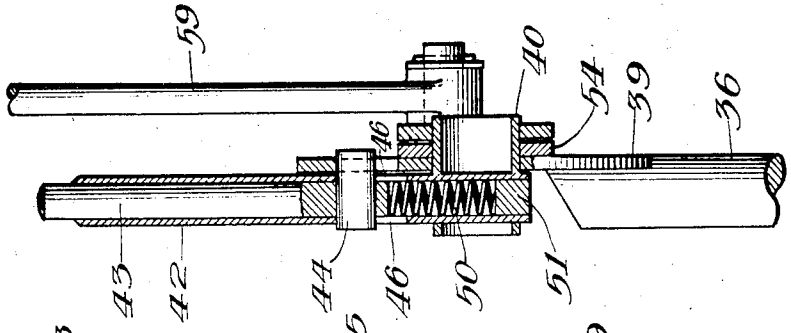
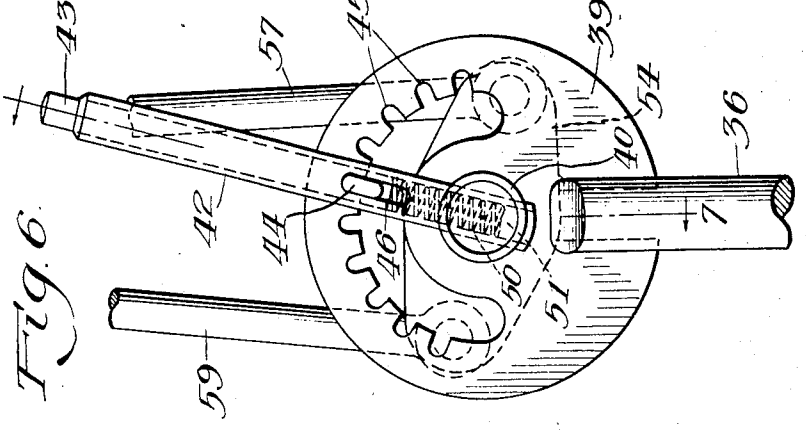


Fig. 6.



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Patented Dec. 20, 1932 1,891,812

UNITED STATES PATENT OFFICE

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AIRPLANE

Application filed August 10, 1931. Serial No. 556,282.

The invention relates to airplanes, and the primary object of the invention is to provide improved airplanes of such construction that the flight characteristics thereof may be changed or adjusted while they are in flight or when they are about to take off.

One form of the invention is embodied in an airplane comprising ailerons pivoted at the trailing edges of the wings. A system of levers and cables operatively connects the ailerons to the joy stick of the airplane so that it may be manipulated to displace the aileron on one wing downwardly and on the other wing upwardly or vice versa, depending upon the direction in which the aviator wishes to turn or upon the direction in which he wishes to roll the plane around the longitudinal axis thereof. Incorporated in the system of levers and cables extending between the ailerons and the joy stick is improved means whereby the ailerons may be angularly displaced in the same direction around their pivotal axes when the aviator wishes to change the flight characteristics of the plane. In this latter position they are employed to obtain a flap action. The construction is such that the airfoil characteristics may be adjusted or changed to develop flap action while the plane is in flight or when it is about to take off. In the illustrated embodiment of the invention, the ailerons may be angularly displaced in the same direction around their pivotal axes to develop flap action and when it is so desired the joy stick may be manipulated simultaneously to displace one of the ailerons in one direction and the other in the other direction. In other words, the aviator may at any time simultaneously control the rolling of the machine and its flap action or he may roll the machine without changing flap action, and then again he may develop flap action without rolling the machine.

In the illustrated embodiment of the invention, relatively simple controls are provided for the ailerons. The construction is such that the aviator may control the flight characteristics of the machine with his left hand while he is manipulating the joy stick with his right hand.

A feature of the invention is that it is adapted to all types of airplanes. Another feature of the invention is that a relatively small wing area may be used as airplanes embodying the invention and provided with relatively small wing areas have the same or slower landing and take off speeds as convention airplanes with larger wing areas. Still another feature of the invention is that airplanes in which it is embodied have slower landing speeds and therefore are easier and safer to operate.

Other objects and advantages will become apparent as the following detailed description progresses, reference being had to the accompanying drawings wherein

Figure 1 is a plan view, partly broken away, of an airplane which embodies the invention.

Fig. 2 is a side elevation of the frame work of the improved airplane, the wing nearest to the observer having been omitted.

Fig. 3 is a diagrammatic perspective view of the ailerons and the aileron controls forming parts of the improved airplane.

Fig. 4 is an enlarged fragmentary section taken on line 4—4 of Figure 2.

Fig. 5 is an enlarged fragmentary section taken substantially on line 5—5 of Figure 1.

Fig. 6 is a side elevation of mechanism for controlling the ailerons and

Fig. 7 is a section taken on line 7—7 of Fig. 6.

Referring to the drawings wherein a preferred form of the invention is illustrated, the reference character 10 designates generally the frame-work of an airplane which is of conventional construction except as hereinafter set forth. The airplane is provided with the usual motor 11, landing gear 12, rudder 13, etc., and also comprises wings 14 and 15 which are provided with ailerons 16 and 17, respectively.

The ailerons 16 and 17 are pivoted at their lower forward edges to the wings 14 and 15, respectively, by hinges 19, or the equivalent, for the purpose. The ailerons may be said to lie normally in a neutral position wherein they are disposed in the same plane and do not tend to roll the ship around its longi-

tudinal axes. In Figure 5, the aileron 16 is shown in its neutral position by dotted lines. When the ailerons are in their neutral positions, the wing section of each wing is one of high speed and low drag.

It is understood that if both of the ailerons are lowered or depressed around their pivotal axes, the wings acquire a higher lift and a high drag characteristic. It is also understood that the ailerons may be angularly displaced in opposite directions to roll the machine in any desired manner.

The plane is provided with the usual joy stick 25. In accordance with the usual practice, means such as cables 26 and 27 operatively connect the joy stick 25 with elevators 28 disposed at the tail of the machine. The joy stick 25 may also be manipulated to cause the ailerons 16 and 17 to be displaced in opposite direction when it is so desired. Referring to Figures 4 and 5, it will be noted that the joy stick 25 is pivoted to the forward end of the shaft 30 which, in turn, is pivotally mounted in bearings 31 and 32 the bearings 31 and 32 being rigidly secured to the frame-work 10. Obviously the joy stick 25 may be oscillated in the plane extending longitudinally of the machine and it may also be oscillated transversely of the machine. The movements of the joy stick 25 in a plane extending longitudinally of the machine control the elevators 28 while the movements of the joy stick in a plane extending transversely of the machine controlling the ailerons 16 and 17.

The means operatively connecting the ailerons 16 and 17 to the joy stick 25 comprises a lever 33 mounted on and constrained to rotate with the shaft 30. A link 35 connects the free end of the lever 33 with the lower end of a shaft 36 which is slidably journaled on a bearing 37. The bearing 37 is rigidly secured to the frame-work 10. Secured to the upper end of the shaft 36 is a disk 39 in which a tubular shaft 40 is rotatably journaled. A tube 42 projects through the tubular shaft 40 and is rigidly secured thereto. Slidably journaled within the tube 42 is a rod 43 which carries a latch member 44 adapted to engage a series of notches 45 formed in the disk 39. The latch member 44 projects through slots 46 cut in the tube 42. A spring 50 disposed in the tube 42 and interposed between the post 43 in a position wherein the latch member 44 will engage one of the notches 45. The rod 43 may be depressed to drive the latch member 44 out of engagement with the notches 45 and when the latch member has disengaged from the notches 45, the tube 42 may be used as a handle whereby the aviator may oscillate tube 42 to oscillate the tubular shaft 40 (see Figures 6 and 7).

A lever 54 is rigidly secured to the tubular shaft 40. One end of the lever 54 is connected by a link 57 to a lever member 58, the other end of the lever 54 being connected by a link 59 to a lever member 60. (See Figures 3 and 5.) The lever members 58 and 60 are pivoted upon a horizontally disposed pin 61 mounted in the frame-work 10. The lever 58 is provided with oppositely disposed arms 58*a* and 58*b*. The lever 60 is provided with oppositely disposed arms 60*a* and 60*b*.

Rotatably journaled in the frame-work 10 are sheaves 63, 64, 65 and 66 over which cables, hereinafter described, are trained to connect the lever members 58 and 60 with the ailerons 16 and 17, respectively.

Associated with the aileron 16 are a pair of lever members 70 and 71 and associated with the aileron 17 are a pair of lever members 72 and 73. The lever members 70, 71, 72 and 73 are pivoted on vertically disposed pins 75, 76, 77 and 78, respectively. The vertically disposed pins 75, 76, 77 and 78 are mounted in the wings 14 and 15 in front of the ailerons 16 and 17, respectively.

Rigid links 80, 81, 82 and 83 connect the ailerons 16 and 17 to the lever members 70, 71, 72 and 73 (see Figure 3). Each of the links 80, 81, 82 and 83 is connected to its associated aileron by a universal joint 85 and is connected to its associated lever member by a universal joint 86.

Oppositely disposed arms 70*a* and 70*b* provided on the lever member 70 are connected by cables 90 and 91, respectively, to oppositely disposed arms 71*a* and 71*b* formed on the lever member 71. Oppositely disposed arms 72*a* and 72*b* are connected by cables 93 and 94, respectively, to oppositely disposed arms 73*a* and 73*b*, respectively, formed on the lever member 73.

The arm 58*a* is connected to the arm 71*b* by a cable 100 trained over the sheave 63 and the arm 58*b* is connected to the arm 71*a* by a cable 101 which is trained over the sheave 66. The arm 60*a* is connected to the arm 73*a* by a cable 102 which is trained over the sheave 64 and the arm 60*b* is connected to the arm 73*b* by a cable 103 which is trained over the sheave 65.

Referring to Figures 1 and 5, it will be noted that the joy stick 25 and the tube handle 42 are arranged adjacent the aviator's seat 110 in such manner that the joy stick 25 may be manipulated by the right hand while the tube handle 42 is being angularly displaced by the left hand.

The operation of the above described aileron controls is substantially as follows: assuming that the ailerons 16 and 17 are in their neutral positions so that the wing sections have a low lift and a low drag and assuming that the joy stick 25 angularly displaced around the longitudinal axis of the shaft 30 in the direction of the arrow (Figure 3), the shaft 30 and the lever 33 will be displaced in the same direction to draw the shaft 36 downwardly and with it the disk 39. Such dis-

placement of the disk 39 displaces the links 57 and 59 in the same direction and causes the lever members 58 and 60 to be angularly displaced in a clock-wise direction (Figure 5). The cables 100 and 101 will then cause the lever members 70 and 71 to be angularly displaced in a clock-wise direction (Figure 3) and such displacement of the lever members 70 and 71 causes the links 80 and 81 to angularly displace the aileron 16 to raise its trailing edge. The cables 102 and 103 will, at the same time, angularly displace the lever members 72 and 73 in a clock-wise direction (Figure 3) and such displacement of these members causes the links 82 and 83 to angularly displace the aileron 17 so that its trailing edge will be depressed.

If the joy stick 26 is angularly displaced in the direction of the arrow *b* (Figure 3), the connections between the joy stick and the ailerons 16 and 17 will cause the trailing edge of the aileron 16 to be depressed and will raise the trailing edge of the aileron 17.

Now, if it is again assumed that the ailerons 16 and 17 are in their neutral positions, it is readily understood that if the joy stick is not displaced, angular displacement of the tube handle 42 in a counter clock-wise direction (Figures 3, 5 and 6) will cause the link 59 to angularly displace the lever member 60 in a clock-wise direction and will cause the link 57 to angularly displace the lever member 58 in a counter clock-wise direction. When the lever 58 is displaced in a counter clock-wise direction, the lever members 70 and 71 are also angularly displaced in a counter clock-wise direction (Figures 3, 5 and 6) and the trailing edge of the aileron 16 is depressed. The simultaneous angular displacement of the lever member 60 in a clock-wise direction causes the lever members 72 and 73 to be displaced in a clock-wise direction so that the links 82 and 83 depress the trailing edge of the aileron 17.

It is readily understood, therefore, that angular displacement of the tube handle 42 in a counter clock-wise direction depresses the ailerons 16 and 17 as a unit and it is readily understood that clock-wise displacement of the tube handle 42 will elevate or raise the trailing edges of the ailerons 16 and 17.

It will also be readily understood that the joy stick 25 and the tube handle 42 may be manipulated simultaneously if it is so desired. Also, if it is assumed that the tube handle 42 has been manipulated to depress the trailing edges of the ailerons 16 and 17, the joy stick 25 may be manipulated afterwards to elevate one of the ailerons and depress the other still farther.

In operating the airplane, the ailerons 16 and 17 are preferably depressed when the machine is about to take off so that the advantage of a high lifting characteristic of the wings is obtained. If the aviator wishes to turn or bank during the take-off, the joy stick 25 may be manipulated to displace one of the ailerons in one direction and the other aileron in the other direction. After the machine is in flight, the ailerons may be referred to their neutral positions so that the wing sections will have the characteristics of low lift and low drag. When the machine is to be brought to land, the ailerons are again depressed to obtain the characteristics of high lift and low speed.

It will be readily understood that an airplane which embodies the invention may be brought out of a flat spin by depressing the ailerons so that the "center lift" of the machine travels to the rear and it becomes "nose-heavy".

In the appended claims, the terms "airplane" and "aircraft" are employed in a broad sense to include aircraft of any and all descriptions.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims, in which it is my intention to claim all novelty inherent in my invention as broadly as permissible, in view of the prior art.

I claim:

1. An airplane provided with wings, ailerons pivoted to said wings, a joy stick movable in two planes at right angles to each other, means for connecting said joy stick to elevators on the tail of the airplane, a rotatably mounted member, means operatively connecting said joy stick to said rotatably mounted member whereby said joy stick may be manipulated to displace said rotatable member in a plane normal to its axis of rotation, a handle member for rotating said rotatable member, and means operatively connecting said rotatable member with said ailerons.

2. An airplane comprising a frame-work, wings extending in opposite sides of said frame-work, ailerons pivoted to said wings, elevator planes mounted on said frame-work, a joy stick operatively connected to said elevator planes, a rotatable member, means controlled by said joy stick for displacing said rotatable member in a plane normal to its axis of rotation, means for manually rotating said rotatable member, and means operatively connecting said rotatable member with said ailerons.

3. An airplane comprising a frame-work, wings extending on opposite sides of said frame-work, ailerons on said wings, a joy stick movable in two planes at right angles to each other, means for connecting said joy stick to the elevators of said airplane, a slid-

ably journaled shaft, means operated by said joy stick for displacing said shaft along its longitudinal axis, a rotatable member, means carried by said shaft for journalling said rotatable member, a lever fixed to said rotatable member, means operatively connecting one end of said lever to one of said ailerons and means for operatively connecting the other end of said lever to the other aileron.

4. An airplane comprising a body portion, wings extending on said opposite sides of said body portion, ailerons pivoted on said wings, a joy stick, means for connecting said joy stick to the elevators of the airplane and means including cables operatively connected to said joy stick for displacing said ailerons in the same direction relative to said wings.

5. An airplane comprising a body portion, wings extending from said body portion, ailerons pivoted on said wings, elevators at the tail end of said airplane, a joy stick mounted for movement around two pivotal axes at right angles to each other, means for connecting said joy stick to said elevators, a pivoted lever, means operatively connecting said joy stick to said pivoted lever whereby said pivoted lever may be displaced bodily by movement of said joy stick, means operatively connecting said lever to said ailerons, and manually operable means for angularly displacing said lever around its pivotal axes.

6. An airplane comprising a body portion, wings extending from said body portion, ailerons pivoted to said wings, elevators at the tail end of said airplane, a rotatable shaft, a joy stick pivoted to said shaft and adapted to be angularly displaced to rotate said shaft, means operatively connecting said joy stick to said elevators, a lever fixed to said shaft, a slidably mounted member operatively connected to the free end of said lever, a second lever pivoted to said slidably mounted member, a handle member for angularly displacing said second lever around its pivotal axes, and means operatively connecting said second lever to said airplane.

7. An airplane comprising a body portion, wings extending from said body portion, ailerons pivotel to said wings, elevators at the tail end of said airplane, a joy stick, means for operatively connecting said joy stick to said elevators, manually operable means for angularly displacing said ailerons in the same direction relative to said wings, means operatively connecting said manually operable means to said ailerons, and means controlled by said joy stick for bodily displacing said manually controlled means to angularly displace said ailerons in opposite directions.

In witness whereof, I have hereunto set my hand this 29th day of July, 1931.

ROY E. GUTHIER.