July 1, 1930. M. D. O'DONNELL 1,769,161

AIRPLANE

Filed March 14, 1929 3 Sheets-Sheet 1

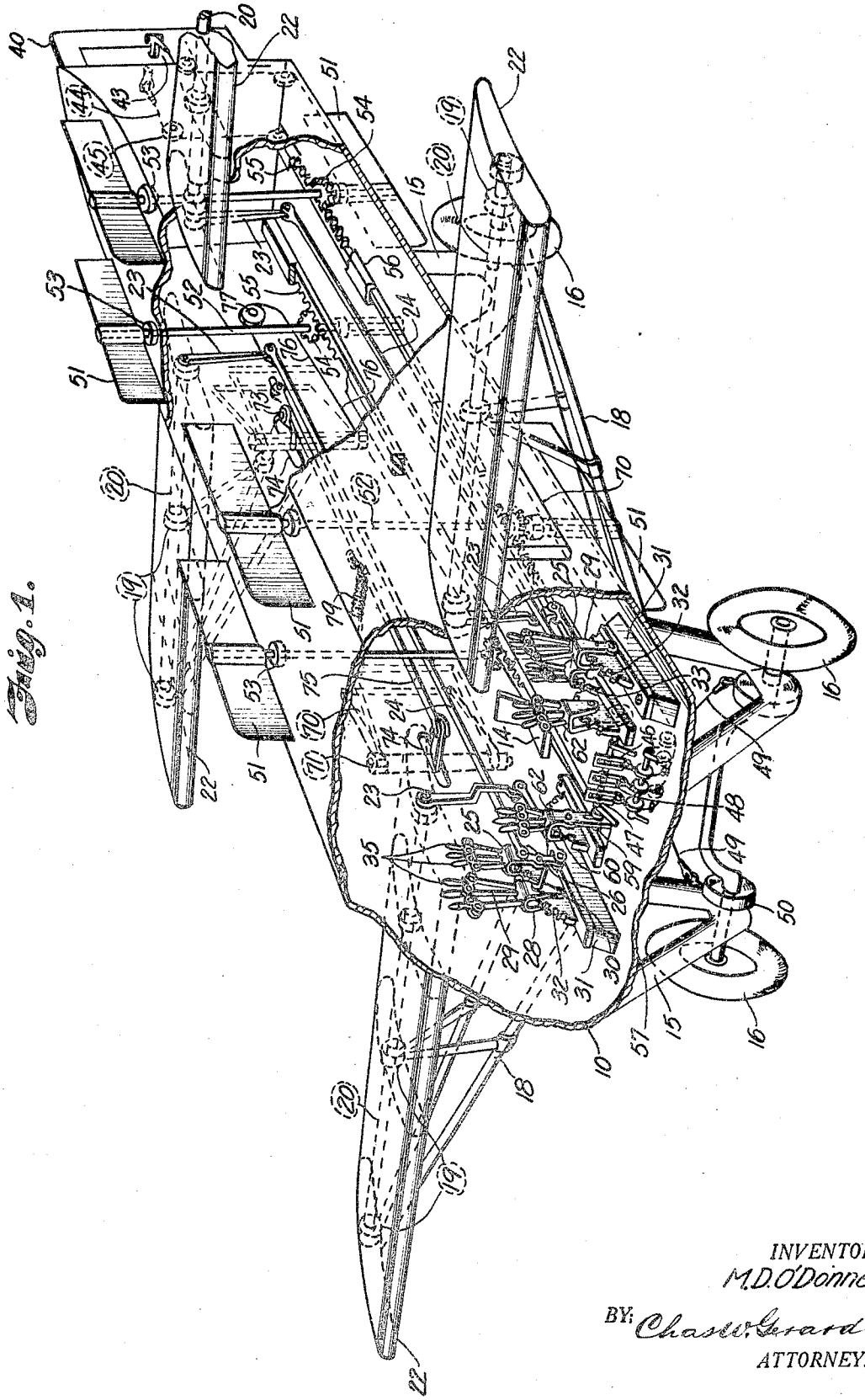


Fig. 1.

INVENTOR:
M.D.O'Donnell

BY: Chas. W. Grard.
ATTORNEY.

July 1, 1930. M. D. O'DONNELL 1,769,161

AIRPLANE

Filed March 14, 1929 3 Sheets-Sheet 2

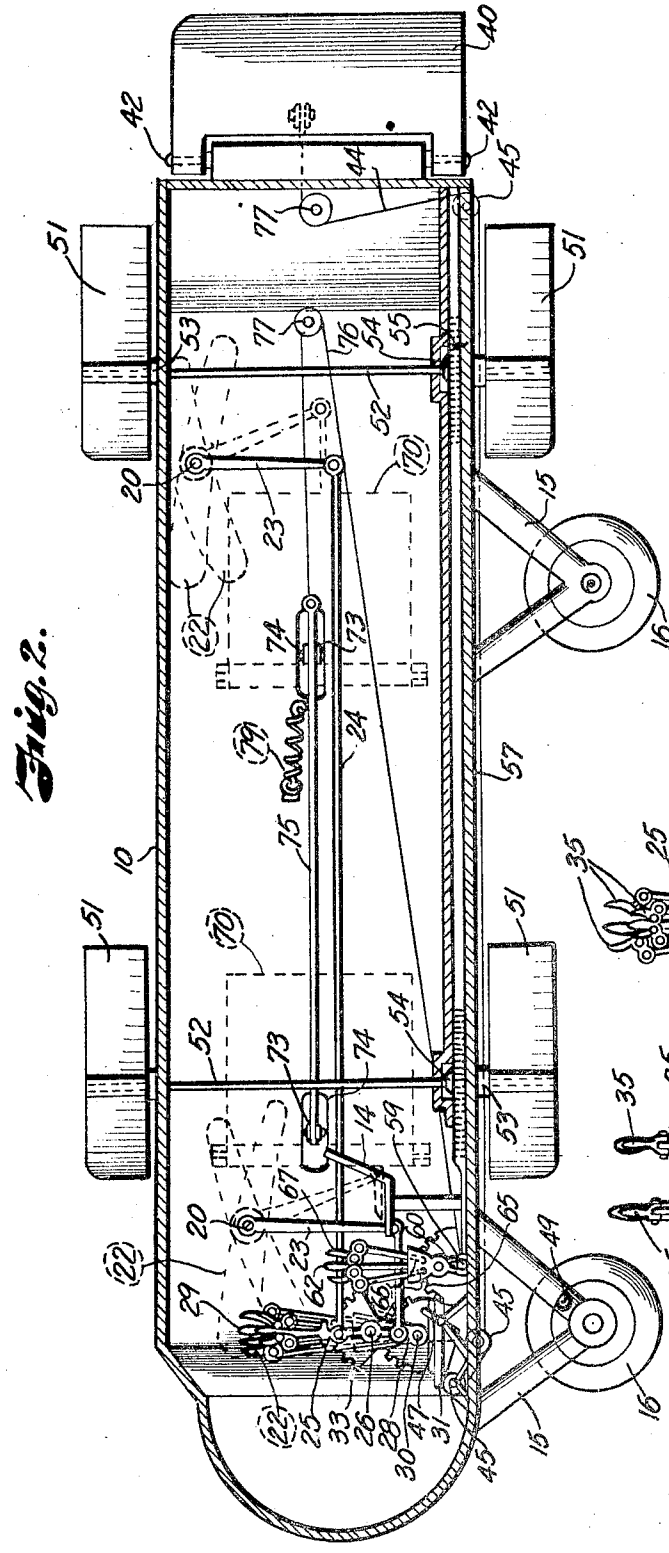


Fig. 2.

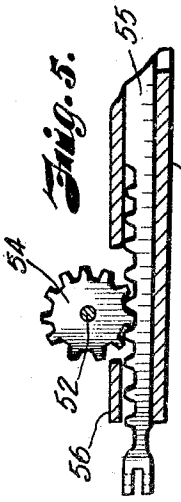


Fig. 5.

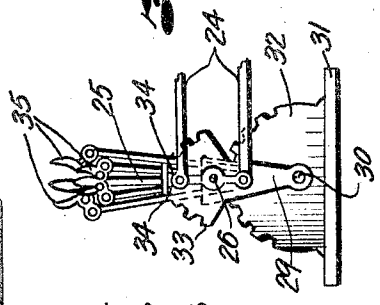


Fig. 4.

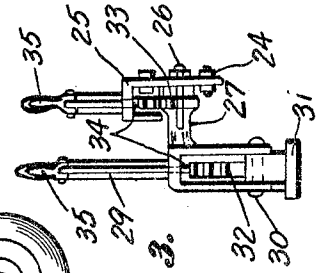


Fig. 3.

INVENTOR:
M. D. O'Donnell
BY: Chas. W. Gerard.
ATTORNEY.

July 1, 1930. M. D. O'DONNELL 1,769,161

AIRPLANE

Filed March 14, 1929 3 Sheets-Sheet 3

Fig. 6.

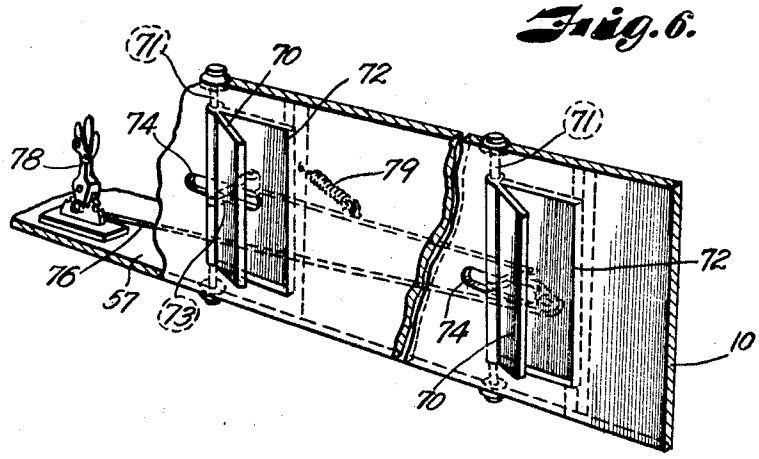


Fig. 7.

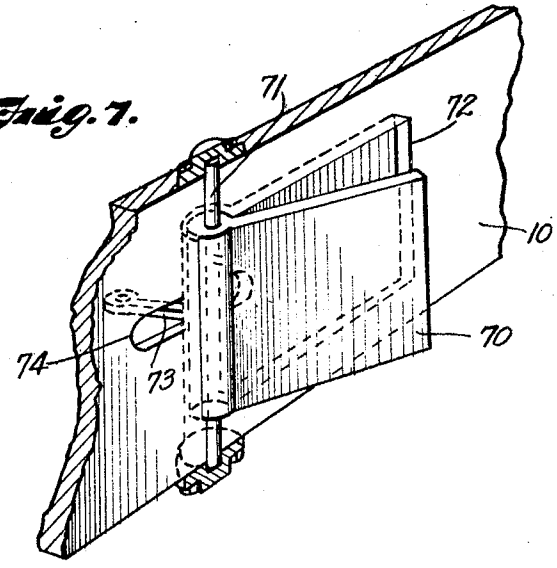
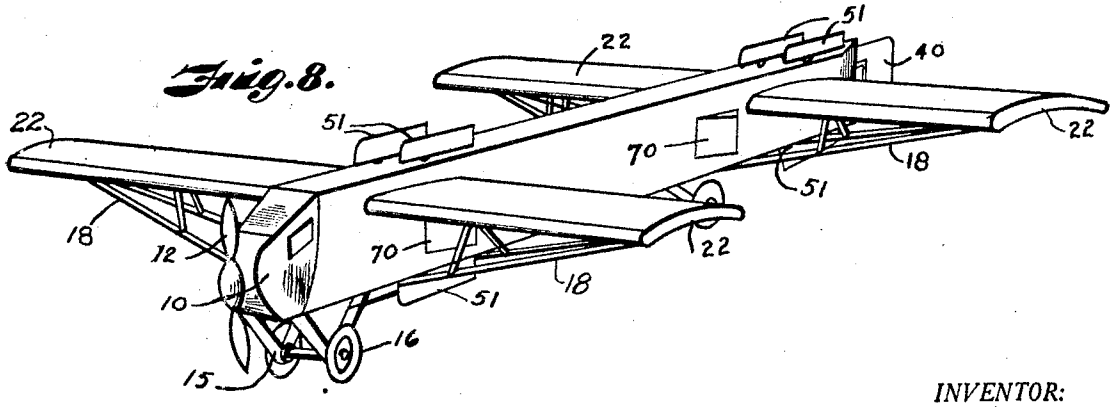


Fig. 8.



INVENTOR:
M. D. O'Donnell.

BY: Chas. W. Gerard,
ATTORNEY.

Patented July 1, 1930 1,769,161

UNITED STATES PATENT OFFICE

MOUNIE D. O'DONNELL, OF LEVASY, MISSOURI

AIRPLANE

Application filed March 14, 1929. Serial No. 346,928.

The present invention relates to airplanes, and the primary object of the invention is to devise an improved craft of this character which will be not only of a thoroughly practical and efficient construction, but also possess a higher degree or factor of safety, and furthermore be characterized by greater ease of control and flexibility in its operation than apparatus of this class as now generally constructed.

The main features of the improvements comprise a novel type and arrangement of banking wings, a series of direction fins of a unique character, as well as a series of auxiliary direction fins of novel form and arrangement, all operative for effectively supporting and guiding the movements of the craft, together with convenient and efficient means for maintaining complete and constant control and operation of anyone or more of the various parts of said supporting and guiding mechanism.

With the foregoing general objects in view, as well as minor objects as will appear in the course of the detailed description, the invention will now be described by reference to the accompanying drawings, illustrating one suitable form of embodiment of my improvements, after which the various features and combinations deemed to be novel will be properly set forth and claimed.

Figure 1 is a perspective view, partly broken away, illustrating an airplane construction embodying the proposed features of improvement;

Figure 2 is a longitudinal sectional view (with dotted lines illustrating different operative positions of the side wings or planes);

Figure 3 is an enlarged front elevation of one set of main and auxiliary control levers for the side wings or planes;

Figure 4 is a side elevation of the same;

Figure 5 is an enlarged sectional detail of a rack and cog adjusting means hereinafter referred to;

Figure 6 is an enlarged perspective detail view showing one of the pairs of side vanes, and their control connections;

Figure 7 is a similar view of one of the vane members shown in Figure 6, and Figure 8 is a perspective view, on a small scale, illustrating an airplane having the improved features of construction.

Referring to the drawings in detail, these illustrate the improved craft as comprising a fuselage member 10 of suitable elongated shape and provided with the usual propeller member 12 and appropriate power plant (not shown), the interior arrangement or fixtures of the fuselage not being illustrated other the pilot seat 14 and the control levers and connections hereinafter described. The under-face of the fuselage is provided with wheel frames 15 and landing wheels 16 of ordinary construction, as shown in Figures 1 and 2.

At opposite sides of the fuselage 10, at both front and rear, is provided suitable framework 18 for bearings 19 in which to mount two pairs of horizontal shafts acting as arms 20 for supporting the front and rear wings or planes 22 projecting at right angles to the sides of the fuselage.

The inner ends of the shafts 20 are provided with downwardly projecting arms or levers 23 which are connected by links 24 to operating levers, of which levers there are two sets, one for each pair of wings at the same side of the fuselage. Accordingly, each pair of links 24 for the same pair of wings or planes 22 are connected with an auxiliary or floating lever 25 at points respectively above and below the fulcrum 26 thereof (see Figures 3 and 4), said fulcrum being carried by an arm 27 projecting laterally from the top of the yoke portion 28 of a main or primary lever 29 which is fulcrumed at 30 to a fixed base 31 having a rack segment 32 projecting up with said yoke portion of the lever 29. The arm 27 also carries a rack segment 33 for the lever 25. It is apparent that with this lever arrangement and system of control connections, the operation of either main or primary lever 29 (with its auxiliary lever 25 moving bodily or in unison therewith) will actuate the corresponding wings or planes 22 in unison and in the same direction; whereas, by leaving the primary lever stationary and operating only its auxiliary lever 25 will result in simultaneous, but opposite movement

of the corresponding wings or planes 22, in an obvious manner.

Each of the levers 25 and 29 is provided with a pair of pawls 34 for engagement with the corresponding rack segments at opposite sides of said levers, and having connections with pawl-actuating levers 35 at opposite sides of the handles of said levers (Figs. 3 and 4). This pawl arrangement insures certainty of latching and securing of the levers 25 and 29 by means of one or the other of the pawls remaining engaged with the racks, regardless of the direction of movement of the lever, since the grip of the operator's hand on the lever will naturally release the forward pawl (as regards direction of the lever's movement) in advance of the other pawl, and thereby insures against any backward movement of the lever when it is entirely released by the operator.

The rear of the fuselage is equipped with the usual form of vertical direction rudder 40, hinged for movement about a vertical axis represented by the pivot pins 42, the oppositely directed movements of the rudder being produced by cables 43 and 44 operating around guide sheaves or pulleys 45 and actuated by pedals 46 and 47, respectively, in front of the pilot's seat 14. A third pedal 48 is provided with operating connections 49 to suitable brake devices 50 associated with the landing wheels 16.

For cooperating with the vertical rudder 40 in producing a more effective and flexible direction control of the craft, I provide a series of auxiliary direction fins or vanes 51 arranged in pairs at the opposite ends of vertical shafts 52 mounted in suitable bearings 53 adjacent to the front and rear pairs of wings or planes 22,—two of said shafts being located intermediate each pair of said planes 22. Each of the shafts 52 is provided with a cog pinion 54 meshing with one of a pair of rack bars 55 operating in guide housings 56 along the floor of the fuselage,—see Figure 2, one rack bar operating both pinions 54 and shafts 52 at the same side of the fuselage. The forward end of each rack bar is provided with a pin 59 slidably engaged by a slot 60 in the lower end of a lever 62 fulcrumed at 63 in a stand 64 provided with a rack segment 65 for a pair of pawls 66 connected with pawl-actuating levers 67 which are arranged and operated in the same manner and for the same purpose as the pawls 34 and pawl-actuating levers 35 of the levers 25 and 29 already described.

At each side of the fuselage are further provided a pair of forward and rear wings or fins 70 carried by vertical shafts 71 mounted in the front margins of recesses or pockets 72 in the sides of the fuselage. Each shaft 71 is provided with an arm 73 projecting through an elongated opening 74 into the interior of the fuselage, where the arms 73 at the same side of the fuselage are connected by links 75 (see Figure 6).

The rear end of each of the links 75 is attached to one end of a cable 76 operating around a guide sheave or pulley 77 and having its other end attached to an operating lever 78 (Figure 6) adjacent to the pilot's seat 14. The wings or fins 70 are maintained normally within the planes of the recesses or pockets 72 (or flush with the side faces of the fuselage) by the action of springs 79 connecting the links 75 with the inner sides of the fuselage, and are operated by the levers 78 to throw said fin or plane elements into more or less open or outwardly projecting position, as represented in the views shown in Figures 6 and 7. In some cases it may be desired, however, to connect said cables 76 for operation by the levers 62, as represented in Figures 1 and 2.

As regards the operative nature of the various supporting and guiding elements, the functions of the wings or planes 22 and vertical rudder member 40, for guiding and stabilizing purposes, are in general similar to those in the usual air-craft construction; but the nature of the operation of the other features of my improved construction, as well as the additional advantages of the planes 22 due to the novel method of controlling the same, may best be brought out by outlining some of the ways in which the several adjustments will affect the movement of the craft.

The adjustment of the planes 22 to raise their forward portions operates normally to elevate that part of the fuselage to which they are connected, whereas the lowering of said forward portions of the planes produces just the opposite effect. Raising the front portions of both front and rear planes 22 to their maximum working angle (angle of incident or attack) will cause the craft to ascend almost vertically while remaining in substantially horizontal position. For banking (or rolling), as in turning, both wings or planes 22 at either side of the fuselage are raised (i. e., their forward portions elevated) for elevating the corresponding side of the fuselage, according to the direction of banking; or the planes 22 at either side may be lowered for producing just the opposite banking effect.

Or again, carrying out the above-described character of operation to a more pronounced degree or effect, the planes 22 at one side may be lowered and those on the opposite side raised for producing a rolling spiral movement of the craft in a horizontal direction, as may be desired in certain kinds of maneuvers.

In each of the foregoing plane adjustments, the same are controlled by operation of the main or primary levers 29, without any relative movement of the auxiliary levers 25, by which levers 25 the planes of

each set (i. e., at the same side of the fuselage) may be adjusted relatively or oppositely to each other. By such an adjustment, and thereby causing the diagonally opposite wings or planes 22 to be positioned at opposite angles or inclinations, the fuselage will be caused to travel in a still wider spiral course, the direction of which would be simply reversed by just reversing the adjustment of the planes through the medium of said auxiliary levers 25.

By the operation of the auxiliary levers 25 to raise the front planes and to lower the rear planes or wings 22, at both sides of the fuselage, a looping movement of the craft will be produced, taking place in a backward direction; while reversing this adjustment, to lower the front planes and raise the rear planes 22, will result in the same character of looping movement, but in the opposite or forward direction,—this movement taking place in a relatively short compass, depending upon the angle of incident or attack to which the planes 22 are adjusted.

The planes or wings 22 are operable for a stabilizing purpose, as in case of a strong side wind, by adjusting the planes on the opposite sides of the fuselage into an opposite angular relationship, for counteracting any tendency of the craft toward being turned over sidewise.

The improved feature as regards relative adjustment of the front and rear wings or planes 22 is effective in the prevention of nose dives as well as in enabling the craft to be brought up out of a nose dive, as by elevating the front planes and lowering the rear ones. In the same way, it is evident that the craft may be brought out of a tail spin by such an adjustment of these planes 22. Again, if at any time either end of the fuselage should get out of horizontal alinement, this can be corrected by operation of the auxiliary levers 25, as by causing the corresponding wings or planes to assume the proper angle for such correction. For example, if the load in the fuselage is so distributed as to impose an unequal burden on a certain portion, the auxiliary levers may be operated to adjust the planes or wings to exert a greater lifting effort for supporting that portion of the craft which sustains the excessive load. This may prove to be an especially valuable feature in the event of a wing or plane becoming lost (or inoperative or defective in some way), in which event the remaining wings or planes may be so adjusted or controlled as to support the craft in substantially horizontal position while it glides to a landing location. In gliding forward, the wings or planes of both sides are adjusted to lower the same, while the same gliding movement may be executed in a reverse or rearward direction by simply reversing the angles of the planes 22, the gliding in either case taking place with the fuselage in approximately horizontal position. Hence, by alternately adjusting the planes or wings 22 in opposite directions, the craft may be brought to land by easy gliding, or coasting movements, backward and forward, in alternately opposite directions. Just at the instant of landing, the planes 22 are set in their maximum raised position, for braking effect, and likewise the direction vanes or fins 51 are operated by their control levers 62 to position said fins at approximately right angles to the fuselage to breast the wind and reinforce the braking effect of the planes 22.

Moreover, the wings or fins 70 are also operable for a similar braking purpose if need be, by means of the levers 78 thrusting said wings or fins into their maximum outwardly projecting relation.

The wings or fins 70 act simply to breast the wind, in contrast to the action of the vanes or fins 51 which cut through as well as breast the wind at varying angles, similar to the action of the wings or planes 22, but on axes at right angles to the axes of said planes. The provision of these fin elements 51 and 70 increases in a very great measure the degree of flexibility of the operation of the craft both as to guiding and stabilizing properties,—the fins especially lending a much more positive guiding function in reinforcement to the action of the rear rudder member 40; and, if necessary, taking the place of the rudder 40 in the event of the latter becoming defective or inoperative. A greater and more accurate balancing effect is secured by the provision of a plurality of relatively smaller fins 51 than would be gained by the use of a lesser number of larger size, on account of the decrease in air resistance offered by the separate smaller fins.

It will thus be apparent that I have devised a comparatively simple and yet highly flexible and efficient apparatus for carrying out all the desired objects of my invention, and while I have illustrated and described what I now regard as perhaps the preferred and most practical form of embodiment of my improvements I desire to be expressly understood as reserving the right to make all such changes or modifications as may fairly fall within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters-Patent, is:

1. In an airplane, the combination with the fuselage, of a pair of planes at each side of the fuselage, a separate and independent lever connected with the planes at each side of the fuselage and operative to oscillate said planes in unison in the same direction about axes at right angles to the fuselage, and means associated with each of said levers for oscillat-

ing the corresponding planes in unison but in opposite angular directions.

2. In an airplane, the combination with the fuselage, of a pair of planes at each side of the fuselage, a separate and independent lever connected with the planes at each side of the fuselage and operative to oscillate said planes in unison in the same direction about axes at right angles to the fuselage, and a lever carried by each of said first levers and operative to oscillate the corresponding planes in unison but in opposite angular directions.

3. In an airplane, the combination with the fuselage, of a pair of front and rear planes carried by shafts projecting outwardly at right angles from each side of the fuselage, operating arms connected with the inner ends of said shafts, and operating means for each of said pairs of planes comprising a main lever supporting an auxiliary lever provided with connections to the corresponding operating arms, said connections being operatively joined to said auxiliary lever on opposite sides of its fulcrum, whereby said planes may be oscillated in unison in either the same angular direction by operation of the main lever or in opposite angular directions by the operation of said auxiliary lever.

4. In an airplane, the combination of a plurality of direction or stabilizing elements, and adjusting means comprising a main lever carrying an auxiliary lever fulcrumed thereon about an axis independent of the axis of the main lever and provided with individual connections to said elements at opposite sides of the fulcrum of said auxiliary lever, whereby said elements may be actuated in unison either in the same direction or in opposite directions.

In witness whereof I hereunto affix my signature.

MOUNIE D. O'DONNELL.