Jan. 14, 1930. V. NEWBAUER 1,743,378

AEROPLANE

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Fig. 1.

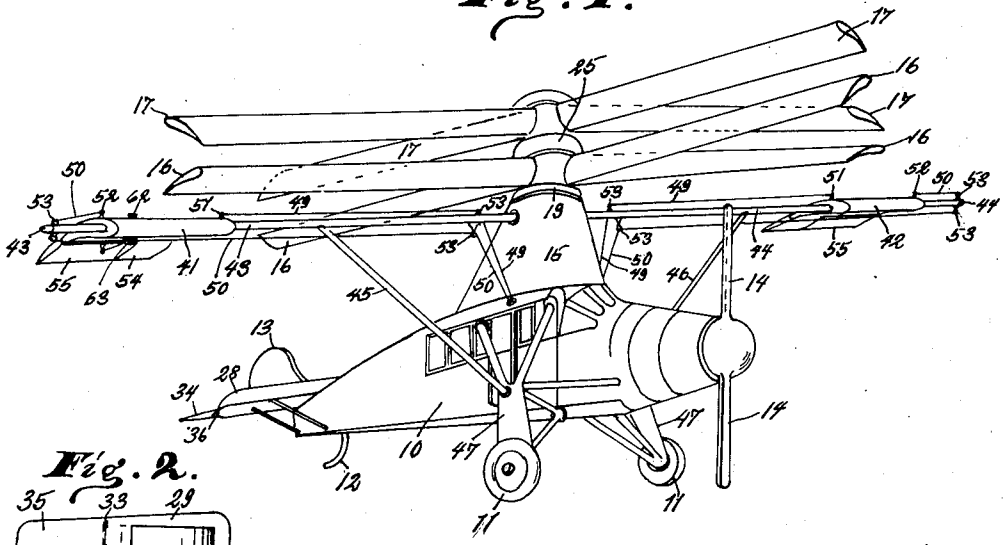


Fig. 2.

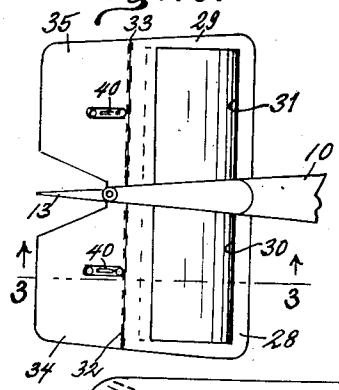


Fig. 3.

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Fig. 4.

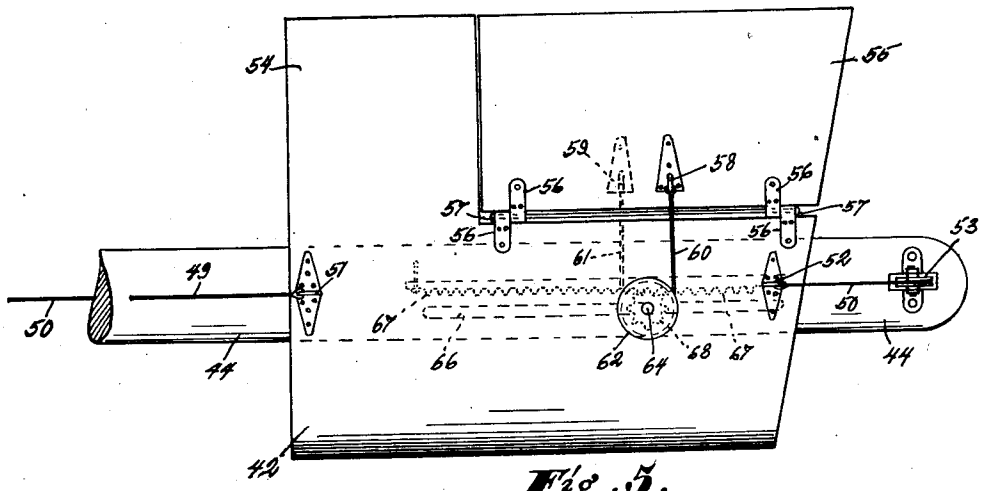


Fig. 5.

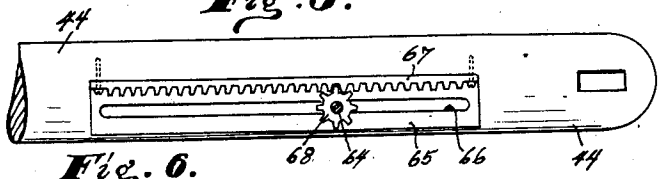


Fig. 6.

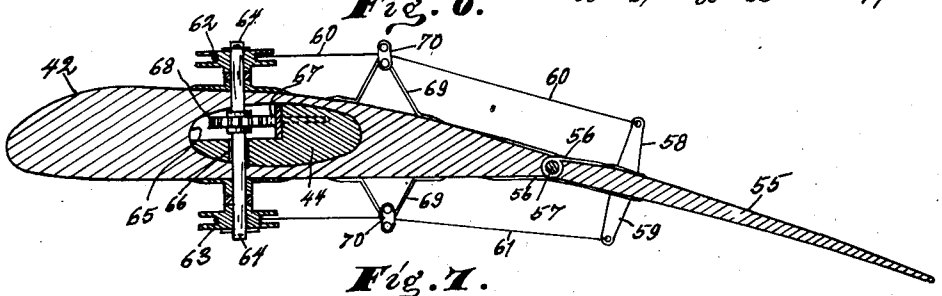
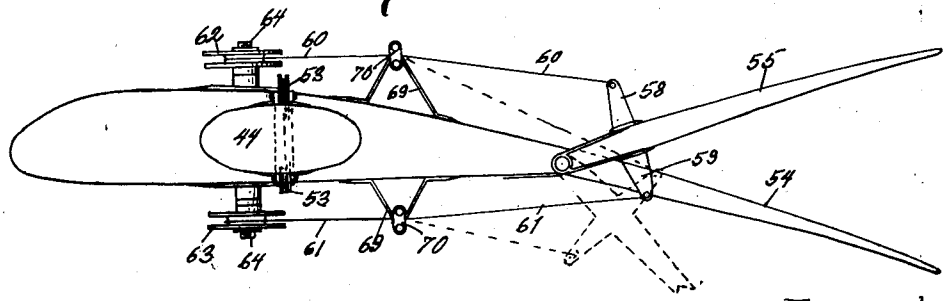


Fig. 7.



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Fig. 8.

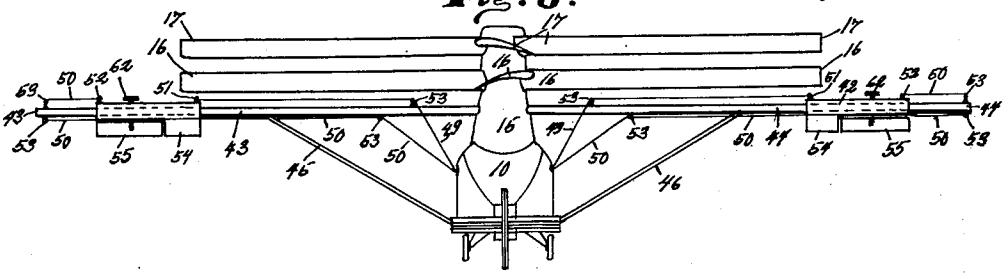


Fig. 9.

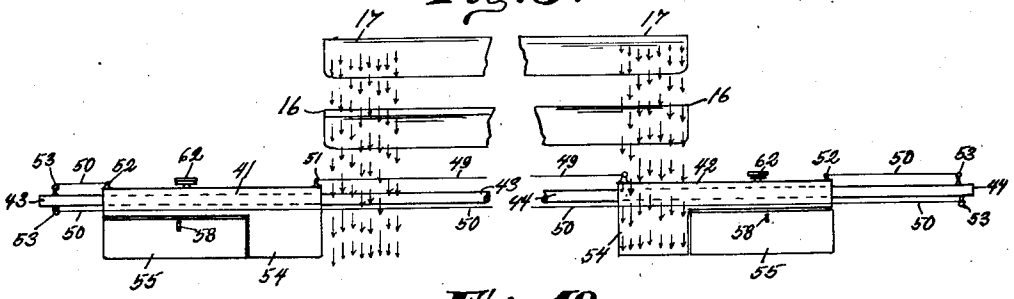


Fig. 10.

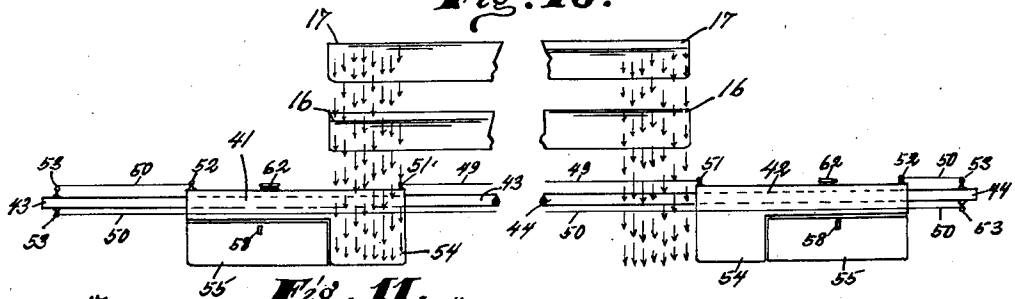
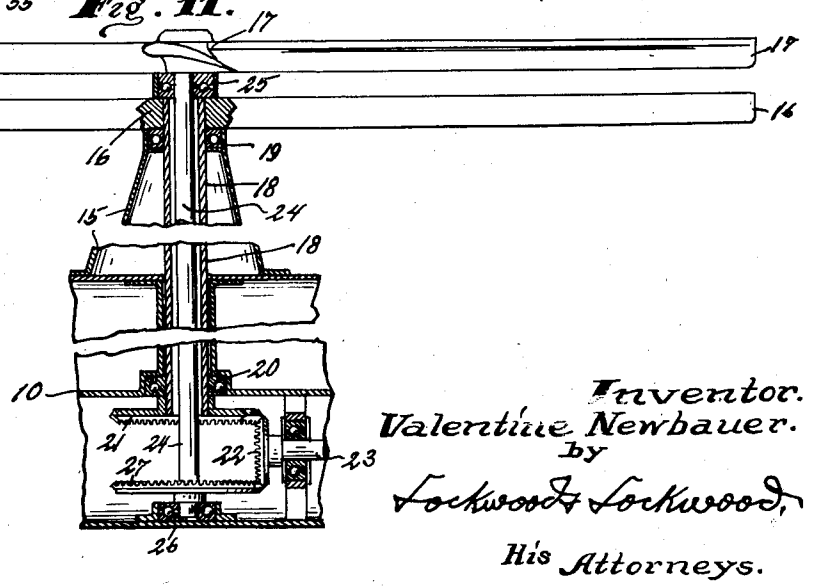


Fig. 11.



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UNITED STATES PATENT OFFICE

VALENTINE NEWBAUER, OF LOS ANGELES, CALIFORNIA, ASSIGNOR TO NEWBAUER VERTICAL AIRPLANE CO., INC., A CORPORATION

AEROPLANE

Application filed January 14, 1928. Serial No. 246,768.

This invention relates to an improvement in the construction, operation and control of a vertically rising aeroplane; and the principal object thereof is to provide a simple and efficient means for obtaining and maintaining a safe and satisfactory equilibrium both in a stationary position and in flight. To that end I provide a pair of lifting wings attached to the top side of the body and arranged transversely thereto and driven to raise and lower the aeroplane in vertical lines, with the wings so driven that they coact with adjustably mounted side ailerons and also adjustable elevators in the rudder group to maintain a relatively perfect equilibrium of the aeroplane that is fully under control of the pilot. That is the adjustable ailerons are connected to a stick control so that they can be manipulated by the pilot to positions best adapted to effect a satisfactory equilibrium.

Another object of the invention is to provide a simple and effective means for navigating the aeroplane in a relatively vertical line both in ascending and descending. To that end I provide each of the pairs of lifting wings with four blades spaced equidistant apart with each blade formed with proper curves and cambers, and varying pitch angles and vacuum curves from the hubs to the outer ends of the wings to effect the greatest lifting power possible, with the wings rotated in opposite directions so that their momentum in cooperation with the manually manipulated side ailerons and also the elevators at the discharge end of the troughs in the rudder group will counterbalance and not cause the body to lose its equilibrium and the aeroplane spin or go into a nose dive or tail spin. Also this reverse rotation of the lifting wings effects a compound thrust to the air that aids greatly in a quick vertical rise of the aeroplane in a relatively straight upward course.

A feature of the invention is shown in the construction and arrangement of the side ailerons which are adjustable so that they can be moved by the pilot to a neutral position in which both will be effected alike by the downward thrust of the air from the lifting wings or moved to a position whereby one and not the other will be depressed by the thrust of air, thereby laterally stabilizing the aeroplane; also a feature of invention is shown in the construction and arrangement of the rudder group in which the elevators are adjustable to cause an upward or downward tilting of the nose of the aeroplane or hold the aeroplane in a balanced horizontal position.

Features of invention are shown in the construction, combination and arrangement of parts whereby an aeroplane is provided that is neat and pleasing in appearance, easy to construct, assemble and operate, and which is safe and durable in use and effectively stabilized.

A feature of invention is shown in the construction of the side ailerons, whereby they automatically move their respective elevator when they are manually shifted by a pilot to laterally stabilize the aeroplane.

Other objects, advantages and features of invention may appear from the accompanying drawings, the subjoined detailed description and the appended claims.

The accompanying drawings illustrate the invention.

Figure 1 is a semidiagrammatic view of an aeroplane constructed in accordance with this invention. Fig. 2 is a fragmental diagrammatic plan view of the tail ailerons and rudder. Fig. 3 is an enlarged fragmental sectinal view on the line 3—3, Fig. 2, showing the aileron tail elevators in neutral position and also indicating by arrows the course of the air from the lifting wings through the ailerons, parts shown semidiagrammatically. Fig. 4 is a plan view of a side aileron, its its support and operating means. Fig. 5 is a fragmental plan view of the support shown

in Fig. 4 with the aileron removed, showing the rack and pinion for automatically actuating the aileron elevator. Fig. 6 is an enlarged cross section through one of the ailerons showing the means for actuating its associated elevator. Fig. 7 is an end view of the aileron shown in Figs. 4 and 6, showing altered positions of the aileron elevator. Fig. 8 is a diagrammatic rear view of the aeroplane showing the side ailerons in neutral position. Fig. 9 is an enlarged fragmental rear view analogous to that shown in Fig. 8, showing the side ailerons shifted toward the right so that all the air thrust is on the right hand aileron and not on the left. Fig. 10 is a view analogous to Fig. 9 showing the side ailerons in a reverse position, and Fig. 11 is a fragmental vertical section through the body of the aeroplane showing the means for driving the lifting wings in reverse directions.

The aeroplane includes the usual body 10 with a nose and tail end, landing wheels 11, skid 12, rudder 13 and navigating propeller 14, it being understood that the propeller 14 is driven by a usual aeroplane engine, not shown.

Mounted on the top and secured to the body 10 is an extension 15 that supports the lifting wings 16, 17. These wings are driven in opposite directions to prevent spinning the body 10 as well as for the purpose of aiding in stabilizing the aeroplane.

As indicated in Fig. 11, the wing 16 is mounted on the upper end of the hollow shaft 18 that is supported in the bearings 19 and 20; and a bevel gear 21 is secured to the lower end of the shaft 18 that is driven by a bevel gear 22 on the engine shaft 23, it being understood that there is a separate engine for driving the wings 16, 17.

The wing 17 is secured to the upper end of a shaft 24 that extends up through the shaft 18. This shaft is supported in the bearings 25, 26 and has a bevel gear 27 arranged oppositely to the gear 21 that also meshes with the gear 22 so that when the shaft 23 is driven the wings 16 and 17 will be rotated in opposite directions.

Each of the wings 16 and 17 is preferably provided with four wings or blades, but there can be more or less if so desired.

Each blade is formed with a heavy hub portion from which the blade extends to its tip end in varying pitch angles, curves and cambers such as have been found in practice to give the greatest lifting power possible. The contour, pitch angles and the like are old and well understood in the art and are therefore not shown or described in detail.

As stated, the lifting wings are arranged and driven in opposite directions for the purpose of compounding the downward thrust on the air. That is, the air displaced by the wing 17 is again acted upon by the wing 16 so that the greatest lifting power is developed.

The great downward thrust on the air, in addition to lifting the aeroplane in vertical lines, is also utilized to stabilize it.

Attached to the tail end of the body is a rudder group including the rudder 13 and troughs 28, 29 that are arranged so that a portion of the down thrust air from the wings 16, 17 will enter the open inlet ends 30, 31 of the troughs and be deflected rearward to the open discharge ends 32, 33 adjacent to which a pair of elevators 34, 35 are pivotally mounted on a rod 36.

The elevators are mounted and arranged so they can be held in a neutral position, as shown in Fig. 3; and so they can be moved to the dotted position *a* to elevate the nose of the aeroplane or to the position *b* to turn the nose downward, or to any intermediate position between the positions *a* and *b*.

When the elevators are moved to the position *a* their noses will engage the floor of the tail group and thereby cause all of the thrust air to pass out above the elevators, which will cause the forward end of the aeroplane to be lifted upward into an ascending position; and when the elevators are lowered to the position *b* the thrust air is driven out under them which will cause the aeroplane to tilt downward into a descending position.

The elevators are operated by a stick control located in the cock pit handy to the pilot. This stick control is well known in the art and therefore is not shown or described in detail.

The stick control is connected by wires 37, 38 with the arms 39, 40 secured to the elevators 34, 35 so that when desired the pilot can raise or lower them.

The tail of the aeroplane is provided with the usual rudder 13 that is also operated in the usual way to guide the aeroplane laterally. Side ailerons 41 and 42 are slidably mounted on bars 43—44 that have their inner ends secured to the extension 15 and which extend laterally to the body 10. The bars are braced by supports 45, 46, that extend from the wheel frame 47 to the bars.

The side ailerons 41, 42 are constructed, as best shown in Figs. 4 to 7, inclusive, and they are operated as best illustrated in Figs. 8 to 10 inclusive. As seen in the former figures the ailerons are provided with transverse openings through which the outer ends of the bars 43, 44 extend and on which they are slidable toward the ends of the bars or toward the extension 15 on the body of the aeroplane.

The ailerons are moved by means of cords 49, 50 that are attached to arms 51, 52 that are secured to the ailerons on the top side and at opposite edges.

The cords 49, 50 extend over proper guides or pulleys 53 to the stick control in the cock pit and are arranged so that when the cords 49 are pulled in the cords 50 will be played out and vice versa.

When the cords 49 are drawn in the side ailerons will be moved inwardly and vice versa. However, these cords are arranged to be actuated reversely to one another. That is when the cord 49 of the right hand aileron is actuated inwardly the cord 49 to the left hand aileron is played out and its cord 50 drawn in. In other words the cords are arranged so that when the right hand aileron is moved inwardly the left hand aileron is moved outwardly and vice versa.

The side ailerons 41, 42 are each provided with an integral extension 54 that is substantially the same length and general form as its associated elevator 55 except that the extension is only about one-third the width of the elevator. These extensions are to increase the area of the ailerons that are more directly affected by the air thrust from the wings 16, 17. That is when a side aileron is shifted to a position in which it will be affected by the air thrust the force will be distributed over the inner surface of the aileron, including its integral extension.

The elevators 55 are secured by strap hinges 56 and a rod 57 to their respective ailerons and are arranged so that when the ailerons are moved inwardly the elevators are raised to aid in lateral stabilization of the aeroplane and when the ailerons are moved outward the elevators are tilted downward to also aid in lateral stabilization.

This tilting of the side elevators 55 is accomplished automatically. That is upper and lower arms 58, 59 are secured to the upper and lower side of the elevators and cords 60, 61 connect these arms to pulleys 62, 63 secured to shaft 64 that are attached to their respective ailerons.

The ends of the bars 43, 44 are recessed at 65 and provided with elongated slots 66 through which the shafts 64 are extended and in which the shafts move when the ailerons are reciprocated.

Rack bars 67 are secured in the recesses 65 and arranged to engage pinions 68 secured to the shaft 64 so that when the ailerons are reciprocated or slid along the bars 43, 44 the pinions 68 will be turned to actuate the pulleys 62 and 63 and thereby wind up one or the other of the cords 60, 61 and play out the other to move the elevators 55 either up or down.

The pulleys 62 and 63 are arranged so that when the ailerons are moved inwardly the cords 60 will be wound up to raise the elevators, and when moved in the reverse direction the elevators will be lowered.

Guides 69 on supports 70 are provided for holding the cords 60, 61 so they will wind and unwind on their respective pulleys.

In operation the wings 16, 17 are driven to raise the aeroplane vertically and also when desired to permit it to descend in the same way but gently and gradually. In other words when an ascension is to be made the lifting wings are driven at a relatively high speed to cause the aeroplane to quickly rise vertically to any desired height, after which the speed is greatly reduced or to a speed that will not fully overcome gravity and by means of increasing or decreasing the speed of the lifting wings the descent can be made as slow or quickly as desired.

After the aeroplane has reached a desired navigating altitude the forward or navigating propeller 14 is actuated to propel the aeroplane.

After the propeller 14 is put in action the speed of the lifting wings can be slightly reduced and driven for the purpose of stabilization, which, as previously indicated, is accomplished by a proper manipulation of the side ailerons and rudder group in cooperation with the lifting wings.

I claim as my invention:

1. In an aeroplane the combination of a body having a nose and a tail and a pair of lifting wings mounted on said body that are arranged to rotate in reverse directions, a rudder group attached to the tail end of said body, troughs in said group having inlet and discharge ends, elevators pivotally connected to the discharge ends of said troughs, means for driving said wings so as to lift said body vertically and also drive air through said troughs, and means for moving said elevators so that the air driven through said troughs will raise or lower the nose of said aeroplane to balance it relative to horizontal lines in navigation.

2. In an aeroplane the combination of a body having a nose and a tail end, a pair of lifting wings mounted on said body, a rudder group connected to the tail end of said body, troughs in said group having inlet and discharge ends, elevators pivotally connected to the discharge ends of said troughs, means for driving said wings in opposite directions to lift said aeroplanes vertically and also drive air into said troughs so it will discharge out over or under said elevators, means for actuating said elevators so as to control the aeroplane relative to horizontal lines in navigation, and a rudder arranged between said elevators for controlling said aeroplane relative to lateral courses in navigation, and other means for maintaining the equilibrium of said aeroplane relative to side tilting.

3. In an aeroplane the combination of a body having a nose and a tail and a pair of lifting wings mounted on said body that are arranged to rotate in reverse direction, a rudder group attached to the tail end of said body, troughs in said group having inlet and discharge ends, elevators pivotally connected to the discharge ends of said troughs, means for driving said wings so as to lift said body vertically and also drive air through said troughs, and means for moving said elevators

so that the air driven through said troughs will raise or lower the nose of said aeroplane to balance it relative to horizontal lines in navigation, and side ailerons carried by said aeroplane that are adjustable toward or from the vertical axis of said lifting wings for the purpose of stabilizing said aeroplane.

4. In an aeroplane the combination of a body having a nose and tail end, a pair of lifting wings mounted on said body, a rudder group connected to the tail end of said body, troughs in said group having inlet and discharge ends, elevators pivotally connected to the discharge ends of said troughs, means for driving said wings in opposite directions to lift said aeroplane vertically and also drive air into said troughs so it will discharge out over or under said elevators, means for actuating said elevators so as to control the aeroplane relative to horizontal lines in navigation, a rudder arranged between said elevators for controlling said aeroplane relative to lateral courses in navigation, and other means for maintaining the equilibrium of said aeroplane relative to side tilting, and a nose to each elevator that is arranged to control the air at the discharge ends of said rudder group.

5. In an aeroplane the combination of a body, wings arranged above and attached to said body that are adapted to be actuated to lift said body in a vertical line, ailerons arranged on opposite sides of said body and adjacent the tip ends of said wings, an operative connection between said ailerons adapted to be operated by the pilot so that as one aileron is moved into the air thrust of said wings the other aileron is proportionately moved out of it so as to maintain the side equilibrium of said aeroplane, and means secured to the tail of said aeroplane for maintaining the equilibrium of said aeroplane relative to horizontal lines in navigation, and elevators pivotally connected to said ailerons for stabilizing said aeroplane.

6. In an aeroplane the combination of a body, wings arranged above and attached to said body that are adapted to be actuated to lift said body in a vertical line, ailerons arranged on opposite sides of said body and adjacent the tip ends of said wings, an operative connection between said ailerons adapted to be operated by the pilot so that as one aileron is moved into the air thrust of said wings the other aileron is proportionately moved out of it so as to maintain the side equilibrium of said aeroplane, and mean secured to the tail of said aeroplane for maintaining the equilibrium of said aeroplane relative to horizontal lines in navigation, and elevators pivotally connected to said ailerons, and automatic means for actuating said elevators when said ailerons are moved transversely to said body.

7. In an aeroplane the combination of a body, wings arranged above and attached to said body that are adapted to lift said body in a vertical line, bars extending transversely to said body that are connected thereto, ailerons slidably mounted on said bars and arranged on opposite sides of said body, means for reversely moving said ailerons toward or from said body so that when one is in the air thrust from said wings the other is out of it for lateral stabilization of the aeroplane, and other means for horizontal stabilization of said aeroplane.

8. In an aeroplane the combination of a body, wings arranged above and attached to said body that are adapted to lift said body in a vertical line, bars extending transversely to said body that are connected thereto, ailerons slidably mounted on said bars and arranged on opposite sides of said body, means for reversely moving said ailerons toward or from said body so that when one is in the air thrust from said wings the other is out of it for lateral stabilization of the aeroplane, other means for horizontal stabilization of said aeroplane, and elevators pivotally connected to said ailerons.

9. In an aeroplane the combination of a body, wings arranged above and attached to said body that are adapted to lift said body in a vertical line, bars extending transversely to said body that are connected thereto, ailerons slidably mounted on said bars and arranged on opposite sides of said body, means for reversely moving said ailerons toward or from said body so that when one is in the air thrust from said wings the other is out of it for lateral stabilization of the aeroplane, and other means for lateral stabilization of the aeroplane, other means for horizontal stabilization of said aeroplane, and elevators pivotally connected when said ailerons are moved toward or from said body.

10. In an aeroplane the combination of a body, wings arranged above and attached to said body that are adapted to lift said body in a vertical line, bars extending transversely to said body that are connected thereto, ailerons slidably mounted on said bars and arranged on opposite sides of said body, means for reversely moving said ailerons toward or from said body so that when one is in the air thrust from said wings the other is out of it for lateral stabilization of the aeroplane, other means for horizontal stabilization of said aeroplane, and elevators pivotally connected to said ailerons, racks secured to said bars, pinions mounted on said ailerons that are engaged by said racks, and a connection between said pinions and elevators whereby the elevators are moved when said ailerons are slid on said bars toward or from said body.

11. In an aeroplane the combination of a body, wings arranged above and attached to said body that are adapted to lift said body in a vertical line, bars extending transversely to

said body that are connected thereto, ailerons slidably mounted on said bars and arranged on opposite sides of said body, means for reversely moving said ailerons toward or from said body so that when one is in the air thrust from said wings the other is out of it for lateral stabilization of the aeroplane, other means for horizontal stabilization of the aeroplane, and a propeller for navigating said aeroplane when it has been lifted by said wings.

In witness whereof, I have hereunto affixed my signature.

VALENTINE NEWBAUER.