

March 31, 1931.

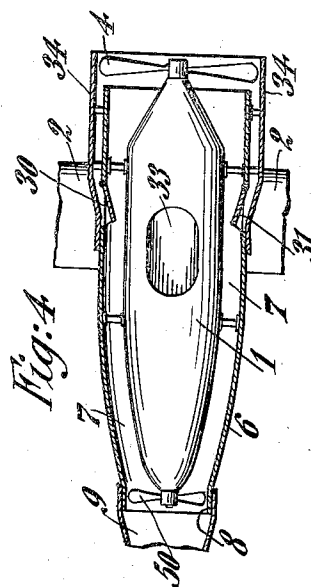
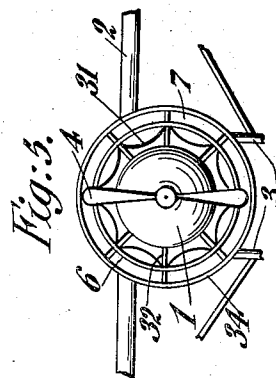
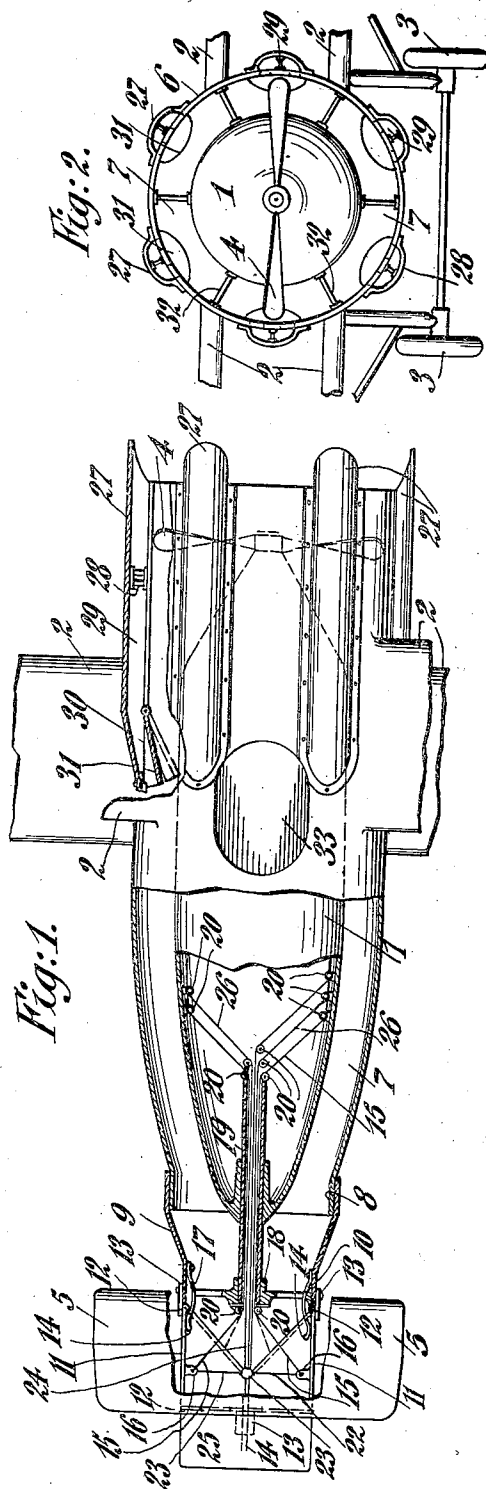
R. CHILLINGWORTH

1,798,141

AEROPLANE

Original Filed Sept. 26, 1927

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig:3.

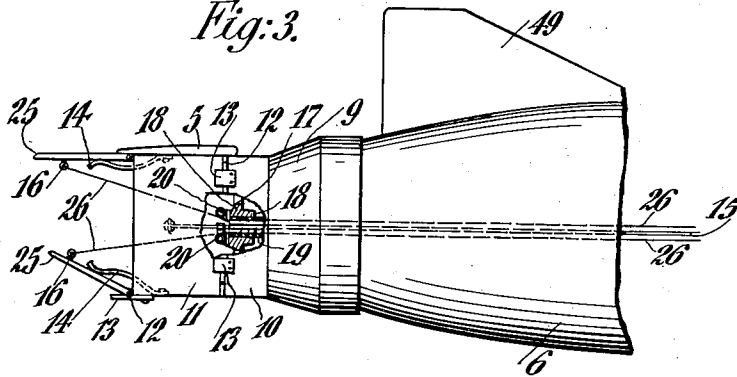


Fig:6.

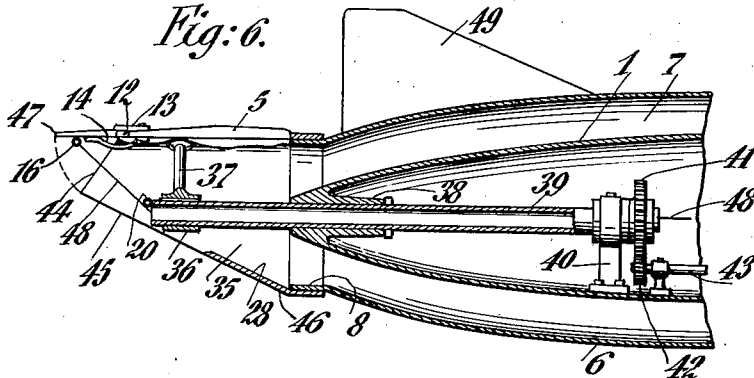
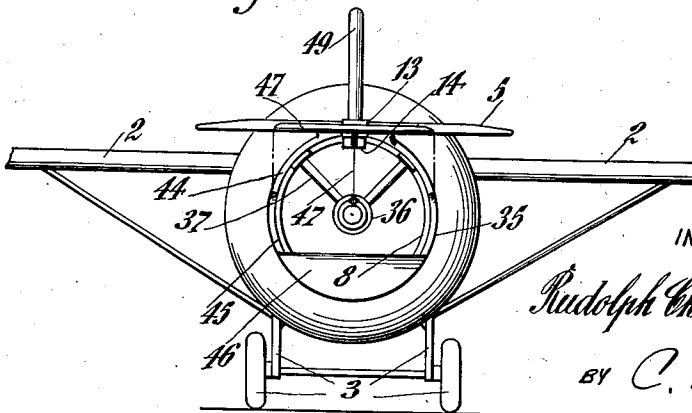


Fig:7.



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AEROPLANE

Original application filed September 26, 1927, Serial No. 221,877. Divided and this application filed April 29, 1929. Serial No. 358,813.

My invention relates to improvements in aeroplanes, and particularly to apparatus for controlling the aeroplane in landing, and the direction of the aeroplane when in flight.

5 An object of the invention is to provide an aeroplane having means for making a landing safely and easily, especially when the aeroplane has been traveling at high speed and the aviator desires to alight.

10 Another object of the invention is to provide apparatus mounted upon the aeroplane for facilitating steering either to the right or left, horizontally; or for the purpose of ascending or descending; said apparatus being easily operated and being adapted also to assist in the control of the aeroplane when a landing is to be made.

Other objects and advantages of this invention are set forth in the following description, taken with the accompanying drawings; and the novel features thereof are pointed out in the appended claims. The disclosure, however, is illustrative only and I may make changes in details, especially in matters of shape, size and arrangement of parts within the principle of the invention, to the full extent indicated by the broad and general meanings of the terms in which the appended claims are expressed.

30 On the drawings,—

Figure 1 is a top plan partly in section of the structure of an aeroplane showing how my invention is put into practice;

35 Fig. 2 is a front view of such an aeroplane; Fig. 3 is a side view of the rear end thereof;

Figs. 4 and 5 are views similar to Figs. 1 and 2 respectively, showing a modification;

40 Fig. 6 is a longitudinal sectional view of the rear part of an aeroplane showing a further modification, and

Fig. 7 is an elevation seen from the left of Fig. 6.

On the drawings the same numerals identify the same parts throughout.

45 I employ the numeral 1 to indicate the body or fuselage of an aeroplane which, in the form shown in Figs. 1, 2 and 3, is illustrated as a biplane having wings 2.

50 Beneath the body are the usual wheel supports 3 and at the front of the fuselage 1 is

mounted the rotatable propeller 4. Auxiliary wings 5 may be carried adjacent the extremity of the tail of the plane on each side thereof.

The body 1 is enveloped by an air tube 6 55 which forms means for enclosing a space surrounding the fuselage 1, providing an air channel 7. This channel may extend all around the fuselage and the tube 6 projects far enough in front of the aeroplane to have 60 the propeller 4 mounted just within the end of same as shown in Fig. 1. This tube is open in front and rear and it terminates adjacent the rear end of the body 1 in a boss or flange 8 upon which is telescopically mounted 65 an extension 9. The body 1, tube 6 and extension 9 may all be round; except that, from the point where the extension 9 is mounted upon the rear end of the tube 6 this extension is cone shaped and terminates in a square section 10. This extension 9 is of course secured 70 in any feasible manner to the tube 6 and in ordinary operation when the propeller is in rotation air acted upon by the propeller can be forced through the annular channel 7 and out through the open rear end of the extension 9. 75

The top and bottom of the extension 9 are continuous and closed but the sides of this extension are of less length than the top and bottom and terminate short of the rear end of the extension, leaving openings which can be controlled by pivotally mounted clack valves or gates 11. There will be one of these gates or shutters at each side of the extension 85 mounted upon hinges 12 secured to the sides of the extension 9 and on the outside of the extension 10 adjacent to the hinges 12 I secure stops 13 to the sides of the extension 10 so that these gates 11 cannot move outwardly any further when they become parallel with the longitudinal axis of the aeroplane. Thus these gates, while free to move inward cannot move outward except to the extent which the stops 13 permit. Their inward movement is opposed by strong springs 14 fixed to the inside of the extension 9 and pressing upon each gate 11 to force these gates normally outward against the stops 13. 90 To move these gates inward, I attach to each 100

gate a wire 15 by means of a suitable eyelet fastener 16 and the cords or wires of course, pass forward into the fuselage to suitable devices such as levers, within reach of the aviator. I have shown at 17 in the square section 10 of the extension 9, a ring or frame connected by rods or spokes to a central bearing 18 in which is mounted a tubular guide 19 which passes forward through the rear end of the body 1; and the cords 15 attached to each gate 11 engage suitable grooved wheels or idler pulleys 20 mounted at the ends of this guide 19, and from the inner end of this guide they pass to similar guide pulleys 20 at each side of the machine and then forward.

From the foregoing description, it will be clear that if the gate on the left hand side of the machine is closed or partly closed, while the gate on the right hand side is fully open the aeroplane can be caused to veer to the right because the closed or partly closed gate 11 in moving to the right as its cord or wire 15 is pulled, acts as a rudder to turn the machine accordingly. If the gate 11 at the right is moved towards closed position while the gate at the left remains open, the machine can be turned in the opposite direction. I also attach to the fasteners 16 cords or wires 22 leading to a central ring 23 from which a cord or wire 24 passes forward through the guide 19 so that when the cord or wire 24 is pulled both gates will move simultaneously inward until their free ends engage and thus the channel 7 will be obstructed because air cannot then flow through the extension 9. When either cord 15 is pulled the cord 22 associated with the gate thereof merely slackens between the fastener 16 and the ring 23 and when the cord or wire 24 is pulled, the ends of the cords 15 adjacent the gates 11 become slack. To prevent the slack wires from becoming disengaged from the groove pulleys 20, eyelet guides for the wires may be mounted adjacent each pulley.

Along the rear edges of the top and bottom of the extension 9, I attach by hinges clack valves or deflectors 25. The hinges for these parts are the same as the above mentioned hinges 12 and stops are also provided on the top and bottom of the extension to prevent these deflectors or rudders from moving beyond parallelism with the top and bottom of the extension 9. At the bottom there may be a stop 13 as above described, while on top the rear edge of the tail wings 5 may project enough to serve as a stop. See Figures 1 and 3. Similar springs 14 also are mounted inside the extension 9 secured to the inner faces of the top and bottom and engaging the rudders 25 to hold them normally against their stops 13. I attach to each of these rudders eyelet fasteners 16 and to these fasteners 16 are secured cords or

wires 26 which are led to guide pulleys 20 and into the guide 19 and out of same over similarly guide pulleys to controlling parts or levers within the aviator's reach. The deflectors 25 are for vertical steering to make the aeroplane ascend or descend. In the position shown in Fig. 3, the lower rudder is in position to make the aeroplane rise higher; while if the lower rudder 25 is permitted to open fully and the upper rudder pulled down slightly the machine can descend.

The front end of the tube 6 is provided with a number of hollow ribs 27 attached to the outside and containing spacing members 28. These ribs extend beyond the front end of the tube 6 and form air ways or channels 29 through which air can flow into the annular channel 7, through ports 30 at the rear ends of the hollow ribs 27. These ports may be controlled by one way valves 31 pivoted at their forward edges. Normally, when the machine is in flight the air from the propeller is driven backward through the interior of the tube 6 and the valves 31 will be kept shut. At times, however, as will be described herein more fully, these valves 31 may open so that air in the tube 6 may flow out through the channels 29.

From this description it will be clear that when the machine is flying the direction of it can be controlled and the aeroplane can be caused to move either to one side or another or to rise in the air or go down, by the proper manipulation of the parts controlling the rudders 11 and 25. So long as the annular air channel is open or partly open at the rear end so that air can flow out through the extension 9 past the vertical and horizontal rudders carried thereby, the air drawn by the propeller 4 will flow through the jacket 6 directly and the valves 31 will be kept closed by the pressure of air flowing past them. When, however, the aviator wishes to make a landing and pulls upon the wires 15 which draws the gates 11 into position to close the extension 9, air entering the front end of this jacket and passing by the propeller 4 will be trapped in the channel 7 and will retard the flight of the aeroplane and slow it down until a speed safe for landing is reached. This effect will be obtained if the engine is allowed to rotate at undiminished speed, and especially if the engine be kept running; because then air which is driven in by the propeller through the open front end of the tube 6 to the space or channel 7 can flow around the valves 31 and out by way of the channels 29. The speed of the aeroplane can thus be reduced very materially before the ground is reached and the danger in making the landing obviated.

The tube is secured to the fuselage 1 in any suitable manner as by means of braces 32 inside and it envelops the body except for the cockpit 33 containing the aviator's seat

which may open through the top of the tube 6.

In the form shown in Figs. 4 and 5, the construction is similar except that in place of hollow ribs 27 the front end of the tube 6 is enveloped by a continuous cylindrical section 34 of larger diameter. This section being tapered at its end remote from the propeller and thus secured to the outside of the tube 6 all around the circumference thereof. Adjacent the inner end of this section 34 are ports 30 as in Fig. 4, controlled by one way opening valves 31. The operation of this form is the same as described above in connection with the first form.

In Figs. 6 and 7 the tube 6 is provided with a flange or rim 8 at its open end as before, and mounted thereon is an extension 35 which is cylindrical and may carry the tail supporting planes 5. This extension carries within it a bearing 36 mounted by means of supporting rods 37 and through this bearing and a similar bearing 38 at the rear end of the fuselage 1 passes a hollow shaft and guide 39 mounted in a bearing 40 within the fuselage 1. Adjacent the bearing this hollow shaft 39 carries a gear wheel 41 which engages a gear wheel 42 on a shaft 43, rotatably mounted in any suitable manner in the fuselage 1 and extending forward to a hand wheel controlled by the aviator. At its outer end the extension or member 35 is cut to provide a diagonal edge 44 which extends from the top downward and another diagonal edge 45 which extends from the lower ends of the edge 44 diagonally downward and forward. The lower part of the extension 35 is partly closed by a portion 46. Between the rear edge of this portion 46 and the top, the extension 35 is open and to the rear end of the top is pivoted a rudder 47 mounted on hinge 12. A stop 13 limits the opening movement of this rudder and a spring 14 secured inside the extension 35 normally holds the rudder in open position. Attached to the rudder is an eyelet fastener 16 from which a cord or wire 48 attached to the fastener passes over a pulley 20 at the rear end of the shaft 39 and through this shaft to a point near the aviator's seat. With this construction the steering is all done with the rudder 47, whether sidewise or up or down. In the position shown in Fig. 6 if the rudder 47 is pulled down the aeroplane will descend. To make it ascend, the shaft 43 is operated to rotate the extension through 180° so that the air passing through the extension and striking the rudder 47 can then depress the tail of the aeroplane. To make the rudder answer for steering to the right or left, the shaft 43 is rotated to turn the shaft 39 and extension 35 through 90° in the proper direction.

Of course, the aeroplane may have a tail fin 49 thereon, if desired.

The invention may be practiced in connection with either biplanes as shown in Figs.

1, 2 and 3 or monoplanes as shown in Figs. 4, 6 and 7.

As will be now understood, the invention is quite simple in its construction, but nevertheless will operate very effectively to control the direction of the machine in flight and to check its velocity for landing purposes.

The shape of the fuselage 1 and tube 6 may be parabolic or conic or any other as conditions of design may require.

The invention operates best for landing purposes when the propeller is not stopped. As soon as the rear end of the tube is closed by operating both gate valves 11 the force of the air current directed rearward through the annular channel 7 reduces the speed of the machine and the obstructed air is forced to reverse in the channel 7 and flows forward and out by way of the channels in the hollow ribs 27 or the channel between the tube 6 and section 34; thus in effect pushing back on the machine and bringing its speed down to the point where landing is not dangerous.

Both the fuselage 1 and the tube 6 are preferably given a stream-like shape; that is, they taper from front to back in such a manner that the resistance of the air is decreased, and thus the speed of the machine can be increased by the propeller 4. This stream-line shape is adapted for all forms of the invention shown herein.

The propelling means for driving the aeroplane may comprise a single propeller 4 as above described, mounted in front, or this propeller 4 and an extra propeller such as illustrated in Figure 4, mounted at the rear end of the fuselage 1. The engine or engines for the propelling means can be placed in any suitable position to drive the propelling means and connected thereto in any suitable way. When the propeller 50 is present, the cords or wires leading from the rudders 11 and 24 may be passed through guides around the inner surface of the tube 6, so that they will not interfere with the rotation of this propeller. In some instances, the extra propeller might even be mounted on the guide 19 and connected to the engine to be rotated by gearing.

The propeller may be of different pitch with respect to the propeller 4 or it may be of the same pitch and be rotated at a different speed. The purpose of the propelling means which drives the air through the space 7 is to force the air out through the rear in sufficient volume and under sufficient compression and any arrangement or number of propellers which produces this result can be employed. The air flowing through the space 7 not only steers the aeroplane when acted upon by the rudders at the rear and stops the aeroplane when landing, but it also as it is discharged from the rear end of the tube 6 forms a relatively dense, continuous compact column which extends out for some

extent beyond the rear of the aeroplane. This column aids in supporting the aeroplane and obviates the consequences which might otherwise ensue from side currents and air pockets; in the manner set forth in my copending application Serial No. 204,489, filed July 9, 1927.

The ribs 27 may project beyond the tube 6 in front or terminate flush therewith or even back of the front of the tube 6.

I may if desired make the top and bottom of the square section 10 of the extension 9 triangular, the edges of the top and bottom meeting in a point at the middle of this square section above and below the ring 23, as indicated in Figure 1, and the diagonal rear edges of the top and bottom will engage the upper and lower edges of the gates 11 when these gates are pulled by the wires 15 as far as these gates can move inward.

Instead of a wire 24 attached to the ring 23, I may of course use a rigid rod extending through guides in the part 19, so that when this rod is pulled the two wires 22 will be operated to move the gates 11 inwardly simultaneously. The advantages of the tube 6 are the same as set forth in my copending allowed case No. 719,480 for aeroplanes, filed June 12, 1924.

This is a division of my patent application Serial No. 221,877 of September 26, 1927, on aeroplanes.

I claim:

1. In an aeroplane, comprising in combination with an aeroplane body having a longitudinal air channel for conducting and delivering a flow of air at the rear of the body, a hollow extension supported to the body for receiving the flow of air from the air channel and having an outlet, said extension extending rearwardly from the rear end of the body and being supported for turning movement relatively to the body, tail planes projecting from the extension and therewith movable, a rudder on the extension at the rear of the tail planes, arranged to operate against the air moving to escape the outlet, and means for operating the rudder independently of the turning movement of the extension.

2. In an aeroplane, embodying a fuselage with propelling means and a tube enveloping the same so as to provide an air channel leading to the rear of the aeroplane for the flow to the rear of the aeroplane of the air current created by the propelling means, a hollow extension turnably fitted at its forward end on the rear of the tube to receive the flow of air therefrom, said extension extending rearwardly well beyond the rear ends of the fuselage and tube and having an air outlet, a rotatable shaft carried by the fuselage, extending into the extension and supporting the extension for rotation with the shaft, a swingable rudder carried by the extension and operable in relation to the outlet

to act on the air at the outlet, and means for swinging the rudder independently of the rotary movement of the extension with the rotary shaft.

3. In an aeroplane, embodying a fuselage with propelling means and a tube enveloping the same so as to provide an air channel leading to the rear of the aeroplane for the flow to the rear of the aeroplane of the air current created by the propelling means, a hollow extension turnably fitting at its forward end on the rear of the tube to receive the flow of air therefrom, said extension extending rearwardly well beyond the rear ends of the fuselage and tube and having an air outlet, rotatable means on the fuselage extending into the extension and supporting the extension for bodily turning movement relatively to the fuselage and tube, a swingable rudder carried by the extension and operable against the air moving for escape at the outlet, spring means for maintaining the rudder in open relation to the outlet, and means for swinging the rudder independently of the rotary movement of the extension and against the action of the spring means in closed relation to the outlet.

In testimony that I claim the foregoing as my invention, I have signed my name hereto.

RUDOLPH CHILLINGWORTH.