

Nov. 6, 1934.

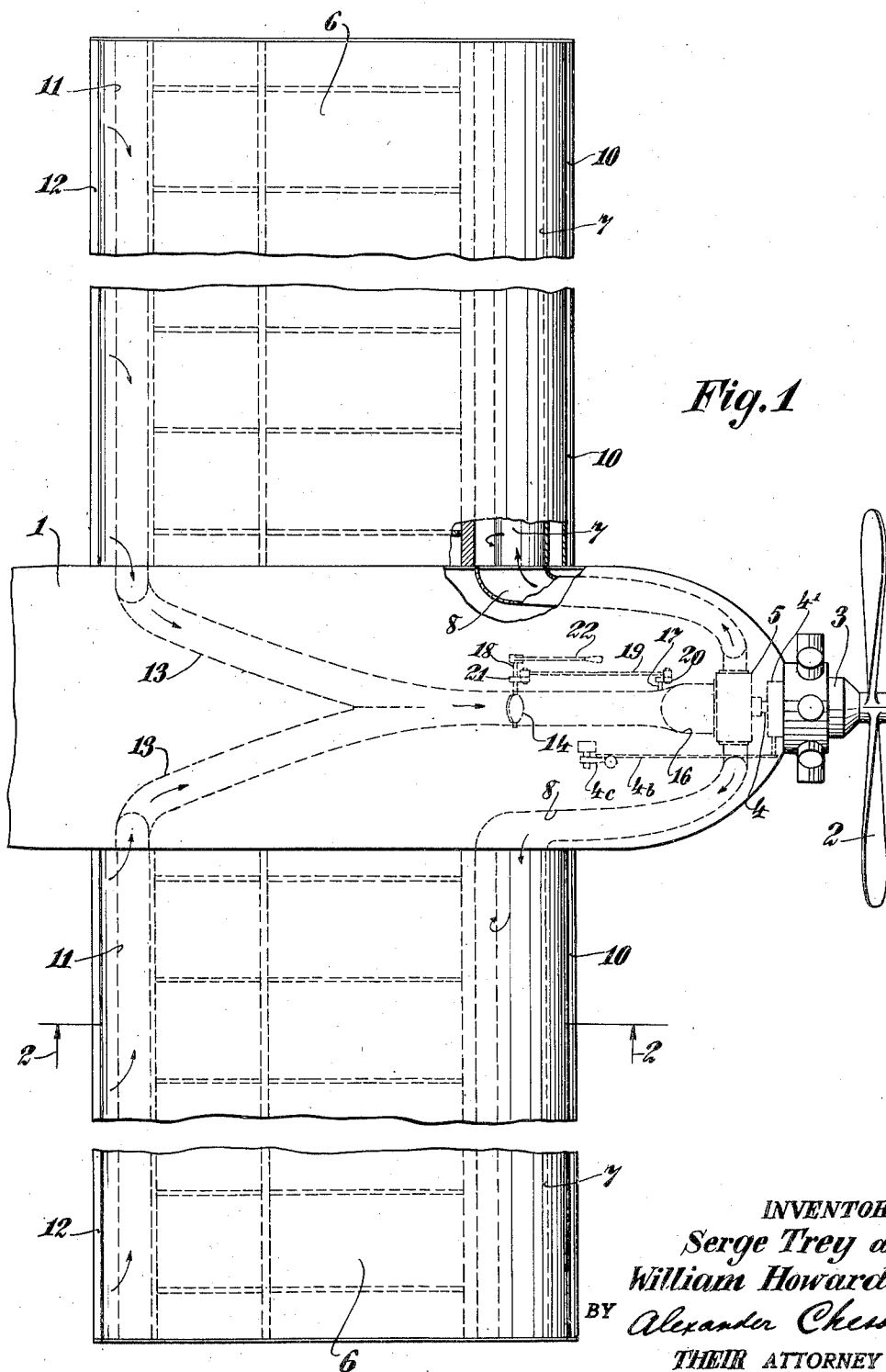
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AEROPLANE WING

Original Filed Aug. 21, 1931

2 Sheets-Sheet 1



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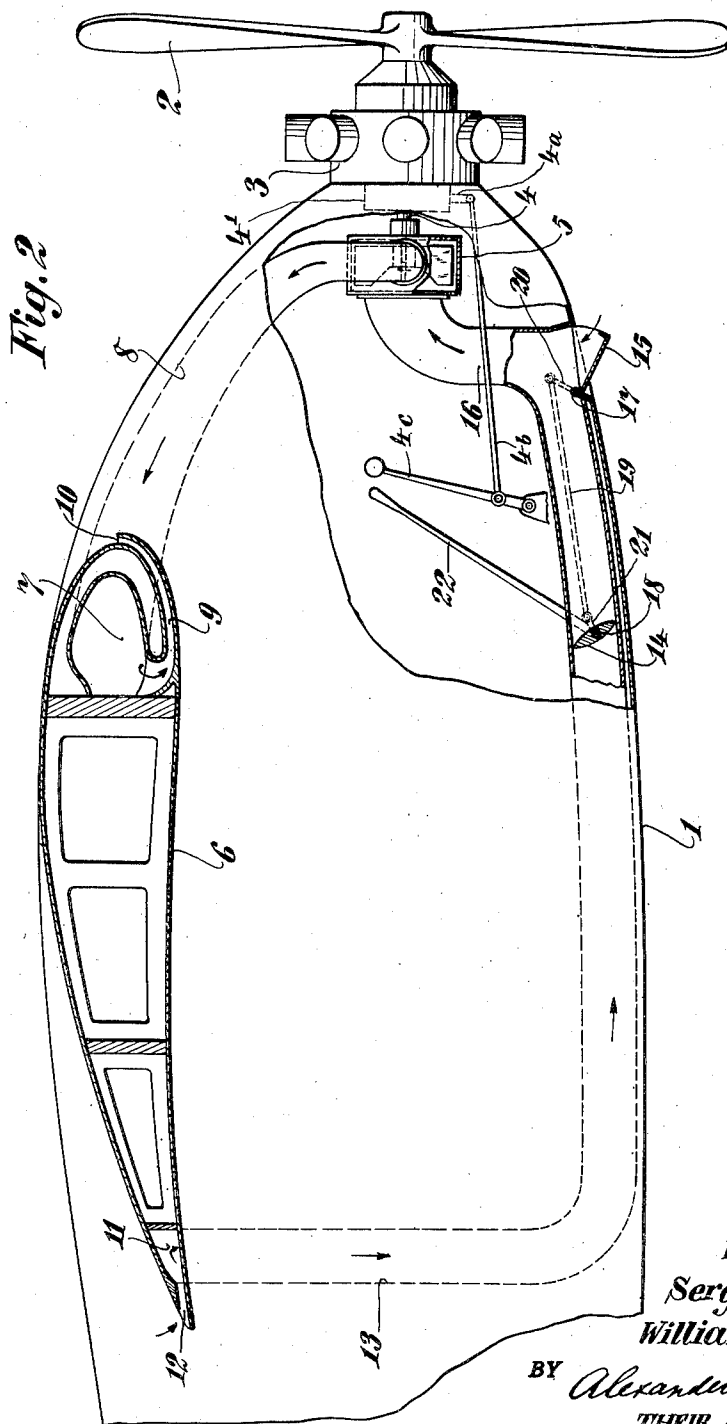
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UNITED STATES PATENT OFFICE

1,979,298

AEROPLANE WING

Serge Trey and William Howard, College Point,
N. Y.Application August 21, 1931, Serial No. 558,534
Renewed February 2, 1934

20 Claims. (Cl. 244—12)

Our invention relates to aerofoils and, more particularly, to the wing of an aeroplane provided with a generator for directing a stream of air to the leading edge of the wing.

5 The invention is designed (1) to effect more favorable aerodynamic conditions in the neighborhood of the aerofoil, (2) to increase the lifting capacity of the wing, and (3) to decrease the drag, or even to cause a negative drag to take place, thus creating a force of propulsion; all of which effects tend to increase the general efficiency of the aerofoil.

10 The invention is further designed to reduce the landing speed of an aeroplane by simultaneously increasing the lift and the drag.

Other purposes of the invention will become apparent from the description which follows.

15 In the drawings, Figure 1 is a top view of an aeroplane embodying our invention, partly shown in section. Figure 2 is a cross section of the same aeroplane taken along the line 2—2 of Figure 1, a portion of the fuselage being broken off to more clearly disclose the arrangements of the device.

20 Referring to the figures in detail, 1 is the fuselage of the aeroplane; 2 is the propeller operated by the engine 3. To the engine frame is attached a gear box 4', from which extends the shaft 4 upon which is mounted a centrifugal blower 5, it being understood that the shafts of the propeller 2 and of the centrifugal blower 5 are connected by suitable gears arranged within the gear box 4'. These gears may be shifted by means of the handle 4^c through a suitable linkage 4^a—4^b. The wing 6 of the aeroplane has a hollow space 7 at the forward end, connected to the blower 5 by means of a duct 8. From this hollow space 7 a channel 9 leads to the opening 10 which thus forms an open end of the passage way or duct 8—9. The opening 10 is preferably located at the intersection of the median surface of the wing with the leading edge thereof, or close to it, above or below. An air port 15, shown in the figure as a scoop adapted to be swung open or shut, thus constituting an inlet air valve, for admitting air to the blower 5, is connected with the blower 5 by the passage way or duct 16. A hollow space 11 at the trailing edge of the wing 6, provided with a suction port 12, connects with the blower 5 by means of the passage ways 13 and 16. A valve 14 operates to close or open the passage way 13. The valve 15 swings on a pivot 17; the valve 14, on a pivot 18. The two valves are connected by the linkage 19—20—21 and are operated by means of a handle 22. When the

valve 14 is closed, the valve 15 is open, and vice-versa. For intermediate positions, both valves are partially open.

During flight, the valve 15 is open, admitting air to the blower 5 which throws an air stream 30 into the hollow space 7 through the duct 8. From the space 7, the air is expelled through the ports 10 along the leading edge of the wing 6. The ports 10 may extend the entire span of the wing, or only a portion thereof. The velocity of the air jet through the ports 10 is regulated by shifting the gears in the gear box 4'. While a centrifugal blower is shown in the drawings, it is to be understood that it serves merely as an illustration and that any generator for producing a stream of air in the described manner may be used in connection with the present invention. Likewise, controlling the speed of the air jet may be effected in other ways than the one illustrated here to show a concrete example only, 75 or a separate engine may be provided for energizing the blower at a variable speed, independently of the propeller speed.

Without going into the theory of the device in detail, it may be said that the effect of the upward jet of air along the leading edge of the aerofoil, as shown, is twofold: (1) it serves to correct the unfavorable aerodynamic conditions obtaining in wings devoid of the present invention by relieving the pressure on the forward end of the wing, and (2) it acts to diminish the inclination from the vertical of the resultant force to which the sustaining power of the aeroplane is due, thereby increasing the lift component and, at the same time, creating a negative drag component which, in absolute amount, may be less than, equal to, or greater than the positive drag component present in wings devoid of the shown arrangement for air jets. When the negative drag component thus created is greater, in absolute amount, than the positive drag existing without the air jet, the total, or resultant, drag is negative, i. e. a force of propulsion is created.

On landing, the valve 15 is gradually closed, while, at the same time, opening the valve 14. Air is then sucked in at the trailing edge of the wing and delivered to the blower, the jet at the leading edge operating as before. One effect is that the lift is increased owing to the absorption of the eddy currents always present at the trailing edge in standard design wings, and another effect is that a force in the direction of flight, equivalent to a positive drag on the wing, is created, thereby slowing down the speed of the aeroplane, while, at the same time, the loss of lifting 110

power due to the reduced speed of the aeroplane is compensated by the increase in lift due to the first effect.

All of the above results have been checked up and fully substantiated in a series of comprehensive tests conducted in a wing tunnel in the city of New York.

We claim:

1. The combination with an aerofoil, of means for producing an air stream, and an open duct for said air stream terminating substantially at the intersection of the median surface of the aerofoil with the leading edge thereof.
2. The combination, with an aerofoil, of means external thereto for producing an air stream, and an open duct for said air stream terminating substantially at the intersection of the median surface of the aerofoil with the leading edge thereof.
3. The combination, with an aerofoil, of means for producing an air stream, and a duct for said air stream having an opening substantially at the intersection of the median surface of the aerofoil with the leading edge thereof for the escape of said air stream in an upward direction.
4. The combination, with an aerofoil, of means external thereto for producing an air stream, and a duct for directing said air stream to the leading edge of said aerofoil, said duct being provided with an opening substantially at the intersection of the median surface of the aerofoil with said leading edge to permit said air to escape upwardly.
5. An aeroplane comprising an air stream generator attached to the fuselage, and an open duct from said generator to the wing of said aeroplane terminating substantially at the intersection of the median surface of said wing with the leading edge thereof.
6. An aeroplane comprising an air stream generator attached to the fuselage, and a duct for directing said air stream to the leading edge of the wing of said aeroplane, said duct being provided with an opening substantially at the intersection of the median surface of said wing with said leading edge to permit said air stream to escape in an upward direction.
7. The combination, with an aerofoil, of an air stream generator, a suction port at the trailing edge of said aerofoil, a duct from said suction port to said generator, and a passage way from said generator to the leading edge of said aerofoil, said passage way being provided with an opening for permitting the air to escape along said leading edge in an upward direction.
8. The combination, with an aerofoil, of an air stream generator, a suction port at the trailing edge of said aerofoil, a duct from said suction port to said generator, and a passage way from said generator to the leading edge of said aerofoil, said passage way being provided with ports at or near the median line of said leading edge to permit the air to escape in an upward direction.
9. The combination, with an aerofoil, of an air stream generator external thereto, a suction port at the trailing edge of said aerofoil, a duct from said suction port to said generator, and an open passage way from said generator to the leading edge of said aerofoil terminating at or near the median line thereof.
10. An aeroplane comprising an air stream generator attached to the fuselage, a suction port at the trailing edge of the wing of said aeroplane, a duct from said suction port to said generator, and a passage way from said generator to the

leading edge of said wing, said passage way being provided with an opening at or near the median line of said leading edge to permit the air to escape in an upward direction.

11. The combination, with an aerofoil, of an air circulating system comprising an air stream generator, a suction port at the trailing edge of said aerofoil, a duct from said suction port to said generator, a passage way from said generator to the leading edge of said aerofoil, an intake valve for admitting air to said generator, and a valve for closing or opening said duct according as said intake valve is opened or closed.

12. The combination, with an aerofoil, of an air circulating system comprising an air stream generator, a suction port at the trailing edge of said aerofoil, a duct from said suction port to said generator, a passage way from said generator to the leading edge of said aerofoil, an intake valve for admitting air to said generator, and a valve for closing or opening said duct according as said intake valve is opened or closed, said passage way being provided with ports to permit the air to escape upwardly along said leading edge.

13. The combination, with an aerofoil, of means for producing a stream of air, an open duct for said air terminating substantially at the intersection of the median surface of the aerofoil with the leading edge thereof, and means for controlling the velocity of said stream of air.

14. The combination, with an aerofoil, of means external thereto for producing a stream of air, an open duct for said air terminating substantially at the intersection of the median surface of the aerofoil with the leading edge thereof, and means for varying the velocity of said stream of air.

15. The combination with an aerofoil, of means for producing a stream of air, a duct for directing said stream to the leading edge of said aerofoil, said duct being provided with an opening substantially at the intersection of the median surface of the aerofoil with said leading edge to permit said air stream to escape upwardly, and means for controlling the velocity of the escaping air.

16. The combination, with an aerofoil, of means external thereto for producing a stream of air, a duct for directing said stream to the leading edge of said aerofoil, said duct being provided with an opening substantially at the intersection of the median surface of the aerofoil with said leading edge to permit said air stream to escape in an upward direction, and means for varying the velocity of the escaping air.

17. The combination, with an aerofoil, of an air circulating system comprising an air stream generator, a suction port at the trailing edge of said aerofoil, a duct from said suction port to said generator, a passage way from said generator to the leading edge of said aerofoil, an intake valve for admitting air to said generator, a valve for closing and opening said duct, means for operating said valves to close one while opening the other one, and means for controlling the velocity of the air in said circulating system.

18. The combination, with an aerofoil, of an air circulating system comprising an air stream generator, a suction port at the trailing edge of said aerofoil, a duct from said suction port to said generator, a passage way from said generator to the leading edge of said aerofoil, an intake valve for admitting air to said generator, a valve for closing and opening said duct, means for oper-

ating said valves to close one while opening the other one, ports at the end of said passage way for permitting the air to escape upwardly along the said leading edge, and means for controlling the velocity of the escaping air.

19. An aeroplane comprising an air stream generator, a duct for directing said stream from said generator to the leading edge of the aeroplane wing, said duct being provided with an opening substantially at the intersection of the median surface of said wing with said leading edge to permit said air stream to escape in an upward direction, and means for varying the ratio of the velocity of the escaping air to the speed of the aeroplane propeller.

20. An aeroplane comprising an air circulat-

ing system including an air stream generator, a suction port at the trailing edge of the aeroplane wing, a duct from said suction port to said generator, a passage way from said generator to the leading edge of said wing, an intake valve for admitting air to said generator, a valve for closing and opening said duct, means for operating said valves to close one while opening the other one, ports at the end of said passage way at or near the median line of said leading edge to permit the air to escape in an upward direction, and means for controlling the velocity of the air in said circulating system.

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