

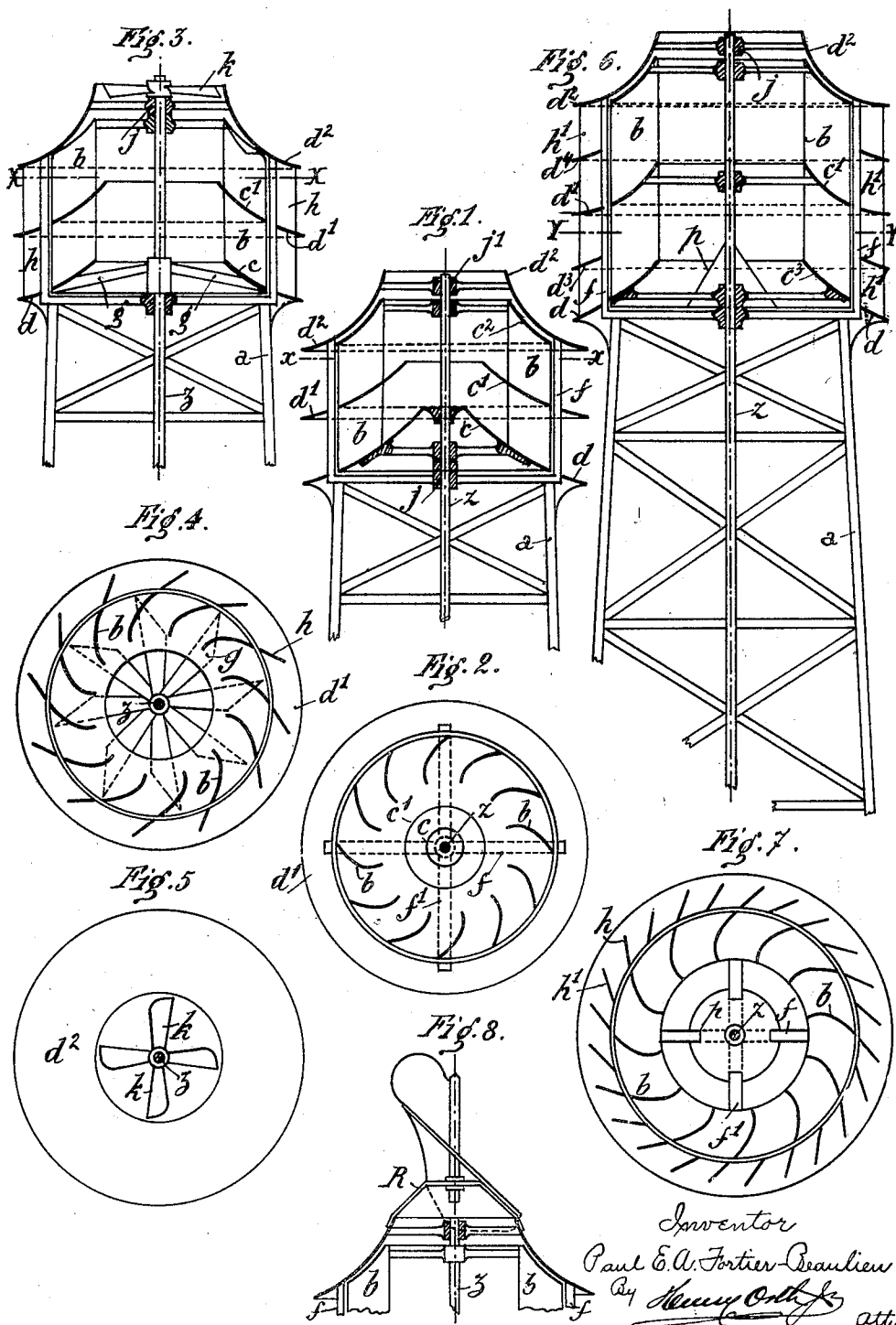
Dec. 16, 1924.

1,519,447

P. E. A. FORTIER-BEAULIEU

AERIAL TURBINE WITH VERTICAL AXIS AND HELICAL CENTRIPETAL CIRCULATION

Filed Jan. 18, 1923



UNITED STATES PATENT OFFICE.

PAUL EUGENE ADOLPHE FORTIER-BEAULIEU, OF ROANNE, FRANCE.

AERIAL TURBINE WITH VERTICAL AXIS AND HELICAL-CENTRIPETAL CIRCULATION.

Application filed January 18, 1923. Serial No. 613,525.

To all whom it may concern:

Be it known that I, PAUL EUGENE ADOLPHE FORTIER-BEAULIEU, a citizen of France, and a resident of Roanne, Loire, France, have invented certain new and useful Improvements in Aerial Turbines with Vertical Axes and Helical-Centripetal Circulation; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to a wind-turbine, with vertical axis, having a high specific power.

It essentially comprises:

1st. A rotary drum or rotor, connected with the shaft, and composed of vertical driving vanes or blades having a curved horizontal section and somewhat narrow, that is to say extending radially over a somewhat small length in order to leave a substantial free space inside. They are limited at their base by a cone, interrupted along their height and limited at the top by crowns or rings so arranged as to determine a vertical component of the wind, and forming diffusers which allow the escape of the wind through the outlet orifice after the same has acted upon the driving or motive blades.

2nd. A fixed part, the stator, which supports the rotor revolving inside. This fixed part is constituted by fixed crowns or rings located in the extension of the rotor crowns and adapted to start the vertical component of the wind, and vertical shutters which are arranged between the fixed crowns, are suitably inclined in order to direct the fluid towards the leading edge of the driving blades or vanes.

3rd. At the upper part of this stator is arranged a crown or ring acting as a diffuser and as an orifice for the exhaust of the driving fluid.

Moreover, the cone which limits the vertical blades at their base can be replaced by different devices constituting modifications.

Furthermore, the crown or ring which limits the blade system at the upper part thereof can be omitted, and in this case, the blades end into an extension which is slightly deflected and curved.

In the accompanying drawings—

Fig. 1 is a vertical section of a wind turbine embodying one form of the invention.

Fig. 2 is a horizontal section on the line $x-x$ of Fig. 1.

Fig. 3 is a vertical section of a modified form.

Fig. 4 is a section on the line $x-x$ of Fig. 3.

Fig. 5 is a plan view of the upper part of Fig. 3.

Fig. 6 is a vertical section of a modified form.

Fig. 7 is a horizontal section on the line $Y-Y$ of Fig. 6.

Fig. 8 is a vertical section of a movable head.

As shown in this drawing, the turbine represented in Fig. 1, is mounted on a framework, a , and essentially comprises a rotor or drum composed of blades or vanes b leaving a free space within the drum, limited at their base and at their top by the cone c and by the crown or ring c^2 respectively; the blades b are connected with the shaft 3 and divided into two equal parts along their height by the crown c^1 , and a stator composed of two frames, arranged in the form of a cross f and f^1 on which are mounted the superposed fixed crowns or rings d , d^1 , d^2 ; the shaft s of the rotor passes through two bearings j and j^1 carried by the stator.

Fig. 2 shows the curved form given to the blades. The latter must be selected so as to catch and utilize the wind under the best possible conditions and to allow the same to slide on the back face in order to reduce as much as possible the effect of the back pressure of the wind in the sector of the rotor where no driving thrust can be exerted by the same.

It is to be observed that when the wind is blowing hard into the interior of the blades b in order to impart to the latter the driving impulse the wind is deflected from its horizontal direction through the fixed crowns d d^1 d^2 and through the whole of the cone c and the movable crowns or rings c^1 , c^2 the central orifices of which are more and more flaring. The wind thus takes a vertical direction in order to reach the outlet or exhaust orifice d^2 which acts as an outlet diffuser.

It is most important to arrange the blades with a sufficient interspace so as to allow

the wind to slide between each of them and, in drawing along the air remaining therein, to create within the rotor a vacuum favorable to the maximum admission of fluid which strikes the driving or motive blades. It will be observed that the air streams tend forcibly to follow the blades in their rotation and execute an ascending movement in the form of a spiral, or in other terms an helical centripetal motion. Figs. 3 and 4 show the turbine the stator of which is completed by vertical shutters h arranged at an angle of a few degrees with reference to the leading edge of the blades of the rotor.

This distributing device substantially improves the output of the motor, as the fluid, on being better canalized, exerts its thrust upon a larger number of blades and the effect of the back pressure in the direction opposite to that of the rotation of the turbine is suppressed in a manner which is the more complete in that the number of fixed shutters is larger.

Fig. 4 shows the number of shutters equal to the number of blades. It is to be noticed that the crown c^2 of Fig. 1 is omitted from the structure shown in Fig. 3 and that the blades are terminated at their upper part by an extension which is slightly deflected and curved in order to allow the wind to exert upon them a last strain before escaping through the outlet diffuser. In Fig. 3 the cone c shown in Fig. 1 is replaced by radial blades g which assist in the suction of the air current and adds to the effect of the vertical blades.

Fig. 5 shows a plan view of the four-blade screw or propeller k which is loosely mounted on the shaft of the turbine. Its revolution is due to the escape of waste gases and prevents any disturbance, which might be caused by a possible dipping action of the wind inside the rotor.

With an apparatus of a larger diameter, it would necessarily involve a larger number of blades.

Figs. 6 and 7 show that it is possible to secure to the stator a certain number of vertical shutters h^1 and of crowns or rings d^3 , d^4 which is twice the number of blades and crowns of the rotor.

This device Fig. 6, allows turbines of a very great height to be constructed, while maintaining an excellent canalization of the driving fluid. It is particularly applicable to turbines having a large diameter.

It will be seen from Fig. 7 that the vertical fixed shutters h , h^1 do not form an angle with the leading edge of the blades or vanes, which constitute a modified form of the device as shown in Fig. 4.

It will be seen that the base cone c , shown in Fig. 1 is replaced in Fig. 6 by a small cone p which enters the movable crown c^3 . This device causes the suction of an ascend-

ing air current to increase the vacuum within the turbine. Finally, in opposition to Figs. 1 and 3, the central orifices of the crowns or rings are not of an increasing diameter but of an equal diameter.

Fig. 8 shows a movable chimney R which can be applied upon the exhaust diffuser and which opposes itself to any disturbance due to the dipping action of the wind and forming an aspirator increases the vacuum inside the rotor. This system is particularly applicable to turbines of small sizes.

It will be understood that alterations may be made to the system of turbine which has just been described with reference to the number, the inclinations and respective forms of the several parts constituting the same without departing from the scope of the present invention.

It is obvious that the two turbines can be mounted in series on the same shaft and that two or more turbines can be mounted in parallel upon distinct shafts which drive a common shaft.

What I claim is:

1. In a wind turbine, a rotary drum or rotor connected with the shaft of the turbine and provided with vertical blades or vanes, a fixed part or frame within which rotates the rotor, and annular partitions disposed upon the rotor one above the other, having the shape of surfaces of revolution around the axes of the turbine for directing the fluid.

2. In a wind turbine, a rotary drum or rotor connected with the shaft of the turbine and provided with vertical blades or vanes, a fixed part or frame within which rotates the rotor, annular partitions disposed upon the rotor one above the other, having the shape of surfaces of revolution around the axes of the turbine for directing the fluid and annular partitions disposed upon the fixed part of frame prolonging the annular partitions upon the rotor.

3. A wind turbine comprising a rotor formed of a series of vertical blades, superposed annular plates connecting the blades, a fixed stator, surrounding the blades and plates formed of superposed annular plates, and a diffuser at the upper end of the rotor.

4. A wind turbine comprising, a rotor formed of a series of vertical blades, superposed annular plates connecting the blades, a fixed stator, surrounding the blades and plates formed of superposed annular plates forming continuations of the rotor plates, and a diffuser at the upper end of the rotor.

5. A wind turbine comprising a rotor formed of a series of vertical blades, superposed annular plates connecting the blades, a fixed stator surrounding the blades and plates formed of superposed annular plates forming continuations of the rotor plates, vertically arranged shutters interposed be-

tween the stator plates, and a diffuser at the upper end of the rotor. arranged shutters interposed between the 10 stator plates, and a diffuser at the upper end of the rotor.

6. A wind turbine comprising a vertical rotary shaft a rotor formed of superposed
5 annular plates connected with the shaft, a series of vertically arranged curved blades, carried by said plates, a stator formed of fixed superposed annular plates forming continuations of the rotor plates, vertically

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

PAUL EUGENE ADOLPHE FORTIER-BEAULIEU.

Witness:

JULIAN CEMBLE LUEDY.