W. WAIT.

AERIAL VESSEL.

APPLICATION FILED FEB. 21, 1910.

996,741.

Patented July 4, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

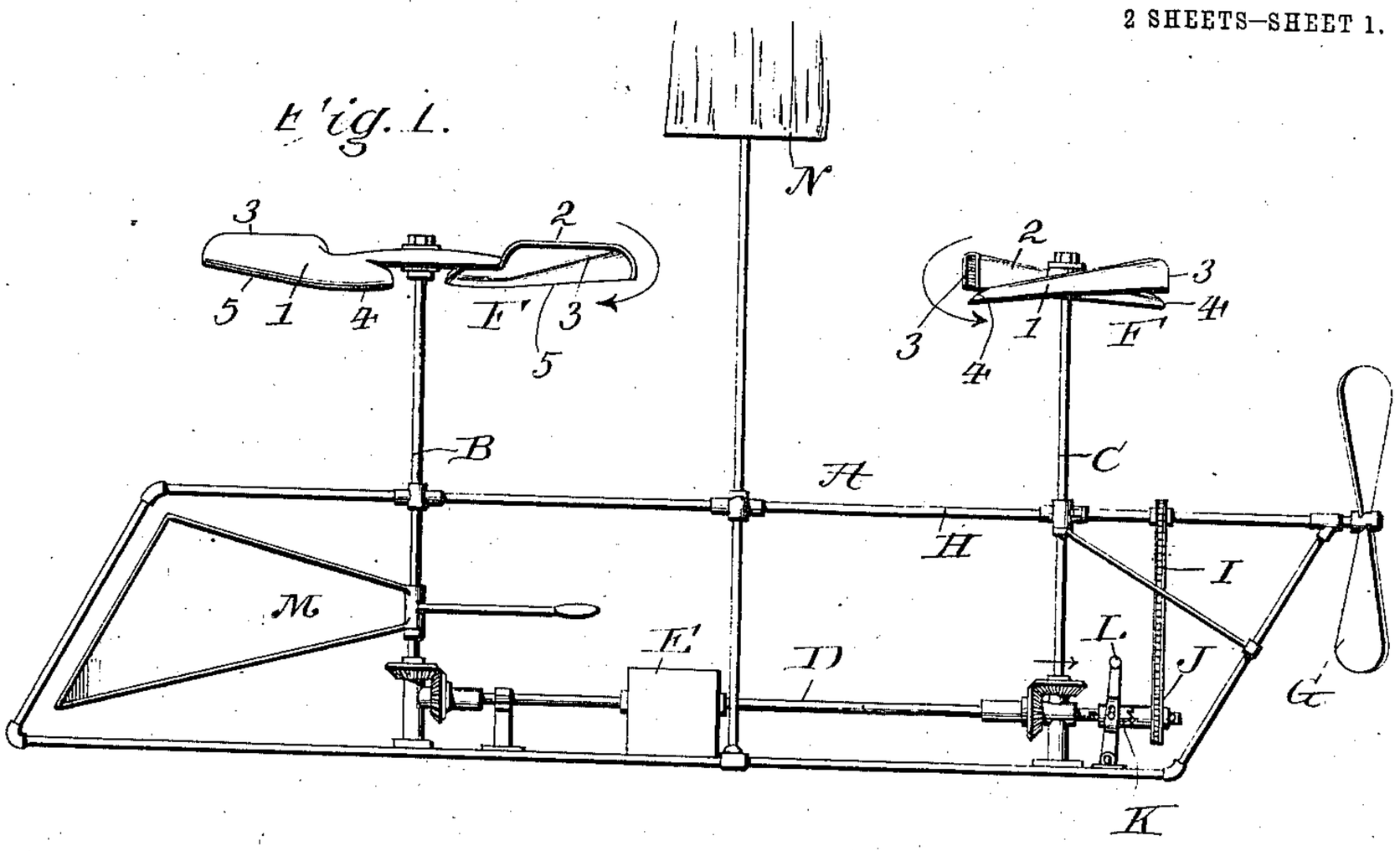


Fig. 2.

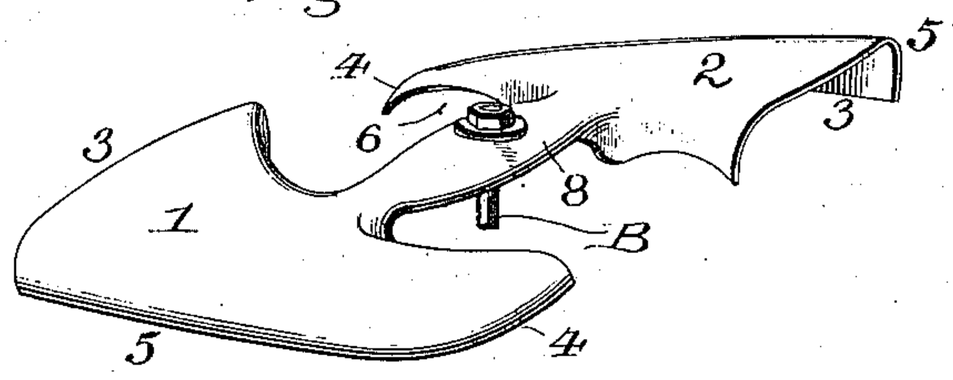


Fig. 4.

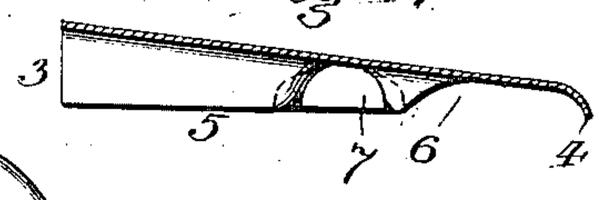
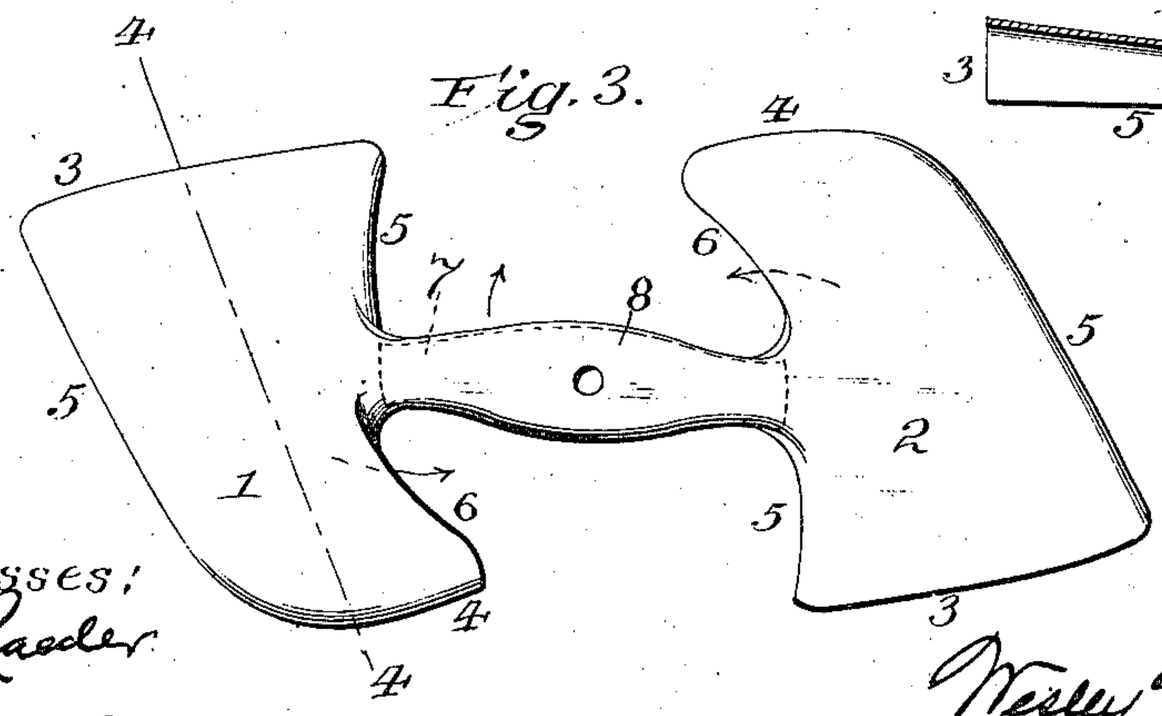


Fig. 3.



Witnesses:

C. H. Raeder

Parker Dodge

Inventor:

Wesley Wait,

By Dodge & Sons,

Attorneys.

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2 SHEETS—SHEET 2.

Fig. 5.

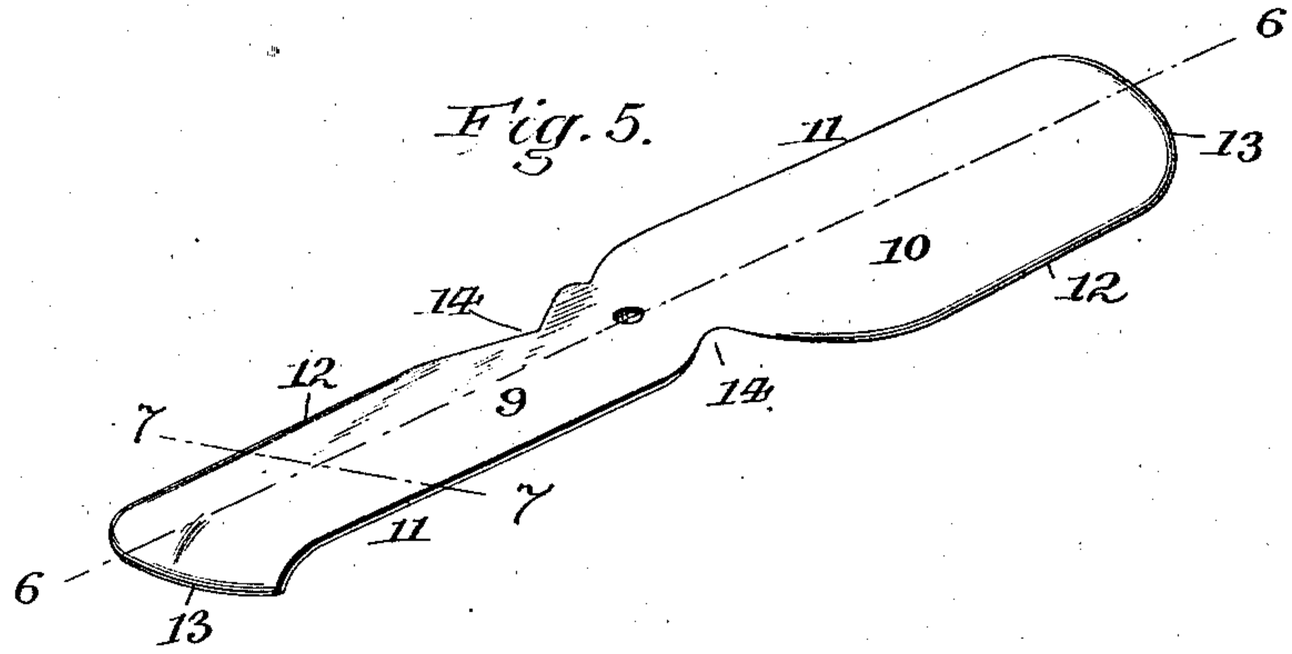


Fig. 6.

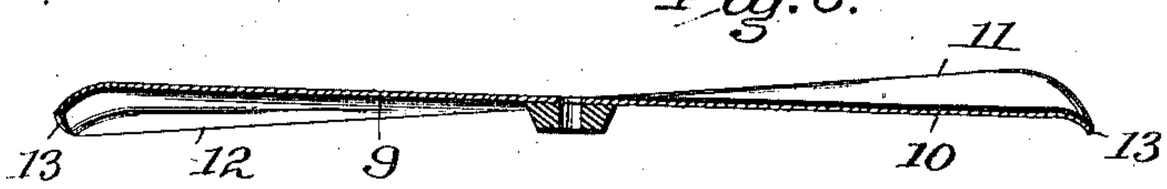


Fig. 7.

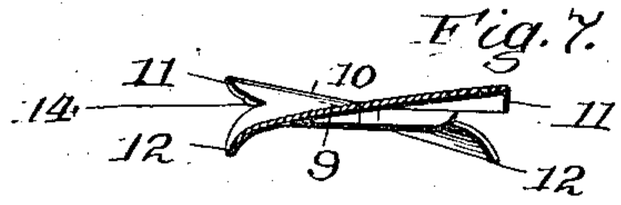
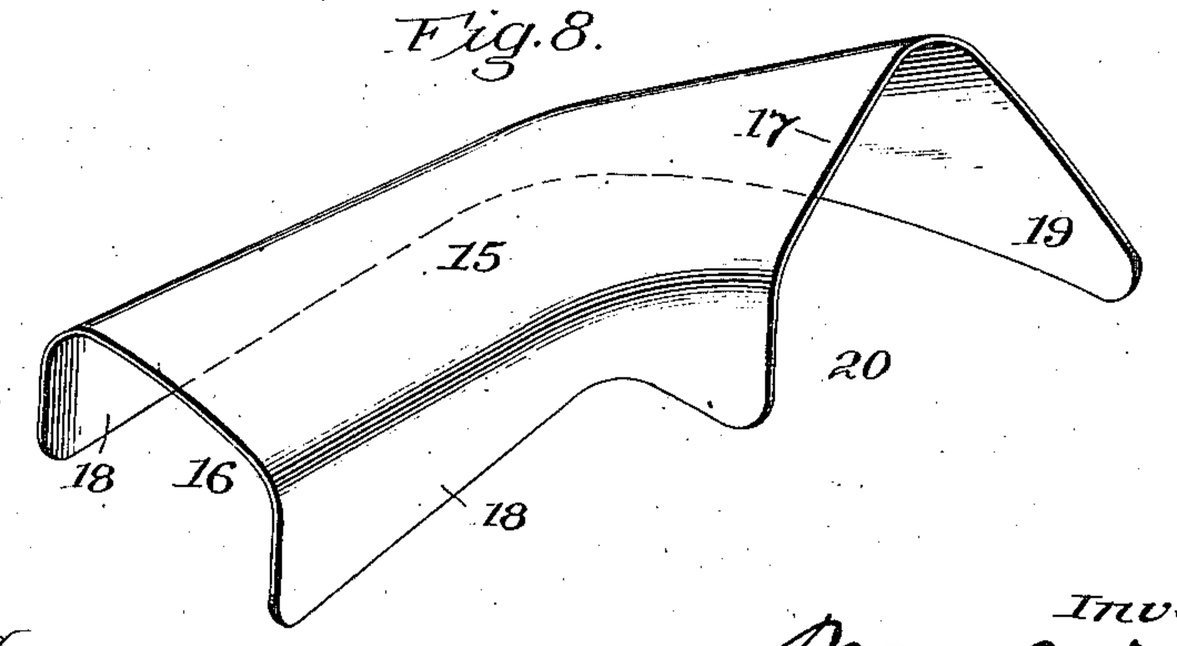


Fig. 8.



Witnesses:

C. H. Rauder

Parker Dodge

Inventor:

Wesley Wait,

By Dodge & Lowe,

Attorneys.

UNITED STATES PATENT OFFICE.

WESLEY WAIT, OF NEWBURGH, NEW YORK.

AERIAL VESSEL.

996,741. Specification of Letters Patent. Patented July 4, 1911.

Application filed February 21, 1910. Serial No. 545,115.

To all whom it may concern:

Be it known that I, WESLEY WAIT, a citizen of the United States, residing at Newburgh, in the county of Orange and State of New York, have invented certain new and useful Improvements in Aerial Vessels, of which the following is a specification.

This invention pertains to aerial navigation, and is directed to that class of structures generally classed under the designation, "helicopter." More specifically, the invention resides in a novel construction of a bladed wheel in the nature of a screw propeller, especially designed to give the lifting effect requisite for structures of the class, though capable of use for effecting movement in horizontal or other direction as well as upward.

The wheel comprises a blade or blades, preferably two, each of which, assuming that the axis of rotation be vertical and the plane of rotation horizontal, is higher and wider at the forward or leading edge than at the rear or trailing edge; is progressively narrower from the leading toward the trailing edge; is unobstructed or open at the leading edge and down-turned at the trailing edge, with the outlet or escape for the air at the inner side and near the rear of the blade, and the longitudinal or fore-and-aft edges of which are down-turned similarly to the trailing edge. The purpose sought is the gathering in of a relatively large volume of air by and beneath the blade, its compression, and its discharge toward and close about the axis of rotation, where, by its accumulation, it shall afford a relatively dense mass or body upon and by which the apparatus may be supported or sustained. In practice, two or more such wheels will be used in combination, either side by side or superposed, and reversely rotated, to the end that each may act in opposition to or in neutralization of the other as regards the tendency to rotate the entire structure about the axis of the wheel, or about an axis of its own.

In the accompanying drawings: Figure 1 is a diagrammatic elevation of an aerial vessel embodying my invention in its preferred form; Fig. 2, a perspective view of the wheel or propeller; Fig. 3, a top plan view of the same; Fig. 4, a section on the line 4—4 of Fig. 3; Fig. 5, a perspective view of a similar modified form of blade; Fig. 6, a longitudinal section on the line 6—6 of Fig. 5; Fig. 7, a transverse section on the line 7—7 of Fig. 5; and Fig. 8, a perspective view showing a further modification of the blade.

The present invention is based upon the theory that in order to render possible the lifting of the requisite weight by means of wheels in the nature of screw propellers, it is necessary to gather in a considerable volume of air, and so compress or compact the same, and retain it beneath the blades of the wheel, that there shall be a relatively firm supporting medium for the structure. The ordinary screw propeller, when rapidly rotated in the atmosphere, tends in considerable degree to throw the air outward away from the wheel, and in some degree to produce a partial vacuum beneath the wheel, where, instead, the air should be gathered and compressed. To overcome this effect or tendency, I construct my wheel as represented in the annexed drawings, in which A indicates a suitable framework provided with two vertical shafts B, C, journaled in suitable bearings, and each connected by gearing with a shaft D driven by a motor E of any suitable description. Each shaft B, C, carries at its upper end a wheel or propeller F, preferably of the form illustrated in Figs. 2, 3 and 4. Upon examining these figures it will be seen that this wheel comprises two blades 1, 2, the leading edge 3 of each being relatively wide, the trailing edge 4 narrower, and the longitudinal or fore-and-aft edges 5 being turned downward in a manner similar to the trailing edge 4. This down-turned edge is preferably made of decreasing depth or vertical measurement from the leading toward the trailing edge, as seen in Fig. 4. The inner fore-and-aft edge 5 is cut away or omitted in the rear portion of the blade, to form an air outlet 6 on the side toward the shaft or the axis of rotation, so that air gathered in by the broad mouth or leading end of the blade, and passing beneath its slanting or inclined top wall, and between its converging side walls 5, is forced into a constantly narrowing space and compressed, but held against free or ready escape, by the down-turned edges or walls, until it reaches the outlets 6, whence it escapes near to, and is directed toward, the supporting shaft or axis of rotation.

In the drawings I have represented the wheel as fashioned out of relatively thin metal, and in one piece, a supporting cross

bar 7 being provided for that portion 8 which connects the two blades. This may be of any suitable material, or the connecting portion 8 may itself be made sufficiently heavy to withstand all stresses to which it is likely to be subjected.

In Fig. 1 the two wheels F are represented as having their blades reversed, and as being geared to revolve in opposite directions. This is a common provision in structures of this class, and is necessary in order to prevent the vessel as a whole rotating about the axis of the wheel, or about some point or axis intermediate the two wheels. The purpose of the wheels F is, primarily, to lift the structure from the ground, and maintain it at the desired elevation, though by causing the vessel or structure to tip more or less, movement horizontally, or in a direction other than vertical, may be effected. I have, however, shown the vessel A as equipped with a propeller G of common form, carried by a shaft H, at the front of the structure, and driven by chain or belt I from a sprocket wheel or pulley J, carried by shaft D. A clutch K, controlled by a hand lever L, serves to connect and disconnect the propeller shaft H with and from the main driving shaft D. A rudder M is provided for varying laterally the course of the vessel. I have indicated in Fig. 1 a parachute N, the lower portion only of which is shown, but which is designed to be used in case of emergency, to retard the descent of the vessel.

In Figs. 5, 6 and 7 I have shown a slightly modified form of the propeller, the essential difference being that the blades are made of less measurement in the direction of rotation, and of greater measurement in a direction radial to the shaft or axis of rotation. In this, as in Figs. 2, 3 and 4, there are two blades 9 and 10, the leading edge 11 of each being free and unobstructed, the trailing edge 12 being down-turned, the fore-and-aft edges 13 being similarly down-turned, and a discharge opening 14 being provided for each blade at a point near the shaft, or axis of rotation, by cutting away the trailing edge at that point. The action is the same in kind as under the previously described construction.

In Fig. 8 is shown a single blade of the same general character as that of Figs. 2, 3 and 4, except that instead of making the top face of the blade incline downward all the way from the leading to the trailing edge, it has such inclination for a considerable portion of the distance, but as it approaches the trailing edge it is directed upward. There is, however, the same flat top 15, inclining downward from the leading edge 16 toward the trailing edge 17 through a considerable portion of the length; there are the same depending fore-and-aft edges 18; there is the same depending trailing edge or skirt 19; and there is an outlet 20 for the air at a point near, and having its mouth directed toward, the supporting shaft or axis of the wheel. The general mode of operation and result are the same as under the first and second described constructions.

In each and all the forms the air is gathered in at the mouth of the blade, is compressed between the inclined top surface and the narrowing or approaching side walls, and is prevented by the depending edges from escaping at the sides, or at the trailing edge, except at those points near the trailing edge where the inner depending wall is cut away, to permit escape of air and direct it toward the supporting shaft or axis of rotation.

The dimensions and relative proportions of the wheel may vary within quite wide limits, provided the principles or features of construction above set forth be retained, and I therefore do not mean to restrict myself to specific proportions or details.

In the drawings I have represented the blades as having flat upper faces, and somewhat sharply turned skirts or edges, and this is the preferred form, but the same results may be obtained in greater or less degree with blades of substantially semi-elliptical or semi-circular cross section. In other words, the essential features, some or all of which may be present in a given structure, are the broad and open mouth adapted to gather the air; the depending skirts or edges serving to confine the air; the outlet for the air at a point near the rear or trailing edge of the blade, and on the side thereof nearest the axis of rotation, the upper surface in all forms inclining downward from the leading toward the trailing edge.

For convenience and certainty of description and statement of claims, it is assumed throughout the specification and the claims that the plane of rotation is horizontal and the axis of rotation vertical, and the claims are therefore to be read with that understanding, though in actual use the parts will not, under all circumstances, occupy such positions.

Having thus described my invention, what I claim is:—

1. A propeller or wheel having a blade formed with an open mouth, with down-turned fore-and-aft and trailing edges, and with a top face inclining downward from the leading toward the trailing edge, and having an air outlet near the trailing edge, on the side toward the axis of rotation.

2. A wheel or propeller, the blades of which are inclined relatively to the horizon, and have down-turned edges in the direction of movement and at the rear, and an air escape near the trailing edge, on the side toward the axis of rotation.

3. A wheel or propeller having the upper faces of its blades inclined downward and narrowing from the leading toward the trailing edge, and having down-turned edges extending from the leading to and across the trailing edge, but cut away near the trailing edge on the side nearest the axis of rotation.

4. In a wheel or propeller, a blade having an oblique surface and down-turned edges except at the front or leading edge of the blade, the cross section of the space inclosed by the top and the down-turned edges progressively lessening from the leading toward the trailing edge of the blade.

5. In a wheel or propeller, a blade having an oblique surface and down-turned edges except at the front or leading edge of the blade, the cross section of the space inclosed by the top and the down-turned edges progressively lessening from the leading toward the trailing edge of the blade, both in height and in width.

6. In a lifting wheel or propeller, a plurality of blades each having an unobstructed leading edge and down-turned following or trailing edges, the latter cut away or omitted at a point near the axis of rotation, and the body of the blade being in a plane oblique to the plane of rotation; whereby the blade is adapted to gather a considerable volume of air as it advances, and to compress the same and discharge it downward and inward toward the center or axis of rotation.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WESLEY WAIT.

Witnesses:

ARTHUR N. MEYER,

CALEB H. BAUMES.