No. 885,174. PATENTED APR. 21, 1908.

H. J. PERKINS.

PROPELLER WHEEL.

APPLICATION FILED SEPT. 22, 1906.

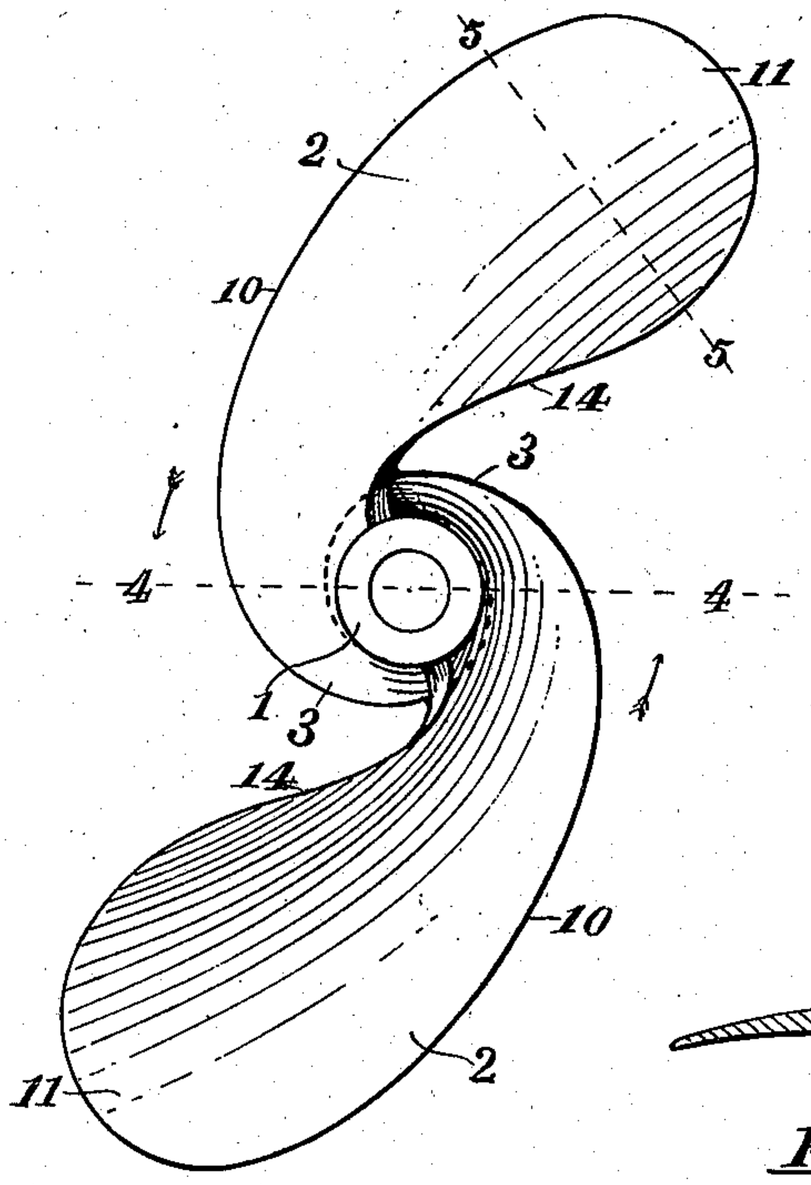

Fig. 1.

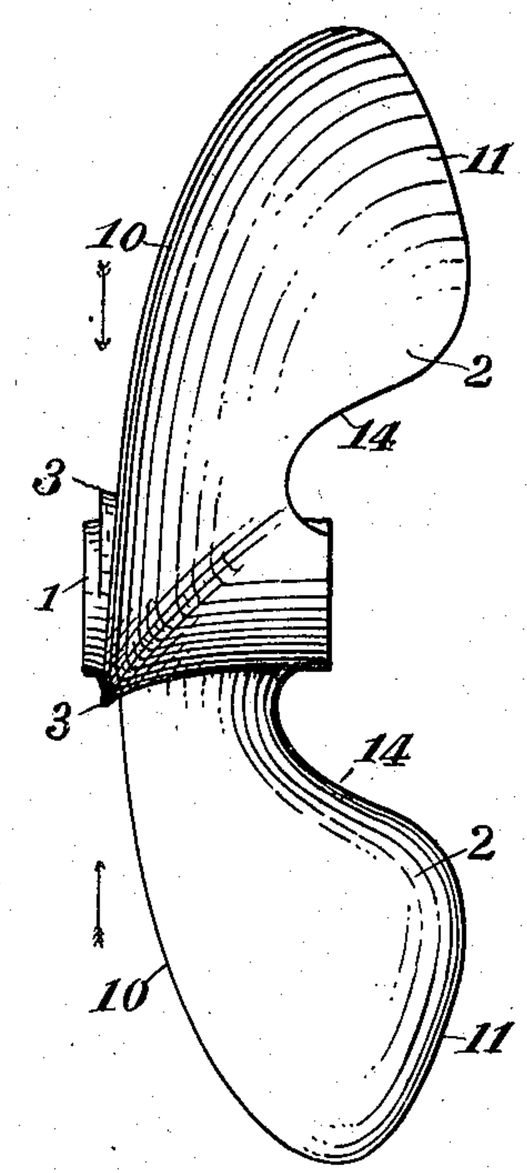

Fig. 5.

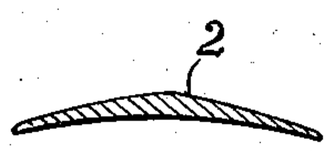

Fig. 2.

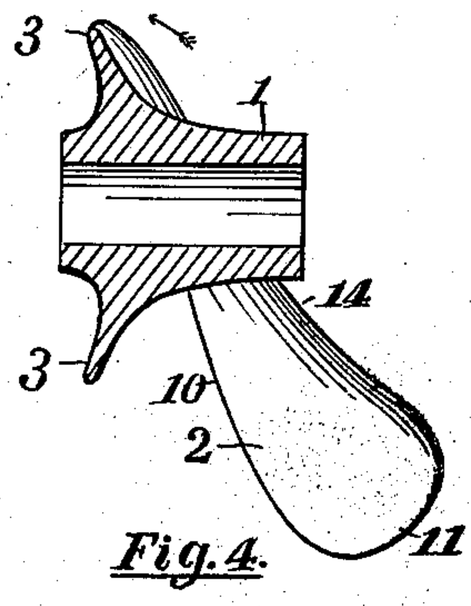

Fig. 4.

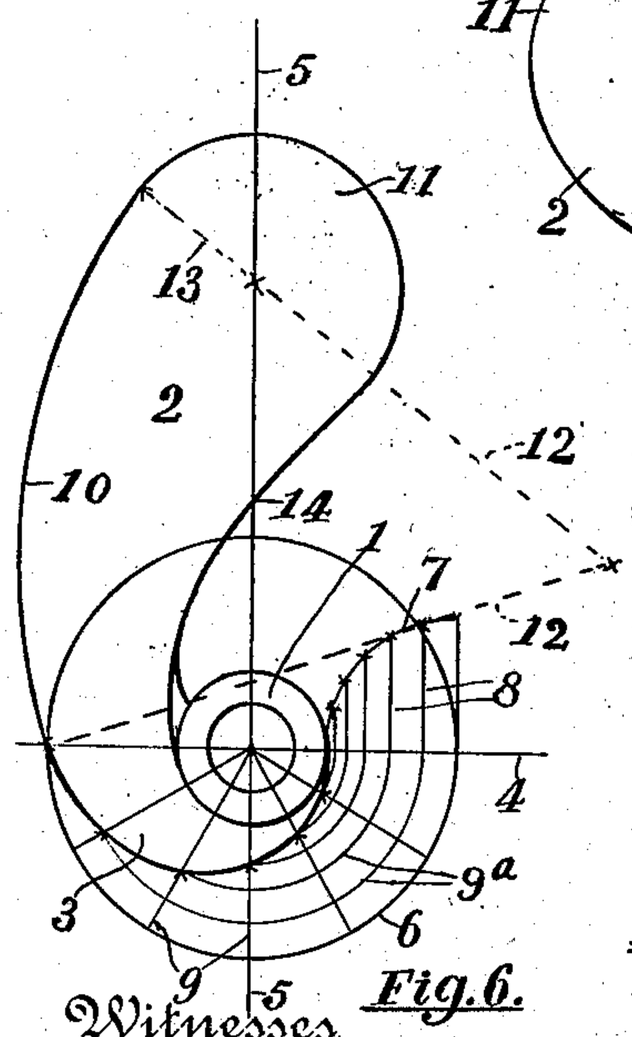

Fig. 6.

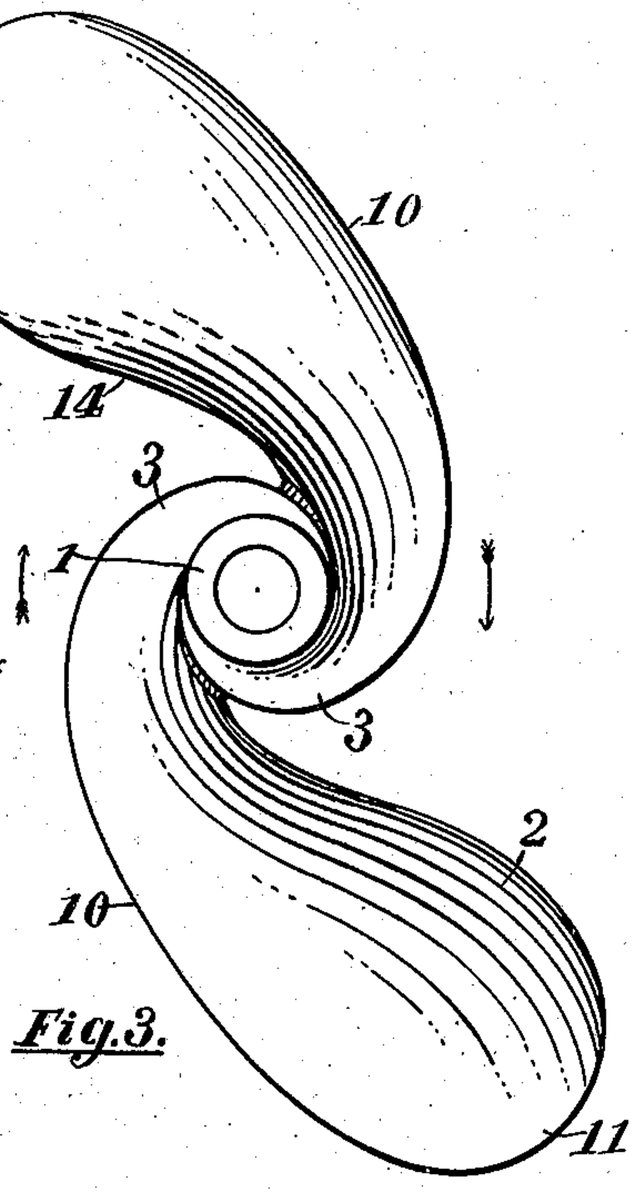

Fig. 3.

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PROPELLER-WHEEL.

No. 885,174. Specification of Letters Patent. Patented April 21, 1908.

Application filed September 22, 1906. Serial No. 335,727.

To all whom it may concern:

Be it known that I, HARRY J. PERKINS, a citizen of the United States of America, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Propeller-Wheels; 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.

My invention relates to improvement in propeller wheels, and more particularly to marine propellers; and its object is to provide an improved "weedless" wheel, that is to say a wheel that will not foul with grass, weeds or the like; to provide an improved construction whereby the blades of such "weedless" wheels are rendered more effective; and to provide the same with various new and useful features hereinafter more fully described and particularly pointed out in the claims.

My invention resides in the novel formation of the blades substantially as hereafter described, reference being had to the accompanying drawings, in which:

Figure 1. is a rear elevation of a wheel embodying my invention; Fig. 2. a side elevation of the same; Fig. 3. an elevation of the forward side of a wheel; Fig. 4. a horizontal section on the line 4—4 of Fig. 1.; Fig. 5. a transverse section on the line 5—5 of Fig. 1; and Fig. 6. a diagram illustrating the outlines of the wheel when viewed in line with its axis.

Like numbers refer to like parts in all of the figures.

1 represents the hub of the wheel; 2 the blades of the same, which blades are of peculiar formation, to-wit when viewed in plane projection in lines parallel with its axis of rotation the forward edge of the blade being tangential to the hub and extends around and outward therefrom throughout about one hundred and eighty degrees in substantially a harmonic curve 3 which in the form shown is a spiral whose equation is $\rho = R + r(1 - \cos.\theta/_2)$ where ρ is the radius vector, R is the radius of the hub, r the radius of the circle 7 and θ the polar angle, and thence is prolonged in substantially an arc 10 having a radius 12 substantially equal to the radius of the wheel and with its center on a line struck from the outer end of said curve and perpendicular to a line tangential to the outer end of said curve. The blade terminating in a substantially semi-circular outline having a radius of about one-fourth of the radius of the wheel and with its center substantially on a radial line vertical to a radial line extending through the starting point of the forward edge. From thence the rear outline 14 of the blade is oppositely curved to form a taper to the blade joining the semicircular outline of the end at a tangent thereto and joining the hub substantially opposite the starting point of the forward edge of the blade and tangential to the hub.

Viewed in plane projection at right angles to the axis of rotation, each blade at its forward edge presents substantially a cycloidal curve extending at the middle across the hub near the forward end thereof and outward to the periphery the end 11 of the blade showing a flattened arch curve, and the rear edge 14 of the same a reverse curve, substantially as illustrated in Fig. 2.

In a transverse section, the blades are made concave on the rear surface to provide increasing axial pitch rearward, and thin at the edges with a thickened middle portion, as in Fig. 5.

On the various pitch circles (that is, various circles concentric with the axis of rotation), the blades are formed with substantially equal axial pitch or lead.

In operation the forward edge of the blade moves through the water at an acute angle to said edge, and thus cuts the water with a sliding motion along said edge, whereby any weeds, grass or other obstructions engaged thereby will slide along said edge toward the periphery, and be discharged from the outer end of the blade. The wheel is thus made self clearing and will not become fouled, and at the same time the blade is made effective throughout its entire surface which is not the case in the unusual forms of so-called weedless wheels, which have the inner portions of the blades more nearly circumferential to the hub. In designing or laying out this wheel, I pursue the following method which enables me to secure the described form with certainty. Referring to Fig. 6. for illustration,

I proceed as follows: Draw a horizontal line 4 and a vertical line 5 crossing the same near the middle; about the point of intersection of these lines, next strike the circles representing the boss or hub (the exact diameter of which hub is not material); around this hub strike another circle 6 of substantially one-third the full diameter of the wheel; with the intersection of the line 4 and the circle 6 as a center, strike the arc 7 of ninety degrees and having a radius equal to the distance from this center to the surface of the hub and divide this arc into any number of equal parts (six being used in this instance); divide the lower half of the circle 6 by equidistant radial lines 9 equal in number to the divisions of the arc 7; draw vertical lines from the points of division of the arc to the line 4 and prolong the same in arcs 9^a concentric with the circle 6 to successive points on the radial lines 9; form the harmonic curve 3 touching these successive points on the radial lines. This profiles the harmonic curved portion of the front edge of the blade. Next prolong this line 3 in an arc 10 having a radius 12 substantially equal to the radius of the wheel and with the center of said arc 10 on a line perpendicular to the tangent at the end of the arc 3, and join the outer end of this arc tangentially with an arc 11 having a radius 13 of substantially one-fourth of that of the wheel and with its center located at the intersection of the line 5, and the line joining the center of the arc 10 and the point of tangency of the arcs 10 and 11, and complete the outline of the blade profile by an oppositely curved line 14 joined tangentially to the arc 11 at one end and to the hub tangentially at the other end.

Any approximate cycloidal curve will properly profile this forward edge of the blades at right angles to the previously described profile. Now by prolonging the working or rear surface of the blade circumferentially and rearward from this forward edge on the respective pitch circles, so that its surface throughout is of substantially the same pitch or lead the wheel is completed and will be found to effectively convert the power applied and that any weeds or other obstructions engaged by the blades will be carried outward along the edge of the same and discharged at the periphery of the wheel.

Obviously the area of the blade may be varied by variation of the radius 13 and changing the location of its center and of the center of the radial lines 12 to connect the radius 10 tangentially with the lines 3 and 11; or varying the location or curve of the rear line 14, will in no wise affect the essential features of the wheel or depart from the spirit of my invention. So also whether the line 14 joins the hub tangential as in Fig. 6 or more nearly radial as in Figs. 1 and 3, will be immaterial.

What I claim is:

1. A propeller wheel, comprising a hub, and a blade whose forward edge when projected on a plane perpendicular to the axis commences at a tangent to the surface of the hub, and extends outward therefrom in a substantially harmonic curve for 180 degrees, and thence is prolonged outward in an arc having a radius substantially the same as the radius of the entire wheel and with its center on a line struck from the outer end of said curve and perpendicular to a line tangential to said curve at its outer end.

2. A propeller wheel, comprising a hub, and a blade whose forward edge when projected on a plane perpendicular to the axis, commences tangential to the hub, thence extends spirally around the hub in a harmonic curve for 180 degrees, and thence is prolonged in a curve having a radius equal to the radius of the entire wheel and with its center on a line struck from the outer end of said curve and perpendicular to a line tangential to said curve at its outer end, said edge being curved rearward in substantially a cycloidal curve when projected on a plane parallel to the axis.

3. In a propeller wheel, a hub, and a blade whose forward edge when projected on a plane at right angles to the axis begins tangential to the surface of the hub and thence extends spirally around the same in substantially a harmonic curve to a point distant from the center one-third the radius of the entire wheel, and thence is prolonged in an arc having a radius substantially equal to the radius of the entire wheel and with its center on a line struck from the outer end of said curve and perpendicular to a line tangential to said curve at its outer end.

4. In a propeller wheel, a hub, and a blade whose forward edge when projected on a plane at right angles to the axis commences tangential to the surface of the hub, thence extends spirally outward in a harmonic curve to a point distant from the center one-third of the radius of the wheel, and from thence is prolonged outward in an arc of substantially the same radius as the entire wheel and with its center on a line struck from the outer end of said curve and perpendicular to a line tangential to said curve at its outer end, the end of said blade being prolonged in a semi-circular outline having a radius of substantially one-fourth of the entire wheel, and the rear edge of said blade being of a reverse curved form and joining tangentially the end curve and the hub.

In testimony whereof I affix my signature in presence of two witnesses.

HARRY J. PERKINS.

Witnesses:
PALMER A. JONES,
LUTHER V. MOULTON.