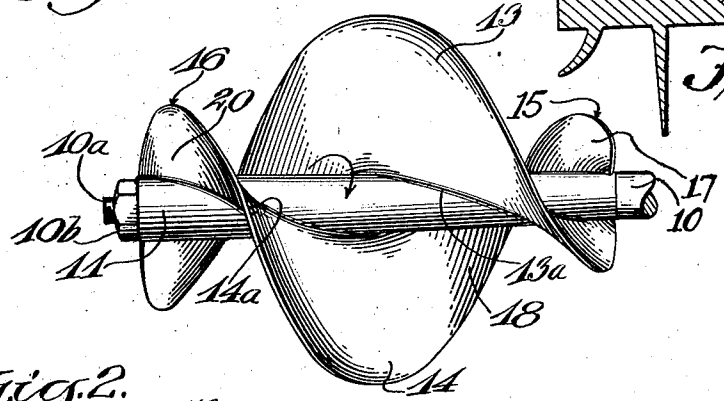
July 20, 1937. J. W. CALDWELL 2,087,243

PROPELLER

Filed June 1, 1932

Fig. 1.



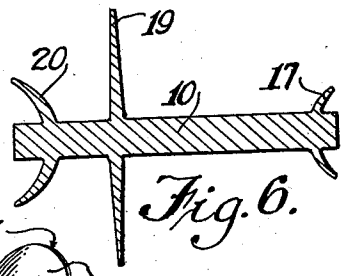


Fig. 6.

Fig. 2.

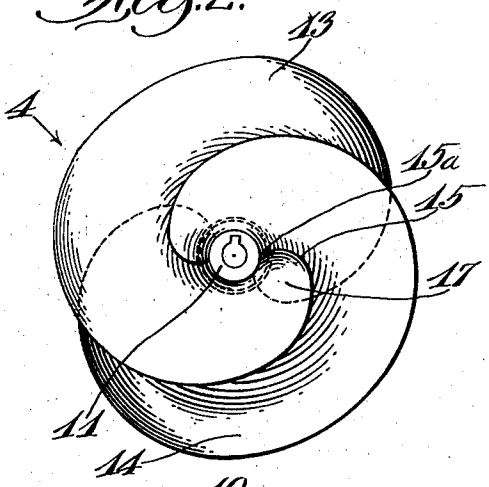


Fig. 3.

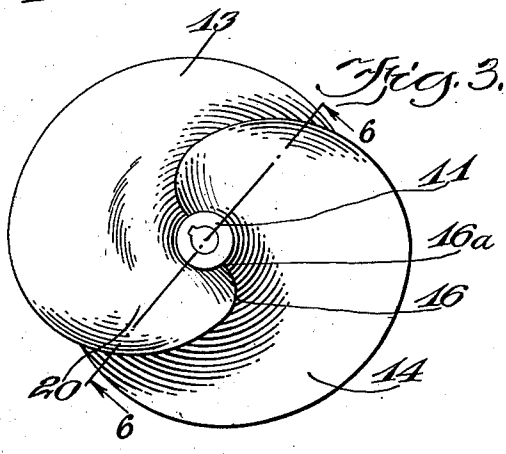


Fig. 4.

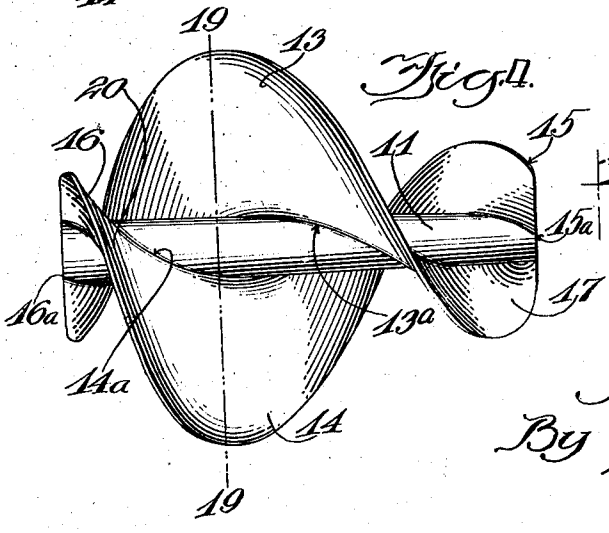
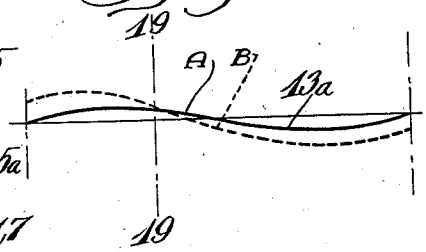


Fig. 5.



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Patented July 20, 1937

2,087,243

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2,087,243

PROPELLER

John W. Caldwell, Chicago, Ill.

Application June 1, 1932, Serial No. 614,716

15 Claims. (Cl. 170—156)

My invention relates to screw propellers applicable to boats and flying machines, and more particularly to those in which the blades are given a spiral formation around the hub, and my object is to build the propeller with such structural values as to operate with greater efficiency in water, air or any other medium.

A further object of the invention is to give the propeller a novel screw formation for easy progress through the medium in which it operates.

A still further object of the invention is to provide the propeller with means to confine and urge the medium mostly in a rearward direction whereby to reduce slippage and waste of power.

Another object of the invention is to construct the propeller of a small diameter as compared with its effective area, whereby to have a high leverage and greater strength.

Other objects will be evident in the course of the following description in connection with the accompanying drawing, in which

Fig. 1 is an elevation of the propeller;

Fig. 2 is an end view from the smaller or right-hand end;

Fig. 3 is an end view from the opposite end;

Fig. 4 is a view from arrow 4 in Fig. 2; and

Fig. 5 is a diagram illustrating the principle of the propeller.

Fig. 6 is a diagrammatic longitudinal section taken substantially on the line 6—6 of Figure 3, and illustrating the profiles of the blades at different points along the hub.

Referring specifically to the drawing, 10 denotes the shaft on which the propeller is mounted. For marine purposes, this shaft is usually at the rear of the vessel and may be reduced, as indicated at 10*a*, to receive the hub 11 of the propeller, and threaded as 10*b* for a nut to make the hub fast. The propeller can be placed at the front part of the vessel, if desired, with advantages that will be apparent in a later section.

While the propeller may have any number of blades, I have shown but two for purposes of illustration, these being interwound spiral formations, spaced diametrically on the hub. For large boats the diameter, pitch and number of blades is increased, but the general shape and number of turns around the hub may be the same.

The development of the novel propeller is founded on the line forming the junction between each blade and the hub. Thus, with the blades marked 13 and 14, it will be noted that the respective junction lines are indicated at 13*a* and 14*a*. Each of these is a uniform spiral, as indicated by the solid line A in Fig. 5, and determines the basal length of its blade, which for purposes of illustration is the length of one full turn. Each blade may, of course, be extended in pitch and diameter where a propeller of greater speed and size is desirable.

The general development of each propeller blade from the line of its junction is in a radial course, the stock being of the proper thickness for the strength required at the junction line and tapering toward the edge of the blade to a limited degree. The peripheral contour of the blade is low at the forward end and rises gradually to about two-thirds of the junction-line pitch, then receding to terminate at a somewhat greater prominence than at the forward end, as indicated in Fig. 1 and the dotted line B of Fig. 5.

Specifically, however, the peripheral contour of the blade follows a new principle in propeller design, whereby to make the propeller weedless, cause it to secure a good hold on the medium for displacement, and procure a forceful final departure from the medium. To carry out the principle referred to, I make the spirality of the peripheral blade contour with a greater pitch than that of the junction line. However, instead of utilizing the ends of the blade so extended, I curtail them by short curves 15 and 16 to meet the ends of the junction line as indicated at 15*a* and 16*a*. The ends of the blade are thus prominent and broad, rather than tapered and reduced, and part rather than entangle weeds by their screw-like advancing action.

By basing the peripheral contour of the blade on a greater pitch, the course of the blade is not limited to strict radial adherence to the internal or junction line. The greater peripheral pitch introduces extra area in the blade, which I utilize by shaping it in ways to secure the greatest working efficiency from the propeller. Thus, with the blade 13 rotatable in the direction of the arrow in Fig. 1, I give the advancing end 17 of the blade, concave obliquity to the hub, with an undercut effect from the junction line, whereby to make a smooth, screw-like cut into the medium and suffer a minimum of resistance. The next part 18 of the blade is substantially a concave wall along the hub, presenting a hollow in its progress to receive the medium as the blade cuts a narrow spiral path therein or threads itself therethrough, so that the bulk of the medium presents no resistance but nestles along the convex rear side of the blade. At about two-thirds

way along the junction line, namely at 19, the blade has attained its greatest radius, as per Fig. 4, and changes from its concavity to a position approximately perpendicular to the hub, then gradually departing to assume concave obliquity in the opposite direction. Now, the blade assumes a progressive concavity on its back face for the last third of its length, pocketing—so to speak—the adjacent medium with a large surface and pressing the same in a rearward direction and without appreciable side slippage, whereby to propel the vessel forward. Finally, the relatively large, fan-like rear portion 20 of the blade acts to beat the medium back with extra force, because the pronounced concavity of the said portion secures a fuller hold on the medium and crowds it more forcefully backward before its release.

It is thus seen that the novel propeller departs in several respects from the conventional interwound spiral, assuming values conducive to (1) easy progress of the propeller through the medium; (2) a more weedless construction for all kinds of boats; (3) a pocketing of the medium in a rearward direction, concentrating pressure to the rear with less slippage; (4) the provision of the largest blade area for such pressure to secure maximum propelling efficiency; (5) the provision of a final concavity of ample area to augment the final force of the propeller upon the medium; (6) the advantage of a favorable power leverage over the conventional long-bladed propeller by confining the entire propeller to a field close to the center shaft, whereby to require considerably less power and provide greater strength in case of strain or impact with obstructions; and (7) to obtain a greater grip upon the medium with a propeller of less diameter for progress in shallow water, whereby to avoid striking logs, rocks and other obstructions along the path of the vessel's motion.

The novel propeller is also designed to function as a wedge for marine purposes, acting to lift the vessel or depress ground in a channel considered too shallow for navigation, enabling the vessel to pursue its course. It is, of course, apparent that the novel propeller may be applied either to the front or to the rear of the craft and could be swiveled from the latter to also serve as a rudder, being capable of procuring a quicker turn of the vessel in such a capacity than the conventional rudder.

While the preferred embodiment of the invention has been illustrated and described, it is possible that minor changes or refinements may be devised to fit the invention for use, and it is understood that such changes and refinements shall come within the scope and spirit of the appended claims.

I claim:—

1. A propeller comprising a hub, and a spiral concavo-convex blade extended around the latter, the peripheral pitch of the blade being constant and varying from that of the line of junction of the blade with the hub.

2. A propeller comprising a hub, and a spiral concavo-convex blade extended around the latter, the peripheral pitch of the blade being constant and greater than that of the line of junction of the blade with the hub.

3. A propeller comprising a hub, a spiral blade extended around the latter, the junction line of the blade being a regular spiral of a given pitch, the peripheral pitch of the blade being greater than that of the junction line, and the blade progressing radially from one end to an intermediate point and receding toward the hub for the balance of its length, the forepart of the blade being deflected in a forward direction to assume a concave obliquity to the hub toward one side, the medial part being substantially perpendicular to the hub, the rear part having a concave obliquity to the hub toward the other side, and the blade being shortened to terminate at the ends of the junction line by curving the terminal portions of the blade toward the hub with prominent endwise edges.

4. A propeller comprising a hub, a spiral blade extended around said hub and having a uniform concavo-convex form at both ends, the junction line of the blade and hub being a regular spiral of a given pitch, the peripheral pitch of the blade being greater than that of said junction line, said blade progressing radially from one end to an intermediate point and receding toward the hub for the balance of its length, the convex faces of said blade at one end of said hub being arranged to face the convex faces at the other end of the hub, the forepart of the blade being deflected in a forward direction to assume a concave obliquity to the hub toward one side, the medial part being substantially perpendicular to the hub, the rear part having a concave obliquity to the hub toward the other side, the blade being shortened to terminate at the ends of the junction line by curving the terminal portions of the blade toward the hub with prominent endwise edges, and the rise of one endwise edge from the hub being greater than that of the other endwise edge.

5. A propeller comprising a hub, a spiral blade extended around said hub and having a uniform concavo-convex form at both ends, the junction line of the blade and hub being a regular spiral of a given pitch, the peripheral pitch of the blade being greater than that of said junction line, said blade progressing radially from one end to an intermediate point and receding toward the hub for the balance of its length, the convex faces of said blade at one end of said hub being arranged to face the convex faces at the other end of the hub, the forepart of the blade being deflected in a forward direction to assume a concave obliquity to the hub toward one side, the medial part being substantially perpendicular to the hub, the rear part having a concave obliquity to the hub toward the other side, the blade being shortened to terminate at the ends of the junction line by curving the terminal portions of the blade toward the hub with prominent endwise edges, and the rise of the rear endwise edge from the hub being greater than that of the front endwise edge.

6. A propeller comprising a hub, and a relatively-thin spiral blade extended from the latter, the forepart of the blade being deflected in forward direction to assume concave obliquity to its hub on its frontal side, and the rear part having a similar formation on its gear, and the blade being shortened to terminate at the frontal end of the junction line with a relatively small cutting edge and at the rear end of the junction line with a relatively large cutting edge.

7. A propeller comprising a hub, a spiral blade extended around the latter, the junction line of the blade being a regular spiral of a given pitch, the peripheral pitch of the blade being greater than that of the junction line, the blade progressing radially from one end to an intermediate point and receding toward the hub for the bal-

ance of its length, and the blade being shortened to terminate at the ends of the junction line by curving the terminal portions of the blade toward the hub with prominent endwise edges.

8. A propeller comprising a hub, a spiral blade extended around the latter, the junction line of the blade being a regular spiral of a given pitch, the peripheral pitch of the blade being greater than that of the junction line, the blade progressing radially from one end to an intermediate point and receding toward the hub for the balance of its length, the blade being shortened to terminate at the ends of the junction line by curving the terminal portions of the blade toward the hub with prominent endwise edges, and the rise of one edgewise edge from the hub being greater than that of the other endwise edge.

9. A propeller comprising a hub, a spiral blade extended around the latter, the junction line of the blade being a regular spiral of a given pitch, the peripheral pitch of the blade being greater than that of the junction line, the blade progressing radially from one end to an intermediate point and receding toward the hub for the balance of its length, the blade being shortened to terminate at the ends of the junction line by curving the terminal portion of the blade toward the hub with prominent endwise edges, and the rise of the rear endwise edge from the hub being greater than that of the front endwise edge.

10. A propeller comprising a hub, a spiral blade extending from the hub, the forepart of said blade being deflected in a forward direction to assume concave obliquity to said hub on the frontal side thereof, the rear part of said blade having an opposite obliquity on its rear side, said blade being shortened to terminate at the front end of the junction line with a relatively small cutting edge and at the rear end with a relatively large cutting edge.

11. A propeller comprising a hub, a spiral blade extending from the hub, the forepart of said blade being deflected in a forward direction to assume concave obliquity to said hub on the frontal side thereof, the rear part of said blade having an opposite obliquity on its rear side, said blade being shortened to terminate at one end of the junction line with a relatively small cutting edge and at the other end with a relatively large cutting edge.

12. A propeller comprising a hub, a spiral blade extending from the hub, the forepart of said blade being deflected in a forward direction to assume concave obliquity to said hub on the frontal side thereof, the rear part of said blade having an opposite obliquity on its rear side, said blade being shortened to terminate at one end of the junction line with a relatively small cutting edge and at the other end with a relatively large cutting edge, and the rise of one endwise edge from the hub being greater than that of the other.

13. A propeller comprising a hub, a spiral blade extending from the hub, the forepart of said blade being deflected in a forward direction to assume concave obliquity to said hub on the frontal side thereof, the rear part of said blade having an opposite obliquity on its rear side, said blade being shortened to terminate at one end of the junction line with a relatively small cutting edge and at the other end with a relatively large cuting edge, and the rise of the frontal endwise edge from the hub being greater than that of the rear.

14. A propeller comprising a hub, and a concavo-convex spiral blade extending around the latter, the line of junction of the blade with the hub being a constant spiral of a given pitch and the peripheral edge of said blade being a constant spiral of a different pitch.

15. A propeller comprising a hub, and a concavo-convex spiral blade extending around the latter, the line of junction of the blade with the hub being a constant spiral of a given pitch and the peripheral edge of said blade being a constant spiral of a greater pitch.

JOHN W. CALDWELL.