

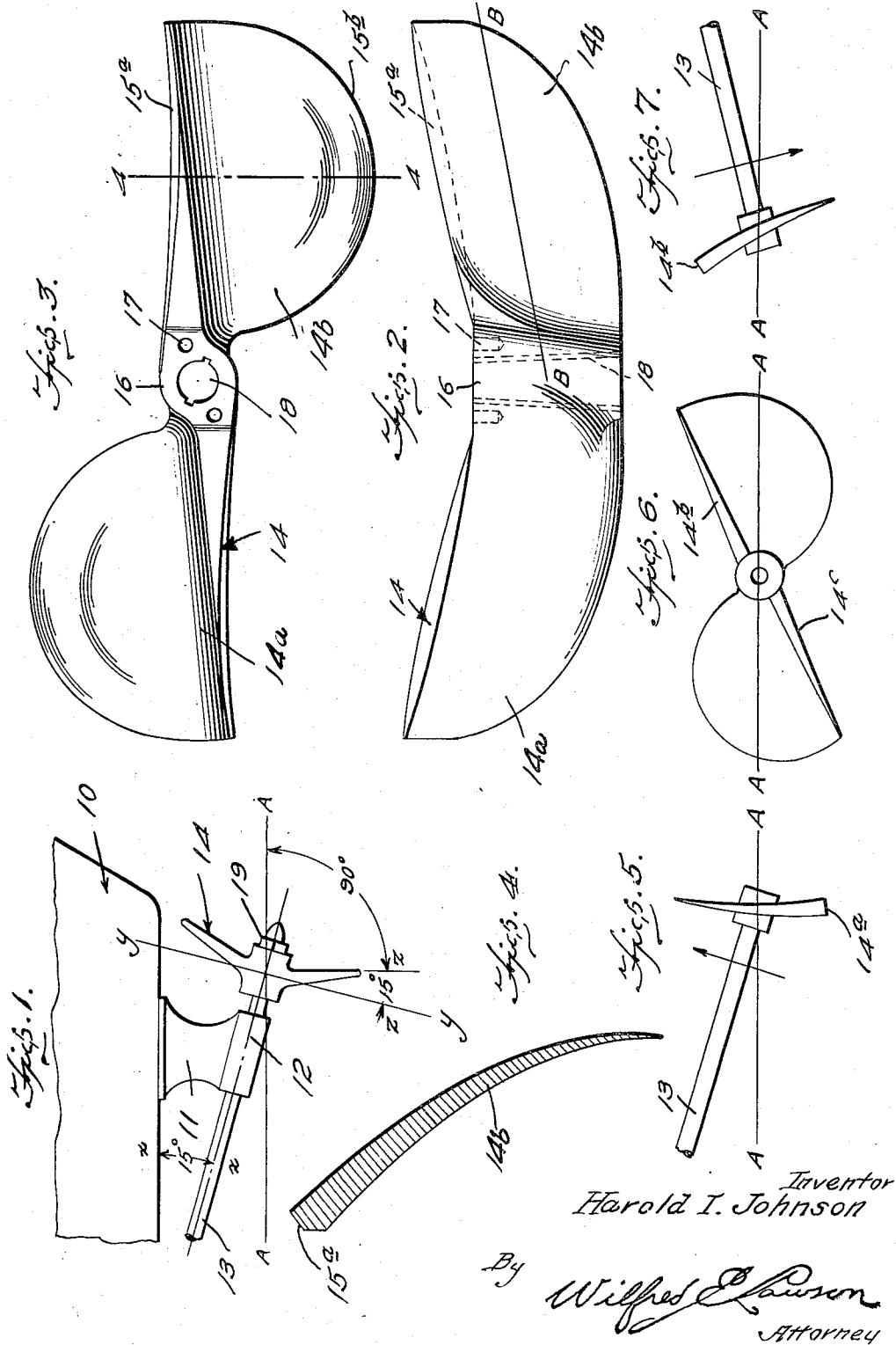
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MARINE PROPELLER AND MOUNTING THEREFOR

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MARINE PROPELLER AND MOUNTING THEREFOR

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4 Claims. (Cl. 115—34)

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This invention relates to boats and propellers therefor and is directed particularly to an improvement in screw type propellers designed especially for marine propulsion.

A primary object of the present invention is to increase the efficiency of a propeller where the shaft upon which it is mounted or its rotating axis is at an angle to the movement of the fluid stream in which it is operating, by forming the propeller blades in a novel manner with respect to the angle of the propeller shaft to the horizontal whereby each blade of the propeller as it enters the water or as it moves downwardly in the water will assume or move into a position substantially perpendicular to the horizontal, which position is attained when the blade is at the lowermost position in its circle of rotation.

Another object of the invention is to increase the efficiency of a propeller structure where the axis of the shaft on which it is mounted or its rotating axis is at an angle with respect to the stream in which the propeller is turning, by giving to the propeller blades a rake angle with respect to its rotation axis, which is approximately the same angle as the angle of the propeller shaft to the keel of the boat or to the slip stream.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawing forming a part of the specification, with the understanding, however, that the invention is not to be limited to the exact details of construction shown and described since obvious modifications will occur to a person skilled in the art.

In the drawing:

Figure 1 is a diagrammatic view illustrating the propeller structure of the present invention and its relation to the horizontal bottom of the boat and the slip stream in which the propeller works.

Figure 2 is a view in elevation of a propeller constructed in accordance with the invention.

Figure 3 is a view in plan of the same looking forward on Figure 1.

Figure 4 is a true sectional view taken substantially on the line 4—4 of Figure 3.

Figures 5, 6 and 7 are diagrammatic views illustrating the manner in which the propeller blade pitch varies in the rotation of the blade, showing particularly the angle of one blade with respect to the slip stream on its downward movement and the angle of the other blade with respect to the slip stream on its upward movement.

Referring more particularly to the drawing the

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numeral 10 in Figure 1 generally designates the lower portion of a boat, adjacent to the stern of which is fixed to the bottom on the center line the strut 11 which carries the shaft bearing 12.

The numeral 13 designates a propeller shaft which passes through the bearing and carries on its rear end a propeller constructed in accordance with the present invention.

The propeller structure 14 is here shown as comprising the two identical blades 14a and 14b and the hub portion 16.

Each of the blades has a thick trailing edge 15a and the symmetrically rounded leading edge 15b. A particular advantage of this thick trailing edge 15a which, as shown in Figure 3, tapers or is of gradually decreasing thickness from the hub 16 outwardly to the tip of the blade, is that at its junction with the hub it provides a wide face in which may be formed tapped holes 17 at opposite sides of the bore 18, into which holes may be threaded studs of a puller device or headed studs to lock in place the nut 19 by which the propeller is secured to the end of the shaft 13. Such design of the trailing edge gives a propeller structure of greater strength and efficiency without increasing the hub size.

The leading edge 15b is, as shown, of symmetrical contour and is of gradually tapering and transversely arcuate contour as illustrated in Figure 4. This tapering thin edge extends entirely from the tip of the propeller to the hub.

In addition to the form above described the blades have a positive rake angle to the axis of the hub. This rake angle is determined by the angle of the axis of rotation for the propeller shaft with respect to the bottom or keel line of the boat or to the line of the slip stream, which line is designated A—A in Figure 1 and which for purpose of illustration is shown as generally parallel to the bottom or keel line of the boat and to the horizontal. The rake angle is designated B—B in Figure 2.

Figure 1 illustrates the assembly of the propeller and shaft under a boat. In this assembly view the arc x—x designating the angle of the shaft 13, or hub axis of the propeller, to the horizontal or keel line, may be taken as approximately 15° although different boats have different angles. The line y—y is at right angle to the axis of the shaft 13, or propeller hub.

The propeller structure generally designated 14 is diagrammatically shown in profile and the arc z—z designates the positive rake angle which in the present case is also 15° or in other words corresponds to the angle of the shaft 13 to the hori-

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zontal bottom of the boat or to the slip stream line A—A if the same are parallel.

By reason of the fact that the rake angle of each blade is the same or approximately the same as the angle between the propeller shaft and the bottom of the boat, the face of the propeller blade which is in the lower position or at the limit of its downward movement in its rotary path, is substantially perpendicular to the slip stream A—A and to the horizontal while the opposite blade, that is the blade which is at the highest point of the rotary path is not.

Due to the disturbed water and vacuum behind the shaft and strut the blade at the top of rotation is not as efficient as the blade at the bottom of rotation which is in solid water, and this invention brings the blade to a position to exert a propelling force generally parallel to the horizontal while the blade is in the most efficient part of rotation.

In order to set forth or illustrate more clearly how the effective angle of pitch with respect to the slip stream or horizontal changes as the propeller rotates reference will be had to the diagrammatic views forming Figures 5, 6 and 7.

Fig. 6 shows the rear side of the propeller of this invention which rotates clockwise, as viewed in this figure and the line A—A represents the plane of the slip stream or the horizontal. Thus the blade 14a is moving upward and the blade 14b downward and the blades are in a substantially horizontal position. The pitch angle of the blades is related to the propeller shaft angle with respect to the bottom of the boat or to the horizontal and where such shaft angle is fifteen degrees, as shown, the pitch angle will be fifteen degrees with respect to a plane perpendicular to the axis of the propeller shaft.

By reason of this relationship between the pitch angle and the shaft angle, the surface of the blade 14a, as shown in Fig. 5, will be at substantially ninety degrees to the plane of the slip stream or to the horizontal and at this point in the path of rotation, will exert zero thrust. On the other hand, the surface of blade 14b as shown in Fig. 7, will be substantially one hundred twenty degrees to the plane of the slip stream or the horizontal and will be exerting substantial thrust. In other words, due to the relationship between the propeller shaft angle and the pitch angle of the blades, the effective pitch of the blade increases as the blades move downward into solid water and decreases as the blades move upward into disturbed water and partial vacuum rearwardly of the propeller shaft 13 and strut 11. This operation together with the positive rake angle related to shaft angle as described above, results in a very material increase in efficiency over conventional propellers.

It will also be apparent that in a propeller constructed in accordance with the present invention the blades have a thin leading edge and a thick trailing edge which at the junction of the same with the hub forms a heavy boss which pro-

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vides structure of ample thickness or weight for tapped holes in which may be threaded studs or bolts of a puller attachment or headed bolts which will function to hold in locked position the nut 19 which is threaded on the end of the propeller shaft, as previously stated.

While the propeller here illustrated is shown with two blades only, it is to be understood that the invention is not so limited since it is applicable to a structure having any number of blades.

I claim:

1. In combination with a boat having a propeller shaft disposed at a predetermined angle with respect to the horizontal, a propeller comprising a plurality of blades emanating from a hub, each blade having a sharp arcuate leading edge and a substantially straight, relatively thick trailing edge disposed substantially radially of said hub, each blade having a positive rake angle substantially equal to said predetermined angle whereby each blade at the lowermost point in its rotary path will be disposed at substantially right angles to the horizontal, will be disposed at substantially parallel to the horizontal.

2. In combination with a boat having a propeller shaft disposed at a predetermined angle with respect to the horizontal, a propeller comprising a plurality of blades emanating from a hub, each blade having a sharp arcuate leading edge and a substantially straight, relatively thick trailing edge, each blade having a positive rake angle substantially equal to said predetermined angle whereby each blade at the lowermost point in its rotary path will be disposed at substantially right angles to the horizontal, thereby providing a thrust substantially parallel to the horizontal.

3. In combination with a boat having a propeller shaft disposed at a predetermined angle with respect to the horizontal, a propeller comprising a plurality of blades emanating from a hub, each blade having a positive rake angle substantially equal to said predetermined angle whereby each blade at the lowermost point in its rotary path will be disposed at substantially right angles to the horizontal, thereby providing a thrust substantially parallel to the horizontal.

4. The structure as defined in claim 3 in which said predetermined angle of said propeller shaft with respect to the horizontal is of the order of 15 degrees and in which said rake angle with respect to a plane at right angles to the longitudinal axis of said propeller is of the order of 15 degrees.

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