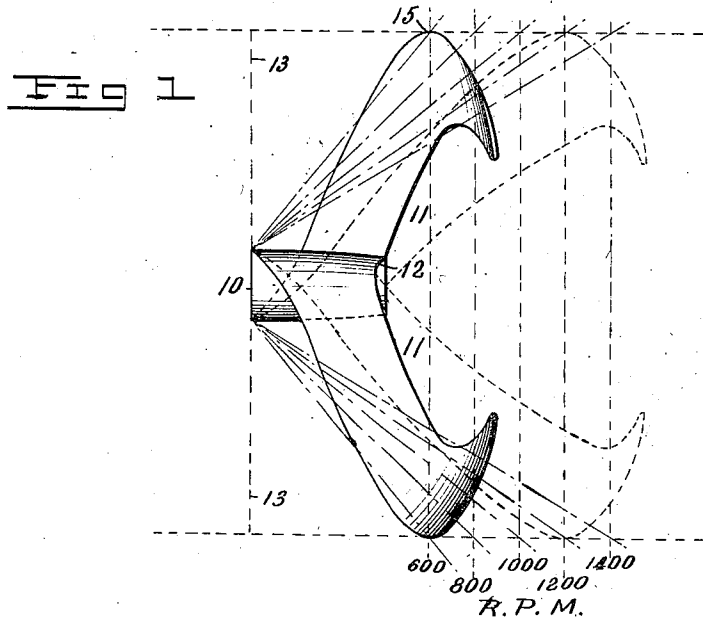
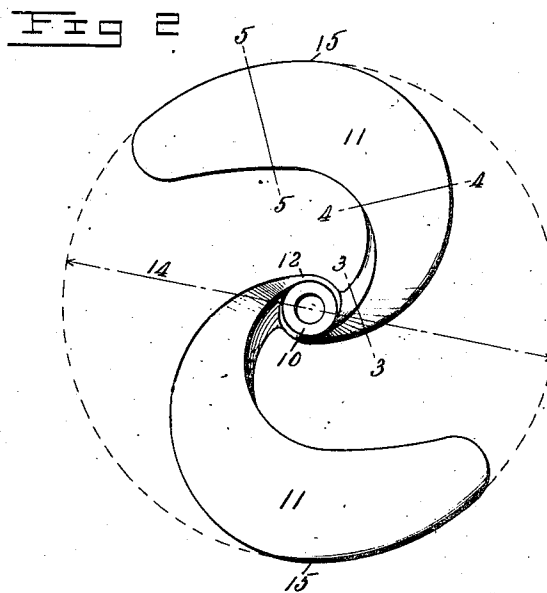


PROPELLER.

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Witnesses

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PROPELLER.

1,087,203.

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To all whom it may concern:

Be it known that I, JULIUS W. WALTERS, a citizen of the United States, residing at Glens Falls, in the county of Warren and State of New York, have invented new and useful Improvements in Propellers, of which the following is a specification.

My invention relates to propellers of the radial blade type. While having the particular relation specified, there are a number of features involved, which may be used with great ensuing advantage in connection with propellers of other types. On the other hand there are certain features which are of particular value when used in connection with propellers of the radial blade type, and it will be noted upon an understanding of my invention that the entire number of features coöperate with each other when combined together in the embodiment which I shall disclose to produce a propeller giving the most efficient results.

In a great number of propellers in use at the present time considerable difficulty is experienced in making them efficient owing to each of several causes. By many propellers there is a breaking up of the waters both next to the hub, and away from it, with the result that the water is not in condition for a most efficient purchase to be had by the propeller upon it. Frequently this breaking up of water occurs next the cutting edges of the propeller, with the result that the portions of the blades in the rear of the cutting edge are forced to act inefficiently. The resulting slippage or so-called slip of the propeller is rendered greater by this action of the propeller, and the speed of the vessel being driven is correspondingly decreased. In connection with many propellers also there is considerable centrifugal action of the propeller on the waters next the hub, and the water so acted upon is thrown out in such a manner as to project it beyond the range of action of the outer portions of the blades. The slip of the propeller is also increased due to this action. And in all of these instances the breaking up of the water and the resulting irregular action of the propeller upon it, especially at high speeds, results in a vibration of the propeller and shaft which is transmitted to the machinery and the frame of the vessel, becoming in many instances very objectionable on account of the

jarring of the machinery, and the unpleasant vibration of the walls of the vessel.

Many attempts have been made to overcome the difficulties, and to remove the objectionable features of the propellers which were thought to have caused them. Worm propellers of certain forms have been used, the spiral form of screw propeller has been used, and the multi-blade spiral, the blades of which emanate from the hub and follow a spiral of gradually increasing diameter, but none of them, so far as I am aware, have been a successful solution of the problem in all of its phases. These difficulties may have been removed in a propeller designed for a certain speed, but at certain other speeds, the same propeller has been found inefficient, and a propeller of the same design could not be made to work efficiently. So also in some propellers one difficulty has been sought to be remedied, and in some another.

It is the object of my invention likewise, to overcome the difficulties named, and I have so far succeeded that the propeller of my invention operates at a greatly increased efficiency, and a propeller of the same design may be used over a wide range of speeds with the same efficient action, breaking up of the water, and centrifugal action of the propeller on it, and the resulting slip having been reduced to a minimum.

In the accomplishment of the object of my invention I use a multi-blade propeller. I so shape and associate the blade with the hub and so form them and their driving edges and faces that all of the above-named difficulties are overcome in great measure.

My invention will be readily understood and appreciated from a consideration of the accompanying drawings in connection with the following description in which the manner of association and formation of the blades of the propeller of my invention are particularly pointed out.

The drawings show one specific embodiment of my invention.

Figure 1 is a side elevation of this propeller, Fig. 2 is a rear elevation of the same, and Figs. 3, 4 and 5 are cross-sections on lines 3, 4, and 5 respectively of Fig. 2.

10 is the hub of the propeller and 11 are the blades. The driving faces of the blades are formed commencing tangent to the hub

as at 12. At this point the elements of the driving faces are substantially perpendicular to a transverse plane, represented by line 13, 13. I extend the blades outwardly and rearwardly along a conical spiral curve, until they reach a certain maximum diameter 14 at a point 15 in their length. From this point on I extend them along a helical curve at a diameter equal to the maximum diameter 14. I terminate the blades before there is apparent overlapping in end projection of the propeller, the blades being terminated before they occupy an angle of 180° around the axis of the hub.

After leaving the hub the face of the blade instead of continuing perpendicular to a transverse plane 13, 13, is increasingly inclined to it, the rear edge of the blades being lagged behind the cutting edge, until a point at or near the point of greatest diameter is reached. Thereafter the incline of the blades to a transverse plane is maintained substantially uniform. The blades also are formed of increasing width from the hub outwardly, and are given the cross-sections shown in Figs. 3, 4, and 5. It will be observed that the blades are thickest at a point nearer the rear edge of the blade than the front edge, or over half-way of the width of face of the blade in any instance from the cutting edge to the rear edge. The sectional areas are substantially triangular in shape.

By virtue of the commencing of the blades, tangent to the hubs, there is little disturbance of the water at the hub, the propeller in effect worming its way through the water in much the same manner as does a worm propeller. Gradually the water is acted upon by the faces of the blades which follow the spiral curve of increasing diameter rearwardly, until it is moving as a substantially solid column, in which shape it is ready to be acted upon and is acted upon by the outer portions of the blades, which are formed on the rearwardly extending spiral curve of substantially uniform diameter. Breaking up of the water due to rotation of the blades adjacent the hub, and due to centrifugal force is reduced to a minimum, and the solid body of water always in the region of the propeller is constantly acted upon by new portions of the blades. Slip is therefore low and efficiency high.

I find that by simply increasing the incline of the blades rearwardly, or in other words by simply decreasing the conical angle of the spiral curve on which the blades are formed with respect to the axis of the hub, I may readily adapt the propeller of my invention to use at higher speeds. This is illustrated by the dotted lines in Fig. 1, the points at which the blades reach their maximum diameter of revolution for speeds of 600, 800,

1000, 1200, and 1400 revolutions being indicated separately. It will be noted that as the speed is increased, the conical angle of the cone of the spiral of the rearwardly extending blades is decreased. Preferably the maximum diameter of revolution of the blades is maintained substantially uniform in the designs for a wide range of speeds. It is assumed of course the blades are elongated in order that the maximum diameter may be preserved when the conical angle is decreased. The propeller of my invention is thus made suitable for use at various speeds throughout a very wide range.

Despite its peculiar shape the propeller is so constructed that it will withstand all the strains imposed upon it under the most severe conditions of normal use without breaking, and this without impairing the efficient cutting action of the blade in the water. The blades are thickest at points nearest the hub on the rear edges of the blades, this thickened portion acting as a backbone as it were, and thus giving strength where strength is most needed. By virtue of this provision also the blade is made to taper gradually from the cutting edge rearwardly substantially to the rear edge, and the action of the blades upon the water is made knife like, the solidarity of the water acted upon by the propeller being thus further preserved. Owing to the fact that each blade occupies an angle less than 180° around the axis of the hub, they may very readily be made of such cross-section as to be quite rigid. It is owing to the efficient action of the propeller upon the water in the peculiar manner previously described, that the linear length of the blades is reduced, and it is by virtue of this reduction to such extent that they occupy angles less than 180°, without apparent overlapping in end projection that the action of the blades upon the water is made substantially independent, resulting in further increase in efficiency.

What I claim is:

A propeller comprising a hub and blades extending outwardly and rearwardly from the hub along a conical spiral curve through approximately 180 degrees to a predetermined maximum diameter and thence along a helical cylindrical curve of said maximum diameter less than 45 degrees whereby to prevent overlapping in end projection of the blades, said blades increasing in width from the hub to the point of maximum diameter thence decreasing in width to their ends and decreasing in thickness toward their ends, the working faces of the blades commencing tangent to the hub whereby to admit of free radial flow of the fluid from the hub and offset vortexing, said working faces continuing outwardly and backwardly at an increasing inclination to the transverse plane of the hub, the rear edges of the blades

lagging behind the cutting edges up to the point of maximum diameter and thence being uniformly inclined whereby the propeller is given worm action effecting the movement of the fluid in a substantially solid column, the outer cylindrical portions of said blades acting upon the solid column of the fluid.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses. 10

JULIUS WM. WALTERS.

Witnesses:

A. C. VANDERZEE,
JOSEPH E. KOBER.