W. R. BOUTWELL.

PROPELLER.

APPLICATION FILED APR. 4, 1912.

1,066,988.

Patented July 8, 1913.

Fig 1

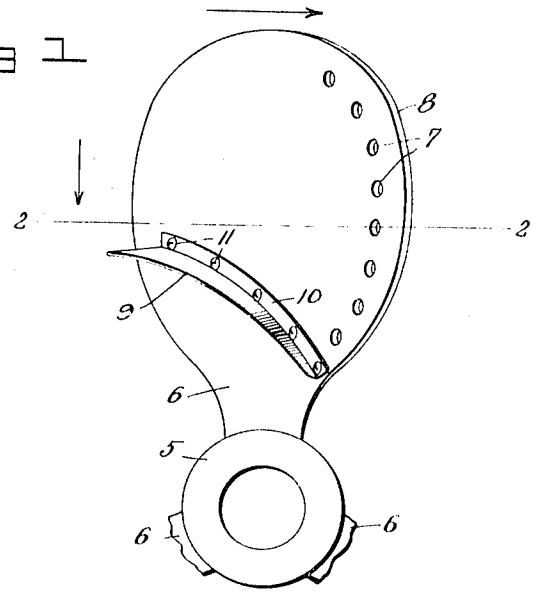


Fig 3

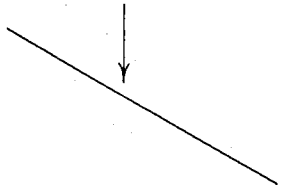


Fig 2

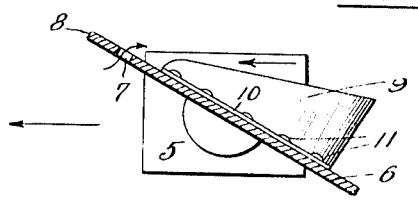
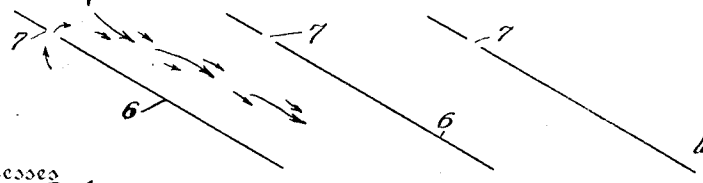


Fig 4



Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM R. BOUTWELL, OF NORFOLK, VIRGINIA.

PROPELLER.

1,066,988. Specification of Letters Patent. Patented July 8, 1913.

Application filed April 4, 1912. Serial No. 688,562.

To all whom it may concern:

Be it known that I, WILLIAM R. BOUTWELL, a citizen of the United States, residing at Norfolk, in the county of Norfolk and State of Virginia, have invented new and useful Improvements in Propellers, of which the following is a specification.

My invention relates to propellers, and more especially to screw propellers used for driving ships and other water craft as well as air ships, my more particular purpose being to lessen or alleviate the trouble due to back pressure against the front faces of the propeller blades and the sluggish centering of the medium around the hub, owing to the back wash of the water or air as the vessel moves forward.

More particularly stated my invention comprehends a propeller so formed as to cause water or air as the case may be, to flow through the propeller blade at points located adjacent to the forward or cutting edge thereof—this water or air flowing in such direction as to meet the back wash and to divert the same, causing it to be discharged between consecutive blades of the propeller.

My invention further relates to the provision of means associated with each propeller blade, for diverting the backwash of water or air from the front faces of the blades and thereby preventing to a great extent the objectionable vortex which obtains about the hub and lower part of the propeller blades.

I have made the discovery that with most propeller blades of simple construction, when used for driving a vessel forward through the water, there is apt to develop considerable pressure against the front faces of the propeller blades due to water known as back wash, and this causes a substantial retardation in the forward movement of the vessel. I have also made the discovery that it is practicable to divert the flow of the back wash to some extent and cause the same to be discharged from the front face of the blade in such manner as to offer a minimum of resistance to the forward movement of the vessel and without impinging the back wash upon the driving faces of succeeding blades of the propeller. I have also discovered that this can best be done by use of the openings above referred to and disposed adjacent to the operative or cutting edge of the blade of the propeller; and also by adding upon the propeller blade, a second blade having preferably a form hereinafter described, this second blade being so located that when the propeller turns, the second blade causes an outward and upward flow of water adjacent to the front face of the propeller blade, thereby reducing to a minimum the vortex at the hub.

Reference is made to the accompanying drawing forming a part of this specification in which like letters indicate like parts.

Figure 1 is a fragmentary elevation of a screw propeller, the front face thereof being the one viewed by the observer. Fig. 2 is a section on the line 2—2 of Fig. 1 and showing the propeller as it would be seen by an observer standing beyond the same according to Fig. 1 and looking downward. Fig. 3 is a diagram illustrating the effect of back wash against the forward or front face of an ordinary propeller blade of simple construction. Fig. 4 is a diagram showing how the openings in the propeller blade are used, in my invention, for diverting the flow of the back wash from the front face of the propeller blade.

The propeller hub is shown at 5, and carries a number of propeller blades 6 which as here shown are of simple construction. Each propeller blade is provided with openings 7, in this instance circular holes, disposed adjacent to one edge 8, this being the forward or cutting edge of the blade as the propeller is turned in a suitable direction to drive the vessel ahead. The row of holes or openings 7 has generally the proximate curvature of the adjacent edge 8 of the propeller blade. A deflecting blade 9, having generally the form of a half lune, is provided with a flange 10 integral with it and of arcuate form, this flange being secured by fastenings 11 directly upon the front face of the propeller blade. The half lune deflecting blade 9 may be cast integral with the propeller blade, or may be secured to it in any suitable and desirable manner. The deflecting blade 9 when brought into the position indicated in Fig. 1, and seen by an observer looking straight down upon it has, in appearance, a substantially trian-

gular form as will be understood from Fig. 2. The deflecting blade 9 has a gradual curvature, being convex upon its outer face and concave upon its inner face, as will be understood from Fig. 1.

According to Fig. 1 the propeller is turning in a clockwise direction. According to Fig. 2 the propeller blade shown in section is moving toward the left.

A general idea of the purpose of this invention and of the manner in which it overcomes the difficulties above suggested may be obtained by analysis of Figs. 3 and 4. Fig. 3 shows a propeller blade of ordinary construction, as the blade would be seen by an observer standing at the rear of the propeller and looking downwardly upon the blade, the latter, in this instance, being supposed to turn toward the left. The primary discharge of the water or air by the blade in consequence of its rotation, is to the rear of the blade. The rotary motion of the blade and the discharge of water or air thereby causes a flow of water or air against the front face of the blade as indicated by the large arrow in Fig. 3. This flow of water or air is what I designate as back wash, and which I desire to divert in order to alleviate or reduce the resistance due to forward movements of the vessel.

Referring to Fig. 4, the effect of providing the openings 7 will be observed. The primary tendency of these openings is to admit a little water to flow from the rear of each propeller blade to the front thereof as indicated by the small arrow at the extreme left of Fig. 4. The small arrows indicate the course of this water or air. The water or air thus passing through the openings 7 is met by the water or air of the back wash, and tends to divert the flow of the back wash, as indicated by the series of large arrows in Fig. 4. That is to say, a little water or air from the rear of the propeller blades, after passing through the openings 7, mixes with the back wash, and the entire volume of water or air making up this admixture now flows substantially midway between two consecutive propeller blades, as indicated in Fig. 4. It is important, in diverting the back wash from the front face of a propeller blade, not to divert the back wash against the next consecutive propeller blade, but rather to have the mixture of the back wash, and water for diverting the same, flow as a unitary stream between consecutive blades.

It is true that the volume of water or air comprising back wash is much greater than the volume of water or air passing through the openings 7. Nevertheless, the small volume of water or air passing through the openings is sufficient to divert the back wash to a slight extent, and this is all that is necessary in order to produce a substantial relief from the pressure due to the back wash against the front face of the propeller blade. The deflecting blades 9 are very useful in coacting with the openings 7 for the purpose of causing the back wash to be removed from the front face of the propeller blade. The curvature of each deflecting blade 9 is such that, when the blade is turning, the volume of water or air flowing against the front or forward face of the blade is pushed outwardly from the center of rotation, and consequently is discharged as nearly as practicable from the outer end of the blade rather than from portions thereof adjacent to the hub. This is of material advantage, as the action of the deflecting blade 9, by removing a portion of the back wash, tends to prevent the back pressure due to the back wash from retarding the general forward movement of the propeller through the water, as well as overcoming the tendency to pocket around the hub.

It appears that the openings 7, in order to have their greatest efficiency, should be preferably located near the periphery of the propeller blade. If located too far inward from the edges of the blade, the water or air admitted through the openings does not effectively divert the flow of the back wash as above described. The shape of the openings is a matter of minor importance and the angle at which the openings extend through the blade may be varied according to circumstances. Ordinarily, the openings may have the form of plain round holes extending at right angles directly through the propeller blade as shown in Figs. 1 and 2.

The peripheral discharge, made by aid of the holes 7, as will be understood by the foregoing description, has a tendency to prevent the objectionable step commonly known in this art as "hubbing"; that is, the accumulation of a body of sluggish water or air in the immediate vicinity of the hub, and particularly in front of the hub reckoning according to the direction in which the vessel is traveling, so as to produce back pressure against the proximate center of the propeller. Not only does the peripheral discharge avoid hubbing, but it also avoids undue pressure due to back wash against the front faces of the blades, even at considerable distances outwardly from the hub. The deflecting blade 9 also tends to prevent hubbing as well as to deflect the back wash which otherwise tends to make back pressure against the propeller blade. The peripheral discharge due to the openings 7 and the flow of water or air due to movements of the deflecting blade 9, therefore, coact together to produce the common object of diverting the back wash from the front faces of the propeller blades and the sluggish water around the hub.

I do not limit myself to the precise construction shown, nor to the use of my device

in any particular fluid medium, though I have in mind more particularly a propeller suitable for use in either water or air.

I claim,—

1. In a propeller, the combination of a propeller blade having a number of perforations near its forward edge adapted to admit therethrough a small portion of the fluid propelled, said perforations being disposed at an angle directing the fluid against the back wash whereby to direct the latter between two adjacent propeller blades, and a diverting blade mounted upon the front face of said propeller blade and having one end located nearer the center of rotation than the opposite end thereof whereby to divert outwardly the flow of back wash against the front face of the propeller blade.

2. In a propeller, the combination of a propeller blade and a diverting blade mounted upon the front face of said propeller blade, the forward end of said diverting blade being located nearer the center of rotation than the opposite end thereof whereby the flow of back wash against the front face of said propeller blade is diverted outwardly.

3. In a propeller, the combination of a revoluble propeller blade and a diverting blade mounted upon the front face of said propeller blade, said diverting blade being wider at one of its ends than at its opposite end, the wide end of said diverting blade being farther than the narrow end thereof from the center of rotation in order to divert outwardly the flow of back wash otherwise tending to press against the adjacent face of said propeller blade.

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

WILLIAM R. BOUTWELL.

Witnesses:
JAS. R. PEAKE,
JOHN D. WATSON.