W. S. BOWEN.

PROPELLER DEVICE.

APPLICATION FILED SEPT. 10, 1917.

1,267,506. Patented May 28, 1918.

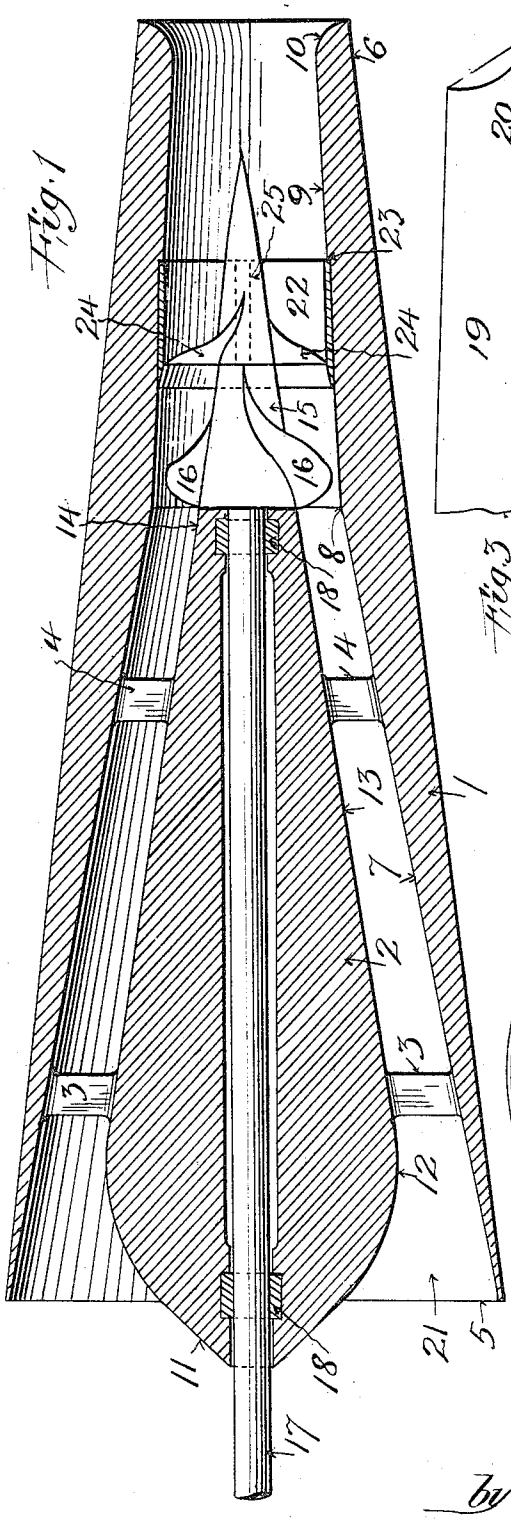


Fig. 1

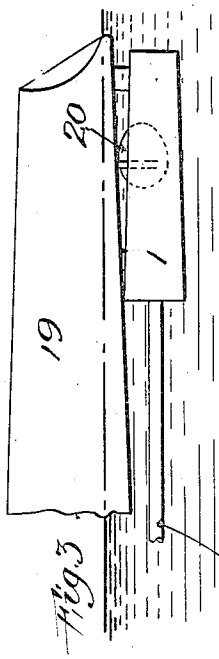


Fig. 3

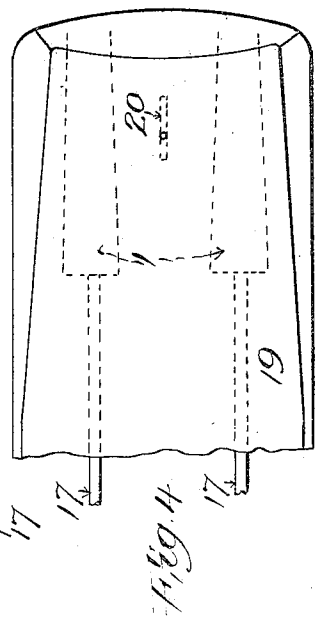


Fig. 4

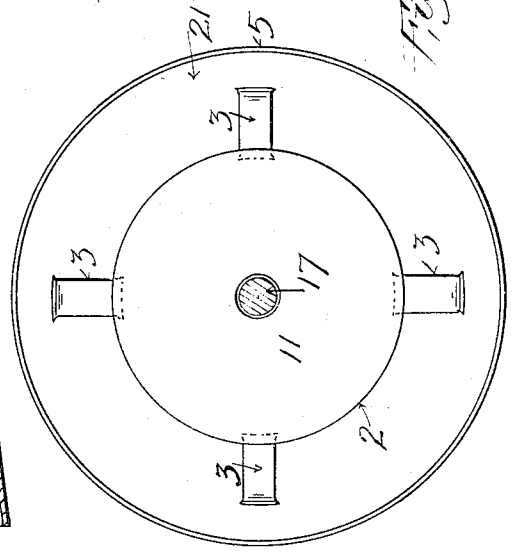


Fig. 2.

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UNITED STATES PATENT OFFICE.

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PROPELLER DEVICE.

1,267,506. Specification of Letters Patent. Patented May 28, 1918.

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To all whom it may concern:

Be it known that I, WILLIAM SPENCER BOWEN, a citizen of the United States, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Propeller Devices, of which the following is a specification.

My invention relates to a propeller device consisting of a propeller and a concentrator associated therewith. The invention is adapted for use in marine propulsion or devices for testing propeller efficiency and in the drawings forming part hereof I have shown the invention adapted for ship propulsion.

The object of the invention is to provide for the operation of a propeller in a fluid in such manner that the propeller may be operated at high speeds without cavitation. The device is adapted to increase the efficiency of the propeller at various speeds and to make it possible to operate it at higher speeds than has heretofore been considered practicable and so that the efficiency at high speed will not be offset by cavitation. The propeller operates within the concentrator. The concentrator casing causes a constant reduction in area and within this casing there is a double conical body supported in and spaced from the casing to provide an intermediate fluid space which is of annular cross section. The casing and interior body cause a reduction in area and the elimination of eddy currents so that the propeller which is arranged in the casing operates always under uniform and favorable conditions. Preferably there are rectifying vanes aft of the propeller for rectifying the direction of the fluid as it leaves the propeller and these may take the form of the fixed vanes of the Thornycroft turbine propeller.

In the drawing forming part of this application,

Figure 1 is a longitudinal sectional view taken through the middle of the device,

Fig. 2 is an end elevation thereof, looking at the left hand end of Fig. 1,

Fig. 3 is an elevation of the stern of a boat to which the invention is applied, and

Fig. 4, is a plan view thereof.

The concentrator comprises a casing 1 and the interior or core member 2, the latter being held in spaced relation to the casing by struts 3, 4 extending between the inner member 2 and the casing 1 and disposed at different positions around the inner member and at different positions along the length thereof. I have shown by way of example four forward struts 3 disposed 90° apart and similar rear struts 4.

The forward end 5 of the casing is of large diameter and the exterior preferably tapers uniformly toward the rear end 6 which is of smaller diameter than the forward end. The exterior surface may be modified more or less but it is preferable that its contour be tapering so that if any fluid is displaced laterally beyond the width of the forward end of the casing it will afterward react on the outer surface and thus reduce the losses in efficiency due to any head resistance.

The interior surface 7 of the casing is generally tapering. It is preferably of extreme width at the forward end 5 and gradually decreasing toward the smaller end as far as the point 8 or nearly opposite the end of the inner member 2. From the point 8 the angle of taper of the bore is preferably lengthened at 9 and the extreme end, I have shown as ending in a short flare 10.

The inner member 2 is double conical. The forward end 11 which is shown as extending slightly forward of the casing, is of small diameter and the member 2 then gradually increases in diameter to the point 12 of maximum diameter which point is well within the casing. From the point 12 of maximum diameter the member 2 gradually tapers at 13 to the smaller end 14 and this taper is such, in the preferred construction, as to make the exterior surface of the member 2 and the interior surface of the casing parallel.

The propeller comprises the body 15 and the blades 16. The body 15 is preferably shaped so as to form substantially a continuation of the member 2. The blades may be of any desired shape or pitch, those shown herein being preferred. The propeller is mounted on the shaft 17 which extends forwardly through the center of the member 2 and there are bearings 18 in the member 2 for the shaft. Where the device is used for boat propulsion the shaft 17 extends forwardly from the member 2 and through the hull 19 to the propelling engine within the boat.

Where the device is used for boat propulsion one of the propellers and a concentrator may be arranged at each side of the stern as shown in Figs. 3 and 4, the larger end 5 of the concentrator facing forward. In this arrangement the rudder 20 will be positioned between the propelling devices. The device may be arranged in various ways other than that shown herein.

When the device is used for propulsion the shaft 17 will be revolved at any desired speed and one advantage of the present device is that it may be operated at much higher speed than the ordinary propeller having no concentrator and there will be no cavitation even at high speed. The revolving propeller will act on the water in the concentrator and at the point of high velocity, *i. e.*, at the restricted portion 8 of the concentrator. The fluid drawn into the larger end of the concentrator in large volume will pass through the space 21 around the inner member 2 and this space is of gradually decreasing area, so that the velocity of the fluid will increase as it passes toward the smaller end of the concentrator. The space 21 is annular in cross section and at the forward end of the concentrator this space decreases in area both by reason of the convergence of the surfaces of the member 2 and casing and by reason of the taper of the casing. If the member 2 is made parallel with the inner wall of the casing from about the point 12 rearward, as in the preferred construction, then the annular cross sectional areas of the space will decrease uniformly toward the propeller. From the point 8 rearward the cross sectional area of the fluid space gradually decreases toward the discharge end, the taper of the inner surface of the casing being on a longer angle at 9 than the forward part 7.

The shape of the fluid space shown herein is such that no matter how fast the propeller is operated there will be no cavitation and the highest velocity in the fluid will be attained at or behind the propeller.

There will be no cavitation or eddy currents caused by the centrifugal action of the propeller and the fluid will be delivered from the discharge end in a compact jet of high velocity.

There are no great losses from head resistance. When the water strikes the forward end 11 of the member 2 the angle of deflection is such that the water will not be driven beyond the lateral limits of the forward end of the casing but will be deflected within the space 21. The reduction of area in the space 21 is gradual in order that the resistance will not be too great.

I prefer to provide rectifying vanes aft of the propeller to change the direction of the water after it leaves the propeller and to cause it to flow axially of the casing. For this purpose I have provided a ring 22 within the casing, which rests against the shoulder 23. This ring carries the oppositely disposed fixed vanes 24 extending radially from the hub 25 in which the shaft 17 has a bearing. These vanes rectify the flow of water as it is delivered from the propeller and direct it substantially parallel with the axis of the casing.

Having described my invention what I claim is:

1. A device of the class described including a concentrator comprising a casing having a bore gradually decreasing from its forward end, an inner member arranged in spaced relation to said casing and forming a longitudinal fluid space of annular cross section and gradually decreasing area, said inner member having a forward end of gradually increasing dimensions followed by a portion of gradually decreasing dimensions, and a propeller in said casing arranged to revolve at or near the rear end of said inner member.

2. A device of the class described including a concentrator comprising a casing having a bore gradually decreasing from its forward end, an inner member arranged in spaced relation to said casing and forming a longitudinal fluid space of annular cross section and of gradually decreasing area, said inner member projecting beyond the forward end of the casing and having a forward end of gradually increasing dimensions followed by a portion of gradually decreasing dimensions, and a propeller in said casing arranged to revolve at or near the rear end of said inner member.

3. A device of the class described including a concentrator comprising a casing having a bore gradually decreasing from its forward end, a stationary inner member arranged in spaced relation to said casing and forming a longitudinal space of annular cross section and of gradually decreasing area, said inner member being of double conical shape, a revoluble propeller body adjacent the rear end of said inner member and shaped to form a continuation of said inner member, and a blade carried by said propeller body.

4. A device of the class described including a concentrator comprising a casing having a tapering exterior and having a bore the forward portion of which gradually decreases from its forward end and the rearward portion gradually decreasing but on a longer angle to the decrease of said forward portion, an inner member of double conical shape spaced from the casing to provide a fluid space of gradually decreasing area, the rear end of said inner member terminating at or near the juncture of said forward and rear bore portions and a propeller arranged near the rear end of said inner member.

5. A device of the class described including a concentrator comprising a casing having a bore gradually decreasing from its forward end, an inner member having conical forward and rear portions and spaced from the casing to provide a fluid space of annular cross section and gradually decreasing area, a propeller arranged in said casing and to the rear of said inner member and rectifying vanes arranged in said casing to the rear of the propeller and adapted to rectify the flow of fluid for the purpose set forth.

Signed this 25th day of August, 1917.

WM. SPENCER BOWEN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."