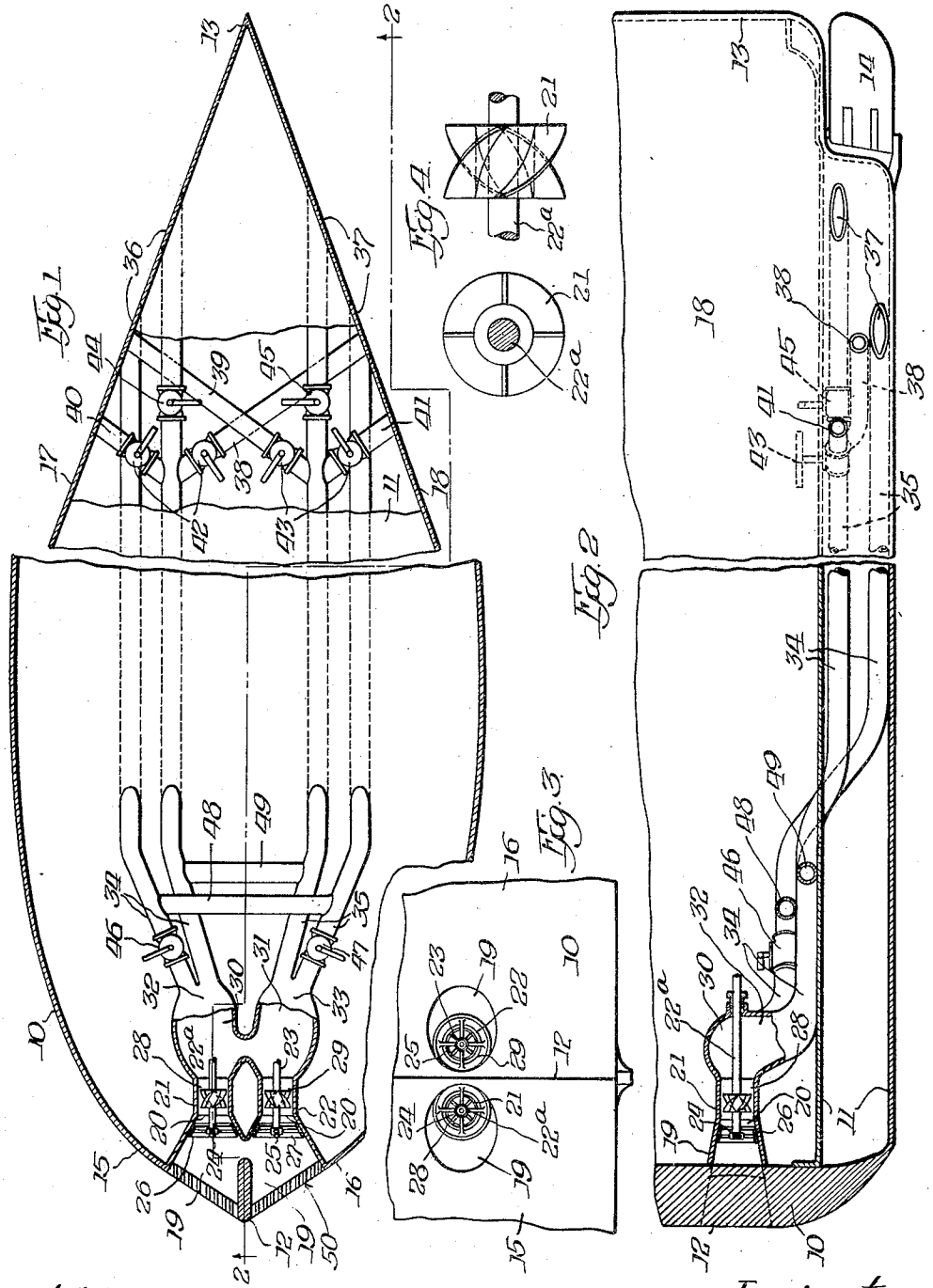
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SHIP PROPULSION

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SHIP PROPULSION

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This invention relates in general to ships and boats and, more particularly, to an improved method of and apparatus for propulsion thereof.

It is well known to those skilled in ship building and in naval constructing and the like that in the ordinary screw-propeller as customarily employed in the power plant of a mechanically propelled vessel such as a steamship, the maximum rate of speed at which the propellers may be driven to obtain the maximum efficiency and economy in operation and also maximum speed of the vessel through the water are all limited by the rate at which the water will flow to the propellers and that the forces normally tending to move water to the propellers are solely the forces of gravity and of the expansive properties of air. That is, in a steam vessel under way with the conventional form of stern propeller, if this propeller, in response to the power in excess of that normally employed to drive the vessel at its maximum rate of speed through the water, is caused to be rotated at a higher rate of speed, the speed of the vessel does not only not increase but may even decrease, for the reason that cavitation begins to take place, that is, owing to the rapid rate at which the blades of the propeller pass through their revolutions their displacement of the water, which in reality results in a forward movement of the vessel, is such that water on the forward faces of the blades, that is, the faces toward the bow of the vessel, which is supplied thereto by the force of gravity and the expansive properties of air, does not reach the blades in time to be of any value, and the result is that behind each blade in its path of rotation there is a vacuum which not only tends to eliminate the forward movement of the vessel but tends to carry any water which is behind the blades in their path of rotation toward the next preceding blade. This condition is further caused to prevail by the forward movement of the vessel through the water and the tendency for the water ahead of the propellers to follow the curved lines of the vessel at its stern. The conditions mentioned above are not materially remedied by placing the propellers at the forward part of the vessel.

It is, therefore, one of the principal objects of my invention to provide in connection with a steam vessel or motor propelled vessel to eliminate cavitation at the propellers and to increase the rate of speed at which the propellers may be efficiently and economically operated to employ all, or nearly all, of the power available in the power plant of the vessel; the provision of an improved method of and means for supplying water to the propellers of a steam vessel or the like whereby to cause the water to flow to the propellers under a force in addition to that of the forces of gravity and the expansive properties of air; the provision of an improved propelling method and means for vessels which includes placing the propellers at the forward part of the vessel and supplying water thereto in excess of that normally required by the propellers to propel the vessel; the provision in a power plant for mechanically propelled boats and ships of an improved propelling means therefor in which the efficiency of the power plant and the action of the propellers on the water are enhanced, whereby to permit of greater rate of revolution of the propellers than that heretofore possible in steamships and other mechanically propelled vessels known to me; and the provision of an improved propelling means for mechanically propelled vessels that which will permit of operation of the propellers without cavitation and also permit of steering the vessel independently of or in conjunction with the usual steering means such as a rudder.

The foregoing and such other objects and advantages as may appear and be pointed out as this description proceeds are obtained in the structural body of this invention indicated in the accompanying drawing in which:

Figure 1 is a plan view partly in section of a vessel equipped with the improved propelling means of my invention;

Figure 2 is a longitudinal sectional view taken on the line of Figure 2—2 of Figure 1 looking in the direction indicated by the arrows;

Figure 3 is a fragmentary elevational view of the forward part of the vessel;

And Figure 4 is an enlarged composite view illustrating the improved construction of propeller employed.

Referring now more particularly to the drawing, I have illustrated a steam vessel having a hull 10 provided with the usual double bottoms 11, the stem being indicated at 12 and the stern at 13.

The vessel may be equipped at the stern with the conventional rudder 14, it being observed from Figure 1, that the lines of the vessel are modified from the usual standard construction by increasing the bluntness of the bow as indicated at 15 and 16 and tapering the sides toward the stern as indicated at 17 and 18.

The improved propelling means of my invention includes water inlets indicated generally at 19, 19, and having each a general cone-like shape in the nature of a funnel with the larger open end thereof adjacent the stem 12 to permit of the entrance of sea water. So as to not weaken the stem of the vessel, this stem may pass downwardly in the usual manner, the intakes 19 being arranged on either side of said stem, without the latter materially interfering with the flow of water into the intake.

At the after-portions of the intakes 19, preferably immediately adjacent the apex 20 thereof, in each instance, I have arranged propellers 21 and 22. Obviously, one intake and one propeller may be employed if desired, but I have preferred to disclose the employment of twin screw propellers, one of each arranged on either side of the fore and aft line of the vessel and receiving water from the funnel-like intakes 19. The propellers 21 and 22, which are preferably of the construction to be hereinafter described, are fixedly mounted upon and have rotation with propeller shafts 22^a and 23. The shafts 22^a and 23 are mounted at their forward portions in bearings 24 and 25 carried by suitable spider frames 26 and 27 located in the intakes 19 or in passageways 28 and 29, forming short extensions of the water intake and in which passageways one each of the propellers 21 and 22 is mounted for rotation. The passageways 28 and 29 extend to and communicate with water expansion chambers 30 and 31, these chambers having downward extensions 32 and 33 which pass water into exhaust or discharge passageways 34 and 35, which extend toward the after part of the vessel. The after ends of the propeller shafts 22 and 23 extend through the walls of the chambers 30 and 31 and into the vessel and are connected in any preferred manner with the main engines.

In order to prevent damage to the exhaust or discharge conduits, these conduits may be housed within the double bottoms 11 and may discharge into the sea at points adjacent the stern of the vessel or just forward of the stern. This arrangement of the discharge conduits in the double bottoms will prevent damage in the event of grounding of the vessel.

I find it expedient to provide two or more of the exhaust passageways 34 and 35 on either side of the fore and aft line of the vessel, extending parallel to the fore and aft line and in spaced relationship so as to be capable of taking care of the water introduced at the intakes and propelled through these passageways by the forward movement of the vessel. These passageways being open at their after ends, as indicated at 36 and 37, will serve, of course, as intakes when backing the vessel.

For the purpose of aiding in the steering of the vessel, I provide by-passes 38 and 39 and 40 and 41 controlled by valves 42, 42 and 43, 43, other valves 44 and 45 and 46 and 47 being arranged in the discharge conduits 34 and 35 for controlling the discharge of sea water from the propellers. The valves 42, 43, 44, 45, 46 and 47 may be controlled synchronously from the bridge of the vessel for the purpose of steering or aiding in the steering, that is, it will be obvious by closing the valves 44, 45, 46 and 47 and opening the starboard or port valves 42 or 43, the discharge of the water in a direction along the line of the by-passes 38 and 39 will result in a tendency for the vessel to be turned to starboard or port, as the case may be. The supply of water for this purpose may be aided by providing the connecting by-passes 48 and 49. These by-passes may be arranged at any convenient point to connect the complemental conduits of the pair 34 and the pair 35.

Suitable gratings 48 (omitted for clearness in Figure 3) may be provided at the intake ends of the funnels 19 for preventing the entrance of heavy objects which may be encountered and would tend to injure the intakes and propellers.

The disposition of the intake 19 in the vessel may be, of course, varied in accordance with the design of the hull and the form of the intake is as readily adaptable to a vessel having a clipper bow as to one having a straight stern as shown.

The method involved in the present invention will be found to reside in the operation of a propeller in which supply of water is had under pressure to the propeller in excess of that normally supplied by gravity and air under pressure. This includes constricting the stream of water to the path directed against the propeller so that cavitation cannot occur. This is best accomplished by reducing the size of the stream from the point of entry to the propeller so that eddy currents and cavitation are prevented by sup-

plying water at a greater rate of speed and pressure than would be supplied were gravity and expansive properties of air depended upon solely.

In the operation of this invention it will be observed that owing to the forward motion of the vessel and the constricted inlet, a given volume of water entering at the mouth of the intake and moving a given distance in a certain length of time is forced to move through a smaller space, that is, through the passageways 28 and 29 in the same length of time. Therefore, the rate of flow of the given volume of water is accelerated and will thereby be introduced to the propellers faster than it ordinarily would be under the force of gravity and the action of the expansive properties of air. Thus, the propellers may operate at a greater rate of speed than normal for the same diameter of propeller and same power plant as applied in the conventional manner at the stern of a vessel and without any means for eliminating cavitation. There will be no tendency for cavitation in applicant's invention, for the reason that the rate of flow of water to the propeller is accelerated by the constricted opening and that the ratio of speed of vessel through the water and rotation of the propeller blades with respect to the rate of flow of the water into the constricted passageway will always be such that the sea water will flow to the propeller at a greater rate than that at which the water enters at the intake. This will hold good regardless of the speed at which the vessel is propelled under its own power.

It will be observed that the normal forces tending to move water toward the propellers are the forces of gravity which are, roughly, 15 pounds of air pressure to the square inch and pressure of about 3 pounds to the square inch gravitation effect of the water, that is, weight of the water, making a total of substantially 18 pounds to the square inch tending to move the water normally toward the propeller blades. When, in addition to this, the same volume of water passing into the intake in a given length of time is caused to pass through a smaller space in the same length of time it must move more rapidly and therefore pressure of 18 pounds to the square inch is exerted, in addition to the effect of such constriction. The effect which this will have on the propellers depends on the size of the intake at its mouth with respect to the diameter of the propellers and the constricted passageways. I have found that with an intake of a substantially 9-foot diameter an angle of approximately 30° of the walls of the intake with respect to the fore and aft line of the ship should be advantageous where a 6-foot propeller is employed, that is, a propeller having a total diameter of six feet.

It will be observed that when there is an excess of water flowing to the propeller which cannot get past the propeller, this water will cause a backing up at the entrance to the intake and create a wave ahead of the vessel, but as this is normal in the operation of all vessels it will have no effect on the efficiency of the device and will have little effect in retarding the progress of the vessel through the water.

In Figure 4, I have illustrated a form of propelled which I prefer to employ, the propeller being in effect an interrupted screw thread or a plurality of screw threads interrupted so that a four-blade propelled be provided. These blades are indicated at 51, 51 and being mounted on the shaft 22 in any approved manner. The blades, it will be observed, are, in effect, interrupted screw threads lying in substantially the same transverse plane and are all substantially the same width throughout their length. Obviously, the diameter of the propeller is such that it substantially snugly rotates in the chamber formed at the apex 20 of the intake so that little or no water can escape between the outer edges of the blades and the interior surface of the wall of the chamber referred to.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is:

1. In a propulsion means for ships, in combination with the hull of the vessel, a funnel shaped intake at the forward part of the vessel below the water line, a propeller arranged axially of said intake at substantially the apex thereof, and substantially filling said intake at said apex and a water exhaust conduit extending aft from said propeller having an enlarged water expansion chamber therein, and means in said conduit for regulating the rate of flow of water therethrough.

2. In a propulsion means for ships, a water inlet having a cone-like contour, a plurality of propellers arranged complementally on either side of the longitudinal axis of said cone-like inlet at approximately the narrowest portion thereof, an enlarged water expansion chamber, a plurality of discharge conduits extending from said chamber and means for controlling separately the flow of water therethrough.

3. In a ship propulsion means, the combination with the hull of the vessel having a stem, of a water intake having converging cone-like portion extending aft from said stem, and having a continuation of substantially uniform diameter, a propeller mounted for rotation in such portion and adjacent to the narrowest portion of said intake, and a water expansion chamber abaft said propeller.

4. In a ship propulsion means, the com-

bination with the hull of the vessel having a stem, of a water intake having converging cone-like portion extending aft from said stem and having a continuation of substantially uniform diameter, a propeller mounted for rotation in such portion and adjacent to the narrowest portion of said intake, a water expansion chamber immediately abaft said propeller, and a plurality of valve controlled discharge passageways extending from said chamber.

In testimony whereof I have hereunto signed my name.

PETER F. RILEY.