H. A. J. DE B. NACHENIUS.

MEANS FOR PROPELLING VESSELS.

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1,437,350.

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Fig. 1.

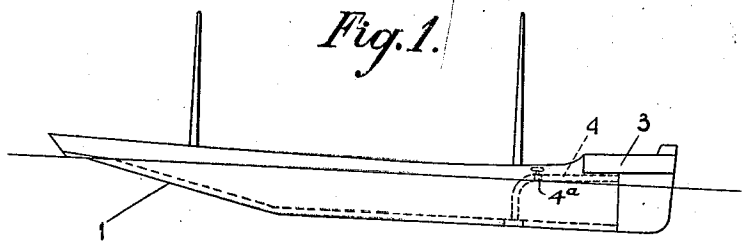


Fig. 2.

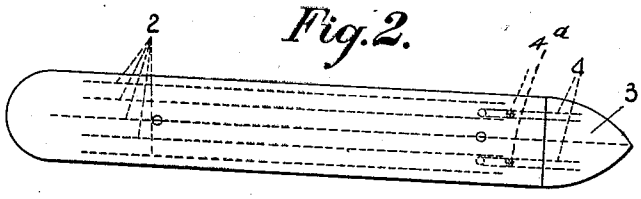


Fig. 3.

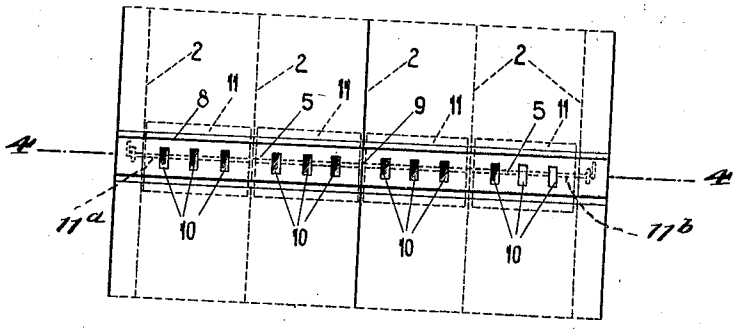
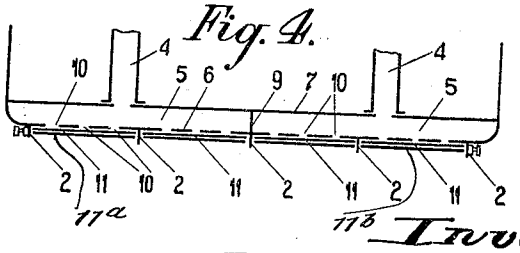


Fig. 4.



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UNITED STATES PATENT OFFICE.

HENRI ARNOLD JOHANNES DE BIJLL NACHENIUS, OF HAARLEM, NETHERLANDS.

MEANS FOR PROPELLING VESSELS.

Application filed February 23, 1921. Serial No. 447,253.

To all whom it may concern:

Be it known that I, HENRI ARNOLD JOHANNES DE BIJLL NACHENIUS, a subject of the Queen of Holland, residing at Haarlem, Netherlands, have invented certain new and useful Improvements in Means for Propelling Vessels, of which the following is a specification.

The present invention relates to means for propelling vessels.

It has frequently been proposed to discharge highly compressed gas in a rearward direction below the water line of a vessel, in the form of a number of thin propulsion jets, and to derive from the reaction of said gas jets upon the outlet openings a propelling effect on the vessel. In this connection reference may be had to British patent specification No. 4231 A. D. 1906. These known methods, however, have no practical value as the efficiency of the energy accumulated in the compressed gas is prohibitively low.

The present invention is as in the above method, based upon the discharge of gas below the water level, but is characterized in that the gas outlet pressure is not, or not considerably higher than the water pressure at the outlet, so that the desired propelling effect is brought about substantially owing to the difference between the specific weight of the gas and of the water.

It may also be noted here that with the old method, the gas will under certain conditions by the difference between its specific weight and that of the water, produce a slight propelling effect, though, unless special provision be made for utilizing this, it will be extremely small. Owing to the high outlet pressure however, at which the gas has formerly been discharged from the jets, it has been forced to a considerable distance through the water before rising to the water level, and thus practically no advantage is taken of the difference between the specific weights of the gas and the water.

According to my novel method, however, there need be no reaction upon the gas outlet openings, and with a sufficiently high speed of the vessel, the gas outlet pressure can even be somewhat lower than the water pressure at the outlet.

In order to obtain a satisfactory speed when applying the novel method considerable quantities of gas must be discharged. Said quantities are so great that it would be practically impossible to discharge same through tubes as has been proposed in the aforementioned patent specification.

According to this invention the gas is preferably allowed to rise to the water level along an upwardly inclined plane forming the stern of the vessel upon which plane the gas exerts a pressure, the horizontal component of which has a tendency to drive the ship forward. It can be easily demonstrated that this propelling force is a function of the vertical distance between the water level and the gas outlet opening (generally speaking the draught of the vessel) and is, at least theoretically, independent of the angle between the horizontal plane and that along which the gas rises to the surface.

A vessel according to this invention is by way of example described hereinafter with reference to the accompanying illustrative drawing, in which:—

Fig. 1 represents a side elevation, and

Fig. 2 a plan view of the vessel,

Fig. 3 is an underneath plan view of a portion of the bottom, and

Fig. 4 is a cross sectional elevation on the line 4—4 of Fig. 3.

The hull of the ship may be assumed to have been obtained by cutting from the hull of an ordinary screw ship, the rear part below the water line and replacing the same by an inclined plane surface 1 extending through the full width of the midship section. The bottom of the vessel is provided on the underside with five parallel webs or ridges 2 of about 30 centimetres height and running through almost the entire length of the vessel. In the forepart of the ship is the engine room 3 which contains the motors and the air compressors. The compressed air is delivered by means of two main pipes 4, which rise above the water line, to two reservoirs 5 located thwart-ships and arranged end to end see Figs. 3 and 4). Said reservoirs are formed by the bottom plate 6, the tank top 7 and the front and rear walls or cross bulkheads 8. They are separated by a longitudinal bulkhead or partition 9.

In the bottom plate 6 of both reservoirs 5 are a number of holes 10 provided side by side and each measuring say 50 centimetres in length and 20 centimetres in width. At a distance of say 8 centimetres below said bottom plate two plates 11 are pivotally mounted on horizontal transverse shafts 11^a and 11^b, one plate being mounted under each reservoir 5. The said plates are adapted to

be swung by their shafts to direct the air from the openings 10 either forwardly or rearwardly.

Each of the valves or plates 11 consists of a simple sheet of metal adapted to oscillate about a horizontal axis 11^a or 11^b extending at right angles to the longitudinal axis of the vessel. It will be noted that the sheet is mounted at a short distance from the bottom of the vessel, so that either its front edge or its rear edge may contact with the bottom of the vessel when the sheet is oscillated by suitable mechanism, not shown, so that the air escapes through an elongated slot, either at the rear side or at the front.

The air discharged through the openings 10 without, or at least without an appreciable overpressure and directed rearwardly for instance, passes under the bottom through the channels formed between the parallel webs 2 and rises along the inclined surface 1 to the water level, thereby exerting a forwardly directed pressure upon the vessel. When the supply of air is reduced or shut off from either of the reservoirs 5 by means of valves 4^a provided in the starboard and port discharge tubes the progression of the vessel will be towards starboard or port. Said valves are adapted to be operated by a steering wheel on the bridge. The rudder and steering gear may thus be dispensed with. Said method of steering does not entail losses of power because the compressed air may be allowed to flow into the other tube when the one tube is shut off. When it is desired to turn the vessel quickly, the air from one of the reservoirs 5 may be directed forwardly and in this manner the ship is for instance forced forwardly by the air flowing through the port channel and rearwardly by the air flowing through the starboard channel.

The valves 4^a are preferably constructed in such a manner that the air may if necessary be allowed to escape into the atmosphere. Said valves may be operable from the bridge so that the propelling effect of the air may be terminated while the engines are still running.

The ship may be propelled sternwards by discharging air along the prow. With the usual construction of ship the efficiency will not be very satisfactory, but this fact is of minor importance. Moreover as long as the ship is still going forward, the plates 11 may be turned by suitable controlling means (not shown) and the compressed air may simultaneously be allowed to blow off so as to permit water to enter the reservoirs 5. By subsequently expelling this water forwardly by means of compressed air, a powerful rearwardly propelling effect is realized.

Although it is not possible to accurately determine theoretically the efficiency of the novel method, actual experiments have shown that the efficiency need not be lower than that of the ordinary propellers. It is to be kept in mind that the discharged air is allowed to rise to the water level along a very large area whereby a reaction surface of considerable size is obtained and whirling and eddies of the water are avoided. Moreover, owing to the provision of a layer of air between the water and the bottom of the ship and to the advantageous shape of the stern, the vessel has to overcome a comparatively small amount of resistance. With the ordinary ship's propeller, which acts on a comparatively very small area of water, great losses due to friction and slip are unavoidable owing to the considerable speed of the propeller blades and the consequential violent movement of the water.

If desired, the exhaust gases from the motors may be discharged into the compressed air tubes whereby the power used for expelling said gases from the motor cylinders is used for the propulsion of the vessel.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. The combination with a vessel hull having a substantially flat bottom extending from its front to a point adjacent its rear end and an inclined plane surface extending upwardly from this point to the stern of the hull, of a series of spaced ribs projecting from said bottom and extending longitudinally of the hull and forming inverted channels, apertures arranged in the bottom of the hull adjacent to the forward end thereof and opening into said channels, and means for discharging compressed gas, at a pressure substantially equal to the water pressure, through said apertures and into said channels, whereby when the hull is moving forwardly through the water, said gas will travel rearwardly along said channels and then upwardly along the inclined plane to drive the vessel forwardly, said means including a plurality of reservoirs arranged end to end and extending transversely of said hull, and a valve controlled pipe connected to each of said reservoirs, so that when compressed gas is supplied to one of said reservoirs the same may be employed for steering the hull.

2. The combination with a vessel hull having a substantially flat bottom extending from its front to a point adjacent its rear end and an inclined plane surface extending upwardly from this point to the stern of the hull, of a series of spaced ribs projecting from said bottom and extending longitudinally of the hull and forming inverted channels, apertures arranged in the bottom of the hull adjacent to the forward end thereof and opening into said channels, means for discharging compressed gas, at a pressure

substantially equal to the water pressure, through said apertures and into said channels, whereby when the hull is moving forwardly through the water, said gas will travel rearwardly along said channels and then upwardly along the inclined plane to drive the vessel forwardly, and pivoted plates arranged in said channels adjacent to said apertures for directing the compressed gas forwardly or rearwardly.

3. In combination, a vessel hull having a bottom provided with a rearwardly extending upwardly inclined plane, ribs projecting downwardly from said bottom and forming inverted channels arranged side by side and extending substantially the entire length of the bottom of said hull, a transversely arranged series of apertures provided in the bottom of said hull and opening into said channels, a plurality of reservoirs for furnishing compressed gas to said apertures, arranged end to end and extending transversely within the hull, a valved pipe for conveying compressed gas at substantially the same pressure as the water in the channels to each of said reservoirs, and means mounted in said channels for directing the compressed gas passing through said apertures either forwardly or rearwardly.

In testimony whereof I affix my signature.

HENRI ARNOLD JOHANNES de BIJLL NACHENIUS.