May 20, 1930. L. KORT 1,759,511

COMBINED SHIP AND PROPELLER

Filed Sept. 20, 1928

Fig. 1.

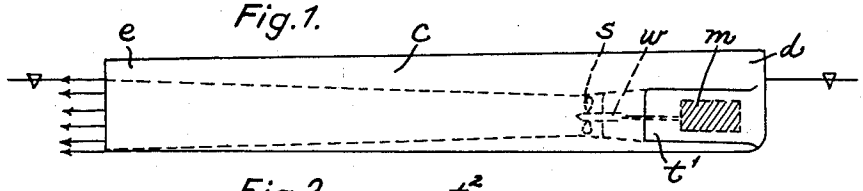


Fig. 2.

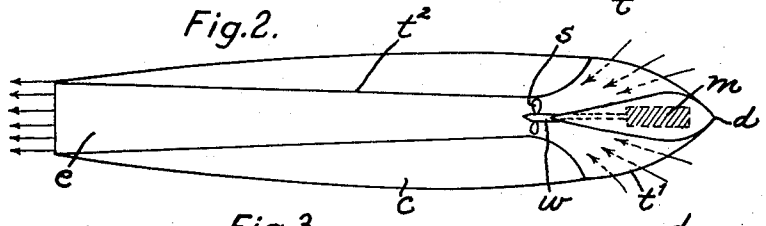


Fig. 3.

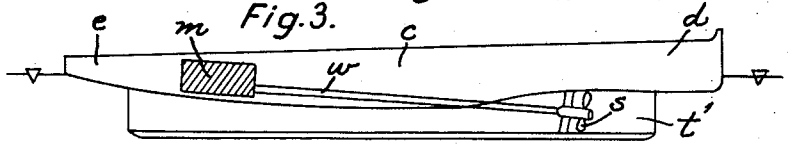


Fig. 4.

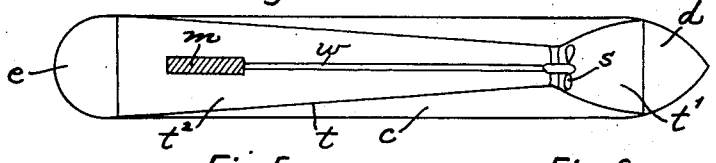


Fig. 5.

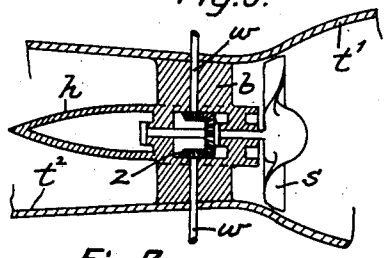


Fig. 6.

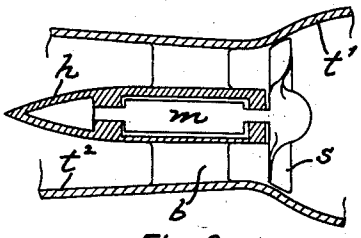


Fig. 7.

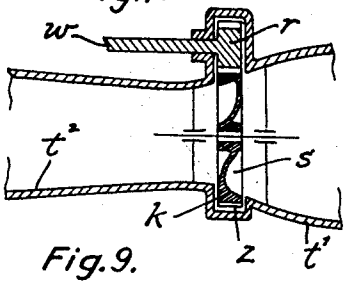


Fig. 8.

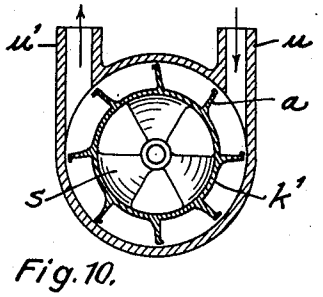


Fig. 9.

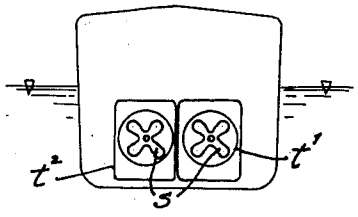
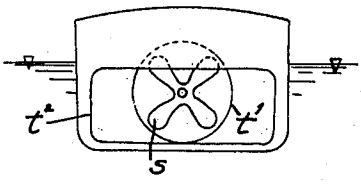


Fig. 10.



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UNITED STATES PATENT OFFICE

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COMBINED SHIP AND PROPELLER

Application filed September 20, 1928, Serial No. 307,162, and in Germany June 10, 1927.

Propellers of ships have already been arranged in a kind of tunnel provided at the bottom of the hull and extending from the bow to the stern, the object of this arrangement being to reduce the resistance which the ship offers and to increase the efficiency. The arrangements in question having become known up to now have not proved successful owing to the reason that the shapes of the tunnels were unsuited for the objects in view. If, for instance, the tunnel is cylindrical in transverse section, matters become the reverse of what they ought to be, in that the resistance is increased instead of decreased, owing to the friction arising at the inner wall of the tunnel.

If the propeller is arranged, for instance, about in the middle of the longitudinal axis of the tunnel, so that the change of the transverse section of the tunnel in front of the propeller, i. e. of that portion of the tunnel through which the water is sucked in, is about the same as the change of the transverse section of the other portion of the tunnel, through which the water is discharged, and if a certain ratio exists between the smallest and the largest sectional area, the tunnel would be strongly conical and the water would flow remote from the inner wall of the tunnel in the discharge portion of the same, and its velocity would not be transformed into pressure, whereas in the sucking portion of the tunnel strong friction would arise.

In contradistinction to all known manners of arranging the propeller in the tunnel, I arrange it in the narrowest part of the same, and I design the tunnel which is conical in front of the propeller, as well as behind it, in such a manner that the cone in front of the propeller is short and increases quickly in diameter from the propeller to the end or, more precisely, to the commencement of the tunnel, whereas the cone behind the propeller is long and increases only slowly in diameter from the propeller to its end. There is, thus, only a small surface in the front portion and, therefore, also only little friction, and there is afforded in the rear portion the possibility to reduce gradually the high speed of the water in this part of the tunnel and to convert it into pressure.

It is possible to design the tunnel in this way that the enlargement proceeds chiefly or only in horizontal direction, that is to say, not or nearly not also in a vertical one. Constructional forms of this kind afford the possibility to use ships with tunnels according to this invention also in shallow water, as the depth of immersion of the ship need not be greater than normally. Concerning, however, ships with deep draught, also the reverse may take place, that is to say, the tunnel can be enlarged more in vertical direction than in a horizontal one. Finally, it is also possible to arrange two or more tunnels side by side, especially with ships for shallow water, so that the draught of the ship is not in the least increased.

The invention is illustrated diagrammatically and by way of example on the accompanying drawing, on which Figure 1 is a side-view of one constructional form of a ship with its tunnel and the propeller therein; Figure 2 is a horizontal section through this constructional form; Figures 3 and 4 are views similar to Figs. 1 and 2 and show another constructional form of the invention; Figures 5, 6 and 7 show three more modifications of only the narrowest portion of the tunnel with the propeller therein, together with means for driving the propeller; Figure 8, which shows a transverse section instead of a longitduinal one, as Figs. 5–7, shows again another modification, Figure 9 is a transverse section through a further modification, and Figure 10 shows also a transverse section, all as fully described hereinafter.

On the drawing, c (Figs. 1 and 2) denotes the hull of the ship, d its bow, and e its stern. t^1 t^2 denote the tunnel, s the propeller, m the motor, and w the shaft driven by the motor and driving the propeller. The shape of the tunnel in the horizontal plane of its axis appears distinctly from Fig. 2, and it is to be seen from this figure, that, apart from that short portion where there is the propeller, the cross-section of the tunnel in all other portions is enlarged solely in horizontal direction. Fig. 2 shows also clearly that the tunnel cone t^2 is short and increases quick-

ly in diameter, and the tunnel cone t^2 is long and increases slowly in diameter. The arrows indicate the direction of flow of the water through the tunnel.

In the modification shown in Figs. 3 and 4, the motor m is arranged above the tunnel, over the rear part thereof, and the shaft w is, therefore, arranged obliquely, as is, consequently, also the propeller. In all other respects, matters are the same as before.

In Figs. 5 and 6 h denotes a hollow body of stream-line shape which is arranged in the tunnel where this latter is narrowest, and is held in place by lateral stays b. These stays may be designed as portions of screw-threads so as to cause the water to circulate in a certain measure. The centre portion in Fig. 5 serves as a bearing for the propeller shaft, and the stays b are designed as bearings for shafts o provided at their inner ends with cog-wheels meshing with an intermediate cog-wheel affixed to the propeller shaft. In Fig. 6 the motor m is located in a chamber provided in the body h. The motor may be an electromotor, an internal combustion motor, a turbine, etc. It is a matter of course that the employment of the body entails a correspondingly larger diameter of the tunnel.

If this cannot be permitted, one or the other of the modifications shown in Figs. 7 and 8 may be used. In Fig. 7 the propeller s is combined with a rim k provided with cogs z meshing with a pinion r secured to the laterally arranged shaft w, and in Fig. 8, the propeller is combined with a rim k^1 having blades a driven by water under pressure admitted through the branch 4 and escaping through the branch u^1.

The transverse section shown in Fig. 9 will be clear without a detailed description, and the same will be true of Fig. 10 which shows distinctly that two tunnels are arranged side by side. It is a matter of course that a propeller is provided in each tunnel. Mention must only be made, with respect to these two modifications, that the ends of the tunnels are not circular, but oblong, as distinctly to be seen in both figures.

I claim:

1. A combined ship and propeller, comprising, in combination with the hull of the ship, a tunnel-forming member provided at its bottom and comprising a short conical front portion, the diameter of which increases quickly in the direction to the respective open end of the tunnel, and a long conical rear portion, the diameter of which increases slowly in the direction to the respective open end of the tunnel, said two portions communicating with one another at their narrow ends and one of them being twoparted; a propeller arranged at the place of communication of said tunnel portions, a motor between the parts of the twoparted tunnel portion, and a shaft connecting said motor and said propeller.

2. A combined ship and propeller, comprising, in combination with the hull of the ship, a tunnel-forming member provided at its bottom and comprising a short conical front portion, the diameter of which increases quickly in the direction to the respective open end of the tunnel, and a long conical rear portion, the diameter of which increases slowly in the direction to the respective open end of the tunnel, said two portions communicating with one another at their narrow end, a propeller arranged at the place of communication of said tunnel portions, means for supporting the propeller, and means for driving it, these means being located near said place for communication, substantially as set forth.

3. A combined ship and propeller, comprising, in combination with the hull of the ship, a tunnel-forming member provided at its bottom and comprising a short conical front portion, the diameter of which increases quickly in the direction to the respective open end of the tunnel, and a long conical rear portion, the diameter of which increases slowly in the direction to the respective open end of the tunnel, said two portions communicating with one another at their narrow end, a propeller arranged at the place of communication of said tunnel portions, means for supporting the propeller, and means for driving it, these means being located in said place of communication, substantially as set forth.

4. A combined ship and propeller, comprising, in combination with the hull of the ship, a tunnel-forming member provided at its bottom and comprising a short conical front portion, the diameter of which increases quickly in the direction to the respective open end of the tunnel, and a long conical rear portion, the diameter of which increases slowly in the direction to the respective open end of the tunnel, said two portions, communicating with one another at their narrow end, a propeller arranged at the place of communication of said tunnel portions; a body of stream-line shape arranged in said place of communication, a propeller carried by this body, and means for driving the propeller, substantially as set forth.

5. A combined ship and propeller, comprising, in combination with the hull of the ship, a tunnel-forming member provided at its bottom and comprising a short conical front portion, the diameter of which increases quickly in the direction to the respective open end of the tunnel, and a long conical rear portion, the diameter of which increases slowly in the direction to the respective open end of the tunnel, said two portions communicating with one another at their narrow end, a propeller arranged at the place of communication of said tunnel portions; a body of stream-

line shape arranged in said place of communication, a propeller carried by this body, and means for driving the propeller, these means being located in the said body, substantially as set forth.

In testimony whereof I affix my signature.

LUDWIG KORT.