Nov. 14, 1939. J. H. DORAN 2,180,140

ELASTIC FLUID TURBINE FOR SHIP PROPULSION

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Fig. 1.

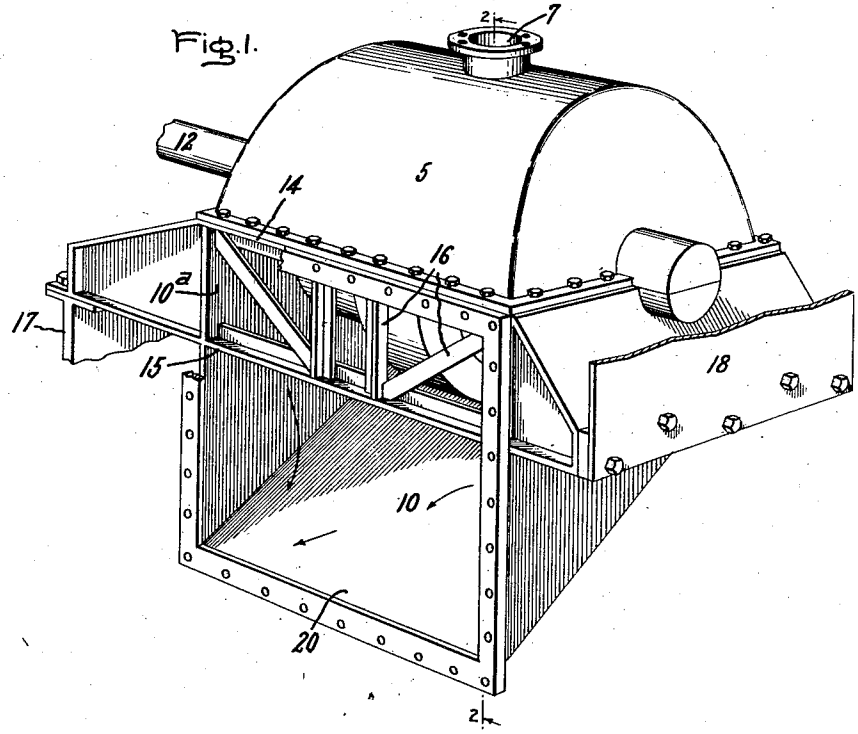

Fig. 2.

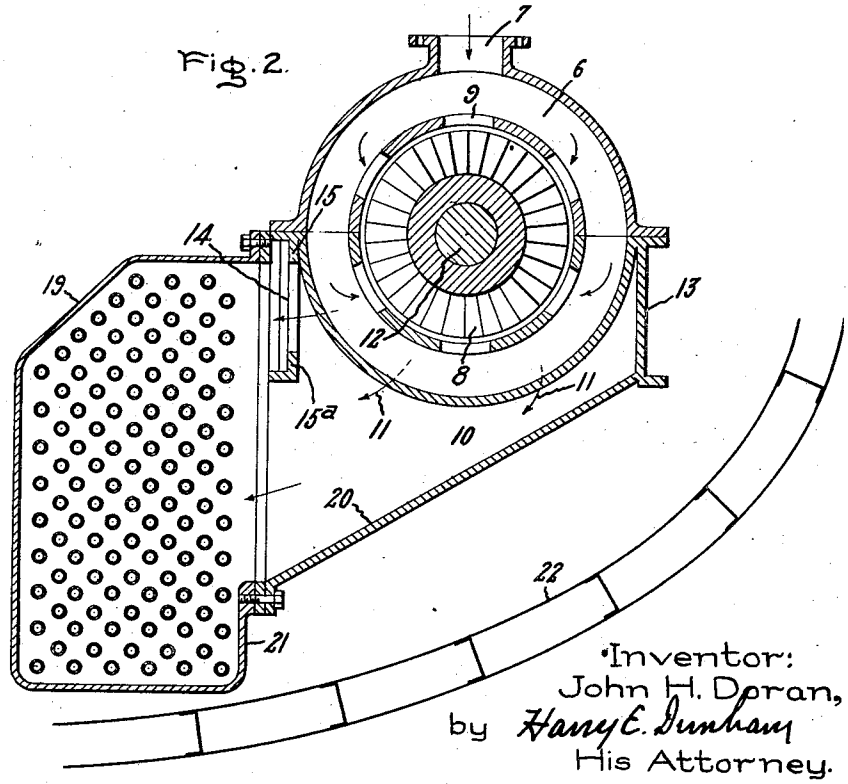

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Fig. 3.

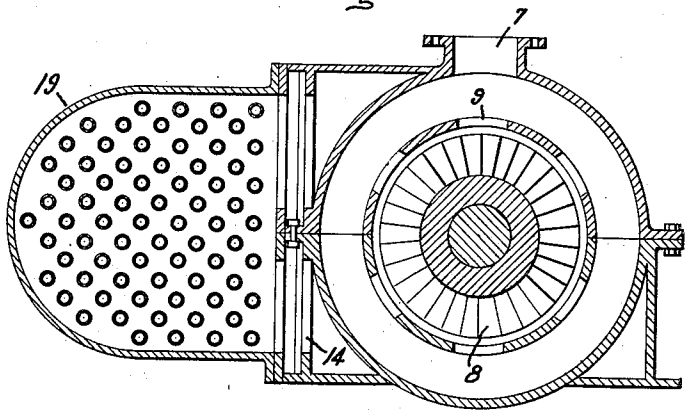
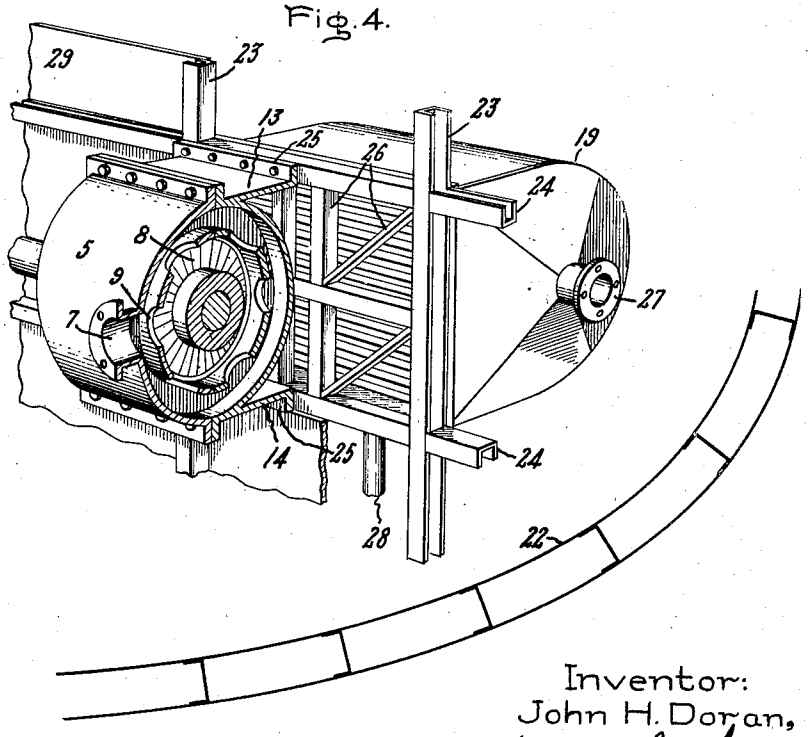


Fig. 4.



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UNITED STATES PATENT OFFICE

2,180,140

ELASTIC FLUID TURBINE FOR SHIP PROPULSION

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Application September 11, 1937, Serial No. 163,505

3 Claims. (Cl. 114—0.5)

The present invention relates to elastic fluid turbines which are primarily intended for propelling ships either through an electric generator and one or more electric motors receiving current from the generator or through speed reducing metallic gearing.

As is well known, the available space in ships for the propelling apparatus is limited, particularly with respect to the head room, and therefore every effort has to be made to reduce the size of the apparatus as much as possible consistent with the power required, and particularly in its vertical dimensions.

The object of my invention is the provision of a turbine structure of improved construction whereby the head room required for its utilization is substantially reduced.

For a consideration of what I believe to be novel and my invention, attention is directed to the accompanying description and the claims appended thereto.

In the drawings which are illustrative of my invention, Fig. 1 is a perspective view of a turbine and its exhaust housing; Fig. 2 is a cross-section of the turbine and its condenser, said section being taken on line 2—2 of Fig. 1; Fig. 3 is a sectional view of a slightly modified arrangement of the turbine and condenser, and Fig. 4 is a perspective view of a further modification.

5 indicates the turbine which may be of any suitable construction. It may be taken as representing a complete turbine or only the low pressure element thereof. As shown, it represents a low pressure element operating on the divided flow plan. Steam or other elastic fluid is admitted to the supply chamber or chest 6 by the conduit 7, and flows from the chamber to the buckets 8 of the rotor through ports 9. The arrangement is such that the steam flows in opposite axial directions from the supply chamber and exhausts at both ends of the rotor into the exhaust housing 10 as indicated by the arrows in Fig. 1 and by the arrows 11 in Fig. 2. The particular construction of the rotor and the way the steam acts thereon is not material to an understanding of my invention. The turbine is supported on both sides by longitudinally extending beams which are parallel to the turbine shaft 12. The right hand beam 13 is of I-beam construction having a solid vertical web which also forms a part of the exhaust housing 10. The left hand beam 14 is differently constructed having top and bottom members 15 and 15a with vertical and diagonal braces 16 to strengthen it and also to afford an exit opening for the exhaust steam from the rotor. The end walls 10a of the exhaust housing in addition to confining the steam therein also close the ends of the passage or opening in the left hand beam 14 through which a part of the exhaust steam flows to the condenser. An advantage in constructing the beam 14 with lattice work or braces resides in the fact that a large opening is thus afforded for the passage of steam into the condenser. As will be appreciated, a free steam passage between the turbine and condenser improves the efficiency of the turbine. The beams on both sides of the turbine are supported at the rear by a vertical wall 17, the latter being supported by a bottom wall of the ship. The front or right hand ends of the beams are supported by a vertical plate 18 attached to an overhead beam, for example a deck beam, of the ship, said plate being capable of bending to permit of axial movements of the turbine casing due to expansion and contraction. In this instance, the vertical wall 17 is fixed in position and since the rear end of the turbine is anchored thereto, the movements of the casing are taken care of by the yielding or bending of the plate 18.

Because of the limited head room available, the condenser 19 is located wholly on one side of the turbine, in this the left hand side, and both it and the turbine are wholly supported by the beams 13 and 14. As shown in Fig. 2, the condenser is located below the horizontal axial plane of the turbine shaft. If the turbine is to be located on the opposite side of the ship, the arrangement will be reversed so that the condenser will be on the right hand side, the construction of the parts being otherwise the same. By locating the condenser wholly on one side of the turbine, the upper half of the casing can be lifted without interfering with the condenser, and conversely the condenser can be opened or removed without interfering with the turbine. By arranging the condenser as shown, that is extending it upwardly to the approximate level of the plane of division of the turbine casing, the total height of the turbine and condenser is reduced without making any sacrifice in the size of the condenser.

The lower wall 20 of the exhaust housing 10 extends diagonally from the beam 13 to a point near the bottom of the condenser casing 21, said casing being secured thereto and to beam 14 by suitably spaced bolts. The curved lines 22 indicate the bottom walls of the ship. It will be noted that by the arrangement described, the turbine may be located nearer the side of the

ship where the head room is necessarily reduced by reason of the curvature of the bottom of the ship while the condenser is located where the head room is greater. It will also be noted that the bottom wall of the condenser casing closely approaches the bottom of the ship but is out of contact therewith. It will be further noted that the entire weight of the condenser which is located wholly on one side of the turbine is nevertheless supported by the same longitudinal beams 13 and 14 which support the turbine. To reduce the weight, the casing of the condenser and the wall 20 of the exhaust housing may be made of plate stock and welded or otherwise fused to form the desired shape.

In Fig. 3, the condenser 19 while supported by the turbine and the horizontal beams 13 and 14, as in the previous figures, has been raised so that parts of it are above as well as below the axial plane of the turbine casing. This arrangement is desirable where the available head room of the ship in which the turbine is located is low. With this construction, it becomes necessary to unbolt the upper half of the condenser casing in order to remove the upper half of the turbine casing, and while not so convenient as that of Figs. 1 and 2, its use is justified in certain types of ships where head room is at a great premium.

In Fig. 4 is shown a further modification of my invention where the turbine and condenser are directly opposite each other and occupy about the same vertical space as in Fig. 3. It differs, however, by the inclusion of certain of the vertical beams of the ship between the turbine and the condenser instead of locating said beams at the ends of the turbine. In this figure, 5 indicates the turbine which is supported by longitudinally extending beams 13 and 14 both of which have solid webs and form parts of the wall of the exhaust housing as before. The casing of the turbine is split in a vertical axial plane instead of a horizontal. 23 indicates parallel vertical beams of the ship. They may be supported by parts of the structure of the ship at or near the lowest part or the bottom thereof, and at their tops may assist in supporting the deck above. The vertical beams are connected by cross beams 24 which extend longitudinally of the ship and may be of any suitable section. The beams 13 and 14 are connected at their ends to form parts of the exhaust housing and the flanges 25 are bolted or otherwise secured to the vertical beams 23 and to the longitudinal beams 24. The beams 23 and 24 are connected by braces 26 in a manner similar to that shown in Fig. 1. The area of the braces is relatively small so that they offer little resistance to the flow of exhaust steam from the turbine to the condenser. As will be seen, the turbine supporting beams are bolted to the casing of the condenser with certain of the ship's beams located between them, whereas in Fig. 1 the beams are supported at their respective ends. This tends to make a somewhat more compact arrangement. The condenser has a flanged opening 27 to receive a conduit admitting cooling water thereto, and 28 indicates a conduit for removing condensate. 29 indicates one of the vertical supporting members within the ship structure and may be taken as a part of a bulkhead or strengthening member extending fore and aft. It is secured to the beams 23 and 24.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A marine turbine installation comprising an elastic fluid turbine, an exhaust housing therefor terminating in a vertical plane, a condenser for the turbine having a casing that also terminates in a vertical plane, a beam extending parallel with the turbine axis located between the turbine and the condenser and forming a support common to both, the beam covering a part of the condenser entrance and containing an opening through which a part of the turbine exhaust flows in entering the condenser, and means for supporting the beam in horizontal position.

2. A marine installation comprising an elastic fluid turbine located at the side of the ship having a casing and an exhaust housing, the latter extending laterally under the turbine and terminating at one side thereof in a vertical plane nearer the center of the ship than the turbine itself, horizontal beams for supporting the turbine extending fore and aft of the ship, one of the beams defining a part of the exhaust housing, the second beam extending across the open end of the exhaust housing and cut away in line with the opening to permit the passage of exhaust from the turbine therethrough, a condenser having a casing secured to exhaust housing and to the second beam, the condenser being located nearer the fore and aft center of the ship than the turbine, and upright members carried by the structural part of the ship for supporting the horizontal beams.

3. A marine installation comprising horizontal beams extending fore and aft of the ship defining an opening through which exhaust is free to flow, upright members of the ship structure supporting the horizontal beams, a turbine located wholly on one side of the beams and supported thereby, the exhaust therefrom flowing through the opening, a condenser located wholly on the opposite side of the beams and supported thereby, means for securing both the turbine and condenser to the beams, and an exhaust housing for the turbine secured to the beams for conveying exhaust from the turbine through the opening in the beams into the condenser.

JOHN H. DORAN.