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PROPELLING MECHANISM FOR TORPEDOES

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2 Sheets-Sheet 1

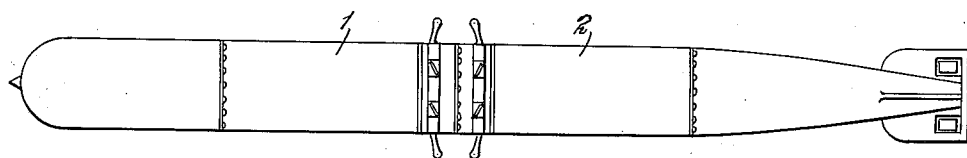


Fig. 1

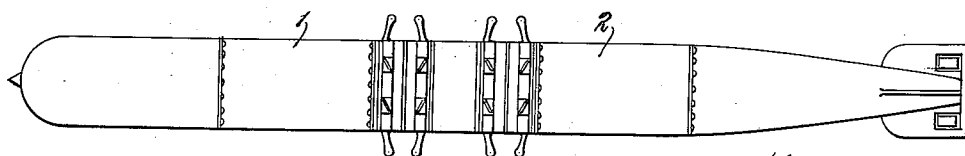


Fig. 2

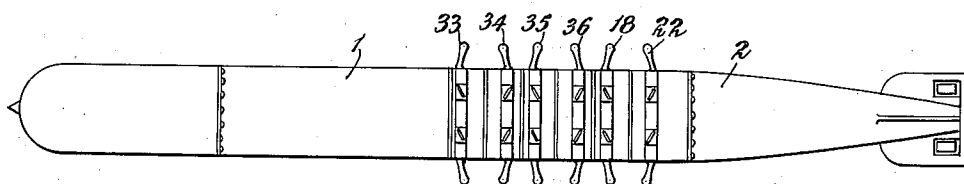


Fig. 3

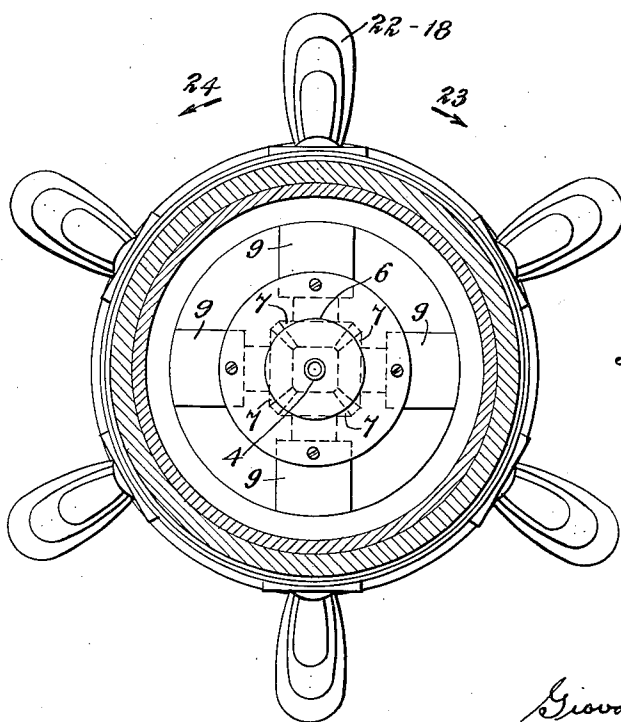


Fig. 5

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2 Sheets-Sheet 2

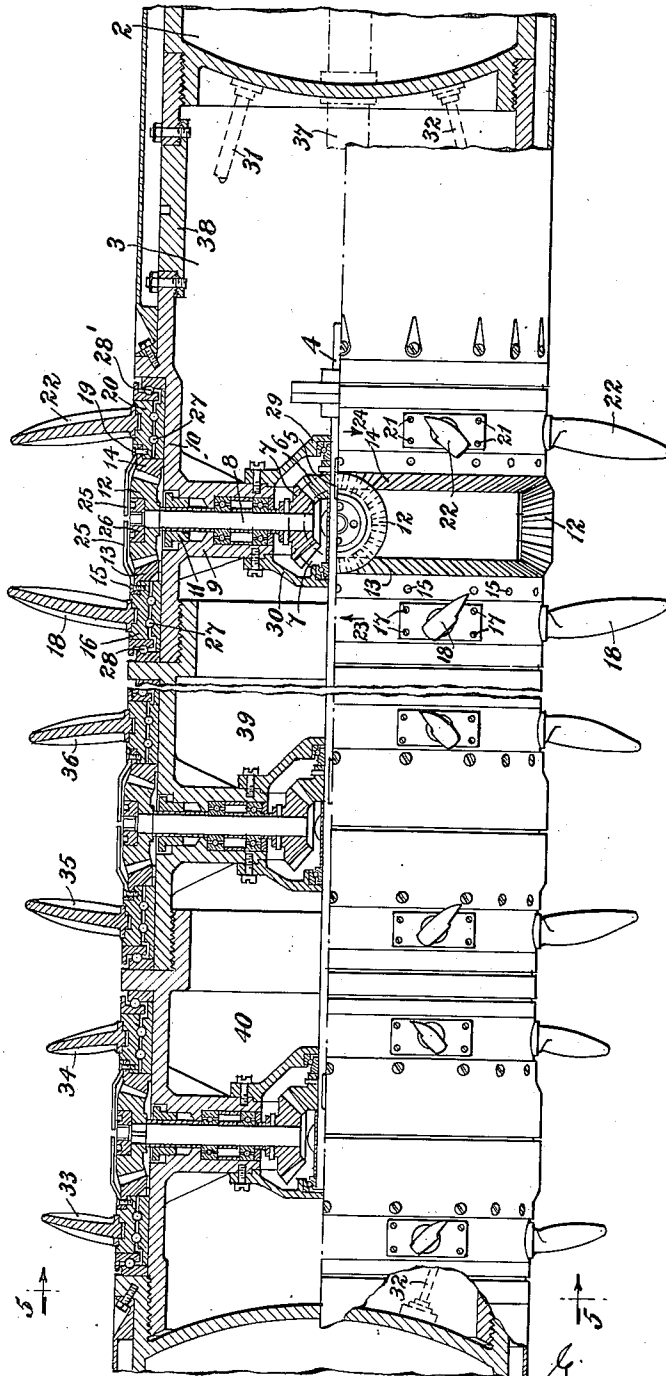


Fig. 4

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PROPELLING MECHANISM FOR TORPEDOES

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4 Claims. (Cl. 114—20)

It is well known that one of the major difficulties heretofore encountered in the proper action of torpedoes is found in the faulty operation of the means and mechanisms of propulsion. By these latter words "mechanisms of propulsion" I intend to include the entire moving structure of the torpedo.

The speed of war ships in general having been notably increased, makes necessary the adoption for the torpedo of certain means of propulsion of much higher potency than any of those that have been used or suggested to date, and which will give to a torpedo a radius of action much wider than the one possible at present. Another grave difficulty with the torpedoes now actually in use, is found in variations during their run, in immersion and in buoyancy, therefore presenting an absence of stability in the pendular movements of oscillation around a horizontal transverse axis, during their course. This is partly remedied by adapting special pendulum-actuated servo-motors designed to maintain the torpedo on its proper course and to avoid fledging; but even such solution, which partly eliminates the above indicated difficulties, is costly, encumbering, and creates a structure which often results in functional imperfections.

Torpedoes are at present furnished with a single propeller unit at the stern, or when a stronger propulsive potency is desired, a multiple of propellers always at the stern. The position of the propeller at the extremity of the stern of the torpedo makes necessary certain special corrective arrangements in order that the forward thrust exercised by the propeller or propellers will give a concentrated result, thereby avoiding undesirable movements of the torpedo. Even so, possibly on account of the complexity of construction or due to the necessity of the use of relatively low power, (because for one or two propeller units a particularly high power cannot be put to use), or finally due to the fact that, as is well known, the operation of one of the propellers in a group of multiple propellers disturbs the functioning of the other contiguous propellers the result achieved is by no means perfect. This is especially so when the group of propellers is situated in the wake of the torpedo.

It is finally to be observed, that the present arrangement of the compressed air chambers and the motors in the torpedoes, on account of the gradual consumption of air during the run of the torpedo, an unbalanced condition occurs and the torpedo tends to assume different orientations from those desired, so that it is necessary

to employ special means in order to obtain a proper balance. These special devices are also complex, costly and of such structure as to often cause functional difficulties.

The principal object of the present invention is the utilization for torpedoes of a new system of propulsion. The adoption of this new system, owing to the special conformation of the torpedo itself and the arrangement in relation thereto of the parts that constitute the mechanism of propulsion, (motor, compressed air chambers, etc.), renders it possible not only to eliminate the difficulties above indicated but also to eliminate other troubles heretofore encountered as will be hereinafter shown.

In view of the increased speed of warships hereinabove referred to, an effective torpedo requires a correspondingly increased speed, and it is therefore necessary in torpedoes to employ motors of high power. It is also desirable to exclude, because of the reasons above indicated, the use of multiple propellers at the stern.

In accordance with my present invention a torpedo is furnished, as a means of propulsion, with propellers whose blades are mounted on rings embracing or surrounding the body of the torpedo and rotating around its axis and therefore with such rotation on the external body of the torpedo, the blades will act on a mass of water which will be found in the best condition for their operation. In fact such blades will function in water which is not perturbed and is devoid of vortexes.

It is, of course, desirable to exploit to the utmost the power of propulsion at disposal and for this reason the torpedo, in accordance with the present invention, presents at least one group, constituting one propeller and a counter-propeller, and in such a group the first named propeller will rotate in one direction and the counter propeller (with reversed blades) will rotate in the opposite direction, each group of blades impressing its own thrust and preferably rotating on suitable ball-bearing supports.

In certain types of torpedoes, I preferably employ multiple groups of propellers and counter-propellers and in such cases each group can be furnished with blades whose dimensions will be increased over the blades of the preceding group disposed forwardly thereof and the degree of the angularity of the blades of each group can be properly varied to suit the circumstances.

In accordance with applicant's propeller construction the blades of one propeller unit comprising a propeller and counter propeller will function somewhat similarly to what happens

in the operation of turbines, as the counter propeller will act on a mass of water moved by the action of the preceding propeller, thereby increasing the effect of its blades.

Another feature of my invention is the simplification of the proper functioning of groups of propellers such as was above indicated through the medium of a single axially disposed motor shaft by which the various groups are rotated. To this end each group is actuated by a simple mechanical arrangement of cone-shaped wheels, the propeller and counter propeller of the same group being connected or engaged simultaneously with one or more cone-shaped gear wheels in such manner as to impart to the propeller and its counter propeller rotations in opposite directions to each other.

The employment of a group of propellers and counter-propellers, as indicated, enables such group or groups to be situated, not at the stern as in present torpedoes, but at a position or positions intermediate the length of the body of the torpedo. Consequently, I am thus enabled to produce a thrust to the torpedo body that besides being particularly active does not require any special expensive contrivances to keep the torpedo on its course.

The arrangement intermediate the ends of the torpedo body of one or more groups of propellers and counter-propellers enables a convenient distribution of the blades of propulsion along the length of the torpedo body, thus ensuring to each group of blades the best possible condition for action; this arrangement also permits each group of blades also to rotate in opposite directions from a contiguous group and to act upon a mass of water which is in such condition as to cause a high propulsive result, also the counter-propellers will function under particularly favorable conditions due to the fact that they are followed by propellers and also because the last counter propeller aft is followed by a portion of the body of the torpedo, the action of which avoids the possibility of unfavorable whirlpools.

The use of multiple groups of blades, which is possible under the present invention, also allows the adoption of motors of such higher power as may be necessary to impress on the torpedo a high velocity of displacement.

The disposition of the group of blades, as indicated, at an intermediate position along the length of the torpedo body also permits a better distribution of the weights of the motor and compressed air tanks, which can be arranged, one near the prow and the other astern of the blades, in such a way as to insure a better balance to the torpedo even during its effective run.

The disposition of the propulsive blades as described above, does not exclude the use of propulsive blades astern. These may be utilized in certain cases. Such blades may be if desired actuated with the methods known at present, or by a method analogous to that which is explained for the blades of the present invention.

The designs attached herewith illustrate only as an example various ways for the realization of the object of this invention. Fig. 1 shows an external view of the torpedo perfected according to the present invention and furnished at an intermediate position of its length, with only one group of a propeller and counter-propeller, both sets of blades being of the same dimensions; Fig. 2 shows in analogous manner a torpedo furnished with two groups of propellers and counter-propellers, situated at proper distance from each

other; Fig. 3 shows a torpedo with three sets of propellers and counter propellers situated at relatively short distances from each other; Fig. 4 shows an axial section and in enlarged scale the particulars of the propeller and the means of propulsion for a case similar to the one indicated by Fig. 3; and Fig. 5 shows a section V—V of Fig. 4, the arrow indicating the direction of rotation.

Referring now particularly to the drawings herein and to the constructions illustrated, it is evident that in the torpedoes shown in the annexed figures, the interior spaces of the portions (1) and (2) can be utilized for the compressed air chambers, with the result that they will be so placed as to give balanced weights. In space (3), (Fig. 4) the motor can be placed which will give power to the shaft (4) which is placed coaxial to the torpedo whichever type of torpedo illustrated is adopted. For each group of propellers and counter-propellers, the power from the shaft (4) is imparted to the blades in the following manner: On the shaft (4) with a key (5) a cone-shaped gear (6) is mounted and engages simultaneously with four cone-shaped gears (7) whose shafts (9) are normal to the main shaft (4), that is, in a radial direction to the axes of the torpedo. In Fig. 4 only two of the cone-shaped gears (7) are visible. The shafts (8) through journals (9) reach to the external part (10) of the body of the torpedo and run through water-tight casing (11); externally at the extremities of the shafts (3) a number of cone-shaped wheels (12) are mounted which wheels rotate all in the same direction and at the same speed with all of the wheels (7) all preferably being equal. As the shafts (8) of each group are all disposed in the same plane and normal to the shaft (4), it is possible to engage with all the wheels (12) of one group a toothed cone-shaped rack (13) on one side and a toothed cone-shaped rack (14) on the other side. The rack (13), by the use of screws (15) is connected with a ring (16) on which, with the screws (17) the blades (18) of a propeller are mounted. The rack (14), by screws (19) is attached to a ring (20) to which by screws (21) are mounted the blades (22) of a counter-propeller. The result of the mechanism hereinabove described is that if the blades (18) are rotated in the direction of the arrow (23), the blades (22) will rotate in the direction of the arrow (24), (Fig. 4). Although the design of the blades (18) and (22) show identical dimensions and with opposite pitches, it must be understood that the dimensions of the blades for the counter-propeller may vary from those of the propeller. All of the mechanism is furnished with properly protective parts (25), means for providing true alignment (26), ball-bearings (27) thrust ball-bearings (28') a jacket (29, 30) which serves as an enclosure for all the mechanism that appears between the journals (9) and the shaft (4). 31 indicates a tube through which compressed air runs from the air chamber (2) to the motor in (3) and (32) is a tube connecting air chamber (1) with air chamber (2) in such manner as to insure a simultaneous utilization of the two chambers and therefore the maintenance of the equilibrium of the torpedo while in motion. In Fig. 4 the particulars relative to the groups of propellers and counter-propellers (33, 34), (35, 36) are not numbered because they are absolutely identical to those of the group of blades (18, 22). Although for descriptive reasons, the present invention is

being based on the matters described and illustrated, many practical modifications can be made to the whole as for an example that of a twin method of propulsion as already stated by the use of propellers situated astern and actuated by the same shaft (4) running through the aft compressed air chamber and through the tube (37), predisposing proper apertures (38) for inspecting and regulating the motor placed in (3), or by the use of a special motor composed of various parts located in the spaces (39) and (40) that are found to be vacant between one group of propellers and counter-propellers and the succeeding one, or by adopting various speed rotations, in proper proportions, for one group of blades of the propellers and counter-propellers, so as to impart to one group of blades a velocity differing with that of the other group, etc. All of these modifications and others are possible being based on the fundamental conception of this invention as resumed in the following claims.

Having described my invention, I claim:

1. A propelling mechanism for torpedoes embodying in combination a support comprising the outer shell of the torpedo; a pair of propellers comprising a propeller and counter-propeller, each of said propellers rotating around the axis of the torpedo and having propeller blades movable externally of the said shell of the torpedo, said propellers being situated at a position intermediate the ends of the torpedo and the blades of one of said pair of propellers rotating around the said axis of the torpedo in a direction opposite to the movement of the blades of the other propeller, each of said propeller members comprising a ring rotatable about the body and coaxially with the axis of the torpedo and a plurality of blades fixed to said ring and movable therewith, and means for actuating said rings, each of said rings being provided with a toothed rack portion, shafts, means at one end for rotating said shafts, and gears on said shafts at the other end engageable with a plurality of racks to drive the same simultaneously.

2. A propelling mechanism for torpedoes embodying in combination a support comprising the outer shell of the torpedo; a pair of propellers comprising a propeller and counter-propeller, each of said propellers rotating around the axis of the torpedo and having propeller blades movable externally of the said shell of the torpedo, said propellers being situated at a position intermediate the ends of the torpedo and the blades of

one of said pair of propellers rotating around the said axis of the torpedo in a direction opposite to the movement of the blades of the other propeller, each of said propeller members comprising a ring rotatable about the body and co-axially with the axis of the torpedo and a plurality of blades fixed to said ring and movable therewith, radial shafts extending from within the torpedo body to the external surface thereof, means for producing water-tight connection between said radial shafts and torpedo body, means at the outer ends of said radial shafts for rotating said rings and means at the inner ends having connections with power devices located within the torpedo body.

3. A propelling mechanism for torpedoes embodying in combination a support comprising the outer shell of the torpedo; a pair of propellers comprising a propeller and counter-propeller, each of said propellers rotating around the axis of the torpedo and having propeller blades movable externally of the said shell of the torpedo, said propellers being situated at a position intermediate the ends of the torpedo and the blades of one of said pair of propellers rotating around the said axis of the torpedo in a direction opposite to the movement of the blades of the other propeller, each of said propeller members comprising a ring rotatable about the body and coaxially with the axis of the torpedo and a plurality of blades fixed to said ring and movable therewith, and means for actuating said rings, each of said rings being provided with a toothed rack portion, shafts, means at one end for rotating said shafts, and gears on said shafts at the other end engageable with a plurality of racks to drive the same simultaneously, an axial power shaft within the torpedo and gear connections between said axial power shaft and said radial shafts.

4. A propelling unit for torpedoes comprising a cylindrical torpedo shell section provided with means for connection to adjacent shell sections, a plurality of rings rotatable about the surface of said shell section, propeller blades fixed to said rings, a plurality of radial shafts extending from said surface of the shell section to the interior thereof, gears at the outer end of said radial shafts each connected with both of said rings to rotate the same conjointly at the same speed, and means connected with the inner ends of said shafts for rotating the same.

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