

June 21, 1960

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2,941,495

IMPELLING AND STEERING DEVICES FOR CRAFTS, VESSELS AND THE LIKE

Filed Aug. 28, 1957

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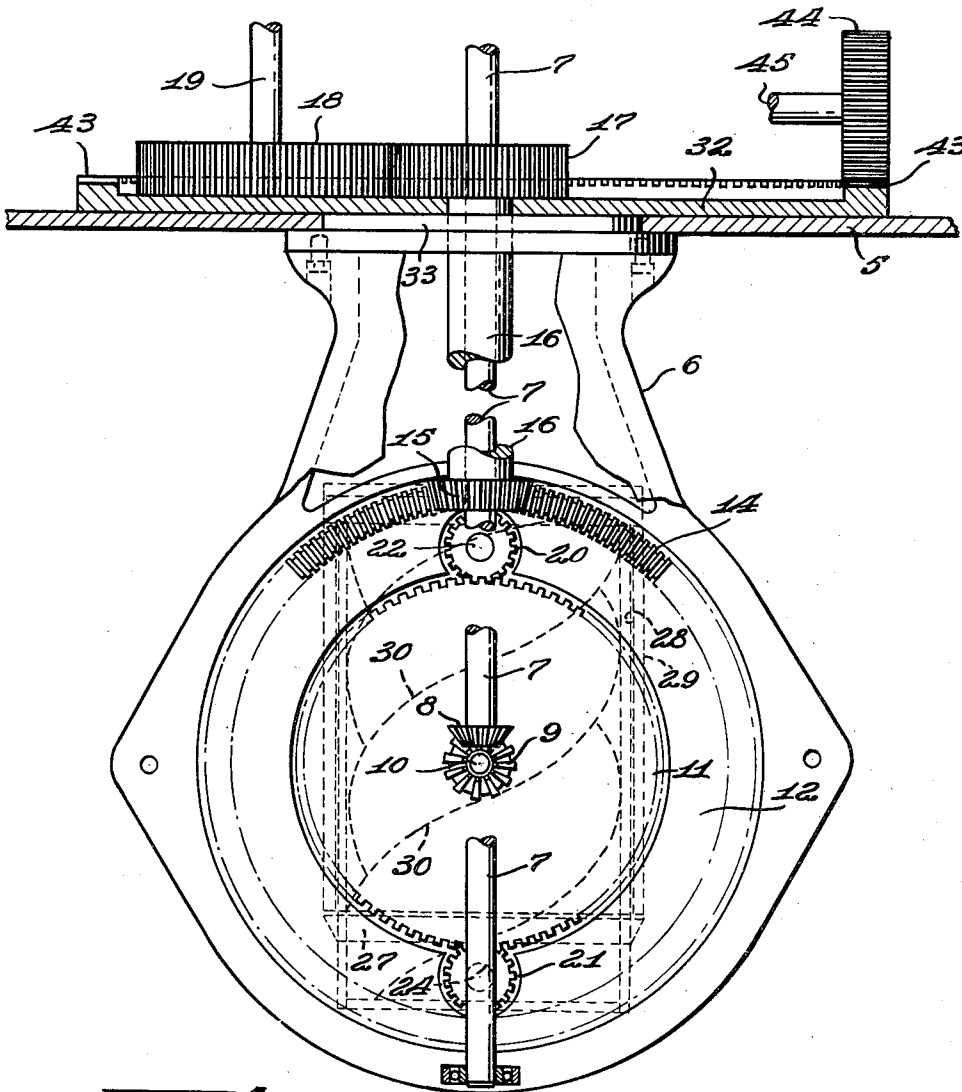


Fig. 1

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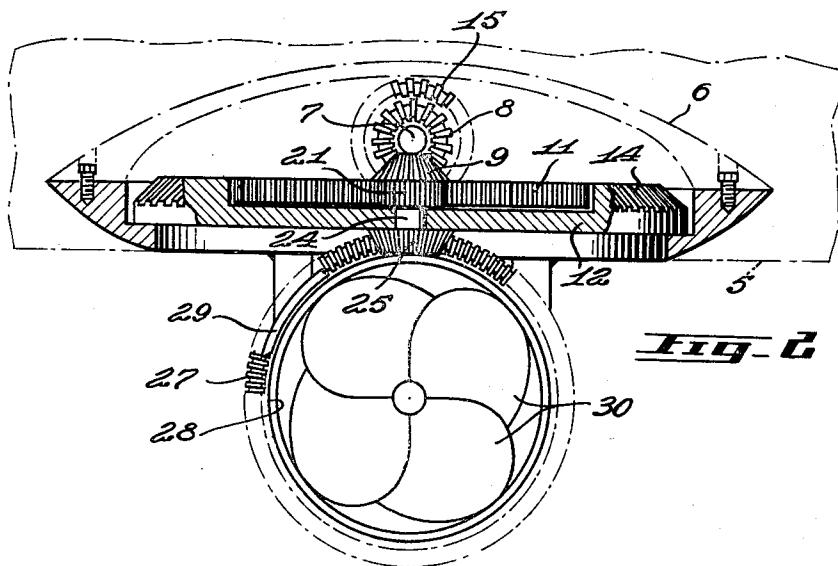
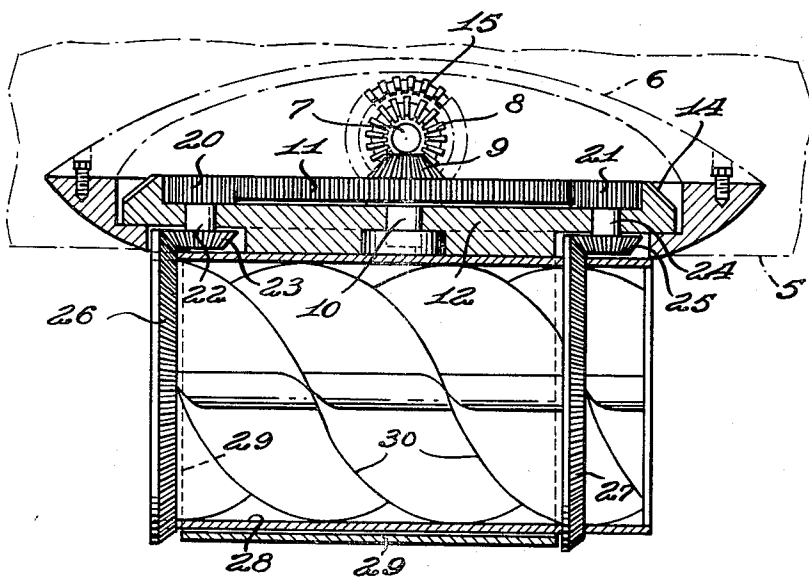


Fig. 4

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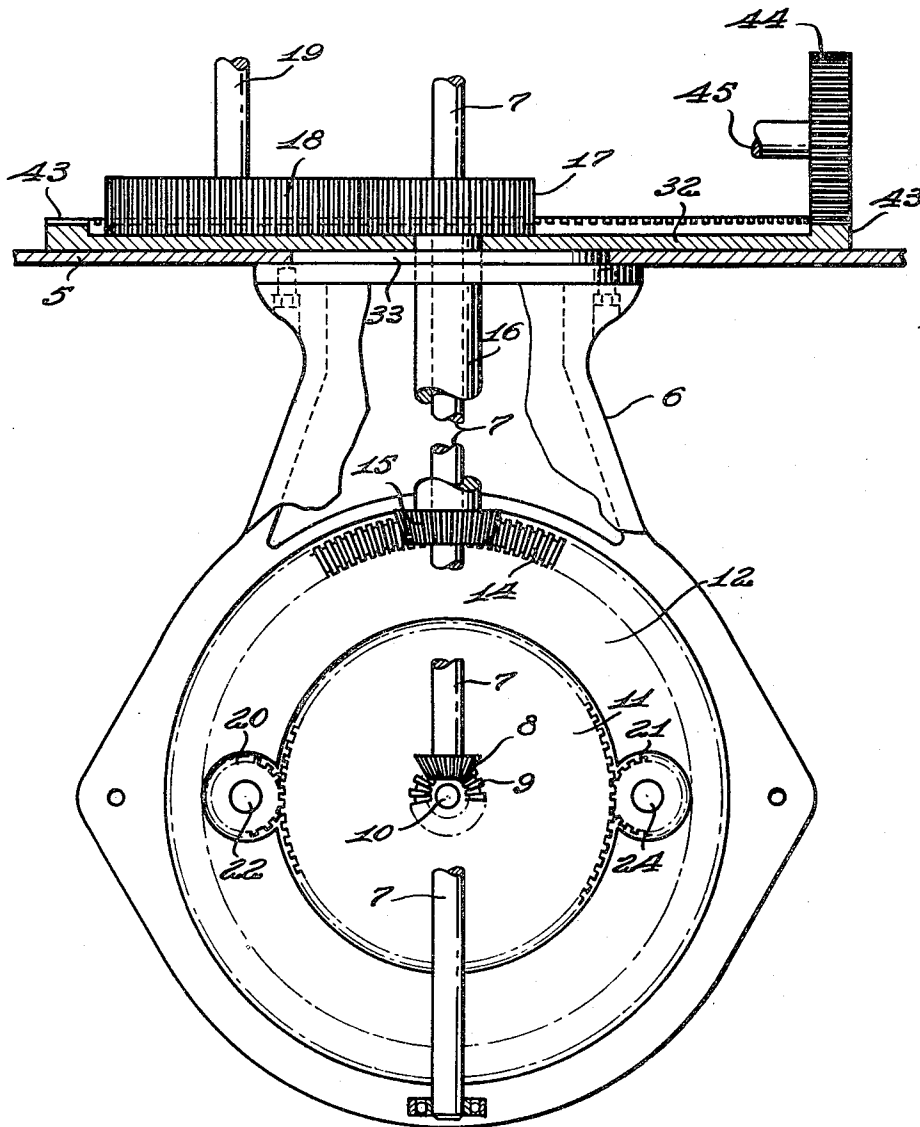


Fig. 3

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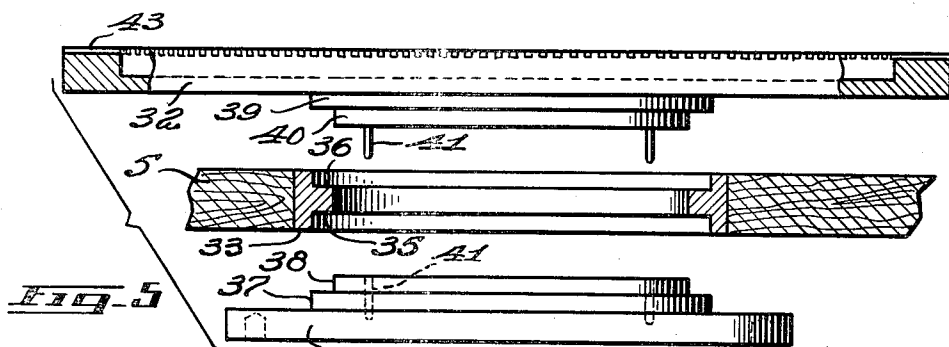
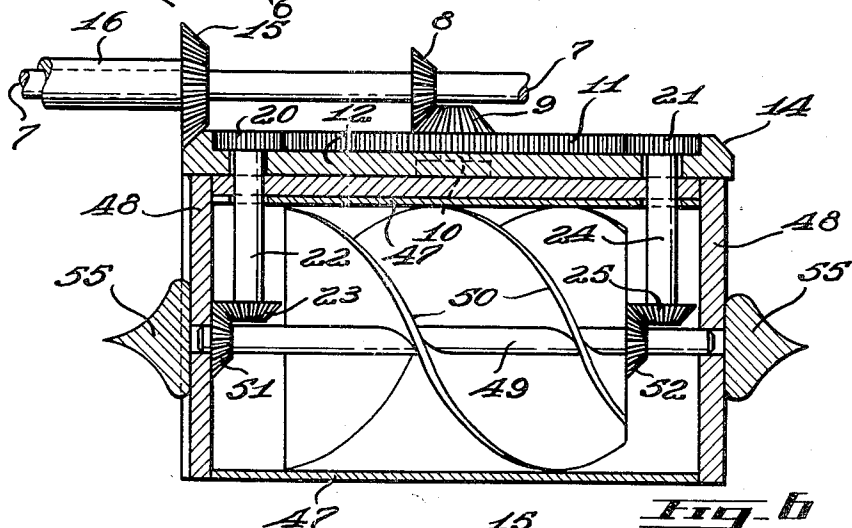
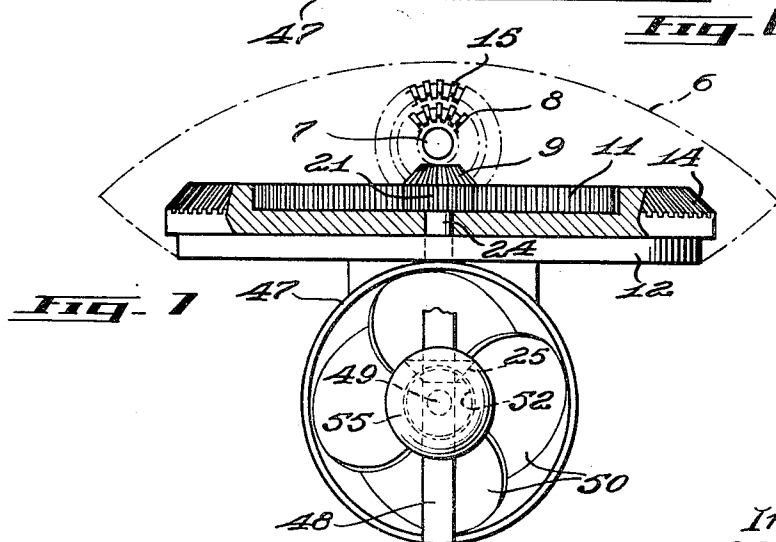
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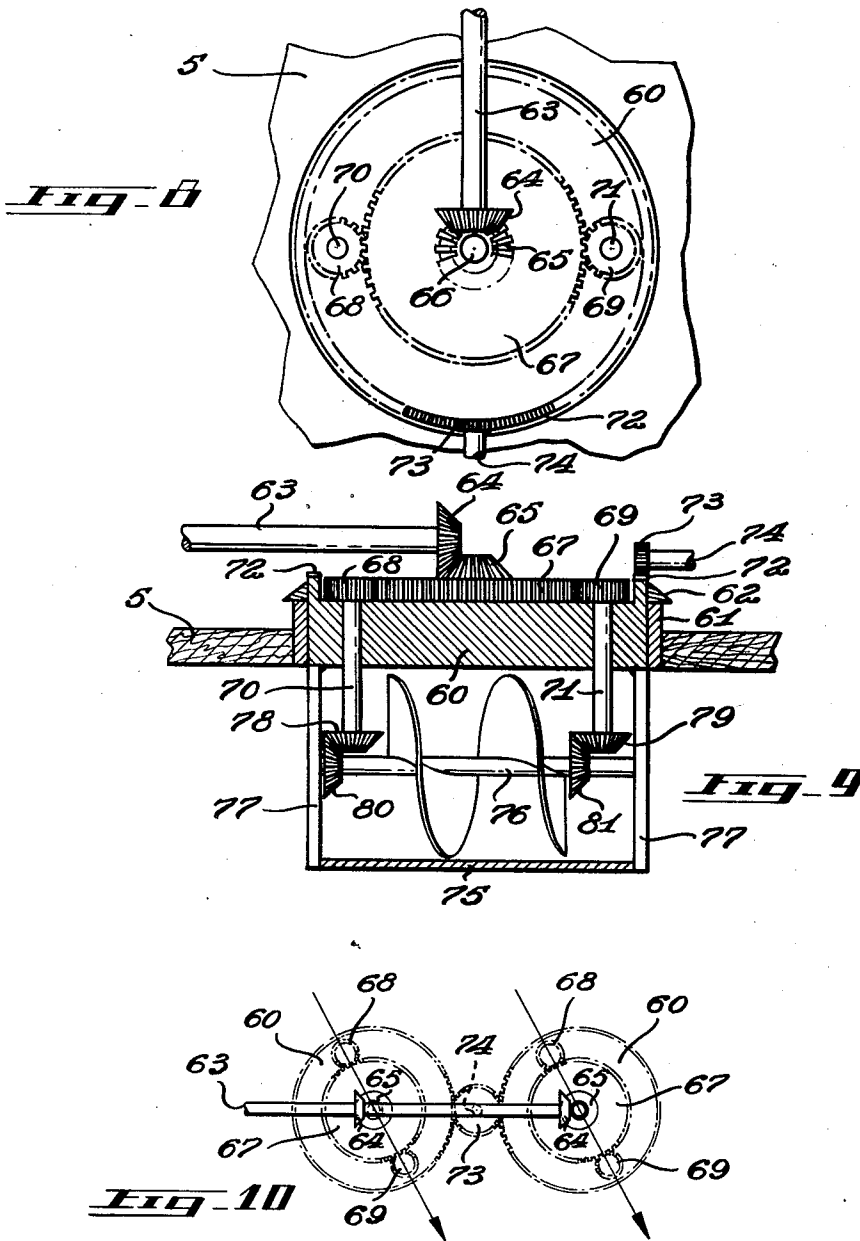
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IMPELLING AND STEERING DEVICES FOR CRAFTS, VESSELS AND THE LIKE

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7 Claims. (Cl. 115—35)

This invention relates to an impelling and steering device for crafts, vessels and the like such as surface water crafts, and with certain modifications which are embodiments of this invention may be usefully employed for aircraft and for submarines or like underwater craft.

A particular object of this invention is to provide a device for impelling and steering with means operable either separately or conjointly with said impelling means which will afford rapid lateral change of direction of the impelling force effected by said impeller.

A device of the kind provided by this invention will afford greater manoeuvrability and will also allow turning of the craft at greater speeds and in a smaller area.

The device also facilitates docking by change of the direction of the impelling force without necessarily complete change of direction of the bow of a craft so that such a craft may be manoeuvred, at least for short distances, in a sidewise direction into a small docking space.

Another object is to provide an impelling and steering device which may be rotated so as to direct the impelling means in a reverse position without the necessity of stopping or reversing the impeller driving means which would necessitate stopping and then imparting reverse rotation of the impeller. This latter would result in the loss of valuable time and distance in emergencies which would be overcome with my invention.

Another object is to provide a novel impelling means in which helical impeller blades are arranged along the length of a cylindrical casing which imparts a greater driving force.

A further object is to provide such an impelling means with drive connections at opposite ends of the impeller blades to impart a positive unitary drive to the impeller with a minimum amount of strain, thereby increasing the potential driving force of the impeller.

Still a further object is to provide an impelling and steering means of the character described with a rotary device adapted to provide elevation or depression of the impelling and steering device either independently of or in cooperation with the lateral deviation means whereby ascent or descent at any angle may be imparted to the craft or vessel.

Thus when employed with a submarine type vessel, descent or ascent at any angle may be made and at sharp angles as well as imparting the ability to move sideways or in reverse without having to reduce the speed of the impellers.

It is also contemplated to employ this device in multiple units which cooperatively function in unison either with surface craft or submarines.

These multiple units, when co-ordinated may also be employed with aircraft, and particularly with triangular or circular types of craft. Their ability to separately or cooperatively change vertical and/or lateral change of direction in unison renders an aircraft capable of manoeuvres not hitherto accomplishable with present day types of impellers.

The above and other objects, advantages and features

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characteristic of this invention will be understood more fully from the following detailed description taken in connection with the accompanying drawings, in which:

Figure 1 is a plan view, partly broken away, showing one embodiment of my invention.

Figure 2 is an elevational view, partly broken away, of the device shown in Figure 1.

Figure 3 is a view similar to Figure 1 but showing certain of the component parts in different relation.

Figure 4 is an elevational view, partly broken away, of the device shown in Figure 3.

Figure 5 is an exploded view detailing certain of the component parts shown in Figures 1 to 4.

Figure 6 is a side view in section of a modified form of the device shown in Figures 1 to 4.

Figure 7 is an end view, partly broken away, of the device shown in Figure 6.

Figure 8 is a plan view of a further modified form of the invention.

Figure 9 is a side view in section of the device shown in Figure 8 and also showing certain of the component parts in different positions.

Figure 10 is a diagrammatic view of a still further modification of my invention.

Referring more particularly to the drawings, 5 generally designates one side or end wall of a craft or vessel to which is attached a housing indicated at 6 on the outside thereof in a manner which will be hereinafter more fully described.

Inside of the craft or vessel is a first horizontal power-driven shaft 7 which extends through the said wall 5 and into the housing 6. Within the housing 6 shaft 7 has a gear 8 secured thereto to rotate with said shaft. The gear 8 is herein shown to be bevelled but may be any other suitable type. Gear 8 is intermeshed with a similar type of gear 9 which freely revolves about a shaft 10 at right-angles to shaft 7. Gear 9 is secured to a spur gear wheel 11 which also freely revolves about the shaft 10. The shaft 10 is secured to a turntable 12 which is rotatable about a common axis relative to said gear 9 and gear wheel 11. Turntable 12 underlies said spur gear wheel 11.

Turntable 12 has upon its edge bevel gear teeth 14 which intermesh with a bevel gear 15 secured to a sleeve 16 which is disposed about shaft 7 for free rotation about a common axis therewith. The sleeve 16 extends through the wall 5 of the craft or vessel and has a spur gear 17 fixed to its inner end to rotate therewith about the shaft 7. A complementary gear 18 carried by a second power driven shaft 19 is intermeshed with spur gear 17, so that rotation of said second power-driven shaft 19 imparts rotation to turntable 12 through the intermediate gears 17, 15 and sleeve 16.

A pair of pinion spur gears 20 and 21 are mounted on the upper face of turntable 12 within the bevel gear teeth 14 of said turntable, each being at opposite sides of the shaft 10 so as to mesh with spur gear wheel 11. Spur gear 20 is fixed to a shaft 22 which extends freely through an opening in the turntable 12, said shaft having secured at its opposite end a bevel gear 23 rotatable with spur gear 20 and underlying the turntable 12. Spur gear 21 is fixed to a shaft 24 which extends freely through another opening in the turntable 12, said shaft 24 having secured at its opposite end a bevel gear 25 rotatable with spur gear 21 and underlying the turntable 12.

When the first power-driven shaft 7 is rotated in a clockwise direction, bevel gear 9 and spur gear wheel 11 secured thereto are driven in a counter-clockwise direction about shaft 10 through the medium of bevel gear 8. This causes the pinion spur gears 20 and 21 meshing with spur gear wheel 11 on either side thereof to rotate in a clockwise direction. Spur gears 20 and 21 in turn rotate

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the bevel gears 23 and 25 which mesh with bevel gear teeth 26 and 27 respectively which are carried by a cylindrical impeller 28 for rotation of same. The impeller 28 is rotatably mounted in a cylindrical outer casing 29 which is connected in suspension to the under side of turntable 12 so that the axis of said impeller is at right-angles to the axis of said turntable. The impeller 28 is provided with spiral vanes 30 extending from the inner circumferential wall of the impeller toward the centre thereof. The vanes 30 are rotated through the action of shaft 7 and the bevel gear teeth 26 and 27. The vanned impeller acts as a screw which gives motion to a craft or vessel when sufficient force is exerted.

The impeller casing 29 is secured to the underside of turntable 12. Thus, when the axis of the impeller 28 is aligned with or parallel to the longitudinal centre line of the craft or vessel as shown in Figs. 1 and 2, a direct forward propulsion will be imparted thereto. When it is desired to alter the lateral course of the craft or vessel, the second power-driven shaft 19 is actuated to rotate the turntable 12 so as to change the direction of the impelling force. For example, in Figs. 3 and 4, I have shown the turntable 12 rotated through 90° thus altering the impelling force to an angle of 90° to the original direction. With two units; one in front and one in back, turned in opposite directions, these will accomplish a lateral change in the direction of the craft in the smallest area. The alteration of the impelling force through the medium of turntable 12 may be accomplished with or without a change in speed of the impelling force applied from the first power-driven shaft 7 to the impeller 28.

If it is desired to reverse the direction of the craft or vessel the turntable 12 is rotated between 90° and 180° either right or left from its original position shown in Figs. 1 and 2, depending on the direction in reverse required. Here again, a reverse direction may be taken with the least possible delay and without the necessity of first stopping and then reversing the direction of rotation of the first power-driven shaft. The cylindrical impeller 28 due to its adaptability to change direction of the impelling force, eliminates the necessity of a rudder or external steering device since the steering and impelling forces are effected through cooperative manipulation of the first and second power-driven shafts 7 and 19.

The external housing 6 is fitted over an opening in the craft side or end wall 5 to a disc 32 on the inside of the craft substantially as shown in Fig. 5. A watertight ring 33 is fitted in the opening of wall 5. Ring 33 has an annular internal projection 34 spaced from both side edges to provide shoulders 35 and 36 on either side of the projection. The inner end of housing 6 has two stepped raised portions 37 and 38, which when fitted into one side of ring 33 the margin of portion 37 bears against shoulder 35 and the stepped portion 38 fits within the annular projection 34. Similarly disc 32 has two stepped raised portions 39 and 40 which fit into the other side of ring 33 so that the margin of portion 39 bears against shoulder 36 and the portion 40 fits within the ring projection 34 in engagement with the opposing surface of the raised portion 38 of housing 6. Any suitable means designated at 41 may be provided to secure said housing 6 and disc 32 together on either side of said ring.

The outer edge of disc 32 is provided with crown gear teeth 43 which mesh with a spur gear 44 secured to a third power-driven shaft 45. Actuation of shaft 45 rotates disc 32 freely about the axis of shaft 7 thereby causing the housing 6 to be turned or tilted about the same axis relative to the side 5 of the craft. This action tilts the turntable 12 to any angle up to 90° from its normal horizontal position so that the axis of rotation of said turntable is altered from the vertical to any selected position of inclination up to a horizontal position. Rotation of said turntable 12 under these conditions serves to direct the impelling force up or down according to the direction of

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rotation of said turntable. Thus it will be seen that a craft may ascend or drive at any angle and in any forward or reverse direction by the cooperative manipulation of the first, second and third power-driven shafts 7, 19 and 45. With the selective or cooperative manipulation of shafts 19 and/or 45, either lateral, vertical or combined lateral and vertical alterations in any direction may be effected. At the same time the rate at which these transitions may be effected are separately controllable by adjustment of the force of the impeller 28 through the medium of the first driven shaft 7.

In Figs. 6 and 7, I have shown a modified form of impeller which comprises a cylindrical, open-end, outer casing 47 secured to the under side of turntable 12. Vertical supports 48 at opposite ends of casing 47 rotatably support the opposite ends of an impeller shaft 49. Spiral vanes 50 project outwardly from shaft 49 towards the inner surface of cylindrical casing 47. Bevel gears 51 and 52 secured to shaft 49 adjacent its opposite ends mesh with the bevel gears 23 and 25 respectively which are secured to rotate with spur gears 20 and 21. The connecting shafts 22 and 24 are suitably elongated to permit the bevel gears 23 and 25 to engage the complementary gears 51 and 52 on impeller shaft 49. Tapered members 55 extend beyond the outer ends of shaft 49 to facilitate movement of the impeller through water with a minimum of resistance and at the same time to direct the flow of water toward the spiral vanes 50 within the impeller casing 47.

In Figs. 8 and 9, a further modification has been illustrated which is particularly adaptable for water surface craft. Here the hull 5 is provided with a bottom opening through which a cylindrical turntable 60 extends. The cylindrical wall of the turntable is fitted in a water-tight cylindrical housing 61 which lines the hull opening, and said turntable is supported within said ring to rotate about a vertical axis. The turntable wall has a bearing flange 62 or other suitable means which engages the upper edge of said housing 61. A first power-driven shaft 63 has a bevel gear 64 which meshes with a second bevel gear 65 mounted to freely revolve about a shaft 66 which is fixed at its lower end to the turntable 60 to separately revolve said turntable about a common axis with bevel gear 65. The bevel gear 65 is secured on its underside to a spur gear wheel 67 which is recessed in the turntable 60 and which freely revolves about the shaft 66 relative to the turntable.

A pair of pinion spur gears 68 and 69 are mounted, one at opposite sides of the spur gear wheel 67 to mesh therewith. Shafts 70 and 71 secured to the pinion spur gears 68 and 69 respectively, extend through openings in the turntable 60 within the outer margin of said turntable. The outer margin of the turntable is provided with gear teeth 72, which may be spur or bevel but are here shown as crown, to mesh with a complementary gear 73 secured to a second power-driven shaft 74.

A cylindrical open-end impeller casing 75 is secured to the underside of turntable 60 to rotate therewith. An impeller shaft 76 is mounted in the casing 75 with its opposite ends bearing in vertical supports 77 extending from the turntable 60 across the open ends of the casing 75 and secured thereto. The impeller shaft is provided with helical blades which extend outwardly from the shaft towards the inner surface of the casing. The lower ends of shaft 70 and 71 have bevel gears 78 and 79 fixed thereto which mesh with complementary gears 80 and 81 fixed to shaft 76 to rotate said impeller in response to actuation of the first driven shaft 63. Actuation of the second power-driven shaft 74 rotates the turntable 60 relative to the housing 61 and also rotates the attached impeller casing 75 to change the direction of its impelling force. Here again it will be appreciated that control of the turntable 60 may either be effected independently of

or in cooperation with control of the impelling force to regulate the speed in the change of course of the craft.

In Fig. 10 I have illustrated diagrammatically a twin assembly in which the impellers are actuated from a single first power-driven shaft 63 carrying bevel gears 64 which mesh with complementary gears 65 of each unit, each of which in turn rotate the impeller actuating spur gears 68 and 69 through the medium of spur gear wheel 67 to drive the impellers of the type shown in Fig. 9. The twin turntables 60 are cooperatively rotated through the medium of an intermediate complementary gear 73 which in turn is driven by a shaft 74 actuated by a power means not shown. In the present instance it is preferable to provide the outer margin with spur gear teeth in place of the crown gear teeth 72 so that only one intermediate gear 73 is required.

In the case of submersibles where change of lateral ascent or descent is required units should be mounted fore and aft, preferably 2 fore and 2 aft each unit diametrically opposite to each other in relation to the center of the vessel so that when those in front descend or lower the front of the vessel those in back can raise the tail end and so change direction more rapidly.

What I claim is:

1. In an impelling and steering device for crafts, vessels and the like, a housing externally mounted in an opening in one side wall of the craft to extend outwardly therefrom, a turntable mounted in said housing to revolve about a central vertical axis, an impeller casing secured to the underside of said turntable and rotatable therewith, said impeller casing extending beneath the lower end of said housing and being provided with an opening at opposite ends thereof, an impeller rotatably mounted in said impeller casing and having its projected axis of rotation extending through said end openings at right angles to the revolving axis of said turntable, a first power-driven means operably connected to said impeller for driving same, a second power-driven means operably connected to said turntable to rotate said turntable so as to laterally shift the direction of the impelling force without interrupting said impeller driving means, and a rotatable disc mounted internally of said craft and connected to said housing substantially within the side wall opening, said disc being rotatable about a horizontal axis so as to rotate said housing whereby the axis of said turntable may be swung to any selected position at right angles to the axis of said disc between vertical and horizontal planes to enable the direction of said impelling force to be converted from lateral to vertical lines.

2. An impelling and steering device as set forth in claim 1, in which said impeller casing is provided with a cylindrical inner wall, the axis of which coincides with the axis of said impeller and in which said impeller comprises a plurality of blades spiralling along the length of the casing substantially between the axis and the inner cylindrical surface of said casing.

3. In an impelling and steering device for crafts, vessels and the like, in combination with a craft provided with an opening in one side wall, a housing mounted externally of said craft to extend outwardly of said side wall with its inner end fitted over said opening with a central portion projecting into said opening, means mounted on the inside of said side wall for securing said housing over said opening, a turntable mounted in said housing to rotate about a central vertical axis, a cylindrical, open-end, impeller casing secured to the underside of said turntable to rotate therewith, said cylindrical impeller casing having its central axis disposed at right angles to the axis of said turntable, an impeller mounted in said cylindrical casing to revolve about the axis of said casing relative thereto, an impeller power driven means operably connected to said impeller to revolve the same, said impeller power driven means comprising a first power driven shaft extending horizontally from the

interior of said craft centrally through said opening and into said housing, a first gear rotatable with said shaft in said housing a second gear engaging said first gear and mounted over said turntable to freely revolve about the vertical axis of said turntable, a gear wheel secured to said second gear to revolve therewith about said axis of the turntable and relative thereto, a pair of pinion gears arranged one at either side of said gear wheel to mesh with gear teeth provided at the outer margin of said gear wheel, each of said pinion gears being fixed to separate vertical shafts extending freely through openings provided in said turntable which are diametrically opposed to the axis of said turntable, the lower end of each of said pinion gear shafts being provided with a second pinion gear which is secured to rotate therewith, an impeller gear mounted on each end of said impeller, each impeller gear meshing with one of said second pinion gears to rotate said impeller in response to actuation of said first power driven shaft; and a turntable power driven means comprising a second power driven shaft mounted interiorly of the craft, a sleeve arranged concentrically about said first power driven shaft and rotatable relative thereto, said sleeve being geared at its inner end to said second power driven shaft, a turntable rotating gear mounted on the outer end of said sleeve to rotate therewith, said turntable being provided with gear teeth about its peripheral margin which mesh with the turntable rotating gear of said sleeve whereby rotation of said turntable about its vertical axis is effected in response to actuation of said second power driven shaft.

4. An impelling and steering device as set forth in claim 3, in which said impeller comprises a cylindrical frame mounted along the length of said casing, said frame being provided with helical blades spiralling from the frame toward the central axis of the impeller throughout the length of same, and in which said impeller gears are arranged about the periphery of said impeller frame at opposite ends thereof to mesh with said second pinion gears.

5. An impeller and steering device as set forth in claim 3, in which said impeller comprises an impeller shaft extending along the axis of said impeller casing and impeller blades spiralling outwardly from said impeller shaft towards the inner surface of said casing along the length thereof, said impeller gears being secured to opposite ends of said impeller shaft to mesh with said second pinion gears.

6. An impeller and steering device as set forth in claim 5, including vertical supports extending from said turntable across the ends of said casing, said impeller shaft having its ends bearing in said vertical supports.

7. An impeller and steering device as set forth in claim 3, in which said means for securing said housing over the side wall opening comprises a disc secured on one face to the central projecting portion of said housing, said disc being rotatable about the common axis of said first power driven shaft and said turntable rotating sleeve, and a third power driven shaft mounted in said craft and geared to said disc to revolve it about its axis whereby said housing is rotated to deviate the vertical axis of rotation of said turntable and the impeller casing carried thereby along selective lines ranging between a vertical line and a horizontal line at right angles to the axis of said rotatable disc, said rotation of the housing being operable independently of the rotational operations of the turntable and the impeller.

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