

Sept. 21, 1965

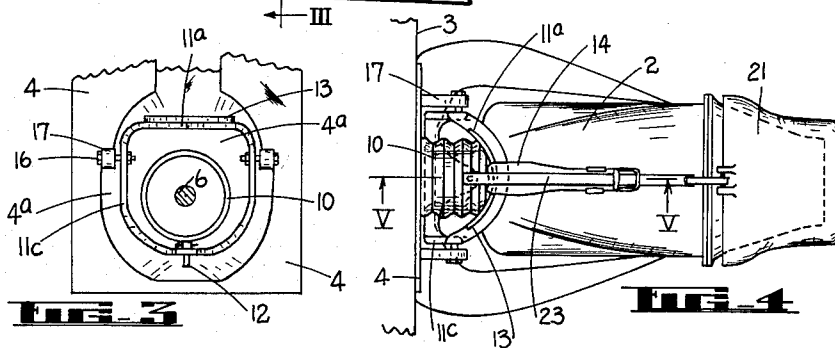
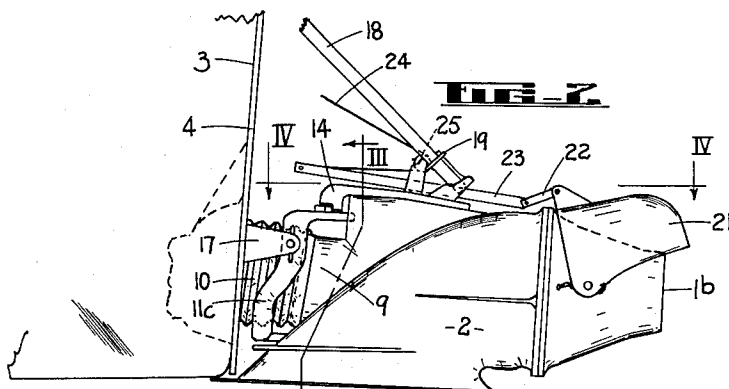
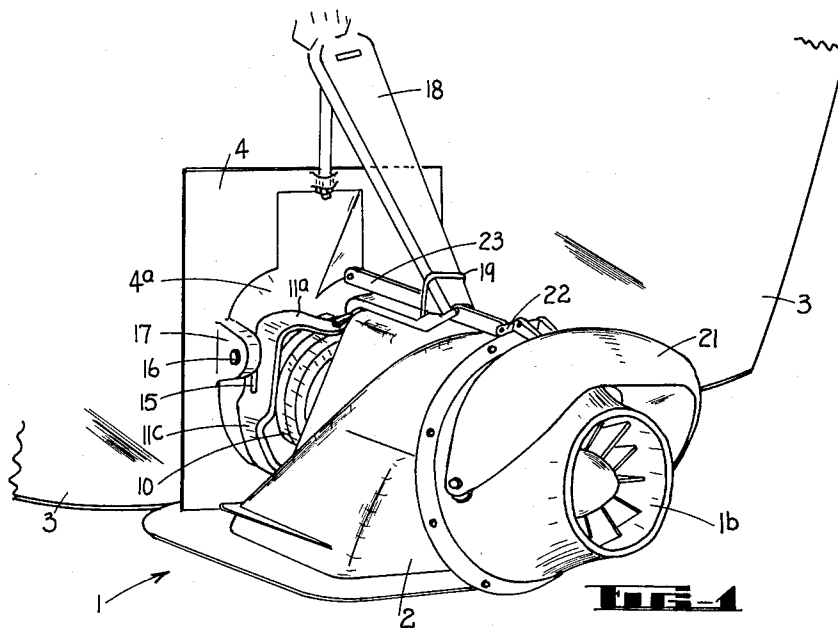
A. FRANCE

3,207,116

ATTACHMENT OF JET PROPULSION UNITS TO WATER-BORNE
CRAFT AND MEANS FOR STEERING THE UNIT

Filed March 30, 1964

2 Sheets-Sheet 1



Sept. 21, 1965

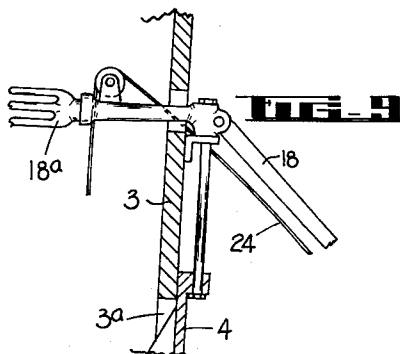
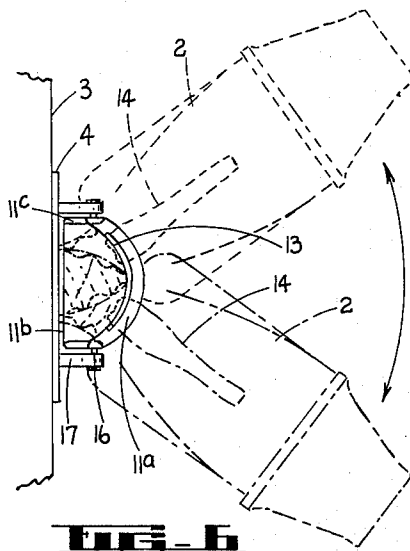
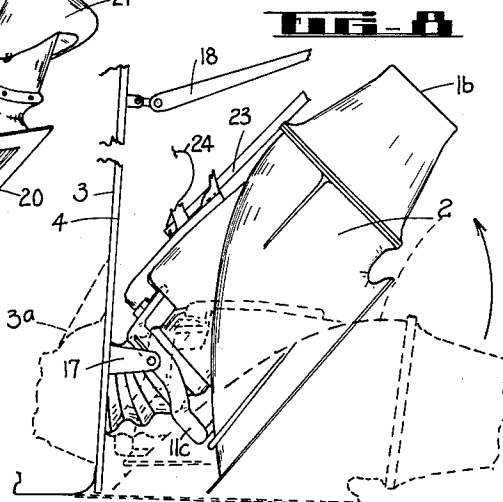
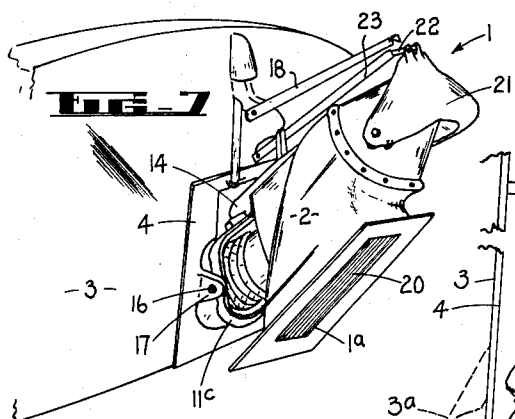
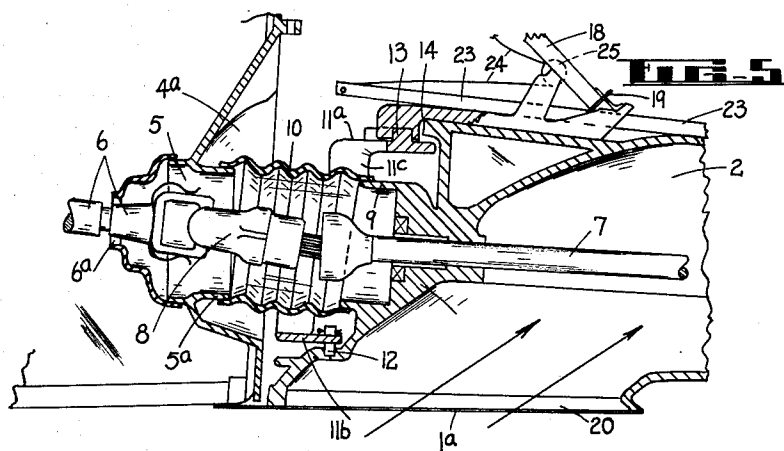
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3,207,116

ATTACHMENT OF JET PROPULSION UNITS TO WATER-BORNE
CRAFT AND MEANS FOR STEERING THE UNIT

Filed March 30, 1964

2 Sheets-Sheet 2



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3,207,116

ATTACHMENT OF JET PROPULSION UNITS TO WATER-BORNE CRAFT AND MEANS FOR STEERING THE UNIT

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13 Claims. (Cl. 115—12)

This invention relates to jet propulsion units for water-borne craft such as speed boats and the like and more particularly the invention is directed towards providing apparatus for use in mounting and attaching the jet propulsion unit in or to water-borne craft whereby an improved means and method of steering such craft propelled by such jet propulsion apparatus is provided by virtue of the improved means of attachment.

Prior to this invention it has been known to provide jet propulsion units for water-borne craft by the provision of a jet propulsion unit including an intake section whereby water is drawn through the hull of a craft into the propulsion apparatus from where it is expelled at high velocity through an orifice at the rear end of the apparatus in the form of a jet, said jet of water providing the means of propelling the craft. Such apparatus has usually been mounted within the hull of the craft and specially designed parts have been made for use in and with the jet propulsion apparatus whereby the jet of water issuing from the apparatus is directed in a desired direction to steer the craft.

It is an object of this invention to provide an improved means and method of mounting jet propulsion units in or on water-borne crafts such as speed boats whereby the method of mounting is of simple construction and whereby jet propulsion units can be fitted to an existing type of craft without the need for major structural change or alteration to be carried out in or on the craft, and whereby by the means of the improved mounting of the propulsion unit according to this invention there is provided a simple means of steering the craft in both a forward and reverse direction.

A further object of this invention is to provide an improved means of attachment for jet propulsion units in or to water-borne craft whereby when the craft is beached the propulsion unit can be moved to a position clear of the bottom of the hull of the craft and clear of the beach or surface on which the craft is resting.

It is a further object of this invention to provide a means associated with a jet propulsion apparatus whereby during reversing of the craft the jet propulsion unit will be moved to a position clear of the water in the event of the unit fouling an object such as a tree or stump or rock or the like.

In this invention the jet propulsion unit referred to is preferably of the kind incorporating an axial-flow pump.

According to this invention the improved apparatus and means for attaching and mounting jet propulsion units of the kind described to water-borne craft comprises providing the stern board of said craft, either integrally therewith or in the form of a member attached thereto, with a portion having an aperture therethrough, the perimeter of said aperture being shaped and formed to accommodate one end of a flexible connection provided between the stern of the craft and a boss portion formed or provided around an entry orifice for a drive shaft of a jet propulsion unit, said jet propulsion unit being provided with a lower pivot point secured to a yoke member surrounding the said flexible connection and an upper movable connection on said yoke member with said yoke member being pivotally and adjustably connected to the craft by members extending from the stern of the craft, the arrangement being such that by means of the said

flexible connection and the pivotal connection between the yoke member and the craft a jet propulsion unit can be attached and mounted on the stern of a water-borne craft for the purpose of propelling said craft through the water, said flexible connection and the yoke member permitting arcuate movement of the jet propulsion unit in a horizontal plane whereby steering of the craft to be effected, and whereby the flexible connection and pivotal connection of the arms to the yoke member is such that the jet propulsion unit, when desired, can be pivoted upwardly on such connection points so as to raise the propulsion unit.

The invention will now be more particularly described with reference to the accompanying drawings, in which:

FIGURE 1 is a general perspective view from the rear of a craft showing a propulsion unit attached to the craft by the means of this invention,

FIGURE 2 is a side elevation (on a different scale) showing a propulsion unit fitted to a craft,

FIGURE 3 is a broken cut-away view substantially on line III—III of FIGURE 2 to show the yoke member in end elevation,

FIGURE 4 is a plan view substantially on line IV—IV of FIGURE 2,

FIGURE 5 is an enlarged broken cross-sectional view on line V—V of FIGURE 4,

FIGURE 6 is a plan view similar to FIGURE 4 and showing in dotted outline the arc of travel of the propulsion unit when actuated to steer the craft during use of said craft,

FIGURE 7 is a perspective view from the rear of a craft showing a propulsion unit attached to the craft and tilted upwardly by the means of this invention,

FIGURE 8 is a broken side elevation showing the propulsion unit tilted as for beaching, transportation and the like, and

FIGURE 9 is an enlarged broken cross-sectional view showing part of the control means, used for turning the propulsion unit, attached to the stern of a craft.

As shown in the drawings and as used in conjunction with this invention the jet propulsion unit or apparatus is generally indicated by arrow 1 and said jet propulsion unit 1 is preferably of a kind known as an axial-flow jet propulsion apparatus, and a suitable unit is one whereby water is drawn through an intake opening 1a in a casing 2 of the propulsion unit 1, which casing 2 is mounted by means of the invention behind the stern 3 of a water-borne craft, and whereby the drawing-in of water through the intake opening 1a is effected by an impeller or impellers (not shown) in the casing 2 so that water is formed therein into a jet and is jetted through an opening or orifice 1b at the rear end of the jet propulsion unit 1, the sucking-in of water through the intake 1a and jetting it out at the rear of the unit 1 providing the means of propulsion for the craft.

In a preferred form of this invention and as shown in the drawings a craft to which such a unit 1 is to be attached by means of this invention has the stern board 3 of the craft formed or provided with a cut-away portion 3a into which may be fitted a plate or like member 4 containing an apertured portion 5. The plate member 4 is preferably located centrally of the central longitudinal axis of the craft, and such plate 4 has formed or provided therein a dish formation 4a with the aperture 5 provided therethrough. The dish formation 4a is such as to extend inwardly towards the interior of the craft, and the perimeter 5a of the aperture 5 provided through the dish portion 4a is preferably formed as a boss (see FIGURE 5) returned rearwardly of the dish formation 4a. The boss 5a, being the perimeter of the aperture 5, provides the means for a flexible connection as between the craft and the jet unit 1. The aperture 5 pro-

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vided in the dished portion 4a is such as to permit the passage and operation therethrough of a drive shaft 6 from a prime mover such as a motor (not shown) mounted in or towards the rear of the water-borne craft, and the drive shaft 6 passed through such aperture 5 may be sealed in position by a water-tight and oil-tight seal 6a (see FIGURE 5).

The jet propulsion unit 1 has, in its casing 2, a drive shaft 7 leading to an impeller or impellers in the casing 2, and said drive shaft 7 is passed out through a rear portion 2a of the casing 2 for connection with the drive shaft 6 from the motor. The drive shaft 7 is sealed by a water and oil tight seal 1a in the casing 2 (see FIGURE 5). The coupling between the two drive shafts 6 and 7 is preferably effected such as by a suitable universal bearing coupling 8. A boss 9 is formed or provided on the casing 2 around the portion 2a and around the drive shaft 7.

Between the boss 5a on the dished formation 4a of the plate 4 and the boss 9 on the jet propulsion unit casing 2 a flexible connection 10 between the plate 4 and the jet propulsion unit 1 can be effected. The flexible connection 10 may be a bellows or flexible pipe. By the provision of the flexible connection 10 between the stern board plate 4 and the boss surrounding the drive shaft 7 leading into the casing 2 of the jet propulsion unit 1 there is provided a sealed compartment (see FIGURE 5) having portions of the drive shafts 6 and 7 together with the universal coupling 8 accommodated therein and such sealing makes it possible for lubricant such as oil to be contained therein for the purposes of lubricating the coupling 8 at all times.

Formed or provided on the casing 2 of the jet propulsion unit 1 and extending above and below the boss portion 9 accommodating the drive shaft 7 is a means for arcuate movement of the casing 2 relative to the stern board plate 4. Such arcuate movement of the casing 2, in use of a craft having a jet propulsion unit 1 fitted by means of this invention, is effected by the provision of a yoke member 11 which has upper and lower members 11a and 11b and side members 11c (see FIGURE 3). The lower member 11b of yoke 11 has formed or provided a downwardly extending pin member 2 which is arranged for pivotal engagement with a lower portion of the casing 2. The upper member 11a of the yoke has an arcuate formation (see FIGURE 4) and has a raised arcuate lip or projection 13 thereon which is engaged by an inverted U-shaped arm member 14 from the casing 2 as shown in FIGURE 5.

The side members 11c of the yoke 11 are slotted at 15 and the side members 11c of the yoke member 11 are engagable by pins or bolts 16 passed through the slots 15, with members in the form of lugs or arms 17 extending rearwardly from the plate 4 and on each side of the dished formation 4a so that the yoke 11 is connected to the plate 4 and hence the craft by virtue of the attachment of the plate 4 to the stern 3 by means of the lugs or arms 17 and the yoke 11 is connected to and supports for movement the casing 2 of the jet propulsion unit 1 by means of the pin member 12 and the lip or projection 13 having engaged therewith the inverted U-shaped arm 14 of the casing 2.

The inverted U-shape of arm 14 extending from the casing 2 of the jet propulsion unit 1 may be a groove in the undersurface of such arm 14, and preferably the arm 14 is located on the casing 2 above the boss 9 of the casing 2.

The pivotal and movable connection of the casing 2 with the yoke 11, by the pin member 12 and the arm 14 with lip or projection 13 on the yoke 11, and the flexible connection 10 between the casing 2 and plate 4 as previously described, and the universal coupling 8 between shafts 6 and 7, permits arcuate movement of the casing 2 relative to the craft and its stern 3 (see FIGURE 6), so that the jet of water issuing from the orifice

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1b of the jet propulsion unit 1 can be directed away from the craft in any desired direction (within the limits of the aforementioned arcuate movement) so that steering of the craft can be effected in any desired direction.

It will be seen from the aforementioned construction and arrangement that the lugs or arms 17 extending from the plate member 4 (or the craft) and pivotally connected to the yoke member 11 provide support for the weight of the jet propulsion unit 1 so that in use thereof the unit 1 is maintained in a substantially horizontal position (see FIGURE 2) with the bottom of the unit 1 substantially level with the bottom of the craft so that the weight is not supported by the flexible connection 10 and/or the drive shafts 6 and 7.

The jet propulsion unit 1 can be moved in an arcuate direction relative to the horizontal axis of the craft and at the stern of the craft for the purpose of steering the craft during forward propulsion (see FIGURE 6). Movement of the casing 2 for steering as previously described is preferably, although not necessarily, effected by the provision of an arm 18 provided on the top of the casing 2 such arm 18 being connected to the stern 3 of the craft and controlled by means of control wires (not shown) through a quadrant 18a or like member and operable by an operator in the craft (see FIGURE 9).

In the use of a water-borne craft having a jet propulsion unit 1 attached thereto in the manner described it is desirable such as during road transportation and in beaching the craft, to lift or tilt the propulsion means at the stern of the craft so that it is not fouled or damaged.

Such lifting or tilting of the casing in this invention, hitherto unknown in jet propulsion apparatus, is effected by virtue of the pivotal attachment of the side members 11c of the yoke 11 to the lugs or arms 17 of the plate 4. The slots 15 in the side members 11c of the yoke 11 enable the maximum lifting movement of the casing 2 by the yoke 11 relative to the stern 3 of the craft to be obtained. Lifting or tilting the casing 2 is effected by releasing a catch 19, which may be any suitable kind of catch, releasably holding the arm 18 which controls the steering of the unit 1. Release of the arm 18 allows the casing 2 to freely move upwardly (see FIGURE 8) and pivot about the pins or bolts 16 engaged with the lugs or arms 17 and the side members 11c of the yoke members 11.

The flexible connection 10 between the casing 2 of the jet propulsion unit 1 and the stern 3 of the craft also permits the upward movement of the casing 2 relative to the stern 3 of the craft. By this arrangement the casing 2 of the unit 1 can be lifted from a horizontal position (see FIGURE 2 and dotted outline in FIGURE 8) to an inclined position (as shown in full in FIGURE 8) so that when the craft is beached or is in shallow waters the jet propulsion unit 1 can be raised off the beach surface so as to prevent fouling of the former with the latter.

A locking means (not shown) may be provided as between the stern 3 of the craft and the casing 2 of the unit 1 near the upper member 11a of the yoke 11 so that in the event of water pressure in the jet propulsion unit 1 tending to lift the unit 17 out of the water on the pivotal connections 16 as previously described, the lock (not shown) can be engaged so that the jet propulsion unit 1 cannot rise from its horizontal position in the water during use thereof.

The intake section 1a of the jet propulsion casing 2 is provided with a grille 20 over the intake opening 1a and such grille 20 is pivotally connected in said opening 1a and may be protected by downward side projections (not shown) around the opening 1a of the casing 2 so that in use a craft with a jet propulsion unit 1 attached according to this invention and in the event of a portion of the grille 20 fouling an object such as a submerged tree stump or boulder or the like the casing of the unit can pivot upwardly on the pins 16 through the lugs 17 and by virtue of the flexible connection 10 so as to clear such obstruction and prevent fouling of the jet propulsion unit 1.

In such circumstances of use the locking means (not shown) will be left disengaged as between the stern 3 of the craft and the casing 2. The grille 20 may also be provided with one or more retractable fins (not shown) in its construction which are usable to prevent fouling of the grille 20.

It will be observed that by the improved apparatus and means of attachment for jet propulsion units 1 in accordance with this invention that the unit 1 can be fitted to any existing type of craft such as a speed boat merely by providing a cut-away portion in the stern board 3 and fitting plate 4 in said cut-away portion to the stern 3 of the craft.

The drive 7 for the impeller of the jet propulsion unit 1 of this invention is provided from drive shaft 6 extending from a suitable motor (not shown) mounted within the hull of the craft and preferably towards the stern 3 thereof, and the drive connection is made through the aperture 5 in the dished formation 4a of the plate member 4 attached to the stern board 3 and continued such as by means of a universal coupling 8 through the flexible connection 10 and boss member 5a to the drive shaft 7 of the jet propulsion unit 1.

It will be observed from the above that steering in a forward direction of the craft is effected by movement of the entire jet propulsion unit 1 on the upper and lower points of movement of the yoke member 11 and by virtue of the flexible connection 10 as between the boss 9 around the shaft 7 of the propulsion unit 1 and the boss 5a of the plate 4 of the stern 3 of the craft. Steering for reversing of the craft is effected in the same manner although for reversing the craft a suitable scoop member 21 or like deflector device is provided over the end of the outlet or orifice 1b of the jet propulsion unit 1 so as to redirect water under the unit 1 to move the craft in a reverse direction. The scoop or like deflector device 21 is preferably hinged by a flexible hinge member 22 to the casing 2 over the orifice 1b and the scoop 21 is actuated by a lever 23 operably connected to the craft such as by a wire or wires 24 passed around a pulley 25 on the arm member 14. Pulling on the wire 24 moves the lever 23 rearwardly to pivot the scoop 21 over the orifice 1b to redirect water issuing therefrom under the unit 1 and the craft to effect reversing of the craft.

The lever 23 and wire 24 may also be used to assist in lifting or tilting the casing 2 from a horizontal to a raised position when beached or transporting the craft.

It will be understood that by this invention the jet propulsion unit 1 is mounted rearwardly of the craft and not within the hull of the craft so that water is taken up through the intake portion of the casing 2 at the rear of the craft and is discharged in a jet at the outlet 1b of the jet propulsion unit 1.

What I do claim and desire to obtain by Letters Patent of the United States of America is:

1. An apparatus and means for attaching and mounting jet propulsion units to water-borne craft comprising providing the stern board of said craft with a portion having an aperture therethrough, the perimeter of said aperture being shaped and formed to accommodate one end of a flexible connection provided between the stern of the craft and a boss portion formed or provided around an entry orifice for a drive shaft of a jet propulsion unit, said jet propulsion unit being provided with a lower pivot point secured to a yoke member surrounding the said flexible connection and an upper movable connection on said yoke member with said yoke member being pivotally and adjustably connected to the craft by members extending from the stern of the craft, the arrangement being such that by means of the said flexible connection and the pivotal connection between the yoke member and the craft a jet propulsion unit can be attached and mounted on the stern of a water-borne craft for the purpose of propelling said craft through the water, said flexible connection and the yoke member permitting arcuate movement of the jet propulsion unit in a horizontal plane

whereby steering of the craft can be effected, and whereby the flexible connection and pivotal connection of the arms to the yoke member is such that the jet propulsion unit can be pivoted upwardly on such connection points so as to raise the propulsion unit.

2. An apparatus as claimed in claim 1, wherein the stern board of the craft is formed or provided with a cut-away portion into which is fitted a plate member, said plate member being fitted centrally of the central longitudinal axis of the craft, said plate member having formed or provided therein a dished formation with an aperture provided through the said dished formation.

3. An apparatus as claimed in claim 2, wherein the aperture provided through the dished formation has the peripheral edges thereof formed as a boss returned rearwardly of the dished formation, said boss providing a means for flexible connection as between the craft and a jet propulsion unit.

4. An apparatus as claimed in claim 2, wherein the aperture provided in and through the dished formation of the plate member is arranged to have passed and operated therethrough a drive shaft from a prime mover such as a motor mounted in a water-borne craft.

5. An apparatus as claimed in claim 1, wherein a jet propulsion unit, such as an axial-flow jet propulsion unit, has its drive shaft operably connected such as by a universal coupling to the motor drive shaft protruding through the aperture in a plate member at the stern of the craft, and the casing of the jet propulsion unit being formed or provided with a boss around the drive shaft passed therethrough, with a flexible connection being connected between the boss of the casing and the boss formation on the dished formation of the plate member whereby a flexible and sealed compartment is provided for portions of the drive shafts and whereby a flexible connection is provided as between the craft and the casing of the jet propulsion unit.

6. An apparatus as claimed in claim 5, wherein the flexible connection between the plate member and the jet propulsion unit is of a flexible pipe formation.

7. An apparatus as claimed in claim 1, wherein the flexible connection between a plate member on the stern on the craft and the jet propulsion unit casing is surrounded by said yoke member, said yoke member having upper and lower members and side members.

8. An apparatus as claimed in claim 7, wherein the yoke member with upper and lower members and side members is arranged whereby the lower member is formed or provided with a downwardly extending pin member arranged for pivotal engagement with a lower portion of the jet propulsion casing, and the upper member of the yoke member is formed or provided with a raised arcuate lip or projection which is engaged by an arm member extending from the jet propulsion casing the arrangement being that the upper and lower members of the yoke member provide a fulcrum for arcuate movement of the jet propulsion unit relative to the stern of the craft.

9. An apparatus as claimed in claim 7, wherein the side members of the yoke are slotted, said side members of the yoke member being engageable with members such as arms extending rearwardly from the plate member on each side of the dished formation thereof, such engagement being effected by pins or bolts passed through the slots in the side members of the yoke member and passed through the arms, such connection of the yoke member to the arms of the plate member providing a pivotal attachment whereby the jet propulsion unit casing can be pivoted upwardly relative to the stern of the craft.

10. An apparatus as claimed in claim 8, wherein the arm extending from the casing of the jet propulsion unit has an inverted U-shaped formation which shape may be effected by grooving the undersurface of such arm whereby said groove is movably engageable on the raised lip or projection on the upper member on the yoke member.

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11. An apparatus as claimed in claim 1, wherein said arcuate movement of the jet propulsion unit relative to the horizontal axis of the craft and the stern of the craft for steering purposes is effected by means of an arm member provided between the stern of the craft and the top of the casing of the jet propulsion unit, said arm being controlled and operable from within the craft, the arcuate movement being possible by virtue of the pivotal and movable connection of the casing of the jet propulsion unit with the yoke member, the yoke member being connected at its lower member by a pin member to the casing and at its upper member by the arm from the casing movably engaged with an arcuate lip or projection on the upper member of the yoke member and by the flexible connection between the casing of the jet propulsion unit and a plate member on the stern of the craft.

12. An apparatus as claimed in claim 11, wherein the jet propulsion unit and its casing can be lifted or tilted relative to the stern of the craft by releasing a catch holding the control arm used to control the arcuate movement of the jet propulsion casing, the casing of the jet

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propulsion unit on release being free to move upwardly and pivot about the pins engaged with the arms and side members of the yoke member whereby the jet propulsion unit is moved upwardly on said pivotal connections at the rear of the craft to avoid obstructions in the water or fouling a beach or the like when the craft is beached.

13. An apparatus as claimed in claim 1, wherein the casing of the jet propulsion unit is formed or provided with a scoop or like deflector device over the outlet orifice of the jet propulsion unit whereby reversing of the craft can be effected, said scoop or deflector device being controlled by a lever operably connected to the craft and whereby actuation of said lever actuates the scoop or deflector device to the desired direction of movement of the jet propulsion unit and the craft.

No references cited.

MILTON BUCHLER, *Primary Examiner*.

FERGUS S. MIDDLETON, *Examiner*.