United States Patent

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[73] Assignee **Jacuzzi Bros., Incorporated**

[54] **MARINE JET PUMPOUT AND FIRE-FIGHTING EQUIPMENT**
10 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** ..... **115/12 R,** 60/221, 114/184
[51] **Int. Cl.** **B63h 11/00**
[50] **Field of Search** 115/12, 14, 16; 114/184; 60/35.54, 35.55, 221

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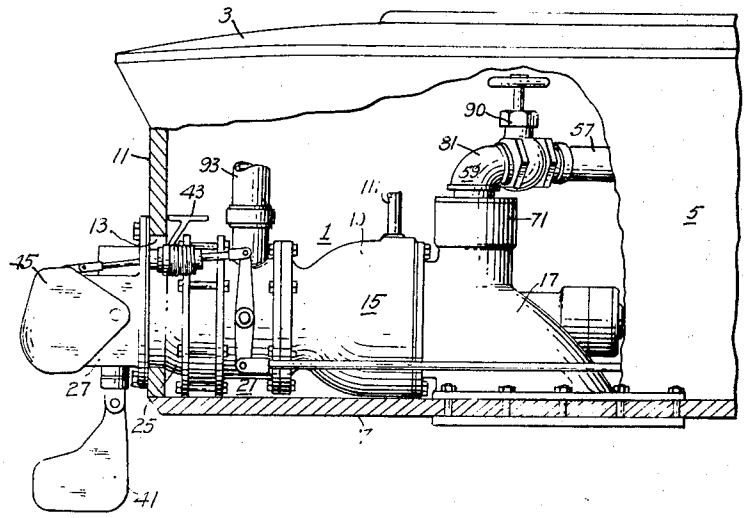
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CLAIM: In combination, a vessel, a jet pump assembly in said vessel, having an intake end, flow connected exteriorly of said vessel below the waterline thereof, and a discharge end at the stern of said vessel for jet propulsion discharge, and including a pump intermediate said intake end and said discharge end, means for steering said vessel, means for reversing, in varying degrees, said discharge, to effect and control reverse direction of movement of said vessel, pump-out means flow coupled to said pump assembly intake end and exposed to the suction side of said pump, and means, independent of said steering and reversing means, for adjustably diverting a portion of the discharge of said pump for use other than jet propulsion.



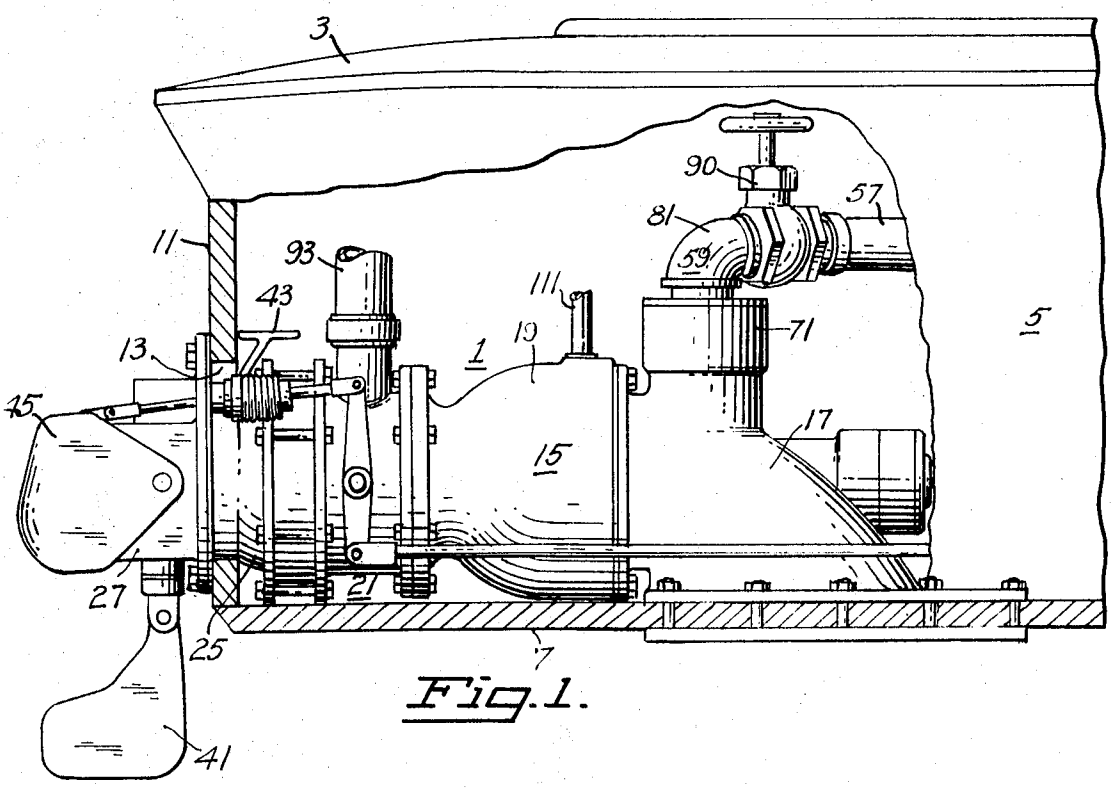


Fig. 1.

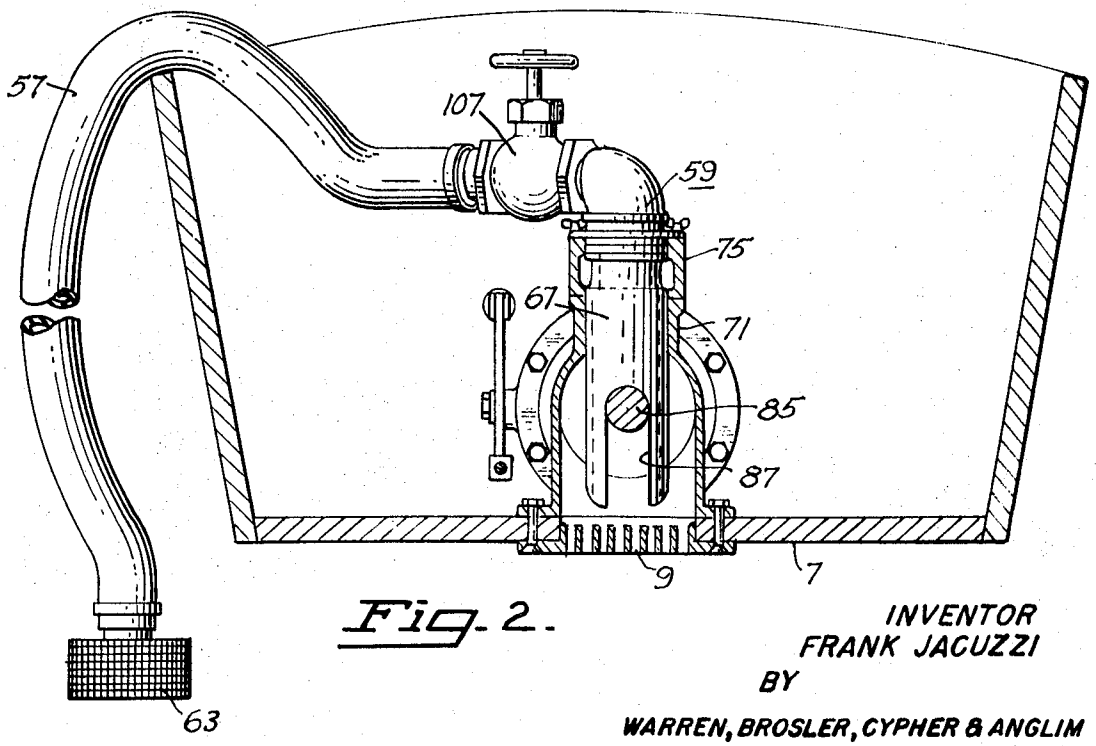


Fig. 2.

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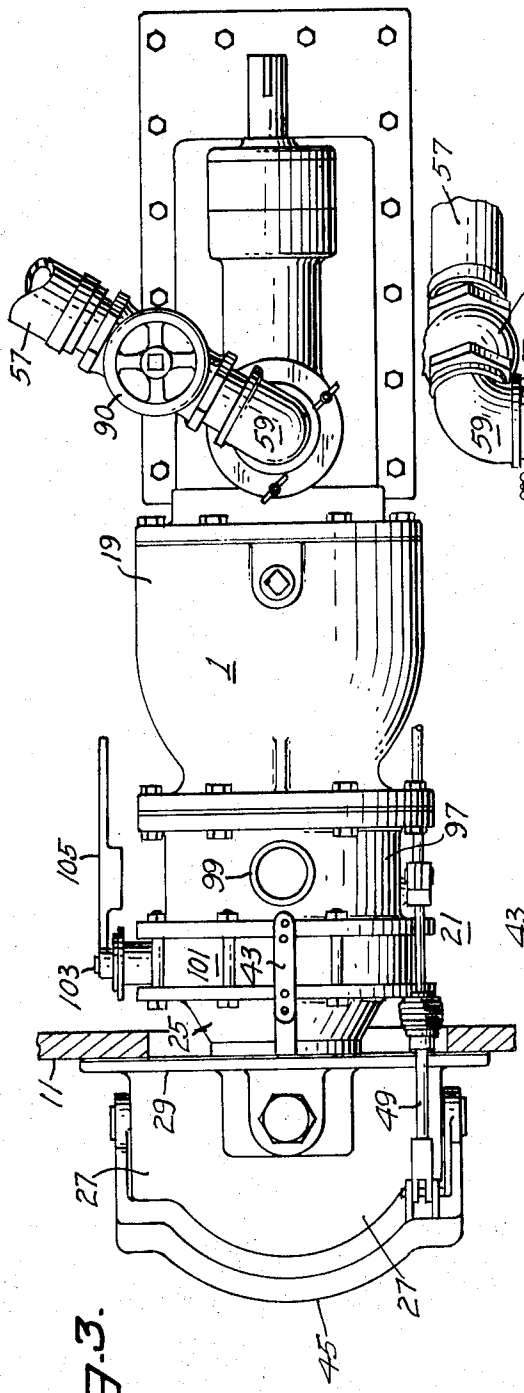


Fig. 3.

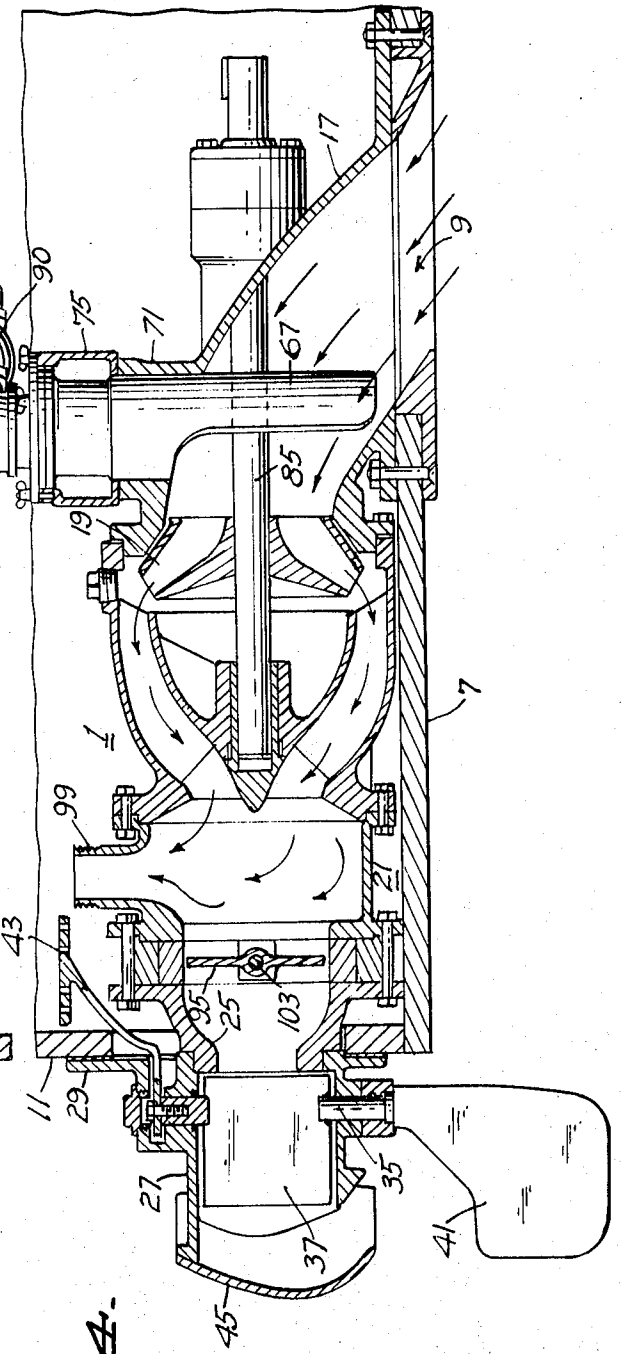


Fig. 4.

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MARINE JET PUMPOUT AND FIRE-FIGHTING EQUIPMENT

My invention relates to jet propulsion drives for vessels and more particularly to marine jet pumpout and fire-fighting equipment as applied thereto.

Vessels, while primarily employed for transportation purposes, such as in the carrying of passengers and/or freight, are sometimes equipped to serve other purposes such as fire fighting, pumping out flooded hulls or flooded dock facilities, and the like.

Among the objects of my invention are

1. To provide a novel and improved jet-propelled vessel having facilities incorporated into the jet propulsion drive of such vessel, which enables utilization of such vessel for fire fighting, pumping out of flooded hulls or the like, or for a variety of other purposes;

2. To provide a novel and improved jet-propelled vessel capable of being stabilized or maneuvered while being employed in fire-fighting or pumping-out operations;

3. To provide novel and improved facilities for incorporation into the jet propulsion drive of a vessel, which will enable such vessel to be utilized for fire fighting, and pumping out of flooded hulls or the like, or for a variety of other purposes; 4. Additional objects of my invention will be brought out in the following description of a preferred embodiment of the same, taken in conjunction with the accompanying drawings.

FIG. 1 is a fragmentary view of the stern portion of a vessel, depicting partly in elevation and partly in cross section, an installation embodying the teachings of the present invention;

FIG. 2 is a view in section taken in the plane 2—2 of FIG. 1;

FIG. 3 is a plan view of a jet propulsion drive for a vessel, incorporating the features of the invention; while

FIG. 4 is a view in section through the jet propulsion drive of FIG. 3.

Referring to the drawings for details of my invention in its preferred form as illustrated, a jet propulsion drive 1 is depicted as installed in the stern portion 3 of a vessel 5 wherein the hull bottom 7 is provided with an intake opening 9, and a transom 11, which is likewise provided with an opening 13.

Coupling the two openings, is a jet pump assembly 15 having a suction line in the form of a casting 17 mounted at its intake end to the bottom of the hull, at the intake opening 9 therein, while the other end is coupled to the inlet of a pump 19, which is one preferably of the turbine bowl or impeller type. The output or discharge end of the pump is flow connected to the opening 13 through the transom, by a pump discharge coupling means 21 bolted or otherwise affixed to the discharge end of the pump, and terminating in a jet-forming nozzle 25 which in turn is supported in one end of an open-ended housing 27, such housing being mounted on the transom externally of the hull, by means of a mounting wall or flange 29 which spans the transom opening.

The jet pump assembly, as thus described, provides a jet discharge for propulsion purposes, which, for forward travel of the vessel, discharges longitudinally through the open-ended housing.

Extending vertically through the floor of the open-ended housing, and journaled therein, is a shaft 35. Within the open-ended housing, this shaft supports a vane 37 at an intermediate location in the housing, this vane, in it median position, lying longitudinally of the housing, but adapted to be rotated on its shaft axis, to the right or left of such position.

Below the floor of the open-ended housing, and affixed to such shaft, for joint rotation therewith, is a rudder 41, which lies in the plane of the vane, and by reason of the fact that the rudder and vane are affixed to the same shaft, both will adjust together in use. Such adjustment is under control of a tiller 43.

To enable reversing the direction of travel of the vessel, while maintaining control of steering, means are provided for causing the jetstream to reverse itself, thereby reversing the direct of thrust exerted by the jetstream. This I broadly accomplish by providing a discharge opening or equivalent, in the floor of the open-ended housing, and blocking the

discharge end of such housing by means of a reversing gate 45, and in such manner as to divert the jetstream through such floor opening or equivalent in a generally reverse direction. Thus, while for forward travel the jetstream will discharge rearwardly to atmosphere, in reversing the jetstream, it will in all probability discharge below the surface of the water.

In establishing the reversing gate, the sidewalls of the open-ended housing preferably terminate in arcuate edges.

The gate will have a radius of curvature corresponding to that of such arcuate sidewall edges, and radial arms pivotally secured to the sidewalls, at points corresponding to the center of curvature of the gate, permit raising and lowering of the gate between a fully raised position and a fully closed or lowered position.

Raising and lowering of the gate may be placed under control of an occupant of the vessel, by passing a control rod 49 through an opening in the transom, and hingedly securing this rod at its external end to the upper edge of the gate, the opening about the rod being closed by a flexible bellows-type seal 51, in which the rod may slide.

Accordingly, to reverse direction of movement of the vessel, the reversing gate will be lowered, which will change the direction of flow of the jetstream to a downward reversed direction. Steering may then be effected by movements of the tiller 43 in the same manner as for forward direction of travel. The vane will continue to divide the jetstream in the manner previously described, so as to effect a maximum use of such jetstream in the steering of the vessel, and in such steering function, it will continue to be assisted by the presence of the rudder.

At intermediate adjustments of the reversing gate, it will be appreciated that the vessel will be exposed to thrust in a forward direction of travel and thrust in a reversing direction simultaneously, the ratio of one to the other varying with adjustment of the reversing gate. It will be appreciated, therefore, that at some adjustment of the reversing gate, the two components of thrust may be caused to substantially balance out, under which condition the vessel will be in neutral, though the pump may be in operation. Thus in the absence of other forces, the vessel will tend to remain stationary, from which position it can be readily maneuvered by adjustments of the reversing gate in the upper or downward direction as the situation dictates. As will be seen, this becomes an important factor in connection with the present invention.

As thus broadly described, the jet propulsion drive constitutes the subject matter of an application to Raymond E. Horan, Jr., for Jet Propulsion Drive for Ships, Ser. No. 248,318, filed Dec. 31, 1962. For purposes of illustration and description, the present invention has been illustrated as incorporated into this particular jet propulsion drive, though obviously the invention is not limited thereto, but may be employed in conjunction with other jet propulsion drives.

In connection with the preferred embodiment illustrated, pumpout means is provided, which utilizes the jet pump assembly, such pumpout means including a flow connection into the suction line of the pump, and comprising an intake hose line 57, flow connected at one end, to the suction line casting, by a coupling 59, and having its other end free for manual placement, such free end preferably culminating in a strainer head 63.

Flow connecting the intake hose line 57 to the suction line casting 17, places the hose line in communication with the suction end of the pump 19, but does not necessarily result in the development of sufficient suction at the point of coupling, to function effectively for all purposes. Accordingly, to assure effective suction at the point of connection of the intake hose line to the suction line casting, I provide an interceptor baffle 67 in the suction line, at any location between the coupling of the intake hose line and the bottom opening 9, or in other words, upstream of the intake hose line connection.

Structurally, such baffle as illustrated, may be made a part of the means for coupling the intake hose line to the suction line casting, and for this purpose, the suction line casting may

be formed with a top side opening, bordered by a wall **71**, which may or may not be extended by a collar **75**, adapted to mount the coupling **59**, and from which coupling downwardly extends the baffle **67**. Where the jet propulsion drive involves a drive shaft **85** in the path of the baffle, the baffle may be provided with a deep notch **87** in the lower edge thereof, of sufficient depth to permit the baffle to straddle such shaft. The coupling **59** may be secured in position by bolting the same to the upper rim of the collar, using wingnuts for the purpose where convenience in installing and removing the pumpout means is desired.

With the pumpout means of the character described thus installed, the free end of the intake hose line may be positioned in any area from which water or other liquid is to be pumped, such water as is thus withdrawn from the area, will obviously mingle with the water entering through the bottom opening to form the jet discharge from the pump.

If the area from which the water is to be pumped, is of a nature permitting pumping from a stationary position, movements of the vessel during such pumpout operation might be quite undesirable, and in the presence of a jet discharge, there would be strong tendency for movement. To therefore accomplish a neutral status of the vessel during pumpout operation, advantage is taken of the reversing gate which can be adjusted to the point where this condition may be realized.

Under certain conditions, it may be desirable to maneuver the vessel while engaging in a pumpout operation, as where it may be desired to improve accessibility of the intake hose line to the area being pumped out or drained. Additional adjustments of the reversing gate would make this possible.

During periods of nonuse, the free end of the intake hose line may be stored inboard of the vessel, and rendered nonfunctional by the inclusion of a shutoff valve **90** in the hose line, preferably adjacent the point of attachment of the hose line to the fitting. Such valve may also be used as a control valve, in determining the flow rate or capacity of the pumpout means while in use.

Employable in conjunction with such pumpout means, is a pressure hose line **93** in flow connection with the pump discharge coupling means **21**, and to assure adequate diversion of water to this pressure hose line, a valve means **95** is installed in the pump discharge coupling means, downstream of the pressure hose connection, for adjustably blocking the main discharge and thereby forcibly diverting a portion of the pump discharge to the pressure hose line as the situation dictates.

For this purpose, the pump discharge coupling means **21** includes a section **97** bolted to the end of the pump housing and provided with a threaded pipe connection **99** for coupling thereto, the pressure hose line; and interposed between this section **97** and the nozzle **25**, is a butterfly-type valve assembly **101** in which the valve shaft **103** extends through the wall of the valve assembly to mount a control handle **105** of any suitable type.

With the valve fully open, essentially all of the output of the pump will pass, as a jetstream, through the transom opening for propulsion, while with the valve fully closed, all of the output of the pump will necessarily pass through the pressure hose line. Intermediate adjustments of the valve will apportion the output of the pump accordingly. A shutoff valve in the pressure hose line will afford additional control.

Such pressure hose line may be terminated in a hose nozzle and thus admirably adapting the pressure hose line for fire-fighting purposes along a waterfront, or on water, in fighting fire on ships. Where the vessel itself may be on fire, the pumpout hose line **57** may have its intake or free end disposed inboard to utilize the water accumulating in the vessel's hull, for fire-fighting purposes, to thereby minimize accumulation of water in the hull and the possibility of the vessel flooding and ultimately sinking.

Under conditions where the fire-fighting equipment is being utilized, maneuverability of the vessel may be highly desirable, and accordingly, by controlling the butterfly valve so as to enable adequate jet operation, and then controlling the reversing gate, such maneuverability can be readily realized.

For small operations in the field of fire fighting or its equivalent, a small-diameter hose line **111** coupled into the pump housing at the point of impeller discharge, will enable one to realize smaller output volumes at somewhat less pressure, but not necessitating the use of any control valve such as the butterfly-type valve assembly **101**, to assure adequate diversion of liquid to such hose line.

As an indication of the relative capacities of the two discharge hose lines, the large hose line, in one installation, permitted of the discharge of 3,000 gallons of water per minute at a pressure of the order of 120 pounds per square inch, while operation with the smaller hose line, enabled an output of 200 to 300 gallons of water per minute at a pressure of the order of 70 pounds per square inch.

From the foregoing description of my invention in its preferred form, it will be apparent that the same fulfills the objects of my invention, and while I have illustrated and described the same in its preferred form and in considerable detail, it will be apparent that the same is subject to alteration and modification without departing from the underlying principles involved, and I accordingly do not desire to be limited in my protection to these specific details illustrated and described except as may be necessitated by the appended claims.

I claim:

1. In combination,
a vessel,
a jet pump assembly in said vessel, having an intake end, flow connected exteriorly of said vessel below the waterline thereof, and a discharge end at the stern of said vessel for jet propulsion discharge, and including a pump intermediate said intake end and said discharge end,
means for steering said vessel,
means for reversing, in varying degrees, said discharge, to effect and control reverse direction of movement of said vessel,
pumpout means flow coupled to said pump assembly intake end and exposed to the suction side of said pump, and means independent of said steering and reversing means, for adjustably diverting a portion of the discharge of said pump for use other than jet propulsion.

2. In combination,
a vessel,
a jet pump assembly in said vessel, having an intake end, flow connected exteriorly of said vessel below the waterline thereof, and a discharge end at the stern of said vessel for jet propulsion discharge, and including a pump intermediate said intake end and said discharge end,
means for steering said vessel,
means for reversing, in varying degrees, said discharge, to effect and control reverse direction of movement of said vessel,
and means independent of said steering and reversing means, for adjustably diverting a portion of the discharge of said pump for use other than jet propulsion,
said reversing means providing a control for stabilizing and maneuvering said vessel during employment of said diverting means.

3. In combination,
a vessel
a jet pump assembly in said vessel, having an intake end, flow connected exteriorly of said vessel below the waterline thereof, and a discharge end at the stern of said vessel for jet propulsion discharge, and including a pump intermediate said intake end and said discharge end,
means for steering said vessel,
means for reversing, in varying degrees, said discharge, to effect and control reverse direction of movement of said vessel,
pumpout means flow coupled to said pump assembly intake end and exposed to the suction side of said pump,

and means independent of said reversing means, for adjustably diverting a portion of the discharge of said pump for use other than jet propulsion,

said reversing means providing a control for stabilizing and maneuvering said vessel during employment of said pumpout means, with or without said diverting means.

4. In combination,

a jet-propelled vessel comprising

a hull hang a bottom provided with an intake opening, and a transom,

a jet pump assembly comprising a pump, a suction line leading to said pump from said bottom opening, and pump discharge coupling means leading to said transom,

means for steering said vessel,

means for reversing in varying degrees, said discharge, to effect and control reverse direction of movement of said vessel,

and pumpout means utilizing said jet pump assembly, said pumpout means including

a flow connection into said suction line, said flow connection comprising

an intake hose line connected at one end to said suction line and having its other end free for manual placement, and a baffle within said suction line between said flow connection and said bottom opening, to partially intercept the otherwise normal flow into said pump through said bottom opening, and provide effective intake flow through said intake hose line.

5. In combination,

a jet-propelled vessel comprising

a hull having a bottom provided with an intake opening, and a transom,

a jet pump assembly comprising a pump, a suction line leading to said pump from said bottom opening, and pump discharge coupling means leading to said transom,

means for steering said vessel,

means for reversing in varying degrees, said discharge, to effect and control reverse direction of movement of said vessel,

and pumpout means utilizing said jet pump assembly, said pumpout means including

a flow connection into said suction line, said flow connection comprising

an intake hose line connected at one end to said suction line and having its other end free for manual placement, and a baffle within said suction line between said flow connection and said bottom opening, to partially intercept the otherwise normal flow into said pump through said bottom opening, and provide effective intake flow through said intake hose line,

said reversing means providing a control for stabilizing said vessel during employment of said pumpout means.

6. In combination,

a jet-propelled vessel comprising

a hull having a bottom provided with an intake opening, and a transom,

a jet pump assembly comprising a pump, a suction line leading to said pump from said bottom opening, and pump discharge coupling means leading to said transom,

means for steering said vessel,

means for reversing in varying degrees, said discharge, to effect and control reverse direction of movement of said vessel,

pumpout means utilizing said jet pump assembly, said pumpout means including

a flow connection into said suction line, said flow connection comprising

an intake hose line connected at one end to said suction line and having its other end free for manual placement,

and a baffle within said suction line between said flow connection and said bottom opening, to partially intercept the otherwise normal flow into said pump through said bottom opening, and provide effective intake flow through said intake hose line,

and means for diverting a portion of the discharge of said pump for use other than jet propulsion, said means including

a pressure hose line in flow connection with said pump discharge coupling means, and valve means in said pump discharge coupling means, downstream of said pressure hose connection, for adjustably diverting a portion of the pump discharge to said pressure hose line.

7. In combination,

a jet-propelled vessel comprising

a hull having a bottom provided with an intake opening, and a transom,

a jet pump assembly comprising a pump, a suction line leading to said pump from said bottom opening, and pump discharge coupling means leading to said transom,

means for steering said vessel,

means for reversing in varying degrees, said discharge, to effect and control reverse direction of movement of said vessel,

pumpout means utilizing said jet pump assembly, said pumpout means including

a flow connection into said suction line, said flow connection comprising

an intake hose line connected at one end to said suction line and having its other end free for manual placement,

and a baffle within said suction line between said flow connection and said bottom opening, to partially intercept the otherwise normal flow into said pump through said bottom opening, and provide effective intake flow through said intake hose line,

and means for diverting a portion of the discharge of said pump for use other than jet propulsion, said means including

a pressure hose line in flow connection with said pump discharge coupling means, and valve means in said pump discharge coupling means, downstream of said pressure hose connection, for adjustably diverting a portion of the pump discharge to said pressure hose line,

and flow control valve means in said pressure hose line,

said reversing means providing a control for stabilizing and maneuvering said vessel during employment of said pumpout means, with or without said diverting means.

8. A jet pump assembly comprising a pump, a suction line from said pump and adapted to terminate at its free end in a bottom opening in a vessel when installed therein, and pump discharge coupling means,

means for controlling the direction of discharge from said pump discharge coupling means,

means for reversing, in varying degrees, said discharge,

pumpout means utilizing said jet pump assembly, said pumpout means including

a flow connection into said suction line, said flow connection comprising

an intake hose line connected at one end to said suction line and having its other end free for manual placement,

and a baffle within said suction line upstream of said flow connection, to intercept a portion of the otherwise normal flow into said pump from a source of supply, and provide effective intake flow through said intake hose line,

and means for diverting a portion of the discharge of said pump, said means including

a pressure hose line in flow connection with said pump discharge coupling means, and valve means in said pump discharge coupling means, downstream of said pressure hose connection, for adjustably diverting a portion of the pump discharge to said pressure hose line,

and flow control valve means in said pressure hose line.

9. A jet pump assembly comprising a pump, a suction line from said pump and adapted to terminate at its free end in a bottom opening in a vessel when installed therein, and pump discharge coupling means,

and pumpout means utilizing said jet pump assembly, said pumpout means including

a flow connection into said suction line,

and means for developing effective suction in said suction line at said flow connection.

10. A jet pump assembly comprising a pump, a suction line from said pump and adapted to terminate at its free end in a bottom opening in a vessel when installed therein, and pump discharge coupling means,

and pumpout means utilizing said jet pump assembly, said pumpout means including

a flow connection into said suction line, said flow connection comprising

an intake house line connected at one end to said suction line and having its other end free for manual placement,

and a baffle within said suction line upstream of said flow connection, to intercept a portion of the otherwise normal flow into said pump from a source of supply, and provide effective intake flow through said intake hose line.