(No Model.)

3 Sheets—Sheet 1.

W. M. JACKSON.

MARINE PROPULSION.

No. 385,182. Patented June 26, 1888.

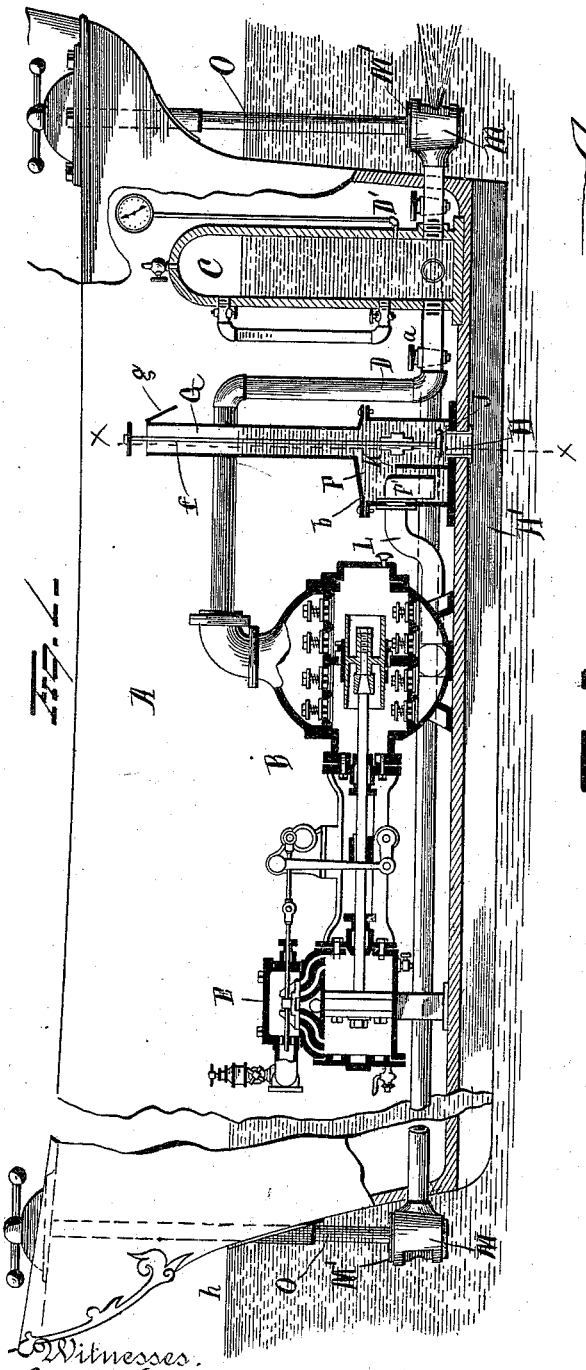

Fig. 1.

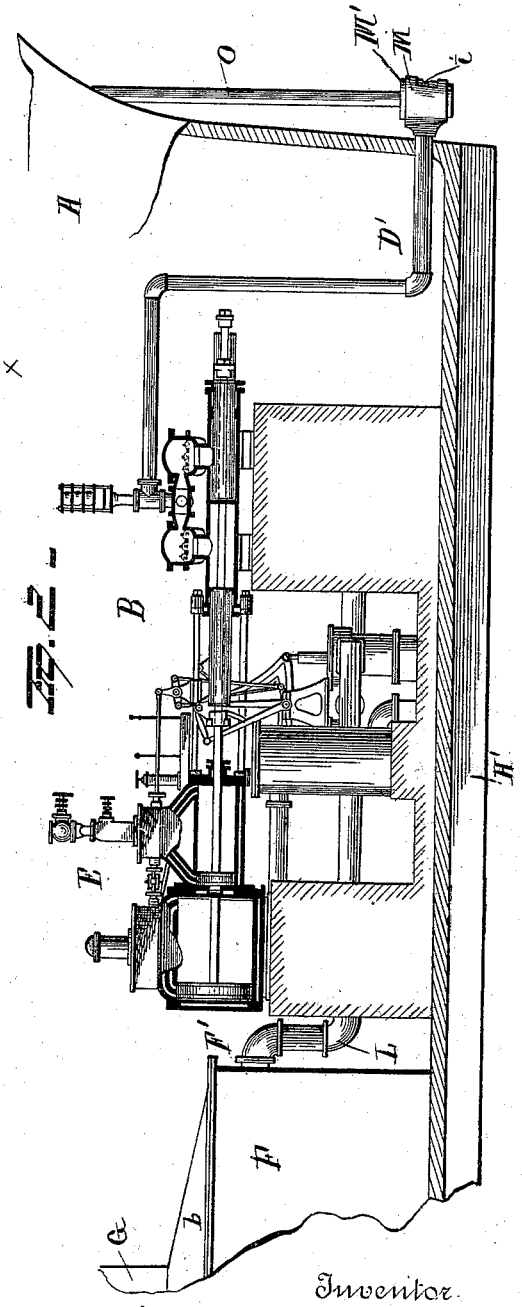

Fig. 2.

Witnesses.
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V. E. Hodges.

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(No Model.) 3 Sheets—Sheet 2.

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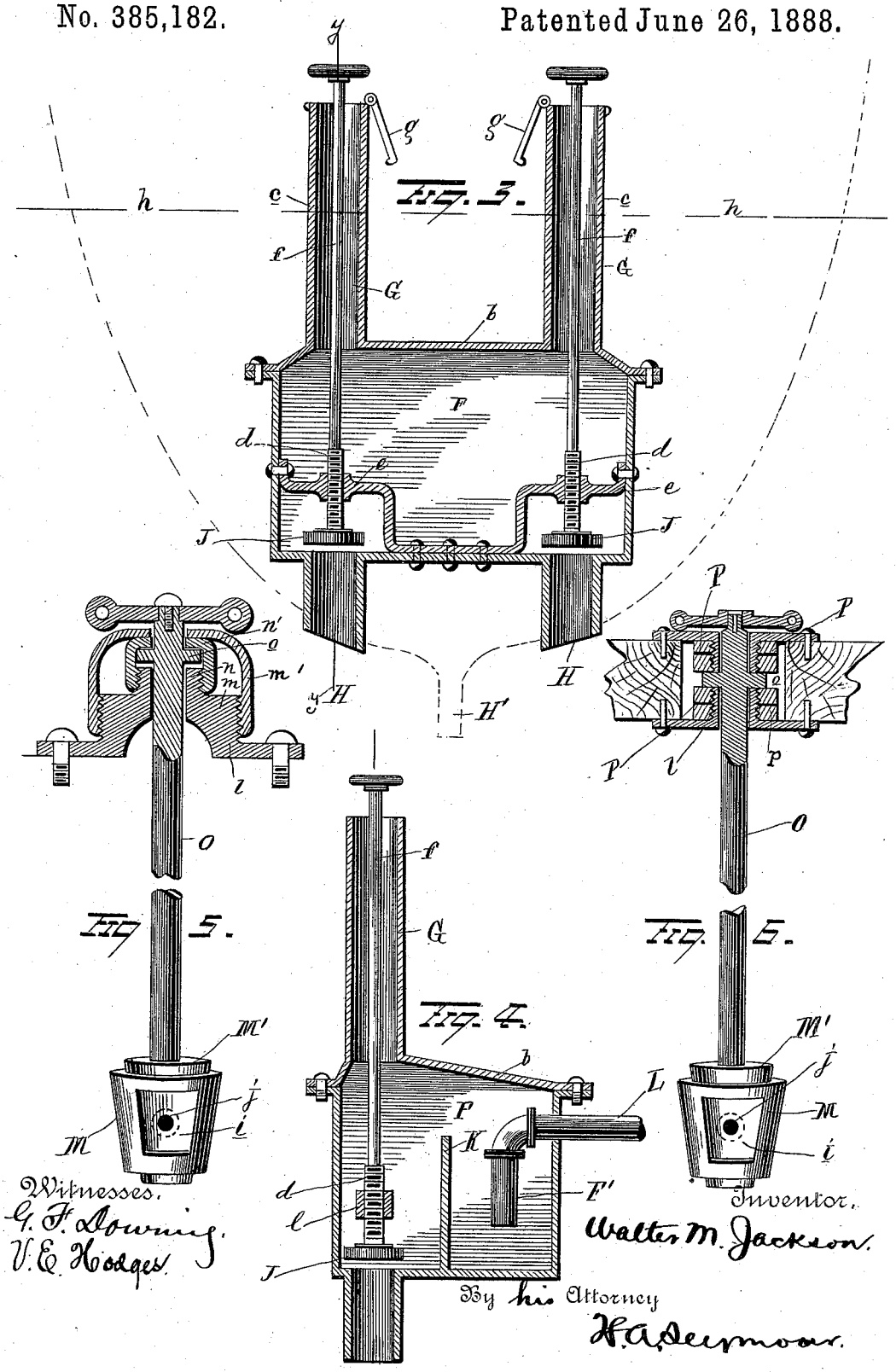

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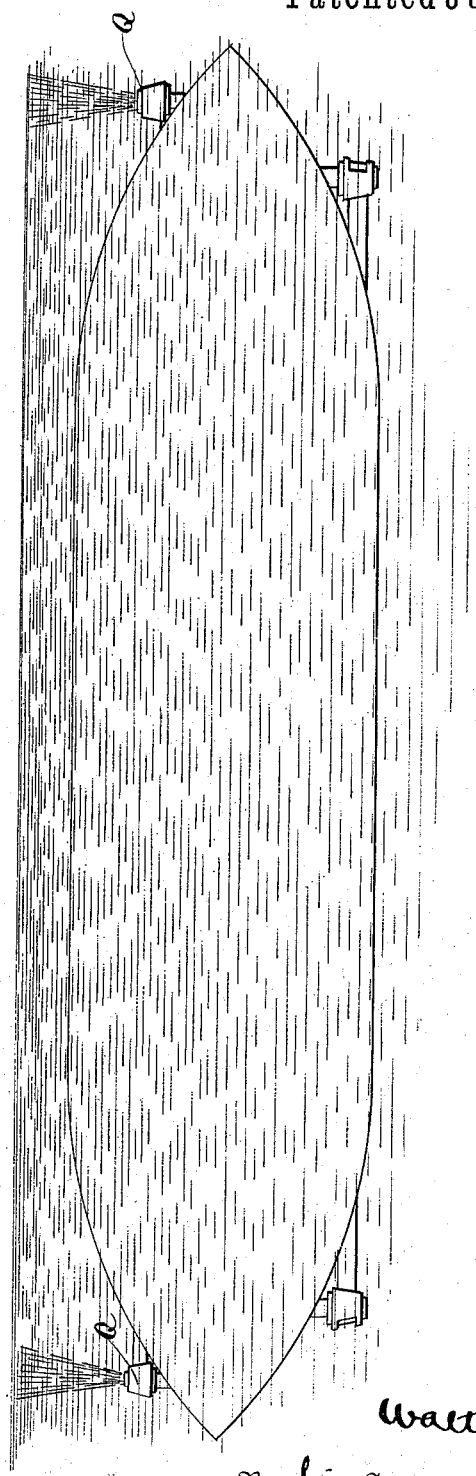

Fig. 1.

Witnesses
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V. E. Hodges.

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UNITED STATES PATENT OFFICE.

WALTER MARSH JACKSON, OF NEW YORK, N. Y.

MARINE PROPULSION.

SPECIFICATION forming part of Letters Patent No. 385,182, dated June 26, 1888.

Application filed July 16, 1887. Serial No. 244,519. (No model.)

To all whom it may concern:

Be it known that I, WALTER MARSH JACKSON, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Marine Propulsion; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to marine propulsion.

Application No. 221,770, filed by me December 16, 1886, was for an improved method and apparatus by which vessels were driven at a high speed and guided by the employment and proper control of a jet of water forcibly ejected from parts of the vessel through the instrumentality of the expansive action of air in a receiver.

The object of my present invention is to secure great velocity of discharged water through the submerged propulsion and maneuvering outlets, and at a higher pressure to the square inch than that exerted to the square inch against the steam-pistons, as indicated by the steam-boiler.

A further object is to attain a still more complete control of vessels by providing a means for varying the direction of the discharge water in any direction for propelling forward, backward, or submerging and emerging vessels to any position relative to the water-level.

A still further object is to provide a means for maintaining a regular supply of water for the pumps, and means for discharging the air which is liable to enter with the water from the bottom of the vessel.

With these ends in view my invention consists in certain features of construction and combinations of parts, as will be hereinafter fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of a vessel, showing my improved apparatus arranged in convenient order. Fig. 2 is a view showing an arrangement of parts for producing approximate results without the receiver, a compound condensing pressure-pumping engine being employed in connection with the parts shown in Fig. 1. Fig. 3 is a transverse section on line *x x* of Fig. 1. Fig. 4 is a section on line *y y* of Fig. 3. Fig. 5 is an elevation, partly in section, of the propelling and steering device. Fig. 6 is a modified form of propelling and steering device; and Fig. 7 is a vertical longitudinal section of a submarine vessel, showing the arrangement of mechanism for submerging, emerging, turning, guiding, propelling, and backing the vessel.

A represents a vessel carrying pump B, a receiver, C, into which the water is forced from the pump through pipes D, controlled by a suitable valve, *a*, and engine E for operating the pump, and discharge pipes or conduits D′, connected to the receiver or directly to the pump or pumps and leading to the discharge-orifices at the bow and stern, or other points of the vessel.

The pump B employed is preferably a compound double steam-piston pump having two steam-pistons of (say for convenience in recording) six inches diameter, while the pump-pistons, also two in number, are two inches in diameter, thus giving them together an area of 6.2832 square inches, while the steam-pistons would together have an area of 56.548 square inches, or about nine times the area of the pump-pistons. Now, supposing a pressure of eighty pounds per square inch be exerted from the boiler upon these steam-pistons alternately to even the flow of pumped water, then the entire pressure on the steam-pistons (56.548 square inches) would be 4523.84 pounds, while the pump-pistons, having but an area of 6.2832 square inches, would receive the entire pressure amounting to (719.98) nearly seven hundred and twenty pounds to the square inch, so that if the submerged outlets were closed the water would be under this pressure, and when open, the orifices being so exceedingly small, the water-pressure upon them would be nearly the whole seven hundred and twenty pounds to the square inch—in other words, the difference between seven hundred and twenty pounds and the loss of pressure caused by the escape through the submerged orifices, according to their size and number. This pump can be employed for forcing the water, without the intervention of a receiver, direct to the discharge-orifices, if desired, as it is obvious that the pressure obtained from the pump is sufficient; but owing to its liability to injury from sudden shutting off of the discharged water and probable in-

equality of action a receiver may be employed to advantage or may be dispensed with altogether, as shown in Fig. 2, and the water driven from the pump directly to the submerged orifices.

The view shown in Fig. 2 is a longitudinal section taken through the large and small steam-pistons of a Worthington compound condensing pressure-pumping engine. This engine has steam-cylinders on each side for the purpose of using the steam expansively. The steam, having exerted its initial boiler-pressure upon the piston of the smaller cylinder, expands upon the larger during the return-stroke, operating to drive the piston in the other direction. Economy of steam-power is thus attained, the difference in favor of the compound over the simple being about thirty per cent. Thus by employing the larger and smaller cylinders economy and increase of pressure over equal-sized cylinders are also obtained in addition to that pressure, as formerly described, exerted by the small size of the pump-pistons; or triple expansion steam-cylinders and pistons may be employed, the steam working upon the smallest first, upon the medium or lesser next, and upon the third or smallest last, before being finally exhausted. This compound use of steam is in effect the same as the cut-off on a crank-engine, only in addition it possesses the great advantage of uniform and steady action upon the water.

When saving of fuel is desirable, the additional cost of the compound engine would be nothing compared to a saving of one-third of the fuel over any simple direct-steam-acting pump on similar work. On larger sizes for ocean steamers, and even private yachts, a condensing apparatus may be added, thus securing additional economic results. As a compound pump uses less steam than a simple direct, its boiler may be of less size, weight, and cost, thus fully covering its own character in that respect. Such a pump properly constructed will give a duty of one-horse power with a consumption of one and three-quarters pound of coal per hour.

In close proximity to the pump the tank F is located, and into this tank the pump suction-pipe F′ extends. The tank F preferably has a slightly-crowning top, *b*, with one or more stand-pipes, G, projecting vertically therefrom and forming continuations of the tank. Directly below these stand-pipes, or at other convenient points, the tank F is provided with inlet-ports H, preferably located on opposite sides of the keel H′, through which water from below the ship is permitted to rise in seeking its level at point *c* in the stand-pipes. Valves J depend over the ports and have screw-threaded stems *d*, registering with the threads or brackets *e*, and extending through the stand-pipes G, out of which they preferably project and terminate in a handle, *f*. It is not necessary that there should be two inlet-ports and two stand-pipes and two valves. More might be employed, or even one would act with very good effect, and one stem might operate both valves, or one valve might open and close the two ports. The valves J are simply used to close the ports when the tank is being cleaned or repaired. Adjustable covers *g* at the top of each stand-pipe may be opened or closed at will; but ordinarily they are left open to allow the air which the vessel in its course forces beneath her, and which, hugging her bottom, enters the ports, to be discharged through the stand-pipes. Another object of these pipes is to receive floating foreign bodies of which it is desirable to free the water before it enters the pump, and still another use of the pipe is to receive the stems of the valves without the necessity of using stuffing-boxes.

A partition, K, extends transversely across the tank to one side of the ports, its upper edge projecting more or less half-way to the top of the tank. On the opposite side from the inlet-ports and below the top of the partition the suction-pump pipes L have their nozzles, so that the suction is not made direct upon the water on entering the ports. By this disposition of parts, since the tank F is located below the vessel-load line *h*, quite a column of water is continually pressing to enter the tank-ports, this column being always equal to the difference in height between the ports and the surface of the water, and, in cases of an entirely-submerged vessel, equal to the difference between the ports and vessel's surface. It is obvious from the arrangement that the tank is always full of solid and still water, the latter extending into the stand-pipes to the water-line, so that any amount of rolling and pitching of the vessel can have no deleterious effect upon the water in the tanks; hence a constant pressure is maintained against the pump-pistons equal to the difference in height between the load-line and pistons, thus helping the pumps by utilizing all this extra pressure. Preferably at the bow, to back the vessel, as well as at the stern, to force it forward, a propeller and steerer is located. This device consists of a casing, M, having an enlarged outlet, *i*, and an inlet, *j*, to which the water is forced through pipe D′ from the receiver, this pipe having a valve for controlling the discharge of water.

A plug, M′, constructed to closely fit the casing and provided with a passage-way for the water, is seated in this casing, and can be rotated at pleasure to change the direction of the issuing jet. The inlet *j* in the casing M is of sufficient size that it will take in a full supply of water irrespective of the position of the valve while maneuvering the vessel. By thus turning the cone or plug M′ the vessel is guided or manipulated. The plug M′ is provided with a stem, O, which extends through the projected portion of the stern or bow, or through brackets or along the front or rear edge of the vessel, if desired, and it may be operated in the usual manner from the pilot-house. At its upper end the stem extends

through a plate or block, *l*, having integrally-formed bosses *m* and *n*, one smaller and above the other and both being screw-threaded on the exterior. A collar, *o*, formed on the stem a little above the smaller boss, *n*, is inclosed in a small cap, *n'*, which screws onto the collar *o* from above, forcing the latter down, and with it the stem and the plug M', into the hollow casing M, so that any wearing of these parts is compensated for by forcing them closely together. A second and larger cap, *m'*, is adapted to screw onto the boss *m*, thus holding the inner cap securely in place against accidentally working off the boss *n*.

In the modification shown in Fig. 6 the collar *o* is located between adjustable nuts P, so that the cone or plug M' may be forced down or up by the turning of the nuts above or below the collar. The water after it leaves the pump can be forced into the receiver, if desired, or the pump or pumps may be connected directly with the conduits leading to the submerged outlets.

In Fig. 7 an elliptical-shaped submarine boat is shown, it having the usual water-compartments, and a pump, B, a receiver C, if desired, engine E, tank F, and connecting pipes and valves, as in Fig. 1. In this case the covers of the stand-pipes are of course kept securely over the top of the stand-pipes, so that the water therein seeking its level could not become discharged inside the vessel, and when the vessel is submerged no air is forced under her and the covers may remain closed. In this vessel propellers are located at the bow and stern, and also on the upper and lower surface of the vessel. The latter-mentioned propellers may be slightly modified, as any construction of valves Q might be used, and other forms might be found even more desirable than the ones previously described for these particular places. Many more propellers might be employed—as, for example, on the sides as well as on the top and bottom and front and rear—and as all are connected to the receiver or pump by pipes it is plainly seen that the boat may be propelled through the water in any direction—forward, backward, up, down, or sidewise, accordingly as the proper propellers are opened.

Not only are ships propelled in this manner particularly desirable for ordinary traffic, but in time of war their use would be practically indispensable for the economy of construction of the operating mechanism as well as the small amount of fuel necessary, and the proportionate rapidity of speed makes their contemplated value a certainty.

Slight changes in construction might be resorted to in the form and arrangement of the several parts described without departing from the spirit and scope of my invention; hence I do not wish to limit myself to the particular construction herein set forth.

The receiver having constituted a salient feature of my former invention, No. 221,770, filed December 16, 1886, I now make no broad claim to this element; nor do I claim in this case the method disclaimed, as the same forms the subject-matter of pending case, No. 259,953, filed by me January 6, 1888.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an apparatus for propelling or maneuvering vessels, the combination, with a steam-pump in which the steam-piston is of greater area than the pump-piston, of a receiver connected with the pump and adapted to contain air or other elastic material and the pumped water stored therein under dynamic compression, and submerged outlets (one or more) in communication with said receiver, substantially as set forth.

2. In an apparatus for propelling or maneuvering vessels, the combination, with steam-pistons of different areas and pump-pistons connected therewith, of a submerged water-discharge orifice, for the purpose of propelling or maneuvering a vessel, substantially as set forth.

3. The combination, with the differential pistons of a compound engine and a pump-piston of less area than the high-pressure piston of the engine, of a receiver adapted to contain air or other elastic material, in which the pumped water is stored under dynamic compression, and submerged water-discharging orifices connected therewith, the latter being of less area than the pump-piston to create and maintain a greater pressure to the square inch at the submerged outlets than the initial boiler-pressure, for the purpose of propelling or maneuvering a vessel, substantially as set forth.

4. In apparatus for propelling or maneuvering a vessel, the combination, with a water-forcing device and a submerged discharge-orifice connected therewith, an adjustable discharge-plug, and a pipe leading from the water-forcing device to the discharge-plug, of a water-supply tank having submerged inlet-ports and a pipe connecting the supply-tank and water-forcing device, substantially as set forth.

5. In apparatus for propelling or maneuvering a vessel, the combination, with a water-forcing device and a submerged discharge, of a water-supply tank having submerged inlet-ports and an air and water separating chamber, and a suction-pipe leading from the tank to the water forcing device, substantially as set forth.

6. In apparatus for propelling or maneuvering a vessel, the combination, with a water-forcing device, a submerged discharge, and a pipe connecting the water-forcing device and submerged discharge, of a chambered water-supply tank having submerged inlet-ports, valves for controlling the ports, elevated air-receiving and discharge stand-pipes, and a suction-pipe leading from one chamber of the tank to the water-forcing device, substantially as set forth.

7. In apparatus for propelling or maneuvering a vessel, the combination, with a water-receiver containing air or other elastic medium and a forcing device for supplying said receiver with water, of a water-supply tank, the latter having submerged inlet-ports, a pipe connecting the supply-tank and water-forcing device, and submerged water-discharge pipe or pipes leading from the receiver, substantially as set forth.

8. In apparatus for propelling or maneuvering a vessel, the combination, with a water-receiver containing air or other elastic medium and a forcing device for supplying said receiver, of a water-supply tank having submerged inlet-ports and an air-receiving chamber, a pipe connecting the supply-tank and water-forcing device, and submerged water-discharge orifice or orifices leading from the water-receiver, substantially as set forth.

9. In apparatus for propelling or maneuvering a vessel, the combination, with a water-receiver containing air or other elastic medium and a forcing device for supplying water to said receiver, of a water-supply tank having submerged water-inlet ports, a pipe connecting the supply-tank and water-forcing device, valves for controlling the ports in said submerged inlet-ports, air-receiving stand-pipes leading upwardly from the water-supply tank, covers for said stand, and submerged water-discharge orifice or orifices leading from the water-receiver, substantially as set forth.

10. In apparatus for propelling or maneuvering a vessel, the combination, with a water-receiver containing air or other elastic medium and a forcing device for supplying said receiver, of a water-supply tank having submerged inlet-ports, valves for controlling the ports, and a partition extending transversely of the tank, pipes connecting the water-forcing device and supply-tank, the ends of the pipe within the tank being below the top of the partition on the opposite side from the inlet-ports, and submerged water-discharge orifice or orifices leading from the receiver, substantially as set forth.

11. In apparatus for propelling and maneuvering a vessel, the combination, with a water and air receiving tank having water-inlet ports and air-chamber, of a water-forcing device having a submerged outlet, and a pipe connecting the water-forcing device and tank, substantially as set forth.

12. In a vessel, a water and air receiving tank having inlet-ports, valves for controlling the ports, air receiving stand-pipes extending above the tank and in communication therewith, and covers for the stand-pipes, substantially as set forth.

13. In apparatus for propelling or maneuvering a vessel, the combination, with a water-forcing device, a tank having submerged inlet-ports, and a pipe connecting the tank and water-forcing device, of a discharge-pipe leading from the water-forcing device, and means for controlling the direction of the water-discharge, substantially as set forth.

14. In apparatus for propelling or maneuvering a vessel, the combination, with a forcing device, a water-receiver partly filled with air or other elastic medium, and a tank having submerged inlet-ports, of a submerged fixed discharge-orifice and an adjustable plug adapted to enter the discharge-orifice and open or close or change the direction of the ejected water-jet, substantially as set forth.

15. A propelling and maneuvering device for vessels, consisting of a pump, a discharge-pipe leading therefrom, and a movable discharge-plug located at the end of the discharge-pipe, substantially as set forth.

16. A propelling and maneuvering device for vessels, consisting, essentially, of a fixed discharge hollow casing having inlet and outlet passages located in or approximately in the same plane, and a perforated plug located in the hollow casing and adapted to be turned therein to vary the direction of the discharged jet of water, substantially as set forth.

17. A propelling and maneuvering device consisting, essentially, of a fixed casing having a water inlet and outlet located in or approximately in the same plane, a plug having an orifice therein adapted to enter said casing, and a lock for locking the plug securely in the casing, substantially as set forth.

18. A propelling and maneuvering device consisting, essentially, of a fixed casing having water inlet and outlet for the free passage of water therein, a stem having a perforated plug on its lower end adapted to enter and turn in the fixed casing, said stem having a collar thereon, and the movable caps at its uppermost end for locking the collar rigidly in place, substantially as set forth.

19. In a vessel, the combination, with a water-forcing device, of submerged discharge-outlets for elevating the vessel to the surface of the water, and pipes connecting the outlets with the water-forcing device, substantially as set forth.

20. In a vessel, the combination, with a water-forcing device, of discharge-outlets at one or both ends of the boat, which direct the discharged water upwardly, and pipes connecting the outlets with the water-forcing device, substantially as set forth.

21. In a vessel, the combination, with a water-forcing device and submerged outlets at the stern for propelling the vessel, of the double discharge-outlets for directing the discharged water up or down, and pipes connecting the water-forcing device with the several outlets, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

WALTER MARSH JACKSON.

Witnesses:

GEO. S. GADEN,

GEO. M WARDWELL.