No. 787,182. PATENTED APR. 11, 1905.

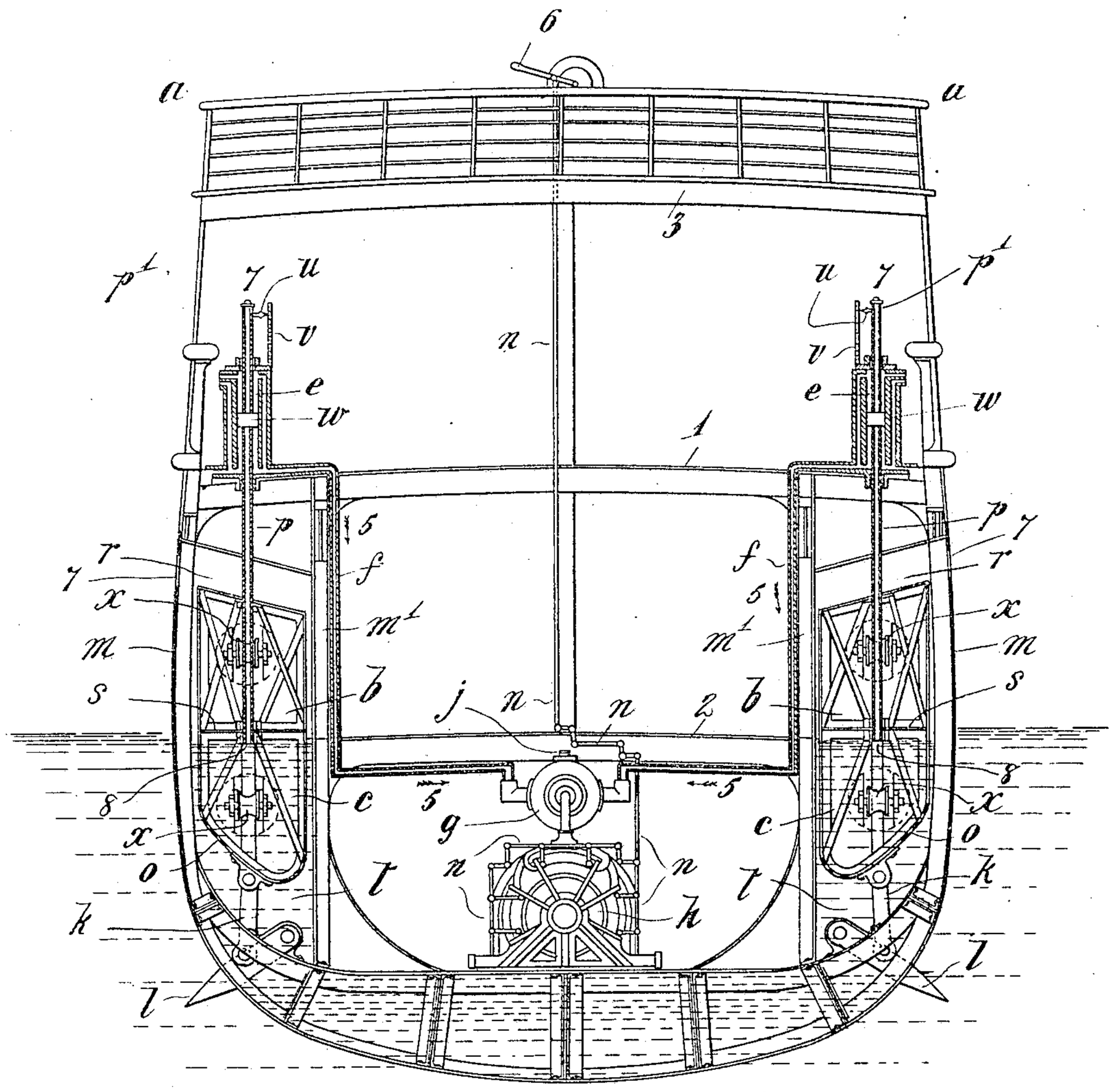
J. HUTCHINGS.

WAVE MOTOR.

APPLICATION FILED JAN. 30, 1905.

3 SHEETS—SHEET 1.

Fig: 1.



Witnesses.
James L. Morris, Jr.
Robert Everett,

Inventor.
John Hutchings.
By James L. Norris.
Att'y.

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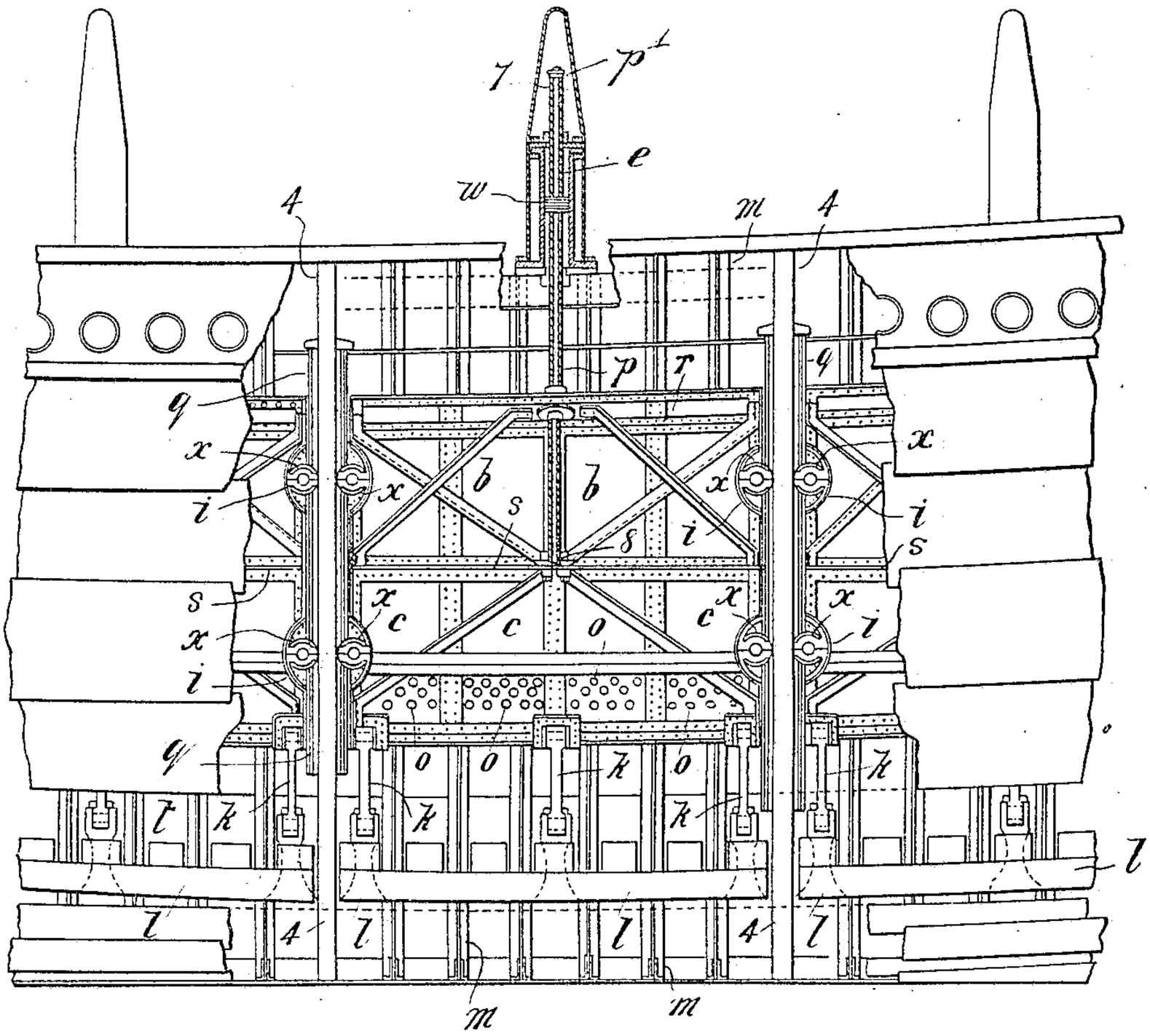
3 SHEETS—SHEET 2.

Fig. 2.



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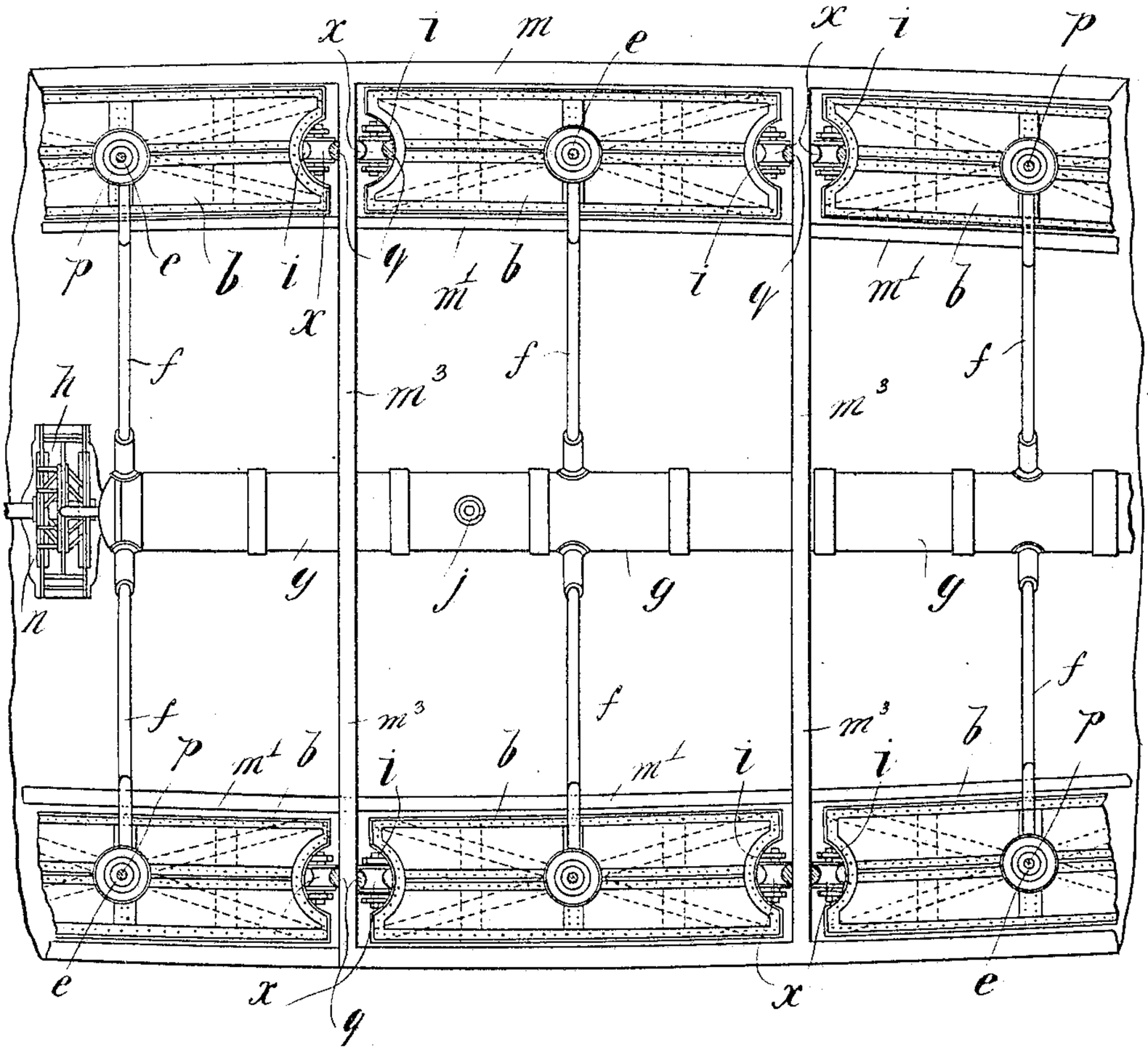
3 SHEETS—SHEET 3.

Fig: 3.



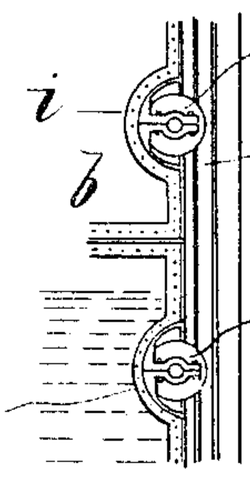


Fig: 4.

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UNITED STATES PATENT OFFICE.

JOHN HUTCHINGS, OF LONDON, ENGLAND.

WAVE-MOTOR.

SPECIFICATION forming part of Letters Patent No. 787,182, dated April 11, 1905.

Application filed January 30, 1905. Serial No. 243,359.

To all whom it may concern:

Be it known that I, JOHN HUTCHINGS, engineer, a subject of the King of Great Britain, residing at 210 Moorgate Station Chambers, in the city of London, England, have invented certain new and useful improvements in and relating to means and apparatus for the generation of motive power by floating bodies—such as ships, buoys, floating docks, and the like—for purposes of propulsion and other uses, of which the following is a specification.

In propelling ships it is customary to use steam or other engines driven by burning coal, petroleum, or other fuel. This means of obtaining or generating power is very costly owing to the great consumption of coal or petroleum, besides the expense involved in the employment of a large number of men required to attend to the stoking of coal and watch the working of the large amount of machinery required by these means of moving ships or other floating bodies through water.

By this invention I provide means in any ship or floating body without coal or petroleum for generating power either for propelling such ships or for other use which this power may be applied to, such as loading, unloading, lighting, and other like operations by the action of the ship and apparatus in contact with the water, through which water such ship or floating body may be moved.

The apparatus as arranged for effecting propulsion of a ship by means of a specially-designed turbine-driven screw is illustrated in the three accompanying drawings, figured, respectively, 1, 2, 3, and 4.

Figure 1 is a cross-section amidships, wherein is shown a sectional view of a containing-ship's body within the figure *a a a a*, the air-buoys *b b*, with their attached water-tanks *c c*, the air or water compressors *e*, the air or water conducting pipes *f f*, the receiver *g*, the turbine *h*, the semispherical friction-roller cases *i i*, the safety-valve *j*, the bilge-keel links *k*, the movable bilge-keel *l*, the ship's framing *m* and *m'*, the deck-beams 1 2, the navigating-bridge 3, the starting, stopping, and reversing valve gear and connection-levers *n n n n*.

Fig. 2 is a side elevation and section combined in one drawing, showing a longitudinal sheer-draft and part-sectional view of a portion of the containing-ship's body. In this figure the shell-plating is shown as having been removed, the more plainly to admit of the interior of the air-buoys *b b* being seen, together with their subtended and attached water tanks or compartments *c c*, the air-compressors or water-pumps *e e*, the ship's body-framing *m* and *m'*, the rib-frame stations 4 4, the balancing-tank water-intake holes *o* at the bottom of each water-compartment, the piped or hollow piston-rod *p*, the steel guide-rods *q*, upon which the air-buoy *b* and water-tank *c* run and work, a sectional view showing the braces, struts, and internal constructional features of the air-buoy *b* and water-tank *c*, the bilge-keel links *k*, and the movable bilge-keel *l*.

Fig. 3 is a plan view taken amidships, showing the general arrangement of the different parts, including the air-buoys *b*, the water-pumps or air-compressors *e*, the conducting-pipes *f*, the receiver *g*, the turbine *h*, the safety-valve *j*, the side body-framing *m* and *m'*, and the frame-station deck-beams m^3.

At convenient points along the ship's side between the outer frames and shell-plating *m m* and the inner shell and plating *m' m'* of the ship's body the power-buoys *b b*, with their attached water-tank *c c*, are hung permanently onto the piston-rod *p*, which, as will be seen by the drawings, is provided with a passage through its center extending from the point at 8 to 7 for the purpose of letting air out of the water-tanks *c c* to enable their being filled with water or regulated so that they occupy their proper position on the load water-line. When a ship fitted with these buoys and tanks is launched or lowered into the water, the tanks *c c* are full of air, by the buoyancy of which the tops of the power-buoys at *r r* are forced upward in the direction of *p p*; but they are filled and adjusted with the proper quantity of water to bring the division-plates *s s* to a level with the load water-line when the ship is at a standstill, which is effected in the following manner: Caps fitted with valves are screwed onto the top ends of the piston-rod at *p' p'*. These valves are designed to be

opened by means of the turning of these caps, thereby allowing the air in the water-tanks *c c* to escape at *p' p'*, Fig. 1, and admitting water into the tanks through the holes *o* in their bottoms in the direction indicated by the arrows 1 1, Figs. 1 and 2, and on the admission of the water the combined tank and air-buoy *c* and *b* begin to descend into the water at *t t*. The valves at *p' p'* are closed as soon as the dividing-plate *s* has reached a point level with the load water-line, which is ascertained by a pointed indicator *u*, fixed to and moving with the piston-rod *p*, Fig. 1, in conjunction with a graduated scale *v*, fixed to the top of the compressors *e e*, Fig. 1. When the position of the combined power-generating tanks *c c* and buoys *b b* have been thus adjusted, they are then allowed to float on the water-line, being in free communication with the water outside the ship and subject to every movement of waves both in the water and any movements produced by the water waves on the ships containing them. The upward movements of the piston-rings *w w*, Fig. 1, are caused (when the containing-ship moves downward) by the buoyancy of the air contained in the buoys *b b*, Figs. 1, 2, and 3. The downward movements of the piston-rings *w w* are caused (when the containing-ship moves upward) by the combined weight of the iron or other materials forming the piston-rod *p*, the combined buoy and water-tank added to the weight of the water in the tanks *c*. These weights (when the dividing-plate *s* is at the water-line) combined are equal to the buoyancy of the air contained in the buoys *b*, thereby producing a uniform pressure in the compression-cylinders *e e*, Figs. 1, 2, and 3, during both the up and down movement of the piston-rings *w w*.

The air-buoys *b b* and water-tanks *c c* have fixed at both their longitudinal ends two semicircular grooved friction-rollers, (shown at *x x*, Figs. 1, 2, 3, and 4.) These friction-rollers are fixed into semispherically-bossed recesses or cases *i i* in the ends of the buoys *b* and tanks *c*, Figs. 2, 3, and also shown in side view, Fig. 4. These friction-rollers are made to fit by their curved periphery and to work or run up or down on or against vertical steel semicircular guide-rods (shown at *q q*, Figs. 2 and 3 and also on side view below Fig. 1) which are fixed to the ship's framing. Thus it will be seen that by this means the tanks *c c* and the buoys *b b* have freedom to move up and down, running on their rollers in this guiding-path in any way they may be influenced so to do by the water surrounding the water-tanks at *t t*, Figs. 1 and 2, or by the movements of the containing-ships. Onto the bottom of the water-tanks *c*, Figs. 1 and 2, is fixed and hinged suitable links at *k k*, which are also attached, by means of hinges, to the movable bilge-keels at *l*. These bilge-keels are fixed in sections at convenient points between the rib-frame stations of the exterior shell-framing of the ship's body. Any pressure against the top surface of these bilge-keels caused when the ship rolls or pitches during the upward movement is transmitted through the tanks *c c*, buoys *b b*, and piston-rod *p* to the piston-ring *w*, thus tending to increase the pressure in the air being compressed or water pumped and forced during the downstroke through the compressors *e e*. Similarly, any pressure against the bottom surface of these bilge-keels *l*, caused when the ship rolls or pitches during the downward movement, is transmitted through the water-tanks *c c*, buoys *b b*, and piston-rod *p* to the piston-ring *w*, thus tending to increase the pressure on the air being compressed or water pumped and forced during the upstroke through the compressors *e e*. The ends of each of these bilge-keel sections are tapered down to thin pliable spring-steel fins for the purpose of assisting propulsion of the ship to which they may be fitted. As the air is being compressed in the compressors *e e* it is forced down through the pipes *f f*, Figs. 1 and 3. leading in the direction of the arrows 5 5, Fig. 1, sectional view, and passing thence into the receiver *g*, Figs. 1 and 3. From the compressor *e* the air passes (when desired by the navigating officer on the officers' bridge) into the turbine or other motor *h*, Figs. 1 and 3, whereby the ship is propelled according to the direction given by the valves. Air-holes 7 afford vent from and access to chamber *r*.

When water is pumped and forced for motive power by this invention the working movements are the same as above described; but in this case the turbine or other motor is placed in a position well above the water-line of the ship to enable the water after being used to return whence it came.

It will be seen by the drawings that by means of the lever-handle 6, Fig. 1, and the connecting-rods and angle-levers *n n n n n*, which control the valves communicating between the receiver *g* and turbine *h*, Fig. 1, or other motor any officer on the officers' bridge of a ship may at will manipulate or control the working of the screw or other propeller.

The lever-handle 6 may be connected with a semicircular disk, upon which there is a graduated scale indicating the position of the lever to produce at the screw-propeller the motion required to go ahead, stop, slow down, back, slow back, or any speed both forward and backward required within the range of the power thus generated, or the indication may be otherwise effected. Although in the application shown the invention is limited to the propulsion of ships the power may in addition or alternately be applied to other uses—such as pumping, raising, and lowering, generation of electric energy, or other uses.

Having now particularly described and ascertained the nature of my said invention and

in what manner the same is to be performed, I declare that what I claim is—

1. An apparatus for the generation of motive power from the rising-and-falling wave motions of water, consisting of a floating vessel, compartmented chambers in said vessel, floating ballasted buoys floating on water inclosed in said chambers, pistons and piston-rods reciprocated by said buoys and cylinders fitting said pistons and affixed to the vessel so that relative movements of the vessel and the said buoys are directly and positively conveyed thereby respectively to the pistons and cylinders, so as to exert pressure on any fluid in said cylinders and means for supply and delivery of such fluid to and from said cylinder and for control thereof, free passages in the vessel from the chambers to the outside body of water, means for guiding the piston-rod, and means for adjusting the ballast in the floating buoys.

2. An apparatus for the generation of motive power from the rising-and-falling wave motions of water, consisting of a floating vessel, compartmented chambers in said vessel, floating ballasted buoys floating on water inclosed in said chambers, pistons and piston-rods reciprocated by said buoys, and cylinders fitting said pistons and affixed to the vessels so that relative movements of the vessel and the said buoys are directly and positively conveyed thereby respectively to the pistons and cylinders, so as to exert pressure on any fluid in said cylinders and means for supply and delivery of such fluid to and from said cylinder and for control thereof, free passages in the vessel from the chambers to the outside body of water, means for guiding the piston-rod, and means for adjusting the ballast in the floating buoys, and a series of hinged bilge-keel boards, and a series of link connections, one such connection between each said board and each said ballasted buoy.

3. In a motor-power-generating apparatus, a water-borne vessel, chambers in said vessel freely communicating with the outside body of water, a motor, means for conveying motive fluid under pressure to said motor, valves to control such conveyance and delivery, a cylinder mounted in said vessel so as to partake of any motions imparted to it by the waves in combination with a piston reciprocated in said cylinder, a piston-rod carrying said piston and reciprocating in packed bearings provided on the vessel, and in guides carried by the framing thereof, buoyant ballasted floats rising and falling on the water within the chambers and rigidly connected to the piston-rods, means for adjusting the ballast in the floats and for controlling the motions of said floats.

4. In a wave-motion motive-power-generating apparatus a buoyant vessel divided into air and water compartments, a hollow rod communicating between the top of the said water-compartment and the atmosphere, a non-return valve and locking-cap controlling the escape of air therethrough, a piston mounted on said rod and a cylinder coöperating with said piston to force fluid through valve-controlled passages to the point where it is to be utilized.

5. In apparatus for compressing aeriform bodies and forcing fluids for storage and motive power a floating vessel and a water-ballasted buoy, the one carrying a piston and the other carrying a cylinder for the former to reciprocatorily coöperate with, means for conveying the forced fluid to a receiving vessel and for its application as a motive power.

6. In apparatus for forcing fluids a floating vessel—such as a ship—chambers therein accessible to the sustaining body of water and to the atmosphere, floats buoyed upon said water, chambers in said floats respectively imprisoning air and water therein, means of communication between said water-chamber and the atmosphere and means for conveying the relative reciprocatory motions of the floating vessel and its contained floats to pistons and cylinders respectively connected thereto, pipes for conveying and valves for controlling the flow of the fluid being forced through said pipes to any suitable means for utilizing the same as motive power.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN HUTCHINGS.

Witnesses:

ALFRED GEORGE BROOKES,
JOHN COODE HARE.