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R. J. SHEEHY.

ENGINE CONTROLLING APPARATUS.

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NO MODEL.

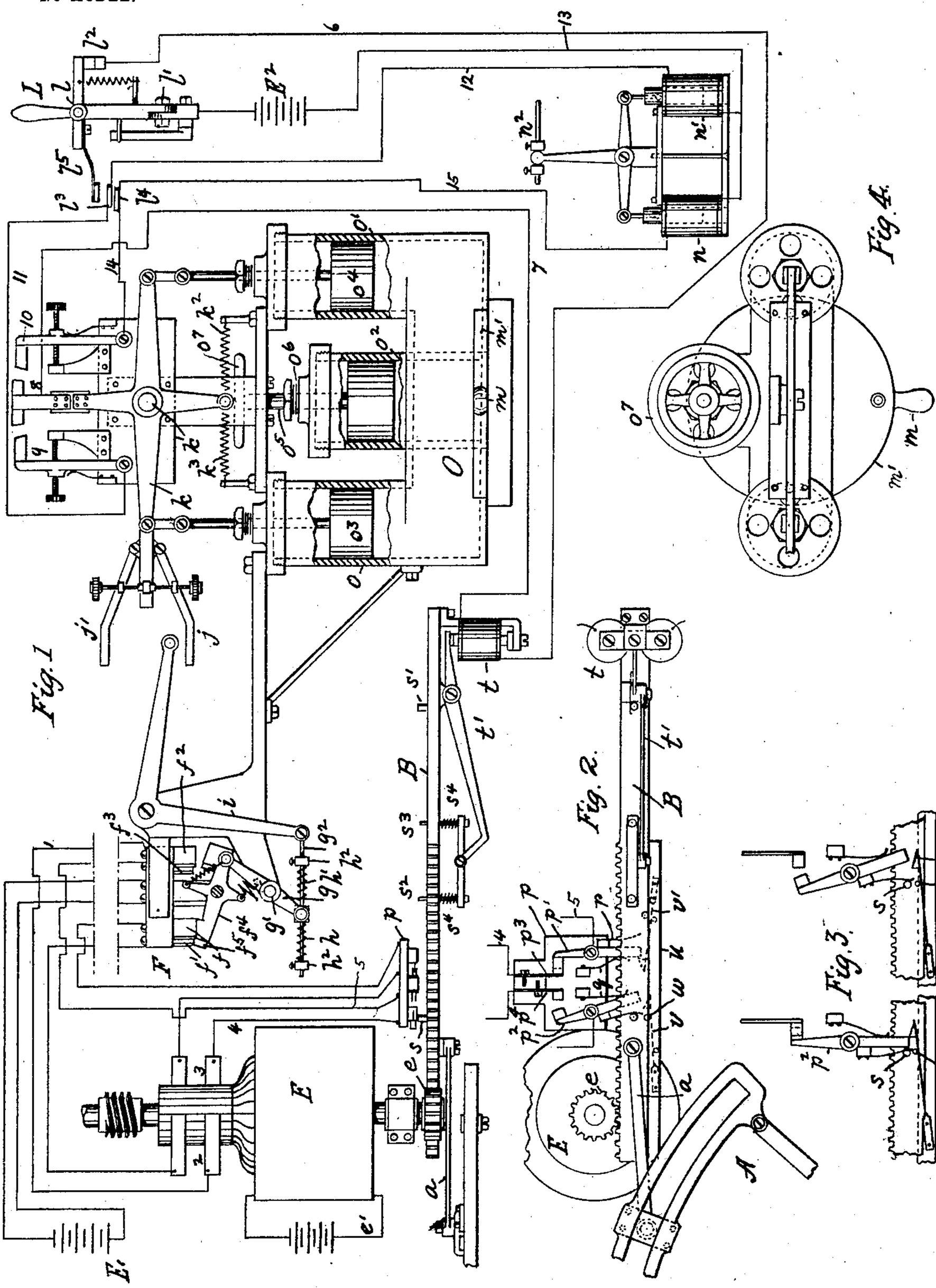

Fig. 1

Fig. 4.

Fig. 2.

Fig. 3.

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ENGINE-CONTROLLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 722,917, dated March 17, 1903.

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To all whom it may concern:

Be it known that I, ROBERT J. SHEEHY, a citizen of the United States, residing at the city of New York, in the borough of Manhattan and State of New York, have invented certain new and useful Improvements in Engine-Controlling Apparatus, of which the following is a full, clear, and exact description.

This invention relates to apparatus for controlling the speed of an engine either automatically or by hand and from a distance to avoid racing of the engine when for any reasons the load is suddenly thrown off and to alter the speed and change the direction in emergencies.

The complete devices herein described relate especially to the control of marine engines, since the controlling devices are thrown into operation by the pitching or rolling of the vessel, it being understood that such movements of the vessel often cause the propeller to rise out of the water, in which case it is desirable to slow down the engine until the propeller is again immersed.

The object of my invention is to provide an apparatus for this purpose which will be quick and effective in action and simple in construction.

In general the invention consists of a body of liquid adapted to act upon the piston or pistons when the motions of the ship change its level, in combination with a motor of approved construction, which is started and stopped by the movements of the piston or pistons to thereby adjust the link or valve operating devices of the main engine.

The invention also consists of certain details and apparatus, which will be fully described hereinafter and pointed out in the claims.

In the accompanying drawings, Figure 1 is a conventional representation of the complete system. Fig. 2 is a side elevation of the devices immediately adjacent to the link of the main engine, the same being shown in plan in Fig. 1. Fig. 3 is a detail of the electric switches, and Fig. 4 is a plan of the liquid-control apparatus.

The main engine is represented only by a portion of its link A, which controls the action of a main valve of the engine. The shifting of this link to alter the speed of the main engine is accomplished by reciprocating a rack-bar B, which is connected to the link A by a connecting-rod *a*. This bar B is reciprocated by means of an electric motor E, whose pinion *e* engages with the rack. The field-magnet of this motor is constantly energized by a circuit *e'*, and its armature is provided with two independent circuits, each of which is fed from a source of electricity E' and one of which when closed is adapted to accomplish the rotation of the motor in one direction, while the other will accomplish the rotation in the opposite direction. The function of the devices hereinafter described is to close these two armature-circuits in succession, and thereby move the rack-bar first in one direction and then in the other, the interval between such closures being dependent upon the time occupied by the ship in its pitching or rolling motions.

An electric switch is indicated at F. It comprises the terminals *f* and *f'* of one of the armature-circuits, the terminals f^2 and f^3 of the other armature-circuit, and the two levers f^4 and f^5, which are the terminals of the source of electricity E'. The levers are adapted to be simultaneously thrown out of connection with one pair of terminals and into connection with the other by a lever *g*, pivoted at *g'* and actuated by a rod g^2. The connection between the lever *g* and the levers f^4 and f^5 is through two springs, as shown, by which when said lever *g'* is thrown across the center the levers f^4 and f^5 are suddenly shifted. This quick movement is enhanced by means of springs *h* and *h'*, interposed between the end of lever *g* and respective collars h^2 on the rod g^2, in which power is stored by the movement of rod g^2 before and during the movement of the lever *g*. The end of the rod g^2 is connected with one end of a bell-crank *i*, pivoted at *i'*, the other end of said bell-crank being located between the adjustable arms of a fork *j j'*. This fork is carried by a lever *k*, pivoted at *k'*.

O is a vessel adapted to contain mercury or other suitable liquid. It is provided with three upwardly-projecting extensions, two of which, *o* and *o'*, are of the same cross-section and preferably cylindrical, while the other, o^2, may be of the same or different cross-section. In each of the extensions *o o'* are placed pis-

tons or floats o^3 and o^4, respectively, which are adapted to be moved by changes in the level of the liquid in the vessel O. The piston o^2 is preferably close-fitting in its chamber, so that it may be adjusted vertically to displace more or less of the liquid, and thereby adjust the normal level thereof in the cylinders o o'. For this purpose the said piston is fitted with a stem o^5, which passes through a threaded bearing at o^6 and is adapted to be rotated by means of a hand-wheel o^7. In case the pistons o^3 and o^4 are to be moved by the pressure of the liquid against them they should be constructed to closely fit the cylinders; but I prefer to make them of buoyant material, so that their movements will be more easily controlled and friction of the parts avoided. The pistons o^3 and o^4 are connected, respectively, through their piston-rods with the opposite ends of the lever k, and springs k^2 and k^3 act upon said lever, as shown, in a manner to maintain the pistons o^3 and o^4 at the same level in their respective cylinders.

The two armature-circuits of the motor also contain each one other switch besides switch F. These two switches are mounted on the block p and consist of the levers p' and p^2, respectively, adapted to engage the terminals p^3 and p^4, the levers themselves forming the other terminal. Springs q tend to close the switches, while springs r, attached to the backs of the levers, are adapted to be struck by pins carried by the rack-bar B to open the switches. The pins referred to are four in number, being indicated by s and s' near the extremities of the bar and s^2 and s^3 near the middle of the bar. The latter pair are movable and engaged by springs s^4, which tend to withdraw them from the path of the switch-levers; but they are normally held projecting, in the manner shown in Fig. 1, by a vitalized magnet t, whose armature-lever t' is connected with both pins in the manner shown. Attached to an immovable portion u of the frame are two spring-latches v and v', which engage the ends of the switch-levers p' and p^2 to lock them in their closed position. These latches are adapted to be thrown aside by another set of pins w, carried by the rack-bar and located adjacent, respectively, to the pins before described.

The operation will now be recited: When the apparatus is to be used to control the speed of the engine when the propeller is lifted out of water by reason of the fore-and-aft pitching of the ship, the liquid-containing vessel O is placed at a convenient point on the ship, with its two cylinders o and o' arranged in a fore-and-aft direction and, for illustration with reference to Fig. 1, with the bow to the left. When the ship pitches downwardly at the bow, the liquid in vessel O rises in the cylinder o and lifts the piston therein, thus elevating the corresponding end of lever k, causing the arm j to strike and lift the arm of bell-crank i. This movement is transmitted through rod g^2 and lever g and throws the switch to the opposite position to that shown in the drawings. This closes a circuit from the source of electricity E′ through the contact f^2, wire 1, brushes 2 and 3, wire 4, terminal p^3, switch-lever p', wire 5, contact f^3, and through the switch F to the source of electricity. This closes an armature-circuit, which will cause the motor to rotate in a direction to carry the rack-bar B to the left. The link A will accordingly be carried to the left, and the main engine will be slowed down. The movement to the left will continue until the pin s^2 strikes the spring r on the switch-lever p' and opens the armature-circuit, pin w' having first disengaged the latch v. The motor then stops, and the main engine continues to run at slow speed until the ship rights herself sufficiently to bring the liquid of the vessel O to a level in both cylinders o and o' or to a higher point in the latter cylinder, in which case the spring k^2 or the pressure on the piston o^4 will reverse the position of lever k, causing the other arm j' of the fork to reverse the position of the bell-crank i. This reverses the switch F and closes the other armature-circuit through the switch-lever p^2, which in the meantime was in its closed position by reason of the pin s leaving it when the rack moved to the left. The closure of this new circuit rotates the armature in the opposite direction and the rack is carried to the right until the switch-lever p^2 is again opened to stop the motor, in which condition the engine is again running at full speed.

It is obvious that adjustments are necessary for determining the time at which the apparatus shall operate, such adjustments being provided for, the screws j^2 for determining the distance apart of the arms j and j' and the piston in the chamber o for determining how soon the surface of the liquid shall engage the pistons o^3 and o^4.

If the ship is provided with two propellers, which, as usual, are driven by two independent engines, it will be desirable to use one of these devices for each engine and to place the liquid vessel O athwart the ship, so as to reduce the speed when either propeller rises from the water in the rolling of the ship. Under some conditions when a ship is provided with only one of these devices, as when the vessel is rolling badly and pitching only slightly, it is desirable to shift the liquid vessel O from its fore-and-aft position to a position athwart the vessel. This can easily be accomplished by simply swinging around upon a vertical axis through an angle of ninety degrees, and for this purpose I show the handle m attached to the circular base m', the vessel being supposed to be mounted on a vertical axis. The control of the speed of the ship can be accomplished by hand also by using a portion of the apparatus hereinbefore described. For this purpose I have shown hand devices consisting of a compound lever L, having joints l

and l', permitting it to swing in two different directions. By moving in one direction the circuit is opened at l^2 and closed at either l^3 or l^4 and when in this position can be moved on the other joint to alternately make connection with either l^3 or l^4. n and n' are two electromagnets adapted to move a rod n^2 in opposite directions. This rod may correspond with the rod g^2 and do the work which the latter does in the hereinbefore-described operation. A source of electricity (indicated by E^2) is connected on one side with lever L and leads then normally through the contacts l^2 by wire 6, electromagnet t, wire 7 to a movable contact 8. This movable contact is attached to the lever k, so that when it tilts in one direction it will engage with the terminal 9 and when it tilts in the opposite direction it will engage with the terminal 10. From terminal 9 the wire 11 leads to the contact l^3, thence by wire 12 to electromagnet n', to the source E^2. From the terminal 10 a wire 14 leads to the contact l^4, thence by wire 15 to the electromagnet n, and by wire 13 to the source. It will thus be seen that when the lever k tilts in either direction the circuit of electromagnet is closed, thus holding the pins s^2 and s^3 extended for the automatic operation; but when the hand apparatus is used the first action is to open the circuit of magnets t' by tilting the upper end of the lever L. The circuit of the source E^2 is thereafter through one or the other of the magnets $n\,n'$, depending upon which of the contacts l^3 and l^4 the brush l^5 is against, and by swinging the handle L on the pivot l' this brush can be put into alternate connection with these contacts. When the contact l^4 is in circuit, the magnet n throws the switch F in one direction to start the motor E. The motor can be allowed to run until the speed of the main engine is reduced to the minimum or until the links are carried beyond the center, whereupon the engine will be reversed; but the motor E can be stopped and started at any time by merely shifting the brush l^5 from one contact to the other, and the speed of the main engine can be regulated to any degree between maximum and minimum in either direction.

I claim—

1. The combination of an electric motor adapted to control the speed of a marine engine, an electric circuit including said motor and two cut-outs a vessel containing a liquid, means whereby a change of level of the liquid will actuate one of the said cut-outs to start the motor and means whereby the other cut-out will be actuated after the motor has run a predetermined time, substantially as described.

2. The combination with a marine engine and an electric motor by which the same is controlled of an electric switch, a vessel adapted to contain a liquid, a body located in said vessel and adapted to be moved by a change of level of the liquid to thereby actuate the electric switch, and a piston or plunger for adjusting the normal level of the liquid.

In witness whereof I subscribe my signature in presence of two witnesses.

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