H. H. LEE.

AUTOMATIC VALVE CONTROLLING MEANS.

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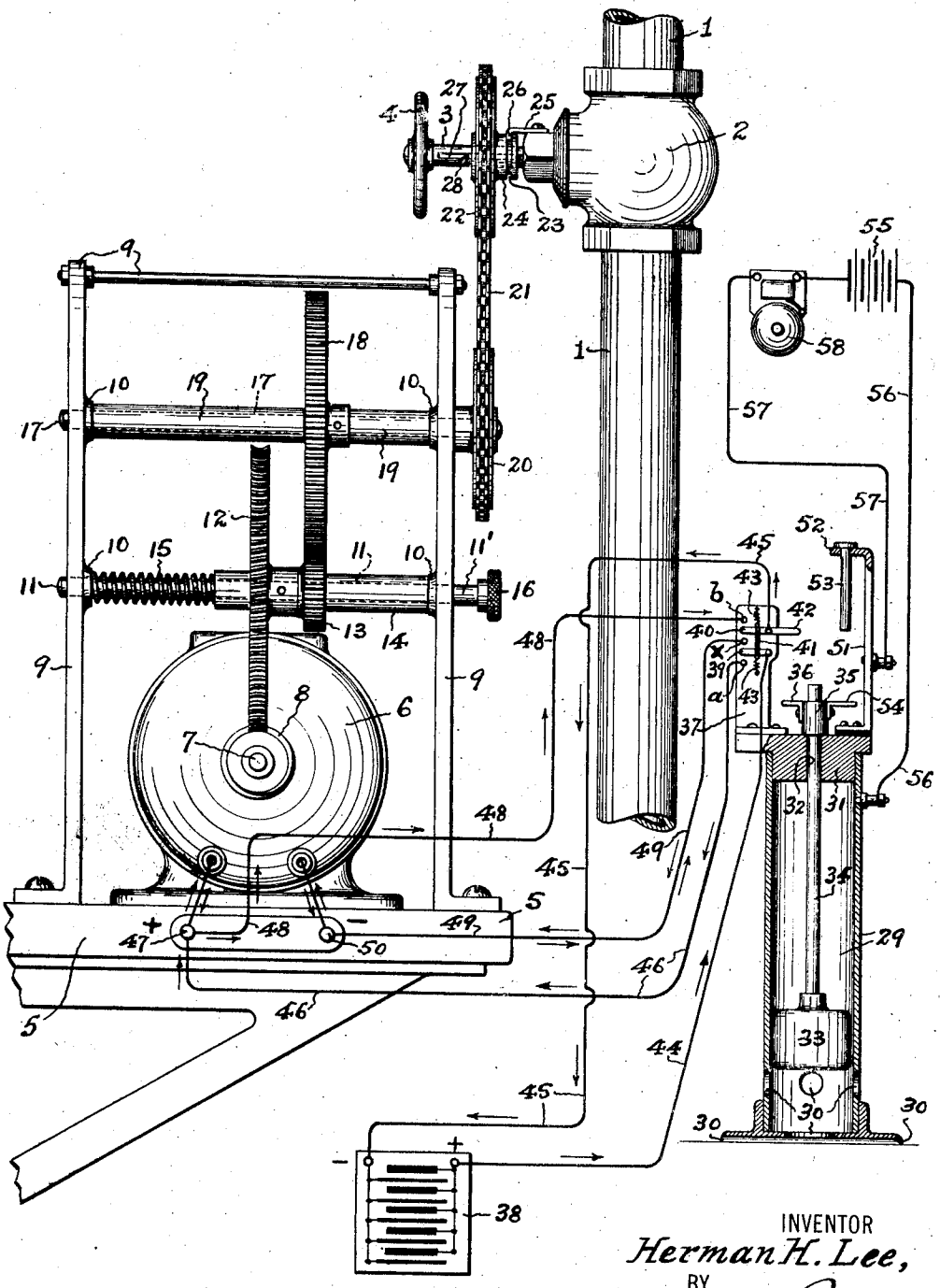

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AUTOMATIC VALVE-CONTROLLING MEANS.

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To all whom it may concern:

Be it known that I, HERMAN H. LEE, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Automatic Valve-Controlling Means; 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, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

The present invention relates, generally, to improvements in automatic steam-pump controlling devices for use in vessels, and for similar uses; and the invention has reference, more particularly, to a novel combination of mechanical and electrical devices whereby the rise and fall of water in the hold of a vessel, due to leaks or other causes, or in any similar place, will automatically control the flow of steam to a steam pump, so that the latter may be started or stopped as may be required, and so that the water may be automatically kept from rising to undue or dangerous heights within a vessel's hold.

The invention has for its principal object to provide a novel and simple arrangement and combination of devices for automatically opening or closing a steam admission valve to a pump mechanism, the operation of the valve opening and closing means being itself automatically controlled by means operated by the rise or fall of water level within a vessel's hold, or similar place.

Other objects of the present invention, not at this time more particularly enumerated, will be clearly understood from the following detailed description of the same.

With the various objects of the said invention in view, the same consists, primarily, in the novel automatic controlling device for steam pumps whereby undue or dangerous rising of water in a vessel's hold may be checked by the operation of said pump as hereinafter set forth; and, furthermore, the invention consists in the several arrangements and combinations of the various devices and parts, as well as in the details of the construction of said parts, all of which will be more fully described in the following specification, and then finally embodied in the claim which is appended thereto.

The invention is clearly illustrated in the accompanying drawing, in which is shown a steam delivery pipe for pumps having a valve which is opened and closed by novel controlling mechanism automatically set in operation by a float controlled electric circuit make and break device operated by the rise and fall of water in the location wherein the pump is effective.

Referring to said drawing the reference-character 1 indicates a steam delivery pipe adapted to deliver steam to a pump (not shown) for operating the latter. Located in the line of said steam delivery pipe 1 is a valve 2, of any ordinary gate type, having a rotatable stem 3 for producing the opening or closing of the gate mechanism, such stem being provided at its outer end with the usual hand-wheel 4 for manually operating the valve.

The novel valve opening and closing means comprises a suitable base 5, upon which is supported an electric motor 6, upon the shaft 7 of which is fixed a driving worm 8. Secured to said base 5 is a suitable framework 9 provided with properly disposed bearing portions 10. Journaled in a pair of oppositely disposed bearing portions 10 is a shaft 11 upon which is fixed a worm gear 12 which normally meshes in driven relation with said driving worm 8. Also fixed on said shaft 11 is a small spur gear 13. A bushing or sleeve 14 is arranged on said shaft 11 between said spur gear 13 and an opposite bearing portion 10, whereby the normal operative position of the worm gear 12 and spur gear 13 is determined. A compression spring 15 coiled around said shaft 11 to bear between said worm gear 12 and an opposite bearing portion 10, tends by its pressure to normally maintain said worm gear 12 and spur gear 13 in said normal operative position. Said shaft 11 is longitudinally movable in its bearing portions against the compression of said spring 15, and said shaft 11 is provided with an outwardly projecting portion 11′, upon which is fixed a nob or finger-piece 16, the purpose of which will be subsequently referred to.

Journaled in another pair of oppositely disposed bearing portions 10, so as to be positioned above said shaft 11, is a counter shaft 17 upon which is fixed a gear-wheel

18 which normally meshes in driven relation with said spur gear 13. Bushings or sleeves 19 on either side of said gear-wheel 18, and interposed between the latter and the bearing portions 10, maintain said gear-wheel and counter shaft against longitudinal displacement.

Fixed on an outwardly projecting end of said counter-shaft 17 is a sprocket wheel 20, over which runs a drive chain 21, which also runs over and drives a similar sprocket wheel 22 mounted on said stem 3 of the valve 2. The said sprocket wheel 22 is so mounted in connection with said stem 3 of the valve 2, that it imparts rotary motion to said stem 3 while still permitting a free longitudinal movement thereof through the sprocket wheel. The means for so mounting the sprocket wheel 22 comprises an annular groove 23 formed in the hub 24 of said sprocket-wheel 22, and positioning lug 25 secured in stationary relation to the valve 2, said lug 25 having a downwardly projecting tongue 26 which enters and rides in said annular groove 23, so that while said sprocket-wheel is free to rotate it is nevertheless held against longitudinal movement or displacement. The valve stem 3 is provided with a longitudinal channel or spline 27 in which rides a key 28 fixed to the hub of said sprocket wheel 22, so that the rotary movement of said sprocket wheel 22 is imparted to said valve stem 3 without necessity of permitting travel of the former in company with the longitudinal movement of the latter.

It may frequently be desired to manipulate the valve 2 by hand, in which case it is desirable to disconnect the transmission mechanism above described from the motor 6, so that the hand-wheel 4 may be turned to rotate the valve stem 3. To this end the knob or finger piece 16 is pressed inwardly, which serves to impart a limited longitudinal movement to the shaft 11 against the compression or tension of the spring 15, whereby the worm gear 12 is moved out of mesh with the driving worm 8, and the transmission mechanism thus freed from operative connection with the motor 6, so that the hand-wheel 4 may easily be turned to manipulate the valve 2 as desired.

It will be noticed that the transmission mechanism comprises in its train a reduction gearing consisting of the driving worm 8 and large worm gear 12, and the small spur gear 13 and the large gear wheel 18, so that while the motor revolves at comparatively high speed, the valve stem 3 is rotated slowly, the loss of speed being translated by such reduction gearing into an increase of power sufficient to assure the proper and certain rotation of the valve stem 3, whereby the valve 2 is duly opened or closed as the case may be.

The means for automatically starting and stopping the motor 6 according to need, comprises a float chamber or well 29, adapted to be located in the hold of a vessel, or similar place, and having inlet openings 30 therein whereby water entering said vessel's hold may immediately find access into the interior of the float chamber or well 29. The top or upper end of said float chamber or well is provided with a top member or cap 31 having a centrally disposed guideway 32 therein. Arranged within said float chamber or well 29 is a float member 33 having an upwardly extending stem 34, the upper extremity of which passes slidably through said guideway 32 to project above said top member 31. Fixed on the upwardly extending external end of said stem 34 is a collar 35. Secured to and projecting outwardly from one side of said collar 35 is a trip finger 36. Mounted on said top member 31, to extend vertically upward therefrom is a supporting bracket 37 upon which is arranged a reversing switch mechanism adapted to be operated by the rise and fall of said float member 33 to cause the proper operation of the motor 6 in one or the other direction of rotation, whereby the valve operating means is operated to open or close said valve 2 as the case may be. Said reversing switch mechanism controls the flow of electrical energy from a battery 38, or any other suitable source of such electrical energy. Said reversing switch mechanism comprises a pivoted switch arm 39 and a second pivoted switch arm 40 arranged in parallel relation, and coupled together by means of a link 41, of non-conducting material, whereby said arms are simultaneously caused to move one with the other on their respective pivotal connections. One of said switch arms, preferably the arm 40, is provided with a rearwardly extending trigger arm 42, which is located to project into the path of movement of said trip finger 36 connected with the stem of said float member. Oppositely acting spring members 43 connected with said switch arms tend to normally hold the latter in and return the same to a normal neutral or circuit breaking position. Interconnecting the positive pole of said battery 38 with said switch arm 39 is an electrical conductor or feed wire 44, and interconnecting the switch arm 40 with the negative pole of said battery 38 is an electrical conductor or return wire 45. Mounted adjacent to the free ends of said switch arms, for electrical coöperation therewith are contact points *a*, *x* and *b*. A motor circuit wire 46 runs from said contact point *a* to the positive pole connection 47 of said motor 6, a reverse motor circuit return wire 48 interconnects said positive pole connection 47 of said motor 6 with said contact point *b*, and a motor circuit

wire 49 interconnects said contact point *x* with the negative pole connection 50 of said motor 6.

The apparatus above described is peculiarly adapted for use in boats and vessels of all kinds to serve the purpose of automatically starting and stopping steam pumps whereby water may be ejected from the holds, and prevented from rising therein to dangerous levels. To this end the steam delivery pipe 1 with its valve 2 is located to interconnect the source of steam power with the pumps, and the float chamber or well 29, controlling the electrical elements of the apparatus, is located within the hold so as to be acted upon by water which may enter and accumulate therein. The apparatus so arranged operates as follows:—

When the water accumulates in the hold to a dangerous degree, due to leaks or other causes, and the level thereof rises, the float 33 is engaged by said water, and being buoyant is caused to rise in the float chamber 29, carrying upward therewith the stem 34. The upward movement of the stem 34 moves the trip arm 36 into engagement with the trigger arm 42 of the switch mechanism, and swings the same upward. The upward swinging movement of the trigger arm 42 turns the switch arms 39 and 40 downward, and carries the same into circuit closing engagement with the contact points *a* and *x*. The electric circuit being thus established electrical energy flows from the positive pole of the battery 38 through the wire 44, switch arm 39, and contact *a* and thence through the wire 46 to the positive pole connection 47 of the motor 6, energizing the same, and then returning through the negative pole connection 50, wire 49, to the contact point *x*, and thence through the switch arm 40 and wire 45 back to the negative pole of the battery 38. In this manner the flow of electrical energy into and through the motor 6 causes the same to rotate in one direction, whereby the mechanical power thereof is transmitted through the transmission gearing 8, 12, 13, 18, 20, 21 and 22, to transmit a rotary motion to the valve stem 3 which is thus caused to move outward in the usual well known manner to open the gate of the valve 2, thus permitting steam to be admitted through the pipe 1 to the steam pumps whereby the latter is put in motion. Inasmuch as but a limited operation of the motor 6 is necessary to open the valve 2, the said motor 6 must be stopped as soon as the valve is opened. This is accomplished by reason of the fact, that a continued rise of the float 33 and its stem 34 carries the trip arm 36 away from the trigger arm 42, thus freeing the latter, so that the upper spring 43 will return the switch arms 39 and 40 to normal initial and neutral position, whereby the battery circuit is broken or interrupted thus stopping the motor 6. The valve 2 now remains open, and consequently steam is continuously delivered to the pumps. As the operation of the pumps ejects water from the hold, and the level of the water therein falls, the float 33, stem 34 and trip arm 36 also move downward. This downward movement carries the trip arm 36 into downwardly swinging engagement with the trigger arm 42, whereby the switch arms 39 and 40 are turned upward to carry the same into circuit closing engagement with the contact points *x* and *b*. The electrical circuit to the motor is again established, but its direction of flow therethrough is reversed causing the same to rotate in a reverse direction. In this way the current is caused to flow from the positive pole of the battery 38 through the wire 44, switch arm 39, and contact point *x*, and thence through the wire 49 to the connection 50 of the motor, which now becomes the positive pole instead of the negative pole, and thence, after passing reversely through the motor returning through the connection 47, wire 48, contact point *b*, switch arm 40, wire 45 back to the negative pole of the battery 38. The motor being thus caused to rotate in a reverse direction, the transmission mechanism also reverses its movement, whereby the valve stem 3 is turned in the opposite direction, and caused to move inward closing the valve, and shutting off the steam from the pumps so that the latter cease operation. The descent of the float 33 and stem 34 carries the trip arm 36 away from the trigger 42, so that the lower spring 43 returns the switch arms 39 and 40 to normal initial and neutral position, thus breaking the circuit and stopping the motor when the valve 2 is closed. It will thus be apparent that my novel apparatus serves to automatically start and stop the pumps according to the need for the operation of the latter as governed by the rise and fall of water in the vessel's hold.

In addition to the electrically controlled pump starting and stopping means, the rise and fall of the float 33 and its stem 34 is also arranged to operate an alarm signal for indicating the rise of water in the hold beyond normal limits. To this end a vertical bracket 51 is mounted on the cap member 31 to parallel the path of the stem movement. This bracket is insulated electrically from the cap-member 31 and well 29. Connected with the upper end of said bracket 51 is lateral projection 52 extending toward the stem 34 in which is mounted a vertically movable contact pin 53. Secured on said stem 34 is an outwardly projecting contact member 54. A battery 55 is connected by the wire 56 on the side with the well 29 to ground the circuit thereof in the well 29, cap 31, stem 34, and contact member 54. The other side of the battery is

connected by the wire 57 with said bracket 51 and contact pin 53. The circuit thus provided includes an electric bell 58, or any other desired form of electrically operated signal device. When the float 33 and stem 34 rise, the contact member 54 is carried into electrical engagement with the lower end of the contact pin 53, and the circuit is closed to operate the alarm device. The circuit is maintained closed, and the alarm device in operation so long as the float rises, since the contact pin 53, being vertically movable, travels upwardly in company with the upward movement of the contact member 54 after being engaged thereby.

I am aware that changes may be made in the general arrangements and combinations of the various devices and parts as well as in the details of the construction of the same, without departing from the scope of my invention as set forth in the foregoing specification and defined in the appended claim. Hence, I do not limit my invention to the exact arrangements and combinations of the devices and parts as described in said specification, nor do I confine myself to the exact details of the construction of the said parts as illustrated in the accompanying drawings.

I claim:—

In a device of the kind described, a pump controlling valve mechanism having a rotary stem, an electric motor, transmission mechanism driven by said motor for rotating said valve stem, an electric circuit serving said motor, a normally open reversing switch mechanism included in said circuit for reversing the flow of current to cause said motor to rotate in a reverse direction, a trigger arm connected with said switch mechanism for moving the same, a vertically movable float mechanism having a stem, a trip arm carried by said stem, upward movement of said stem being adapted to carry said trip arm in passing engagement with said trigger arm to operate said switch mechanism to pass the current through said motor causing a time limited rotation of the latter in one direction, the downward movement of said stem being adapted to carry said trip arm in a reversed passing engagement with said trigger arm to operate said switch mechanism to reverse the current through said motor causing a time limited rotation of the latter in the opposite direction, and a fluid chamber having fluid admission passages in which said float mechanism is mounted.

In testimony that I claim the invention set forth above I have hereunto set my hand this 29th day of January, 1919.

HERMAN H. LEE.

Witnesses:
GEORGE D. RICHARDS,
ADOLPH HANSEN.