

Jan. 7, 1930.

W. A. CHRYST ET AL

1,742,848

ELECTRIC PUMP

Filed June 1, 1925

2 Sheets-Sheet 1

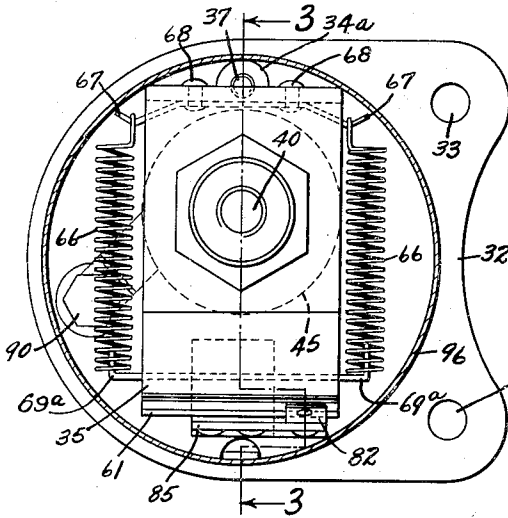


Fig. 1

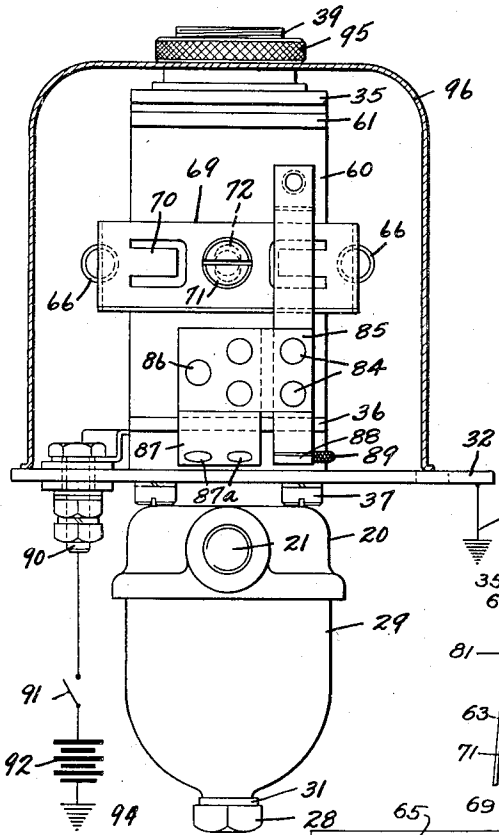


Fig. 2

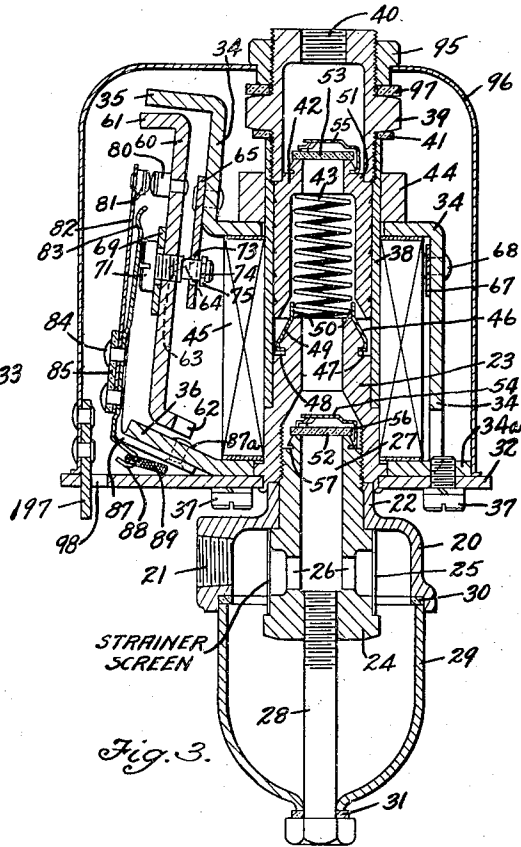


Fig. 3.

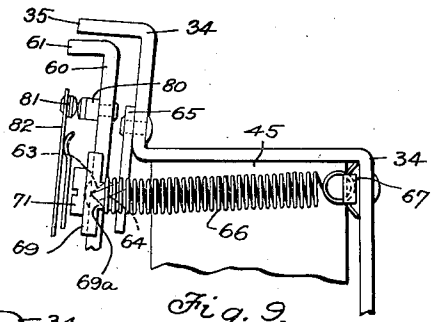


Fig. 9.

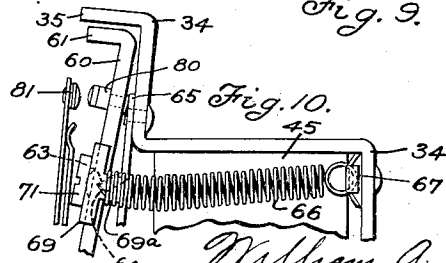


Fig. 10.

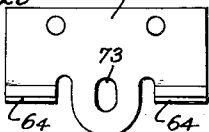


Fig. 4.

Inventors
William A. Chryst
and Herbert C. Mattie
Spencer Swell and Raymond
their Attorneys

Jan. 7, 1930.

W. A. CHRYST ET AL

1,742,848

ELECTRIC PUMP

Filed June 1, 1925

2 Sheets-Sheet 2

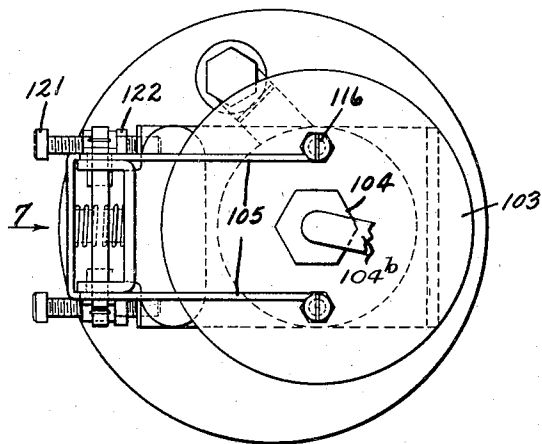


Fig. 5

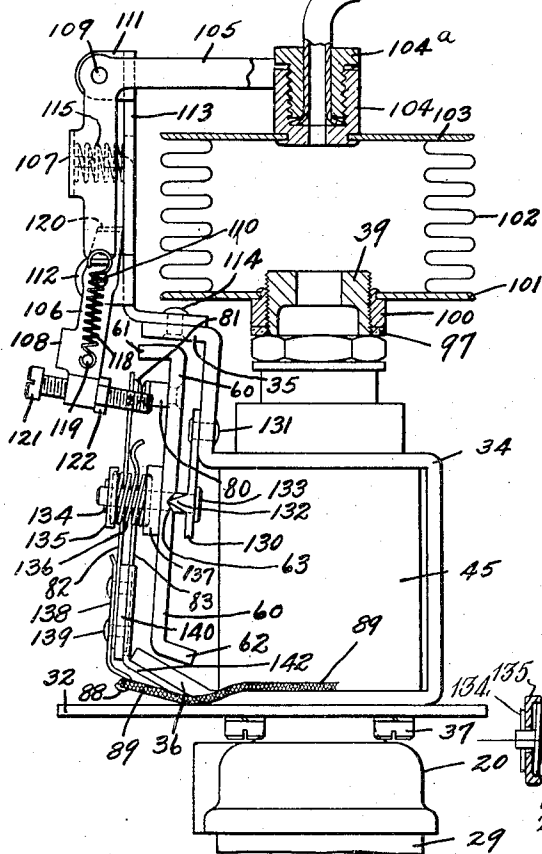


Fig. 6

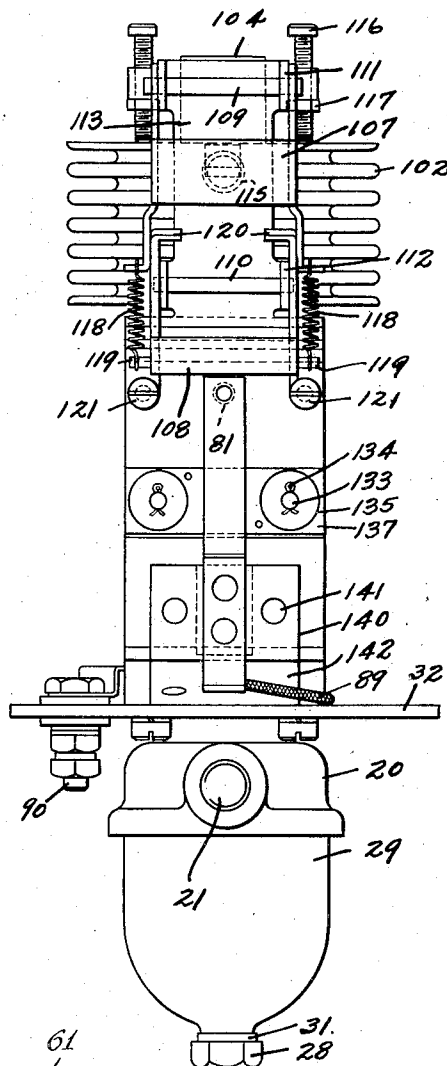


Fig. 7

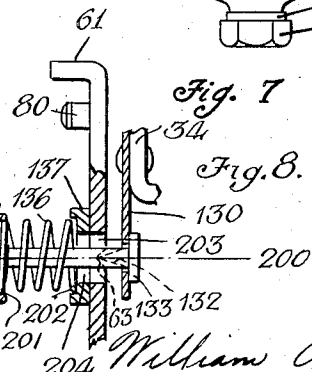


Fig. 8

Inventor
 William A. Chryst
 and Herbert C. Walters
 By Spencer Small and Hardman
 their Attorneys

UNITED STATES PATENT OFFICE

WILLIAM A. CHRYST AND HERBERT C. WALTERS, OF DAYTON, OHIO, ASSIGNORS, BY
MESNE ASSIGNMENTS, TO DELCO-REMY CORPORATION, OF DAYTON, OHIO, A COR-
PORATION OF DELAWARE

ELECTRIC PUMP

Application filed June 1, 1925. Serial No. 34,074.

This invention relates to electrical pumps for pumping liquids, and particularly to the type of electrical pump described and claimed in the patent of Hugh Wallace #1,690,348, issued Nov. 6, 1928, filed May 25, 1925. This patent discloses an electrical pump including an electromagnet having a magnetic circuit including two movable members one of which is the plunger of the pump and the other is a vibratory member which controls the opening and closing of the magnet circuit and which is maintained in a state of motion by intermittently connecting the magnet with a source of current.

One of the objects of the present invention is to improve the durability of a pump of this type and particularly to improve the manner of hinging the vibratory member.

A further object is to provide means responsive to pressure in the outlet connected with the pump for rendering the pump inoperative. In the disclosed form of the present invention this is accomplished by mechanism responsive to pressure for preventing movement of the vibratory member to close the switch contacts controlling the pump magnet coil.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein preferred forms of the present invention are clearly shown.

In the drawings:

Figs. 1, 2 and 3 are plan, side and sectional views of a form of the present invention, Fig. 3 being taken on the section line 3—3 of Fig. 1;

Fig. 4 is a view in elevation of a knife-edge bracket providing a fulcrum for the vibratory member of the pump;

Fig. 5 is a plan view of a modified form of the invention;

Fig. 6 is a side view in the direction of the

arrow 6 of Fig. 5, certain parts being shown in section; and

Fig. 7 is a side view in the direction of arrow 7 of Fig. 5;

Fig. 8 is a detailed fragmentary view of the spring adjustment of the vibratory member.

Fig. 9 is a fragmentary view of the device showing the position of the circuit interrupter when in circuit closing position.

Fig. 10 is a view similar to Fig. 9 showing the circuit interrupter in circuit breaking position.

In both forms of the invention shown in the drawings the parts providing the fuel duct, pump cylinder and piston are identical. Referring particularly to Fig. 3, this fuel duct includes an inverted cup-shaped inlet member 20 having a threaded hole 21 for receiving an inlet pipe. The member 20 is provided with a tubular extension 22 which is maintained in engagement with the lower end of a tubular magnet core 23 of magnetizable material by a tubular screw 24 having a shank which passes thru the extension 22 and threadedly engages the core 23. The cylindrical head of the screw 24 is surrounded by a strainer screen 25 admitting passage of liquid through the passages 26 and 27 in the screw 24. The head of the screw 24 is tapped to receive a bolt 28 which attaches to the member 20 a vessel 29. A gasket 30 is located between the rim of the vessel 29 and the member 20, and a gasket 31 is located between the vessel 29 and the head of the bolt 28.

The core member 23 is attached to a platform or bracket 32 provided with openings 33 for receiving screws or bolts which may be used to attach the bracket 32 to a support. A magnet frame 34 of magnetizable material having poles 35 and 36, is attached to the bracket 32 by screws 37. The core 23 is connected with a non-magnetizable cylinder 38 which is connected with a pipe coupling 39 having a threaded hole 40 for receiving a pump outlet pipe. The joint between the cyl-

5 inder 38 and the coupling 39 is sealed by a
 gasket 41. A piston 42 of magnetizable ma-
 terial is slidable within the cylinder 38 and is
 maintained normally in the position shown
 10 in Fig. 3, by spring 43 located between the
 piston and the core 23. The cylinder 38 is
 surrounded by a magnetizable collar 44 in en-
 gagement with the magnet frame 34. The
 cylinder 38 and the core 23 are surrounded
 15 by magnet coil 45. When this coil is con-
 nected with a current source, the piston 42
 will be moved toward the core 23. The down-
 ward movement of the piston toward the core
 20 23 is limited by a non-magnetizable stop mem-
 ber 46, having a flange 47 which is received
 by a groove 48 in the core 23 and having a
 conical surface 49 conforming to a similar
 conical surface of the core 23 and having a
 25 cylindrical portion 50 which receives the
 lower end of the spring 43 and which tele-
 scopically engages the piston 42. The stop
 member 46, therefore, cooperates with the
 cylinder 38, the core 23, and the piston 42
 to provide a dashpot which retards the down-
 30 ward movement of the piston and, therefore,
 cushions the impact of the piston against the
 stop member 46. The dashpot for retarding
 the upward movement of the piston 42, is pro-
 vided by forming the piston with a portion
 35 51 reduced in diameter, which is adapted to
 telescopically engage the coupling 39. The
 screw 24 and the piston 42 provide seats for
 valves 52 and 53 respectively, which are re-
 tained by valve cages 54 and 55 respectively,
 40 each having three legs 56 adapted to be re-
 ceived by grooves 57 provided in each of the
 members 24 and 42 respectively. Obviously,
 the reciprocation of the piston 42 will cause
 the liquid to be drawn in through the opening
 45 21 and to be forced out through the opening
 40.

The mechanism for intermittently connect-
 ing the magnet 45 with a source of current
 includes a vibratory member 60 having poles
 45 61 and 62 cooperating, respectively, with the
 poles 35 and 36 of the magnet frame 34.
 The vibratory member 60 is provided with
 notches 63 for receiving knife edges 64 ex-
 tending from a bracket 65 which is attached
 50 to the magnet frame 34. The parts 60 and 64
 are maintained in engagement by two springs
 66, each having one end attached to a bracket
 67 secured by rivets 68 to the magnet frame
 34. The other ends of the springs 66 are se-
 55 cured to apertured ears 69^a formed on the
 plate 69, said plate having resilient fingers 70
 for yieldingly engaging the vibratory mem-
 ber 60. The plate 69 is secured in various
 positions of adjustment with respect to the
 60 vibratory member 60 by a screw 71 which
 passes through the slot 72 in the plate 69 and
 threadedly engages the member 60. Springs
 66 are secured between bracket 67 and the ears
 69^a of the plate 69 so that the springs are
 65 under tension, thereby holding the vibratory

member upon its fulcrum. Plate 69 should
 be positioned upon the vibratory member so
 that normally the tension of the springs will
 hold the vibratory member in circuit closing
 position as illustrated in Fig. 9. When the
 70 said member is attracted by the pole pieces of
 the field frame, the action of the ears 69^a of
 plate 69, due to the rocking of the vibratory
 member, will flex the convolutions of the
 springs out of alignment (see Fig. 10) there-
 75 by increasing the tension of the springs which
 tension reacts to return the vibratory member
 to normal circuit closing position when the
 said member is no longer attracted by the pole
 pieces. The position of the spring connec-
 80 tions on ears 69^a relative to the fulcrum of the
 vibratory member controls the contact pres-
 sure of the interrupter and the frequency of
 operation of said member. Moving the plate
 69 a greater distance from the said fulcrum
 85 will increase the contact pressure and de-
 crease the frequency of operation and the
 moving of said plate toward the fulcrum will
 produce less contact pressure and faster oper-
 ation. The screw 71 is provided with a por-
 90 tion of reduced diameter which extends
 through a hole 73 in the knife-edge bracket
 65. The reduced diameter screw portion and
 the bracket 65, therefore, cooperate to limit
 the swinging of the member 60. The screw
 95 71 is provided with a groove 74 for receiving
 a split ring 75 which is adapted to engage the
 bracket 65 and limit the unscrewing of the
 screw 71 out of the member 60 so that the
 member 60 will not be separated from the
 100 knife-edge support 65 when the screw 71 is
 turned to permit adjusting the plate 69.

The vibratory member 60 carries the con-
 tact 80 which cooperates with the contact 81
 to control the circuit of the magnet coil 45.
 105 The contact 81 is attached to a leaf spring
 conductor 82 which with the stop member 83
 is attached by rivets 84 to a non-conducting
 plate 85 which in turn is secured by rivets 86
 to a bracket 87 secured by rivets 87^a to the
 110 pole 36 of the magnet frame. The stop mem-
 ber 83 is provided with a hook 88 to which is
 attached a wire 89 connected with one end of
 the magnet coil 45. The other end of the
 magnet coil is connected with a terminal bolt
 115 90 which is insulatingly supported by the
 bracket 32. The plate 69 is adjusted along
 the vibratory member 60 so that springs 66
 tend to urge the contacts 80 and 81 into en-
 gagement and the member 60 away from the
 120 poles 35 and 36. To separate contact 80 from
 the contact 81, the magnet 45 is connected
 with the source of current by a switch 91
 which connects a battery 92 with the termi-
 125 nal 90. The circuit to the magnet coil is
 completed through the contacts 80 and 81 and
 by ground connection indicated at 93 and 94
 between the bracket 32 and the battery 92.
 As soon as the coil 45 is energized the piston
 42 will be attracted toward the core 23 and 130

the member 60 will be attracted toward the poles 36 and 35, in order to open the contacts 80 and 81. After contacts 80 and 81 are separated causing de-energization of coil 45 spring 43 will return the piston 42 to upper position and springs 66 will return the member 60 to the position for closing contacts 80 and 81. Then the cycle of operation will be repeated, the frequency of this cycle depending upon the natural frequency of the vibratory member 60. During a portion of the movement of the member 60 toward the poles 35 and 36, the engagement between the contacts 80 and 81 is maintained, therefore, there will be a slight sliding of the contact 81 upon the contact 80 before separation takes place, and again after engagement is resumed. In this way the contact surfaces are maintained relatively clean so that sticking of the contacts will not take place.

The pipe coupling 39 is threaded to receive a nut 95 which retains in position an inverted cup-shaped cover 96 resting upon the platform. A gasket 97 is located between the nut 95 and the coupling 39. One portion of the rim of the cover 96 engages the portion 34^a which is formed from the frame 34 to receive the screw 37. Opposite to the portion 34^a the rim of the cover 96 is secured to a lug 197 which extends through a hole 98 in the bracket 32.

Instead of the nut 95, the coupling 39 is adapted to receive a nut 100 shown in Fig. 6, which is attached to a plate 101 to which one end of a metal bellows 102 is secured. The opposite end of the bellows is secured to a plate 103 connected with a pipe coupling 104 adapted to receive a nipple 104^a secured to a pipe 104^b which leads to the carburetor, not shown. The bellows 102 will expand as the pressure of the liquid therein increases, in order to operate a device for rendering the pump inoperative when the pressure in the bellows 102 exceeds a certain amount. In order to permit movement of the bellows 102 the pipe 104^b which is adapted to be connected with the coupling 104 should be flexible. The mechanism operated by the bellows 102 includes bifurcated levers 105 and 106, having yokes 107 and 108, respectively, and pivotally supported by rods 109 and 110, respectively, which are carried by ears 111 and 112, respectively, provided by a bracket 113 which is attached by rivets 114 to the pole 35 of magnet frame 34. A spring 115 is located between the yoke 107 of lever 105 and the bracket 113, and normally maintains screws 116 carried by lever 105 in engagement with the plate 103. Screws 116 are threaded through the lever 105 and are maintained in adjusted position by lock nuts 117. Lever 105 is connected by springs 118 with studs 119 carried by the lever 106. When the pressure within the bellows 102 is normal, the plate 103 will be located substantially as

shown in Figs. 6 and 7, and the center lines of the springs 118 will be located to the left of the axis of the rod 110. Therefore, the springs 118 will tend to move the lever 106 clockwise so that the stop 120 provided by the lever 106 will engage the bracket 113. When the lever 106 is in this position, the screws 121 carried thereby will be maintained out of engagement with the vibratory member 60. The screws 121 are threaded through the lever 106 and are maintained in the desired position of adjustment by lock nuts 122.

If the pressure in the bellows 102 should exceed a certain amount the plate 103 will exert pressure upon the screws 116 in order to move the lever 105 counterclockwise to shift the center lines of the springs 118 to the right of the axis of the rod 110. This will cause the lever 106 to move counterclockwise so that the screws 121 will be moved into engagement with the vibratory member 60 to maintain the contact 80 out of engagement with the contact 81. When the pressure in the bellows 102 falls below a certain amount, the spring 115 will be released to restore the lever 105 to the position shown in the drawing. This movement of lever 105 will cause the springs 118 to be shifted so as to move the lever 106 and the screw 121 out of contact with the vibratory member 60, so that the operation of the pump may be resumed. In this manner the delivery of liquid from the pump is controlled by the pressure of the liquid in the duct connected with the outlet of the pump. This feature is advantageous especially where the apparatus is used to pump gasoline from a tank to the float chamber of the carburetor. When the fuel in the carburetor exceeds a certain level, the float valve of the carburetor will stop the flow of fuel thereto. Therefore, the pressure of the fuel in the bellows 102 will increase until the bellows expands sufficiently to cause the screws 121 to engage the vibratory member 60, stopping the pump as described. As fuel in the carburetor bowl is consumed, the float valve will open to connect the pump and carburetor bowl, and the pressure of the liquid in the bellows 102 will diminish to permit the pump to operate again.

Figs. 6, 7 and 8 show a modified form of mounting the vibratory member 60. A bracket 130 is attached by rivets 131 to the frame 34 and is provided with a knife-edge fulcrum 132 received by the notch 63 of the member 60. Two pins 133 pass loosely through openings in the bracket 130 and the member 60, and carry cotter pins 134 which retain in position washers 135. Springs 136 are located between the washers 135, and a bar 137 which is attached to the member 60, said bar 137 being provided with openings 204 for receiving the pins 133. The openings in the member 60 through which pins 133 pass are

numbered 203 in Fig. 8. Both openings 202 and 203 are in alignment and are of considerably larger transverse dimension than the pins 133.

In order to vary the pressure of the contact 80 upon the contact 81, the springs 136 are so constructed that the ends 201 and 202 thereof are located substantially on the same side of the axial center of the spring. When it is desired to cause the contact 80 to engage the contact 81 with a greater pressure, the springs 136 are rotated relative to the washers 135 and the bar 137 so that the ends of the spring 136 are located a greater distance below the center line 200 of the pivot formed by the notch 63 and knife-edge 132. In Fig. 8, one of the springs 136 is shown adjusted to the position in which it will exert the greatest turning force on the bar 137. Here the ends of the spring are located a distance below the center line of pivot, equal to half the diameter of the spring. If the spring is rotated so that its ends would lie on the line 200 then the force of the spring to turn the member 60 about the pivot or knife-edge would be substantially nil. If the spring ends are adjusted to lie above the line 200 then the springs would exert a force to move the number 60 in a clockwise direction about the pivot and thus hold open the contacts 80 and 81. Consequently it may be seen that the spring ends 201 and 202 must lie beneath the center line 200 to effect operation of the member 60 to close the contacts.

Instead of being a part of the member 83, the clip 88 is made a part of a member 138 which, with the members 82 and 83, is attached by rivets 139 to a non-conducting block 140. The block 140 is attached by rivets 141 to a bracket 142, which is attached to the pole 36 of the magnet frame 34.

While the forms of embodiment of the invention as herein disclosed, constitute preferred forms, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. An electric pump comprising, in combination, a fluid-receiving chamber, means for displacing fluid therefrom, an electro-magnet for operating said means and having a magnetic circuit including a magnet frame having spaced poles, a magnetizable member mounted to vibrate between said poles, a switch for controlling the magnet circuit and having contacts separated by movement of said vibratory member toward said poles, a spring connected with the vibratory member and tending to maintain it in position for closing the contacts, and means for holding the spring in various positions of adjustment which shift its center line of action with respect to the fulcrum of said vibratory member.

2. An electric pump comprising, in com-

bination, a fluid-receiving chamber, means for displacing fluid therefrom, an electro-magnet for operating said means and having a magnetic circuit including a magnet frame having spaced poles, a magnetizable member mounted to vibrate between said poles, a switch for controlling the magnet circuit and having contacts separated by movement of said vibratory member toward said poles, a knife-edge fulcrum for said vibratory member, a spring for maintaining the member upon its fulcrum, and means for holding the spring in various positions of adjustment which shift its center line of action with respect to the fulcrum of said vibratory member.

3. An electric pump comprising, in combination, a fluid displacement member; an expansible outlet chamber; an electro-magnet for operating said displacement member; a circuit interrupter for controlling the operation of the electro-magnet; and means adapted to be operated by the expansion of the outlet chamber in response to increasing pressure therein for rendering the circuit interrupter inoperative.

4. An electric pump comprising, in combination, a fluid inlet chamber; an expansible fluid outlet chamber; means for lifting fluid from the inlet chamber and delivering it under pressure to the outlet chamber; an electro-magnet for operating said means; a circuit interrupter having a vibratory magnetizable member included in the magnetic circuit of the electro-magnet, and operated by said electro-magnet intermittently to disconnect said magnet from a current source; and means adapted to be moved into engagement with the vibratory member by the expanding movement of the inlet chamber in response to increased fluid pressure therein, for rendering said vibratory member inoperative.

5. An electric pump comprising, in combination, a fluid-receiving chamber, means for displacing fluid therefrom, an electro-magnet for operating said means and having a magnetic circuit including a magnet frame having spaced poles, a magnetizable member mounted to vibrate between said poles, a switch for controlling the magnet circuit and having contacts separated by movement of said vibratory member toward said poles, a spring connected with the vibratory member and tending to maintain it in position for closing the contacts, a plate adjustably secured to the vibratory member, providing means for securing the spring to said member and adapted to be moved into various positions of adjustment whereby the center line of spring action is shifted with respect to the fulcrum of said vibratory member, and a screw for securing the adjustable plate to the vibratory member, said screw having an extending portion which cooper-

ates with the mounting of the vibratory member to limit the movement of, and substantially prevent the removal of said member.

6. An electric pump comprising, in combination, a fluid-receiving member, means for displacing fluid therefrom, an electromagnet for operating said means and having a magnetic circuit including a magnet frame having spaced poles, a magnetizable member mounted to vibrate between said poles, a switch for controlling the magnet circuit and having contacts separated by movement of said vibratory member toward said poles, a bracket carried by the magnet frame and providing a knife-edge fulcrum for said vibratory member, a spring for maintaining the member upon its fulcrum and normally in circuit closing position; a plate adjustably secured to said vibratory member and providing an anchorage for the spring, said plate being adjustable into different positions to shift the center line of spring action with respect to the fulcrum of the vibratory member; and a screw for holding said plate in adjusted position upon the said member, said screw having its shank portion extending through an aperture in the bracket and cooperating therewith to limit the movement of said vibratory member.

7. An electric pump comprising in combination, a fluid displacement member, an expansible outlet chamber, an electromagnet for operating said displacement member, circuit interrupting means for controlling the operation of the electromagnet, and means outside the outlet chamber adapted to be operated by said outlet chamber when it is expanded in response to increasing pressures within said chamber for rendering the circuit interrupting means inoperative.

8. An electric pump comprising in combination, a fluid displacement member, an expansible fluid receiving chamber, an electromagnet for operating the displacement member, a vibratory circuit interrupter for controlling the operation of the electromagnet, and means without the fluid receiving chamber, adapted to be engaged by said fluid receiving chamber and moved into engagement with the vibratory circuit interrupter to render it ineffective when the fluid receiving chamber has been expanded in response to increasing fluid pressures therein.

9. An electric pump comprising in combination, a fluid displacement member, an electromagnet for operating said member, means for controlling the operation of the electromagnet, an expansible fluid receiving chamber, and means without said chamber adapted to be moved into engagement with the electromagnet controlling means by the expansion of the receiving chamber in response to increasing pressures therein to render the electromagnet inoperative.

10. An electric pump comprising in com-

bination, a fluid displacement member, an electromagnet for operating said member, a vibratory circuit interrupter for controlling the operation of the electromagnet, a fluid receiving chamber having a portion movable by fluid pressure within said chamber, and means adapted to be engaged by the movable portion of the fluid receiving chamber and moved into engagement with the vibratory means to render it ineffective when the fluid chamber within said receiving chamber attains a proper value.

In testimony whereof we hereto affix our signatures.

WILLIAM A. CHRYST.
HERBERT C. WALTERS.