No. 693,542. Patented Feb. 18, 1902.

J. H. FOX & C. M. LOWTHER.

AUTOMATIC SHUT-OFF FOR ELECTRIC PUMPS.

(Application filed Dec. 4, 1901.)

(No Model.) 2 Sheets—Sheet 1.

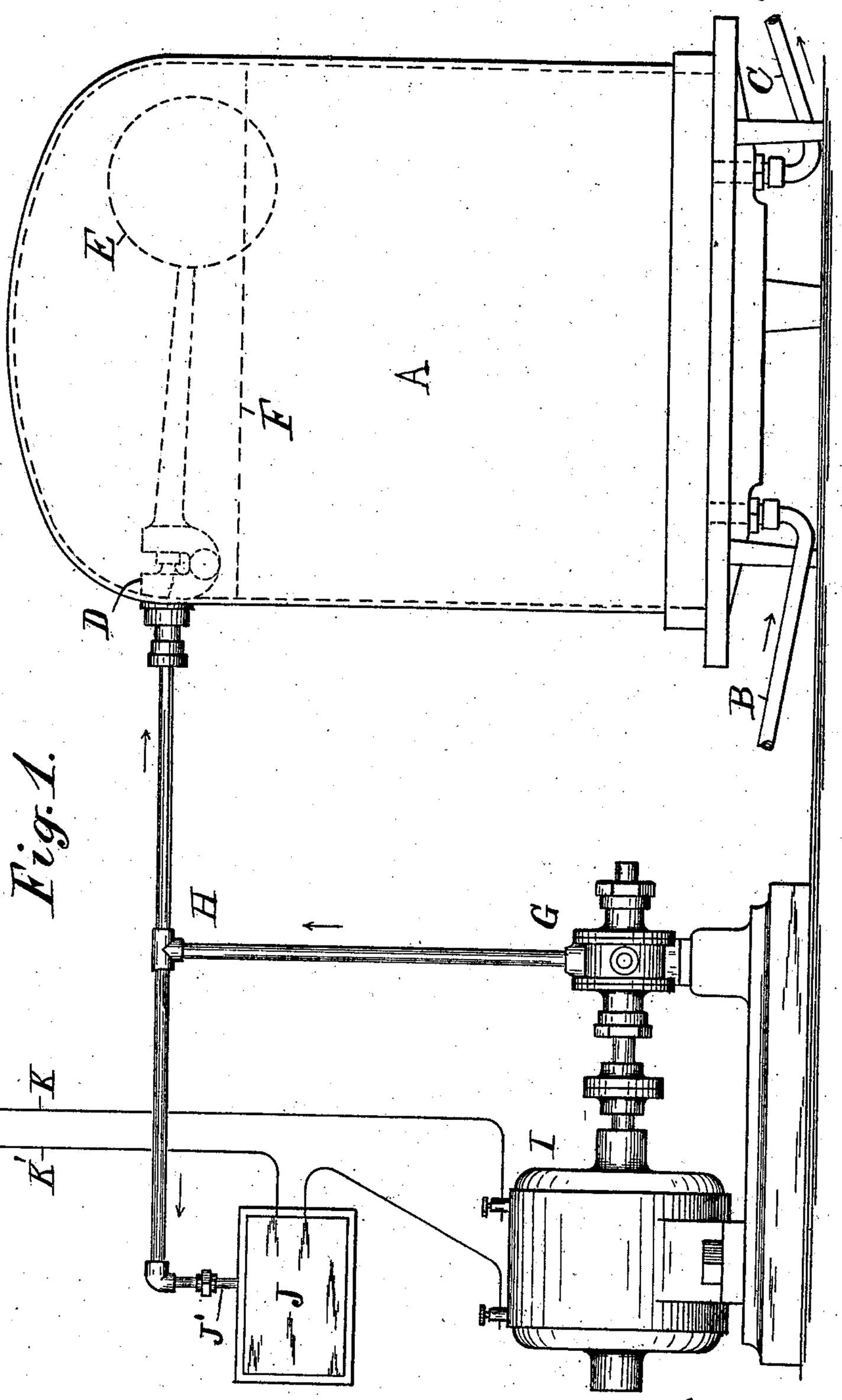

Fig. 1.

Attest:
L. Lee.
Walter H. Talmage.

Inventors:
John H. Fox,
Christopher M. Lowther
per Thomas S. Crane, Atty

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Fig. 2.

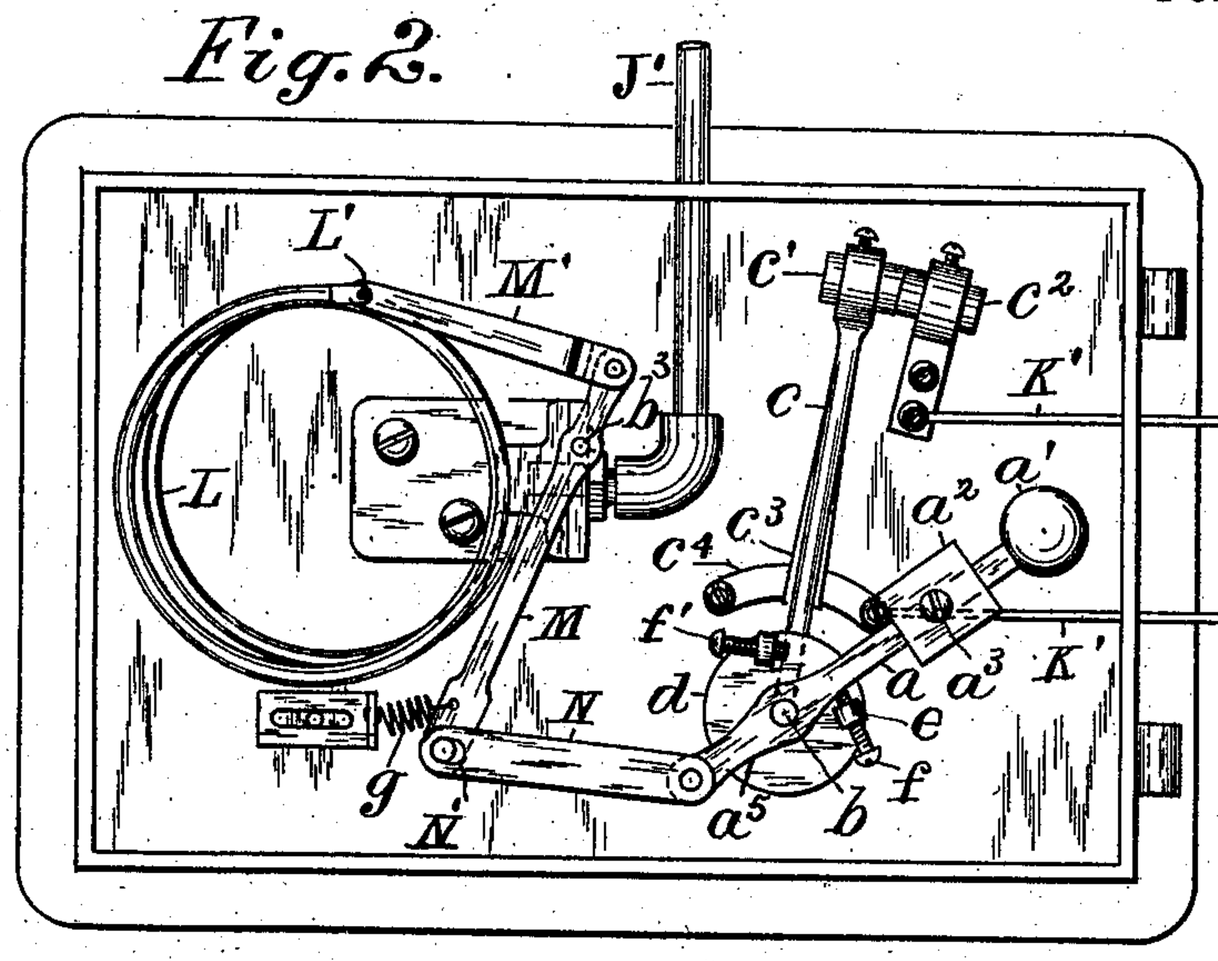
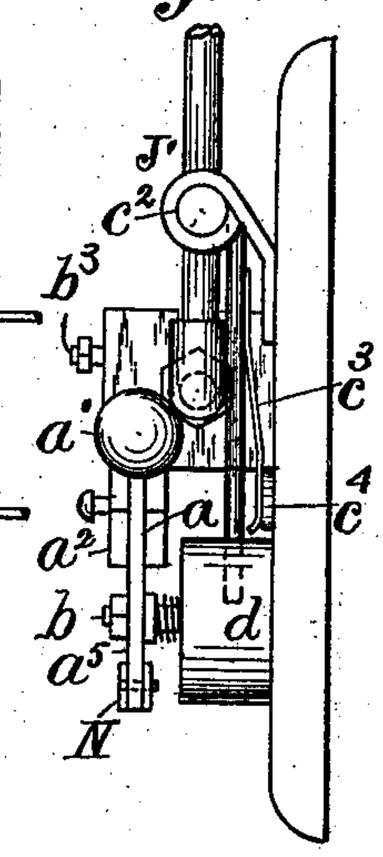


Fig. 3.



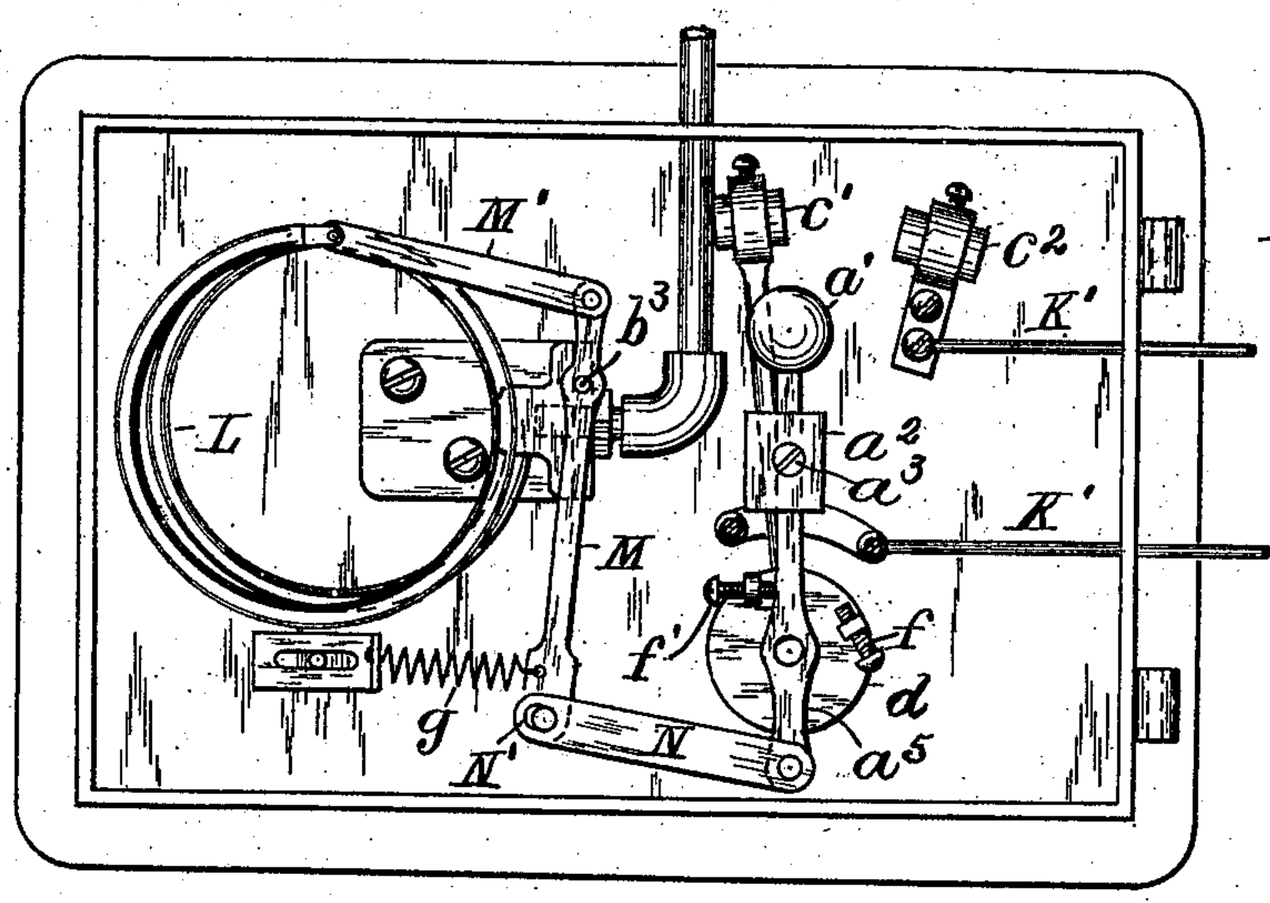


Fig. 4.

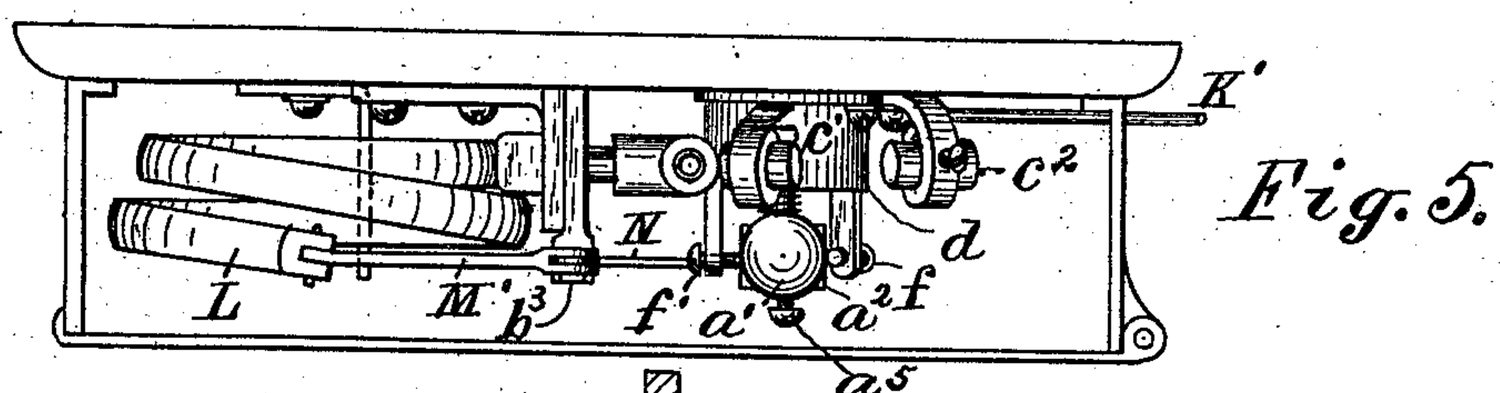


Fig. 5.

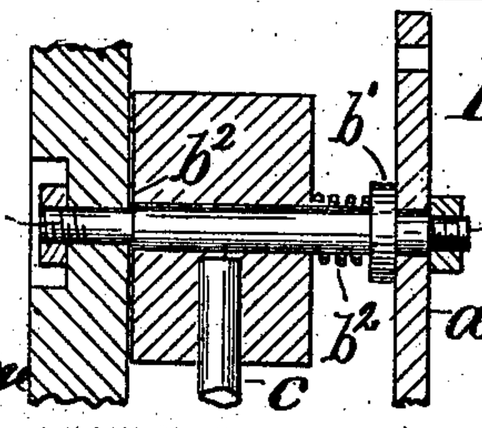


Fig. 6.

Attest:
L. Lee.
Walter H. Talbuzy

Inventors.
John H. Fox
Christopher M. Lowther
per Thos. S. Crane, Atty.

UNITED STATES PATENT OFFICE.

JOHN H. FOX AND CHRISTOPHER M. LOWTHER, OF NEW YORK, N. Y.

AUTOMATIC SHUT-OFF FOR ELECTRIC PUMPS.

SPECIFICATION forming part of Letters Patent No. 693,542, dated February 18, 1902.

Application filed December 4, 1901. Serial No. 84,603. (No model.)

To all whom it may concern:

Be it known that we, JOHN H. FOX, residing at 234 East Thirty-third street, and CHRISTOPHER M. LOWTHER, residing at 36 Riverside Drive, New York, county and State of New York, citizens of the United States, have invented certain new and useful Improvements in Automatic Shut-Offs for Electric Pumps, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of the present invention is to furnish an effective and economical means of cutting off the current from an electric pump when a sufficient pressure has been generated by the movements of the motor attached to the pump.

In the present invention the regulator comprises a tubular coil connected with the pressure-pipe of the pump, a switch-lever, a weighted arm with dogs to actuate such lever, and connections from the tubular coil to such weighted arm to actuate the latter. The expansion of the tubular coil when the maximum pressure is reached operates to raise the weighted lever and after a sufficient movement has been produced to cause one of the dogs to shift the switch-lever. A weight is fixed adjustably upon the weighted arm, and the adjustment of such weight and of screws inserted in the dogs permits the movement to be regulated so as to open the switch at various pressures.

The invention is illustrated in connection with a carbonator in which water and gas are pumped into a receiver under pressure; but the invention may be used in connection with any other application of the pressure-pump when propelled by an electric motor.

In the drawings, Figure 1 is a diagram showing an electric pump connected with a carbonator and with the regulator. Fig. 2 is a front view of the regulator with the cover removed and showing the switch closed. Fig. 3 is an end view of the regulator with the end casing broken away. Fig. 4 is a front view of the regulator with the cover removed and the switch shown open. Fig. 5 is a plan of the regulator with the cover removed, and Fig. 6 is a section of the insulated support for the switch-lever and the hub of the weighted arm.

In Fig. 1, A designates a carbonator having gas-inlet pipe B, which in practice is supplied with gas under pressure, and with pipe C, from which the carbonated liquid is drawn. An inlet-valve D is shown with the ball-float E attached thereto to close the valve when the water reaches the desired level F. The valve D is connected with a pump G by a pressure-pipe H, and the pump is represented as connected with a motor I. The regulator is designated J and has an inlet-pipe J′ connected with a branch of the pipe H to receive the same pressure as the valve D, and therefore receives the same pressure as the carbonator-tank when the valve D is open. The circuit-wire K is shown connected to one of two binding-posts upon the motor, and the other circuit-wire K′ is shown extended through the regulator and connected to the other binding-post. In the regulator as shown in the other figures the pipe J′ is connected to the inlet of a tubular coil L, the opposite end of the coil being closed and connected by pivot L′ with a link M′, jointed to the short arm of a multiplying-lever M. The lever M is pivoted at b^3 and connected by link N with an extension a^5 of the weighted arm a, which is shown pivoted upon the top of a stationary stud b. The switch-lever c is shown attached to an insulating-hub d, fitted to turn freely upon such stud. The switch-arm carries a contact-block c', which moves when the lever is vibrated to and from the stationary contact-block c^2 in connection with one part of the circuit-wire K′. A spring c^3 upon the switch-lever bears upon a segment c^4, which is connected with the other part of the circuit-wire K′. Fig. 2 represents the circuit closed by the contact of the blocks c' and c^2. The insulating-hub is provided with lugs e, having set-screws f f', which form adjustable dogs to contact with opposite sides of the weighted arm a. The arm a forms a lever with fulcrum between its ends and is supported upon a collar b' upon the stud b, and a spring b^2 is inserted underneath the collar to press the hub d lightly upon a washer b^2 beneath the hub, (see Fig. 6,) thus creating a light frictional resistance to the movement of the switch-lever. The arm is shown with a fixed weight a' upon the end and with a weight a^2 secured adjustably upon the arm by set-screw a^3, so that it may be shifted to

vary the action of the arm. A spring *g* is attached to the arm M to resist very lightly the pull of the link M′ when the tubular coil is expanded by pressure.

Fig. 4 shows the coil expanded, the spring *g* extended, and the switch-lever forced over by the movement of the weighted arm, thus breaking the connection of the contacts *c′* and *c²*. Considerable play is provided between the points of the dogs or set-screws *f f′* and the weighted arm, so that the gradual expansion of the tubular coil during the increase of pressure produces no effect upon the switch-arm until the prescribed pressure is reached, when the adjustment of the parts brings the arm into contact with the dog *f′* and moves the switch-lever to open the circuit. Conversely, the weighted arm is moved a certain space when the pressure in the tubular coil diminishes before it strikes the dog *f* and shifts the switch-lever to again close the circuit, and the dogs can be so adjusted as to regulate the range of pressure through which the tubular coil operates in opening and closing the switch.

It will be observed by reference to Fig. 2 that the weighted arm lies normally at one side of its pivot, so that the weights *a′* and *a²* resist the expanding movement of the tubular coil; but when the weighted arm has opened the switch the arm stands above the pivot, so as to remain normally in that position. The extension *a⁵* of the weighted arm, to which the link N is attached, is much shorter than the arm which carries the weights, and this, in conjunction with the proportions of the multiplying-lever M, enables the weights to offer a resistance to the coil L which is very much greater than the weights themselves.

We will describe the operation of the apparatus in conjunction with the carbonator and assume that the carbonator is constantly supplied with gas of a pressure of one hundred and fifty pounds per square inch and that it is desired to pump the water into the carbonator-tank to the level F, which operates to close the valve D. The increased pressure in the pipes H then expands the tubular coil L and opens the electric circuit by shifting the switch-arm *c*, which immediately breaks the circuit and stops the motor I, attached to the pump. Under these conditions the weight *a²* would be adjusted upon the weighted arm to permit the movement of the arm and close the switch again when the pressure in the coil L fell to one hundred and fifty-five or one hundred and sixty pounds per square inch, as such pressure is necessary in practice to overcome the resistance of the fluid in the pipes and the one hundred and fifty pounds pressure of the gas in the carbonator. The pump again starts when the water falls in the carbonator below the level F, so as to open the valve D, which relieves the pipe H of any pressure below one hundred and fifty-five pounds and permits the tubular coil to contract, and such contraction reverses the movement of the weighted arm *a* and restores it to its initial position, (shown in Fig. 2,) thus closing the switch and renewing the movement of the motor and pump. It is obvious that the whole action of the regulator is produced by the increase or variations of pressure in the tubular coil L, and it may therefore be used not only with the carbonator shown in the drawings, but with any other device in which it is desired to regulate the flow of the liquid from the pump.

In the illustration shown the increased pressure in the pressure-pipe of the pump is produced by the closing of the carbonator-valve D; but in other kinds of apparatus the increased pressure may result from a variety of causes, but would in any case operate the same as described herein to expand the coil L and cause the opening of the switch to stop the pump-motor.

In Fig. 1 of the drawings a rotary pump is shown connected with an electric motor I; but it is more common to use a reciprocating pump to generate any considerable pressure, and such a pump causes pulsations of pressure in the pipe J′ and produces vibrations of the tubular coil L. Such vibrations are prevented from having any effect upon the weighted arm by providing a small amount of lost motion in the connections from the coil to such arm.

The link N is shown in Figs. 2 and 3 provided with a slot N′ a little larger than the bolt or pin which connects it with the lever M, and such slot permits the lever M to vibrate slightly under any pulsations of pressure in the coil L without imparting such vibrations or pulsations to the weighted arm *a*. When the coil is expanded sufficiently to move the weighted arm, as shown in Fig. 4, the pin moves to the inner end of the slot when pressing the arm around against the dog *f′*.

From the above description it will be seen that the operation of the apparatus is positive, while the construction is simple and not liable to derangement.

Having thus set forth the nature of the invention, what is claimed herein is—

1. In an electric-pump regulator, the combination, with a tubular coil connected with the pressure-pipe of the pump, of a pivoted switch-lever, a weighted arm adapted to move such switch-lever, and connections from the tubular coil to such weighted arm to oscillate it at a given pressure.

2. In an electric-pump regulator, the combination, with a switch-lever movable freely upon a pivot with a weighted arm jointed to such pivot, and dogs to convey the movement of the arm to the switch-lever, of a tubular coil having its inlet connected with the pressure-pipe of the pump, and having its extremity connected with an extension of the weighted arm to actuate the same, substantially as herein set forth.

3. In an electric-pump regulator, the combination, with a switch-lever movable freely

upon a pivot with a weighted arm jointed to such pivot, and dogs to convey the movement of the arm to the switch-lever, of a tubular coil having its inlet connected with the pressure-pipe of the pump, a multiplying-lever having its short arm linked to the free end of the tubular coil, and its long end linked to a short extension of the weighted arm, whereby the expansion of the coil operates to shift the switch-lever.

4. In an electric-pump regulator, the combination, with a switch-lever having an insulating-hub, of a stud to support such hub movably, the plate c^4 connected with the circuit-wire, the spring c^3 upon the switch-lever to bear on such plate, adjustable dogs upon the hub, the weighted arm *a* pivoted upon the stud to strike against the dogs, the tubular coil L having its inlet connected with the pressure-pipe of the pump, and connections from the free end of the coil to the weighted arm to oscillate the same for moving the switch-lever.

5. In an electric-pump regulator, the combination, with a switch-lever movable freely upon a pivot with a weighted arm jointed to such pivot, and dogs to convey the movement of the arm to the switch-lever, of a tubular coil having its inlet connected with the pressure-pipe of the pump, a multiplying-lever having its short arm linked to the free end of the tubular coil and its long arm linked to a short extension of the weighted arm, and the spring *g* extended by the expansion of the coil and operating upon the multiplying-lever to reverse the movement of the weighted arm when the tubular coil contracts.

6. In an electric-pump regulator, the combination, with a tubular coil connected with the pressure-pipe of the pump, of a pivoted switch-lever, a weighted arm adapted to move such switch-lever, and connections from the tubular coil to such weighted arm to oscillate it at a given pressure, such connections affording a small lost motion to compensate for pulsations of the pumping device and corresponding vibrations of the tubular coil.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

JOHN H. FOX.
CHRISTOPHER M. LOWTHER.

Witnesses:
L. LEE,
THOMAS S. CRANE.