

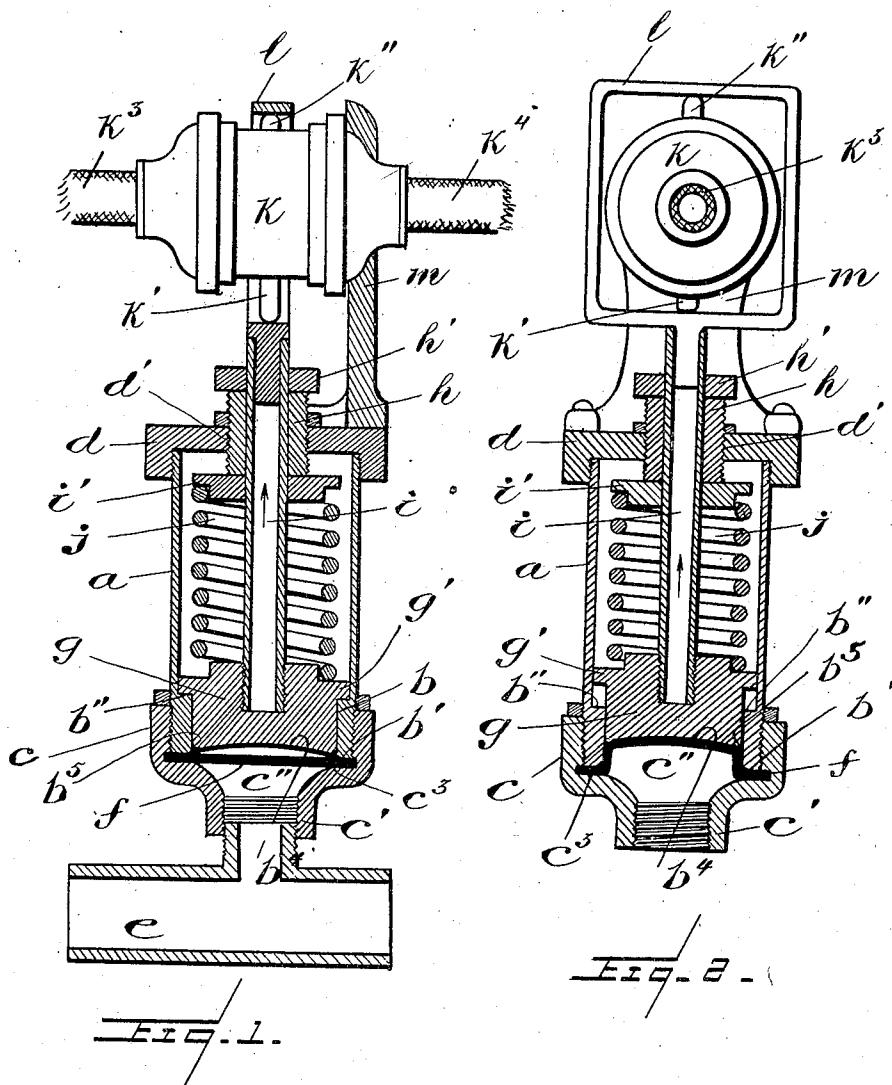
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PRESSURE REGULATING MEANS FOR ELECTRICALLY OPERATED APPARATUS

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PRESSURE-REGULATING MEANS FOR ELECTRICALLY-OPERATED APPARATUS.

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To all whom it may concern:

Be it known that I, MARTIN JOSEPH QUINN, of the city of Toronto, in the county of York and Province of Ontario, Dominion
5 of Canada, have invented certain new and useful Improvements in Pressure-Regulating Means for Electrically-Operated Apparatus; and I hereby declare the following to be a full, clear, and exact description of the
10 same.

This invention relates to a pressure regulating means for electrically operated pumping and other apparatus in which the fluid agent is subject to variations of pressure, the object of the invention being to sensitively and positively control the circuit of the current as the pressure of the fluid agent rises or falls to predetermined limits, this object being attained by a peculiarly
15 constructed pressure actuated motor which respectively opens and closes the switch controlling the circuit of the current, when the pressure of the fluid agent rises or falls to that for which the motor is set.

25 In the drawings:

Fig. 1, is a sectional elevational view of a preferred type of apparatus, by which the foregoing object may be attained, with the parts in their low pressure position, and
30 Fig. 2, is a similar view taken at right angles to Fig. 1, with the parts in their high pressure position.

Like characters of reference refer to like parts throughout the specification and drawings.
35 In carrying out the invention the pressure regulating apparatus must positively and sensitively act and react during the changes of pressure of the fluid agent, and it is therefore necessary that its motive parts should be so constructed as to enable it to correctly perform these functions.

In the preferred type of apparatus is a pressure actuated motor, consisting of a
45 cylindrical wall *a*, having an internal annular enlargement *b* extending to one and thereof.

The external surface of the cylindrical wall is screwthreaded near each end to receive the internally threaded caps *c* and *d*, which when assembled with the cylindrical wall constitute the housing of the motor. The cap *c* is formed with a hollow nipple *c'*, the inner end of which is of a frusto-conical
55 shape to form a pressure chamber *c''* into which the fluid agent enters from the main

or pipe *e* with which the nipple *c'* is connected, and surrounding the pressure chamber is a ledge *c**.

Overlying the pressure chamber *c''* is an elastic diaphragm *f* of corresponding diameter to the inner diameter of the cap *c*.
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The end *b'* of the enlargement *b* is opposed to the ledge *c**, and in conjunction with the cap *c* securely holds the diaphragm in position. The diaphragm is preferably made of pure rubber and of a thickness suitable to the pressure of the fluid agent.
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Axially movable in the housing of the motor is a piston *g* of corresponding cross-sectional shape and dimensions to the bore of the enlargement *b*, and near the upper end of the piston is a surrounding flange *g'* which, when the piston is in its low pressure position, engages the shoulder *b''* at the
70 other end of the enlargement, and arrests the movement of the piston towards the diaphragm.

The length of the piston from the flange *g'* to the piston head *b** is slightly less than that of the enlargement *b* so that when the flange *g'* is seated on the shoulder *b''*, the piston head *b** will not be in contact under pressure with the diaphragm *f* until the latter is distended by the pressure of the fluid agent. The piston head *b** is of a concave shape and the edge *b** is slightly rounded to avoid the cutting of the diaphragm when in contact therewith.
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Centrally formed through the cap *d* is a screw-threaded bore *d'*, and adjustable through the bore *d'* is an externally screw-threaded hollow plug *h* for regulating the pressure at which the motor will operate, the head *h'* of the plug being preferably hexagonal. Fitted to the piston is one end of a piston rod *i* which extends axially through the bore of the plug and beyond the head *h'*. Encircling the piston rod *i* is a washer *i'* and bearing against the washer *i'* and the piston is a coiled spring *j*, normally pressing the piston *g* towards the diaphragm, and resisting its movement therefrom.
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In the operation of the apparatus thus far described, the fluid agent, entering the pressure chamber, distends the diaphragm against the piston head *b** and moves the piston in the direction indicated by arrow in the drawings until the piston has reached the limit of its high pressure position, the piston throughout its travel covering the whole active area of the diaphragm.
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When the pressure of the fluid agent falls the piston moves back to its low pressure position under the influence of the spring and closes the circuit.

5 The diaphragm, being made of elastic rubber, is quickly responsive to changes of pressure, and enables the piston to quickly act and react as the pressure of the fluid agent in the pressure chamber rises and falls, and its whole active surface remains in contact with the piston head throughout its travel, and its free movement is restricted only by the movement of the piston.

10 By this means the difficulties arising from the use of diaphragms not entirely supported throughout their entire area by contact with the piston heads during their entire movement are overcome.

While this pressure actuated motor may be used to open and close any standard or approved type of switch it is in the present case especially adapted for use in connection with a switch k , having two plungers k' , k'' , which respectively open and close the circuit formed by the conductors k^3 , k^4 .

To actuate a switch of this type the piston rod is provided with operating means, shown in the present case to consist of a yoke l connected with the piston rod and encircling the switch k , and plungers k' , k'' .

During the outward movement of the piston rod i with the piston g , the yoke engages the plunger k' and moves it to open the circuit through the switch k , and this movement of the plunger k' positions the plunger k'' to be engaged by the yoke on the return stroke to again close the circuit.

A switch support preferably consisting of an outwardly extending arm m is bolted to the cap d , and to this arm is fixedly attached the switch k . As the type of switch will depend to a large extent on the system with which the pressure regulating apparatus is used it may be necessary to vary the structural arrangement of the support m and the switch operating means, and adapt them to the particular type of switch employed.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a pressure regulating apparatus for electrically operated systems, a pressure actuated motor comprising a housing, a movable piston therein, a piston rod for the piston, a pressure spring normally resisting the movement of the piston and piston rod, a pressure chamber opposed to the piston, an elastic diaphragm whose free movement is restricted only by the movement of the piston, interposed between the piston and pressure chamber, with the whole of its active surface in contact with the piston throughout its travel and out of contact with it when not distended.

2. A pressure regulating apparatus comprising a housing, a movable piston therein, a pressure chamber opposed to the piston, and an elastic diaphragm, whose movement is restricted only by the movement of the piston, interposed between the piston and pressure chamber, with the whole of its active surface in contact with the piston throughout its travel and out of contact with it when not distended.

3. A pressure regulating apparatus comprising a housing, a movable piston therein, a pressure chamber opposed to the piston, and an elastic diaphragm, whose movement is restricted only by the movement of the piston, interposed between the piston and pressure chamber, with the whole of its active surface in contact with the piston throughout its travel and out of contact with it when not distended, a pressure spring resisting the movement of the piston; and an abutment within the housing arresting the movement of the piston towards the diaphragm and maintaining it out of contact with it until the diaphragm is distended.

4. A pressure regulating apparatus comprising a housing, a movable piston therein, a pressure chamber opposed to the piston, and an elastic diaphragm, whose movement is restricted only by the movement of the piston, interposed between the piston and pressure chamber, with the whole of its active surface in contact with the piston throughout its travel and out of contact with it when not distended, the surface of the piston opposed to the diaphragm being concave.

5. A pressure regulating apparatus comprising a housing consisting of a cylindrical wall having an internal annular enlargement extending to one end thereof, caps fitted on the ends of said wall one of which is opposed to said enlargement, an elastic diaphragm interposed between the end of the enlargement and the corresponding cap, and a piston axially movable in the housing of corresponding cross-sectional shape and dimensions to the bore of the enlargement having near its upper end a surrounding flange which when the piston is in its low pressure position, engages the inner end of the enlargement and arrests the movement of the piston towards the diaphragm, said piston overlying the whole active area of the diaphragm with which it contacts during the whole of its movement.

6. A pressure regulating apparatus comprising a housing consisting of a cylindrical wall having an internal annular enlargement extending to one end thereof, caps fitted on the ends of said wall one of which is opposed to said enlargement, an elastic diaphragm interposed between the end of the enlargement and the corresponding cap, and a piston axially movable in the housing,

- of corresponding cross-sectional shape and dimensions to the bore of the enlargement having near its upper end a surrounding flange which, when the piston is in its low pressure position, engages the inner end of the enlargement and arrests the movement of the piston towards the diaphragm, said piston overlying the whole active area of the diaphragm with which it contacts during the whole of its movement, the piston being slightly less in length than the enlargement so that when the diaphragm is not distended under pressure, it will be out of contact with the piston.
7. A pressure regulating apparatus comprising a housing consisting of a cylindrical wall having an internal annular enlargement extending to one end thereof, caps fitted on the ends of said wall one of which is opposed to said enlargement, an elastic diaphragm interposed between the end of the enlargement and the corresponding cap, a piston axially movable in the housing, of corresponding cross-sectional shape and dimensions to the bore of the enlargement having near its upper end a surrounding flange which when the piston is in its low pressure position, engages the inner end of the enlargement and arrests the movement of the piston towards the diaphragm, said piston overlying the whole active area of the diaphragm with which it contacts during the whole of its movement, a piston-rod for the piston extending axially through said housing and a yoke at the outer end of the piston-rod.
- Toronto, Ontario, November 16th, 1920.
- MARTIN JOSEPH QUINN.
- Signed in the presence of—
CHAS. H. RICHES,
I. E. SHERRIFF.