A. C. DURDIN, Jr.

PRESSURE REGULATOR.

APPLICATION FILED SEPT. 14, 1907.

916,957. Patented Mar. 30, 1909.

Fig. 1.

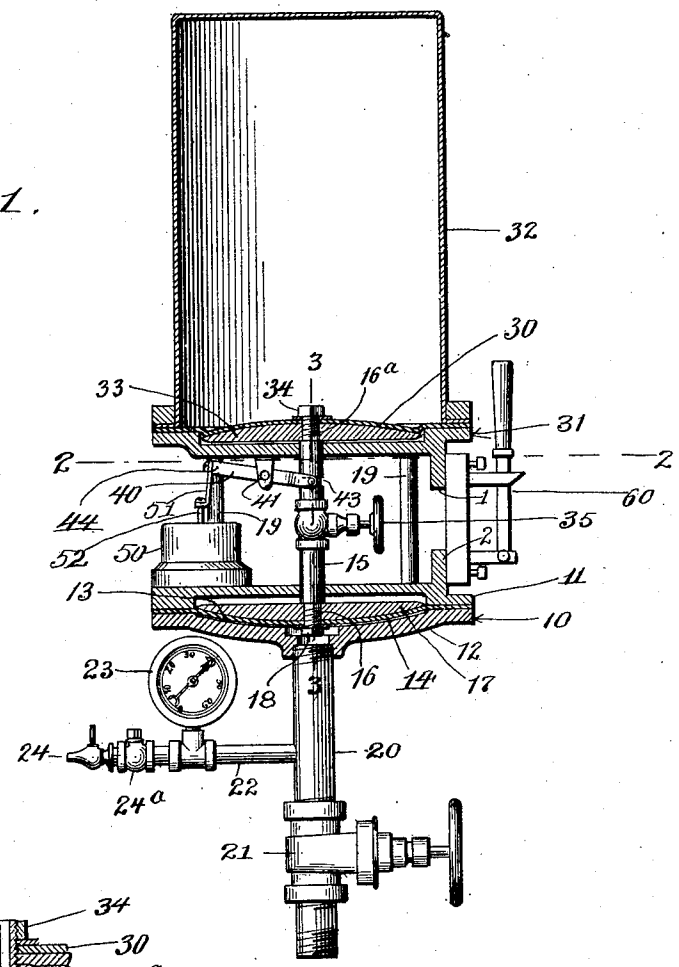
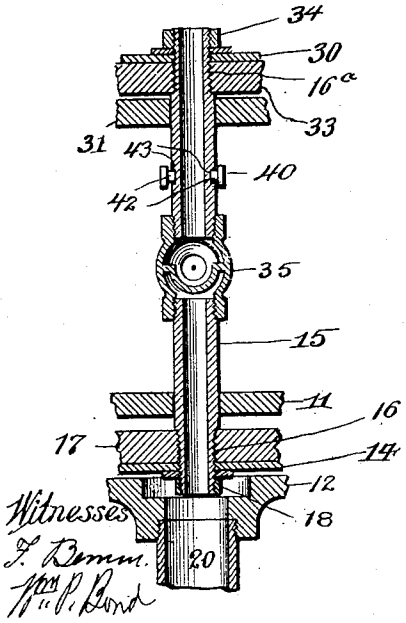
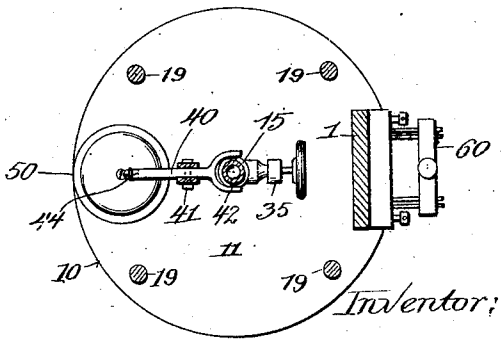


Fig. 3.



Witnesses
F. Bemm.
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Fig. 2



Inventor;
Augustus C. Durdin, Jr.,
by Charles O. Skinner
his Atty.

THE NORRIS PETERS CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

AUGUSTUS C. DURDIN, JR., OF CHICAGO, ILLINOIS, ASSIGNOR OF THIRTY-FIVE ONE-HUNDREDTHS TO MAURICE I. WEIL, OF CHICAGO, ILLINOIS.

PRESSURE-REGULATOR.

No. 916,957. Specification of Letters Patent. Patented March 30, 1909.

Application filed September 14, 1907. Serial No. 392,923.

To all whom it may concern:

Be it known that I, AUGUSTUS C. DURDIN, Jr., a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Pressure-Regulators, of which the following is a specification.

My invention relates to improvements in pressure regulators of that class which are adapted for maintaining a uniform or constant head or pressure in reservoirs or water systems.

The invention relates more particularly to pressure regulators that are interposed between a suitable source of electric supply and the motor which drives the pumps or compressors that supply the reservoir or system with pressure.

One of the objects of this invention is to provide a large range of adjustment in regulators of this type, whereby a more uniform and constant pressure can be maintained regardless of the degree of pressure and by which the pressure can be varied to suit different conditions without any difficulty and without the use of complicated and expensive mechanism.

Other objects and advantages will appear in the course of this specification and the essential features will be more definitely pointed out in the claims.

The invention is clearly illustrated in the drawings furnished herewith in which:

Figure 1 is a central vertical section through an apparatus containing my improvements. Fig. 2 is a horizontal section taken on line 2—2, Fig. 1, and Fig. 3 is a detail vertical section, taken on line 3—3 of Fig. 1.

In the drawings 10 is a diaphragm casing, preferably made of two halves 11, 12 that are connected together in any suitable manner to make a perfectly tight diaphragm chamber 13. This chamber communicates with a fluid pressure reservoir or system, (not shown) by means of a pipe 20, which has interposed therein a valve 21, the object of which will appear later. A charging pipe 22, is screwed into the pipe 20, and communicates with a pressure gage 23. A pet-cock 24, is threaded upon the end of the charging pipe 22, and a valve 24ª is interposed in said pipe. Communication between the diaphragm chamber 13, and pressure gage is thus afforded, as well as between the main pipe 20 and pressure gage 23.

The chamber 13 contains a diaphragm 14, which is exposed on one side to the fluid pressure in the reservoir or system, and said diaphragm is secured upon a reciprocable stem 15, by means of a screw threaded portion 16, of the stem, which passes through the diaphragm 14, and through a diaphragm plate 17, a nut 18 being threaded upon the outer end of the screw threaded portion 16, and bearing upon the diaphragm. The diaphragm 14, is yieldingly held down against the fluid pressure of the reservoir by mechanism connected to the stem 15, and as shown this mechanism comprises a diaphragm 30 that operates within a casing 31, which is secured to the casing 10 by struts 19, or other connecting devices. The casing 31 has a hood 32, above the diaphragm 30, which hood is adapted to act as a pressure chamber for compressed air or other compressible fluid, to resist the action of the reservoir pressure upon the diaphragm 14. The diaphragm 30 is secured upon the upper end of the stem 15, by a screw threaded portion 16ª, which passes through the diaphragm 30, and through a diaphragm plate 33. A nut 34 is threaded upon the end of the extension 16ª, and bears upon the diaphragm to connect it with the stem 15. The stem is preferably in the form of a tube, whereby communication is afforded between the pressure chamber and the charging pipe 22 and a valve 35 is interposed in said stem, whereby said means of communication may be cut off or established at will.

A switch operating lever 40, is pivoted to the casing 31 as at 41, and engages with the stem 15, by means of a pin and groove connection 42, 43, the lever being forked to extend around the stem 15, and the pins engaging the stem through the annular groove 43. Vertical movement of the stem will thus be transmitted into an oscillatory movement of the lever 40. The end 44, of the lever, connects with a snap switch 50, through a link 51, which is attached to the lever 40 and the stem 52 of the snap switch. Any well known form of snap switch may be used and as its construction is not material to this specification it will not be described in detail. As is well known, the switch of this type is not affected by movement of the stem until it has traveled a certain distance,

whereupon the mechanism of the switch operates to shift the stem past a dead center point and simultaneously throw the switch "on" or "off." It is to be understood that when the stem 52 is up, then the switch is closed, and when the stem is down then the switch is open.

For convenience in connecting up the device with a suitable source of electric supply, the snap switch is connected with a knife switch 60, which is secured to lugs 1 and 2 formed on the casings 31 and 10 and the knife switch in turn is interposed between the source of electric supply and the motor that drives the pump. The snap switch is in circuit with the knife switch, and the latter is interposed in the circuit between the generator to the pump motor, in the well known manner.

In operation the pipe 20 is screwed into reservoir, or pipe in the system in which it is desired to maintain a constant pressure, the knife switch connected up with the mains and electric motor which drives the pump that supplies the reservoir or system with fluid under pressure. The valve 21 is closed and the valves 24ª, 35, opened and a force pump connected with the pet-cock 24. Air or other compressible fluid is then pumped into the pressure chamber by means of said force pump, until the gage 23 registers the pressure that it is desired to maintain in the system. The valves 24ª and 35 are then closed and the valve 21 opened. If now there be no pressure in the reservoir or if the pressure is below that in the pressure chamber, the diaphragms will consequently be held down by the compressed fluid in the pressure chamber, 32 and the stem of the snap switch will be held in raised position thereby maintaining the circuit closed; and consequently establishing electrical connection between the source of supply and the pump motor. The motor will continue to drive the pump and consequently increase the pressure in the reservoir or system, until the pressure reaches or rather over-balances the pressure in the pressure chamber, thereby lifting the diaphragms and stem against the action of the pressure within the pressure chamber. The rising of the stem will effect a downward movement of the end 44 of the lever 40, thus depressing the stem of the snap switch until at the critical moment the switch will be thrown "off" and the motor disconnected from the generator. The moment the pressure in the pipe 20 falls below that in the pressure chamber, the reverse operation takes place and the switch is thrown "on" and the circuit to the motor again closed. In this manner a constant pressure can be automatically maintained in the system, and the personal service of an attendant is thereby avoided. If the fluid, whose pressure is to be regulated, is composed of air or other like compressible fluid, then the valve 21 can be opened to charge the pressure chamber, the valve 35, being allowed to remain open until the predetermined pressure is indicated on the dial of the gage, whereupon the valve 35 is then closed. If it is desired that the regulator shall operate at a lower pressure than the valves 24, 24ª, 35 are opened and enough air allowed to escape to reduce the pressure to the desired amount, conversely if it is desired to have the regulator operate at a higher degree of pressure, the force pump is used to raise the pressure within the pressure chamber to the desired degree.

In my experiments with pressure regulators of this type, I have discovered that it is a most difficult undertaking when using a spring for operating the diaphragm, to provide any adjusting means which is delicate enough to obtain any fine adjustment and at the same time have any considerable range of adjustment. For instance, a spring which might operate at from 10 to 40 lbs. could not be used to operate the diaphragm when 100 and 150 lbs. pressure was used; nor could such a device be adjusted to operate with any degree of certainty at the lbs. pressure desired. Furthermore when a low pressure spring was employed, and it was found necessary to use high pressure then it became necessary to compress the spring to such an extent that it frequently set the spring. By the use of a fluid pressure operated diaphragm or plunger, I am enabled to obtain a great range of adjustment, by merely increasing or decreasing the fluid pressure in the pressure chamber, and this pressure can be regulated to a nicety so that the device will operate with perfect regularity.

While I have shown and described only the preferred form of construction, it is to be understood that various alterations and modifications are possible without departing from the spirit of my invention and I do not desire, therefore, to limit myself to the specific form except as defined by the claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a device of the class described, the combination of two diaphragm casings having diaphragms therein of substantially equal working surfaces, one of said diaphragms being constantly exposed in one of said casings to a suitable source of generated fluid pressure, and operated in one direction thereby, and the other diaphragm being exposed in the other of said casings to a constant regulating fluid pressure which alone is sufficient to over-balance the generated fluid pressure up to a predetermined point, means for supplying any desired degree of constant regulating fluid pressure in the casing over the

second named diaphragm, a rigid connection between said diaphragms for causing them to move in unison, and a switch, operated by the movement of said diaphragms.

2. In a device of the class described the combination of two pressure controlled diaphragms, a connection between them having a controllable passage-way and a switch mechanism operable by the movement of said diaphragms.

3. In a device of the class described, the combination of a chamber having a diaphragm exposed on one side to the generated fluid pressure, a fluid pressure chamber on the opposite side of said diaphragm, the fluid pressure of which is regulatable, independent of the generated fluid pressure, a diaphragm in said regulatable fluid pressure chamber, a tubular connection between said diaphragms having a valve therein, and motor controlling mechanism operated by the movement of said diaphragms.

4. In a device of the class described, the combination of two chambers having opposing, fluid pressure operated diaphragms, means for regulating the fluid pressure upon one diaphragm independent of the pressure upon the other, a stem between said diaphragms containing a controllable passage-way between said chambers, and a switch operating lever.

5. In a device of the class described, the combination of two opposing pressure operated diaphragms, a tubular stem, a valve in said stem, and a switch operating lever.

6. In a device of the class described, the combination of a diaphragm, a diaphragm chamber, a charging pipe communicating with said chamber, a pressure chamber, a diaphragm in said pressure chamber, a hollow stem connecting said diaphragms, a valve in said stem and a switch mechanism operated by movement of said stem.

7. In a device of the class described, the combination of a diaphragm exposed on one side to the generated fluid pressure, an opposing diaphragm connected to move with the first named diaphragm, a pressure chamber for said second named diaphragm, containing a fluid pressure which alone is sufficient to overcome the generated fluid pressure up to a certain predetermined point, a pipe for charging said pressure chamber containing an independent section which forms the connection between the diaphragms and opens out through said diaphragms, a valve in said independent section, a switch and connections between said switch and diaphragms for actuating said switch.

8. In a device of the class described, the combination of a diaphragm exposed on one side to the generated fluid pressure, a chamber for said diaphragm, an opposing diaphragm connected to move with the first named diaphragm, the connection between said diaphragms having a controllable passageway opening out through said diaphragms, a pressure chamber for said second named diaphragm, the pressure of which is regulatable independent of the generated fluid pressure, and a switch operated by the movement of the diaphragms.

9. In a device of the class described, the combination of a movable member, exposed on one side to the generated fluid pressure, a second movable member, a rigid connection between said movable members containing a controllable passageway, a fluid pressure chamber in which the second member operates, and a switch mechanism operable by said connection.

10. In a device of the class described, the combination of a chamber containing a movable member exposed on one side to the generated fluid pressure, a fluid pressure chamber upon the other side of said movable member whose pressure is arranged to resist movement of the member in one direction until said pressure is overbalanced by the generated fluid pressure, a charging pipe containing a pressure gage, a controllable passageway between said chambers extending through said movable member, and a switch mechanism operable by said movable member.

In witness whereof I have executed the above application for Letters Patent at Chicago, county of Cook, and State of Illinois, this 5th day of September 1907.

AUGUSTUS C. DURDIN, JR.

Witnesses:
MAURICE I. WEIL,
CHARLES O. SHERVEY.