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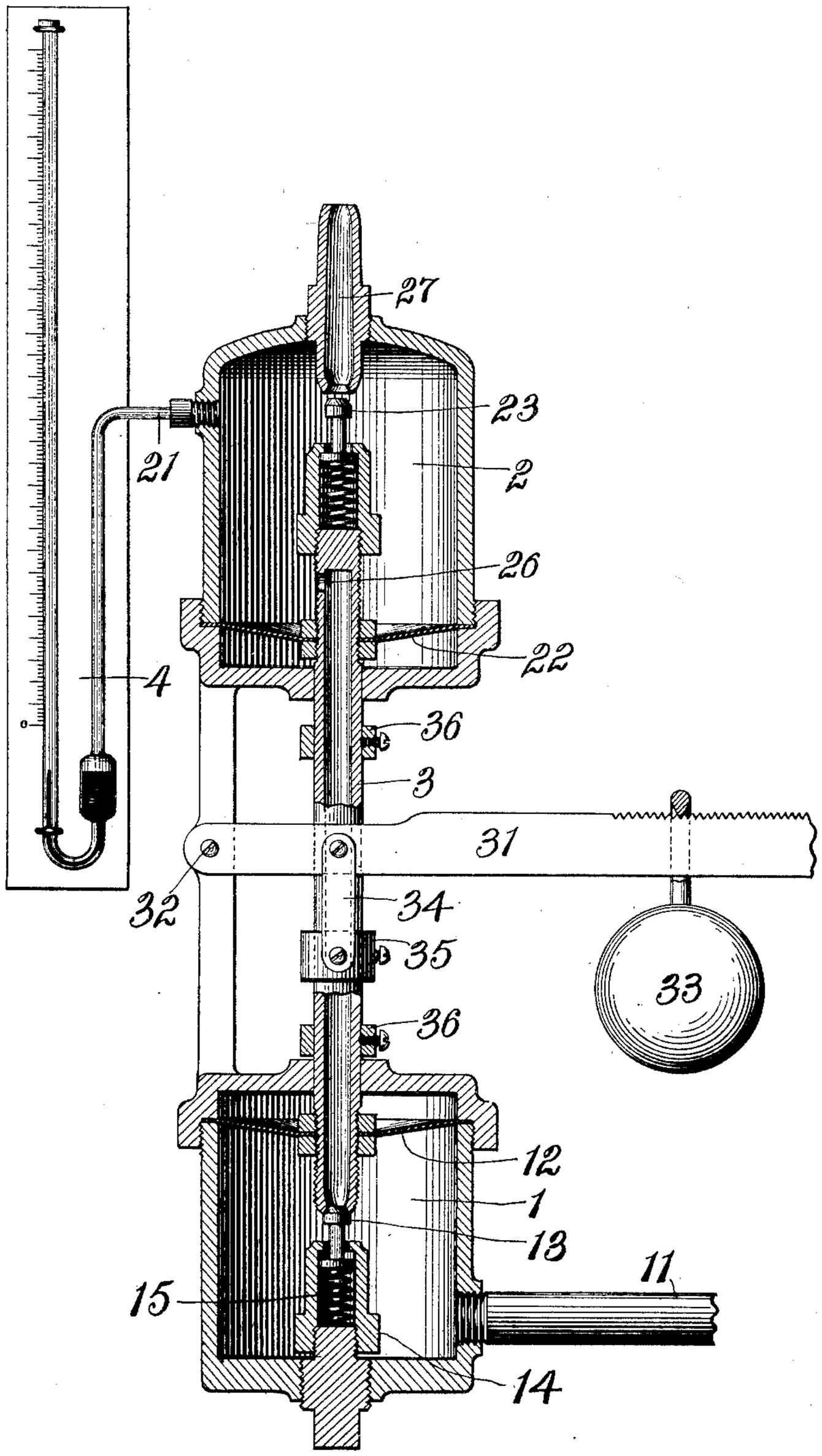
D. C. ANDERSON & S. Y. ANDERSON, JR.

FLUID PRESSURE REGULATOR.

(Application filed Feb. 13, 1901.)

(No Model.)



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UNITED STATES PATENT OFFICE.

DAVID C. ANDERSON AND SAMUEL Y. ANDERSON, JR., OF SEWICKLEY, PENNSYLVANIA.

FLUID-PRESSURE REGULATOR.

SPECIFICATION forming part of Letters Patent No. 675,704, dated June 4, 1901.

Application filed February 13, 1901. Serial No. 47,095. (No model.)

To all whom it may concern:

Be it known that we, DAVID CLARK ANDERSON and SAMUEL YOUNG ANDERSON, Jr., citizens of the United States, residing at Sewickley, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Fluid-Pressure Regulators, of which improvement the following is a specification.

Our invention relates to mechanism for controlling fluid-pressure transmitted through conduits; and its object is to provide a mechanism in which the moving parts operate without any appreciable amount of friction.

Our regulator is particularly adapted for use in connection with a pressure-gage for the purpose and in the manner herein described.

The accompanying drawing shows our improved mechanism in vertical section.

It consists, essentially, as shown, of two chambers 1 and 2 and a connecting-pipe 3, the flow through which is controlled in a manner presently to be explained. Chamber 1 is the inlet-chamber, communicating freely through a pipe 11 with the main or other source of fluid-pressure. Chamber 2 is the outlet-chamber, communicating freely through a pipe 21 with the outlet, which may be a supply-pipe or, as shown in the drawing, a pressure-gage 4. The pipe 3, through which fluid-pressure is communicated from one chamber to the other, is rigidly mounted upon and carried by two movable abutments 12 and 22, which form the adjacent walls of chambers 1 and 2, respectively. Our preferred form of abutment is a flexible diaphragm, as the drawing indicates. These abutments 12 and 22 are adapted to move in response to variation in the pressures which they sustain and in moving to carry their common stem—the pipe 3—to and fro in longitudinal movement. The opening of pipe 3 into chamber 1 is shaped into a seat adapted to receive a valve 13. This valve is suitably mounted in chamber 1 and is capable of yielding in the direction of movement of pipe 3. These parts are so adjusted that when pressure in chamber 1 exerted on diaphragm 12 drives pipe 3 in one direction in a manner to be explained hereinafter the valve will open, and when the opposing forces carry the pipe in the opposite direction the valve will be closed. Pipe 3 opens freely into chamber 2 through an orifice 26. In the wall of chamber 2, at a point suitably arranged with respect to pipe 3 to secure the adjustment of parts hereinafter to be explained, is a discharge 27 to atmospheric pressure. The mouth of the discharge from chamber 2 is shaped into a seat adapted to receive a valve 23. This valve 23 is suitably mounted upon or connected to pipe 3, the connection being such that when the valve is carried to its seat by the movement of pipe 3 further movement of that pipe will not be prevented. These valves and ports are so adjusted that the movement of pipe 3 which closes valve 13 tends to open valve 23, and the movement which opens valve 13 tends to close valve 23. Our preferred form of construction is shown in the drawing. The stem of valve 13 is telescopically mounted in a thimble 14, and the thimble is adjustably mounted in the wall of chamber 1. The valve is held in raised position by a spring 15, which allows it to descend when the valve is seated and pipe 3 descends farther in response to an impelling force. Valve 23 is mounted within chamber 2 on the upper end of pipe 3 in similar manner, and the discharge-nozzle 27, in which is the seat for valve 23, is adjustably mounted in the wall of chamber 2. The valves are backed by springs to allow free movement of the abutments, and the positions of valve 13 and of the seat of valve 23 may be varied that each apparatus may be accurately adjusted when completed.

We employ means whereby a constant but adjustable force is applied to pipe 3 in opposition to the pressure in chamber 1. The drawing shows the construction which we preferably employ in this regard. Chambers 1 and 2 are separated. A lever 31 is connected to the pipe where it extends from one chamber to the other. The fulcrum of the lever 32 is at one end and is conveniently fixed in a support connecting chambers 1 and 2, and a weight 33 is adjustably mounted

upon the lever. The gravity of weight 33 tends to carry pipe 3 down in opposition to the pressure in chamber 1.

34 represents a link connection between lever 31 and a collar 35 upon pipe 3.

36 36 are adjustable stops which limit the longitudinal traverse of pipe 3.

As illustrated, the abutments 12 and 22 are of equal size. This equality is not an essential feature of our invention, and it will be understood that when desired the relative size of the abutments may be varied.

The operation of the parts is as follows: As shown in the drawing, the mechanism is at rest. Fluid under pressure flows through pipe 11 and fills chamber 1. When this pressure acting upon abutment 12 is greater than the counteracting gravity of weight 33, abutment 12 will rise and in rising carry with it stem 3, opening valve 13 and closing valve 23. Communication will then be open from chamber 1 to chamber 2. Fluid will pass out through pipe 21 at a pressure less than the initial pressure by a definite amount, represented by the gravity of weight 33 acting through lever 31 upon stem 3. Weight 33 being adjustable upon lever 31, the definite loss of pressure which fluid meets in passing through the apparatus may be varied as required. If for any reason pressure in chamber 2 tends to rise unduly, a corresponding depression imparted by abutment 22 to stem 3 will cause the opening of valve 23 and the tendency will be overcome.

Such a regulator as we have described has the advantage of being constructed without packing-glands and accordingly without the employment of the chief cause of friction in mechanisms of this character. It is designed to be employed where the initial pressure is sufficiently constant and a definite reduction of that pressure is desired. We have found our regulator peculiarly adapted for use in connection with gages for indicating the depth of water in reservoirs.

In the drawing, 4 indicates a gage of the U type, wherein a column of fluid (commonly mercury) rising and falling against a graduated card in response to variations of pressure gives the desired indication. Any form of pressure-gage may be employed, for the gage of itself forms no part of our invention. As indicated in the drawing, the gage is connected with the outlet 21 of the regulator. It is of course obvious that such a gage may be connected with a reservoir on a level with its bottom, and when so connected it will indicate the depth of water in the reservoir; but where it is desired to place the gage at some point in the supply-line at an indefinite distance below the reservoir the gage will of course indicate the head at that point. Our mechanism interposed between the main and the gage is designed to eliminate the pressure due to the difference in level between the point of insertion of the gage and the bottom of the reservoir. We connect the regulator with the gage in the manner shown in the drawing and connect inlet 21 with the water-main at the desired point. We then adjust our weight 33 or other means of applying force so that it will exactly counteract the pressure due to the difference in level referred to. It will be understood that such adjustment may be made in the mechanism at whatever point in the line it may be placed. By making the abutments unequal in size the range of movement of the gage may be changed, as will readily be understood, and when this is done a corresponding change in graduation must be made.

We claim herein as our invention—

1. In a fluid-pressure regulator, the combination of an inlet-chamber; an outlet-chamber; valves having yielding supports and controlling the flow of fluid from the inlet-chamber to the outlet-chamber and from the outlet-chamber to the discharge; and a member, movable in response to variation in the difference between the pressures of the fluid in the two said chambers, and in the range of its movement opening and closing the said valves.

2. In a fluid-pressure regulator, the combination of an inlet-chamber; an outlet-chamber; and a pipe extending from one chamber to the other, said pipe being adapted to move longitudinally in response to variation in the pressures of the fluid in the two chambers and adapted by its movement to control communication from one chamber to the other through it and from the second chamber to the atmosphere; substantially as described.

3. In a fluid-pressure regulator, the combination of inlet and outlet chambers, in the adjacent walls of which are placed abutments movable in response to variations in pressure of the fluid contained in them, the said abutments being mounted on a common hollow stem extending into the two chambers, the parts being so arranged that by the movement of the abutments the orifice of the hollow stem is opened and closed and a port from the outlet-chamber to the atmosphere is closed and opened; together with means whereby the pressure in the outlet-chamber is maintained at a fixed amount less than that in the inlet-chamber, substantially as described.

In testimony whereof we have hereunto set our hands.

DAVID C. ANDERSON.
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Witnesses:
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