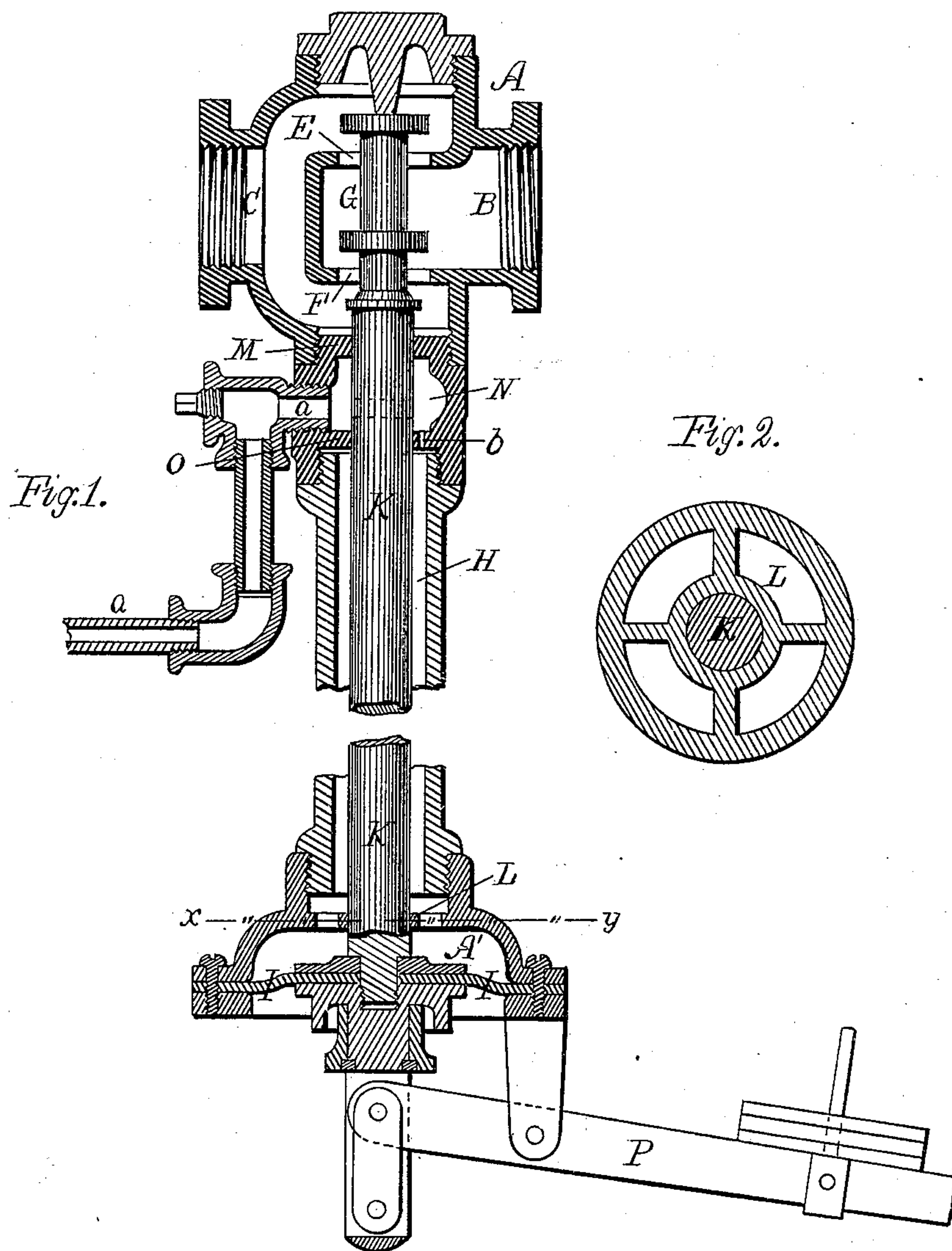


(No Model.)

J. E. WATTS.
PRESSURE REGULATOR.

No. 253,567.

Patented Feb. 14, 1882.



Witnesses.
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UNITED STATES PATENT OFFICE.

JOSEPH E. WATTS, OF LAWRENCE, MASSACHUSETTS.

PRESSURE-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 253,567, dated February 14, 1882.

Application filed December 24, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH E. WATTS, a citizen of the United States, residing at Lawrence, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Pressure-Regulators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to pressure regulators for controlling the pressure of steam, gas, or other fluids or liquids by which a uniform pressure in the delivery pipe or drum or the apparatus supplied with such steam or fluid may be maintained regardless of fluctuations of pressure from the generator or variations in the amount consumed.

Several patents of the United States have been issued to myself relating more or less intimately to the subject of my present improvement; but the one to which such improvement especially relates was originally granted on the 13th day of April, 1875, subsequently re-issued on the 12th day of March, 1878. In this patented regulator the valve-stem is secured at its lower end to an elastic diaphragm contained within a chamber at the bottom of the hollow standard of the regulator, and connected at its lower end to the base of a weighted lever or a spring, such lever or spring operating to open or close the valve to increase or diminish the amount of fluid admitted to the delivery-pipe of the apparatus which uses such fluid, in order that the pressure at the last point of use shall be uniform, though the amount used may be increased or diminished. In the regulator as above patented the valve-chamber is isolated from the water-well below, and an orifice is created in the wall of the hollow case of the regulator above the column of water in said well, and a pipe connects with the orifice and communicates with the service or delivery pipe preferably at the end of the latter most remote from the valve, the purpose of the auxiliary pipe being that in the event of the pressure in the said pipe falling

below the maximum determined upon, the pressure of steam or other fluid upon the column of water in the well and upon the diaphragm at the bottom of this well, by way of such auxiliary pipe permit the weighted lever to overcome the pressure and raise the valve and with it the diaphragm, and admit an increased amount of steam to the delivery-pipe until the maximum pressure is restored to the latter, while if the pressure at the point of connection of small pipe exceeds the maximum the pressure within the delivery-pipe will exert itself upon the column of water and the diaphragm will be lowered, thereby partially closing the supply-valve. The upper part of the well-tube above the water-level in this patented valve is closed by a horizontal shelf located immediately below the point of connection of the auxiliary pipe, such shelf constituting a guide to the valve-stem, while a second shelf is employed at the bottom of the water-well and between the latter and the diaphragm chamber, which also serves as a guide to the valve-stem and has a contracted orifice to permit of passage of water from the well to the chamber, the object of this orifice being to allow the fluctuations of pressure in the well to be communicated to the diaphragm gradually and easily, and thereby protect the latter from the effects of the water-hammer.

In practical application of the regulator as above patented I have met with several obstacles. First, owing to the fact that the water remains permanently in the well it becomes thick from various causes and will not circulate through the small orifice in the lower shelf above named, thereby invalidating the operation of the valve in many instances.

The object of my present improvement is to relieve the diaphragm from the injurious effects of the unrestrained pulsations or fluctuations of the water in the well in order that violent or abrupt opening or closing of the valve may be avoided, and I secure the result by dispensing with the lower shelf above named, and substituting for it an open guide for the valve-stem, and by the employment of a horizontal partition in the steam-space above the water-well, having a small orifice to permit the steam or other prime fluid to get access to such water-well and the water in the

latter, in order that the thrusts or shocks of any sudden changes in pressure in the prime fluid at the point of connection of small pipe shall be imparted to the column of water in the well by an elastic fluid operating gradually through a contracted orifice. If water is the medium employed to communicate these fluctuations through the contracted passage, it not only becomes inoperative by thickening, but owing to its non-compressibility these fluctuations act more violently upon the diaphragm than if an elastic fluid like steam is employed to circulate through the said passage. Under ordinary circumstances, if the lower shelf were omitted the auxiliary pipe before named would be rendered inoperative; but by placing a partition in the upper part or steam-space of the water-well I am enabled to omit the shelf at the bottom of such well, and to operate to better advantage upon the diaphragm, and yet retain all the advantages resulting from the said pipe.

The drawings accompanying this specification represent, in Figure 1, a vertical section, and in Fig. 2 a horizontal section taken through plane xy , of a steam or other fluid-pressure regulator containing my invention.

Reference being had to such drawings, it will be seen that the case of the valve is shown at A as resembling in general form that of the usual balance-valve, the inlet port of such case being shown at B, and its eduction or discharge port at C.

The valve-ports of the case A are shown at E and F, respectively, and the valve at G, such valve being a balanced "plunger-valve," so called.

The water-well which the valve-case surmounts is a vertical tube, H, which ordinarily stands about two-thirds full of condense-water, the lower and enlarged end, A', of this tube constituting the diaphragm-chamber, which is closed by an elastic diaphragm, I, confined in position in a suitable manner and connected with the lower portion of the rod K of the valve G. The extreme lower end of the valve-rod K is connected with the base of a weighted lever, P, pivoted to the lower portion of the well-tube, and operating to counterbalance the reduced pressure upon the diaphragm.

In the lower part of the well-tube H, I place an open guide, L, to direct the movements of the valve-stem, and I place a second but close guide or shelf, M, at the upper part of the steam-space N of said well, and between the latter and the valve-case A.

The auxiliary or equilibrium pipe before alluded to is shown at a as communicating at one end with the steam-space of the well H and at its opposite or remote end with the service or delivery pipe, at a point preferably most remote from the valve, in order that the pressure at intermediate points may not fall below that at the point of connection of the small pipe.

In carrying out my present improvement I

omit the close shelf at the bottom of the well-tube and substitute for it, as before explained, the open guide L, which shall offer practically no impediment to the water in such well, and I retain the upper closed shelf, M, and in combination with this latter shelf, M, I employ a horizontal partition, O, which constitutes a guide to the valve-stem, and is located below the opening into the pipe a and in the steam-space of the water-well, and has an orifice, b , this orifice being of such size as to permit the fluctuations of pressure in the apparatus supplied with steam to get access to the water in the well, and through the latter to the diaphragm, but at the same time sufficiently contracted to operate as a governor to prevent such pulsations from unduly affecting the diaphragm and to insure a uniformly steady movement of the valve.

By the employment of the partition O in the steam-space of the water-well below the pipe a , in lieu of at the bottom of the water-well, I govern the effects of return-pressure upon the diaphragm through the said pipe a by reducing the pressure of steam upon the column of water in the well, whereas heretofore the water has been subjected to the full pressure of such steam as might return by way of said pipe. For this reason any change of pressure in the apparatus making itself felt within the steam-chamber of the water-well above the partition O is lessened and equalized by passing through the orifice b before getting access to the column of water below, and as this water is not obstructed by an attenuated passage, as before, but has full access to the diaphragm, the latter is always equally sensitive to the fluctuations of pressure in said steam-space.

As steam is an elastic fluid, while water is practically non-compressible, the pulsations of the column of water upon the diaphragm are cushioned by the small amount of steam admitted through the orifice b , and the pulsations of the diaphragm are thus rendered less frequent and abrupt, while at the same time the diaphragm is more uniformly sensitive to variations in steam-pressure.

I claim—

In fluid-pressure regulators, a closed partition in the steam-space of the water-well below the mouth of the equilibrium-pipe which connects the water-well with the delivery-pipe of the regulator, this partition having a passage to permit fluctuations in pressure at the point of connection with equalizing-pipe to be communicated to the column of water in the well, and through the latter to the elastic diaphragm.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH E. WATTS.

Witnesses:

H. E. LODGE,
F. CURTIS.