J. E. WATTS.

Steam or Water Pressure Regulator.

No. 161,917. Patented April 13, 1875.

Fig. 1.

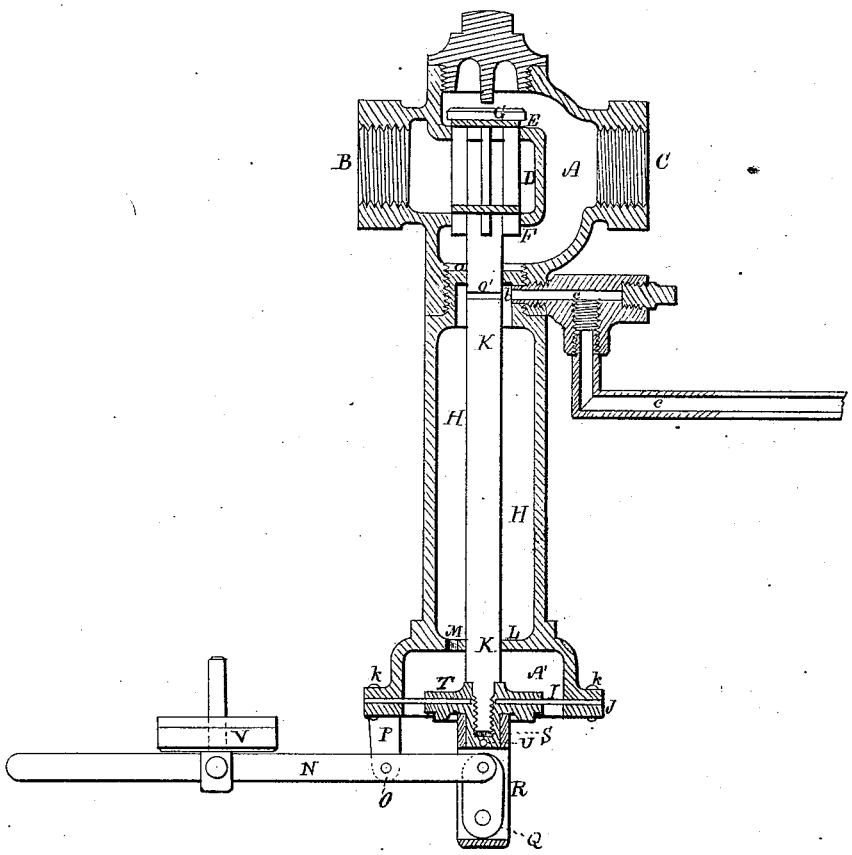
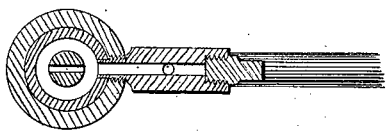


Fig. 2.



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UNITED STATES PATENT OFFICE.

JOSEPH E. WATTS, OF LAWRENCE, MASSACHUSETTS.

IMPROVEMENT IN STEAM OR WATER PRESSURE REGULATORS.

Specification forming part of Letters Patent No. **161,917**, dated April 13, 1875; application filed March 1, 1875.

To all whom it may concern:

Be it known that I, JOSEPH E. WATTS, of Lawrence, Essex county, Massachusetts, have invented certain Improvements in Steam or Water Pressure Regulators, of which the following is a specification:

These improvements relate to pressure-regulators which govern automatically the supply of fluid which is delivered through a valve, the amount of fluid delivered being governed by the amount requisite to do the work required of it, the class of regulators to which my present invention appertains being that in which the stem of the valve is supported at bottom upon an elastic diaphragm and connected with an adjustable lever, which, in turn, is operated by the mechanism which the fluid acts upon, in such manner that the valve is operated to open or close, according to the amount of fluid required.

A notable instance of the class of regulators to which my present improvements relate is seen in Letters Patent of the United States issued to me on the 6th day of January, 1874.

These improvements consist in shutting off communication between the fluid-chamber of the valve and the condensed-water well below, and creating in the case or column of such valve, and immediately over the body of water in such well, an orifice, with which I connect a pipe that communicates with the main service or distributing pipe or conduit, into which the valve discharges, the arrangement and operation of these additions being as hereinafter stated.

The drawings accompanying this specification represent, in Figure 1, a vertical section, and in Fig. 2 a horizontal section, of a pressure-regulator valve containing my invention.

In these drawings, A represents the case of my valve, which, in general form, resembles an ordinary globe-valve, the inlet-port of such case being shown at B, and its eduction or discharge port at C. Within the center of the case A is cast a pocket or hollow boss, D, pierced at top and bottom with valve-ports E and F, of equal area, while playing within these ports, and opening or closing the same, is a vertical valve, G, which is balanced to the pressure of steam, in order that the pulsations of the elastic diaphragm, hereinafter alluded to, which supports the valve, may readily and surely raise or lower the latter. The well-tube of the instrument, which the case A surmounts, is shown at H as a vertical pipe, which usually is about full of condense-water, the lower mouth or diaphragm-chamber A′ of this tube being closed by an elastic diaphragm, I, of suitable material, such diaphragm being confined in position by an annular cap-plate or ring, J, which is screwed to the bottom of the tube by a series of screws, *k k*, &c., placed equidistant from one another, in order that the plate and the lever carried by it may be moved upon the tube a distance equal to the space between two or more screws. The valve-rod depends vertically from the valve G, as shown at K in the drawings, and is confined at its lower end to the elastic horizontal diaphragm I, before named, and passes through a horizontal shelf, L, or bridge, or its equivalent, which closes the lower part of the well H, and shuts off, to a great extent, communication between such well and the diaphragm-chamber A′, the said shelf serving as a guide to insure a correct vertical position of the valve and stem, and prevent any side motion or unsteadiness of the same, whereby a perfectly free movement is obtained, and wear upon the parts obviated. The shelf L also serves to protect the diaphragm from thrusts and shocks resulting from the back pressure upon the water-well. N in the accompanying drawing represents a horizontal lever, whose fulcrum O is a pendent stud, P, hanging from the cap-plate J before named, the base of the lever being pivoted to the upper part of a forked swivel, Q, whose lower end is, in turn, pivoted to and within a furcated thimble, R, the upper end of such thimble inclosing a tenon, S, depending from the lower nut T, which confines the valve-stem to the diaphragm, a pin, U, being passed through the thimble and stud to confine them together, the lever being provided with an adjustable weight, V.

In carrying my present improvements into practice, I close the upper part of the well H by a horizontal shelf, *a*, which, in addition to closing the top of such well, constitutes also a guide or bearing for the valve-stem K. I then create in the well-tube H an orifice, *b*, which communicates with its interior, and I

place this orifice preferably at the extreme upper part of the well-tube, as shown, in order that a considerable column of water may stand over the diaphragm to protect it. Any small amount of steam which may creep through the joint between the valve-stem and shelf *a* will be condensed in the well H, or escape through the orifice *b*. I next provide a pipe, *c*, which I connect at one end with the orifice *b*, and the other end of this pipe, whatever the distance traversed by such pipe may be, is connected with the interior of the service or supply pipe or drum, from which the various branch pipes are taken that supply the driers with steam, and which supply-pipe is supplied through the valve A. The point at which the pipe *c* intersects the supply-pipe may be varied according to circumstances; but I prefer to place such pipe *c* at the end of such supply-pipe most remote from the valve, as by so doing I govern my valve from this point, and am enabled to maintain a uniform pressure throughout such supply-pipe. We will suppose a regulator-valve, with my present improvements added, adapted to heat a stack of cylinder-driers, such as are generally employed in print-works, in which case the valve delivers steam to a general delivery pipe or drum, from which branch pipes depart to the various drier-cylinders, the valve being weighted, for instance, to operate at an average pressure of fifteen pounds to the square inch. Heretofore, as more or less cloths are led over the driers, or such cloths contain a greater or less degree of moisture, the pressure of steam in the drum varies very greatly, and oftentimes much blows off at the safety-valve of such drum, and is wasted. In my invention, should the pressure in the service pipe or drum fall below the maximum of fifteen pounds, the pressure upon the column of water in the well H and the diaphragm I will be lowered to such an extent that the lever N partially overcomes the pressure, and raises the rod K and valve G, and admits an increased amount of steam to the drum until its maximum pressure is restored. Should such pressure exceed the proper point, the steam within such drum passes through the pipe *c* into the well H, and, by exerting its pressure upon the body of water within such well, and through this water upon the diaphragm, will distend the latter outward, and, by lowering the valve-stem K and valve G, partially close the latter, and reduce the amount of steam admitted through it to the distributing-drum. My apparatus thus becomes self-operating and continuous, and, in addition to saving much waste of steam, I gain other important advantages.

It will be seen that by my construction of parts I dispense with stuffing-boxes about the valve-stem, which is a matter of importance, as the waste of power required to overcome the friction of an effective stuffing-box would present a very serious drawback to the points of economy claimed for my improvement. When a portion of the supply of steam which is admitted to the service pipe or drum is obtained, as is frequently the case, from the exhaust of the engine that drives the drier, the utility of my present improvement is seen to great advantage, as, by placing the pipe *c* at the point at which the exhaust-pipe intersects the said service-pipe, I govern the valve or regulator by the pressure at this point, thereby maintaining a uniform back pressure upon the engine, and insuring a uniform and steady motion of the latter. I am enabled to dry cloths more uniformly and desirably than heretofore, and to maintain uniform temperature and pressure in the steaming-boxes employed to set the colors of prints in such instances, as my improvement is adapted to this labor. Heretofore the pressure of steam within the distributing pipe or drum has been governed by the valve, and hence the various changes of this pressure are communicated to the valve indirectly and slowly. By my improvement, in which I regulate and control this pressure from the drum itself, I obtain very great advantages. I also, to a great extent, protect the elastic diaphragm from the thrusts and strains to which it has heretofore been liable in many regulators of this class, as in mine steam is shut off from direct action upon the water in the well H, from the chamber of the valve, and can only get access to such well by an indirect route from the distributing-drum through the pipe *c*. By means of the orifice *b*, I can get access to the valve-stem to insert a pin within the hole *o'*, created in such stem, in order to prevent the latter from rotating when the nut upon its lower end is applied or removed; and this orifice also becomes available as a means of readily attaching a steam-gage, should it be desirable so to do.

Although I have explained my invention as applicable mainly to diaphragm-regulators, it is equally applicable to piston or other regulators.

I claim—

In a steam or water pressure regulator, as described, the combination, with the regulating-valve, the fluid-chamber A, and the well-tube H, of the closing diaphragm or partition *a* and the pipe *c*, leading from the distributing pipe or drum, and entering the well-tube below the diaphragm *a*, substantially as and for the purposes set forth.

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Witnesses:

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