J. E. WATTS.

Pressure-Regulator.

No. 217,307. Patented July 8, 1879.

Fig. 1.

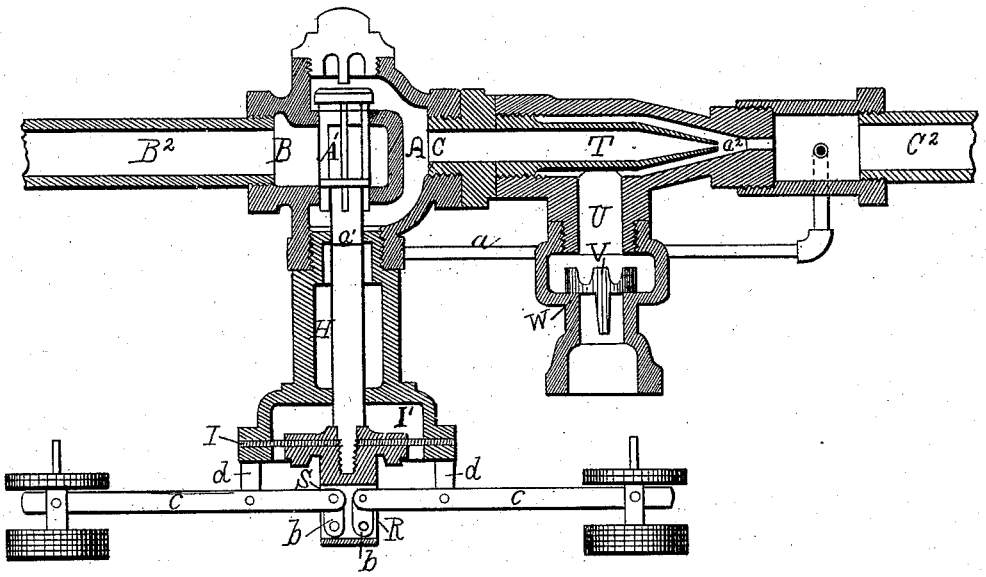
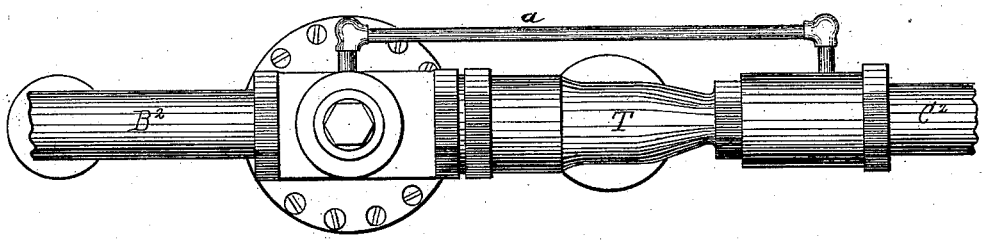


Fig. 2.



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UNITED STATES PATENT OFFICE.

JOSEPH E. WATTS, OF LAWRENCE, MASSACHUSETTS.

IMPROVEMENT IN PRESSURE-REGULATORS.

Specification forming part of Letters Patent No. **217,307**, dated July 8, 1879; application filed May 5, 1879.

To all whom it may concern:

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

These improvements relate to pressure-regulators for governing the pressure of steam, gas, or other fluids or liquids, in order that a uniform pressure may be maintained in the delivery or distributing pipe or drum as against irregularities of pressure in the supply-pipe, or the varying quantities of fluid required in the apparatus which the valve provided with said regulator supplies, the valve thus provided being governed practically by the pressure in the distributing-pipe at the point of use, in lieu of at the immediate locality of the valve itself.

A notable instance of the class of regulators to which my present improvements pertain is shown in Letters Patent of the United States issued to me on the 13th day of April, 1875, reissued March 12, 1878, in which the stem or spindle of the regulating-valve is supported, at its lower end, upon an elastic diaphragm, being properly connected to a weighted lever or a spring to act upon the valve-stem and valve and open or close the valve in consonance with variations in the pressure in the delivery or distributing pipe or drum, or the apparatus supplied with fluid, which the valve is designed to govern, the main feature of the invention covered by such Letters Patent consisting in the employment of a pipe connecting at one end with the receiver and at the other with the distributing pipe or apparatus to be supplied with fluid.

My present improvements consist, first, in the peculiar method of connecting the weighted levers with the valve-stem, by which the pressure upon the stem is equalized, and it is allowed to move at all times in an axial alignment with the face of valve-case or well-tube of the regulator.

My improvements consist, secondly, in the combination, with pressure-regulators, of an injector for enabling exhaust-steam from an engine or otherwise to be utilized and employed with regulators of this class, and by means of which such exhaust-steam is reinstated at a pressure of five pounds or more by the use of a small amount of direct-steam without perceptible back-pressure on the engine.

The drawings accompanying this specification represent, in Figure 1, a vertical section, and in Fig. 2 a plan, of a regulator embodying my improvements.

In said drawings, A represents the case of a regulator-valve, A′, which, in this instance, is a "balanced plunger-valve," so called, the inlet-port of such valve-case being shown at B, and its eduction or discharge port at C, while the fluid-supply pipe, which supplies fluid to the valve-case through said port B, is shown at B^2, and the service-pipe, which connects with the port C, and receives the fluid as it leaves the valve-chamber, at C^2.

The "well-tube," so called, of the valve-case is shown at H, the elastic diaphragm at I, and the chamber inclosing the latter at I′, while the hub or stem depending from the under side of the diaphragm, and to which the weighted lever is connected, is shown at R.

The service-pipe communicates with or itself constitutes the first part of the distributing pipe or drum, the connections of the latter varying with the class of machines to which the regulator is attached.

The independent return-pipe, to which allusion has heretofore been made, is shown at *a* as connected at one end with the interior of the well-tube H below the valve A′ and shelf a^1, and at the other with service or distributing pipe C^2, practically as shown in my Letters Patent before mentioned.

I am aware that exhaust-steam from steam-engines, &c., has heretofore been used for drying purposes—for instance, in the cylinder drying-machines of print-works and slasher drying-machines of cotton-mills, &c.; but in order to make effectual use of the exhaust-steam for this purpose too great back-pressure has been exerted upon the engine at considerable expense of power. My improvement avoids this objection, and enables me to utilize the exhaust-steam, as hereinafter explained.

In carrying my present improvement into practice I proceed first to secure to the lower end of the hub or stem R, or otherwise to the under side of the diaphragm, a pendent yoke, S, and to this yoke I pivot by links *b b*

the inner ends of two oppositely-disposed horizontal twin levers, *c c*, to which hangers *d d* of the diaphragm-chamber are fulcrumed, the outer ends of such levers being weighted to the desired extent, and acting upon the valve-stem and valve A′ to open or close the latter in accordance with variations in pressure in the supply and distributing pipe or apparatus which the valve governs.

It will be obvious that as the levers are of equal length, and arranged at equal distances from the axis of the well-tube and valve-stem, and upon opposite sides of the latter, they rise and fall together by and with the pulsations of the diaphragm, and that as a consequence the valve-stem moves always in a vertical direction. By this means I avoid unequal strain and friction upon the parts, which is of importance, especially in large regulators, which employ diaphragms of considerable size, and in which the valve traverses a considerable distance.

In carrying out the second feature in these improvements I employ an injector of any suitable construction, the one shown in this instance being an ordinary Gifford injector employed in feeding steam-boilers, and being shown in the accompanying drawings, at T, as arranged horizontally between the valve-case A and the distributing-pipe C^2, the contracted outlet a^2 of this injector terminating immediately in front of the mouth of the said distributing-pipe C^2.

U in the drawings represents the pipe for exhaust-steam, one end of such pipe communicating with the interior of the injector, as shown in Fig. 1, and at the other connecting with the supply of exhaust-steam.

Direct-steam admitted through the valve A′ passes through the injector T, and at the outlet of the latter intercepts the exhaust-steam entering by the pipe U, the result being that such exhaust-steam, by the superior power of the direct, is carried along by and with the latter into the distributing or service pipe, and receives heat and pressure, and is thereby enabled to contribute its part in the general result.

The form of the injector is such that practically no back-pressure is exerted upon the engine through the exhaust-pipe U, and I am enabled to utilize wholly or in part the exhaust-steam, and as a consequence greatly economize the use of direct-steam.

I am aware that an injector has heretofore been employed to utilize exhaust-steam in connection with a valve constituting part of the injector and not balanced to the boiler-pressure, the stem of the valve in this case passing through a stuffing-box to prevent escape of steam. In this case any change in the boiler-pressure will affect the pressure, which the regulator and injector are intended to maintain uniform, while the stuffing-box, if effectual, presents a serious objection, from the fact that it exerts great friction upon the valve-stem and interferes with the nice action of the valve.

V in the accompanying drawings represents an ordinary check-valve arranged in the exhaust-pipe U, and closing downward upon its seat W.

Should the supply of direct-steam for any reason be cut off from entering the valve A′, any tendency to back or return pressure from an opposite direction through the valve into the exhaust-pipe and be wasted will close the valve V, and such waste will thereby be prevented.

I claim—

1. In a pressure-regulator constructed substantially as shown, the combination, with the valve-stem and pulsating diaphragm, of oppositely-disposed twin weighted levers, pivoted to the valve-case and to the diaphragm, and operating to exert an equal action upon the valve and diaphragm from opposite sides, essentially as stated.

2. The combination, with a pressure-regulator valve balanced to the pressure of the supply-fluid, of an injector connected both with the direct and exhaust fluid, and adapted to increase the pressure of said exhaust, substantially as stated.

JOSEPH E. WATTS.

Witnesses:
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