

J. E. WATTS.
Steam-Regulating Valves.

No. 146,153.

Patented Jan. 6, 1874.

Fig. 1.

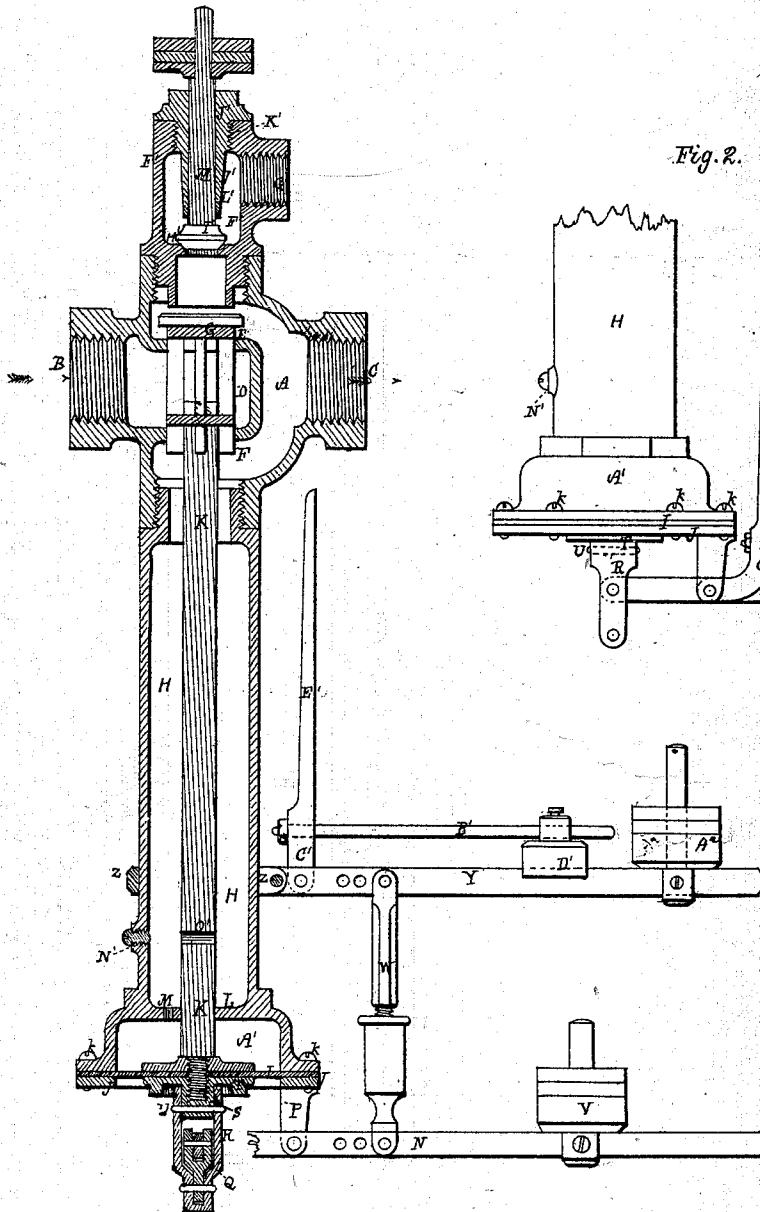
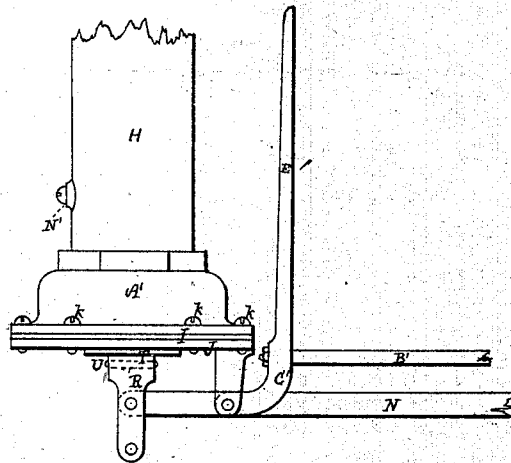


Fig. 2.



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IMPROVEMENT IN STEAM-REGULATING VALVES.

Specification forming part of Letters Patent No. **146,153**, dated January 6, 1874; application filed September 6, 1873.

To all whom it may concern:

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

These improvements are based upon steam-valves which automatically govern the supply of steam according to the requirements of the occasion or the amount of labor being done, or to be done, by the machinery which is driven by such steam, the class of valves to which my improvements have especial reference being those in which the stem of the valve (the latter being a balanced valve) is supported upon an elastic diaphragm, and connected with an adjustable lever, which, in turn, is acted upon by the mechanism driven by the steam passing through the valve, in such manner that, as the said machinery ceases its operations or performs a greater or less amount of labor, the valve operates in consonance therewith, and opens or closes according to the necessities of the machinery. These improvements consist, first, in such a construction of the condense-water well or pipe that the back pressure of steam upon the water surrounding the diaphragm shall be lessened to such an extent as to result in no injury to such diaphragm; and I effect this object by placing a shelf or partition in the lower part of the well, and above the diaphragm, and creating in this shelf one or more contracted holes or openings, of a size sufficient to allow the steam to exert a pressure upon the valve through the medium of the water, and yet sufficiently attenuated to retard passage of steam, and lessen the sudden concussions or thrusts which are constantly taking place. Heretofore the condense-water well or tube has been unobstructed—that is to say, has been of uniform area, or practically so, throughout—so that any and all changes in back pressure of the steam upon the condense-water are imparted immediately and directly to the diaphragm with injurious consequences, as fracture of the diaphragm often takes place from this cause. Second, these improvements consist in the employment of an auxiliary or ad-

ditional lever, pivoted to and carried by the primary lever, which governs the movements of the valve, the said auxiliary lever being pivoted at its base to the bore of the primary lever, and formed or provided with a standard or post, so disposed in relation to the various parts of the valve, and the belt-shipper of the machinery with which the valve is used, that, upon stoppage of such machinery, the shipper abuts against the said post and elevates the free or weighted end of the auxiliary lever from off the primary lever, and relieves the latter of its weight, the result being that a corresponding weight or pressure is removed from the diaphragm, and the valve closes to a greater or less extent, and diminishes the amount of steam delivered through the valve. Third, these improvements consist in combining, with a valve of the character hereinbefore named, a safety-valve which shall blow off at any given pressure, by this means protecting the diaphragm and other parts of the valve from injury by overpressure of steam, which, otherwise, might often occur. In the present instance, I carry out this feature of my improvements by creating a passage or bore through the upper portion of the valve-case, within which bore I create a valve-seat and dispose a valve, which is to be weighted to the desired extent, varying with circumstances. Fourth, these improvements consist in forming, in one side of the water-well, an orifice, and combining with this orifice a pressure-gage to denote the pressure upon the parts; this orifice serving, further, as a passage-way, whereby a rod or pin may be inserted within a hole in the valve-stem, and the latter retained firmly in place and locked against rotation, while removal or inspection of the diaphragm, in case of accident, takes place. Fifth, these improvements consist in the peculiar mode of attaching the secondary lever to the well-tube in instances where a compound lever is used, the same consisting in applying to the well-tube a split ring or clasp, which incloses it, the said lever being pivoted to this clasp, while the lower or primary portion of the lever is in turn pivoted to the lower cap-plate or head of the well-tube, which is secured in

place by a number of screws equidistant from each other, the whole being arranged as hereinafter explained, by which the position of the levers, with respect to the ports of the valve, may be varied to suit circumstances.

Several minor points in my improvements will be duly explained hereafter.

The drawings accompanying this specification represent, in Figure 1, a vertical section of a valve containing my improvements, while Fig. 2 represents a section of a modified form of the valve-governing levers.

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 valve. The arrangement of the pocket D, ports E and F, and valve G with the case A is of prior invention or use, and contains nothing original with myself.

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 A¹ 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 A¹, 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 posts obviated.

I have said that the shelf L closes to a great extent communication between the well H and diaphragm-chamber A¹. The object of this is to prevent sudden concussions, changes, or thrusts of the back-pressure steam from acting instantly upon the diaphragm, while in order that the pressure of the steam shall act to the necessary degree upon the diaphragm,

by means of the interposed body of water which stands upon such diaphragm, I create in the shelf one or more small orifices, M, of a size sufficient to obtain the desired result.

It will thus be seen that the shelf, or its equivalent, performs two important offices—that of breaking or retarding the back pressure of steam and protecting the diaphragm, and of constituting a guide for the valve-stem. In lieu of the orifice M in the shelf L, an equivalent would be to employ a pipe leading from the well above such shelf, and entering the diaphragm-chamber below said shelf, such pipe having a proper valve.

N in the accompanying drawing represents a horizontal lever, whose fulcrum O is a pendant 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.

This mode of uniting the lever to the diaphragm constitutes one of the details of my improvements, and is a very useful one, as it allows the lever to exert a draft upon the valve at all times in an axial line with such valve and its rod, while it further has the merit of enabling the lever to be immediately disconnected from the valve-stem or diaphragm, when it becomes necessary to remove or inspect the latter.

The lever N is provided with a sliding weight, V, and is connected by an adjustable rod, W, with a second lever, Y, disposed above it, and provided with a sliding weight, A², this second lever being pivoted at its base to a band or split ring, Z, which clasps or encompasses the well-tube H, and is clamped tightly thereto by a screw which passes through its ends, this mode of applying the lever Y to the tube H enabling it to be moved in position thereon, according as the lever N may be turned upon the said tube, thus allowing the two levers at all times to be in alignment with each other, should their common position be changed for any reason. This mode of applying the lever Y constitutes the fifth portion of these improvements. *finish*

B' in the drawings represents an additional lever, disposed above the lever Y, and pivoted at its base or head, C', to the base of the said lever Y, the lever B' being provided with a sliding weight, D', which rests upon the lever Y, the base or head C' of the lever B' being prolonged upward into the arm E', as shown in Fig. 1 of the drawings, this standard rising to such a height as to be readily struck by the shipper of the machine to which the valve is applied.

This valve will be found of service in many

localities, but one especial use to which I intend putting it is in connection with the slashers or dressing-machines of cotton-mills and the driers of print-mills.

Upon shipping the belt in stopping the machine, the shipper strikes against the arm E' and tilts it inward toward the well-tube, the lever B' and its weight D' being, by the act, lifted from off the lever Y. The weight of the lever B' and its weight D' being removed from the lever Y, and consequently from the lever N, the back pressure of steam, acting upon the water above the diaphragm, depresses the latter and the valve, and closes the latter to a greater or less degree, and, as a consequence, shuts off or diminishes the amount of steam delivered through the valve. Upon reversing the shipper, the lever B' and its weight drop upon the lever Y, and the latter, with the lever N, is depressed, the result being that the valve rises and admits of passage of a greater amount of steam. The employment of the auxiliary lever B' economizes, to a great extent, the consumption of steam, and relieves the diaphragm from the sudden thrust which would otherwise ensue from the sudden stoppage of the machinery.

The lever Y may be dispensed with, and the lever B' applied to the lower lever N, as shown in Fig. 2 of the accompanying drawings; and still further modifications may be made in the mode of employing the auxiliary lever B' without departing from the spirit of the second portion of these improvements, which embraces the said lever B', or its equivalent, in combination with the device which governs the movements of the valve.

In carrying out the third portion of these improvements, I erect upon the top of the valve-case A an upright hollow extension or cap, F', formed with a blow-off port, G', and below such blow-off with a valve-seat, H', which is closed by a drop-valve, I', the stem M' of which rises through the top of the cap F', and is provided with a weight or series of weights, which are to be graduated to correspond to the pressure of steam required. The plug J', which closes the mouth K' of the extension F', terminates at the bottom in a thin thimble, L', which surrounds the valve-stem M', and serves not only as a stop to determine the height to which the valve I' shall rise, but as a packing to prevent escape of steam about such stem, since the pressure of the blow-off steam contracts the thimble about the valve-stem, and effectually excludes steam, which

would otherwise find its way through the bearings of the stem.

By the employment of the safety-valve I', I am enabled to govern the pressure of the steam passing through the valve, and also to obviate bursting or danger to the valve or its diaphragm; and in this safety-valve, in combination with the valve proper and its adjuncts, will be seen the third portion of these improvements.

In carrying out the fourth portion of these improvements, I create, in any convenient part of the well-tube H, an orifice, N', as shown in Fig. 1 of the drawings, to which I intend applying a pressure-gage, for reasons which will be at once obvious; while, as a still further element of this portion of my invention, I bore in the valve-stem K a horizontal hole, O', to coincide with the orifice N'. When it becomes desirable to inspect, repair, or remove the diaphragm I, a pin is to be passed into the orifice N' and the hole O', which prevents rotation of the valve-stem, and confines it securely in one position while the lower nut T is being unscrewed and the diaphragm removed.

The length of the well-tube H should be such that the water which stands in it shall be of sufficient depth to remain cool immediately above and about the diaphragm, in order that the latter shall receive no injury from a high temperature of water.

I claim—

1. A steam-regulating valve comprising the well tube or case H, valve G, and diaphragm I, in combination with the shelf L and safety-valve I', for protecting the diaphragm against excesses and sudden changes in steam-pressure, as herein shown and set forth.

2. The combination, with the elastic diaphragm and weighted-lever mechanism connected and operating with the same, as described, of the lever B' E', arranged and operating, in connection with said main-lever mechanism, in the manner and for the purposes shown and set forth.

3. In combination, the case H, provided with orifice N', and the valve-stem K, provided with hole O', arranged to operate substantially as shown and described.

4. The diaphragm I and lever N, in combination with lever Y, clasp Z, and lever B' E', all constructed substantially as shown and set forth.

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