(No Model.)

W. G. TAAFEL.

PRESSURE REGULATOR.

No. 527,902. Patented Oct. 23, 1894.

Fig. 1.

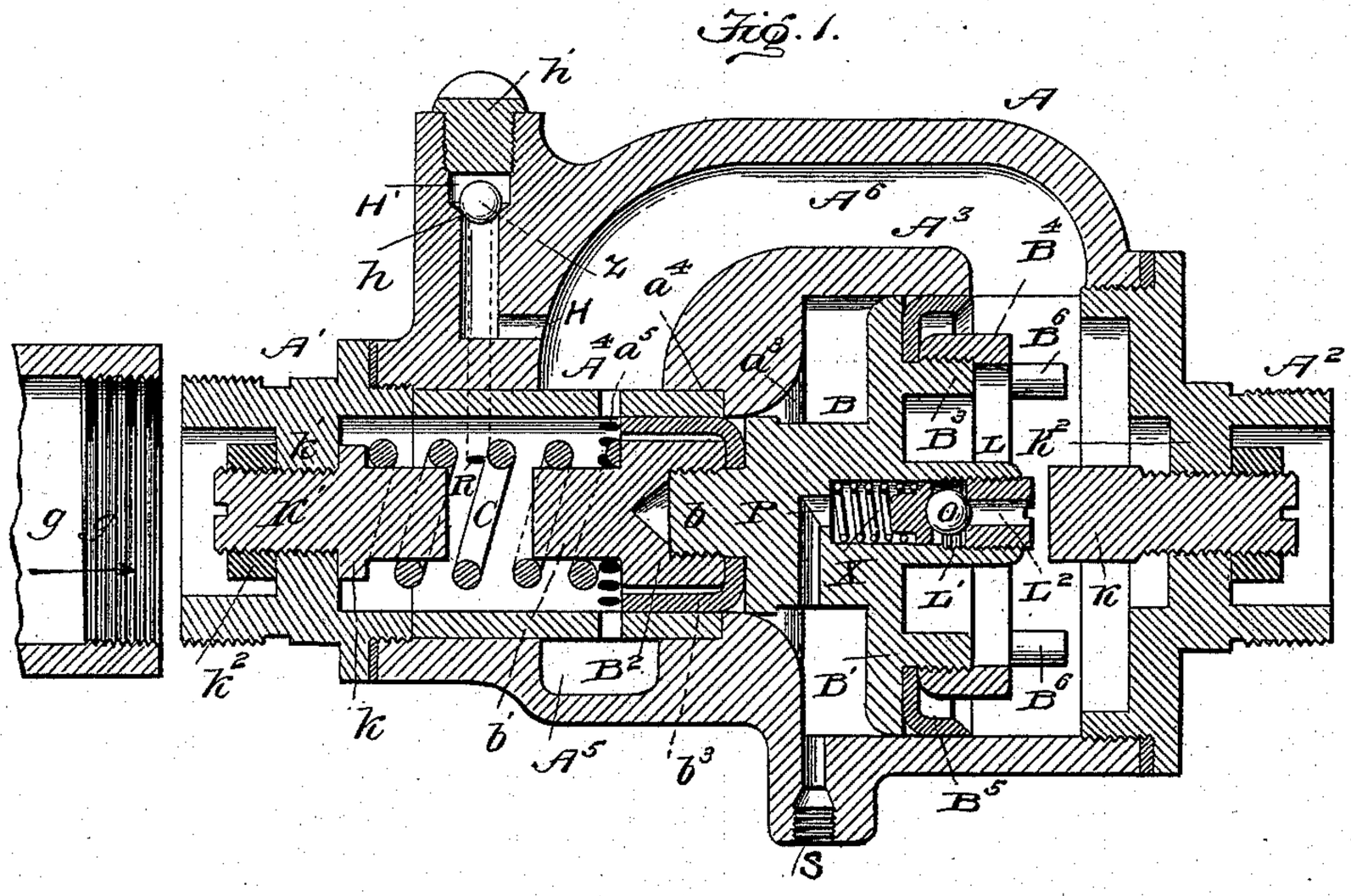


Fig. 2.

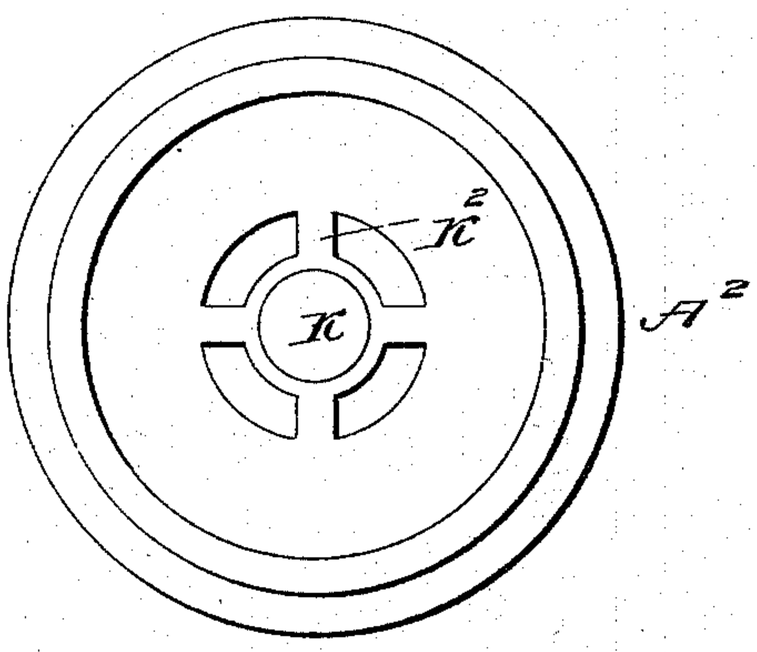
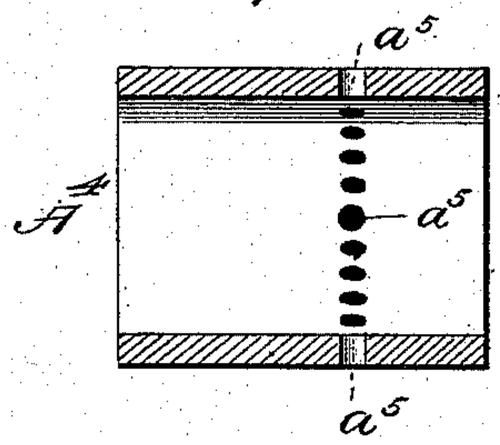


Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM GODFREY TAAFEL, OF NEWARK, OHIO.

PRESSURE-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 527,902, dated October 23, 1894.

Application filed August 27, 1894. Serial No. 521,450. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM GODFREY TAAFEL, a citizen of the United States, residing at Newark, Licking county, Ohio, have invented certain new and useful Improvements in Pressure-Regulators, of which the following specification contains a full, clear, and exact description, reference being had to the accompanying drawings, forming part thereof, in which—

Figure 1 is a longitudinal vertical section of my improved pressure regulator; a small portion of the supply pipe *g* being also shown. Fig. 2 is a face view of one of the annular end caps or couplings; both being alike except as to size, and Fig. 3 is a longitudinal section of the smaller piston cylinder detached.

The object of the invention is to provide a simple and inexpensive pressure regulator in which the flow may be regulated or adjusted to a pre-determined extent, independent of a pressure regulating mechanism for adjusting the double piston so that it will not close the inlet openings until a predetermined pressure at the outlet side is reached; also to shorten the stroke or throw of the double piston and thereby lengthen its wear and this latter result is accomplished by providing an annular series of small perforations for the smaller or inlet end of the double piston to work over instead of a single large opening; also to provide a check-valve connection between the outlet side of the piston and the inlet end of the valve; the check-valve being held closed by the pressure of the fluid in the inlet and opened by back pressure from the outlet side when the water is shut off in the supply pipe by the usual waste cock and thereby permit the fluid to run back past the regulator and out of the waste cock to prevent freezing.

The invention will first be described and then specifically pointed out in the claims.

A represents the regulator casing provided with open ends into which are screwed the annular inlet and outlet couplings or caps A′ A^2 respectively; the outlet opening being large enough to permit the double piston or reducing valve to be inserted and removed therethrough as will be hereinafter described.

Within the casing between its ends is cast the cylinder A^3, for the larger end B′ of the double piston B and this cylinder has an opening a^3 through its end wall, which opening is provided with an annular recess at its end next the inlet end of the casing, as shown at a^4; this recess being of the same diameter as the said inlet end to receive the inner end of an open ended cylinder A^4, in which works the smaller end B^2 of the double piston B. This cylinder A^4 is provided within the casing with a circumferential series of small perforations a^5 which open out into an annular groove or channel A^5 formed in the interior of the casing A, the said cylinder A^4 forming the inner wall of the said channel. From the upper side of the channel A^5 leads a passage A^6 which connects it with the enlarged outlet end of the casing in front of the larger end B′ of the piston B. These small perforations a^5 have an aggregate area sufficient for the full flow of liquid from the inlet to pass therethrough, and are just as effective in this respect as a single large opening such as the adjacent end of the passage A^6 but they have a great advantage over a single large opening in this respect, viz., they permit of a much shorter throw of the piston, for the full throw of the piston is only as great as the diameter of one of these small perforations, instead of the several times longer throw necessary to open and close a single large aperture of the combined areas of the small ones. It follows therefore, that my piston will not have to be repacked nearly so often.

The smaller piston B^2 screws upon a threaded stud *b* on the stem which connects the two pistons and clamps the packing b^3 in place and the outer end of the said piston B^2 is provided with a reduced portion *b*′ which enters and guides one end of a spiral spring C, the opposite end of which receives the inner plain end of a pressure adjusting screw K′ which is provided with a shoulder *k* bearing against that end of the spring. This screw K′ is mounted in a central threaded opening formed in a cross piece or spider *k*′ cast integral with the interior of the inlet coupling or cap A′ and k^2 is a lock nut on the outer threaded end of the said screw, by means of which it may be locked in its adjusted position.

The front face of the piston B′ has an annular externally threaded flange B^3 upon which screws the ring B^4 which clamps the packing

B^5 in place. The ring B^4 is provided with a plurality of finger lugs B^6, by means of which it may be turned.

The annular outlet coupling or cap A^2 is formed with an internal spider or cross-piece K^2 having a central threaded aperture in which the flow-regulating screw K is mounted with its inner end in alignment with the piston and adapted to be adjusted toward and from the piston to limit the extreme throw thereof and permit its smaller piston B^2 to uncover only a predetermined portion of the apertures a^5 regardless of the pressure in the inlet. Thus only a certain amount of fluid can flow through the regulator and the smaller the flow, the less distance the piston will have to travel. This flow adjustment is entirely independent of the pressure regulating screw K′ and its spring C. After the flow regulating screw K is set to limit the throw of the piston toward the outlet end of the regulator, the screw K′ may be adjusted to force the spring C a greater or less distance toward the piston, so that a greater or less pressure on the larger end of the piston will be required to move it against the action of said spring and cause its smaller end to close over the apertures A^5.

L is the excess pressure relief valve and comprises a valve chamber L′ in the center of the larger piston B′ the rear end of which chamber communicates with a passage P extending out laterally through the piston stem into the cylinder A^3 behind the piston B′ which cylinder has the exhaust or outlet S in its bottom. A spring X is placed in the rear end of the said valve chamber, and has a follower at its forward end bearing against a ball valve O which is held in place by the tubular screw threaded valve seat L^2 which screws into the outer end of the valve chamber L′. Whenever the fluid in the outlet pipe is expanded sufficiently to overcome the force of the spring X, which may be set to yield at any desired pressure by adjusting the seat L^2, the pressure relief valve O will be moved inwardly and the fluid escape into the cylinder A^3 and pass out through drain or exhaust opening S.

H is a drain passage leading from the main passage A^6 upwardly into a valve chamber H′ closed by a plug h' and a ball valve Z closes down upon a seat h at the upper end of the said passage H.

R is a passage leading from the valve chamber H′ down into the cylinder A^4 in advance of its aperture a^5 and beyond the throw of the smaller piston B^2.

The pressure in the inlet pipe when the fluid such as water, is turned on, in the supply pipe g, forces the valve Z to its seat but when the water is turned off by means of the usual waste cock to prevent freezing, the back pressure of water in the pipes leading to various parts of the building from the outlet end of the regulator will raise the valve Z from its seat and flow out through the inlet pipe and its waste cock. The area of the larger piston of the reducing valve or double piston B is over three times the diameter of the smaller piston and when the pressure on the larger piston equals approximately eighty per cent. (80%) of that on the smaller piston, the latter will be made to close the openings a^5.

It will be noticed that both adjusting screws K K′ are nicked at their outer ends to receive screw drivers, and that these nicked ends and the jamb or set nuts lie within the outer ends of the end couplings or caps, so that they may be operated by inserting the proper implement in said ends. The outer end of the valve seat L is also nicked and may be readily reached by removing the larger end coupling or cap. As both screws are carried by the respective end caps, they are inserted and removed simultaneously therewith, which leaves the casing ends wholly unobstructed when they are removed, so that the interior may be inspected or the double piston or reducing valve may be removed if desired.

When my pressure regulator is used in domestic service pipes the water is drawn from the various faucets in an evenly running stream without the usual waste of water which ensues when delivered at main pressure. During the winter when the waste cock is opened all water in the various pipes will flow back through the regulator past the drain valve to the said waste cock and when the waste cock is closed in the morning the pressure of the inflowing water holds valve Z closed. If the kitchen boiler or other hot water heater becomes overheated so that the water is forced back at high pressure into the cold water supply pipe as frequently happens, all excessive pressure will be relieved through the excess-pressure relief valve L.

All of the foregoing operations in the regulator take place automatically and without the manual operation of a single part. The regulator will operate successfully when placed vertically, at an angle or horizontally as shown in the drawings.

The regulator is intended for use with steam, air, gas, water and other fluids.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A pressure regulator comprising the casing having a cylinder in two diameters, the larger section of which is integral with the casing, and the smaller section being formed of an open ended tube inserted through the smaller end of the casing and provided between its ends with a circumferential series of small perforations, an annular channel formed in the casing, around said perforations, a longitudinal passage leading from said annular channel to the larger outlet end of the casing, an annular coupling or cap screwed into the smaller end of the casing, and abutting on the outer end of the smaller cylinder section, a larger annular coupling or

cap at the outlet end of the casing, and a piston in two diameters working in the said cylinder; the smaller end of the piston facing the inlet end of the casing and its larger end facing the outlet end, substantially as described.

2. The combination of the casing having the cylinder in two diameters and in longitudinal alignment with the inlet and outlet ends, of a piston in two diameters, controlling the flow through the casing and having its smaller and larger ends facing the open inlet and outlet ends respectively of the casing, a longitudinal central screw mounted in a bearing in the inlet end of the casing to permit the free flow therethrough, and a spring interposed between the inner end of the screw and the smaller end of the piston; the outer end of the screw being accessible through the inlet end of the casing for adjustment, substantially as described.

3. A pressure regulator comprising the casing having the cylinder in two diameters and in longitudinal alignment with the inlet and outlet ends, a piston in two diameters controlling the flow through the casing with its larger end facing the outlet end of the casing and its smaller end facing the inlet end, a longitudinal central pressure-regulating screw mounted in the inlet end of the casing, a spring interposed between the inner end of the screw and the smaller end of the piston, and a longitudinal central flow-regulating screw mounted in the larger outlet end of the casing with its inner end in the path of the larger end of the piston; the fluid being permitted to flow freely past the said two screws in entering and leaving the casing, substantially as described.

4. The combination with the casing having a cylinder in two diameters in line with the inlet and outlet ends, of the piston in two diameters with its smaller and larger ends facing the inlet and outlet ends of the casing, respectively, a passage extending inwardly from the face of the larger piston and then laterally in rear thereof into the exhaust space at the inner end of the larger cylinder section, and an excess pressure relief valve, carried by the larger piston, and controlling said passage, the said valve being wholly within the casing, substantially as set forth.

5. The combination with the casing, having a cylinder in two diameters in line with the inlet and outlet ends, of the piston in two diameters with its smaller and larger ends facing the inlet and outlet ends of the casing respectively, a valve chamber in the larger piston, a passage extending from the inner end of said chamber laterally into the exhaust space at the inner end of the larger cylinder section, a spring in the chamber, an excess pressure relief valve engaged by said spring, and a tubular threaded adjustable valve seat in the outer end of the valve chamber; the said excess pressure relief valve mechanism being carried by the larger piston and lying within the outlet end of the casing, substantas set forth.

6. The combination with the casing having a cylinder in two diameters in longitudinal alignment with the inlet and outlet ends, of a piston in two diameters controlling the flow through the casing, and having its smaller and larger ends facing the inlet and outlet ends of the casing respectively, and a central longitudinal screw mounted within the outlet end of the casing with its inner end in the path of the larger piston and its outer end exposed for adjustment through said outlet end, substantially as set forth.

7. In a piston regulator, the combination with the annular coupling or cap for the outlet end of the casing, provided with an apertured cross-piece, of the flow regulating screw mounted in the apertured cross-piece to limit the throw of the piston or reducing valve, substantially as set forth.

8. The combination with the regulator having an annular coupling or cap for its inlet end provided with an apertured cross piece and the double piston or reducing valve controlling communication between the inlet and outlet ends of the regulator, of a spring between the cross-piece and the face of the smaller piston and a pressure regulating screw mounted in said cross-piece and bearing on the said spring, substantially as set forth.

9. In a pressure regulator the combination with the double piston having a reduced portion on the face of its smaller piston, of an annular coupling or end cap for the inlet end of the regulator and provided with an apertured cross-piece, a pressure regulating screw extending through said cross piece and having a shoulder on its inner end, and a spiral spring guided on the inner end of said screw and on said reduced portion of the smaller piston, substantially as set forth.

10. A pressure regulator comprising the open ended casing having a cylinder in two diameters and a double piston or reducing valve aligning said open ends and controlling communication between the said open ends, of annular couplings or caps on the ends of the casing; the one at the outlet being provided with an inwardly extending central adjusting screw to limit the forward throw of the piston and regulate the flow, and the inlet coupling or cap also having an inwardly extending central screw, and a spring bearing between the inner end of the latter screw and the face of the smaller piston, substantially as set forth.

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Witnesses:
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