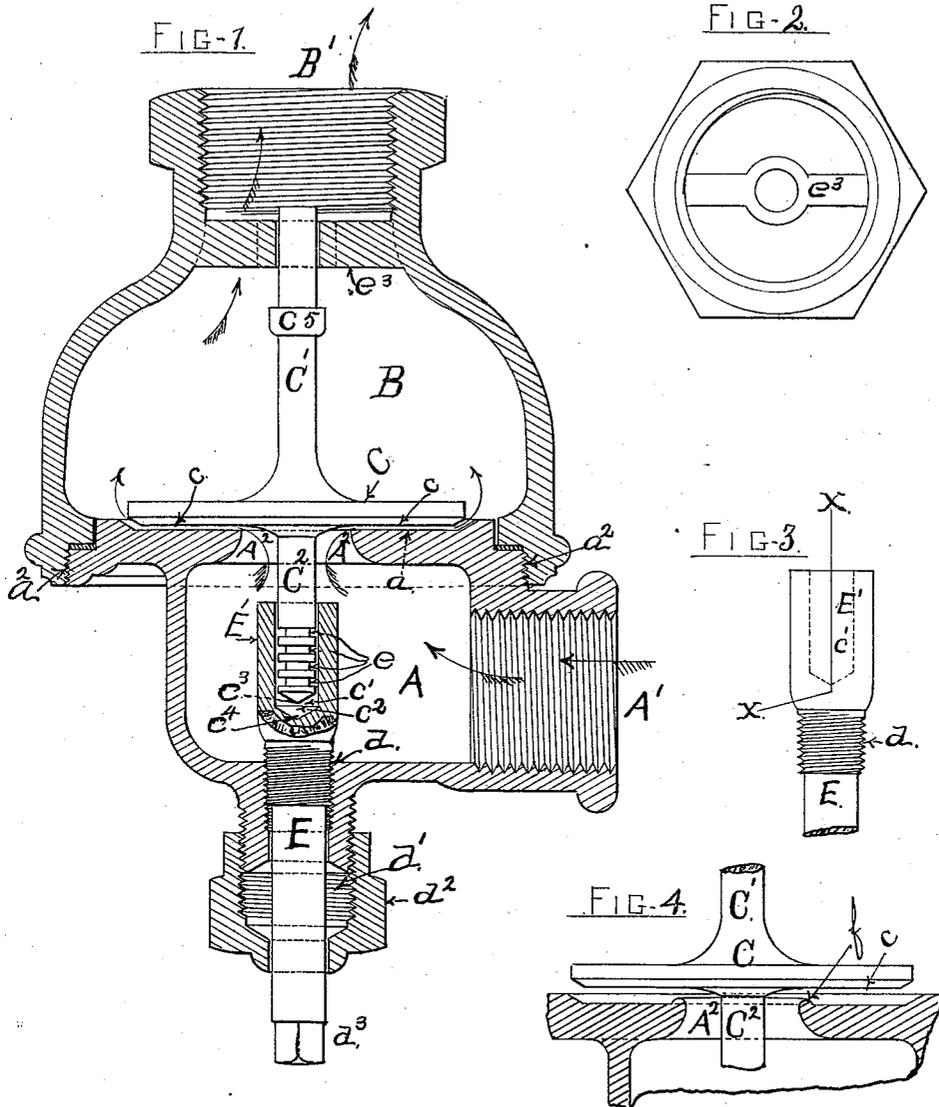


(No Model.)

E. P. HOLLY.
PRESSURE REDUCING VALVE.

No. 533,953.

Patented Feb. 12, 1895.



WITNESSES
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PRESSURE-REDUCING VALVE.

SPECIFICATION forming part of Letters Patent No. 533,953, dated February 12, 1895.

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To all whom it may concern:

Be it known that I, EDGAR P. HOLLY, a citizen of the United States, residing in Providence, in the county of Providence and State of Rhode Island, have invented a new and useful Pressure-Reducing Valve, of which the following is a specification.

My invention relates to improvements in pressure reducing valves, which are designed to reduce and maintain an even steam, air or water pressure lower than the initial pressure.

The objects of my improvements are, first, to produce a device for reducing pressure from a higher to a lower degree without the use of springs, weights or levers, and to accomplish the same without wearing surfaces in contact; second, to produce a device for reducing pressure from a higher to a lower degree; third, to produce a device for reducing pressure from a higher to a lower degree and all the intervening pressure between the lowest and the initial, without adding weight or increasing the tension of springs. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a vertical section of the entire device. Fig. 2 is a top view or plan of the top or discharge end of the device, and is to show chiefly the upper guide for the reducing disk. Fig. 3 is a vertical elevation of a portion of the lower guide for the reducing disk; containing line $x x$ indicating the section of the same part shown in Fig. 1. Fig. 4 is an elevation of a portion of the reducing disk, and section of its seat differing from Fig. 1 in that it shows a raised narrow seat.

Similar letters refer to similar parts throughout the several views.

The housing or case of the device consists of two chambers A and B, containing what I term, the reducing disk C. The lower chamber A is for the reception of the high or initial pressure (be it of air, water or steam and in this description I shall describe the device as used for reducing steam pressure) through the opening or pipe connection A'. The steam passes upward through the outlet or passage A² into the upper chamber B. The passage A² is covered by a horizontal circular disk C which is considerably larger in diameter than the passage A² which it covers.

The circular disk C has a flat lower surface

c corresponding with a flat upper surface a of the chamber A. The two surfaces a and c are presented toward each other and at rest, or when no steam is passing through, would be in contact from the diameter of the passage A² to the outer diameter of the disk C. This disk C is provided with a centrally projecting stem or shaft; the portion C' extending above from the upper side of the disk C, and a portion C² extending down from the lower side of the disk C. This stem or shaft C' and C² is a part of the disk, is centrally located, and at right angles to the two faces.

The upper chamber B is made large enough to conveniently include the disk C, and is screwed or bolted to the lower chamber A at a^2 . Above the disk the chamber is reduced in diameter to the regular outlet size at B'. The inlet A' and outlet B' may be of equal diameter but it is preferable, and I have shown the outlet larger than the inlet, or if the latter be for one inch pipe, the former would be for a pipe of one and one-fourth or one and one-half inches diameter, to compensate in some measure for the increased volume of steam under reduced pressure.

The central stem C' of disk C extends upward through the guide e^3 which is a bar cast across the outlet B', and bored centrally to receive the end of said stem. To preserve this vertical movement of the disk correctly, the portion C² of the central stem extends down into chamber A and terminates in the upper end of a vertical stud E which is located directly under the center of disk C and extends through the bottom of chamber A.

The upper end of the stud E is enlarged at E' for a certain distance, and bored to receive the lower end of the disk stem C² which is turned to fill nicely the bored portion of stud E, also grooved or channeled for water packing, as at e . The upper end of stud E at E' therefore forms the guide for the stem C² and also a small dash-pot for disk C. The stud E below E' is threaded for a short distance at d fitting a correspondingly threaded opening through bottom of chamber A. Below the portion d , the stud is turned to bottom of thread and passes through a stuffing box d' and packing follower d^2 to the outside of chamber A and is either squared at the end as at d^3 , or provided with a hand-wheel, by

means of which, the stud E may be made to assume a position higher or lower than shown, by turning stud E to the right or left, as the screw d will serve to elevate or depress the whole as desired. As shown the stud E is at a low position, leaving a space c^2 between the end (c^3) of stem C^2 and bottom of hole c^4 in upper end of stud. With the stud in the position shown the two faces a and c would rest in contact if no steam were passing through.

The object of the dash-pot guide and grooves in stem C^2 is to prevent repeated sudden movement—vertically of the disk C or what is called chattering. As the space not filled by the stem C^2 will be occupied by water which will have to pass from one groove to another when the disk changes its position (it can only change vertically) the time required for the water to change its position would prevent any very sudden movement of disk. The stem C' is enlarged at c^5 , to a diameter larger than the hole through the guide bar e^3 . This is to stop the vertical movement of disk before the stem C^2 leaves the end of stud E.

In Fig. 1 the chambers A and B are shown in section, together with stuffing box follower. The disk C is shown in a full exterior view, as is also the stud E, with the exception of the upper portion E' which is shown in section on line $x x$ of Fig. 3.

Fig. 4 is a vertical section of a portion of the lower chamber A, and a full view of the disk C. This is to show the raised seat f . This form of seat is preferable when the device is to be used for reducing water pressure, and at times to be closed tight against said pressure or where it is used both as a positive valve, and a reducing valve, I shall use both types of seats shown, for steam or water as conditions require. I have shown the flat seat or surface a on upper side of chamber A depressed somewhat below the surface outside of the diameter of disk C, and a corresponding bevel on under outer edge of disk. This is not necessary to the operation but has a tendency to direct the steam as it passes out from between the surfaces a and c in an upward direction. Said bevel may be any angle or may be dispensed with entirely.

The operation of the device to reduce pressure is as follows: When steam is admitted to the lower chamber A (through the pipe connections A') it will pass as indicated by the arrows, up through the opening or passage A^2 , between the disk C and the upper surface of chamber A (or between the surfaces a and c) into the chamber B, and out through the discharge B'. In passing from the opening A^2 into the chamber B the atmospheric or included pressure is excluded from the under side of the disk C, (or between the surfaces a and c) and consequently is effective on the opposite or upper side to hold said disk against the initial, or pressure contained in chamber A. The atmospheric or included pressure above said disk does not prevent

the escape of steam but allows it to flow at a reduced pressure, as desired or as the two diameters are proportioned for the terminal pressure. For example, assume that the area of A^2 equals one square inch and that the area of the disk C equals nine square inches. Then with atmospheric pressure removed from one side there would be an effective pressure against the other of nine times fifteen or one hundred and thirty-five pounds, and as the area of A^2 is but one square inch there would be required a pressure equal to, or slightly above one hundred and thirty-five pounds on the smaller area to overcome the atmospheric resistance on the larger area. I proportion the two areas for any terminal pressure I wish to maintain from a known initial. Suppose the device as shown with a steam pressure of fifty pounds per square inch in the chamber A would allow five pounds per square inch in chamber B, and that the device is reducing the pressure for a steam heating system, and from shutting off a portion of the radiation the terminal pressure should rise to 5.1 pounds. This increases the pressure on the upper side of disk .9 of one pound, which would move the disk nearer the top of chamber A or reduce the space between the surfaces a and c , thereby, reducing the quantity of steam passing between said surfaces thus causing the pressure in the system to fall at once to five pounds when the disk C would remain in a balanced position between the initial and terminal pressures but held positive in its position by the terminal pressure. If from using more radiation requiring a greater quantity of steam, the terminal pressure should fall to 4.9 pounds per square inch, then there would be a reduction of weight on the upper face of disk C amounting to .9 of one pound. The initial pressure immediately has a slight advantage over the terminal, and moves the disk a little farther from the seat or surface a , thereby increasing slightly the distance between a and c . As soon as a sufficiently greater quantity of steam has filled the system beyond chamber B and raised the pressure to five pounds, the disk would remain balanced in the position that would allow this greater quantity of steam to maintain the required pressure, the disk C always automatically adjusting itself vertically to the terminal pressure to allow the necessary opening between a and c that will furnish the quantity necessary to maintain the terminal five pounds. In speaking of five pounds I mean five pounds above atmospheric pressure and I only use the amount stated for illustration as I may have any terminal pressure required. I make the proportioned areas A^2 and C for any lowest pressure I may require. Should I wish to increase the terminal pressure above said lowest pressure, I increase positively the space between a and c by screwing the stud E higher into the chamber A to such an elevation that the bottom c^4 of the recess c' (which receives and guides the stem C' at the same

time forming a dash-pot for disk C) will engage with lower end c^3 of disk stem C' . A still greater elevation of the stud E would increase the distance between a and c and permit, says six pounds terminal pressure. A still greater elevation of the stud E would increase the distance between a and c and permit seven pounds terminal pressure, and so on by increasing positively the distance between a and c I increase the terminal pressure proportionately. If the initial pressure should be increased ten pounds the terminal would only receive one-tenth of the increase or one pound. Then if necessary I would lower slightly the stud E and adjust for five pounds and so in a reverse order.

In operation there are no parts in contact except the guide portions of disk C and consequently the device will not be affected to destroy its accuracy by any wearing that may occur by use, as is the case in similar devices where the valve is of the slide or piston type.

My device will operate just as perfectly, if reversed allowing the discharge end B to be below the disk or in other words upside down. In that position I should place a light coil spring or its equivalent between the guide bar e^3 and disk C simply to overcome the weight of disk so that when steam should be shut off entirely the disk would not fall out of the controlling influence of the terminal pressure.

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

1. In a pressure reducing valve, the following instrumentalities: a supply chamber and a receiving chamber of lower pressure, a passage connecting said chambers, a disk of not less than four times the area of said passage, to cover it, and an adjustable stud entering into the initial pressure chamber to hold said disk at a higher or lower position, substantially as set forth.

2. In a pressure reducing valve, the combination of an initial pressure chamber, a receiving chamber, a passage connecting said chambers, a disk larger than the passage, to cover it, stems projecting from both faces of the disk with guides fast to the chambers, ar-

ranged to guide the stems, and an adjustable stud entering into the initial pressure chamber to raise or lower said disk by the stem on its under side, substantially as described.

3. In a pressure reducing valve, the combination of the chambers A and B, with passage A^2 , a disk as C having a central shaft or stem C' C^2 , to guide said disk in a vertical movement, a guide e^3 , in the chamber B, a stud E, receiving in one end of itself a portion of the stem C^2 , said portion having a series of annular grooves made around it to form a piston packing to prevent sudden vibrations of the disk, said stud E provided with a screw d , fitting a threaded opening through chamber A, and a stuffing box d' , and follower d^2 , substantially as described.

4. In a pressure reducing valve, the combination of the chambers A and B, passage A^2 , between said chambers, disk C, covering the passage A^2 , a centrally projecting stem on said disk in chamber B with a position guide therefor formed in said chamber B, a centrally projecting stem on said disk in chamber A, a stud E, constructed to receive a portion of said latter stem to raise the disk from the passage and increase the pressure in the chamber B, substantially as described.

5. In a pressure reducing valve, the combination of the chambers A and B, disk C, having a central shaft or stem C' , C^2 , C' being enlarged at c^3 , to a diameter larger than the opening in guide e^3 , thereby forming a stop of the vertical movement of disk C, and adjusting stud E, substantially as described.

6. In a pressure reducing valve, the combination of the chambers A and B, a passage A^2 , to the chamber A, a disk C provided with stems C' , C^2 , covering said passage A^2 , and of a considerably larger diameter than said passage, and guided in its vertical motion by the guide bar e^3 , and stud E, a raised seat f , surrounding said passage A^2 , all substantially as shown and described for the purpose as set forth.

EDGAR P. HOLLY.

Witnesses:

ROSA M. HOLLY,
HENRY NEWTON.