No. 802,496. PATENTED OCT. 24, 1905.

G. W. COLLIN.

STEAM PRESSURE REDUCING VALVE.

APPLICATION FILED APR. 22, 1904. RENEWED MAR. 30, 1905.

2 SHEETS—SHEET 1.

Fig. 2.

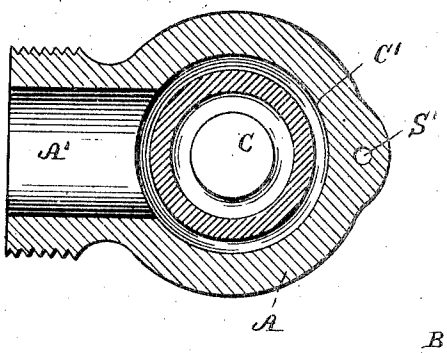

Fig. 1.

Witnesses

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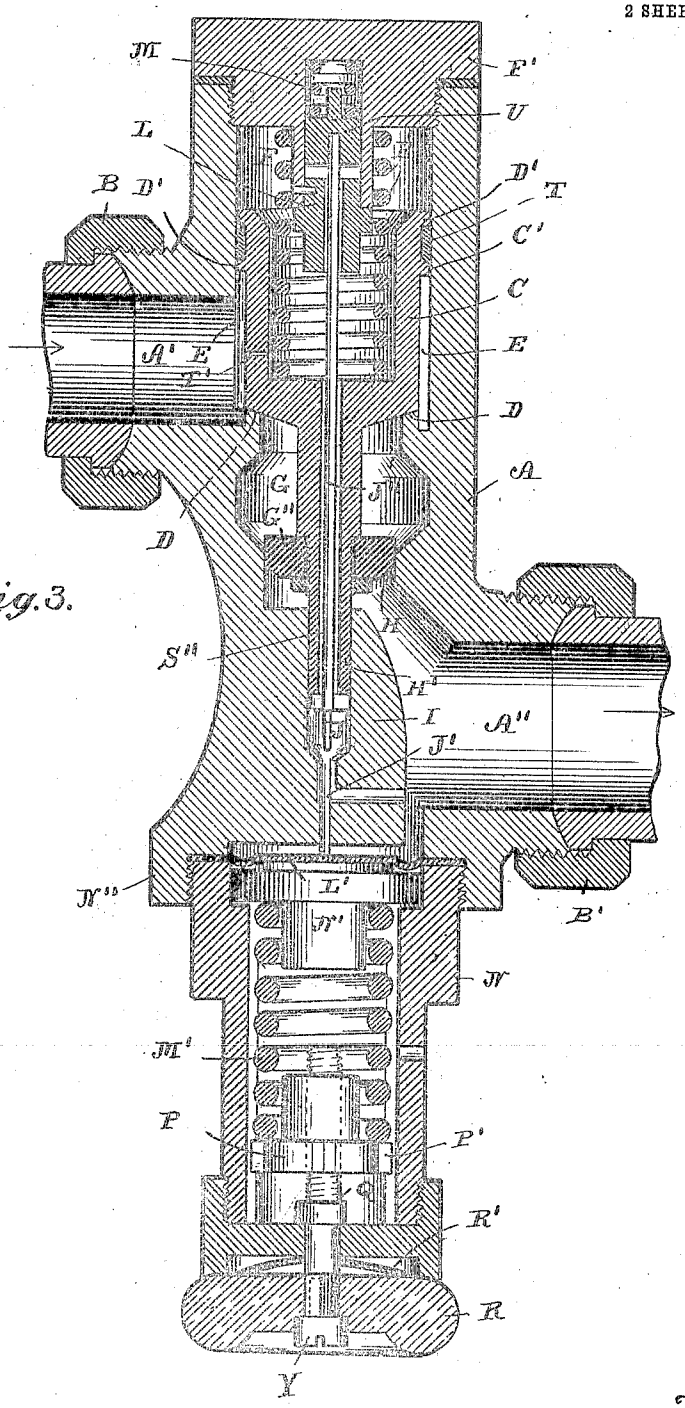

Fig. 3.

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UNITED STATES PATENT OFFICE.

GEORGE W. COLLIN, OF BRIDGEPORT, CONNECTICUT.

STEAM-PRESSURE-REDUCING VALVE.

No. 802,496. Specification of Letters Patent. Patented Oct. 24, 1905.

Application filed April 22, 1904. Renewed March 30, 1905. Serial No. 252,918.

To all whom it may concern:

Be it known that I, GEORGE W. COLLIN, a citizen of the United States, and a resident of Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Steam-Pressure-Reducing Valves, of which the following is a specification.

My invention relates to new and useful improvements in steam-valves, and more particularly to steam-pressure-reducing valves, such as are employed upon railroad-locomotives, intermediate of the steam-supply for heating the passenger-cars, or in marine practice or like places where high pressures of steam are reduced to lower pressures for various purposes and uses.

It is the object of my invention to improve the construction of devices of this class by producing a reducing-valve which has a supplementary regulating-port between the main valve and the lower-pressure side, to regulate the movement of the main valve in a manner to prevent its hammering or chattering when opening or closing, and to provide means for so regulating the flow of steam that the valve will not be wire-drawn or cut by the steam, as will later be explained; finally, to provide a valve which consists in part of a main valve, an auxiliary valve, a diaphragm, and means for regulating the tension on the same, said valves being located in separate chambers of the valve-casing and independent from said diaphragm, so as to be removable without disturbing said diaphragm.

With the above objects in view my invention resides and consists in the novel construction and combination of parts shown upon the accompanying two sheets of drawings, forming a part of this specification, upon which similar characters of reference denote like or corresponding parts throughout the several figures, and of which—

Figure 1 shows a vertical central sectional view through my improved valve complete. Fig. 2 is a transverse cross-section taken on line 2 2 of Fig. 1. Fig. 3 is a central vertical section somewhat similar to Fig. 1, but showing a slightly-modified form of my invention.

My device, as will be seen, comprises a suitable casing in which the main-valve body, with its several elements, and the auxiliary valve are held in their respective chambers and operated through the medium of a diaphragm. This diaphragm is operated by the system-pressure and is provided with a spring and means for regulating the tension of said spring against said diaphragm. The whole device is constructed in a way to allow free access to the valve mechanism in case inspection or repairs are desired, and likewise to insure perfect drainage.

Referring in detail to the characters of reference marked upon the drawings, and more especially to Figs. 1 and 2, A indicates the main casing of the valve, which, as shown, is provided with an inlet-nipple A′, and a coupling B for connection to the locomotive or initial pressure, and an outlet-nipple A″ with a coupling B′ for connection with the heating system, as is obviously necessary. C indicates a body, the bottom of which forms a valve to contact with a valve-seat D of the casing A. The upper part of the body forms a reciprocating piston D′, that loosely engages the bore C′ of the casing in a way to admit a slight passage of steam thereby, and the lower end of the body contains a stem that engages a guide-lug I of the casing. Below the valve-seat D is formed a cushion-chamber G and a supplementary regulating-port H to receive the plunger G′ on the depending stem of the valve-body C, which plunger enters the port H of the casing in a way to loosely close the same. The top of the bore of the casing is closed by a plug F′, which projects downward in reduced size, forming a hub F″, upon which a spring E′ is clamped and which extends to the bottom of the hollow valve-body C for its engagement. By inserting a hook into eye V of the valve-body C the same and spring can be lifted out of the bore, allowing free access to the interior of the casing, there being but two elements—the plug F′ and valve-body C—to disassemble and assemble in case cleaning is necessary. The steam-passage S′ connects the chamber F above the piston D′ to the service system through auxiliary valve J and allowing the steam which escapes by the piston D′ from valve-chamber E to the chamber F to enter the service system when auxiliary valve J is open in a way to insure an equal pressure in chamber F and the low-pressure side of the device when the auxiliary valve is open. The auxiliary valve J is for the purpose of governing the pressure in the chamber F above the piston D′ and is grooved to allow steam to pass when open. It is horizontally chambered in the casing, as seen in Fig. 1, and has a stem on both ends. The stem J″ extends through a guide L in plug S and into a hub U, which

is pressed inward by spring M. The guide L is pinned into the plug S, making a permanent assembly of the elements which are chambered therein so they can be removed and handled as if but one piece. The inner stem J' extends across the barrel and through a hole in the opposite wall of the casing and into the diaphragm-chamber against diaphragm L'. As here shown, the auxiliary valve J is entirely separated from the main valve and can be removed from its chamber and cleaned should it become foul and fail to properly operate. This is accomplished by first removing plug S, taking hold of the stem J'', and drawing the valve out of its chamber, which exposes the valve-seat near the surface so as to be readily cleaned. The diaphragm-chamber N'' is separated from the barrel of the casing, except by the drilled passages for the valve-stem J' and the lower passage L'' for steam-inlet and drainage-outlet. The diaphragm is clamped between the threaded hub N'' and the bonnet N. The presser-hub N' is interposed between the said diaphragm L' and the spring M', which is housed within the sleeve of the bonnet. The opposite end of this spring is engaged by a nut P, which has ears P' to engage grooves in the sleeve of the bonnet to prevent its turning. This nut is adjusted to and from the diaphragm by means of an adjusting-screw Q, which is journaled in cap Q', threadably attached to the sleeve of bonnet N. Upon the outer end of the adjusting-screw Q is attached a hand-wheel R, by means of which the screw is turned to adjust the pressure of nut P on the regulating-spring M'. A friction spring-disk R' is interposed in a pocket of the cap Q' and between the same and the wheel R and clamped between them by a screw Y, which is set into the squared end of the barrel of the adjusting-screw Q, forcing the wheel R down to its place and spreading the spring-disk R' in a way to frictionally hold the adjusting-screw Q and wheel R in their adjusted positions.

Referring to Fig. 3, it will be seen that the construction therein shown differs but slightly from that disclosed in Figs. 1 and 2 so far as its practical operation is concerned, the principal difference in construction being the location of the diaphragm, its bonnet, and adjusting mechanism, which, as shown in Fig. 3, is located at the bottom of the valve-casing, while in Fig. 1 it is located at the side of the valve-casing. The location of the auxiliary valve J is also different, being arranged vertically and directly beneath the guide-stem H' of the valve-body C. The upper stem J'' of this valve extends centrally through the passage S'' of the valve-body and into the spring-actuated hub U, housed in a suitable recess of plug F'. By removing the plug F' the spring E' and the parts inclosed by the guide L can be removed together, and by taking hold of auxiliary-valve stem J'' the main-valve body and the auxiliary valve can be drawn from the casing, thus removing the entire valve mechanism and leaving the interior of the casing free for inspection or cleaning. The passage S'' takes the place of the passage S' in the wall of the main casing (shown in Fig. 1) and furnishes an outlet between chamber F and the low-pressure side of the casing when auxiliary valve J is open. The plunger G'' (shown in Fig. 3) is made detachable to permit its removal, if desirable. The piston D' on valve-body C, as shown in Fig. 3, is provided with steam-packing T and a small port T' through the side of the body C to permit the initial steam from valve-chamber E to enter chamber F and exert a pressure on piston D' when auxiliary valve J is closed.

As previously stated, the operation of the two constructions are precisely the same and substantially as follows: When the steam is admitted to valve-chamber E, the pressure, acting on the lower side of piston D', forces the valve-body C upward, lifting the valve from its seat D against the spring E', which has no pressure on the valve-body when the valve is in a closed position and is only to prevent a too-violent lifting of the valve-body when the steam is first admitted to chamber E. With the opening of the main valve, as above set forth, steam is obviously free to enter the service system to the pressure desired, which when obtained causes the valve to automatically operate and sustain said pressure in the following way: When the pressure in the system reaches the height desired, regulated by the pressure of spring M' on diaphragm L', said diaphragm is forced outward, releasing the auxiliary valve J and permitting spring M to push the auxiliary valve J into its seat, cutting off the escape of steam from chamber F to the system through the intervening passage, causing the pressure to rise above the piston D' until it overbalances the initial lifting-pressure, forcing the valve-body C down. As the valve-body descends the plunger enters its port before said valve reaches its seat D, cutting off the free passage of steam, which being checked in cushion-chamber G forms a pressure-cushion below the valve, checking its descent. The pressure then rises in chamber F, overcoming this resistance and forces the valve to its seat without hammering or chattering. The area of the bottom of the valve being greater than the area of the plunger gives a pressure-cushion to the bottom of the valve, and with proportions of parts shown in the drawings there will be a cushion-resistance of eighty-eight pounds when the plunger G' enters its port H, providing the initial pressure is two hundred pounds. When the pressure becomes reduced sufficient to allow the spring M' to force the diaphragm L' inward, the auxiliary-valve stem J' is pushed back, opening the auxiliary valve J, allowing

the steam-pressure in chamber F to escape to the system through passage S', and the initial pressure in valve-chamber E, acting on the lower side of the piston D, again lifts the valve-body, opening the main valve. When the valve begins to lift from its seat D, as above, steam enters the cushion-chamber G and will sustain the initial pressure therein so that there will be no velocity of steam through the valve until the plunger G' is lifted from its port to allow a free passage of steam to the system, at which time the valve will be so far above its seat that wire-drawing is impossible.

In this invention I do not wish to be limited to the details of construction shown, since these can obviously be changed without departing from the essence of the invention. This is particularly true with reference to the location of the diaphragm or auxiliary valve and likewise the several features of the main valve and auxiliary chambers.

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

1. A steam-pressure-reducing valve, comprising a casing having a high-pressure chamber an auxiliary-valve chamber and a diaphragm-chamber, and containing a main-valve body, an auxiliary valve and a diaphragm each respectively located in said separate and independent compartments of the casing in a way to permit any one of them to be removed and replaced without disturbing the others, and suitable ports connecting said valves and diaphragm.

2. In a steam-pressure-reducing valve, the combination with a valve-casing, containing a main-valve chamber, an auxiliary-valve chamber, and ports connecting the same, of a valve-body in the first-named chamber, an auxiliary valve in the second-named chamber, a diaphragm and chamber therein and means to allow the removal of each or any of said ports without disturbing the others.

3. In a steam-pressure-reducing valve, the combination of a casing containing a main-valve chamber and body, an auxiliary-valve chamber, a diaphragm and chamber for the same, ports connecting said chambers, an auxiliary valve connected with the diaphragm in a way to be operated thereby to open and close, means to permit the removal of either said valve, diaphragm or body independent of the others.

4. In a steam-pressure-regulating valve, the combination with a casing containing a valve chamber and seat, and a cushion-chamber and port, of a body movably mounted in said chambers bearing a main valve to engage said seat and a plunger to close the port of the cushion-chamber, said valve and plunger being so proportioned and arranged with relation to said seat and port that the said seat is opened in advance of the port with the rise of the body.

5. In a steam-pressure-regulating valve, the combination with a suitable casing bearing a high-pressure inlet and a low-pressure outlet, of a valve-body intermediate of said inlet and outlet, a cushion-chamber having an outlet to the system, a plunger attached to said body adapted to close the outlet, said valve and plunger being so located and proportioned with relation to each other that the valve opens in advance of the plunger in a way to prevent the cutting of the valve-seat substantially as described.

6. In a steam-pressure-reducing valve, the combination with a casing provided with a valve-seat, of a body mounted therein, a cushion-chamber below the body having an outlet-port, a plunger carried by the body adapted to fit said outlet-port, said plunger and seat being so proportioned and arranged with relation to each other that the valve is opened in advance of the outlet-port in a way to first fill the cushion-chamber to check the flow of steam and prevent the cutting of the valve.

7. In a steam-pressure-reducing valve, the combination with a casing, a body bearing a piston, an inlet and chamber below the piston, a chamber above the piston, a passage through the body intermediate of said chambers, a cushion-chamber below the body, a plunger connected with the body to open and close an outlet-port of said cushion-chamber and means for automatically operating the body with the varying pressure in the system in a manner to open and close said port.

8. In a steam-pressure-reducing valve, the combination with a casing, of a valve-body, fitted therein provided with a piston, seat and plunger, a cushion-chamber intermediate of the seat and plunger, a diaphragm, an auxiliary valve operated by the diaphragm, ports leading from said auxiliary valve to a chamber above the valve-body and to the system-outlet whereby the initial flow of steam to the system is controlled and whereby the pressure upon the top side of the body is increased or decreased to open and close the same.

9. In a steam-pressure-reducing valve, the combination with a casing of a movable valve-body fitted therein bearing a piston, a chamber above and below said piston, a cushion-chamber below the body, an outlet for said cushion-chamber, a plunger attached to the body in a way to open and close the outlet from the cushion-chamber to the system with the movement of the body, a diaphragm operated by the system-pressure, an auxiliary valve controlled by said diaphragm, a port leading from the chamber above the body to the low-pressure side of the valve in a way to control the initial flow of steam from said chamber to said low-pressure side.

10. In a steam-pressure-reducing valve, the combination with a casing bearing a high-pressure inlet and a low-pressure outlet, of a body fitted within the casing bearing a piston, a chamber above and below the piston, a port

in the body intermediate of said chamber, a seat for the body, a passage leading from said upper chamber to the low-pressure outlet, an auxiliary valve intermediate of said passage, and means for automatically operating said auxiliary valve to control the initial pressure of steam from the high-pressure to the low-pressure side of the valve.

11. In a steam-pressure-reducing valve, the combination with a casing, of a body movably mounted therein bearing a piston and ports, a chamber above and below the piston, a seat and means for normally holding the body down upon said seat, a steam-passage leading from the upper chamber to the low-pressure side of the valve, an auxiliary valve in said passage to govern the initial flow of steam to the system, a diaphragm operated by the low pressure to control said auxiliary valve, a spring and means for adjusting the same to regulate the tension on the diaphragm.

12. In a steam-pressure-regulating valve, the combination with a casing, of a body movably mounted therein bearing a piston having steam-ports, a chamber beneath and above said piston, a passage leading from said upper chamber to the outlet of the valve, an auxiliary valve in said passage, a diaphragm for opening said auxiliary valve in one direction, a spring for closing the same, a plug in which the stem of the valve is slidably mounted in a way to permit of the removal of the valve by the detachment of the plug.

13. In a steam-pressure-reducing valve, the combination with a casing, having an inlet and outlet, of a body bearing a piston, a chamber below the piston, an outlet from said chamber, a chamber above the piston connected with the inlet, a passage from said chamber, connected with the outlet, an auxiliary valve in said passage, a diaphragm for operating the auxiliary valve and means for regulating the tension of said diaphragm.

Signed at Bridgeport, in the county of Fairfield and State of Connecticut, this 20th day of April, A. D. 1904.

GEORGE W. COLLIN.

Witnesses:
C. M. NEWMAN,
W. V. DEVITT.