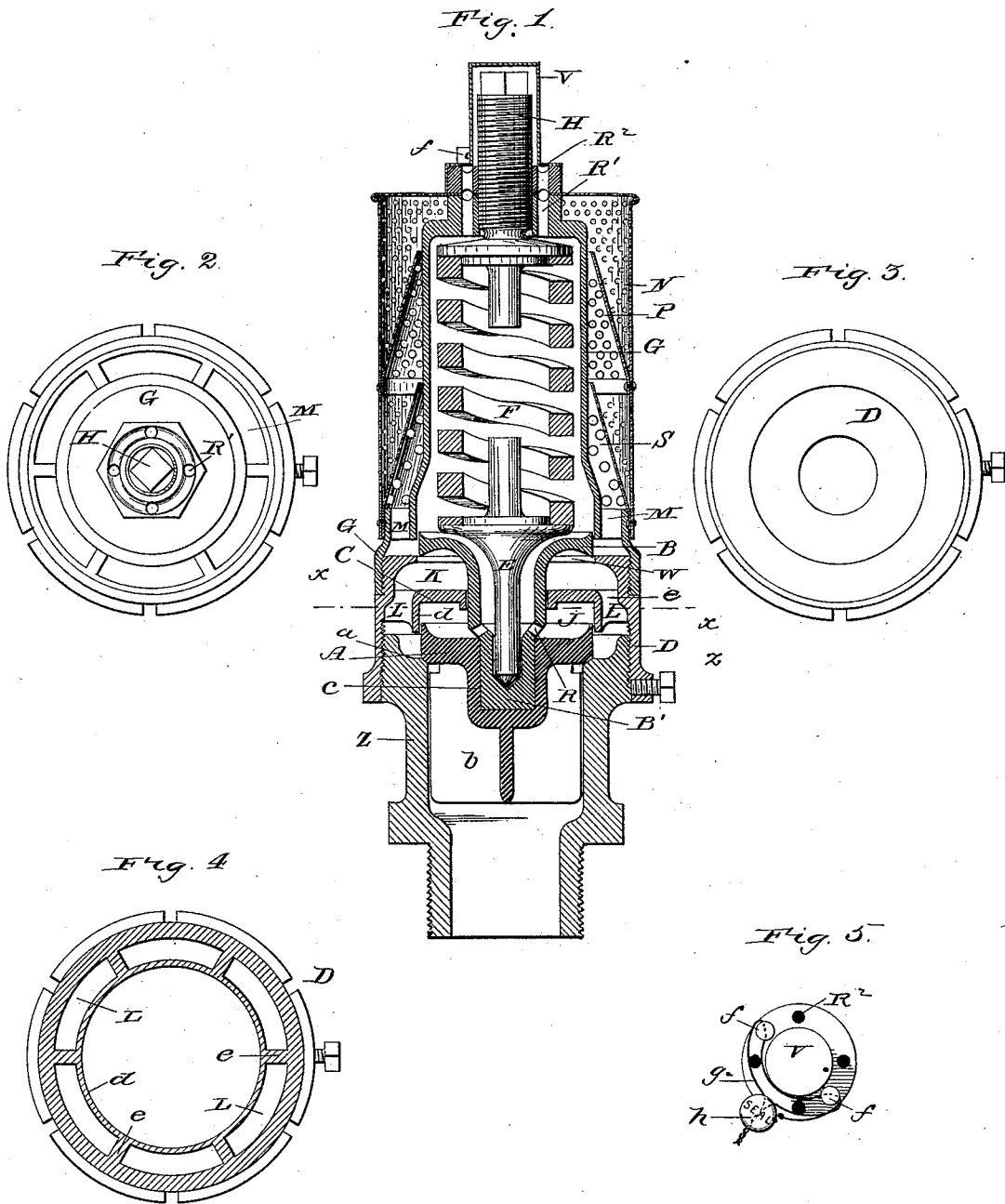


(No Model.)

J. M. COALE.
SAFETY VALVE AND MUFFLER.

No. 297,066.

Patented Apr. 15, 1884.



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UNITED STATES PATENT OFFICE.

JOSEPH M. COALE, OF BALTIMORE, MARYLAND.

SAFETY-VALVE AND MUFFLER.

SPECIFICATION forming part of Letters Patent No. 297,066, dated April 15, 1884.

Application filed January 17, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH M. COALE, of the city and county of Baltimore, and State of Maryland, have invented certain new and useful Improvements in Safety-Valves and Mufflers, of which the following is a specification.

These improvements have reference to what are usually known as "pop safety-valves." They relate in the main to the means for determining and adjusting the opening and closing of the valve, the object being to organize and arrange these means in such manner as to combine simplicity and ease of manufacture with accuracy and efficiency; and they also relate to the manner of combining with the other parts of the valve a muffler for suppressing the noise made by the escaping steam.

My improvement can best be explained and understood by reference to the accompanying drawings, in which—

Figure 1 is a vertical central section of the valve. Fig. 2 is a plan of the same with the muffler removed. Fig. 3 is a plan, and Fig. 4 is a section (on line *xx*) of the adjusting-case. Fig. 5 is a plan of the seal-cap for the adjusting screw-bolt of the valve-spring.

The valve represented in the drawings is one in which the main valve proper is combined with an auxiliary valve, and a controlling-spring common to both valves.

The valve shell or body is lettered *Z*. Within it is a valve-seat, *a*, for the main valve or valve proper, *A*, which, as usual, has wings *b* to serve as guides for it in the valve-shell. The valve *A* has in its head a central socket or recess, *c*, to receive the downwardly-projecting hub or stem *B'* of the auxiliary valve *B*, which hub is normally pressed down in its seat therein by the valve-spring *F*, the latter bearing at its lower end against the head or flange of the valve-spindle *E*, (which is stepped in auxiliary valve *B*), and at its upper end against the head of the adjusting screw-bolt *H*.

The valve *B* is intended to co-operate with an annular lip, *W*, between which and the said valve the body of steam which escapes from valve *A* must pass. This lip (which encircles the trumpet-shaped head of the auxiliary valve, so as to leave a slight opening between the two) is carried by a case or sleeve, *D*, movable up and down, for the purpose of adjusting the position of said lip relatively to

the valve. The case is made thus adjustable in the present instance by screwing onto the shell *Z*, as indicated at *z*. By screwing the case up or down the position of the lip *W* with respect to the auxiliary valve *B* can be regulated with great nicety.

With a view to preventing back-pressure on valve *A*, there is interposed between it and the auxiliary valve *B* a diaphragm, *C*, formed with a central hole for the passage of the stem or hub *B'*, and with an annular depending flange, *d*, which encircles and surrounds the head of valve *A* snugly, but not so tightly as to prevent the valve from lifting freely. The diaphragm *C* is connected to the adjusting-case by radial wings *e*, the spaces between which form steam-openings *L*, through which the steam escaping from valve *A* will pass to chamber *K*, (between diaphragm *C* and auxiliary valve *B*), and thence through the annular opening between *B* and *W* to the open air.

The adjusting-case *D*, which, as already described, carries the diaphragm *C* and lip *W*, also carries the valve-spring case *G*. The latter, as shown, screws onto the upper end of the adjusting-case, and is formed with openings *M*, through which the steam which escapes from between the lip *W* and the auxiliary valve *B* is discharged. A contracted portion of the spring-case *G* encircles the head of valve *B*, to exclude, as far as possible, the escaping steam from passing up between them. The steam may discharge directly into the open air; but I prefer to discharge it into a muffler, to which end *I* attach to the enlarged lower portion of the valve-spring case outside of the openings *M* a finely-perforated cylindrical shell, *N*, whose closed head or top is united to the top of the spring-case by a binding-nut or other suitable means. Within this cylindrical shell are two or more perforated deflecting-cones, *S P*, which at their contracted ends embrace the case *G*. The steam, in its effort to escape to the atmosphere, passes through these cones and thence through the cylindrical outer shell. It is in this way deflected and scattered, and the harsh disagreeable noise, which usually attends the escape of steam, is effectually suppressed. Under this arrangement it will be noted that both the valve-spring case and muffler, while adjustable or movable bodily with the adjusting-case *D*, are also movable inde-

pendently of the latter whenever occasion may demand. The tension of the valve-spring is adjusted, as usual, by the screw-bolt H, mounted in and carried by the spring-case G in the customary way. This bolt, when adjusted properly, is to be covered by the cap V. The latter has holes, which permit it to fit down around pins *f*, through the projecting heads of which are passed a wire, *g*, or the like, whose free ends are secured by a seal, *h*, to prevent the removal of the cap.

When the valve is in use, there is liability of steam leaking through into the space above valve B, and also into the space or chamber J between the head of valve A and the diaphragm C. To prevent back-pressure on valves A B from this cause, I enlarge and make tubular that portion of hub B' above the end that is stepped in valve A, so as to leave between it and the spindle E an annular passage, and I form in this portion of the hub B' vents or outlets R leading from chamber J into this annular passage. I also form in the walls of the neck of the spring-case G, through which the adjusting screw-bolt H passes, other vents or outlets, R', which register with openings R' in the seal-cap V. Through these outlets steam, which might otherwise accumulate above valve A B, can escape freely to the open air. The pressure at which the valve will open is determined by adjusting the screw-bolt H, and the point at which it will close is regulated by the adjustment of the case D. Both of these adjustments can, if desired, be readily made while the valve is under steam.

The operation is as follows: When the pressure under valve A is within, say, one pound of the maximum pressure for which the valve is set, valve A will open slightly and steam will escape through the openings L into chamber K, and from thence to the air through the annular orifice between the periphery of valve B and the lip W. As soon as the pressure attains the exact maximum point, valve A will be lifted sufficiently to allow steam to enter chamber K faster than it can escape through the annular orifice between B and W, and the steam, thus accumulating, will act upon the increased area afforded by the valve B to effectually overcome the increasing resistance of the spring, the two valves, as a consequence, being rapidly forced wide open, so as to relieve the boiler. The pressure then slowly decreases until it reaches about one pound below the starting-point, at which time the valve promptly closes. During the escape of steam the outlets R R' effectually prevent, as before ex-

plained, any back-pressure, due to steam that may leak through into the spaces immediately above the valves.

Having now described my improvements and the best way known to me of carrying the same into effect, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. The combination of the valve proper, the diaphragm above the same, the auxiliary valve, and the tubular auxiliary valve hub or stem resting in a recess or socket in the valve proper, and formed with vent-holes for the escape of steam that may leak through into the chamber formed by the valve proper and diaphragm, as and for the purposes hereinbefore set forth.

2. The combination of the valve proper, A, the diaphragm C, the auxiliary valve B, the hub or stem B', provided with vent-holes R, the valve-spring, and the spring-case C, having outlets R', as and for the purposes hereinbefore set forth.

3. The spring-case G, carrying the muffler, and having outlets M, which open into the muffler, and outlets R', which have no communication with the muffler, in combination with the valve proper, A, the diaphragm C, the auxiliary valve B, and the hub or stem B', provided with vent-holes R, as and for the purposes hereinbefore set forth.

4. The combination, with the main and auxiliary valves, of the valve shell or body, and the adjusting-case having the lip W and the diaphragm C, as and for the purposes hereinbefore set forth.

5. The case D, adjustable on the valve shell or body, and provided with lip W and diaphragm C, in combination with the main and auxiliary valves, their controlling-spring, and means for adjusting the tension of said spring, substantially as hereinbefore set forth.

6. The valve shell or body and the case D, adjustable thereon, and having diaphragm C and lip W, in combination with the spring-case G, carried by said adjustable case, the main and auxiliary valves A B, the valve-controlling-spring, and means for adjusting the tension of said spring.

7. The combination of the valve shell or body, the case D, adjustable thereon, and the spring-case G and muffler, carried by and movable with said case D, substantially as hereinbefore set forth.

In testimony whereof I have hereunto set my hand.

JOSEPH M. COALE.

Witnesses:

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JOHN S. REESE, Jr.