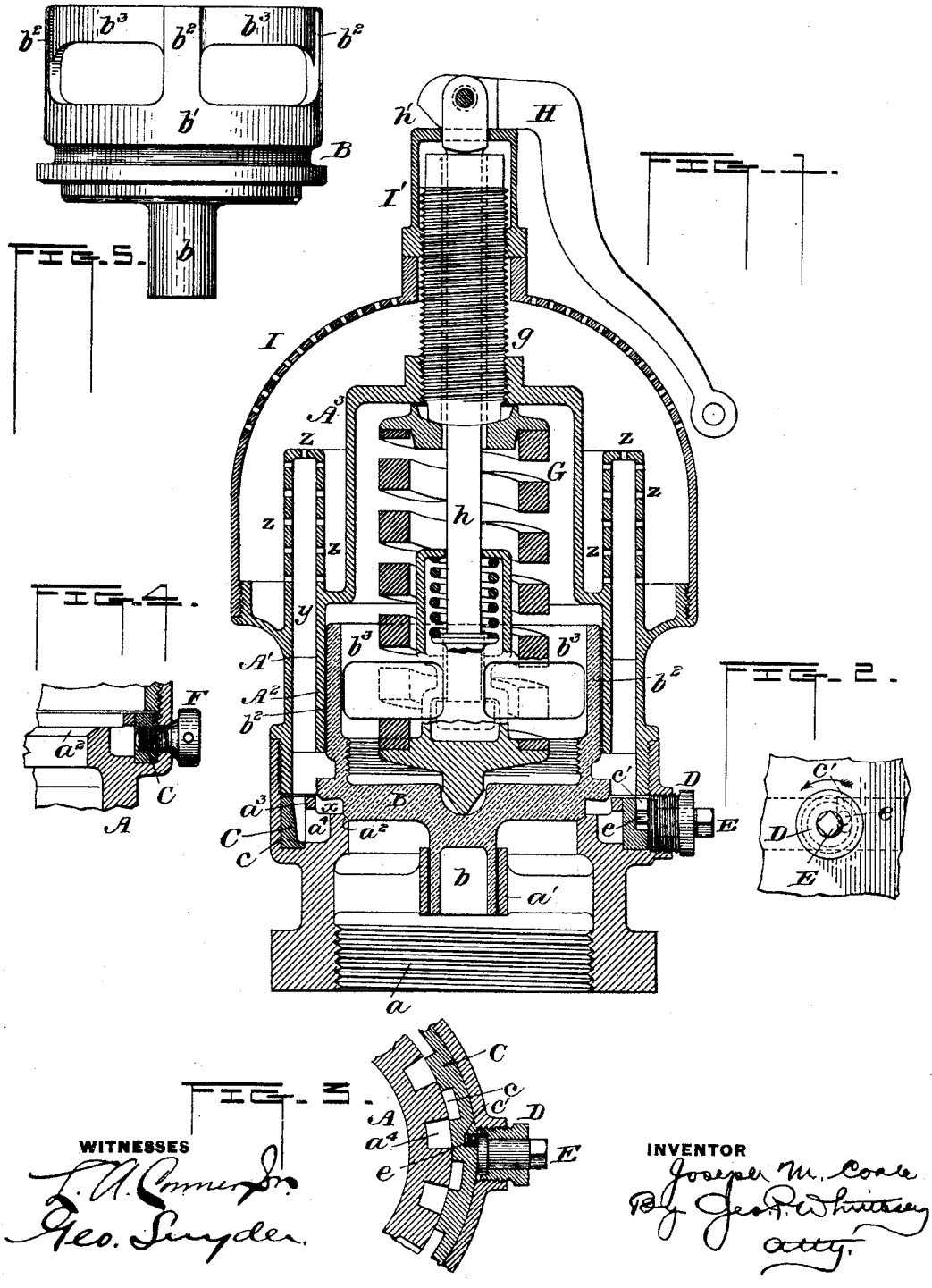
(No Model.)

J. M. COALE.

POP SAFETY VALVE.

No. 461,237. Patented Oct. 13, 1891.



UNITED STATES PATENT OFFICE.

JOSEPH M. COALE, OF BALTIMORE, MARYLAND.

POP SAFETY-VALVE.

SPECIFICATION forming part of Letters Patent No. 461,237, dated October 13, 1891.

Application filed May 8, 1891. Serial No. 392,007. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH M. COALE, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Pop Safety-Valves; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to safety-valves of the class known as "pop-valves;" and it consists in certain improvements in the construction of the valve, in the means for adjusting the reduction in the pressure to be effected by the operation of the valve, and in the construction of the muffler through which the steam escapes.

It is desirable that a safety-valve shall open promptly when the boiler-pressure reaches the point at which the valve is set to blow off and shall close with equal promptness when the excessive pressure has been relieved and the gage has fallen to the point below which it is not desirable to have the pressure go. Since the difference in pressure at which the old-style pop-valves open and close is usually considerable, and inasmuch as it is frequently desirable to have the valve close after the pressure has been but slightly reduced, various devices have been proposed whereby the relative closing and opening points of the valve can be adjusted. These devices consist, essentially, of one or more openings from the pop-chamber to the outer air so arranged as not to be affected in area by the movements of the valve and acting in conjunction with the varying opening from said chamber under the edge of the valve as the valve rises and falls to permit the escape of steam from the pop-chamber. By enlarging or contracting the area of the former opening or openings the escape of the steam from the pop-chamber takes place more or less rapidly and the valve will close more or less quickly, as the case may be, thereby relieving the boiler to a lesser or greater extent, respectively. My invention is designed to permit this adjustment to be made with great accuracy, and with the further advantage of being effected without disturbing the valve-casing or valve and without shutting off the steam.

It consists in a stationary valve-seat forming a part of the pop-chamber and having a series of ports communicating with the pop-chamber, an annular valve adapted to coact with the ports in the valve-seat and to close or open the same more or less, and means for adjusting said annulus operative outside of the valve-casing.

My invention also consists in certain improvements in the construction of the valve and the muffler.

In the drawings, Figure 1 is a vertical sectional view of a safety-valve and muffler embodying my improvements. Figs. 2 and 3 are details. Fig. 4 is a modification, and Fig. 5 is an elevation, of the valve.

The base A is provided with screw-threads a or other means for attaching it to a boiler. It also comprises a central bearing a' for the stem b of the valve B, which seats upon a seat a^2. Concentric with the seat and of a somewhat greater diameter is an upwardly-projecting flange a^3, which forms the outer wall of the pop-chamber x. An annular well, preferably cylindrical, is formed in the base A concentric with and surrounding the flange a^2. A series of ports a^4 is drilled or cored out in the base A, extending from the pop-chamber x to the annular well. A ring C is fitted into the well so as to be capable of oscillation therein. In the ring are formed ports c, adapted to coact with the ports a^4 in the base A. The ports a^4 and c are preferably of about the same width, and the width of the metal between two adjacent ports is preferably somewhat greater than that of either port, as clearly shown in Fig. 3. By this construction the two series of ports can be effectually closed by oscillating or partially rotating the ring, so as to bring the ports into the staggered position in which they are shown in Fig. 3. It is evident, however, that by a slight movement of the ring C the ports a^4 and c will be put into communication, the effective area of the opening depending upon the position of the ring C and being capable of the finest adjustment. It is evident that the con-

struction and arrangement of the ring may be considerably modified to suit special requirements.

The ring may be adjusted by any one of several devices. I prefer that shown in Figs. 1, 2, and 3. A threaded sleeve or hollow bolt D is fitted into a threaded opening in the wall of the base A adjacent to the ring C. The inner end of the sleeve is counterbored to receive the disk-shaped end of the shaft E, which turns snugly in the sleeve, the outer projecting end of the shaft being squared to adapt it to be turned by a wrench. The disk carries a wrist-pin *e*, which enters a vertical recess *c'* in the outer face of the ring C. Upon turning the shaft in the direction of the arrow in Fig. 2 the ring is oscillated to open the ports. When the ports have been properly adjusted, the shaft can be locked by turning the sleeve D, which abuts against the disk and acts as a jam-nut. It will be seen that the slightest movement of the shaft alters the opening of the ports, while the tightening of the sleeve not only locks the parts firmly, but also closes steam-tight the opening in which the sleeve works, so that no steam can escape there when the valve is blowing off. It is evident that the specific construction of the several parts of this adjusting device may be variously modified without departing from the spirit of my invention. A simple device to accomplish the same purpose is shown in Fig. 4. A screw F passes through an oblong slot in the base A and enters a threaded hole in the ring C. Upon slacking off the screw it serves as a handle whereby to move the ring laterally, and when properly adjusted the screw is tightened, locking the ring in position.

Another feature of my invention is the valve B, which, in addition to the central stem *b*, is provided with cylindrical flange *b'*, rising from the top of the valve. This flange fits steam-tight within a cylindrical shell A^2, formed integral with or attached to the valve-casing A' and concentric therewith. Guide-wings b^2 project up from the flange *b'* and are united by webs b^3, which preferably do not come in contact with the shell A^2. This construction affords a sufficient height to the valve to make it slide smoothly and evenly without giving it too great weight.

The shell A^2 and casing A' are united at the top, as shown, being parallel throughout. Concentric with the shell is an inverted cup-shaped cylinder A^3, united with the shell A^2 about midway of its length by an outwardly-projecting flange, as shown. This cylinder and that portion of the shell A^2 below it form the chamber for the spring G, which is provided with an adjusting-screw *g* and a relief-lever H and rod *h* of any approved form. The flange *b'* of the valve closes the lower end of the spring-chamber and prevents the steam from entering it. The steam that escapes from the valve-opening rises into the cylindrical annular chamber *y*, surrounding the spring-chamber, formed by the casing A' and the shell A^2. It escapes from this chamber through the holes *z*, which pierce the parallel walls of the casing A and shell A^2 above the point where the cylinder A^3 is united to the latter. The holes *z* are all of the same size, and their aggregate area is enough greater than the area of the valve-opening to afford an easy outlet to the steam that flows into the chamber *y*. In order to pass through the holes, the course of the steam must be turned at right angles, and this, added to the breaking of the volume of steam into a multitude of small jets, results in effectually muffling it. I prefer, however, to add another muffler consisting of the perforated dome or hood I, attached to the casing A' and inclosing the upper part of said casing and the spring-chamber.

The bolt *g* for adjusting the tension of the spring G passes up through the hood, being covered by a cap I', which serves also as a lock-nut for the bolt. The relief-rod *h* projects through the top of the cap, and the lever H, which is fulcrumed in the forked end of the rod, rests upon the cap. The end of the lever is a cam, which lifts the rod when the lever is raised. A flat face *h'* on the cam locks the lever when it has been raised.

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

1. The combination, with the base containing a valve-seat, pop-chamber, ports communicating with said chamber, and an annular well surrounding the same, of an annular valve located in said well and controlling said ports, substantially as described.

2. A pop safety-valve having ports in the valve-seat communicating with the pop-chamber, and an oscillating ring containing ports adapted to coact with the ports in the valve-seat, substantially as described.

3. A pop safety-valve having ports in the valve-seat communicating with the pop-chamber, an oscillating ported ring coacting therewith, and means, substantially as described, for adjusting said ring from outside of the valve-case, substantially as described.

4. The combination, with a pop safety-valve, of a valve-seat having ports communicating with the pop-chamber, a ring containing ports adapted to coact therewith, and a shaft projecting through the valve-case, having a wrist-pin engaging with said ring, substantially as described.

5. The combination, with the base A, containing a valve-seat, pop-chamber, ports a^4, communicating with said chamber, and an annular well surrounding the same, of a ring C, seated in said well and containing the ports *c*, a threaded sleeve D, located in an opening in the base, and a shaft E, journaled in the sleeve and having a disk-shaped inner end provided with a wrist-pin *e*, engaging with a slot in the outer face of the ring, substantially as described.

6. A safety-valve B, having a stem b and an upwardly-projecting flange b', provided with guide-wings b^2, in combination with a valve-casing having a shell A^2, receiving the flange and guide-wings, substantially as described.

7. The combination, with a safety-valve and its seat, of a cylindrical casing A′ and an interior shell A^2, concentric and parallel therewith, forming an annular cylindrical chamber y for the escaping steam, the upper portion of the chamber having outlet-holes z, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH M. COALE.

Witnesses:

JASPER M. BERRY,

FRANK W. COALE.