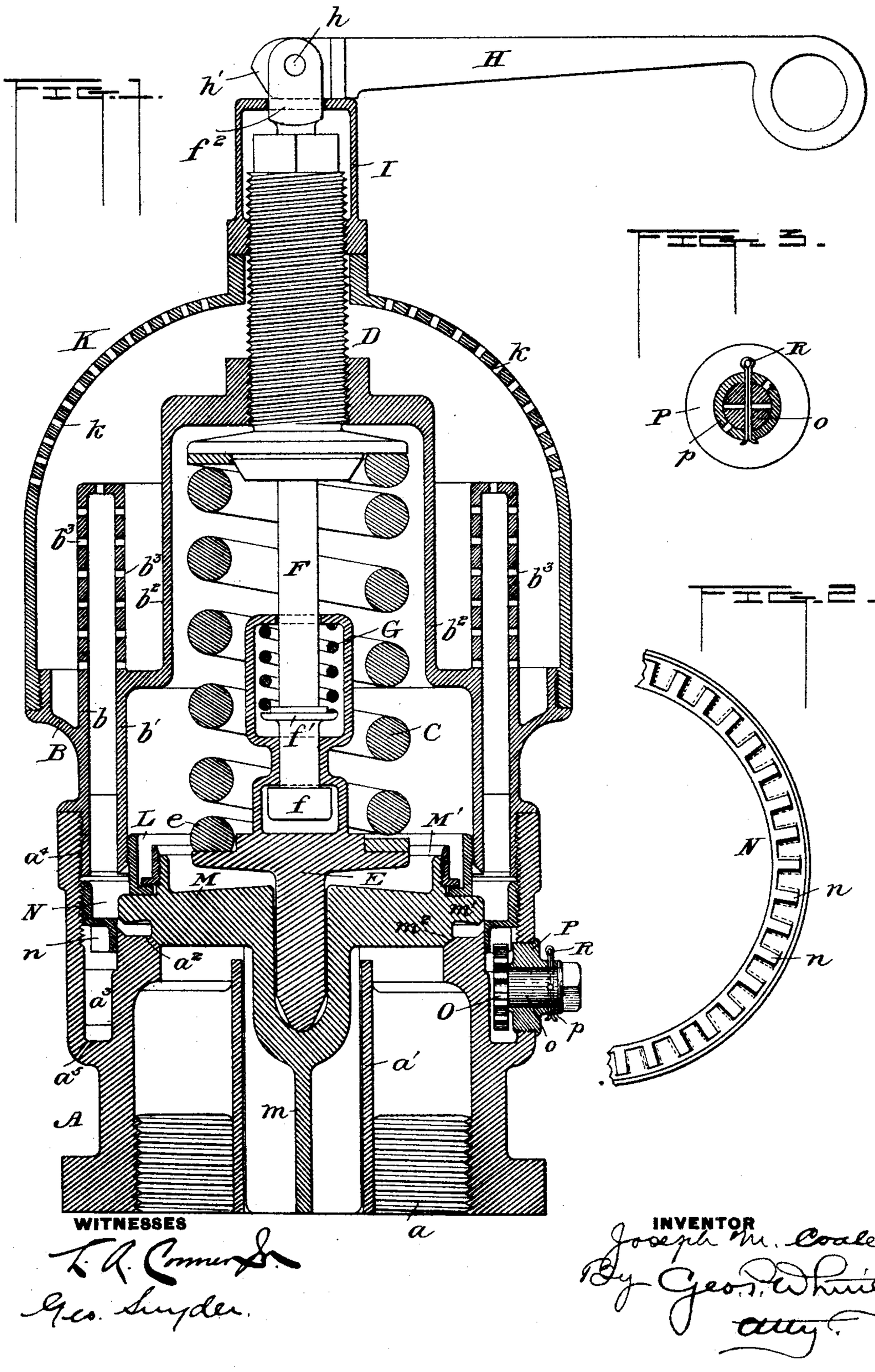
(No Model.)

J. M. COALE.

SAFETY VALVE.

No. 459,104. Patented Sept. 8, 1891.



WITNESSES

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SAFETY-VALVE.

SPECIFICATION forming part of Letters Patent No. 459,104, dated September 8, 1891.

Application filed April 7, 1891. Serial No. 387,991. (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 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; and its objects are, first, to so connect the valve and the relief-lever-lifting rod that the latter will not shake or rattle when the valve blows off; second, to so construct the relief-lever that when it is moved into operative position it will automatically lock itself in that position and remain so until forcibly changed, and, third, to render the ring which regulates the amount of pressure that the valve will blow down adjustable from the outside of the valve-case without disturbing the case or any of the other parts. These objects are accomplished, first, by inserting between the lifting-rod and the valve or lower spring-abutment a spring normally under compression and adapted to expand when the valve rises, so as to exert a constant thrust on the rod, and thereby hold it from rising or shaking when the valve rises. The rod has a head or shoulder which lies under a shoulder on the valve or spring-abutment and serves to lift the valve or spring positively when the relief-lever is moved.

The second object is effected by fulcruming the relief-lever in the upper end of the lifting-rod, with its edge resting directly on the cap or upper part of the valve-case and having a configuration which causes it when moved to act like a cam against the surface of said case. A portion of the cam at its point of greatest throw is flat, and when this portion is brought to rest upon the valve-case the lever will remain locked in this position, holding the valve open.

The third object of my invention is accomplished by providing the aforesaid ring with screw-threads by which it can be adjusted vertically within the valve-case, and with an annular rack engaged by a pinion secured upon the inner end of a short shaft projecting out through the side of the valve-case and provided with means for turning and locking it accessible from the outside.

In the accompanying drawings, Figure 1 is a vertical diametrical section of a muffled valve embodying my improvements. Fig. 2 is a bottom plan view of a portion of the annular rack. Fig. 3 is a cross-section of the shaft.

The valve-case consists of a section A, having screw-threads a or other means of securing it to a steam-pipe, a central guide a' for the valve-stem, an annular valve-seat a^2, surrounded by an annular well a^3, and internal screw-threads a^4 for the attachment of the threaded adjustable ring and the upper section B of the valve-case. This section is preferably of the form shown, consisting of two cylindrical concentric walls $b\,b'$, united at the top, and an inverted cup-shaped portion b^2, rising concentrically within the inner cylinder b'. The valve is guided by the lower part of the cylinder b', as hereinafter described. The parts $b'\,b^2$ constitute the spring-chamber inclosing the spring C, which abuts at its upper end against a shoulder on the threaded hollow adjusting-screw D, working in a threaded opening in the upper end of the portion b^2 of the case. The lower end of the spring rests, preferably, on an annular shoulder e on the post E, which is stepped in a central socket in the valve. The upper part of the post is hollow, containing, preferably, two chambers, one above the other. The lifting-rod F passes down centrally through said chambers, having a head f received in the lower chamber and adapted to abut against the top thereof. Between the two chambers the passage for the rod fits it closely, as shown, in order to prevent lateral play of the parts. The rod has a collar f' located in the upper chamber, and between said collar and the top of the chamber is a light spring G, normally under compression when the parts are in the position shown in Fig. 1. The spring C is so much stronger than the spring G that the lifting effect of the latter on the post E is of no consequence. The rod F extends up through the hollow screw D to a point outside the valve-case, where it is pro-

vided with a lever or other means for lifting it. It will be observed that the light spring G keeps a constant downward thrust upon the rod, which holds it steady under all circumstances. When the valve opens and the post E is raised, the spring G takes up the play and by expanding keeps the rod F quiet. The chambers inclosing the head *f* and the collar *f'* are long enough to permit the valve to open fully and freely without disturbing the rod. When the rod is lifted by means of its lever, the head *f* instantly engages with the top of its chamber and positively raises the post E, thereby relieving the valve of the tension of the spring C and allowing it to open. I prefer a lever to lift the rod F.

In the drawings the lever H is fulcrumed on a horizontal pin *h*, passing through jaws f^2, formed at the upper end of the rod F. The edge of the lever forms a cam, in which the flat tangent surface *h'* lies farther from the axis of the pin *h* than does the surface shown in contact with the top of the valve-case. It therefore follows that when the end of the lever is raised the rod F will also be raised, and that when the surface *h'* comes to rest on the top of the valve-case the lever will remain locked in that position with the rod F raised.

In the drawings the lever is shown resting on top of a cap I, which covers the upper end of the screw D. A shell or cover K is screwed upon the upper section B of the valve-case, and the cap is screwed down on the screw D until it abuts upon the upper end of the shell K, thereby forming a lock-nut for the adjusting-screw D. A number of perforations b^3 *k* are made in the upper part of the valve-case and shell, and serve to muffle the escaping steam, which rises through the annular passage between the cylinders *b b'*, passes laterally into the shell K, and thence radiates into the open air. The steam is prevented from entering the spring-chamber by means of a flanged packing-ring L, resting loosely on the top of the valve M and fitting snugly the interior of the cylinder b^2. A collar M', secured upon the upper part of the valve, compels the packing-ring to rise and fall with the valve, but leaves the latter free to play a little laterally, so that it may not become cramped and may seat squarely. The valve M has a central stem *m* sliding in the guide *a'*. It is provided with a flange *m'*, projecting horizontally beyond the face m^2, and serving to form, with the valve-seat and the adjustable ring N, the pop-chamber. The ring N is exteriorly threaded to engage with the screw-threads a^4. It extends across the annular well a^3, and has an internal face fitting and sliding vertically on the outer surface of that portion of the valve-case A containing the valve-seat a^2, as shown. The ring thus practically shuts out the steam from the well a^3. Should any steam enter the well, it can escape through the drip a^5.

In order to rotate the ring, I form on it, preferably on its under surface, a series of gear-teeth *n*, constituting an annular rack, as shown. Meshing with this rack is a pinion O, which is secured to the end of a short shaft *o*, projecting through the side of the valve-case. To facilitate removal, the shaft is preferably journaled in a screw-plug P, inserted in an opening in the side of the case A and slightly greater in diameter than the pinion O. The plug has a projecting neck *p*, through which the shaft *o* passes, the end of the shaft being squared to enable it to be readily turned. When the pinion is rotated, the ring N is turned in the case and is slowly screwed up or down, as desired. When properly adjusted, a pin or key R is put through registering-holes in the neck *p* and shaft *o* to lock the latter. Two holes are made through the shaft at right angles with each other. The two holes in the neck *p* stand at forty-five degrees apart. This enables the shaft to be locked in eight positions in every revolution. The teeth *n* of the rack and those of the pinion *o* are cut deep enough to insure their remaining in mesh during the extreme vertical movement of the ring.

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

1. The combination, with the main spring of a safety-valve and the part upon which it operates to shut the valve, of a lifting-rod engaging loosely with said part and a spring interposed between abutments on said part and rod and tending to move said part against the tension of the main spring, substantially as described.

2. The combination, with a safety-valve and its spring, of a post interposed between said spring and valve and containing a chamber, a lifting-rod passing through said chamber and having a head engaging with the post to lift the same, and a spring inclosed in said chamber and normally compressed between the top of the same and an abutment on the rod, substantially as described.

3. The combination, with a valve-case and safety-valve, of a post bearing on said valve and containing two chambers, one above the other, a spring exerting pressure on the post and valve, a lifting-rod suspended from the top of the case and passing down through both chambers, having a head received in the lower chamber and a collar in the upper chamber, and a light spring normally compressed between said collar and the top of the upper chamber, substantially as described.

4. The combination, with a pop safety-valve and its case, of a threaded ring forming the outer wall of the pop-chamber and provided with an annular rack, a pinion meshing with said rack to turn the ring, and a shaft carrying said pinion and extending through the wall of the case, so as to be accessible from the outside thereof, substantially as described.

5. The combination, with a pop safety-valve

and its case, the latter having internal screw-threads, and an annular well surrounding the valve-seat, of a threaded ring engaged with said screw-threads, said ring forming the outer wall of the pop-chamber and extending across the top of said well and provided with an annular rack on its under side, a pinion located in the well and meshing with the rack, and a shaft carrying said pinion and extending through the wall of the valve-case, substantially as described.

6. The combination, with the valve-case A, of the vertically-movable screw-ring N, having the teeth *n*, the pinion O, the shaft *o*, having one or more transverse holes, the screw-plug P in which the shaft is mounted, also provided with one or more holes, and a pin R, adapted to pass through said holes and lock the shaft, substantially as described.

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

JOSEPH M. COALE.

Witnesses:
WILLIAM J. O'BRIEN,
FRANK W. COALE.