(No Model.) 2 Sheets—Sheet 1.

J. M. COALE.

SAFETY VALVE.

No. 488,309. Patented Dec. 20, 1892.

Fig. 1.

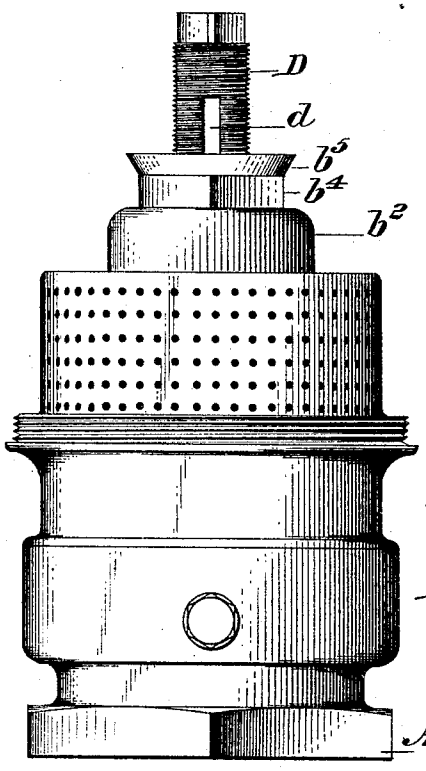
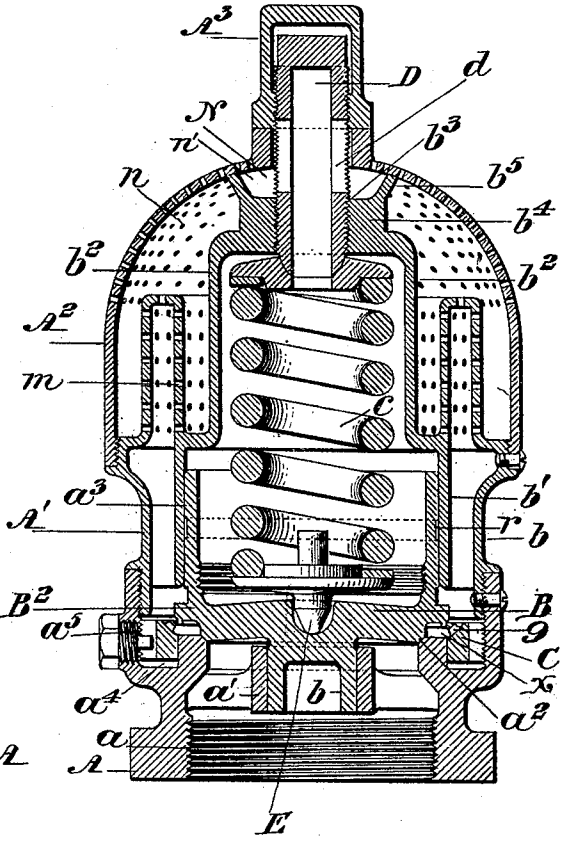


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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SAFETY VALVE.

No. 488,309. Patented Dec. 20, 1892.

Fig. 3.

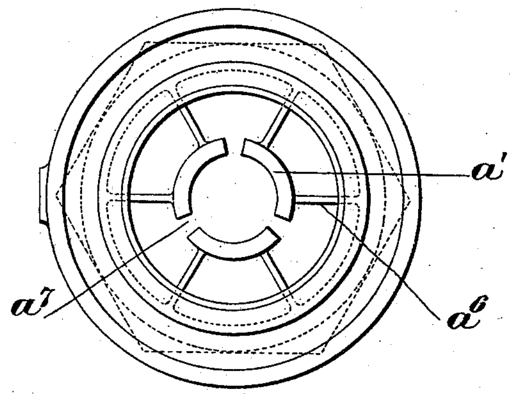


Fig. 4.

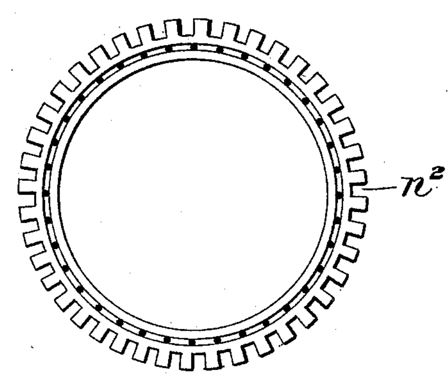


Fig. 5.

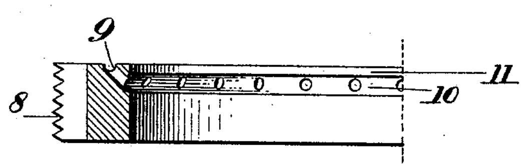
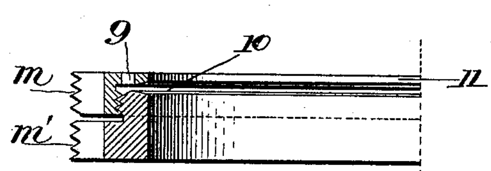


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOSEPH M. COALE, OF BALTIMORE, MARYLAND.

SAFETY-VALVE.

SPECIFICATION forming part of Letters Patent No. 488,309, dated December 20, 1892.

Application filed May 3, 1892. Serial No. 431,660. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH M. COALE, a citizen of the United States, residing in the city of Baltimore, State of Maryland, have invented certain new and useful Improvements in Safety-Valves, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to safety valves, and the several features thereof are applicable respectively to the classes known as pop valves and muffled safety valves, and may be used to advantage in safety valves combining the features of both those classes.

My invention is designed to supply mechanism capable of adjustment with great accuracy, and acting in combination with the pop valve, whereby when the boiler pressure reaches the point at which the valve is set to blow off, and the valve rises in consequence thereof, it shall close with equal promptness when the excess of pressure has been relieved, and the gage has fallen to a point below which it is not desirable to have the pressure recede; it therefore consists of the combination with a pop valve and the external case of a vertically adjustable valve seat whereby the relative closing and opening pressure of the valve can be adjusted with accuracy.

My invention also has for its object the steadying of the valve stem, and the provision of means therefor which will not be affected by the great heat of the steam passing over the same and entering the valve through the large induction port at the base of the valve case and where it is attached to the boiler; and to this end it consists of the mechanical means therefor hereinafter described and pointed out in the claims.

My invention finally relates to the construction of the spring chamber, its hollow steadying tube, and the combination with said parts of the external muffler casing whereby the latter is partitioned off to form a chamber into and through which steam and air may be discharged from the spring chamber; and to this end my invention consists in the construction hereinafter described of the spring chamber casing, the steadying tube, and of the combination and arrangement with these parts of the external muffler dome or casing.

In the accompanying drawings illustrating my invention, Figure 1 is a perspective view of a muffled safety valve embodying the several features of my present invention; the drawing showing the external muffler case removed. Fig. 2 is a vertical sectional view of the same (except that of Fig. 6); the external muffler casing being in place thereon. Fig. 3 is a plan view of the mechanical means devised by me for steadying the valve stem. Fig. 4 is a plan top view of my improved adjustable valve seat. Fig. 5 is a vertical sectional view through Fig. 4; and, Fig. 6 is a vertical sectional view of a modification thereof.

The base A of the valve case is provided with screw threads a or other suitable 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 an annular ground joint seat a^2. The construction of said central bearing a' forms one of the features of my present invention, and will be fully described hereinafter.

Surrounding the annular valve seat a^2 is an annular well a^4, formed in the casing. Internal screw threads are formed in the walls of the case and well for the attachment of the threaded adjustable ring valve seat C hereinafter described and the upper section A′ of the valve case. This section is preferably of the form shown consisting of two cylindrical walls b b' united at the top and an inverted cup shaped portion b^2 rising concentric with the inner cylinder b'. The valve B is guided by the lower part of the cylinder b' as hereinafter described. The part b' constitutes 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 b^3 in the upper end of the portion b^2 of the spring cylinder. The lower end of the spring rests preferably on an annular shoulder of the post E which is stepped in a central socket in the head or outer face of the valve B. A muffler dome or casing A^2 is screwed upon the upper section A′ of the valve case, and a cap A^3 covers the upper end of the hollow screw D; said cap being screwed down on the screw D until it abuts upon the upper end of the dome or casing A^2, thereby forming a locked nut

for the adjusting screw D. A series of perforations m are made in the upper part of the section $b\ b'$ of the valve case. The outer dome shell or case A^2 is provided with a series of like perforations n. Said perforations serve to muffle the escaping steam which rises into the annular passage between the cylindrical walls $b\ b'$ and passing the perforation m therein, and then laterally into a shell A^2 and thence radiates through the perforations in the same into the open air.

The steam is prevented from entering the spring chamber by means of the closely fitting contacting surface of the upper portion of the valve B with the inner face of the wall b' of the section A′ of the casing. A packing ring may, however, be inserted between said contacting surfaces in an annular goove as at r, if desired. Should, however, any steam enter said spring chamber, and in order to allow free outlet for such steam, and also to prevent compression of air within said chamber on the rising of the valve, the adjusting screw D is made hollow and slitted at one or two places as at d, in order to allow communication through the same with an annular chamber N formed in the perforated top of the section A^2 of the dome or casing. This chamber is formed by an annular extension b^5 of the wall of the inverted cup shaped portion b^2 of the valve case, said extension rising from the solid portion b^4 surrounding the adjusting screw D and being substantially of the form of an annular flaring collar b^5, the edge of which is of such size relatively to the dome shell or casing A^2 as to abut against the inner face of the same when the parts are assembled and held tightly together by being screwed down. It will be observed that the annular extension or collar b^5 thus acts as a dividing wall to form an inner chamber N partioned off from the main portion of the dome shell A^2 said chamber N being open to the atmosphere through the inner row or series of perforations n in the shell or cover A^2.

Another feature of my invention consists in the construction of the central bearing a' for the stem b of the valve B. Said bearing consists of a ring a' supported by arms a^6 constructed integrally with a section A of the shell. The construction is shown in plan view in Fig. 3, Sheet 2. And my present improvement in that form of construction is the provision of dividing the ring-bearing a' into arc sections by cutting away parts of it at intervals between the arms, as at a^7. The object of this being to allow for contraction and expansion of the metal. It has been found that with such a construction of bearing, made as heretofore, the great heat of the steam playing directly upon it, causes contraction and expansion, which takes it out of a true line, and consequently it will not serve for accurate guidance of the valve stem b which plays vertically in it. Much difficulty has been heretofore experienced with valves provided with such guide bearings due to this cause, as the valve will not seat properly. After repeated experiments I have discovered that by making the guide bearing ring a' in sections, as shown in Fig. 3, and thus allowing for contraction and expansion, no difficulty whatever is experienced, and the guide allows perfect vertical reciprocation of the valve stem b.

The last part of my present invention consists of the construction of the vertically adjustable ring valve seat, whereby the relative closing and opening points of the valve can be adjusted with accuracy. Its two forms are shown in Figs. 5 and 6. In safety valves heretofore constructed, it has been customary to accomplish this adjusting result by making an outlet or outlets from the pop chamber in the valve itself, and to provide some means for adjusting the size of this outlet. In my present invention I make the outlets in the outer or supplemental valve seat, which is formed by an annular ring C, and secure the adjustment by the provision of means for vertically adjusting the latter. In Fig. 2, is shown the form of adjusting ring shown in Fig. 5. It is screw threaded on its exterior periphery as at 8, to fit in the screw threads a^5 of the section A of the valve casing. It is provided on its top surface with an annular series of perforations 9 extending downward to an annular groove 10 on its interior face. The outer rim of the pop chamber x of the valve B rests upon the upper face of the ring inside of the annular series of perforations 9 and the groove with which these perforations connect communicates with the interior of the pop chamber.

In the form of ring shown in Fig. 6 it is made in two parts m and m', the groove 10 being formed by the overhanging ledge 11, which groove is made wider or narrower by screwing the part m upward or downward and separating it from or bringing it closer to the part m', which remains stationary. The valve B has a central stem b sliding in the guide a'. It is provided with a flange B^2 projecting horizontally beyond the face of the initial valve seat a^2 and serving to form with the valve seat and the adjustable ring C (forming a second or supplemental valve seat) the pop chamber x. The ring C is exteriorly threaded at 8 to engage with the screw threads a^5 in the section A of the casing. It extends across the annular well a^4 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. The ring thus practically shuts out the steam from the well a^4.

In order to rotate the ring, I form on its periphery a series of gear teeth n, constituting an annular rack. By appropriate means, the ring C is turned in the case and is slowly screwed up or down as desired, and the outer openings through the valve seat from the pop chamber made greater or less as circumstances of adjustment may require or be desirable.

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

1. The combination with the pop chamber of the valve, annularly surrounding the initial valve seat, and with the screw threaded valve casing of the mechanism herein described consisting of the adjustable ring C having the parts 8, 9, 10 and 11, for forming a supplemental valve seat and regulating and adjusting thereby the area of the supplemental passage for the escape of steam from the pop chamber, substantially as and for the purpose described.

2. The combination with the valve casing the initial valve seat formed thereon, the supporting arms, and a guide-bearing constructed in sections, of a valve adapted to said valve seat, and having a stem adapted to be reciprocated vertically in said guide-bearing; substantially as described.

3. The combination with a valve casing, its valve, an interior spring-casing having an upwardly extended annular wall, a perforated external muffler chamber, partitioned by said annular wall to form an interior chamber open to the air through one or more series of said perforations, and a hollow spring-adjusting screw passing through said interior chamber, provided with a recess opening into the same; substantially as described.

In testimony whereof I have hereunto affixed my signature this 29th day of April, A. D. 1892.

JOSEPH M. COALE.

Witnesses:
GEO. M. DAVIS,
JOS. G. COALE.