

UNITED STATES PATENT OFFICE.

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SAFETY-VALVE.

No. 855,431.

Specification of Letters Patent.

Patented May 28, 1907.

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To all whom it may concern:

Be it known that JOSEPH M. COALE, late a citizen of the United States, deceased, (of whose last will and testament FRANK W. COALE and MARY L. COALE are executors,) did in his lifetime invent 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.

The invention about to be described relates to safety valves of the class known as pop-valves, which comprise a huddling chamber beyond the initial valve-seat, and an adjusting ring for regulating the size of the strictured orifice from the huddling chamber. Such a safety valve is described in two several Letters Patent of the United States, granted to said Joseph M. Coale No. 459,104 dated September 8, 1891, and No. 657,086 dated September 4, 1900. The adjusting ring referred to operates, as is well known, to vary the size of the annular strictured orifice, and thereby regulate the amount of pressure that the valve will blow down; but it has been observed that in such valves there is an excess of steam pressure blown off beyond that necessary to compress the spring and lift the valve, which excess is suddenly lost when the valve is lifted, hence the valve drops back slightly, and without closing. This is due to the fact that the pressure in the huddling chamber is greater than that at which the valve was lifted from its seat, and that the huddling chamber opens directly into a large discharge chamber, hence a part of this pressure is suddenly lost, and the valve rebounds backward to some extent. This is a defect in the operation of such valves which precludes the provision of a sensitively-operating valve which will respond to and hold the valve open under slight increase of pressure above that at which it is set to open, and without lifting it more than enough to discharge the excess of pressure required.

This present invention has for its object to remedy the defect referred to, and it consists of specific means to provide an intermediate annular throat or passageway between the discharge annulus of the pop-chamber and the large discharge chamber of the valve;

this present application being a division of an allowed application Serial No. 227,268 filed October 5, 1904 by said Joseph M. Coale in his lifetime, in which said application was described and claimed the generic invention and one specific form thereof but not the specific form herein described and claimed, the same having been divided out of said application.

In the drawings illustrating this invention:—Figure 1 is a vertical diametric section of the lower portion of a muffled safety-valve embodying this improvement; Fig. 2 is a plan view of a segment of the adjusting ring, forming one wall of the pop-chamber.

The old portion of the valve, illustrated in the drawings, may be briefly described as follows:—

A is the lower section of the valve casing; it is screw-threaded at *a* to attach it to steam piping; and it is provided, as usual, with the guide *a'* for the valve stem *c*, and has an annular beveled or countersunk valve-seat *a²*, also an annular well *a³*, concentric with said seat, and the screw-threaded tubular part *a⁴* for the reception of the screw-threaded neck *b* of the upper section B of the valve-casing. The valve C has a central depending stem *c* adapted to operatively fit the guide *a'*, and has an annular beveled face *c'* to fit the beveled valve-seat *a²*, and a projecting flange *c²*, which is undercut and provided with a beveled edge *c³* to form the top and inner side of the huddling or pop-chamber. The valve is held to its seat by a spring *d* as usual, resting on a disk H supported on the upper face of the valve C, and has a long annular flange *m* which operates to guide the valve in its rise and fall, relatively to the inner wall *m'* of the upper or spring casing.

The outer wall of the pop-chamber is formed by the adjusting ring E, in Fig. 1. This ring is adjustable vertically in the well *a³* in the lower casing A, by means of an annular rack N, shown in Fig. 2, or otherwise, actuated by a pinion on the short shaft of the screw O projecting through the wall of the valve case and engaging with the rack N. The inner face of the adjusting ring E, is screw-threaded at *s* to engage with coinciding threads on the lower valve-casing.

In the devices of said prior patents, as in all other pop-valves of which we have knowl-

edge, the huddling chamber (in which the steam after lifting the valve from its seat, acquires and imparts an additional force which gives a second lift to the valve), the steam is discharged through the strictured annular opening of the huddling chamber, directly into a comparatively large chamber indicated at D in Fig. 1. The only useful function of the huddling chamber is to hold the valve open, for a while, after it has been lifted from its seat; but the effect of huddling the steam therein is to increase its lifting force much above that at which it lifted the valve from its seat a^2 , thus throwing it up somewhat higher than is necessary, and this excess of force, beyond what is necessary to merely hold the valve open, is suddenly lost by a discharge of the steam from the strictured pop-chamber directly into a comparatively large chamber, hence a portion of the pressure, beyond what is intended to be blown off, will be lost, and the sensitiveness of the device diminished, indicated by the fact that the valve will slightly rebound backward.

The invention consists in the discovery that this defect can be remedied by interposing between the strictured orifice of the pop-chamber and the aforesaid comparatively large discharge chamber, an intermediate annular throat or passageway, which is in effect a second strictured steam passage, and operating to prevent a sudden drop of the pressure and the consequent backward rebound of the valve. Such intermediate annular throat at each end thereof, should be much smaller in area than the base of the discharge chamber into which it opens, and larger, in a lesser proportion, than any variable area of the annular strictured orifice of the huddling chamber. In the drawings, these elements are drawn to a scale, from such valves made and operated, and are to be taken as examples of the correct proportions. Slight variations however, would not be material, provided the described relation of the areas is maintained.

We will now proceed to describe the new elements constituting the means hereinafter claimed, to provide such an intermediate annular throat or passage. It consists, as seen

in Fig. 1, of an inwardly-extending projection E^3 the back of which is coincident with the wall of the upper and outer wall of the valve casing B. The face of this projection forms one wall of the aforesaid annular throat or passage E^2 , the opposite wall thereof being formed by the projection c^2 of the valve. In the drawing, Fig. 1, this inwardly extending projection forms an integral part of the upper or spring casing B, though it is obvious that it may be formed separate therefrom. As seen in the drawings, the annular throat, thus formed, is contiguous to and in operative relation with the adjusting ring E, the huddling or pop-chamber, its annular strictured orifice, and intermediate said chamber and the comparatively large discharge chamber. The result, in the operation of the device is, that the valve is far more sensitive than before, there is no sudden release of excess pressure in the pop-chamber by which the valve was lifted and held open, and consequently no backward rebound of the valve, and the valve will be found to close promptly when the excess of pressure over that at which it is set to open, has been blown off.

Having thus described the invention, we claim as new and desire to secure by Letters Patent:—

In a safety valve of the class described, the combination with the valve and the valve casing and with the adjusting ring forming the outer wall of the huddling chamber, of an inwardly extending annular projection on the inner wall of the casing, arranged above the adjusting ring and operating to form a restricted annular throat or passageway intermediate the huddling chamber and the relatively large discharge chamber.

In testimony whereof, we have hereunto affixed our signatures this twenty-seventh day of December A. D. 1905.

FRANK W. COALE,
MARY L. COALE,

*Executors of last will of Joseph M. Coale,
dec'd.*

Witnesses:

E. MERRYMAN,
C. M. FUSTING.