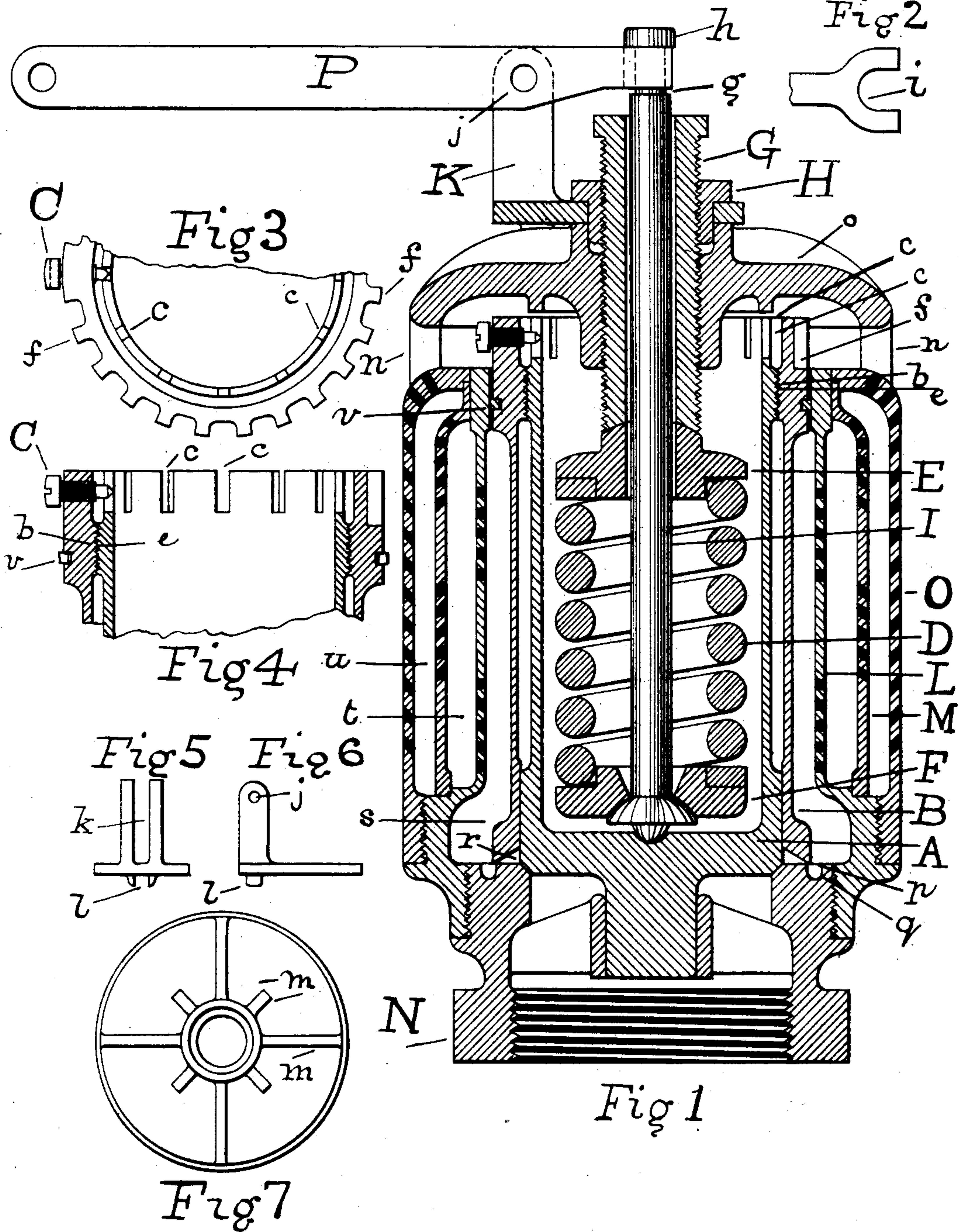


(No Model.)

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MUFFLED SAFETY VALVE.

No. 541,609.

Patented June 25, 1895.



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# UNITED STATES PATENT OFFICE.

GEORGE BLAGDEN HAZLEHURST AND FRANCIS JOHN COLE, OF BALTIMORE, MARYLAND.

## MUFFLED SAFETY-VALVE.

SPECIFICATION forming part of Letters Patent No. 541,609, dated June 25, 1895.

Application filed March 15, 1895. Serial No. 541,929. (No model.)

*To all whom it may concern:*

Be it known that we, GEORGE BLAGDEN HAZLEHURST and FRANCIS JOHN COLE, citizens of the United States, residing at Baltimore, in the State of Maryland, have invented a new and useful Improvement in Safety-Valves, of which the following is a specification.

Our invention relates to improvements in muffled safety valves, used on steam boilers and particularly on locomotives, of the type usually known as pop safety valves, in which the pressure of the steam is resisted by means of a spring.

The object of this invention is to provide a simple and efficient valve, which reduces the noise of the escaping steam to a minimum, constructed so as to admit of easy and quick adjustment for different steam pressures and desired amounts of blow back; and of simple construction, easy to repair and keep in order. We obtain these objects by the arrangement illustrated in the accompanying drawings, in which—

Figure 1 is a vertical cross-section through center of the valve and casing. Fig. 2 is a fragmentary plan of the relief-lever, showing the jaw. Fig. 3 is a fragmentary plan of the upper portion of valve and the adjusting-ring; Fig. 4, a fragmentary vertical section of same. Fig. 5 is an elevation of fulcrum for relief-lever; Fig. 6, a side view of same. Fig. 7 is a plan of upper portion of top of outer case, showing the ribs which engage in the lugs on lower portion of the relief-lever fulcrum.

Similar letters refer to similar parts throughout the several views.

"A" is the valve, having a cylindrical chamber on its top side, which contains the spring, spring spindle and seats. This cylindrical chamber is provided on its upper end with an external thread "b" and notches on its extreme upper end "c c."

"B" is an adjusting ring working on outside of valve and extending to upper part of casing, with an internal thread "e" engaging in the threads "b" in valve.

"f f" are teeth in the upper part of adjusting ring for the purpose of revolving the ad-

justing ring "B" on valve "A," thus altering the relative height and amount of blow back.

"C" is a set screw whose point engages in the notches "c c" and locks the adjusting ring and valve together when the desired adjustment is made.

"D" is a spring, "E" the upper spring seat and "F" the lower spring seat.

"G" is the adjusting screw for spring, which can be screwed down to any desired tension. "H" is a lock nut for same, fastening it securely in place when the desired adjustment has been made, and also holding in place the relief lever fulcrum.

"I" is a spring spindle with an annular groove "g" in its upper end, terminating in head "h," slightly larger than body.

"P" is a relief lever, and "i" a jaw in end of same which engages in the annular groove "g" of the valve spindle.

"j" is the relief lever fulcrum pin.

"K" is the relief lever fulcrum, with a jaw "k" for relief lever and the lugs "l" for engagement with the ribs "m m," Fig. 7.

"L" is a cylindrical inner case, perforated with a number of small holes, arranged to discharge the steam against the blank spaces in the cylindrical intermediate case "M," whose perforations are inclined downward but do not match those in the inner case "L." This is for the purpose of muffling the noise of the escaping steam.

"O" is a cylindrical outer case, perforated with a number of holes inclined upward, so as to allow the escaping steam to ascend and not settle around the valve and the boiler to which it is attached.

"n n" are columns or posts, which in this particular valve are located ninety degrees apart, connecting the lower portion of outer case with the upper part "o o."

"p" is the lower portion of the adjusting ring "B," arranged to slightly overlap the annular groove "q," cut in the valve chamber or seat "N."

In operation the adjusting screw "G" is screwed down until the tension equals the pressure of steam at which the valve is desired to lift. The blow back, that is the difference between the pressure at which the



valve rises and at which it seats, is then adjusted by means of the adjusting ring "B." The set screw "C" is screwed out and the adjusting ring revolved, either up or down, by means of the teeth "ff," by which it is pried around by a sharp pointed instrument inserted against the posts or columns "n n." If it is screwed down the blow back will be greater; if screwed up, less. When the valve lifts the steam passes up into the chamber "r," formed by the lower edge "p" of the adjusting ring, the valve chamber "N," and valve. Owing to the increased area exposed the valve is lifted well up off its seat. The steam then passes into the chamber "s," between the adjusting ring and the inner casing "L," and thus through the small perforations into the intermediate chamber "t," and strikes against the intermediate casing "M," whence it passes through the small holes into the outer chamber "u," gradually expanding as it passes through these different chambers, and finally passing to the atmosphere through the inclined holes in the outer case "O." By this time the jets of steam are so expanded and broken up and the velocity so decreased that the noise is reduced to a very small amount; to such an extent that it no longer causes any annoyance in covered railroad stations, or by frightening horses, &c. If for any reason it is thought that the valve is sticking on its seat and not relieving promptly, the spring pressure can be entirely relieved by pressing on the relief lever "P." The fulcrum of this relief lever can be moved around to eight different positions on the ribs "m m." This is often a convenience in locating it on a locomotive as the lever is more conveniently arranged when it points toward the rear of the engine. It will be noticed that the upper part of the adjusting ring fits loosely in the inner case. This is done for the purpose of preventing any possibility of the valve sticking, by any deposit of incrustation, &c., caused by using water containing a large amount of mineral or other impurities; and too large an escape of unexpanded steam is prevented by the steam expansion ring "v."

Having described our invention, what we claim, and desire to secure by Letters Patent, is—

1. The combination in a muffled safety valve, of the muffling casings perforated with small holes, the upper portion of the outer casing forming a cap or bridge, screw threaded in its center to receive the axial adjusting screw which passes out through the top of casing; a valve seat or chamber attached to the lower portion of the muffling casings; a spring pressed valve; and a long cylindrical adjust-

ing ring surrounding said valve, screw threaded on inside and provided with means for revolving and locking it in the desired position.

2. The combination in a muffled safety valve, of the muffling casings perforated with small holes, the upper portion of the outer casing forming a cap or bridge, screw threaded in its center to receive the axial adjusting screw "G," and attached to the perforated portion of the casing, by a number of columns or posts, "n n," forming openings, through which the long cylindrical adjusting ring can be revolved and locked; a valve seat or chamber attached to the lower portion of the muffling casings; and a spring pressed valve.

3. The combination in a muffled safety valve, of the muffling casings perforated with small holes, the upper portion of the outer casing forming a cap or bridge, arranged to receive the axial adjusting screw; openings in the upper portion of the outer muffling casing for revolving and locking the long cylindrical adjusting ring; a spring pressed valve; a valve seat or chamber secured to the lower portion of the muffling casings; a spring spindle with an annular groove at its upper end; and a relief lever with jaws for engagement in said groove.

4. The combination in a muffled safety valve, of the muffling casings perforated with small holes, the upper portion of the outer casing forming a cap or bridge, arranged to receive the axial adjusting screw; openings in the upper portion of the outer muffling casing for revolving and locking the long cylindrical adjusting ring; a spring pressed valve; a valve seat or chamber secured to the lower portion of the muffling casings; a spring spindle with an annular groove at its upper end; a relief lever with jaws for engagement in said groove; and the adjustable fulcrum "K," as described.

5. The combination in a muffled safety valve of the three muffling casings perforated with small holes and staggered as described, the upper portion of the outer casing forming a cap or bridge, screw threaded in its center to receive the axial adjusting screw, which passes out through the top of casing; a valve seat or chamber attached to the lower portion of the muffling casings; a spring pressed valve; a long cylindrical adjusting ring surrounding said valve, screw threaded on inside and provided with means for revolving and locking it in the desired position.

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Witnesses:

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