

G. H. CROSBY.
Safety-Valve.

No. 159,157.

Patented Jan. 26, 1875.

Fig. 1.

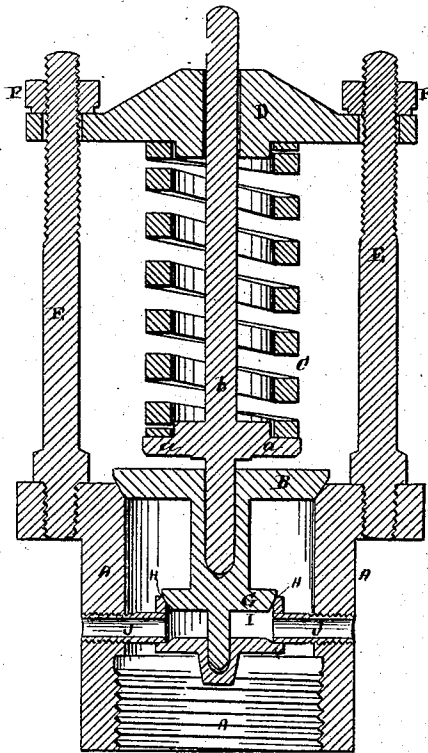
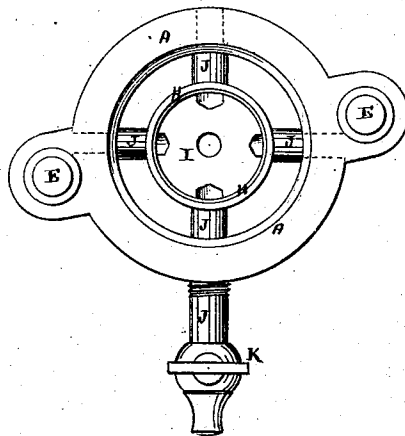


Fig. 2.



Witnesses
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UNITED STATES PATENT OFFICE.

GEORGE H. CROSBY, OF SOMERVILLE, MASSACHUSETTS.

IMPROVEMENT IN SAFETY-VALVES.

Specification forming part of Letters Patent No. **159,157**, dated January 26, 1875; application filed December 21, 1874.

To all whom it may concern:

Be it known that I, GEORGE H. CROSBY, of Somerville, Middlesex county, and State of Massachusetts, have invented certain new and useful Improvements in Safety-Valves, of which the following is a specification, reference being had to the accompanying drawing, in which—

Figure 1 is a vertical central section of a safety-valve embodying my invention. Fig. 2 is a plan of the same, with the valve proper, spring, and cross-head removed, for the purpose of exposing the interior of the shell.

A is the shell. B is the main valve proper, which I shall term the primary valve. C is the spiral closing-spring, which is confined between a shoulder, *a*, on valve-spindle *b* at one end, and the cross-head D at the other end. The cross-head at each end fits on a screw-threaded post, E, and is held down by nuts F, which serve to compress the spring more or less for the purpose of regulating its resistance to the lifting action of the steam. I connect with the primary valve a supplemental valve, G, which is of less diameter than the primary valve, and moves with the primary valve, which supplemental valve is within the shell, and in its normal position rests on a seat, H, by which the under face of the valve, when in this position, is shielded from the action of the steam. Under this arrangement the steam under boiler pressure presses against the under face of the larger primary valve and the upper face of the smaller supplemental valve; consequently the lifting force exerted by the steam is equal to the number of pounds pressure per square inch on the boiler multiplied by the difference between the areas of the exposed surfaces of the two valves. When this product exceeds the resistance offered by the spring C the primary valve will rise; but in so doing it lifts the supplemental valve from its seat, and steam is admitted below the under surface of the latter valve. The surface upon which the lifting force of the steam can act is in this way increased by an amount equal to the area of the supplemental valve, and consequently increased power is obtained to open the primary valve still wider against the resistance of the spring, which resistance, of course, in-

creases in proportion to the compression of the spring.

I form the seat of the supplemental valve on a chamber, I, closed at the bottom and communicating with the exterior through one or more discharge-passages, J. The combined area of the discharge-outlets is, preferably, less than the area of the opening into the chamber closed by the supplemental valve. This arrangement can be effected in various ways. The chamber I is within the shell A, and steam passes freely up around it to the primary valve. Under this arrangement, when the primary valve is lifted, and with it the supplemental valve, of course, the increased lifting power of the steam will be governed by the difference between the area of the supplemental valve and the areas of the discharge-outlets; and the steam will escape in two directions up through the main exit around the primary valve, and down through the chamber I and outlets J.

The above-described arrangement renders it feasible to vary the reduction in the number of pounds pressure effected by the blowing off of the valve without the removal of any part from the boiler, and even while the valve is under pressure; and, further, the valve can be immediately adjusted from working properly at a high pressure to working properly at a low pressure, and vice versa. The results I attain by providing one or more of the discharge-outlets J with stop-cocks K, bushings, or other suitable means for varying the size of the opening to which they are attached. These devices may be so adjusted that the steam cannot escape from the chamber I as fast as it enters it, and thereby the supplemental valve is acted on by a differential pressure, which, as above explained, tends to open the valves wider. This extra lift of the valves, and the number of pounds pressure reduced while the valves are open, are both dependent upon the amount of said differential pressure, which is regulated and determined by the size of the openings or outlets from the chamber; and the size of these outlets is regulated at pleasure and at any time by means of the stop-cocks or other devices for closing, or partially closing, said outlets or any one of them.

In conclusion, I would state that I do not limit myself to the specific construction and arrangement of parts herein shown in illustration of my improvements, for the same may be varied in many particulars without departure from my invention.

What I claim, and desire to secure by Letters Patent, is—

1. The supplemental chamber and its discharge-passages or outlets, in combination with stop-cocks or other regulator at one or more of said outlets, to regulate the discharge of steam therefrom, substantially as set forth.

2. In combination with the valve-shell and

primary valve, the supplemental valve and chamber within the steam-space of the shell, the discharge-passages or outlets leading from said chamber through and out from the shell, and means, substantially as described, for regulating the escape of steam from said outlets for joint operation, as shown and set forth.

In testimony whereof I have hereunto signed my name this 18th day of December, A. D. 1874.

GEORGE H. CROSBY

Witnesses:

J. H. MILLETT,

SAML. W. CLIFFORD, Jr.