(No Model.)

G. H. CROSBY.

SAFETY VALVE.

No. 306,386. Patented Oct. 14, 1884.

Fig. 1.

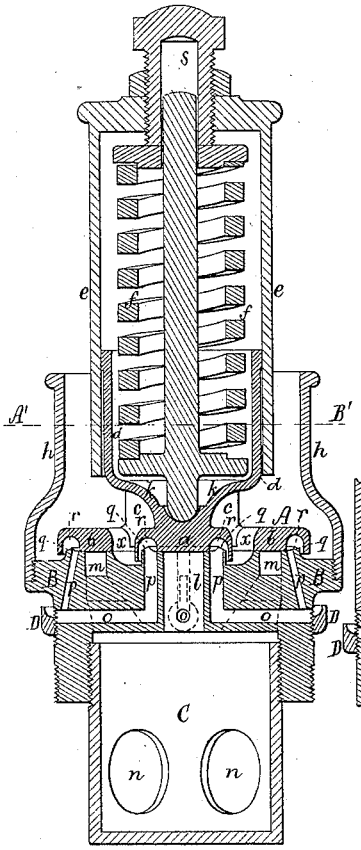


Fig. 5.

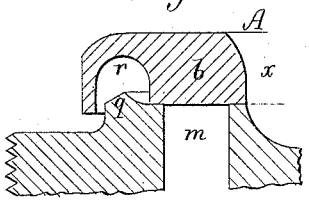


Fig. 4.

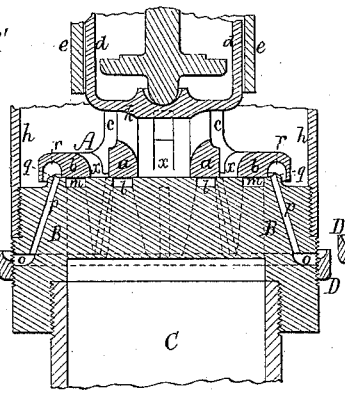


Fig. 3.

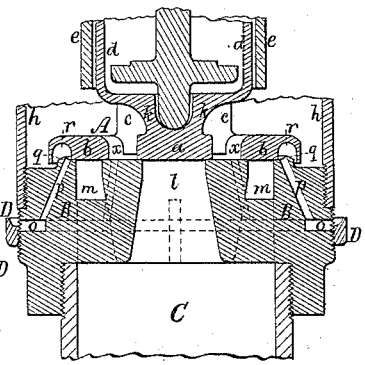


Fig. 2.

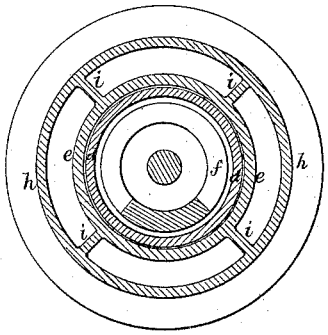


Fig. 6.

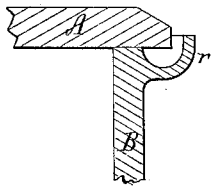
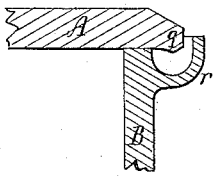


Fig. 7.



Witnesses.
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UNITED STATES PATENT OFFICE.

GEORGE HANNIBAL CROSBY, OF SOMERVILLE, MASSACHUSETTS.

SAFETY-VALVE.

SPECIFICATION forming part of Letters Patent No. 306,386, dated October 14, 1884.

Application filed May 5, 1884. (No model.)

To all whom it may concern:

Be it known that I, GEORGE HANNIBAL CROSBY, of Somerville, in the county of Middlesex, of the Commonwealth of Massachusetts, have invented a new and useful Improvement in Safety-Valves for Steam-Boilers; and I do hereby declare the same to be described in the following specification and represented in the accompanying drawings, of which--

Figure 1 is a vertical and transverse section of a safety-valve and its operative mechanism provided with my invention, the nature of which is defined in the claims hereinafter presented. Fig. 2 is a horizontal and transverse section through the line A' B' of Fig. 1. Figs. 3 and 4 are transverse sections of the improved valve and its seat or seats as somewhat differently constructed. Fig. 5 is a transverse section, on an enlarged scale, of the deflectors *q* and *r* and part *b* of the valve A, as hereinafter described. Figs. 6 and 7 are hereinafter explained.

In Figs. 1, 3, and 4 of such drawings the valve A is represented as a compound one, it in Figs. 1 and 3 being shown as composed of a central disk-bearing, *a*, and a single ring or annular valve-bearing, *b*, concentric with each other, and connected by arm *c*, extended from one to the other as the spokes of a wheel do with reference to its hub and rim. In Fig. 4, however, the valve-bearing *a* is shown as an annulus in cross-section. In each of the said figures the valve is represented as provided with a guiding-sleeve, *d*, that extends upward within the cylindrical case or cover *e* of the valve-spring *f*, such case *e* being extended down within and above a tubular casing, *h*, and connected therewith by a series of radial arms, *i*, there being spaces between the arms for the escape of the steam in passing through the casing *h*. The said casing *h* is screwed upon and extends upward from the valve-seat base B. The sleeve *d*, properly fitted to the inner periphery of the case *e*, serves with such case not only to guide the valve in its vertical movements, but as a bottom to the said case *e*, and thereby as a means of preventing the steam, when escaping, from impinging against the spring and producing deposits thereon. The sleeve *d* is connected with the valve by a tapering or flaring neck, *k*, that constitutes a deflector of the steam into the casing *h*, after the escape of such steam from between the valve-bearings *a* and *b*.

In the drawings the central steam induction-passage through the valve-seat base B is shown at *l* as directly beneath the valve-bearing *a*, there being around and concentric with the passage *l* another induction-passage, *m*, by which steam is led from the boiler to the annular valve-bearing *b*.

Extending down from the hollow base B is what I term the "guard-pot" C, which is a cylindrical or other proper-shaped pot open at top, and having in its sides a series of holes, *n*. This guard-pot is to prevent the water in the boiler, when suddenly foaming, from being driven upward into and through the valve-seat base B, as it is liable to be at times when the said base is without the said guard or some device for the purpose.

Encompassing and screwed on the base B is an annulus or gate, D, which, on being screwed downward relatively to the outer end of the passage *o*, opening laterally out of the valve-seat base, suffices to open such ends or passages more or less to interrupt and regulate the egress of steam from them.

Leading downward from the valve-seat are other passages, *p*, that open into the passage *o* in manner as represented, each of such passages *p* being a cylindrical hole bored or made downward in the valve-seat base B. In Fig. 1 two ranges of such passages are shown, while in Figs. 3 and 4 but one range of them is represented as in the said base B.

Extending upward from the base and around each range *p* is an annular rib, *q*, or internal deflector for deflecting steam from the next adjacent valve-seat upward into a downward external annular deflector, *r*, projecting from the valve A in manner as represented, such deflector *r* encompassing the deflector *q* at a short distance from it. By means of the internal and external deflectors, *q* and *r*, the steam, on the valve being forced upward, will be deflected directly downward upon the base in a manner to aid by its reaction in forcing the valve upward. Each valve-annulus *a* or *b* of the valve has within it and bounded by its periphery an opening, *x*, for the escape of steam through such opening from the valve-seat, when the

valve is raised from such, such opening being closed when the valve is down upon the base B. With this construction of the valve the steam has a greater chance for escape than would be the case were the valve without any such opening or openings. Were all the escaping steam to be thrown into the deflector, the latter, though performing its duty of aiding in forcing the valve upward, would operate to prevent the free escape of the steam, and therefore by having within the valve an opening or openings, *x*, as described, much of the steam, as the valve may rise from its seat, can escape through the said opening or openings, and the rest be utilized in acting within and from the deflector, as described.

Instead of having the deflector *r* applied directly to the valve, it may be to the valve-seat base, as shown in Fig. 6, in which part of the valve is exhibited at A, the seat-base at B, and the deflector at *r*, such deflector extending upward, as shown, with respect to the periphery of the valve. In this case the valve A is without any deflector *q;* but it may have one, as shown in Fig. 7, in which case the base B should have extending from it the upward deflector *r*. I allude to these arrangements of the deflectors, as they are but colorable changes involving the principle of my invention. The valve resting on its seat will be held down thereon by the spring *f*, against the pressure of the steam in the boiler, to which the safety-valve may be applied, the tension or pressure of the spring on the valve being increased by screwing downward the screws *s* over the head of the spring. The areas of the valve that are directly over the passages *l* and *m* are what the steam-pressure ordinarily acts upon to overcome the resistance of the spring. The valve-surface covering each seat will not be so acted on until the valve may rise from such seat. When the pressure of the steam under the valve is sufficient to move the valve off its seat, steam escaping will impinge against the tapering deflector *k*, and by it will be deflected upward within the casing *h* in a manner to aid, rather than retard, the escape of the steam from between the deflectors *q* and *r*. The steam will also cross the valve-seats and be driven downward through the passage *p* into the passages *o*, out of which it will escape, the amount escaping being regulated by the ring D. As soon as the valve is forced off its seat, the steam will be free to act on a greater surface of the valve than it could when the valve rested on its seat, and consequently the valve will be forced upward with an increased power against the increasing power of its spring, as the spring becomes contracted.

I do not herein claim the ring or gate D adapted to the valve-seat base, and the passages *o* thereof; but

I claim—

1. The compound valve A, provided with the concentric bearings *a* and *b*, and the deflectors *q* or *r*, arranged essentially as set forth, in combination with the valve-seat base B, having the passages *o* and *p*, *l* and *m*, and the annular gate D, substantially as specified and represented.

2. The valve provided with the downward deflector in combination with the valve-seat base having the upward deflector, and the passages *p*, extending therefrom downward into the passage *o*, provided with the gate D.

3. The valve A, provided with the guiding-sleeve *d* and tapering deflector *k*, extending above the said valve, the said deflector constituting a bottom to such sleeve and the spring-case.

4. The valve provided with the downward deflector, *r*, in combination with the valve-seat base having the passages *p* extending therefrom downward into the passages *o*, provided with the gate D, as described.

5. The valve A, having an opening or openings, *x*, through it for the escape of steam, and also having at its edge or periphery a downward deflector, *r*, as described, in combination with the base B, having a seat for and to close each opening when the valve is resting on such base.

6. The open or compound valve A and its seat B, provided with an upward deflector, *r*, applied to the periphery of one of them, as set forth.

GEORGE HANNIBAL CROSBY.

Witnesses:
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