F W. RICHARDSON.
Safety-Valves.

No. 207,820. Patented Sept. 10, 1878.

Fig. 1.

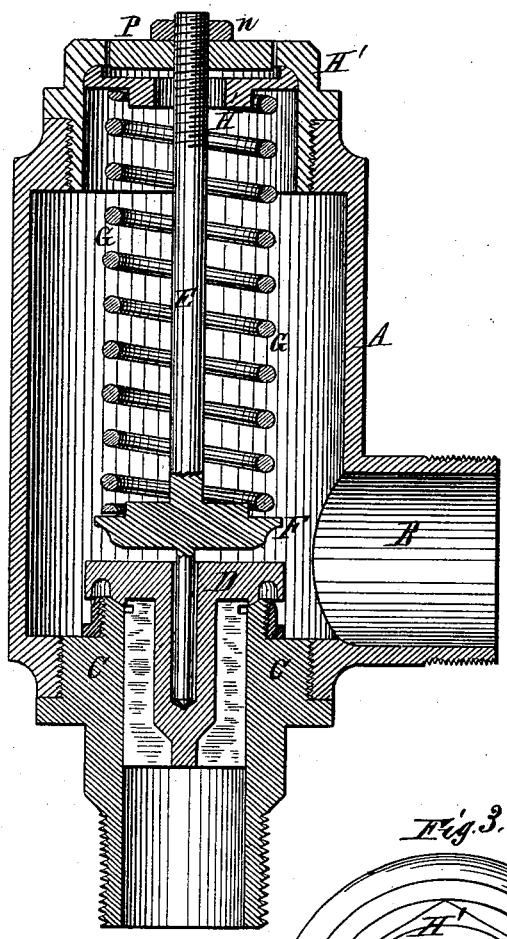


Fig. 2.

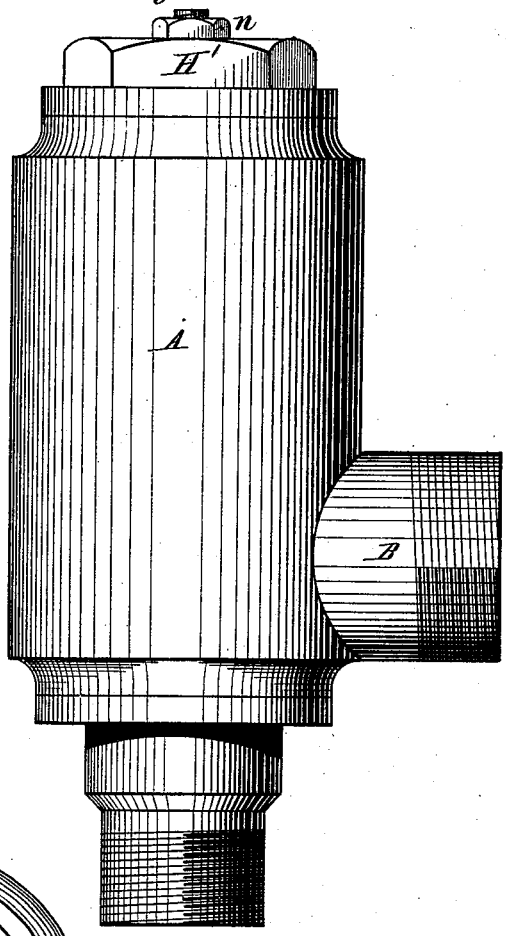
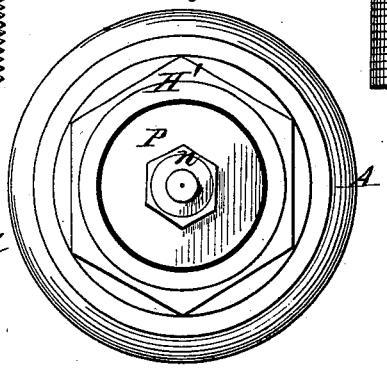


Fig. 3.



Attest:
Chas. H. Searle
W. Spelling.

F. W. Richardson,
Inventor:
By North Wescott,
Attorney.

UNITED STATES PATENT OFFICE.

FRED W. RICHARDSON, OF TROY, NEW YORK.

IMPROVEMENT IN SAFETY-VALVES.

Specification forming part of Letters Patent No. **207,820**, dated September 10, 1878; application filed August 9, 1878.

To all whom it may concern:

Be it known that I, FRED W. RICHARDSON, of Troy, county of Rensselaer, and State of New York, 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, and to the letters of reference marked thereon.

Figure 1 is a vertical section of my improved safety-valve; Fig. 2, an elevation or exterior view, and Fig. 3 a plan or top view of the cap and piston.

Like letters in all the figures indicate corresponding parts.

My present invention has special relation to that class of valves denominated "reactionary spring-loaded safety-valves," such as the Richardson, Orme, Crosby, Cameron, and others.

The object of my invention is to adapt the safety-valve to be inclosed or covered by a casing, from which a pipe may conduct the escaping steam to any desired point or place to accomplish any particular purpose—as, for instance, to heat the feed-water, or to conduct steam to a muffler for the purpose of getting rid of the objectionable noise of the steam as it escapes from the safety-valve, or to conduct the escaping steam to the smoke-arch or other convenient place for a like purpose.

To this end my invention consists in balancing the safety-valve within the casing, and in certain new and useful arrangements or combinations of parts, all of which will be hereinafter first fully described, and then pointed out in the claims.

It is obvious that if a chamber or case were formed around an ordinary safety-valve, or around any of those of the class hereinbefore mentioned, and the steam should escape from the boiler into this chamber or case in such volume that the conducting-pipe could not properly discharge it, a back-pressure would be formed in such chamber, which would tend to close or seat the safety-valve before it would sufficiently relieve the boiler of excess of steam. To obviate this difficulty it has heretofore been proposed to so incase the valve within the outer casing or chamber as that the escaping steam cannot come in contact with the head of the valve. This construction necessitates a double casing, within the inner wall of which the valve is liable to stick, and thus fail to accomplish its proper purposes; and such assemblage of parts is likewise considerably complicated, expensive, and more liable to get out of order than the improved device below described.

In order to illustrate the principles of my invention, I have chosen an ordinary Richardson safety-valve, to which my improvements are applied, as represented in the drawing.s

A is the exterior casing or chamber, having escape-opening B, from which the conducting-pipe leads to any desired point, and C is the valve-seat upon which valve D rests. E is a spindle, on which is secured a bearing-plate, F, for the spring G. At H is an annular collar, surrounding the spindle and abutting against the screw-cap H′, which collar serves as a top bearing-plate for spring G, and admits free access of steam to the piston P, which is attached to spindle E.

The screw-cap H′ forms a short cylinder for accommodation of piston P, and also operates to compress the spring G when desired, thereby affording means for regulating the requisite load for the safety-valve. The piston P is held in proper working position by means of a jam-nut, *u*, upon the screw-threaded section of spindle E, on which said piston may be conveniently set and made fast at any desired point. The area of piston or disk P should be made equal to the area of valve D in the particular class of safety-valves shown; and when this counterbalancing-piston is employed in connection with other forms of safety-valves the relative areas of the two should be so adjusted that the pressure upon both will be equal.

From the construction and arrangement shown, it is apparent that when steam unseats valve D and enters chamber A the pressure upon the inner face of piston P will be equal to the pressure upon the top of valve D, and will therefore diminish the spring-load by an amount equal to this pressure, in consequence of which the back-pressure within the chamber tending to reseat the valve is counterbalanced—or, in other words, the combined effect of the spring-load and the downward pressure

upon the valve is only as great as would be that of the spring-load alone without the interposition of the piston.

A similar result may be attained by attaching the piston or disk to a spindle, which is made a part of or which is rigidly connected with the safety-valve. Under this latter construction the pressure upon the under side of the piston will be equal to that upon the top of the valve; and since the upward pressure is directly opposed to the downward pressure, the former will counterbalance the effect of the latter.

The improved construction obviates the necessity of the secondary or interior casing hereinbefore alluded to, renders the action of the safety-valve equally independent of back-pressure, while the whole arrangement is simple, comparatively inexpensive, little liable to get out of order, any of the parts are easy of access for repairs or adjustment, and the whole possesses obvious mechanical advantages over any other previous form of device for similar purposes—which, it is believed, will recommend it for general use.

With respect to arrangements of pipes in connection with this incased and counterbalanced valve, I desire to state that I propose to make a separate application for patent therefor.

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

1. In combination with a spring-loaded safety-valve of the character herein specified, a piston or disk adapted to relieve the valve of a pressure about equal in amount to the pressure of the steam upon said disk, substantially as and for the purpose set forth.

2. In combination with an incased safety-valve, a spring bearing thereon, a movable piston or disk adapted to receive the pressure of steam, and a spindle connected with said disk and with the spring, the whole being arranged to operate substantially as explained.

3. The piston P, in combination with a reactionary spring-loaded and incased safety-valve, substantially as set forth.

4. The combination of piston P, spindle E, screw-cap H′, collar H, spring G, case A, and a reactionary safety-valve, substantially as shown and described.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of two witnesses.

F. W. RICHARDSON.

Witnesses:
WORTH OSGOOD,
GEO. F. GRAHAM.