(No Model.)

G. W. RICHARDSON.

SAFETY VALVE.

No. 344,866. Patented July 6, 1886.

FIG. 1.

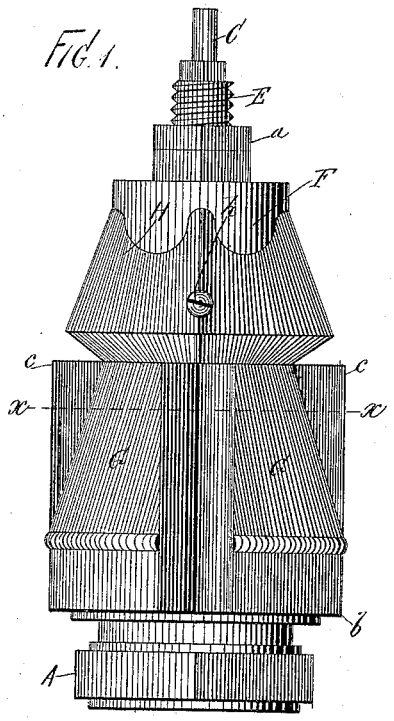


FIG. 2.

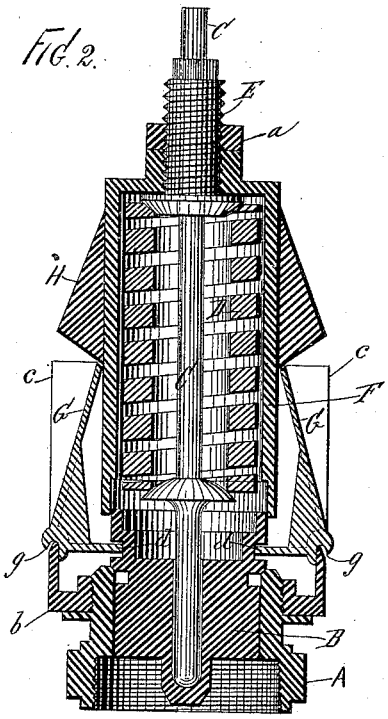


FIG. 3.

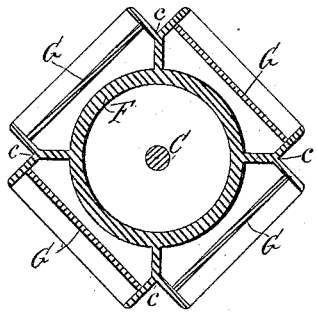


FIG. 4.

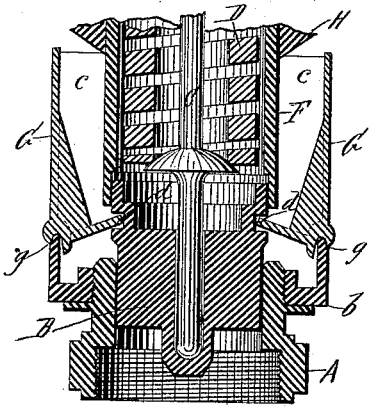
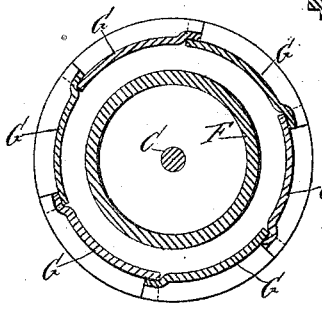


FIG. 5.



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UNITED STATES PATENT OFFICE.

GEORGE W. RICHARDSON, OF MEDFORD, MASSACHUSETTS, ASSIGNOR TO THE CONSOLIDATED SAFETY VALVE COMPANY, OF HARTFORD, CONN.

SAFETY-VALVE.

SPECIFICATION forming part of Letters Patent No. 344,866, dated July 6, 1886.

Application filed August 10, 1885. Renewed May 14, 1886. Serial No. 202,222. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. RICHARDSON, of Medford, county of Middlesex, and State of Massachusetts, 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.

My invention has relation to safety-valves, such as are ordinarily employed in connection with steam-boilers and other vessels for containing liquids or fluids under pressure for purposes well understood.

Among the objects of my present invention are the production of a simple, cheap, durable, and effective device of the class named, wherein the valve which governs the escape-port leading from the boiler shall be assisted to rise from its seat against the action of the tension appliance (spring or weight) by the pressure of the escaping steam or fluid or liquid upon hinged plates arranged to properly transmit the force of the escaping steam, &c., and to improve the general construction and arrangement of the auxiliary plates and adjacent parts, so as to insure prompt, reliable, powerful, and accurate action, to enable the steam to be discharged directly with the atmosphere after performing its duty, to provide a simple means of regulating or controlling the action of the escaping steam, &c., upon the hinged plates, and to simplify the construction and manufacture of the device as a whole.

To accomplish all of this, my improvements involve certain novel and useful peculiarities of construction, relative arrangements or combinations of parts, and principles of operation, all of which will be herein first fully described, and then pointed out in the claims.

In a previous application for patent I have shown a hinged plate or damper, connected by suitable mechanism with the tension appliance of a safety-valve, said hinged plate being located within a chamber distinct from that within which the safety-valve is located; and in another application I have shown plates connected directly with the safety-valve and arranged to assist the same to rise within an inclosing case or wall, from which the steam finally emerged through a suitable opening more or less contracted. I do not desire to be understood as making any claim to such features in the present case.

In the accompanying drawings, forming part of this specification, Figure 1 is an elevation, and Fig. 2 a central vertical section, of a safety-valve constructed and arranged for operation in accordance with my invention, and embodying the principles thereof, the hinged plates being shown in closed position, as when the valve is seated. Fig. 3 is a cross-section through line *x x* of Fig. 1. Fig. 4 is a view similar to Fig. 2, but omitting the upper part of the structure, and showing the plates opened instead of closed. Fig. 5 is a sectional view, showing how the plates may be arranged in circular form around the valve-spindle instead of flat or plain, as in previous figures.

In all these figures like letters of reference, wherever they occur, indicate corresponding parts.

The valve-structure may be connected with the boiler in any suitable manner, as by the base-piece A, having an internal or external thread.

B is the valve intended to be seated upon the base-piece, or in some equivalent way, and arranged to govern the port or passage which communicates with the interior of the boiler.

C is the valve-spindle upon which a tension-spring, D, or equivalent weight, is made to act. The tension of this spring may be adjusted or regulated by means of a hollow tension-screw, E, through which the spindle C passes, and the screw E, locked in any position by a jam-nut, as *a*.

F is a casing, which surrounds the spring D, but not the valve B. This casing protects the spring against contact of steam therewith, and its top affords a seat for the tension-screw E, said casing being connected with the base-piece by means of the interiorly-threaded ring or part *b*, which, in turn, is united with the casing by the wings or flanges *c*. These parts are usually cast together, but may be otherwise formed.

G G are the auxiliary lifting-plates. These are provided with recesses, as at *g g*, and rest upon the upper margin of the ring *b*, upon which they move as upon a hinge, and from which they may be detached by lifting the

valve high enough to free them. On each plate is a projecting tang, *d*, which engages in a recess cut or formed in the side of the valve or plug. This engagement is made so that when the plates are forced to swing open by the escaping steam they will act upon the valve and tend to lift it; but the same lifting tendency would result from engagement of the tangs *d* with the valve-spindle or other part of the tension appliance, all of which is contemplated by my invention.

According to Figs. 1 to 4, the hinged plates are made to move or swing between the flanges *c*. When closed (as they always are when the valve is seated) their upper edges nearly touch the regulator H, and thus close in practically tight all around the casing. As soon as the valve leaves its seat the escaping steam acts upon the hinged plates and tends to force them open, the power being proportioned to the pressure of the escaping steam, and the power which forces the plates open is transmitted through the tangs upon the valve and acts in a direction to raise the valve still higher. Thus the valve is made to rise not only with a force due to the pressure within the boiler, but, further, with a force due to the pressure of the steam which has passed the valve-seat, and as soon as the pressure within the boiler is reduced below the predetermined point the valve closes under the influence of the tension appliance and without unnecessary waste of steam. The steam escapes past the hinged plates directly into the surrounding atmosphere. The effect of the use of the plates is to relieve the boiler, not only promptly, but to the fullest extent desired, and to permit the sudden closing of the valve at the desired instant, and they (the plates) also operate to obviate the "chattering" of the valve which often occurs before it can close after being opened. The leverage with which each plate operates upon the valve may, of course, be modified by increasing or decreasing the length of the tank, or increasing or decreasing the area of the plates, as will be readily understood. The effect of the escaping steam upon the plates may also be modified by use of a regulator calculated to vary the area of the discharge-passages. Such a regulation is shown at H. It is a simple block made adjustable upon the spring-casing, and having an inwardly-inclined under surface of any degree of inclination. It is set at any desired point by a simple set-screw, *h*, or otherwise, as may be desired. By moving this regulator down below the point shown in the drawings the plates will require to be forced or swung farther out before affording an outlet-opening of area as great as when the regulator is at a higher point, and thus more of the available power of the escaping steam is employed for the desired purpose—that is, to assist the valve to rise. By adjusting the regulator the working effect of the escaping steam may be controlled as may be desired.

I have shown four of the plain plates. Manifestly any number may be employed, and it is not necessary that they be made flat or plain. They might be arranged in circular form, as indicated in Fig. 5, and, instead of employing the flanges *c*, might be made to lap one over the other, as indicated.

Any form of valve and valve-seat may be used.

The general pattern of safety-valve shown is intended chiefly for use upon locomotives, but may be employed in any situation.

When constructed and arranged substantially in accordance with the foregoing explanations, the improved device has been found to answer the purposes or objects of the invention, as previously set forth.

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

1. In a safety-valve, the hinged plates adapted to be moved by the escaping steam and to assist in raising the valve, said plates being mounted upon a ring connected with the spring-casing, substantially as shown and described.

2. In a safety-valve, the hinged plates surrounding the valve-seat and combined with the spring-casing and valve, and governing the openings between the valve-seat and the atmosphere, substantially as and for the purposes set forth.

3. In a safety-valve, the combination of the valve, the tension appliance, the spring-casing, the hinged plates mounted upon a ring formed on or with said casing, and the flanges, substantially as shown and described.

4. In a safety-valve, the combination, with the hinged plates, of the adjustable regulator mounted and made movable upon the spring-casing, substantially as shown and described.

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

GEORGE W. RICHARDSON.

Witnesses:

JOHN E. COSTELLO.

GEORGE R. SWASEY.