(No Model.) 2 Sheets—Sheet 1.

# G. W. RICHARDSON.

## MARINE SAFETY VALVE.

No. 297,007. Patented Apr. 15, 1884.

FIG. 2.

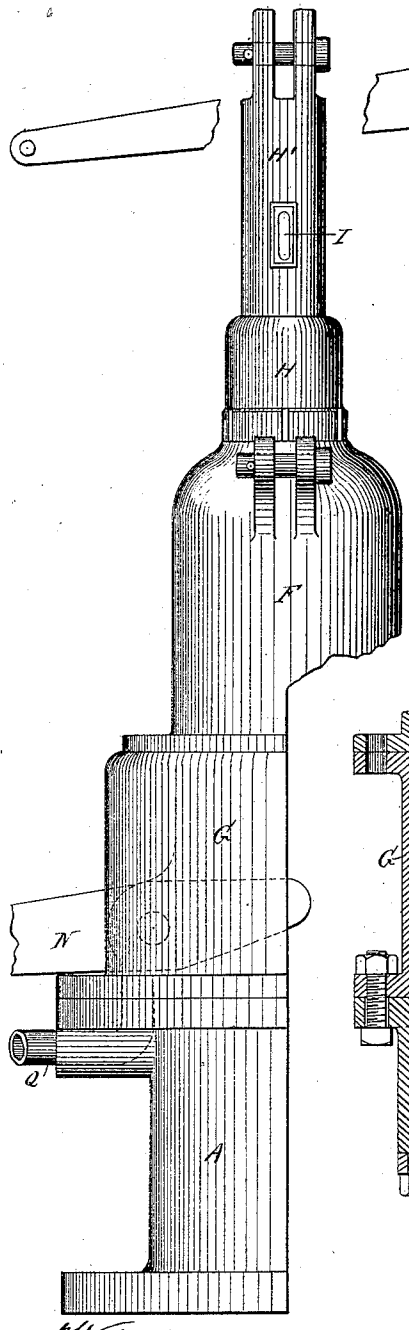
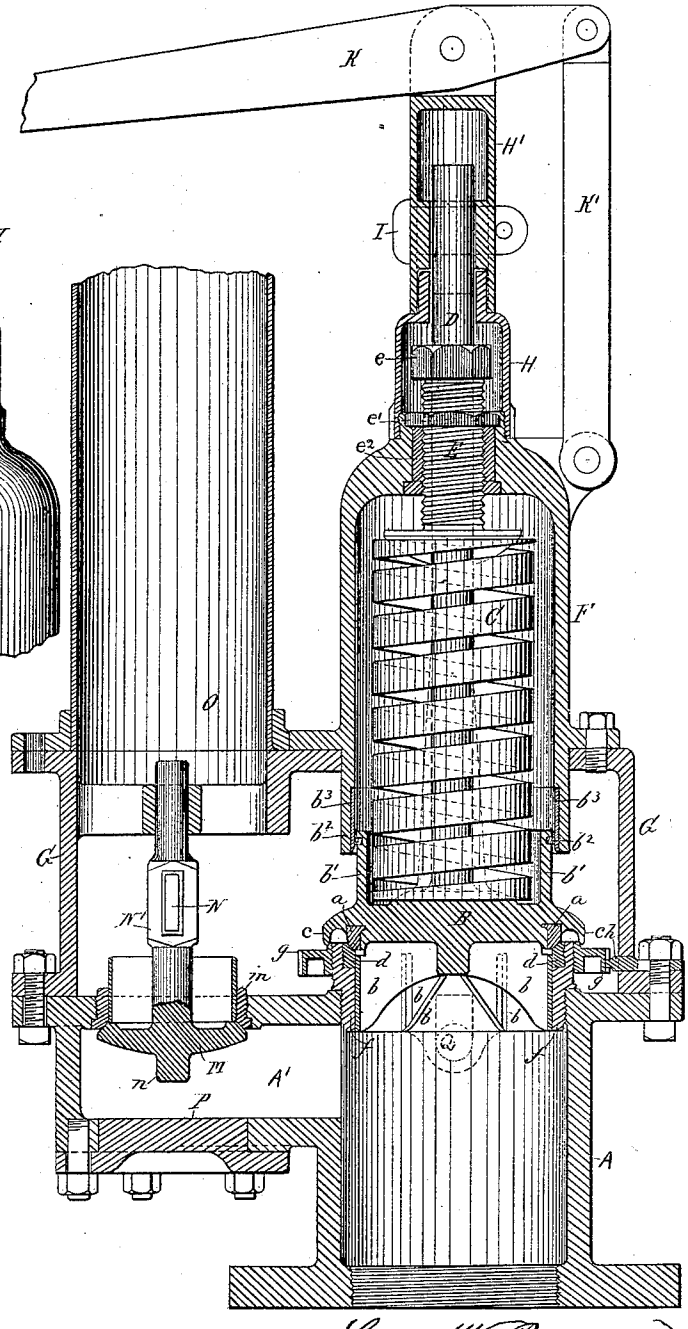



FIG. 1.




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(No Model.) 2 Sheets—Sheet 2.

# G. W. RICHARDSON.

## MARINE SAFETY VALVE.

No. 297,007. Patented Apr. 15, 1884.

FIG. 3.

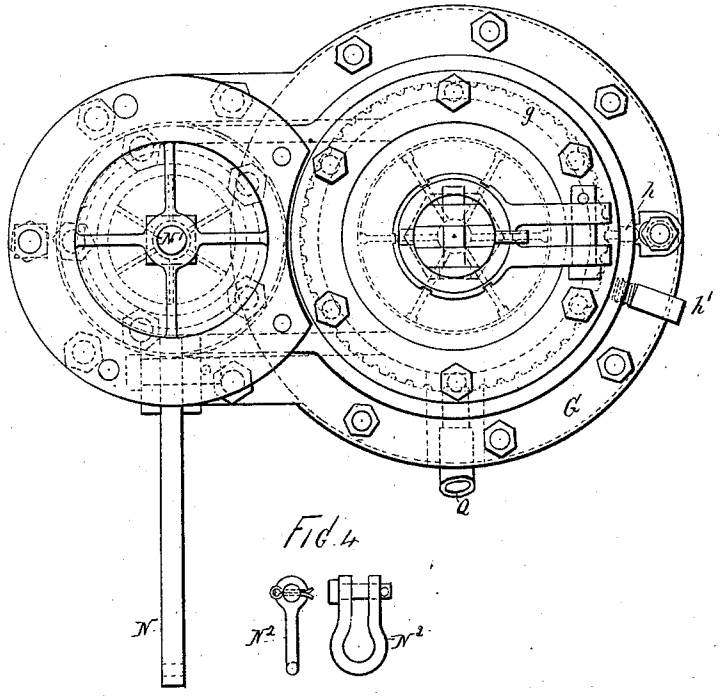



FIG. 4.




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# UNITED STATES PATENT OFFICE.

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

## MARINE SAFETY-VALVE.

SPECIFICATION forming part of Letters Patent No. 297,007, dated April 15, 1884.

Application filed August 27, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE W. RICHARDSON, of Boston, county of Suffolk, and State of Massachusetts, have invented certain new and useful Improvements in Marine 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 and their adjuncts, specially designed for use upon marine and other boilers of large size; but the improvements herein set forth may be used upon other boilers as well.

Among the objects of my invention are the formation of the lock-up casing in such manner that the valve-spindle may be elevated without in any way disturbing the main section of the casing or interfering with the security of the lock-up arrangement; the provision of a simple and durable form of relief-valve to be operated within the same structure as the safety-valve, and convenient appliances for obtaining access to the relief-valve; the provision of a chamber common to the outlets of both valves, such chamber communicating directly with an outlet-conduit supported upon the valve-casing, and suitable means for draining the casing, the whole being compact and efficient for the general uses and purposes for which intended, and arranged to be connected with the boiler through a single opening therein.

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

In the accompanying drawings, forming part of this specification, Figure 1 is an axial section and partial elevation of a safety-valve with appliances constructed and arranged for operation in accordance with my invention. Fig. 2 is an elevation of a portion of the structure shown in Fig. 1. Fig. 3 is a plan or top view. Fig. 4 represents a side and front elevation of a clevis which may be employed in attaching a weight to the lever connected with the safety-valve, or to the lever connected with the relief-valve.

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

A is the base part of the structure, intended to be secured upon the boiler by any of the ordinary means, and upon this base the several parts of my improved device are erected and secured.

B is the safety-valve, preferably of the kind now commonly known as "pop-valves."

C is the tension-spring by which the pressure upon the outer surface of valve B is regulated, and D is the valve-spindle, extending up through the spring and through the hollow adjusting-screw E.

F is the removable spring-casing, the same being mounted upon a chamber, G, secured upon the base, the walls of said chamber being made to surround the safety-valve, the lower end of the spring-casing, and the opening governed by the relief-valve. By removing the casing F the safety-valve may be readily dismounted.

The valve B has the usual wings, *b b*, (six in number in the drawings,) which guide it in the opening which it is to govern, and the usual overhanging lip, *c*. The bearing-surface of the face of the valve is made in the form of a ring, *a*, of some wear-resisting metal—such as nickel. This is cast in the valve, with a lip or flange, as shown, entering a corresponding recess in the valve, and this lip, being thin, unites with the material of the valve and firmly holds the ring from slipping. The seat for the valve is also of a similar wear-resisting material—in this case shown to be of a threaded ring, *d*, and this is mounted in a larger ring, *f*, also screw-threaded and seated in the top of the base-piece A, as shown. Upon the exterior of ring *f* is an adjustable ring, *g*, the purpose of which is to regulate the size or area of the opening through which steam escapes when the valve is unseated. This ring has a series of teeth upon its exterior, with which a pin, *h*, passing in from the exterior, may engage, its purpose being to hold the ring securely in any position to which it may be adjusted. I make no claim herein to the form of this ring, the same having been made one feature of a previous patent. To adjust this ring any instrument is inserted

through a perforation in the casing G and made to engage with the teeth upon the ring, after which the pin *h* is properly set and the perforation securely stopped, as by a plug, *h'*. A collar or neck, *b'*, upon the valve B extends up into the lower end of the spring-chamber, and has upon it a packing-ring, *b²*, to effectually exclude steam from said chamber, and yet permit all the required movements of the valve. To prevent wear upon the spring-chamber, (the same being made of cast-iron,) its lower end has an interior bushing, *b³*, of some wear-resisting material, which may be removed and replaced at any time. Of course, if the case itself were made of some hard or wear-resisting metal, this bushing might be omitted. In order to prevent back-pressure of steam upon the valve, the diameter of the packing-ring or of the bushing in the spring-chamber should be about midway between the diameters of the inner and outer circles of the valve-seat, as explained in a previous application for patent. The adjusting-screw E is turned to the proper point by the application of a suitable tool to the angular head *e*, and may then be set by the set-nut *e'*. This screw works through a removable bushing, *e²*, in the top of the spring-chamber.

H represents any form of lock-up casing, which is applied for the purpose of preventing unauthorized interference with the tension-screw. The valve-spindle D passes up through an opening in the top of the lock-up casing, and its extremity is covered and protected by a top section, H', which fits down over a neck upon the casing H. A key, I, passes through the upper section and through a suitable slot in the valve-spindle, and may be locked in place by a padlock or seal-lock, or be otherwise secured.

From the construction indicated it will appear that access cannot be had to the adjusting-screw (to alter the tension of the spring) or to the valve-spindle without the key I is first removed.

The lever K is fulcrumed upon any suitable arm, as K', and connected with the top section, H', so that by elevating the lever the valve-spindle will be drawn up and the valve unseated, as is frequently done to test the working condition of the valve. This testing does not expose any part of the valve-spindle or the adjusting-screw, and does not interfere with the security of the lock-up arrangement. As shown in the drawings, the lever is so mounted that it cannot turn around the axis of the valve-spindle. This is advantageous in that it prevents grinding of the valve on its seat when the apparatus is coupled up ready for use. The slot in the valve-spindle is made long, so that the valve B is always free to rise when the pressure beneath it is sufficient, and so that the lever may not be adjusted or weighted in any way to increase the downward pressure on the top of the valve. The lever K might be connected with the section H' and the fulcrum in such manner as to elevate the section of casing when the end of the lever is depressed, and it may be operated by a line or chain rigged as convenience may suggest. The valve and its spindle are cast together or screwed together tightly, so as to form practically one piece, and the ball for fitting the lower end of the spring is formed on the valve. This construction enables me to obtain greater length of spring, without any corresponding increase in the length or depth of the spring-casing, than can be obtained when the ball is placed upon the spindle above the valve, as in former constructions, and it also affords more direct and accurate action of the spring upon the valve.

At M is a relief-valve opening downwardly, and arranged to control an opening through the top of the base-piece at one side of the seat for the safety-valve. When the structure is in use upon a boiler, the pressure of steam upon the under side of this relief-valve will tend always to keep it properly seated.

It frequently occurs, after steam has been "blown off," that condensation of what remains produces a partial vacuum in the boiler, resulting in an excessive external pressure, or (if care be not exercised) drawing in cold water, either circumstance producing injurious effects upon the boiler. The relief-valve is so arranged that when the internal pressure is reduced below a certain point the valve will fall or open and permit air from the exterior to enter the boiler, preventing the formation of the vacuum above alluded to. This valve may also be employed for governing the outlet of steam from the boiler, being for this purpose provided with a lever, N, which engages with the spindle N'. The steam escaping past the safety-valve, or past the relief-valve, finds its exit through a common conduit, O, which may be carried to any desired point. This conduit is mounted upon the casing G, and communicates with the space inclosed thereby, so that the whole device is compact.

Steam in the boiler may be reduced or blown off at any time by depressing the relief-valve, thus obviating the use of the automatic safety-valve for that purpose, thereby saving its seat from wear or the collection of sediment thereon and its spring from being under extra and possibly damaging strain. The upwardly-projecting conduit O carries the steam away a considerable distance, so that its presence and the noise produced upon escaping into the air can produce no serious objections, as in former arrangements and appliances. By suitably directing the conduit O the steam might be discharged under water. It will be observed that the arrangement is such as to require but one opening to be cut through into the boiler—an advantage over cutting the separate openings heretofore required which will be readily appreciated.

For the relief-valve I provide a hard-metal seat, as at *m*, which may be withdrawn at any time after detaching the hand-hole plate P, located in the bottom of the chamber A'.

Upon the bottom of the relief-valve is a square or angular projection, *n*, to receive a socket-wrench, by which the valve may be turned or ground in its seat whenever required.

$N^2$, Fig. 4, is a clevis, by use of which a weight may be applied upon the levers, for the purpose of obviating any accidental elevation of said levers, and consequent opening of the valves. The overhanging end of the lever connected with the relief-valve by its weight tends to keep said valve in a normally-closed position.

At Q is a pipe or conduit tapped into the base-piece A below the level of the safety-valve seat, which pipe may be conveniently employed for conveying the condense water away from the valve and interior parts of the chamber.

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

All the working parts, and especially those subject to wear and requiring nicely-fitted joints, may be easily detached and repaired, or replaced by new parts—an advantage of particular importance in a mechanism of this character.

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

1. In combination with the two-part lock-up case, composed of the two independent sections mounted upon the spring-casing, the lever connected with and arranged to move the upper section, said section being connected with the valve-spindle, substantially as shown and described.

2. The combination, as before set forth, of the slotted valve-spindle, the two-part lock-up case, the key passing through the upper section and through the valve-spindle, and arranged to receive a lock, and the testing-lever connected with the upper section, substantially as explained.

3. In combination with the base-piece carrying a safety-valve and its appliances, a relief-valve communicating with the chamber which incloses the safety-valve, and a steam-discharge conduit leading from said chamber, substantially as shown and described.

4. In combination with the relief-valve mounted upon same base as the safety-valve, the removable hand-hole plate, arranged substantially as shown, and for the purposes set forth.

5. The herein-described appliance for steam-boilers, the same consisting, essentially, of a spring-actuated safety-valve, a relief-valve, and a conduit for conveying steam discharged from the ports governed by said valves, the whole being mounted upon a suitable base, arranged to communicate with the interior of the boiler through a single opening therein, and adapted for operation substantially in the manner and for the purposes explained.

6. In combination with the casing surrounding the seat for the safety-valve, and also the seat for the relief-valve, as explained, the drain-pipe tapped into said casing, and arranged to drain the chamber formed thereby, substantially as shown and described.

7. In an appliance for steam-boilers of the character herein set forth, the casing surrounding the openings governed by the relief and safety valves, and the casing for the tension-spring mounted upon the first-named casing and made removable therefrom, substantially as shown and described.

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

GEO. W. RICHARDSON.

Witnesses:
JOHN BUCKLER,
WORTH OSGOOD.