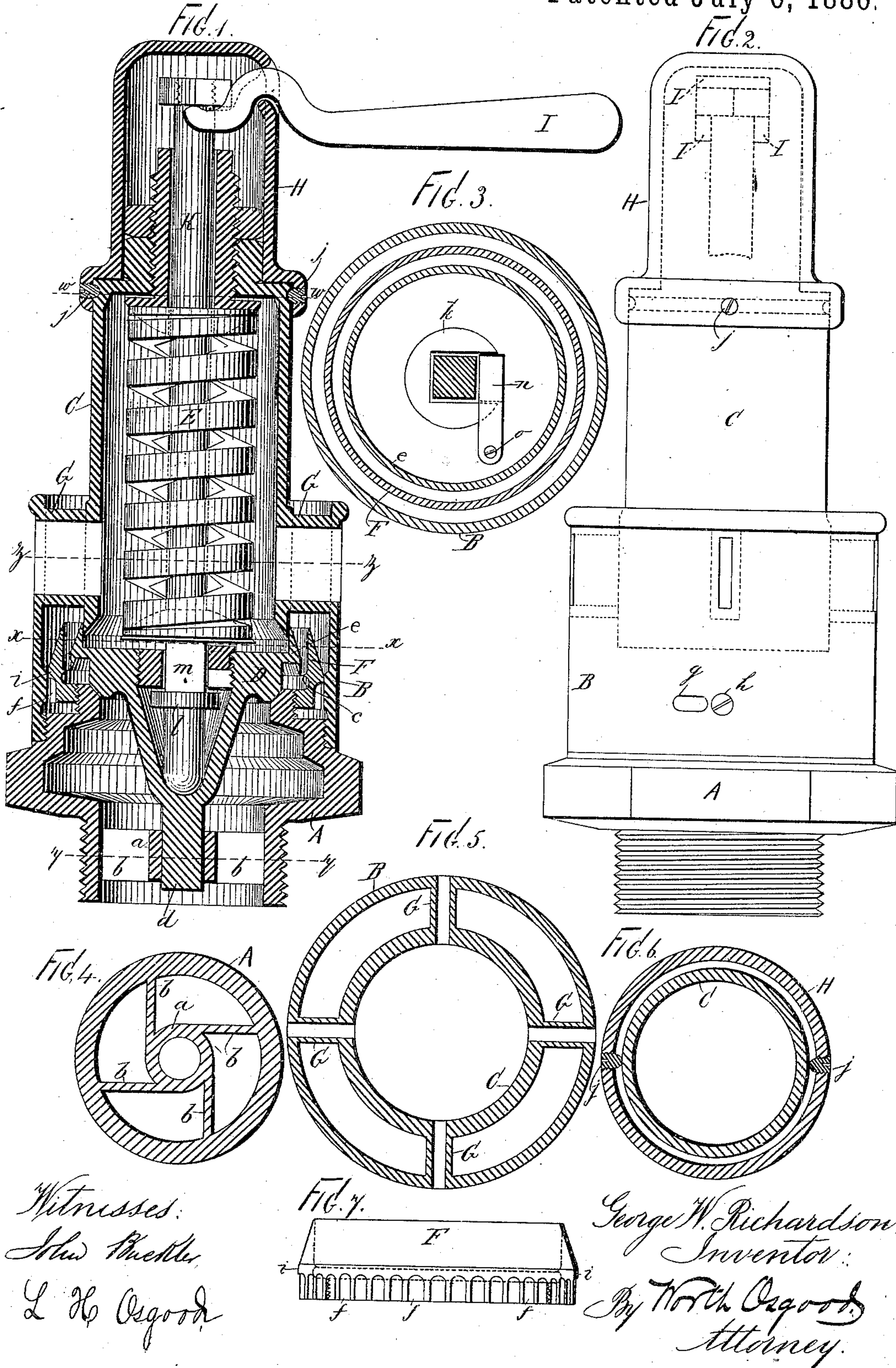


(No Model.)

G. W. RICHARDSON.  
SAFETY VALVE.

No. 344,862.

Patented July 6, 1886.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

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## SAFETY-VALVE.

SPECIFICATION forming part of Letters Patent No. 344,862, dated July 6, 1886.

Application filed February 19, 1886. Serial No. 192,539. (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 improvements have relation generally to safety-valves such as are employed in connection with steam and other boilers, and particularly to that kind known as "pop-valves," though some of my improvements may be employed in other kinds.

Among the objects of my invention are the provision of means for guiding the valve during its movements, insuring accuracy, obviating disarrangement of the lower guide, and shortening the valve structure; the provision of a new and useful form of adjustable ring to vary the size and form of the huddling-chamber; the application to the valve of an extended flange, serving as the upper guide for the valve, and acting, in conjunction with a flange upon the adjustable ring, to guide the escaping steam past the lower end of the spring-casing in such manner as to prevent admission of steam or air to said casing; to provide for a circulation of air in and through the spring chamber or casing, so as to obviate rusting of the spring; to provide a simple and efficient cap for the valve-spindle and tension-screw, which cap may be turned upon its seat, so as to bring the testing-lever within convenient reach of the operator; to provide a simple and efficient means for connecting the spindle with the valve, so that the two may be easily adjusted, and so that both may be turned or raised together, and to secure other advantages, as will hereinafter appear.

To accomplish all of this, my improvements involve certain new 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 the accompanying drawings, forming part of this specification, Figure 1 is a central vertical section of a safety-valve constructed

and arranged for operation in accordance with my invention and involving the principles thereof, and Fig. 2 is an exterior view or elevation of the same upon a plane at right angles to that of Fig. 1. Fig. 3 is a cross-section through line *xx* of Fig. 1; Fig. 4, a cross-section through line *yy*; Fig. 5, a cross-section through line *zz*, and Fig. 6 a cross-section through line *ww*. Fig. 7 is a side elevation of the adjustable ring detached, the dotted lines showing form of interior.

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

A is the base-piece, which supports the various parts of the structure, and by which the structure is mounted upon the boiler or in position for use.

B is the shell or casing which surrounds the valve, and C the shell or casing forming the spring-chamber.

D is the valve, and E the valve-spring. The valve is shown as seated upon a flange formed on the base A; but the valve-seat and base A may be made separate parts, if desired. The valve is provided with a cylindrical projecting piece *d*, which enters a guide-ring, *a*, within the lower neck of the base. The ring *a* is sustained by arms *b b*, connected with the base, and these arms, instead of being radial with respect to ring *a*, are located in lines tangent to said ring. The effect of this arrangement is that when the base is screwed to place firmly, as is always required, any compression of the neck in the seat in which it is screwed, or any strain brought thereon by the application of the wrench or spanner, or any due to expansion or contraction, tends only to revolve the ring around its vertical axis, leading it always in proper line and unchanged in size or shape. The ring then constitutes an unchangeable guide for the projection *d* of the valve, so that the valve cannot be canted, (by which the accuracy of its seating would be defeated,) and so that the free movement of *d* within *a* cannot be interfered with by any change in size or shape of *a*. When the arms are located radially with respect to ring *a*, the ring is liable to be forced out of line or changed in size or shape, and the



accurate and free movements of the valve thereby rendered impossible. By locating the guide-ring and the arms within the neck of the base, as is not only possible but entirely practicable with this improvement in the arrangement of the arms, the valve is guided at a lower point than in other constructions, and this enables me to lower the valve-seat, and consequently to materially reduce the height of the general structure, which is an important consideration in this class of valves, the same being required for use upon locomotives running in tunnels and in other situations where the valve is of necessity made as low as possible.

F is the adjustable ring, threaded upon the exterior of the valve-seat and movable up and down to vary the size and form of the huddling-chamber, which is the chamber formed by the ring and the overhanging lip of the valve extending beyond the valve-seat. Within this ring is a circular projection, *c*, the same being slightly undercut, as indicated, forming a recess, within which the escaping steam collects and turns before finally issuing between the projection *c* and the lip upon the valve. By moving the ring up or down the size of the issuing-orifice and the size and form of the huddling-chamber are varied and regulated according to the circumstances of the case. The purpose of huddling the steam is to secure a greater upward movement of the valve, so as to more effectually relieve the boiler, and to insure the prompt closing of the valve at the proper instant, all of which is now well understood. The form given the huddling-chamber by the projection *c* and the undercut recess is found to increase the efficiency of the escaping steam in its operation upon the valve, and to permit the valve to close more promptly than in former constructions, besides modifying the force and direction of the moving current, which is important in the matter of protecting the spring. The upper part of the valve is provided with a flange, *e*, the same being extended upwardly and fitted loosely upon the lower extremity of the spring-casing and downwardly to form the overhanging lip of the valve. The upward extension of *e* is inclined upon its exterior toward the spring-casing, and forms the upper guide for the valve. The guide is fitted loosely to the end of the spring-casing, so that the valve may work smoothly. The spring-casing is joined with the casing B by any number of arms, G G, the same or any one of the same being made hollow or perforated for the passage of air. The escaping steam, passing the joint between C and *e*, is so directed by the ring F and flange *e* as to induce a current of air to flow through the hollow arm or arms G and said joint, the tendency of the current being to produce a vacuum in the spring-chamber. This air circulates within the spring-chamber and keeps the spring dry, thus obviating rusting. The arms (one or more) are always open for the admission of air to the spring-chamber,

so that, though the valve does not rise, the interior of the chamber is kept free from confined moisture. The outer openings may be covered with wire-cloth, to prevent entrance of sparks, dust, &c. The lower portion of flange *e* is made sharp, so as to avoid any cutting effect thereon of matters which may be discharged with the steam.

The ring F is adjusted from the exterior. For this purpose it is provided with a series of notches or indentations, *f f*. These are reached by any suitable implement through a slot, *g*, in the casing B, and when the ring has been adjusted it is secured in proper place by a set-screw, as *h*.

The ring is cast with a portion, *i*, projecting a little beyond the walls of the notches *f*, and this portion *i* is turned off, so as to fit the interior of casing B in such a manner that the ring may move easily, it being thus rendered unnecessary to turn the ledges between the notches, which would be difficult. The joint between *i* and B prevents admission of steam to the space beneath the ring F. The ring is extended upwardly beyond its circular ledge, so that the steam will be directed in a narrow annular channel, whereby air or back-pressure (as in the case where a muffler is applied) cannot interfere with the tendency to form a vacuum in the spring-chamber.

H is the cap which covers the projecting end of the valve-spindle and the tension-screw, and in which the lifting-lever is fulcrumed. This casing is mounted upon the top of the spring-chamber, so that it can be revolved thereon. One, two, or more screws, as *j j*, pass through the cap and enter a circular groove in the spring-casing. These screws may be sealed in any suitable way, so as to prevent unauthorized removal of the cap. They permit the revolution of the cap, so that the lifting-lever I may be brought around to any desired position within convenient reach of the operator.

K is the valve-spindle, operated upon by the spring and bearing upon the valve. It is necessary to connect the spindle with the valve so that the valve may be positively raised by the lifting-lever.

The screw-thread within the valve is primarily made for the purpose of adjusting the valve upon the lathe in which it is turned and fitted. Within this threaded part I fit an open-sided nut, *k*. A ledge, *l*, upon the valve-stem strikes the nut *k* whenever the stem is raised and thus lifts the valve from its seat. The valve is sometimes required to be turned in its seat, so as to insure its proper working. I therefore make the portion *m* of the valve-stem within the nut angular, and lock the nut so that it cannot turn in its threaded seat. This locking may be effected in various ways. A strip, *n*, may be fitted to enter the recess in the nut, and be secured upon the top of the valve by a simple screw, as *o*. This will prevent the nut from turning independently of the valve. Being thus arranged, by removing



the cap the valve-stem may be twisted or turned, and will carry the valve with it, thus grinding the valve upon its seat.

The improvements above described are found to admirably answer the purposes of the invention, previously set forth.

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

10 1. The guide-ring for the stem upon the valve, the same being held in position by the tangential arms, substantially as and for the purposes set forth.

15 2. In combination with the valve, the adjustable ring having the interior circular ledge, substantially as and for the purposes set forth.

20 3. In combination with the valve, the adjustable ring provided with the exterior notches and the flange overhanging said notches, substantially as shown and described.

25 4. The combination, with the valve fitted upon the neck, of the spring-casing, and the adjustable ring having an upwardly-extending neck arranged to direct the escaping steam, substantially in the manner and for the purposes explained.

5. In a safety-valve structure, the casing surrounding the valve and the spring-case, the two being united by hollow or perforated 30 arms (one or more) through which air may enter the spring-casing, substantially as and for the purposes set forth.

6. In a safety-valve, the combination, with the spring-casing, of the revolving cap, mounted and arranged upon said casing, substantially as and for the purposes set forth. 35

7. In combination with the valve, the spindle having the flange and the recessed nut arranged to receive the spindle and connect the 40 same with the valve, for the objects named.

8. The combination, with the valve-spindle having the angular portion, of the recessed nut located in the valve and locked therein, substantially in the manner and for the purposes set forth. 45

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

GEORGE W. RICHARDSON.

Witnesses:

JOHN BUCKLER,  
WORTH OSGOOD.