(No Model.)

2 Sheets—Sheet 1.

G. W. RICHARDSON.

SAFETY VALVE.

No. 344,865. Patented July 6, 1886.

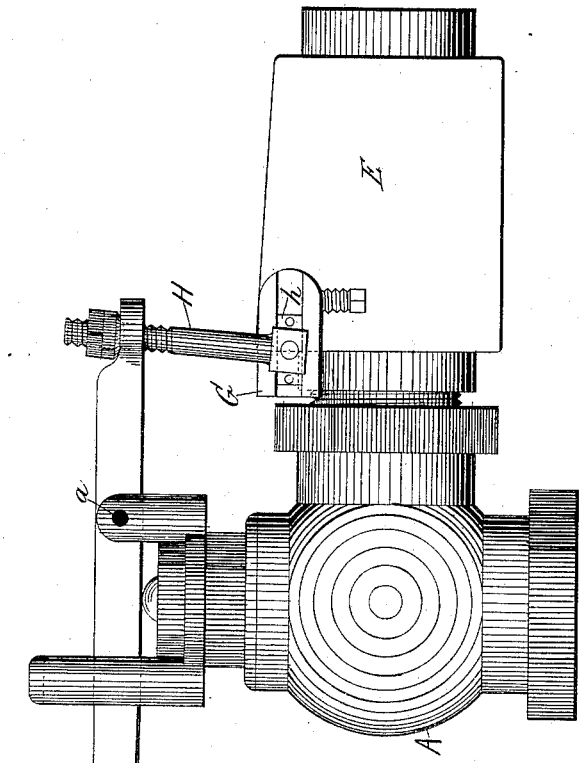


FIG. 1.

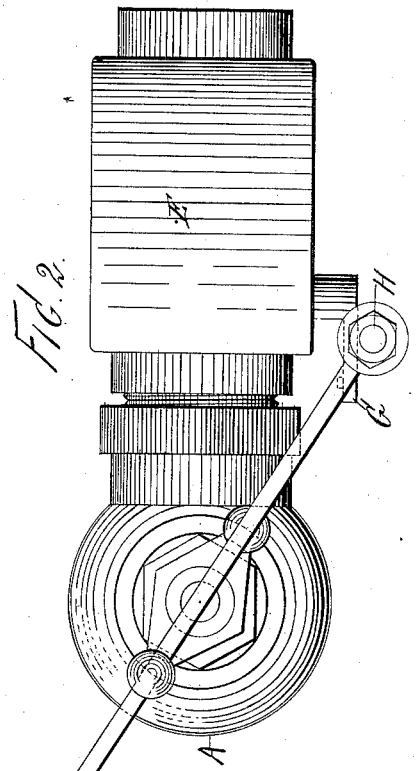
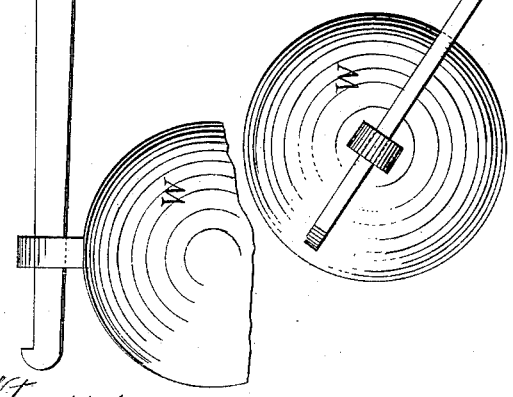


FIG. 2.



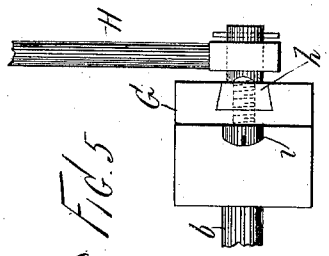


FIG. 5.

Witnesses:
John Buckler,
L. H. Osgood

George W. Richardson,
Inventor.
By Wm. H. Osgood,
Attorney.

(No Model.) 2 Sheets—Sheet 2.

G. W. RICHARDSON.

SAFETY VALVE.

No. 344,865. Patented July 6, 1886.

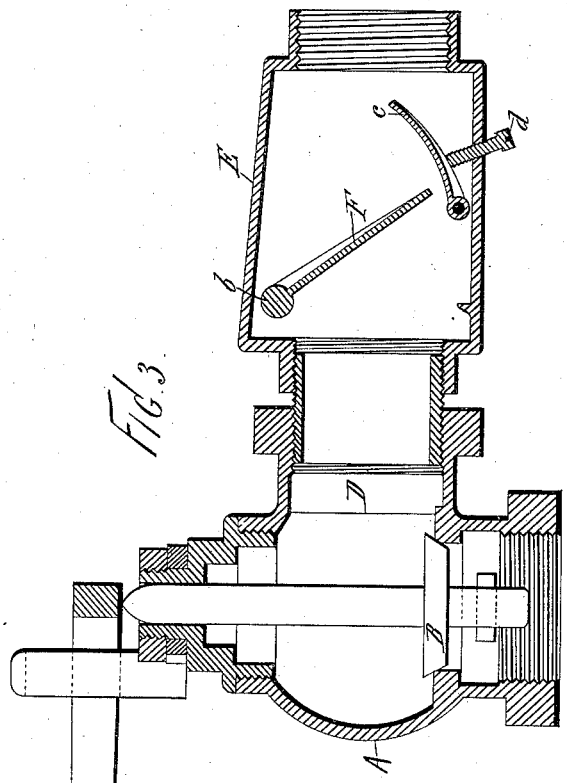


Fig. 3.

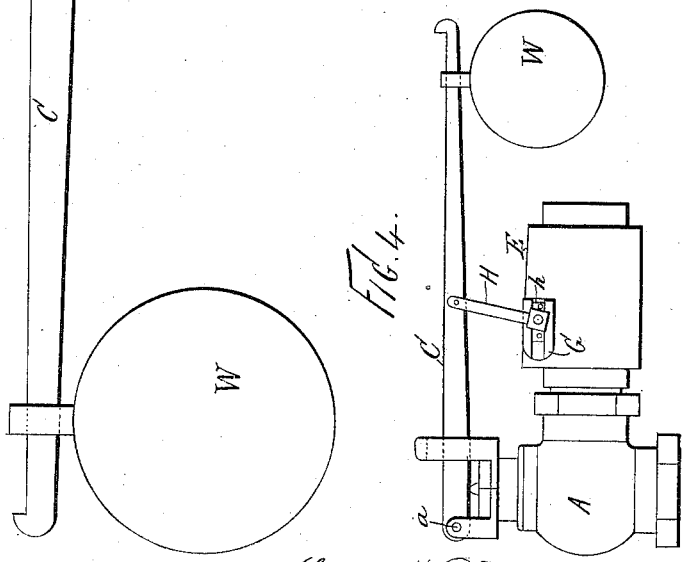


Fig. 4.

Witnesses:
John Buckler,
L. L. Osgood.

George W. Richardson,
Inventor.
By Wood, Osgood & Co.
Attorney.

UNITED STATES PATENT OFFICE.

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

SAFETY-VALVE.

SPECIFICATION forming part of Letters Patent No. 344,865, dated July 6, 1886.

Application filed November 1, 1884. Renewed May 4, 1886. Serial No. 201,099. (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 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 that class of devices employed in connection with steam-boilers and other vessels for containing liquids or fluids under pressure, and commonly known as "safety-valves," their purpose being to afford relief to the boiler against excessive internal pressure. Of these safety-valves there are a variety of forms, and these may, for the purpose of the present description, be divided into two general classes—viz., first, the ordinary common valve, which rises readily from off its seat, but which will not close down until the boiler-pressure is reduced considerably below the point or pressure at which the valve is set to blow, the result of which is a very great loss or waste of working force, which would otherwise be available. The second class are generally known as "pop safety-valves," wherein the valve or plug is provided with an overhanging lip or flange, so formed and combined with the valve-seat or adjacent elements that the valve will be compelled, under the influence of its spring or weight appliances, to close as soon as the boiler-pressure is reduced only a trifle below the point at which the valve is set to blow.

My present invention relates chiefly to the first of the above-named classes; and its principal object is to provide the common valve with an appliance which shall cause it not only to close down upon its seat as soon as the boiler-pressure is reduced a trifle below the point at which the valve is set to blow, but also cause it to open wider or farther from its seat than ordinarily, thus affording a more prompt and effective reduction of the internal boiler-pressure.

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

In the accompanying drawings, forming part of this specification, Figure 1 is a side elevation, Fig. 2 a top or plan view, and Fig. 3 a sectional elevation, of an apparatus constructed and arranged for operation in accordance with my invention, and involving the principles thereof. Fig. 4 is a view similar to Fig. 1, but showing a different order of lever applied to hold the valve, and this on a smaller scale than in previous figures. Fig. 5 is an end elevation, on an enlarged scale, showing one manner of adjusting the connecting-rod.

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

A is the valve-casing, containing the seat for the safety-valve R, and arranged to be applied on or in connection with the boiler in any preferred manner. The valve is of the ordinary form, and is held to its seat by a lever, C, fulcrumed as at *a*, bearing down upon the projecting stem of the valve with a pressure which is regulated by a movable weight, W, as will be readily understood.

D is the outlet from the valve-casing for the escape of the steam when the valve rises. In connection with this outlet I apply a chamber, E, within which is a hinged valve, damper, or plate, F, against which the escaping steam must impinge before finding an outlet from the chamber E. The axis *b* of this plate projects through to the exterior of the casing, and carries an arm or crank, G, which in turn is connected with the lever C by means of a connecting-rod, H. As soon as the valve rises, the escaping steam causes the plate F to revolve upon its axis or to open, and this pressure is transmitted to the lever C through the connecting-rod H, diminishing the effective force of the weight W in proportion to the pressure upon the said plate F, and thereby permitting the valve B to rise higher, thus affording a more rapid escape of the steam or fluid than would otherwise occur.

In Figs. 1 and 2 the fulcrum of lever C is arranged between the weight W and the point of application of the connecting-rod H, in which case the rod H must pull down upon the end of the lever in order to diminish the force of the weight. In Fig. 4 the rod H is so arranged as to thrust upwardly on the lever

between the fulcrum and weight when the damper is moved. The principle in either case is precisely the same.

In order to regulate the power with which the damper or valve F may operate upon the lever and its weight, I find it desirable to make the connecting-rod H adjustable upon the arm G, so that the distance of the foot of the arm H from the axis of revolution of F may be varied, and thus the leverage with which the valve F operates be capable of adjustment at pleasure. One means by which this adjustment may be effected is plainly indicated in Fig. 5, wherein the arm H is pivoted upon a block, *h*, movable back and forth in a dovetailed groove formed in the arm G, and arranged to be set at any point to which adjusted by use of a set-screw, *i*. This is a simple form of construction or arrangement, and may be replaced by any equivalent means of adjustment.

From the casing E the escaping steam may be conducted away to perform any useful work, or it may be discharged directly into the atmosphere, if desired. The flap or valve F need not be fitted with extra nicety in the casing.

To prevent the steam from escaping too rapidly past the valve F, as it might do when this valve rises, I employ a hinged plate, *c*, called a "baffle-plate," which operates to confine the steam for a greater or less length of time, according to the height at which it is set, thus forcing the valve F to rise to a certain height before the steam can escape freely, and consequently moving the lever C through a corresponding distance, and resulting in a corresponding opening of the valve B. The baffle-plate *c* may be adjusted from the exterior by means of a simple screw, *d*. It may be made solid or perforated, and should not fit the casing too tightly, a slight passage for the escape of steam being preferably left beneath the hinge-axis, so that damper F will not be retarded unnecessarily in its downward or closing movements. In some constructions this baffle-plate might be omitted.

In the construction which I have chosen to illustrate my invention the safety-valve is held to its seat by means of a weight and lever. Manifestly, this weight and lever might be replaced by the ordinary tension-spring and the damper F connected therewith without departing from the spirit of my invention.

In the illustration the axis *b* is made to project through one side of the casing. It might project through both sides, and each end be supplied with an arm, like G. In this case the two arms could be joined by a yoke in such manner as to bring the lever C straight with the axis of the casing E instead of across it, as indicated in Fig. 2.

Although the improved appliances are designed especially for use in connection with the ordinary or common safety-valve, they might be applied with some advantage in connection with the pop-valves and still be within the scope of my invention.

In a previous application for patent I have shown a damper or lid located in the valve-casing and operating directly upon a valve, and I do not desire to be understood as making any claim herein which would cover such a construction.

One of the chief advantages of the present improvements is, that they are applicable in connection with lever safety-valves and their casings which are already made, (and even mounted in place for use,) requiring no alteration of parts beyond the mere connection of the rod H with the tension appliances, of whatever character they may be.

When applied in connection with the ordinary forms of valves, the improvements are found in practice to render those valves quite as efficient in opening and closing as the more improved forms.

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

1. In a safety-valve, a plate located within a chamber exterior to the valve-casing and arranged to be moved by the escaping steam or fluid, said plate being connected with the tension appliance which operates upon the safety-valve, and arranged to diminish the force of the tension appliance, and to raise the valve, substantially in the manner and for the purposes set forth.

2. In combination with a safety-valve casing, a chamber communicating with the outlet-port from said casing, and containing a movable plate connected with the tension appliance of the safety-valve, and arranged to diminish the force of the tension appliance, substantially as shown and described.

3. In combination with a safety-valve, a tension appliance and a hinged valve or damper arranged to transmit the force of the escaping steam to the tension appliance, and to raise the valve, substantially as and for the purposes set forth.

4. In combination with a hinged damper or valve connected with the tension appliance of a safety-valve, a baffle-plate made adjustable, substantially as and for the purposes set forth.

5. The combination, with the hinged valve or damper, of the rod for connecting the same with the tension appliance and the tension appliance of the safety-valve, said rod being made adjustable upon the arm connected with the hinged valve, substantially as and for the purposes set forth.

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.