(No Model.)

T. SHAW.

SAFETY VALVE AND ALARM.

No. 372,493. Patented Nov. 1, 1887.

Fig. 1.

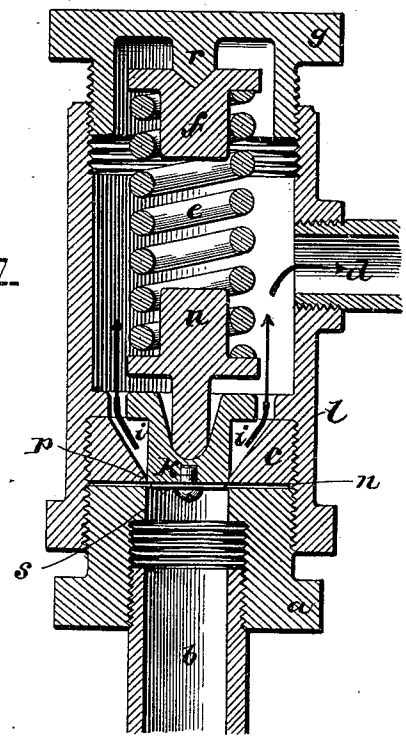
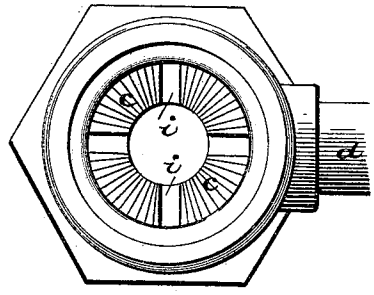


Fig. 2.



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UNITED STATES PATENT OFFICE.

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SAFETY-VALVE AND ALARM.

SPECIFICATION forming part of Letters Patent No. 372,493, dated November 1, 1887.

Application filed September 8, 1885. Serial No. 176,476. (No model.)

To all whom it may concern:

Be it known that I, THOMAS SHAW, of the city and county of Philadelphia, Pennsylvania, have invented a new and Improved Maximum-Pressure Relief-Valve and High-Pressure Alarm for Steam, Gas, or Hydraulic Pressures; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention consists in the employment of a flat-faced valve without the usual valve-seat, and of unalterable area of valve-surface to pressure, and in the provision of a diaphragm to prevent leakage through the valve and to prevent corrosion of the valve, and in the combination of a whistle or alarm, all arranged in the manner and for the purpose as hereinafter described.

The object of the invention is to furnish a special safety-valve and alarm that is certain of action and secure against leakage for all purposes of fluid or gas pressures, one that cannot corrode fast to its valve-seat and cement itself immovably during long periods of inactivity; one that is sure to blow off at any predetermined pressure, and capable of giving alarm, if desired.

In order to enable others to use and practice my invention, I will proceed to describe its construction and operation.

On reference to the accompanying drawings, which form part of the specification, Figure 1 represents a vertical section through the center of valve. Fig. 2 is a top view with spring-valve, &c., removed.

Similar letters refer to similar parts, of which—

l is the main body or cylinder portion of valve, provided with a female thread on its under side for the reception of a stationary valve guide-ring, *c*, and screw attachment plug *a*, the valve *k*, consisting of a cylindrical body portion fitting the bored passage-way in the center of ring *c*, and terminating at its upper end in a flange, the guide-bearings of said valve *k* being furnished by wings *i*, which project inwardly from said ring *c*, as shown in Figs. 1 and 2. The lower edge of guide-ring *c* is turned to a sharp edge on its inner diameter, (shown at *p*,) at the same angle shown in the solid or ring portion of said ring *c*. Said angle is provided for the ready escape of steam, &c., between the wings *i*, whenever said valve is caused to blow off. The said flange at the upper end of the valve *k* is for the purpose of furnishing a rest or limiting its downward movement to the top of wings *i*, which locates the face of the valve in its proper position when in a state of rest. A central bearing-plug, *n*, transmits load of spring *e* to said valve *k*. A similar plug, *f*, at the top, receives any regulated pressure from screw-cap *g*, which has a central pivot arranged to press upon said spring *e*, all for the purpose hereinafter described.

d is escape passage-way for attachment of ordinary whistle or other suitable alarm, actuated by the escaping steam or gases. The screw-plug *r* is intended, when set, to be screwed solid to the shoulder to prevent any alterations of the spring-pressure after the valve is once set.

A diaphragm of lead-foil is interposed between screw-plug *a* and the face of the guide or valve ring *c*, where it is secured tight against leakage by screwing tightly the plug *a*. A washer, of soft metal or of tanite, can be placed next to the plug *a* to take the frictional wear and to press into any inequalities of the faces. This diaphragm of lead-foil covers the intervening space or crevice between valve *k* and the guide-ring *c*, preventing any leakage of steam, &c., that may press upon the under side of said valve *k*, and at the same time prevents access of corrosive fluids, &c., to the face of valve *k*. The pipe *b* is connected with a steam-boiler or any source of pressure that is desired to limit the maximum pressure.

s is a metallic washer held in position by screw, (shown in center of valve *k*,) which holds the lead diaphragm against the lower end of valve *k*, preventing the destruction of the said diaphragm by any vacuum that may form on the under side.

The operation of valve is in this wise: The screw-cap *g* is screwed down to press upon spring *e* to any desired pressure ascertained by test trials or otherwise, which determines the length of said spring *e*, when said cap can be screwed firmly to the shoulder of cylinder

l. The said lead-foil diaphragm is inserted and secured in place between guide-ring *c* and screw-plug *a*, as before described, when the valve is ready for use, and on applying steam or other pressure in the passage-way *b* up to the maximum point at which the valve is set. The cutting-edge cuts any feeble resistance offered by the foil-diaphragm and at the same time lifts the valve, permitting the escape of steam through the passage-ways between the wings *i*, and out of the exit-passage *d*, in direction indicated by arrows, to sound any whistle or other alarm or to blow off into the air, as desired, and to afford relief of pressure, the size of valve passage-ways, &c., being regulated by the demands made upon the same. It will be observed that the said valve *k* comes down to a sharp edge where it meets the cylinder portion of guide-ring *c* at the diaphragm or face of valve. This minimum contact of metal surfaces at the valve-face prevents any possible corrosive action from securing hold upon the valve, and avoids one of the principal dangers of the ordinary safety-valves, with large face-contact, subjected to corrosive action and possible cementation to its seat, which renders the valve dangerous, and therefore unreliable after any lengthy period of inaction, and which difficulty this maximum-pressure valve is designed to overcome. It will also be observed that the lead diaphragm covering the face of valve fully protects the face of valve from corrosive action of steam or gases, and that the valve, having no valve seat to press upon, is not liable to the fluctuation of pressures caused by different areas of valve surface, which difficulty occurs more or less in all safety-valves, and is perhaps best illustrated in the ordinary large-faced conical safety-valve of one-inch bore and quarter-inch face. The face area in this case is equal to the bore, in which case, if the valve be ground tight into its seat and set to one hundred pounds pressure on its smallest area, the same valve, if leaking, would blow off at fifty pounds pressure, on account of the increased area of valve-face, doubling the working-area of the valve, which difficulty is entirely overcome in the described maximum-pressure valve.

The lead diaphragm is destroyed and required to be renewed every time the valve is permitted to blow off, the destruction of the said diaphragm being evidence that the valve has blown off.

It will be evident that other metals or materials can be substituted for the lead-foil, and that the same valve can be controlled by the ordinary lever and weights, in place of the spring, and that it can be variously modified in shape without any alteration in the result. I therefore do not wish to confine myself to the exact shape here given.

What I claim, and desire to secure by Letters Patent, is—

1. The combination of the valve guide-ring having a beveled face and radial wings, and a valve fitting the opening in the ring at the lower end and between the radial wings, substantially as described.

2. The combination of the valve guide-ring having a beveled face and inwardly-projecting wings, and a valve with a cylindrical body and top flange resting on said wings, and a spring bearing on the valve, substantially as described.

3. The valve *k*, operating as described, in combination with the sharp-edged guide-ring *c*, for the purpose of limiting the valve-face contact, as set forth.

4. The combination of a valve guide-ring and spring-seated valve above the ring closing the opening thereof, and a friable diaphragm stretched across the valve-opening below the ring, substantially as described.

5. In combination with valve *k* and a friable diaphragm secured thereto and stretched across the valve-opening, a disk or washer, *s*, which holds the diaphragm against the valve and operates to prevent destruction of diaphragm by back-pressure, substantially as described.

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