(No Model.)

A. M. BARNUM.

CYLINDER RELIEF VALVE.

No. 401,477. Patented Apr. 16, 1889.

Fig. 1.

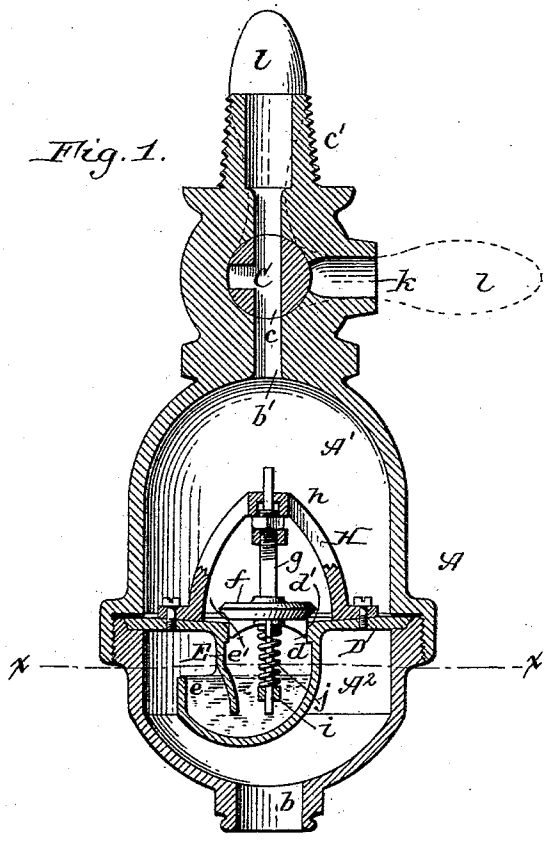
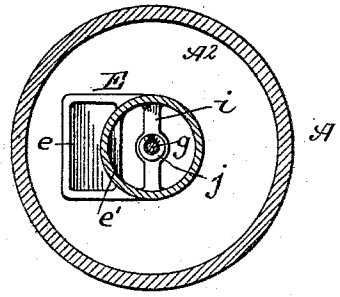


Fig. 2.



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UNITED STATES PATENT OFFICE.

ALEXANDER M. BARNUM, OF BUFFALO, NEW YORK.

CYLINDER RELIEF-VALVE.

SPECIFICATION forming part of Letters Patent No. 401,477, dated April 16, 1889.

Application filed January 10, 1889. Serial No. 295,910. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER M. BARNUM, a citizen of the United States, and a resident of Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Cylinder Relief-Valves, of which the following is a specification.

This invention relates to an improvement in cylinder relief-valves which are employed in steam-cylinders for drawing off the water of condensation therefrom.

The object of my invention is to construct a reliable steam-trap which shall be automatically opened and allow the water to escape from the cylinder when the latter is relieved from the steam-pressure, and which will be closed so as to prevent the escape of steam from the cylinder when the latter is in operation or under pressure, thus providing a self-acting discharge device which requires no attention on the part of the engineer, and avoiding the danger from negligence heretofore incurred with the ordinary cylinder-cocks.

My invention consists of the improvements which will be hereinafter fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a sectional elevation of my improved steam-trap. Fig. 2 is a horizontal section thereof in line *x x*, Fig. 1.

Like letters of reference refer to like parts in both figures.

A represents the inclosing-casing of the trap, which is cylindrical in form, and consists of an upper part, A′, and a lower part, A^2, the two parts being connected together by a screw-thread, as shown. The casing A is provided at its lower end with a discharge-opening, *b*, and at its upper end with an inlet-passage, *b′*, which communicates with the passage *c* of a three-way cock, C, arranged at the upper end of the casing. The passage of the cock C communicates with the interior of the steam-cylinder, and the cock is formed with a screw-stem, *c′*, whereby the steam-trap is attached to the cylinder.

D represents a diaphragm, arranged about centrally within the casing A, and which is held in place by being clamped between the adjacent edges of the parts A′ A^2 of the casing, the lower part, A^2, being formed in its upper edge with an annular recess or depression, in which the diaphragm is seated, as clearly shown in Fig. 1.

d is a circular discharge-opening formed in the center of the diaphragm D, and provided at its upper end with a conical valve-seat, *d′*.

E is an air-trap arranged within the lower part, A^2, of the casing A below the opening *d*, and receiving the water of condensation flowing through said opening. The air-trap E is preferably formed on the under side of the diaphragm D, and is constructed like an ordinary sewer-trap, consisting of a bowl or receptacle having an elevated discharge-opening, *e*, and a wall or plate, *e′*, the lower end of which is constantly immersed when there is water in the trap. The water collecting in the air-trap overflows and is discharged from the casing A through the opening *b*, while a portion of the water always remains in the trap, thereby preventing the cold external atmosphere from entering the steam-cylinder through the steam-trap and the cock C, and hastening the condensation of the steam in the cylinder.

f is an automatic disk-valve arranged above the valve-seat *d′*, and which is closed against said seat by the pressure of the steam in the cylinder and in the upper chamber of the casing A, so as to close the opening *d* and prevent the escape of steam from the trap. The valve *f* is attached to a vertical stem, *g*, which is guided at its upper end in a bearing, *h*, formed in a bridge-tree, H, secured to the upper side of the diaphragm D, and at its lower end in a horizontal cross-bar or bridge-piece, *i*, arranged in the air-trap E.

j is a spiral spring surrounding the lower portion of the valve-stem *g* and interposed between the valve *f* and the bridge-piece *i*. This spring tends to force the valve upwardly away from its seat, so as to clear the opening *d* and permit the water of condensation which has accumulated in the trap above the diaphragm D to escape through said opening into the air-trap E below.

When the engine is in operation and the steam-cylinder is under pressure, the valve *f* is forced against its seat by the steam-pressure, and the steam is prevented from escaping from the cylinder through the trap. As soon as the steam is shut off from the cylinder, the valve *f* is relieved from the steam-

pressure, and the spring *j*, which has been compressed by the depression of the valve, now reacts and lifts the valve from its seat, opening the passage *d* in the diaphragm D, and allowing any water which may collect in the cylinder and the chamber of the casing above the diaphragm to pass into the air-trap E, from which it is discharged through the outlet-passage *b* of the steam-trap.

The three-way cock C is used for the purpose of closing the communication between the steam-cylinder and the steam-trap, so as to permit the valve *f* to be adjusted or repairs to be made. The cock is provided with a lateral discharge passage or nozzle, *k*, so that the steam may be discharged directly through said nozzle, if desired, to enable the engineer to observe whether the steam is wet or dry. The cock is preferably so constructed that when its arm *l* is in an upright position, as shown by full lines in Fig. 1, the nozzle *k* will be closed and the steam-cylinder placed in communication with the steam-trap, while when the arm is turned into the horizontal position indicated by dotted lines in the same figure the nozzle *k* will be connected with the steam-cylinder and the steam-trap be cut off from the same.

When my improved trap is employed on locomotives, the actuating arms or handles of the shut-off cocks C of each steam-cylinder are connected together, and are simultaneously operated from the cab like the ordinary blow-off cocks.

By my improved self-acting steam-trap the water of condensation is discharged from the cylinder whenever the engine comes to a state of rest, and as this ordinarily occurs at least once every day all danger of an excessive accumulation of water in the cylinder is obviated.

I claim as my invention—

1. In a steam-trap for steam-cylinders, the combination, with a casing having an inlet-passage communicating with the steam-cylinder and with a discharge-opening, of an automatic valve arranged in said discharge-opening and closed against its seat by the pressure of the steam in the cylinder, a spring whereby said valve is opened when the steam-pressure is removed therefrom, and an air-trap receiving the water of condensation passing through said discharge, and whereby the exterior atmosphere is excluded from the steam-cylinder, substantially as set forth.

2. In a steam-trap for steam-cylinders, the combination, with a casing communicating with the steam-cylinder and provided with a discharge-opening, of a diaphragm arranged within said casing and having a central opening, an automatic valve applied to said opening and closed against the same by the pressure of the steam in the cylinder, a spring whereby said valve is lifted from its seat to clear said opening when the valve is relieved from the steam-pressure, and an air-trap attached to the under side of said diaphragm and receiving the water of condensation passing through the opening in the diaphragm, substantially as set forth.

3. In a steam-trap for steam-cylinders, the combination, with a casing having inlet and discharge passages, of a diaphragm, D, arranged in said casing and having an opening, *d*, a valve, *f*, adapted to close said opening and provided with a stem, *g*, a bridge-tree, H, secured to the upper side of the diaphragm in which said stem is guided, a spring, *j*, bearing against the under side of said valve, and the air-trap E, attached to the under side of said diaphragm below the opening *d*, substantially as set forth.

4. In a steam-trap for steam-cylinders, the combination, with a casing having inlet and discharge passages and composed of two parts, A' A^2, united by a screw-thread, of a diaphragm, D, arranged in said casing clamped between the parts A' A^2, and having an opening, *d*, a valve, *f*, adapted to close said opening and provided with a stem, *g*, a bridge-tree, H, secured to the upper side of the diaphragm in which said stem is guided, a spring, *j*, bearing against the under side of said valve, and the air-trap E, attached to the under side of said diaphragm below the opening *d*, substantially as set forth.

5. In a steam-trap for steam-cylinders, the combination, with a casing having an inlet-passage communicating with the steam-cylinder and with a discharge-opening, of a stop-cock arranged in said inlet-passage, an automatic valve arranged in said discharge-opening and closed against its seat by the pressure of the steam in the cylinder, a spring whereby said valve is opened when the steam-pressure is removed therefrom, and an air-trap receiving the water of condensation passing through said discharge, and whereby the exterior atmosphere is excluded from the steam-cylinder, substantially as set forth.

6. In a steam-trap for steam-cylinders, the combination, with the casing A, having an inlet-passage, *b'*, and discharge-passage *b*, of the three-way cock C, arranged in the inlet-passage *b'*, and having a discharge-nozzle, *k*, the diaphragm D, having the opening *d*, the automatic valve *f*, closing said opening, and the spring *j*, substantially as set forth.

Witness my hand this 27th day of December, 1888.

ALEXANDER M. BARNUM.

Witnesses:
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