(No Model.)

J. BISHOP.

STEAM TRAP.

No. 376,850. Patented Jan. 24, 1888.

Fig. 1

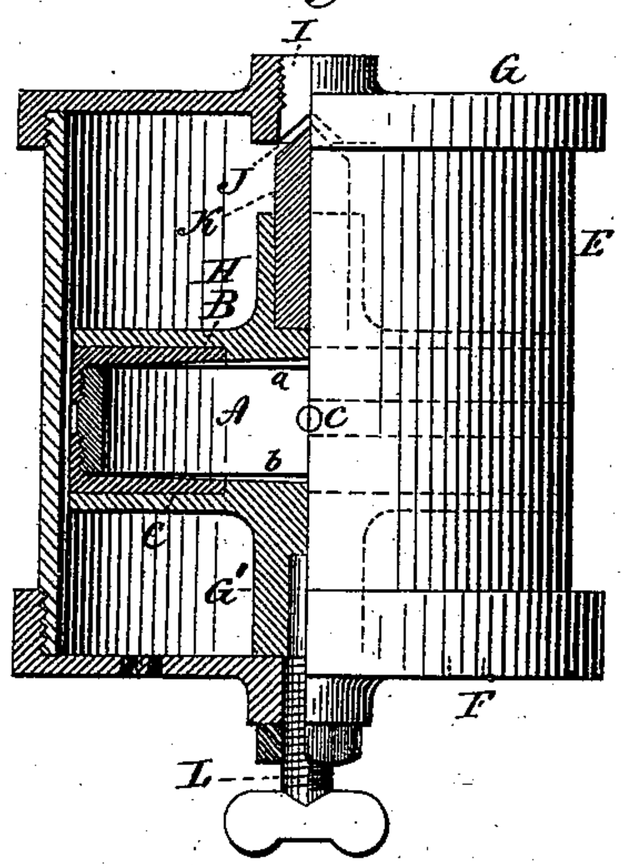


Fig. 2

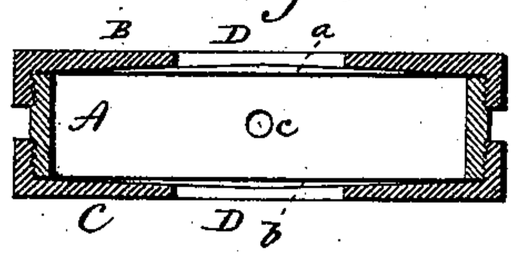


Fig. 3.

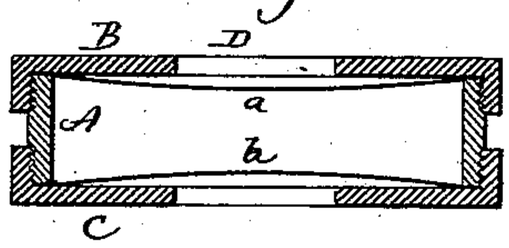
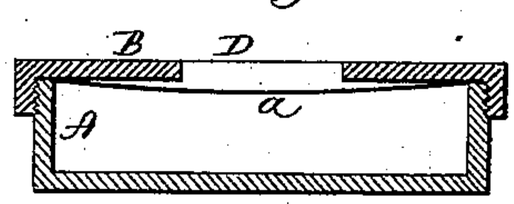


Fig. 4.



Witnesses
J. N. Shumway.
Fred C. Earle

Joseph Bishop,
Inventor,
By atty,
Wm. C. Earle.

UNITED STATES PATENT OFFICE.

JOSEPH BISHOP, OF MERIDEN, CONNECTICUT.

STEAM-TRAP.

SPECIFICATION forming part of Letters Patent No. 376,850, dated January 24, 1888.

Application filed October 31, 1887. Serial No. 253,811. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH BISHOP, of Meriden, in the county of New Haven and State of Connecticut, have invented a new Improvement in Steam-Traps; and I do hereby declare the following, when taken in connection with accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a sectional side view of a steam-trap embodying this invention; Fig. 2, a sectional side view of the diaphragm detached; Figs. 3 and 4, modifications in the construction of the diaphragm.

This invention relates to an improvement in the device commonly called "steam-trap"—that is to say, a device which is placed in connection with steam-pipes, by which water of condensation in the pipes may escape therefrom to avoid accumulation of water in the pipes—this trap being particularly adapted to the steam-heating pipes of railway-trains, the invention relating particularly to the construction of a diaphragm by which the valve of the trap is operated, the construction of the diaphragm being applicable to expansible diaphragms for other purposes.

The diaphragm of this invention consists of a chamber formed, preferably, by a ring of circular shape, having a disk secured thereto upon its two sides, and so as to form a chamber within the ring, which is filled with an expansible material, and so that by the expansion of the material the diaphragms will separate according to the expansion or approach each other according to the contraction of the contents of the chamber. Such diaphragms are usually made from metal—that is, a rigid metal ring with thin disks secured to the opposite sides of the ring—and the chamber filled with some material which will expand under the action of heat, and so as to cause the disks at the center to separate. The strain of this expansion is sometimes very great, and the two expansible sides being free, the expansion frequently so strains the connection between the two sides and the surrounding wall as to produce a leak. Again, in this class of diaphragms, where there is a constant variation in the temperature, first to expand and immediately to contract, this constant working of the disks under unlimited expansion produces leakage at the connection between the disks and ring.

The object of my invention is to provide the diaphragm with stops or checks which will limit the amount of expansion of the disks, and so that undue strain cannot be produced upon the disks; and the invention consists in a diaphragm composed of a rigid wall with elastic or flexible disks or plates forming the two sides of the diaphragm, combined with caps secured to the wall of the diaphragm and covering the disks, but so as to allow a limited amount of play of the disks before they will come to a bearing against the said caps, as more fully hereinafter described.

The best form of the diaphragm is of cylindrical or circular shape, and it is made of an unyielding metal ring, A, which forms the outer wall of the diaphragm. Upon the upper side of the ring an elastic or flexible disk, *a*, is applied, preferably of metal, and preferably upon the under side a like elastic or flexible metal disk, *b*, is applied, the two disks being permanently secured to the ring and so as to form a tight chamber, which is adapted to be filled with any suitable fluid or material which will expand under the action of heat; and as a convenient means for filling the diaphragm the ring is pierced, as at *c*. This diaphragm, broadly considered, is a common construction.

To the upper side of the diaphragm I apply a cap, B, which is in the form of an inverted cup, the sides of the cup screw-threaded upon the inner surface, and the outer surface of the ring correspondingly screw-threaded, so that the cap may be screwed to that side of the ring, and upon the under side a like cap, C, is applied in the same manner. The inner surface of these two caps is made substantially concave, and so as to leave a space at the center between the inner surface of the caps and the surface of the disks, as clearly indicated in Fig. 2, and so that the expansion of the fluid in the diaphragm will force the disks or sides of the diaphragm outward until they come to a bearing against the inner surfaces of the caps, when further expansion will

be prevented. Then as the diaphragm cools and contracts the sides will return to their normal position and away from contact with the respective caps.

Instead of making the caps concave upon the inner side, they may be made flat, as indicated in Fig. 3, and the disks or sides of the diaphragm made concave, as represented in Fig. 3. In that case the same stop or support is given to the sides of the diaphragm under expansion.

The caps have a central opening, D, through them, by which a bearing may be attained directly upon the diaphragm, to utilize the expansion and contraction thereof.

The application of this diaphragm to a steam-trap is represented in Fig. 1, in which E represents an outer casing, F the lower head, and G the upper head, forming a chamber, in which the diaphragm is set, as there represented. The lower side of the diaphragm rests upon a post, G′, which extends through the opening in the lower cap of the diaphragm, and so that the lower side of the diaphragm will rest directly upon this post as a support. At the upper side a similar post, H, is arranged through the opening D in the cap upon the upper side of the diaphragm, and so as to rest directly upon that side of the diaphragm. The top G of the trap is provided with an opening, I, by which connection may be made directly with the steam-pipe, and opens into the trap, so that the contents of the steam-pipe may pass into the trap. The inner side of this opening forms a valve-seat, J, and to the upper post, H, a valve, K, is applied, which is adapted to set upon the valve-seat J, so as to close the opening, but normally stands distant from the opening, and to an extent within the limits of the expansion of the diaphragm, and so that as the diaphragm expands it will bring the valve to its seat and close that opening, or when the diaphragm is contracted it will open the valve, as represented in Fig. 1.

The lower end of the trap is provided with one or more holes, through which water may escape, and for convenience of adjustment the lower head is provided with a set-screw, L, by which the diaphragm may be raised or lowered to increase or diminish the extent of opening of the valve.

The diaphragm and caps are constructed of somewhat less diameter than the casing, or so as to leave sufficient space between the casing and the diaphragm for the water to pass below, as seen in Fig. 1.

This trap being applied so that the steam-pipe may communicate therewith in the usual manner for opening steam-pipes to the trap, steam will pass into the trap through the opening J and cause the diaphragm to expand, and that expansion will immediately close the trap, so as to prevent the further admission of steam; but the trap being exposed to the atmosphere will cool the diaphragm and cause it to contract, open the valve, and permit whatever water may have accumulated in the pipe to flow therein until steam will again enter the trap and cause expansion of the diaphragm to close the valve, the water passing off through the trap to waste.

In some cases a single expansible side of the diaphragm will be sufficient for practical purposes—say as seen in Fig. 4. In this case it will be understood that the cap is only applied to the flexible side. I therefore wish to be understood as including the cap as applied to one or both sides of the diaphragm, accordingly as said sides are elastic or flexible, and so as to leave a limited amount of space between the cap and its adjacent side of the diaphragm, and serve as a stop to limit the extent of movement of that side of the diaphragm.

This general application of the diaphragm to one steam-trap will be sufficient to enable others skilled in the art to apply it to other traps or to other purposes where a similar diaphragm is desired.

I claim—

1. The herein-described diaphragm for steam-traps and like purposes, consisting of a rigid wall, with one or both sides composed of elastic or flexible material, combined with a cap corresponding to the respective elastic or flexible sides, secured to the rigid wall of the diaphragm, the said caps having an opening through them to the said elastic side or sides of the diaphragm, and the caps constructed to form a recess between their inner surface and the adjacent surface of the said sides of the diaphragm, substantially as described, and whereby said caps form stops to limit the expansion of the said diaphragm.

2. A steam-trap consisting of a chamber, E, closed at its upper and lower ends, a diaphragm within said chamber, composed of a rigid wall with elastic or flexible top and bottom, with caps made fast to said diaphragm, and so as to cover the said flexible or elastic sides, but leave a limited space between the inner surface of the caps and the adjacent surface of the sides of the diaphragm, the said caps having a central opening therein to said sides of the diaphragm, a support, G′, in the bottom of the diaphragm and upon which the lower side of the diaphragm rests, a valve supported on the upper side of said diaphragm through the cap, the upper end of the trap provided with a valve-opening, which said valve on the diaphragm is adapted to open or close, substantially as described.

JOSEPH BISHOP.

Witnesses:
FRED C. EARLE,
LILLIAN D. KELSEY.