(No Model.) 2 Sheets—Sheet 1.

F. LAMPLOUGH.

TRAP.

No. 528,727. Patented Nov. 6, 1894.

FIG. 1.

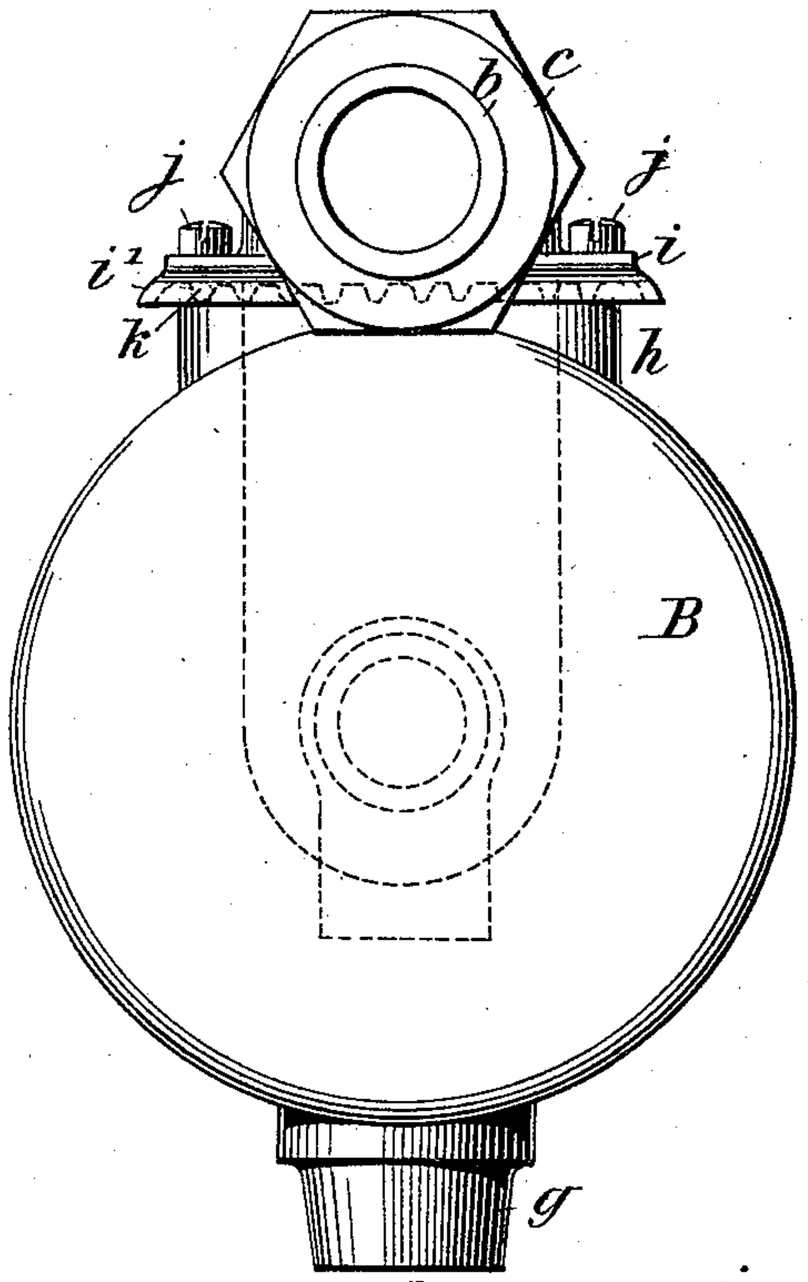

FIG. 2.

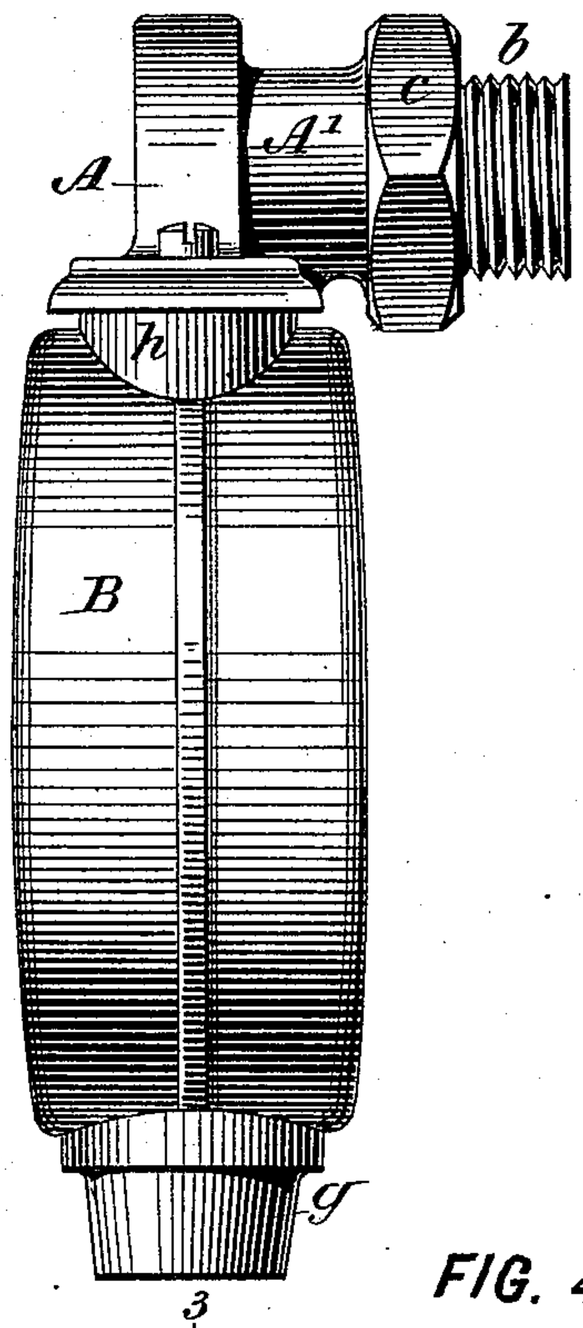

FIG. 3.

FIG. 4.

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(No Model.) 2 Sheets—Sheet 2.

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FIG. 5.

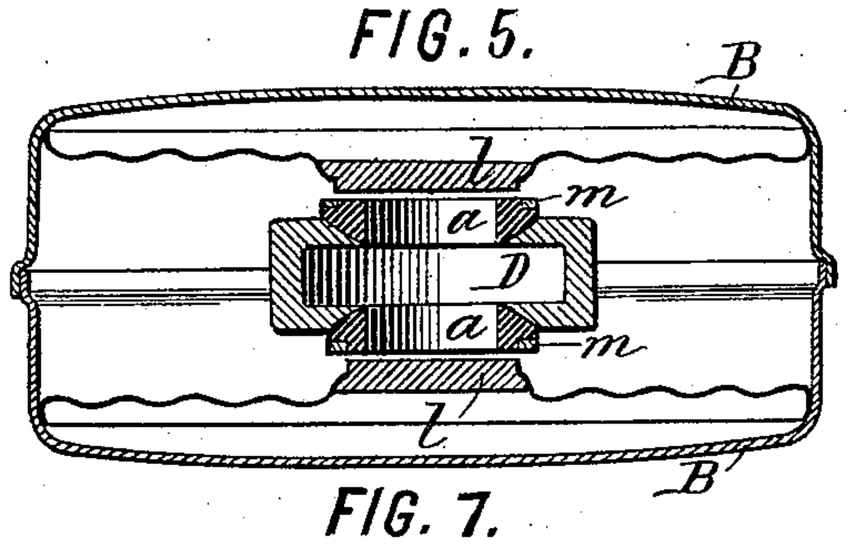


FIG. 7.

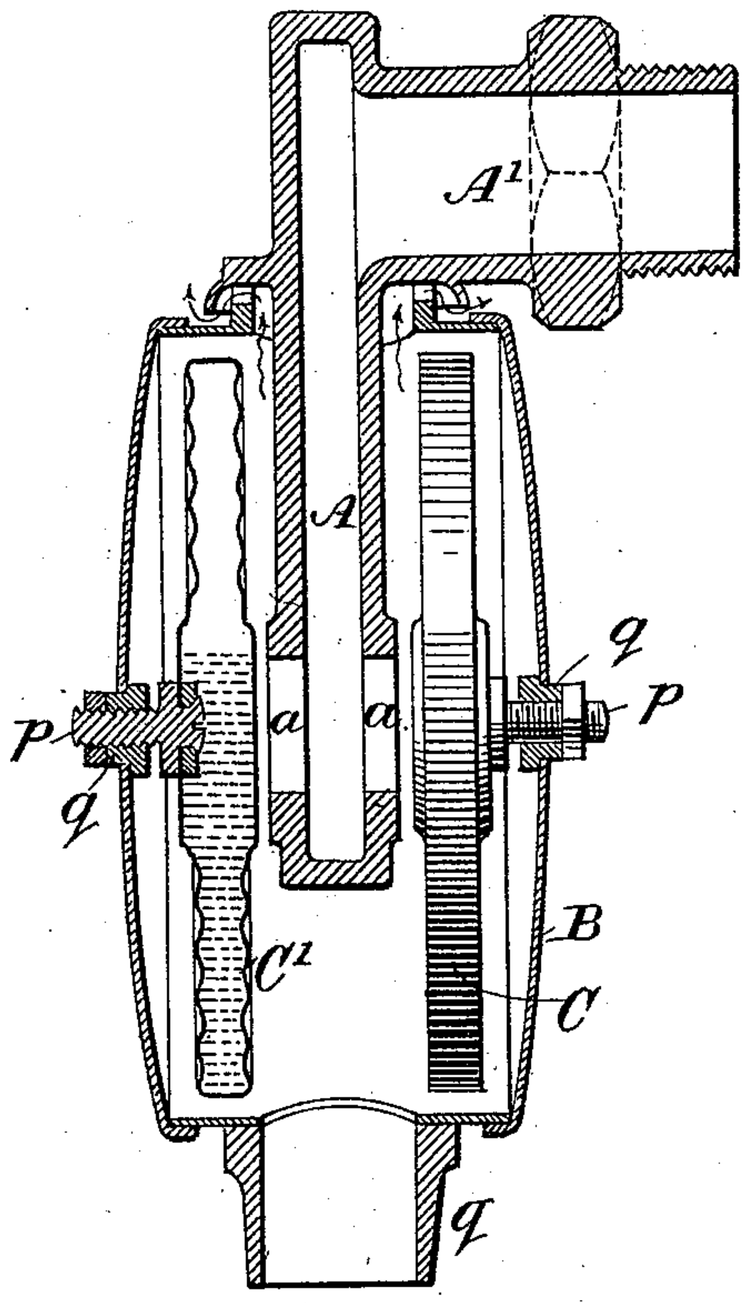
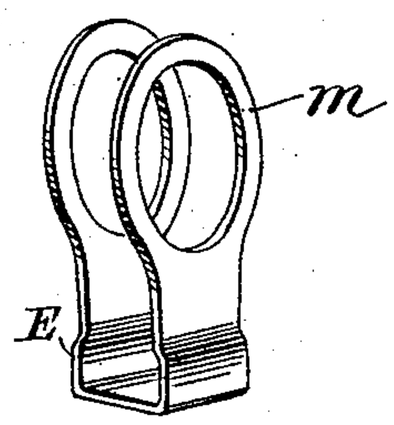


FIG. 6.



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UNITED STATES PATENT OFFICE.

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TRAP.

SPECIFICATION forming part of Letters Patent No. 528,727, dated November 6, 1894.

Application filed January 26, 1894. Serial No. 498,074. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK LAMPLOUGH, a subject of the Queen of Great Britain, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Traps, (being an improvement on the Gold thermostatic trap,) of which the following is a specification.

This invention relates to thermostatic steam traps adapted for draining off water of condensation as rapidly as it cools, and constitutes an improvement upon traps of that class wherein the thermostatic device consists of an expansion chamber having a movable wall or diaphragm, and containing a volatile fluid, which upon the application of heat expands the chamber and forces the movable wall or diaphragm against the discharge opening or seat to close the trap.

The present invention aims to improve and cheapen the construction of such traps, to render them more sensitive, and to increase their discharge capacity.

To this end my improved trap is made with two opposite expansion chambers inclosed in a casing and adapted as they expand to seat against two opposite openings formed in opposite sides of a tubular arm constituting a steam passage, which enters the casing and extends therein radially between the expansion chambers, terminating in said openings, which are made preferably concentric with the casing so as to face the middle portions of the diaphragms or movable walls of the expansion chambers. The casing is constructed of two sheet metal cups joined together instead of being made of cast metal as heretofore, and it is detachably connected to the tubular arm so that by unfastening it it may be removed therefrom to get access to the seats. The seats are composed of rings of suitable packing material, mounted in sockets at the discharge openings, and held in these sockets by a spring or springs. To make the seats self-adjusting, they are formed as segments of spheres on their inner sides, and the sockets to receive them are made correspondingly spherical, so that the seats may rock in the sockets to adapt their outer or flat faces to the seating faces of the diaphragms. Provision is made for assisting the cooling of the expansion chambers by an upward circulation of air within the casing, entering through the outlet opening at the bottom and escaping through ventilating openings at the top.

Figure 1 of the accompanying drawings is a face view of my improved trap. Fig. 2 is a side elevation thereof. Fig. 3 is a vertical section on the line 3—3 in Fig 4. Fig. 4 is a vertical transverse section on the line 4—4 in Fig. 3. Fig. 5 is a horizontal section on the line 5—5 in Fig. 3. Fig. 6 is a perspective view of the fastening spring. Fig. 7 is a vertical transverse section answering to Fig. 4 but showing a modification.

The steam enters through a pipe A′ into a tubular arm A, through which it passes to the discharge openings *a a*. The arm A is preferably flattened as shown. The pipe A′ is shown as projecting at right angles from it, although this is not essential, and has a screwthreaded portion *b* and a hexagonal head *c* for uniting it to the steam pipe or vessel to be drained, but other means for so uniting it may be substituted. The arm A projects into the casing B, which is preferably circular in form, with the discharge openings *a a* concentric with its center. Within the casing are two expansion chambers C C partly filled with alcohol or other volatile liquid, which upon being heated will expand and force the inner or movable walls *d d*, which are constructed as flexible diaphragms, to close or seat themselves against the margins of the openings *a a* to close these openings. The chambers C C may be distinct or self-contained chambers inclosed within the casing B, as shown at C′ C′ in Fig. 7, but preferably they are constructed as shown in Fig. 4, the walls of the casing B forming the outer walls of the chambers, while the inner walls are formed of the diaphragms *d d* which are fastened within the casing, their margins being soldered or otherwise joined thereto. By this construction the cooling of the expansion chambers is accelerated, since heat can be readily transmitted therefrom through the thin wall of the casing B into contact with the outer air. To facilitate this transmission of heat, and at the same time to render the construction of the casing as cheap, light and simple as possible, the casing is made of sheet metal, preferably by uniting two sheet metal cups which are drawn, pressed

or spun into shape, being made of steel, brass, or other suitable metal. The two cups or shells have their edges overlapped as shown in Fig. 5, and are soldered or otherwise joined thereto. The sheet metal casing thus formed is provided with an opening *e* at its bottom, and an opening *f* at its top. In the opening *e* is fastened a tubular outlet spout *g* to direct the issuing water or steam downward, and to impart a neat finish to the outlet. To the top opening *f* is soldered or otherwise fastened a hollow casting or collar *h* forming a head-piece for the casing. For fastening the casing to the hollow arm A, the latter is formed with a flange *i*, and some suitable means is provided for attaching the collar *h* to this flange. The preferred means consists of two screws *j j* passed through the flange and screwing into sockets in the collar, as shown in Fig. 3. By removing these screws the casing can be drawn down and disconnected from the hollow arm A, so that not only can access be had to the discharge openings *a* and the seating faces around them, but also the interior of the casing is rendered accessible through the opening *f*.

In thermostatic traps of this character as ordinarily constructed, only one expansion chamber is used, and the steam passage enters axially through the opposite side of the casing in line with the discharge opening. To secure the required area of discharge, the opening is necessarily made somewhat large, with the result that when high steam pressures are used, the pressure of the steam against so large an area of the diaphragm or movable wall of the expansion chamber, is liable to strain or buckle the diaphragm and cause the trap to leak. By my improved construction I substitute for the single opening of a given area, two openings having each only half the required area, so that the pressure comes against a smaller portion of the diaphragm and is attended with a correspondingly reduced liability to distort or injure the diaphragm. The result is that the trap is less liable to leak, and the diaphragms have a longer life. By my new construction the steam passage instead of entering axially through one side of the casing, enters in radial direction in the space between the chambers, passing from the exterior into the casing, and extending to and beyond the center, in order that the discharge openings *a a* may be located at the center of the respective diaphragms. It is preferable to enter the steam passage or hollow arm A at the top of the casing, and extend it downwardly, but it might instead be entered at the side or elsewhere, this being equivalent to turning the trap shown in Fig. 1 sidewise. In case of any such change of position, the discharge spout *g* should be rearranged to bring it to the under side of the casing.

Around the discharge openings *a* are formed seating faces against which the diaphragms may seat in the well known way. According to the preferred construction I make these seating faces on seating rings D D which are socketed in the opposite sides of the hollow arm A in the manner shown in Fig. 4. The outer faces of the seating rings are flat or otherwise shaped to conform them to the relative seating faces on or carried by the diaphragms. The inner faces of the seating rings, however, are formed as segments of spheres, and rest in sockets which are likewise formed as segments of spheres. The dotted circle *x* in Fig. 4 shows a development of the outline of the sphere of which the right hand seating ring is a segment. This construction constitutes a sort of ball-and-socket seat which is capable of rocking or tilting to adjust itself acurately to the position of the corresponding seating faces on the diaphragm, so that when the diaphragm expands against it, a tight seat is formed whereby leakage is prevented. The seating rings D D are easily removable, being held in position by the tension of a looped spring E. Shown separately in Fig. 6. This spring is of aproximately U-shape, bending under the end of the arm A, and its two legs are formed to engage the opposite seating rings D D, and by tending to press together they hold the opposite rings firmly in place in their sockets. To enable the spring to firmly engage the seating rings, the latter are formed with concentric rabbets on their outer sides by which their outer seating faces are made to project, and the spring is formed with a ring-shaped or annular portion *m* on each of its legs, which annular portion passes over the projecting portion or outer seat of the ring and embraces it, so that relative displacement between the rings and the spring is prevented.

By the preferred construction of the expansion chambers so that their outer walls are integral with the walls of the casing, an extended heat-radiating surface is formed exposed to the cold outer air by which the heat which is imparted to the contents of the chambers is rapidly conducted away, and the trap thereby made more sensitive or prompt in action than those traps in which the expansion chamber is a separate vessel inclosed within the casing. To further enhance the sensitiveness of the trap in this respect, I provide for cooling the inner surfaces or diaphragms of the chambers by causing an upward circulation of air within the casing. The air enters through the spout *g* and bottom opening *e*, and ascends within the casing against the surfaces of the diaphragms, passing up through the top opening *f*, and finally escaping through ventilating holes *k k* at the top. These holes are preferably formed between the collar *h* and flange *i*, and by notching one or the other of these parts. As shown, they are formed as notches in the upper edge or the collar *h*, these notches being shown in dotted lines in Fig. 1, and in section in Fig. 4. Outside of the ventilating holes *k*, the flange *i* is turned downward at *i'* in order that if

any steam or hot water should be forced out through these holes it would be directed downwardly, so that no damage will be done, instead of being thrown outwardly or upwardly as would otherwise occur.

The seating faces on the diaphragms may be formed as a flat portion of the metal of which the diaphragm is made, as shown in Fig. 7, or preferably a flat disk of thicker material may be fastened to the diaphragm, as shown at *l* in Fig. 4.

Fig. 7 shows a modification in which the expansion chambers, here lettered C′ C′, are distinct from the casing B, being mounted inside of it and rendered adjustable by means of screws *p* and nuts *q*, so that they may be set nearer to or farther from the seating faces of the discharge openings *a a*. The separate seating rings D D (Fig. 4) are omitted in this construction.

My invention may be otherwise modified without departing from its essential features, which are hereinafter defined in the claims.

My invention is not to be understood as wholly limited to the employment of two opposite expansion chambers, as one of these chambers might be omitted without entirely departing from my invention.

I claim as my invention the following-defined novel features, substantially as hereinbefore specified, namely:

1. A steam trap consisting of a tubular arm forming a steam passage, having opposite discharge openings, combined with two opposite expansion chambers having their movable walls adapted to seat against said openings respectively when heated.

2. A steam trap consisting of a casing, two opposite expansion chambers within said casing, and a tubular arm forming a steam passage entering said casing between said chambers and formed with opposite discharge openings facing the movable walls of the respective expansion chambers to be closed thereby when heated.

3. A steam trap consisting of a casing, two expansion chambers formed in opposite sides of said casing, with their movable walls facing each other, and a tubular arm forming a steam passage entering said casing radially between said chambers and formed with opposite discharge openings facing and concentric with said movable walls, to be closed thereby when the chambers are heated.

4. In a thermostatic steam trap the combination of a casing, having a thermo-expansion chamber, and formed with an opening at one side, and a tubular arm smaller than said opening entering through the opening and forming a steam passage extending radially within said casing and terminating at the center thereof, and means for detachably connecting the casing to the arm, whereby the casing may be unfastened and removed from the arm to get access to the seating faces.

5. In a thermostatic steam trap the combination of a casing having opposite flattened sides with two diaphragms fastened within it to form two opposite expansion chambers, of which the opposite sides of the casing constitute the outer rigid walls and the diaphragms constitute the inner and movable walls, and a tubular arm constituting a steam passage projecting radially into said casing to the center and formed with opposite discharge openings facing and adjacent to said diaphragms to be closed thereby when heated.

6. In a thermostatic steam trap the combination of a casing consisting of two shells of sheet metal joined edge to edge, two opposite expansion chambers within said casing, and a tubular arm constituting a steam passage projecting radially into said casing to the center and formed with opposite discharge openings facing and adjacent to the movable walls of said expansion chambers.

7. In a thermostatic steam trap the combination of a casing consisting of two shells of sheet metal joined edge to edge, with an opening between them, a collar fastened to them at said opening, an expansion chamber in said casing, a tubular arm constituting a steam passage projecting through said opening and formed with a flange, and a fastening device for detachably fastening said flange to said collar.

8. In a thermostatic steam trap comprising a casing, an expansion chamber and a steam passage terminating in a discharge opening facing the movable wall of said chamber, the combination therewith of a seating ring inclosing said opening and a spring pressing against said ring to hold it in place, whereby it is readily removable by pressing out said spring.

9. In a steam trap comprising a tubular arm forming a steam passage and having opposite discharge openings, and two opposite expansion chambers adapted to close said openings when heated, the combination therewith of detachable seating rings applied at said openings, and a bowed spring the opposite arms of which engage the respective rings and press toward each other to hold the rings in place.

10. In a steam trap comprising a tubular arm forming a steam passage and having opposite discharge openings, and two opposite expansion chambers adapted to close said openings when heated, the combination therewith of detachable seating rings applied at said openings, sockets formed around said openings to receive the seating rings, and a bowed spring the opposite arms of which are formed with openings to embrace the respective seating rings, and press toward each other to hold the rings in their sockets.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

FREDERICK LAMPLOUGH.

Witnesses:

GEORGE H. FRASER,

ARTHUR C. FRASER.