(No Model.)

E. E. GOLD.

THERMOSTATIC TRAP.

No. 556,093. Patented Mar. 10, 1896.

FIG. 1.

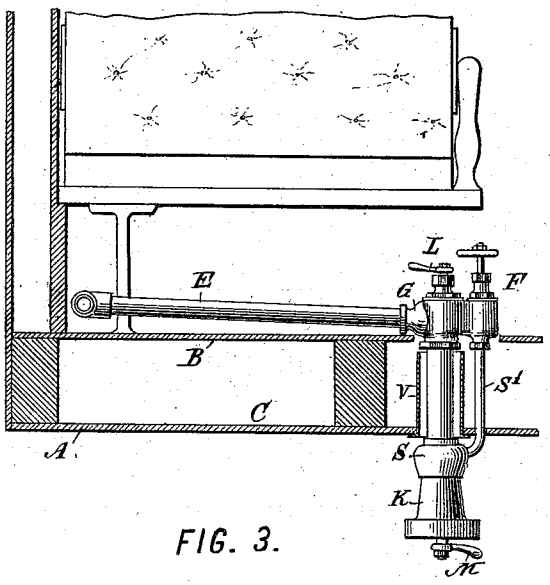


FIG. 3.

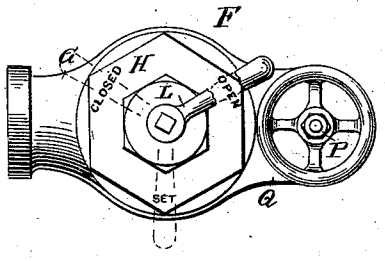


FIG. 4.

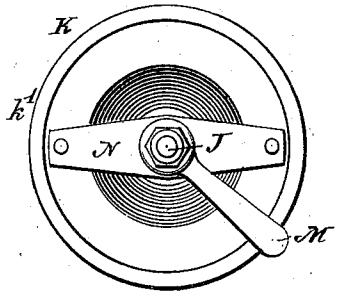
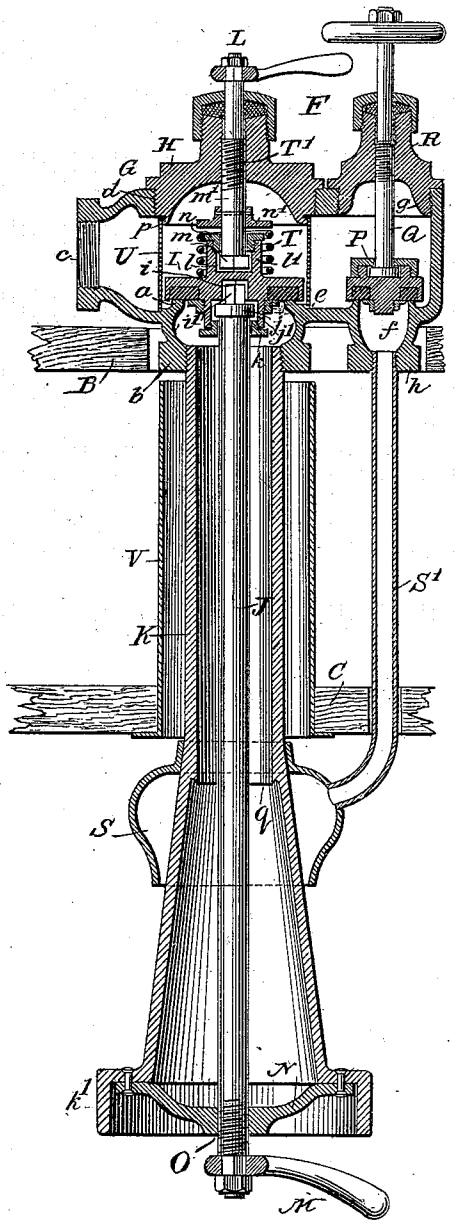


FIG. 2.



WITNESSES:

Fred White

Thos. W. Wallace

INVENTOR:

Edward E. Gold,

By his Attorneys,

Arthur G. Fraser & Co.

UNITED STATES PATENT OFFICE.

EDWARD E. GOLD, OF NEW YORK, N. Y.

THERMOSTATIC TRAP.

SPECIFICATION forming part of Letters Patent No. 556,093, dated March 10, 1896.

Application filed June 14, 1893. Serial No. 477,517. (No model.)

To all whom it may concern:

Be it known that I, EDWARD E. GOLD, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Thermostatic Traps, of which the following is a specification.

This invention relates to thermostatic traps of the class employed in connection with steam-heating apparatus or systems. Heretofore such traps have been constructed with an outer tubular member surrounding the outlet from the valve and an inner valve-rod of highly expansible metal inclosed in said member fixedly carried thereby at one end and carrying the valve at the other end, whereby when the valve-rod became heated by the escape through the valve it would expand and close the latter, and when cooled would contract and open the valve for another discharge. Other constructions have employed a casing and valve-rod of similar expansibility and provided a thermo-expansible vessel within the casing for moving the rod.

My invention aims to provide an improved thermostatic trap which shall be simple of construction, convenient and effective in operation, and not liable to impairment. It also aims to provide a thermostatic valve which can be utilized at wish as a relief and expansion valve or an ordinary blow-off.

To this end in carrying out the preferred form of my invention I provide my improved thermostatic trap with a relatively non-expansive valve-rod carrying the valve and a relatively highly-expansive tubular casing surrounding and inclosing this rod connected thereto at one end and to the valve-seat at its other end and acting to open or close the valve as its temperature changes, and I provide a yielding connection between said rod and casing having sufficient rigidity to control the operation of the valve under ordinary conditions and sufficient yield to prevent impairment thereof under unusual conditions, and I provide certain other improvements in construction and operation of the valve, which will be fully hereinafter set forth.

In the accompanying drawings, which illustrate the preferred form of my invention, Figure 1 is a fragmentary cross-section of the body of a car, showing my improved trap applied to the steam-heating pipe thereof. Fig. 2 is an enlarged axial section of my improved trap in its preferred form. Fig. 3 is a plan view thereof looking at the top, and Fig. 4 is an under side plan view thereof.

Referring to the drawings, let A indicate the body of a car; B, the floor thereof; C, the bottom sheathing thereof; E, the steam-heating pipe thereof, and F my improved trap applied to said pipe.

I will now describe in its preferred form all the details of my invention as embodied in the construction shown in the several figures of the drawings as applied for use in connection with the steam-heating system of a railway-car.

The trap consists of a suitably-shaped valve body or shell G, a valve I therein, a valve-rod J connected to the valve, a tubular expansible casing K connected to the shell at the top and to the valve-rod at bottom, a handle L at top engaging said valve for manipulating it, and a handle M at bottom engaging said rod for adjusting it. As heretofore, an auxiliary valve P is provided on the shell G and consists of a simple blow-off valve.

The shell G is preferably a metal shell having valve-seat *a*, a depending screw-threaded neck *b* concentrically of and below said seat, a screw-threaded neck *c* for attachment to the pipe of the system with which the trap is employed, a screw-threaded aperture *d* above and concentric with said seat *a* and into which is tapped the usual cap H, carrying the handle L, and beneath this aperture *d* the shell is provided internally with an annular shoulder *e* concentric with its seat *a* and of less diameter than the aperture *d*. In the construction shown the shell G has an extension Q, having valve-seat *f* at bottom and screw-threaded aperture *g* at top, into which is screwed a cap R carrying the blow-off valve P. Below the seat *f* is a screw-threaded depending neck *h*.

According to my invention the valve I and rod J are preferably loosely connected together in such manner that there is slight vertical play between the valve and rod and room for slight relative axial movement; but when the limit of this movement is reached the two must move together. This connection is preferably made by constructing the

valve with a square socket *i* and the rod with a square head *i'* entering this socket, but of somewhat smaller size than the socket, whereby a slight looseness for relative rotative movement exists. The rod J below this square portion is constructed with an annular shoulder *j*, which enters an annular socket *j'* formed in a thimble on the lower side of the valve I, which socket is closed at bottom by a gland *k* screwed into the lower end of the thimble, and the thickness of the shoulder *j* is slightly less than the depth of the socket *j'*, whereby slight relative vertical play exists between the valve and its rod. This freedom of vertical movement is sufficient to permit the slight opening and closing of the valve I when it is set for a relief-valve, but is not so great as to prevent the operation of the valve by the expansion or contraction of the casing K. The shell and valve are within the compartment to be heated.

The valve-rod J is preferably of comparatively non-expansive metal and depends downwardly from the valve I, terminating in a screw-threaded end, on a square portion of which is fixed the handle M for adjusting the rod. The casing K is outside of the compartment to be heated and is of relatively high expansive metal, preferably brass, surrounds and incloses the rod J, is connected at its upper end to the shell G by a screw-thread engaging the neck *b* thereof, extends downwardly in cylindrical form to a lip *q* below the floor-sheathing C, and thence on downwardly in conical or flaring form to its lower end, where it is enlarged into a mouth *k'* and connected to the rod J. Preferably the connection between the rod and casing is an adjustable and yielding connection. That shown consists of an elastic bar N riveted at its ends to the opposite sides of the mouth *k'*, bulging downwardly and having a screw-threaded middle aperture *o*, the threads of which are engaged by the screw-threaded end of the rod. The cross-bar is sufficiently narrow to provide abundant room for egress through the lower end of the casing and is of sufficient rigidity to transmit all the expansive or contractile movements of the casing to the rod and through it to the valve under ordinary conditions, but is sufficiently yielding to compensate for these movements in case the valve is immovably set or becomes impaired by an accumulation of sediment on its seat.

By rotating the handle M the rod and the valve can be adjusted relatively to the casing K.

Preferably the casing is constructed with an apron S surrounding its conical portion immediately beneath the sheathing C, which apron has a swelling annular body and a contracted annular lip surrounding the casing and providing an annular chamber thereabout. Into this apron leads a small pipe S', connected at its upper end to the neck *h* below the blow-off valve and opening at its lower end into the apron. By this construction the hot steam or other discharge from the blow-off can be directed around all sides of the lower portion of the casing and jetted downwardly in an annular stream from the lip of its apron to expand the casing rapidly or to thaw out any ice that may have accumulated therein. A sheath V open at top and bottom surrounds the casing from the sheathing C up for giving access of the outer air thereto.

The valve I may be of any suitable construction; preferably, according to this invention, it is engaged at top by a controlling-handle L in such manner that it can be set either permanently closed or permanently open or at an intermediate position, usually called the "set" position, at which it is at liberty to open or close according to the action of the thermostat or to open and close as a relief-valve independently of such action. The valve and its handle L are preferably connected together loosely to have a slight relative freedom for rotative movement, beyond the limit of which they must rotate together, and to have a slight freedom for independent longitudinal or axial movement. This connection is preferably accomplished by providing a square socket *l* in a collar *l'* on the top of the valve and a somewhat smaller squared end *m* on the lower end of the stem *m'* of the handle L, this head *m* being of lesser depth than the socket *l* to permit the freedom for axial movement. The top of the collar *l'* is engaged by a screw-threaded thimble *n*, which surrounds the stem *m'* and constitutes the upper end of the socket *l*, thus locking the valve I and handle L together. Above the thimble *n* a shoulder *n'* is fixed on the stem, and between this shoulder and the valve I is disposed a spiral spring T, which reacts to force the valve toward its seat. This spring is of such tension that normally it will hold the valve on its seat when the stem *m'* is in the mid-position or set position within the socket *l*, and if rarefaction in the shell G or the system of piping connected therewith occurs the valve will be lifted against the spring by the air-pressure from the outside, thus relieving the vacuum within and at the same time permitting the escape of any water lying in the shell or pipes. Above the shoulder *n'* the stem has a screw-thread T' engaging a corresponding screw-thread in the cap H, these screw-threads being preferably of such pitch that a rotation of the handle L from the closed position to the set position (about one-third of a revolution) will shift the stem from its lowermost position in which it clamps the valve tightly against its seat to the mid-position in which its squared head *m* is midway between the top and bottom of the recess *l*, whereupon the valve is free to vibrate independently of the stem, and a movement of the handle from this position to the "open" position (about one hundred and twenty degrees) will bring the squared head of the stem against the upper

end of the socket *l* and lift the valve from its seat and maintain it open. Thus by manipulating the handle the valve can be set in either an open or a closed position or in an intermediate vibratory or "relief" condition, in which latter condition it is susceptible to the operation of the thermostat.

When set either open or closed any expansion or contraction of the casing K beyond that taking up the looseness between the valve and its rod J will be extinguished in the spring cross-bar N, which will yield because of the immovability of the valve.

According to one feature of my invention I provide an improved sediment-guard for the valve I, which guard is preferably a cylindrical screen U engaging and swaged into a grooved shoulder *p* in the under side of the cap H at top, and extending thence downwardly concentrically of the valve and surrounding it to and engaging the annular shoulder *e* of the shell G below the valve-seat. Thus the valve and its working parts are entirely inclosed in this screen and thereby protected from all sediment. The screen is removable with the cap H, whereby upon unscrewing the lower end of the rod J and removing its handle M the entire valve can be withdrawn by detaching the cap H. The blow-off valve P is preferably at the opposite side of the screen U from the ingress-neck *c* of the valve-shell G, so that the inrush of steam, when the blow-off valve is opened, will blow all sediment off the screen which may have accumulated thereon.

In operation, if the valve is not to be used as a thermostatic valve, the rod J will be screwed upwardly in the bar N until it almost contacts with the under side of the valve when closed and when the casing K is cold. The handle L can then be adjusted to open or close the valve or set it at relief, and the valve will operate independently of the thermostat. If to be used as a thermostatic valve the rod J will be adjusted to lift the valve when the casing K cools and contracts and to close the valve when this casing is heated and expanded, and the handle L will be set in the mid or set position, leaving the valve free to operate under the action of the thermostat. Then the valve will be opened by the contraction of the casing when cool, and thereupon accumulated water of condensation will be discharged through it and flow out through the casing K, and when this is exhausted the hot steam following will quickly heat and expand the casing, thereby drawing the valve down to its seat and closing it. It will remain closed until the casing cools sufficiently to open it again, whereupon the operation will be continued as described. To blow out the valve it will be thrown to the open position by its handle L, whereupon it will discharge independently of its thermostatic action. To close it permanently the handle will be set to the closed position, thus holding it seated against the opening tendency due to the contraction of the casing. To thaw out the valve, in case any ice should accumulate in the lower part thereof, it can be quickly heated by opening the blow-off valve P and thereby jetting steam around its lower portion.

It will be seen that my invention provides an improved valve which can be variously availed of. The use of a comparatively highly expansive outer casing K in connection with a relatively low expansive valve-rod J is an advantageous feature of the invention, since it quickens the thermo action of the valve by placing the expansive member where it is most exposed to the cooling action of the outer air, whereby after closing the shell will be more quickly cooled and contracted than heretofore in valves in which the expansible member has been inclosed in a non-expansible shell. In such valves the expansible member has been confined within the shell within which considerable of the hot discharge through the valve has remained, and thereby this member has been kept heated and expanded longer than would be the case were it exposed to the normal temperature without, as is done by my invention.

It will be understood that the invention is not limited to the exact details of construction and arrangement hereinbefore set forth as its preferred form, but that it can be availed of in whole or in part according to such other forms or modifications as those skilled in the art may suggest without departing from its essential features.

The construction of the casing K with a conical diverging or flaring lower end facilitates the escape of water of condensation and tends to prevent the freezing of such water within the casing and to facilitate the removal of ice therefrom if such should at any time accumulate therein. The conical shape will permit the expansion downwardly in the event of such freezing, and the yielding cross-bar N will yield sufficiently to allow for this expansion. The drip will be precipitated from the lip *q* away from the lower wall.

The sheath V will prevent the accumulation of hot air around the casing K.

My invention provides a thermostatic trap which can be adjusted from either within or outside the car. When either handle L or M is operated, the stem, valve, and rod being in engagement, it follows that the stem and rod will rotate together after the lost motion is taken up. Thus the rod is to some extent adjusted in its connection with the shell K when the handle L is rotated. The extent and nature of this adjustment will vary with different constructions. In that shown it is slight and tends to adjust the rod J by screwing it through its bar N to move it in the direction the valve is moved by the handle L. When the stem *m'* has a screw-thread T', (which is not always essential,) this screw-thread may be at like pitch to that on the end of the rod J, or differential thereto, as desired.

What I claim is, in thermostatic traps, the

following-defined novel features and combinations, substantially as hereinbefore set forth, namely:

1. In a thermostatic trap, a valve, a valve-rod loosely connected thereto and a thermostat connected to said rod and operating it to operate said valve, and a controlling-handle loosely connected to said valve and operating it independently of said thermostat.

2. In a thermostatic trap, the shell G having valve-seat *a*, in combination with the valve I, the valve-rod J connected thereto, and the casing K inclosing said rod, of greater thermo-expansibility than said rod, and the cross-bar N connecting said casing and rod together, and affording a yielding connection for taking up any expansion occurring after the valve has been drawn to its seat, substantially as and for the purpose set forth.

3. In a thermostatic trap, a shell G having valve-seat *a* and neck *b*, in combination with a valve I engaging said seat and having a depending rod J, an expansible casing K surrounding and connected to said rod for operating it and having an apron S, a blow-off valve P in communication with said shell G, and a connection between the discharge from said blow-off valve and said apron S, whereby the discharge from the blow-off valve can be directed into said apron to reach said casing, substantially as and for the purpose set forth.

4. In a steam-trap, a shell having a valve-seat, and a valve engaging said seat, in combination with a tubular casing connected to said shell at the egress side of said seat, receiving the discharge from said valve, depending vertically therebelow, and having an internal lip *q* disposed to precipitate the drip downwardly out of contact with its side walls, substantially as and for the purpose set forth.

5. In a thermostatic trap for a car, a valve-shell a valve therein, and depending valve-rod, in combination with an expansible casing connected to said shell near the floor of the car, depending downwardly therefrom through the sheathing of the car and projecting below said sheathing, said casing inclosing said rod, connected thereto for operating said valve, receiving and heated by the discharge from said valve and cooled by the outer air, and a tubular sheath V open at top and bottom and surrounding said casing between the sheathing and floor of the car, whereby outer air can rise within said sheath to cool the upper portion of said casing.

6. In a thermostatic trap, a valve-shell, a valve therein, a valve-rod beneath said valve, a thermostat connected to said valve through the medium of said rod, in combination with a handle for turning said valve arranged above said shell and a screw forming part of the connection between said valve and said thermostat, whereby said valve can be adjusted relatively to said thermostat by turning said handle from above.

7. In a thermostatic trap, a valve-shell, a valve therein, and a thermostat connected to said valve for operating it, in combination with handles for said valve above and below said shell, and an adjustable connection between said thermostat and valve, whereby the latter can be adjusted from above or below as desired.

8. In a thermostatic trap, a valve rotatively connected to a valve-stem at top and a valve-rod at bottom, in combination with said said stem and rod.

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

EDWARD E. GOLD.

Witnesses:
FRED WHITE,
CHARLES K. FRASER.