No. 801,837. PATENTED OCT. 17, 1905.

F. BASON.

STEAM TRAP.

APPLICATION FILED JUNE 7, 1905.

2 SHEETS—SHEET 1.

FIG. 1.

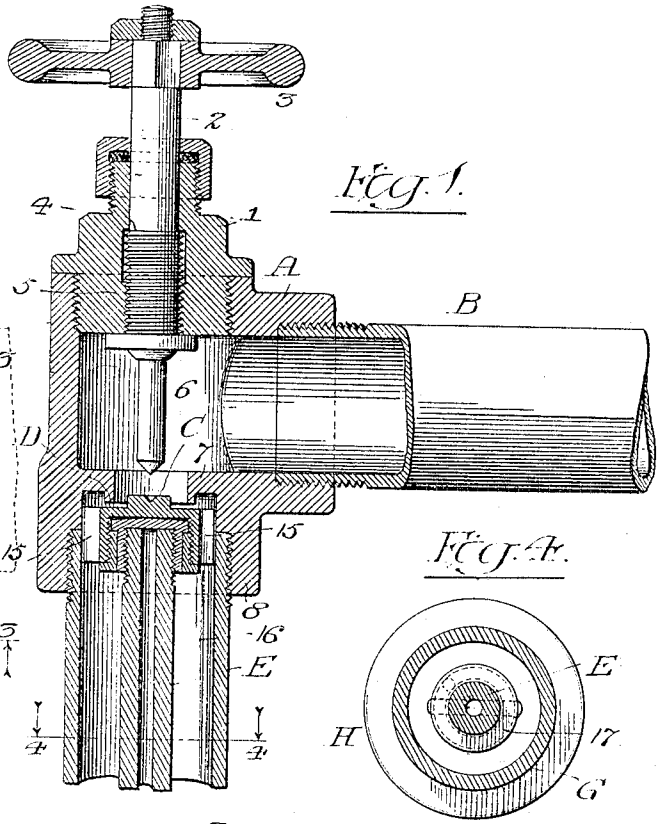


FIG. 2.

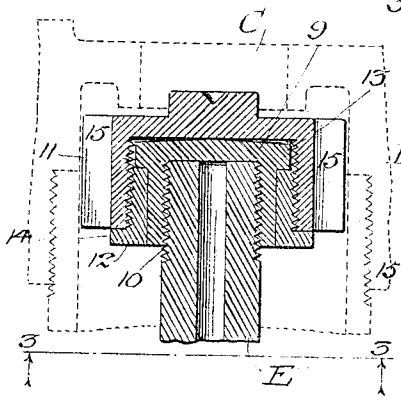


FIG. 4.

FIG. 3.

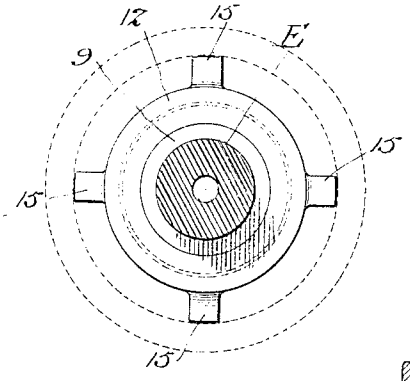
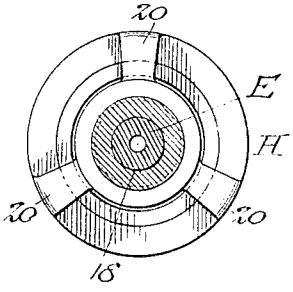
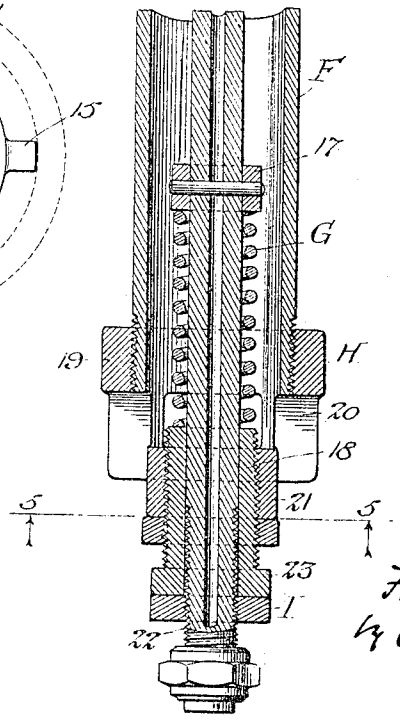


FIG. 5.





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STEAM TRAP.

APPLICATION FILED JUNE 7, 1905.

2 SHEETS—SHEET 2.

Fig. 7.

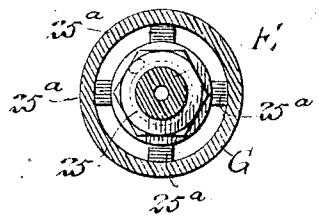


Fig. 6.

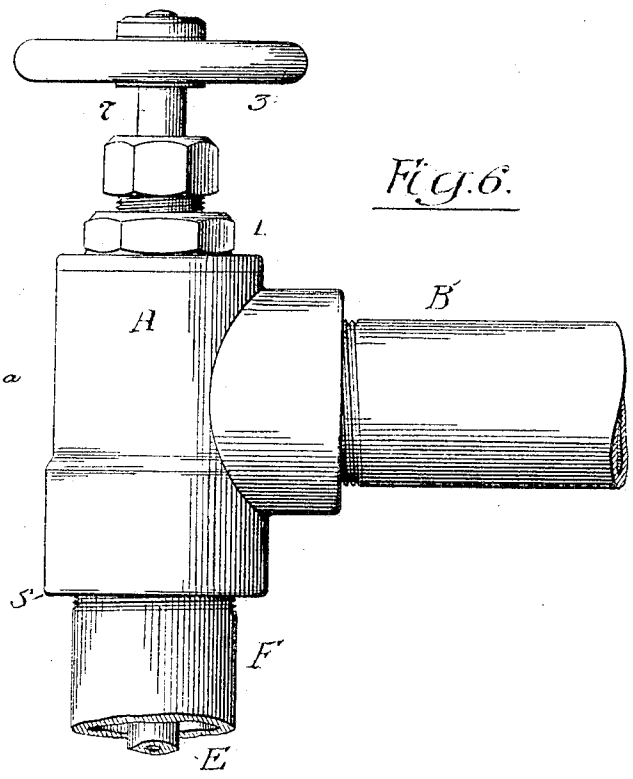
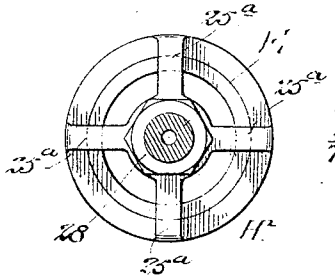
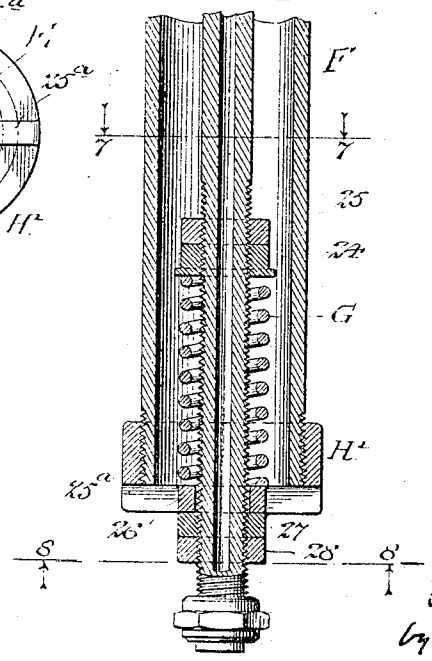


Fig. 8.





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UNITED STATES PATENT OFFICE.

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STEAM-TRAP.

No. 801,837. Specification of Letters Patent. Patented Oct. 17, 1905.

Application filed June 7, 1905. Serial No. 264,175.

To all whom it may concern:

Be it known that I, FREDERICK BASON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Traps, of which the following is a specification.

My invention relates to steam-traps, and more particularly to steam-traps used in connection with the heating apparatus of railroad-cars and adapted for permitting the automatic escape of the water of condensation.

Prominent objects of my invention are to permit the escape of the water of condensation and at the same time prevent the escape and waste of steam, to avoid frequent or continuous leakage of steam, to avoid the common occurrence of cutting off steam from the coil or pipes while a car is on the road, to avoid cutting the valve and by what is termed "wiredrawing" of the steam and water between the seat and valve, to prevent wiredrawing of the water between valve and its seat during use, to provide for an easy quiet discharge of the water of condensation, to check the action termed "water-hammer," to permit the device to discharge the water as near to the road-bed as may be desired, to use one and the same pipe for conducting water and steam from the blow-off valve, and to provide a highly-efficient and durable device involving matters of improved detail, combination, and arrangement.

In the accompanying drawings, Figure 1 is a section on a vertical central plane through a steam-trap embodying the principles of my invention. Fig. 2 is a detail showing in vertical central section the valve and a portion of its stem on a larger scale. Fig. 3 is a cross-section on line 3 3 in Fig. 2, the device being understood to be shown on the scale of said Fig. 2. Fig. 4 is a section on line 4 4 in Fig. 1. Fig. 5 is a section on line 5 5 in Fig. 1. Fig. 6 shows the steam-trap partly in side elevation and partly in vertical central section. Fig. 7 is a section on line 7 7 in Fig. 6. Fig. 8 is a section through the device on line 8 8 in Fig. 6.

A indicates a casing or coupling having its interior space or chamber connected at one side with pipe B, which is understood to be a portion of a steam-coil or other desired pipe system for steam-heating. The casing A is provided at the top with a plug 1, which is screwed into the upper end of the casing and which forms the bearing for a rotary adjustable stem or plunger 2, having a hand-wheel 3, and provided with a threaded portion 4, which is fitted to work in a correspondingly-threaded portion 5 of the bearing formed by the cap or plug 1. The rotary stem 2 extends downwardly within chamber 6 of the casing, whereby the stem 2 can, when so desired, be screwed downwardly to an extent to cause it to engage and depress and thereby positively open a valve C.

The valve C is arranged below and in co-operative relationship with the valve-seat D, which latter is an annular valve-seat, preferably integral with the casing A and arranged as a portion of an annular flange 7, which is at the bottom of chamber 6 and somewhat above the lower end portion 8 of the casing A. As the cap-plug 1 is separable from the casing A and made separate therefrom, the said casing can be made integral with the flange D, having its inner marginal portion turned down to form the annular valve-seat D. The valve C is secured upon the upper end of a metal rod E, which is capable of longitudinal expansion and longitudinal contraction according to the degree of heat or cold to which it is subjected. The valve may be secured to the stem E in any suitable way. As herein shown, a cap 9 is screwed upon the upper threaded end portion 10 of the stem E, and the valve is recessed to receive the cap 9 and also internally threaded, as at 11, to engage a nut 12, which is fitted between cap 9 and the hollow body of the valve 11, the cap 9 having a flange 13, against which the upper end of nut 12 abuts, and the said nut has a flange 14, which abuts against the lower end of the hollow body of the valve, as best illustrated in Fig. 2. With this arrangement the valve is screwed to the nut 12, while the latter in place of being screwed to cap 13 has its surfaces which contact with said cap smooth and unthreaded, whereby the valve can turn upon the stem or yield with a slight turning movement, and thereby avoid undesirable relative torsional strain. When the valve is seated against valve-seat D, the chamber 6 is closed at its bottom, and therefore closed as against escape of either steam or water, the top seating-surface of the valve in such case being close against the valve-seat. When, however, the valve is lowered, as in Fig. 1, a passage-way for the escape of water of condensation will be formed between the

valve and the seat D, and in order to allow the water of condensation to pass by the valve the body of the latter is made of less diameter than the conduit or passage in which the valve is arranged for operation, and the valve is provided with lateral wings 15, which contact with the walls of said conduit or passage 16, thereby steadying the valve and at the same time providing ample space for the downward flow of water.

The casing F is adapted to form the conduit-passage 16 and is screwed at its upper end into the casing or coupling A, whereby it can be removed therefrom when so desired. The valve-stem E extends from the valve downward and centrally within the passage 16 and is upheld by a spring G, it being observed that the valve-stem is capable of longitudinal bodily movement in addition to its capacity for longitudinal expansion and contraction. The upper end of the spring G in Fig. 1 abuts against a shoulder or stop 17 on the valve-stem, while the lower end of said spring in said figure rests upon the upper end of a hollow plug or cap-nut 18. This cap-nut 18 is screwed into the lower portion of a carrier H, which is formed with an annular internally-threaded upper portion 19, screwed onto the lower end of the casing F, and a lower spider portion comprising wings 20, uniting at their lower inturned end portions with a base portion 21, into which the cap-nut 18 is screwed. The central bore through the cap-nut 18 is smooth, whereby the lower portion of the stem may slide longitudinally therein, although such portion of the stem may be threaded, as illustrated in Fig. 1. A nut I is arranged for adjustment upon the lower threaded end portion 22 of the valve-stem, said nut in Fig. 1 being screwed up against the headed lower end 23 of the cap-nut 18. The nut I is an adjustable stop, which when in abutment against the stop or shoulder formed by the cap-nut 23 prevents further longitudinally-upward movement on the part of the valve-stem, but does not prevent the valve-stem from being bodily depressed against the yielding resistance of the spring G. The tension of the spring can therefore be governed by the adjustment of the nut 23 on the carrier or lower portion of the casing, and it can also be varied by the adjustment of the nut I on the valve-stem.

In Fig. 6 the stem is threaded to a greater extent than in Fig. 1, and in place of the fixed stop 17 (shown in Fig. 1) I have fitted upon the upper part of such threaded portion of the stem an adjustable nut 24 and a lock-nut 25, whereby the stop or abutment for the upper end of the spring can be adjusted in point of position along the valve-stem. In Fig. 6 the carrier H′ is screwed to the casing F and generally corresponds with the carrier H. (Shown in Fig. 1.) In Fig. 6 the carrier H has wings 25^a, corresponding with the wings 20 of Fig. 1 and united at their lower inturned ends to an annular portion 26, corresponding with the annular portion 21 of Fig. 1, but having a smooth bore, so that the threaded portion of the valve-stem can slide through it. Also in Fig. 6 the adjustable nut 27 abuts against the annular portion 26, and a lock-nut 28 abuts against the adjusting-nut 27, said two nuts being arranged upon the lower threaded portion of the valve-stem. The principles of adjustment shown in Figs. 1 and 6 are substantially the same, the construction, arrangement, and details being, however, slightly different.

From the foregoing it will be seen that while the valve-stem provided with a valve at its upper end is urged upwardly and supported by the spring the limit of its upward movement induced by the spring is defined and restricted by an adjustable stop device. When, however, the valve-stem is subject to sufficient steam heat, it will expand longitudinally, and thereby tend to further raise the valve, and when it is allowed to cool it will tend to contract, thereby opening a passage between the valve and its seat. The water of condensation from a heater or heating system with which my trap may be connected passes directly between the valve-face and its seat and is conducted down the trap-casing F, between the inner wall of said casing and the expansible valve-stem, imparting its heat to said stem on the outer surface of the latter, thereby insuring a larger and more constant flow of water than can be obtained by a steam-trap in which the water of condensation passes through an expansible tube operating as a valve at its lower end.

In the construction herein illustrated the water and steam is retained in the heater when they are of the same degree of temperature; but all water below such temperature is discharged automatically. When my improved steam-trap is connected with the heater by a pipe adapted to conduct water of condensation to the trap and the valve is sufficiently opened to permit steam to pass the valve and flow out through the spaces between the wings of the valve-carrier, the lock-nut having been loosened from the valve-adjusting nut, an attendant or operator may also adjust the valve-adjusting nut so as to allow the tension of the spring to force the valve toward its seat until steam ceases to flow through the openings in the carrier or lower casing portion H or H′. The adjusting-nut may then at this point be locked by the nuts. As soon as the water of condensation gets below the temperature of the steam (which occurs almost immediately) the expansible stem, which had been expanded by the previously-passing steam, will contract and the water of condensation will escape through the space between the valve and its seat, it being understood that this con-

traction of the stem serves to open the valve and that the lower the temperature of the water the greater will be the opening for its escape and the larger the volume of water discharged. When the outflowing water is nearly at the temperature of the steam, the stem will expand and partially close the valve or so reduce the space between the valve and seat that the escape of water will be decreased.

Should the pressure of steam in the heater be lowered, a larger quantity of water of condensation will of course collect in the heater, and when the pressure of the steam is increased to meet this change the velocity of the escaping water of condensation will be greatly increased, causing an increase of pressure at the valve-opening and overcoming the difference of a pound, or thereabouts, of pressure between the steam-pressure and the heater and the tension of the sustaining-spring, thereby forcing the valve farther from the seat against the yielding resistance of the spring without noise or what is termed "water-hammer." When the discharging water of condensation is very near the temperature of the steam in the heater, the space or passage between the valve-seat and its face is comparatively small and the spring-yielding nature of the valve which is supported by a spring will prevent what is termed "wire drawing," the water passing through such space or passage noiselessly and without wearing the valve-face or valve-seat.

Should it become necessary to clean the valve-seat or valve or to blow the water and steam out of the heater, as when a car is cut off the train, the stem 2 can be screwed down until it depresses and opens the valve. When desired, the several parts of my improved steam-trap can be readily taken apart.

From the foregoing it will be seen that the valve C is a valve for controlling the discharge of water of condensation and that when said valve is closed upwardly against the seat D it serves to close the discharge-port of a pipe section or chamber having said port formed through its bottom; also, that the conduit 16 is at the delivery side of the valve C, so as to receive the water and steam which may have passed by the said valve; also, that the valve-stem is arranged within the conduit and is therein subject to steam and water, and that the valve is secured upon said stem, and that the latter is movable downwardly against the spring resistance of a spring G, which upholds the stem and valve thereon.

What I claim as my invention is—

1. In a steam-trap, a valve for controlling the discharge of water of condensation; an expansible stem carrying the valve; a spring forming an elastic cushion by which the valve-stem is upheld; and means for adjusting the tension of the spring, the stem being contracted longitudinally to open the valve, and being longitudinally expanded to close the valve.

2. In a steam-trap, a casing; a valve-stem adapted and arranged for longitudinal expansion and contraction and provided with a valve at its upper end; a spring arranged to uphold the valve; and an adjustable stop device for limiting the bodily upward movement of the valve-stem, the valve-stem being subject to steam and water of condensation from a heater when the casing is connected to receive the water of condensation.

3. In a steam-trap, the valve-stem adapted and arranged for longitudinal expansion and contraction and provided with a valve at its upper end and upheld by a spring; and an adjustable expansible stem 2 for positively opening the valve.

4. In a steam-trap, a valve for controlling the discharge of water of condensation; an expansible stem provided with a valve at its upper end; a seat against which the valve seats upwardly; a spring-cushion upholding the valve; a casing through which the valve-stem extends, and an adjustable stop device comprising a nut and stop or shoulder for limiting the upward thrust of the valve-stem and adjusting the tension of the spring.

5. In a steam-trap, a valve for controlling the discharge of water of condensation; a conduit at the delivery side of said valve; a stem arranged within said conduit and having said valve secured upon it, the stem being adapted and arranged to expand longitudinally and close the valve upwardly when subject to heat within the conduit, and to contract longitudinally and open the valve downwardly when suitably cooled; and a spring supporting the stem which is bodily movable against such spring resistance.

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