(No Model.) 3 Sheets—Sheet 1.

R. M. DIXON & E. E. ALLBEE.

STEAM TRAP.

No. 564,979. Patented Aug. 4, 1896.

Fig. I.

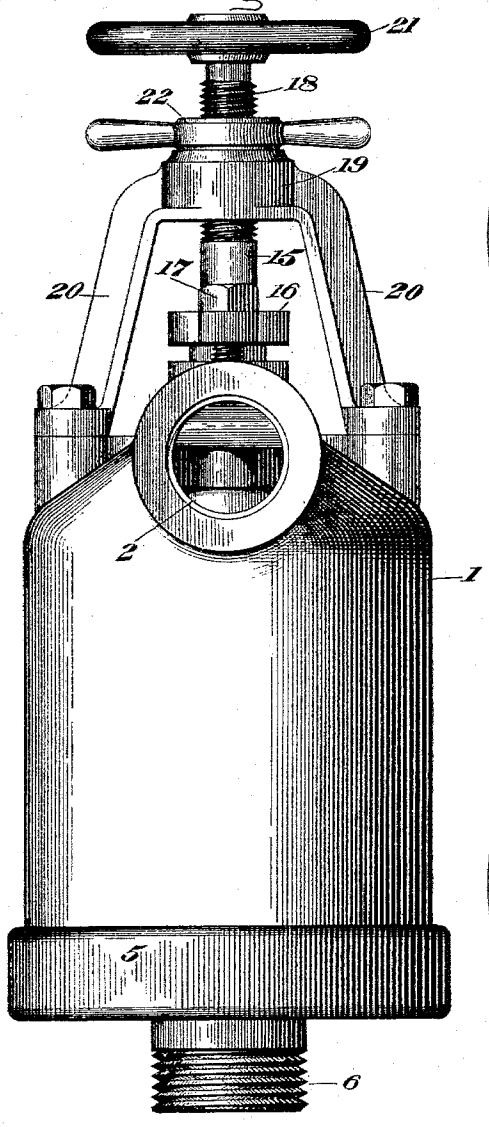

Fig. II.

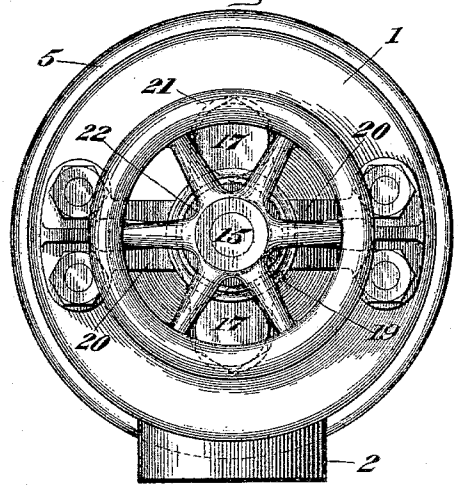

Fig. III.

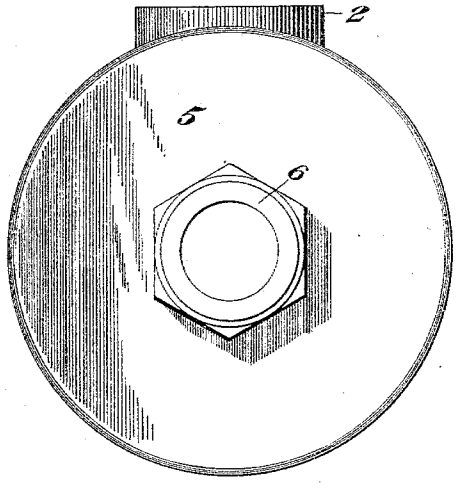

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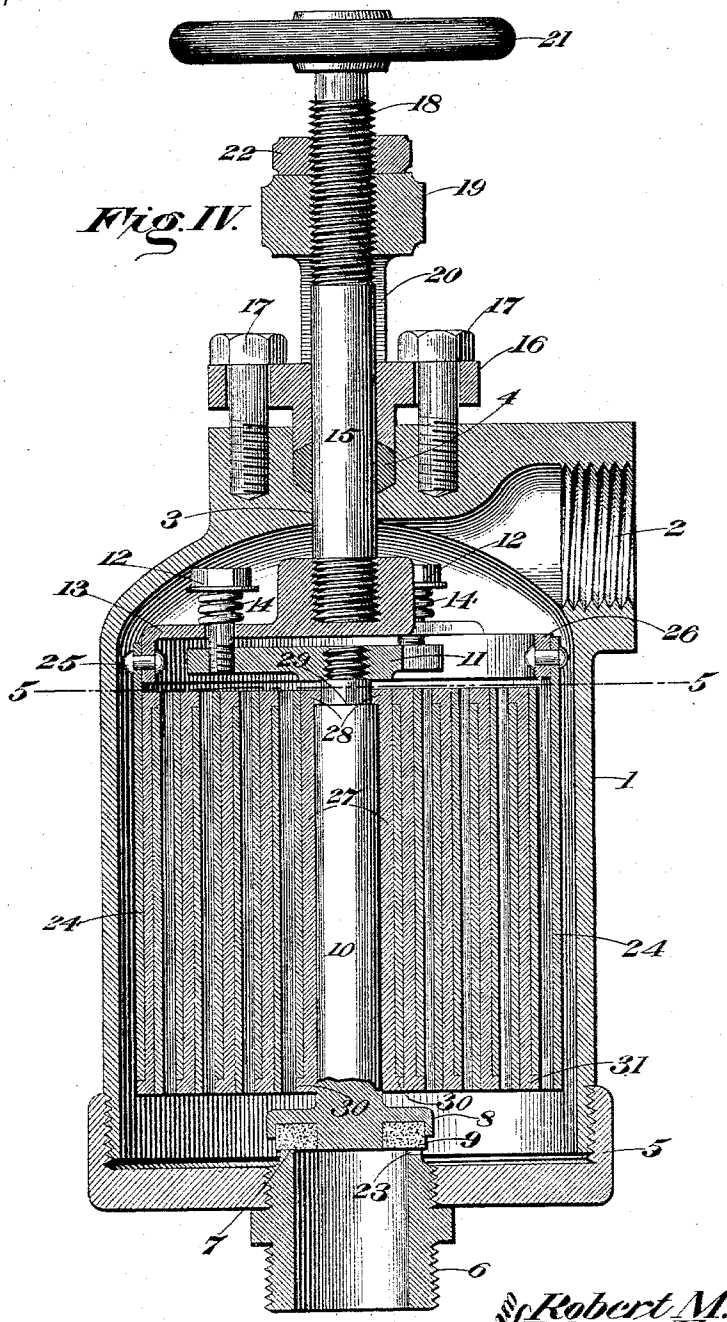
Fig. IV.



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(No Model.) 3 Sheets—Sheet 3.

R. M. DIXON & E. E. ALLBEE.

STEAM TRAP.

No. 564,979. Patented Aug. 4, 1896.

Fig. V.

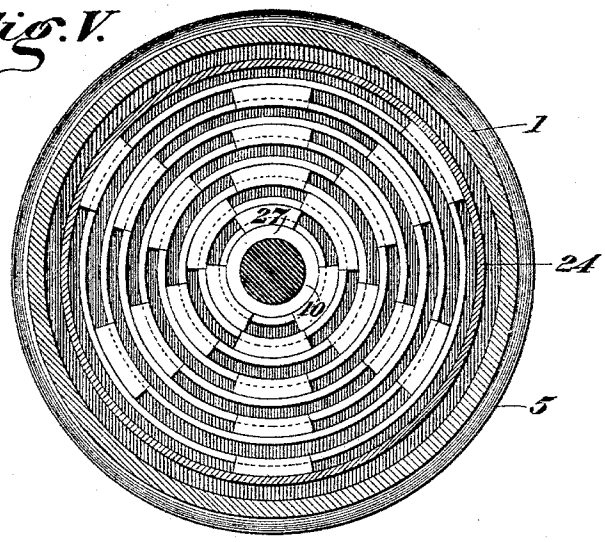


Fig. VII.

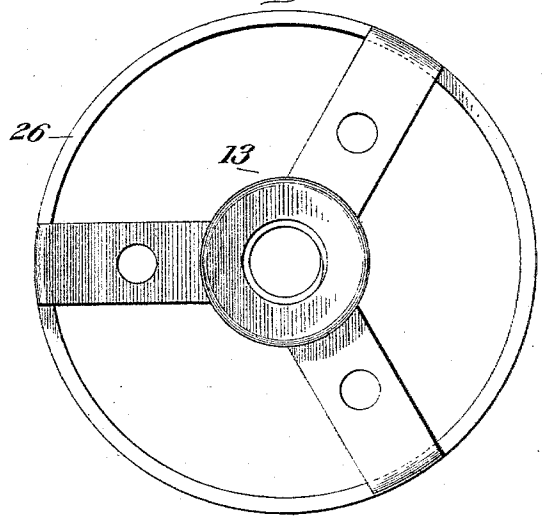
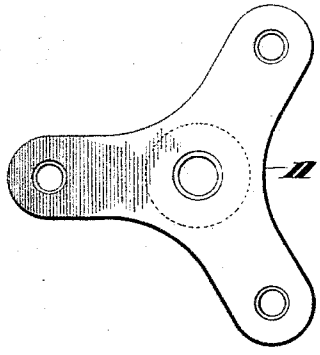


Fig. VI.



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UNITED STATES PATENT OFFICE.

ROBERT MUNN DIXON, OF EAST ORANGE, AND ELMER E. ALLBEE, OF ARLINGTON, NEW JERSEY.

STEAM-TRAP.

SPECIFICATION forming part of Letters Patent No. 564,979, dated August 4, 1896.

Application filed March 25, 1895. Serial No. 543,166. (No model.)

To all whom it may concern:

Be it known that we, ROBERT MUNN DIXON, of East Orange, county of Essex, and ELMER E. ALLBEE, of Arlington, county of Hudson, State of New Jersey, have invented certain new and useful Improvements in Steam-Traps, of which the following is a specification, reference being had to the accompanying drawings.

The object of our invention is to produce an automatic steam-trap designed, for example, to drain the water of condensation from the pipes of a steam-heating system and so constructed as to be extremely sensitive and responsive to slight changes in temperature, and which, on account of its sensitive quality and its compactness, is less liable to freeze than traps at present in ordinary use.

In the accompanying drawings, Figure I is an elevation of our trap; Fig. II, a top plan view; Fig. III, a bottom plan view; Fig. IV, a central longitudinal section of Fig. I; Fig. V, a section on the line 5 5 of Fig. IV. Fig. VI is a view of the valve-stem support; Fig. VII, a top plan view of the thermostat-support.

Referring to the figures on the drawings, 1 indicates the shell of our trap, which is preferably cast with a threaded inlet-port 2, a stem-bearing 3, and a stuffing-box 4. A terminal cap 5 is preferably screwed to the end of the shell and is designed to receive a screw-threaded valve-seat thimble 6, whose upper part 7 defines the valve-seat.

8 indicates a valve provided with a packing-ring 9, designed to close upon the valve-seat, and a stem 10, which is carried upon a valve-support 11. The valve-support is in turn, by screws 12, united to a thermostat-support 13, the screws being yieldingly supported, as by coiled springs 14, which tend to counteract any force that would separate the valve-support from the thermostat-support. The valve-support and the thermostat-support consist, preferably, of three arms, as shown in Figs. VI and VII. The thermostat-support is preferably provided with a stem 15, screwed into the upper part thereof, for example, and which, moving through the bearing 3, is packed by a gland 16, controlled by screw-bolts 17 in the usual manner. The upper part of the stem is preferably screw-threaded, as indicated at 18, and moves within an internally-screw-threaded collar 19, supported by arms 20 upon the shell 1. A wheel-handle 21 is designed to actuate the stem 15, and when the desired adjustment is obtained the stem may be locked by means of a lock-nut 22.

By the mechanism above described the distance between the packing-ring 9 and the valve-seat 7 may be regulated and fixed. In practice, the packing-ring is adjusted at a sufficient distance from its seat to permit the water of condensation to escape through the thimble 6, the thermostat being designed to automatically close the valve when the water of condensation has escaped and the temperature of the steam is raised sufficiently to expand the thermostat. The mechanism above described may therefore be called the "coarse adjustment" mechanism.

A minute opening 23 in the valve-seat may be provided for the discharge of a minimum amount of water of condensation when the valve is closed, the main object of the valve being to provide for the discharge of large accumulations of water, such as may occur under widely-varying conditions.

In providing for the automatic closing of the previously-adjusted valve we employ a thermostat of peculiar construction. It is made up of alternate elements of metals of different expansions, each couple adding an increment of expansion to that which it receives. For example, the outside element 24 preferably consists of a cylinder of high expansive property—as, for example, brass—and is secured, as by rivets 25, to the annular rim 26 of the thermostat-support. The extreme inside element 27 consists of a metal of lower expansive property—as, for example, cast-iron. It fits nicely around the valve-stem 10, its lower end being free to move thereon, as will be necessitated by the differences in the metals of which the stem 10 and the sleeve 27 are composed. The upper end of the sleeve is, however, preferably provided with an internal annular flange 28, that overlaps a bench 29 on the stem 10. The lower end of the sleeve is provided with an exterior annular flange 30, which is designed to support an adjacent element of the thermostat.

Theoretically, the outside element 24 of the thermostat might rest directly upon the exterior flange 30 of the interior element 27, and in that way the differences between the expansions of the two elements would actuate the valve-stem 10. The degree of movement of the valve-stem, however, would be so minute as to be of little value in practice. Therefore it is necessary to employ a number of elements between the outside element 24 and the inside element 27, each alternate element being composed, respectively, of metals of different coefficients of expansion. These elements are united with one another and with the outside and inside elements by the employment of flanges 31, resembling in structure and office the flanges 29 and 30, already described. From this description it will appear that as the outside element 24 becomes heated it will expand, and its end, which engages with the flange 31 of the adjacent element, will move that element a certain distance in the direction of the valve-seat 7. The adjacent element, however, is also heated and expands; but, possessing less expansibility, the distance of its upper end from the normal position will be the difference between the expansion of the two elements. This difference of expansion will communicate itself to the next pair of elements, and so on, until the full complement of thermostatic movement is communicated to the stem 10. This movement of the stem 10 will represent the difference of expansion of the two metals making up the different elements multiplied by the number of elemental couples.

In the drawings, for example, ten couples are shown, and the motion of the valve would be, therefore, ten times the difference between the expansions of the two metals of which each couple of the thermostat is composed. The force of the thermostatic couples tending to close the valve by the means of the valve-stem 10 exerts upon the valve-support 11 a force which tends to compress the springs 14. Therefore, when the thermostat is contracted after expansion, the force of the springs 14 will tend to retract the valve-stem 10 and insure the separation of the valve from its seat. When, therefore, the temperature of the thermostat is lowered by the presence of water of condensation in the trap, the valve will open and allow the water to escape. As the water is driven out by the incoming steam, the steam takes its place in the trap, raises the temperature of the thermostat, and closes the valve.

The construction of the trap and its extreme sensitiveness practically insure it against freezing under all ordinary temperatures.

In practice the shell, gland, wheel-handle, and collar are preferably made of cast-iron, the other parts of the trap being preferably made of brass, with the exception of the alternate elements of the thermostat above described.

What we claim is—

1. In a trap, the combination with a shell, valve and valve-seat, of a thermostat interposed between the shell and valve, composed of elements of different expansions of cylindrical form and arranged coaxially, certain of said elements or all of them being provided with terminal flanges designed to support an adjacent element, substantially as specified.

2. In a trap, the combination with a shell, valve and valve-seat, of a valve-support, a thermostat and thermostat-support, the valve-support yieldingly secured to the thermostat-support, and coarse adjusting mechanism for regulating the position of the valve, substantially as set forth.

3. In a trap, the combination with a shell, valve and valve-seat, of a valve-support, a thermostat and thermostat-support, screws uniting the thermostat-support to the valve-support, springs yieldingly supporting the screws upon the thermostat-support, and coarse adjustment mechanism, substantially as specified.

4. In a trap, the combination with a shell, valve and valve-seat, of a valve-support, a thermostat-support yieldingly secured to the valve-support, a thermostat secured to the thermostat-support, and consisting of elements of different expansions united together and to the thermostat-support and valve, respectively, substantially as set forth.

5. In a trap, the combination with a shell, valve and valve-seat, of a valve-support and thermostat-support yieldingly united together, a thermostat operatively uniting the valve and the thermostat-support, coarse adjustment mechanism for regulating the valve, and lock mechanism for locking the coarse adjustment mechanism, substantially as set forth.

In testimony of all which we have hereunto subscribed our names.

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ELMER E. ALLBEE.

Witnesses:
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E. W. BULKLEY.