H. A. HOKE.

LOW WATER ALARM FOR STEAM BOILERS.

APPLICATION FILED MAY 5, 1911.

1,050,023.

Patented Jan. 7, 1913.

2 SHEETS—SHEET 1.

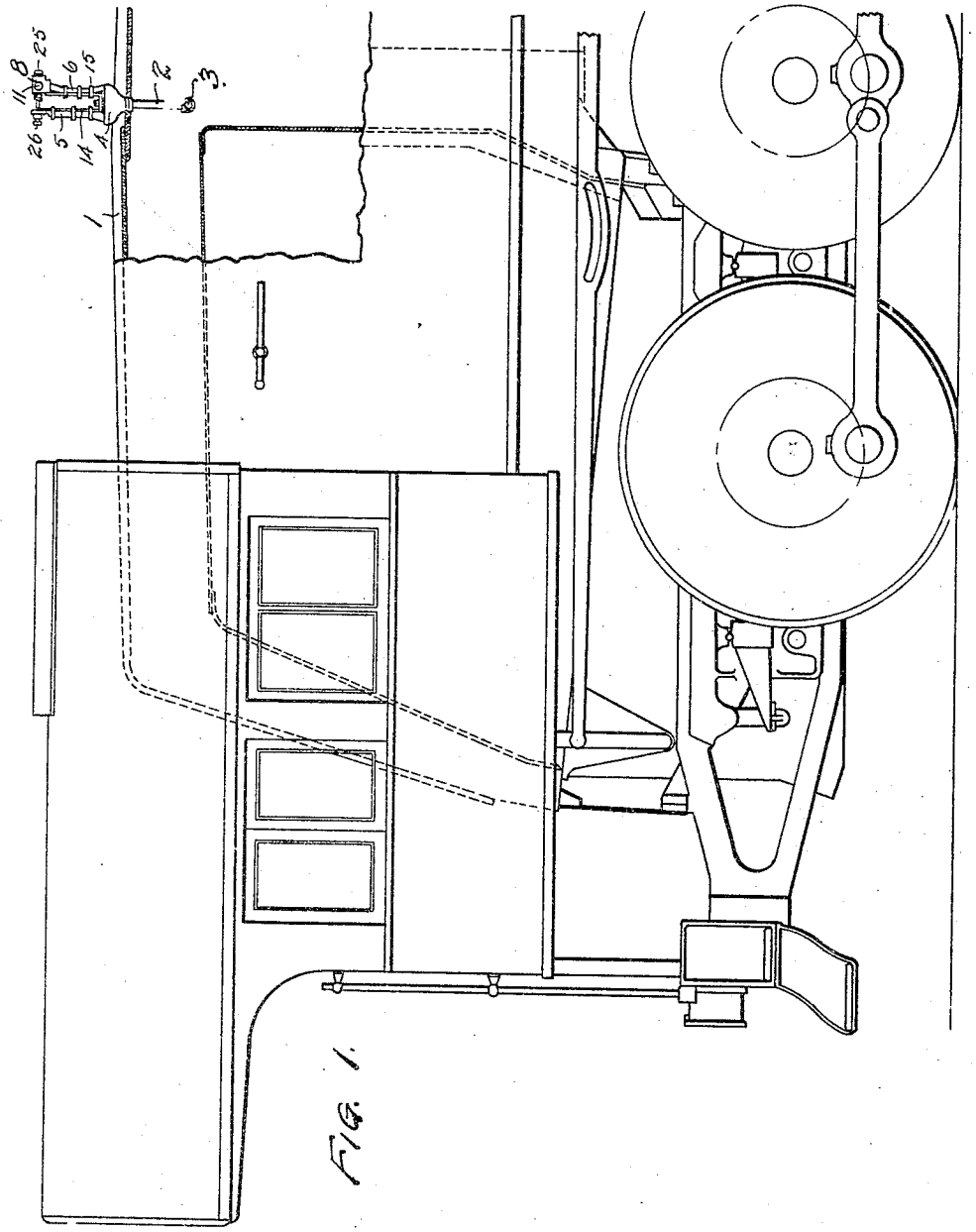

Fig. 1.

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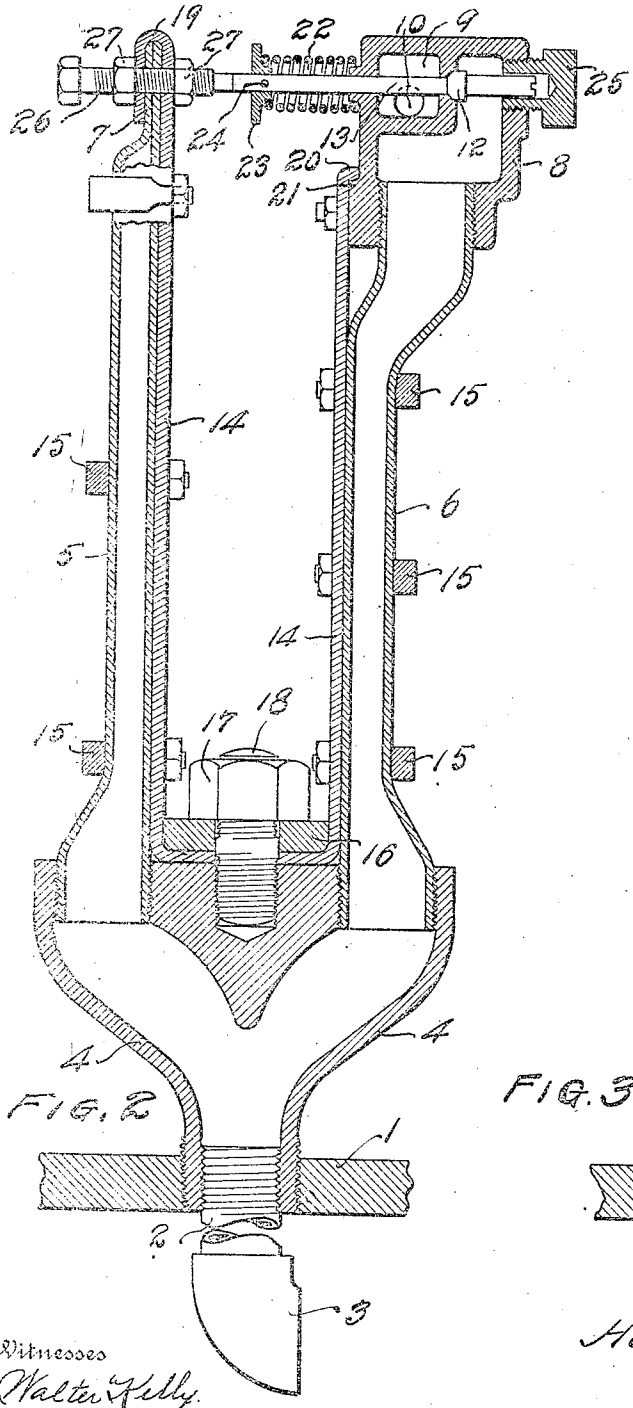

FIG. 2.

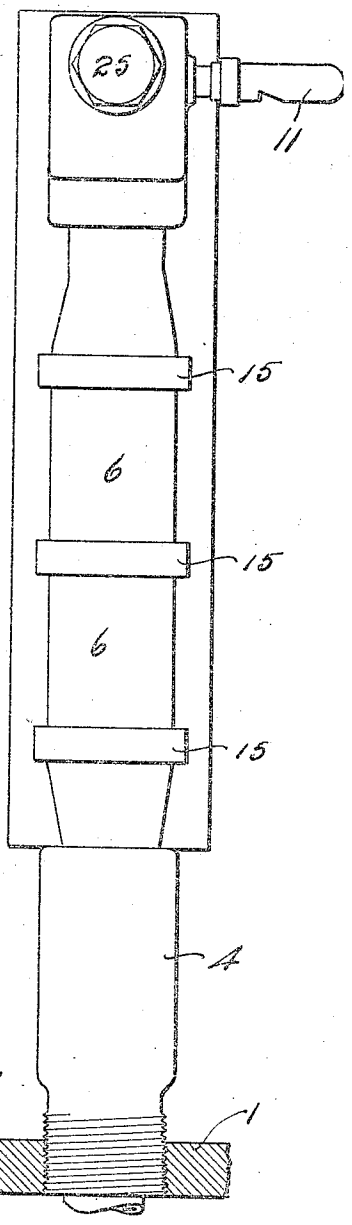

FIG. 3.

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UNITED STATES PATENT OFFICE.

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LOW-WATER ALARM FOR STEAM-BOILERS.

1,050,023. Specification of Letters Patent. Patented Jan. 7, 1913.

Application filed May 5, 1911. Serial No. 625,388.

To all whom it may concern:

Be it known that I, HARRY A. HOKE, a citizen of the United States, residing at Altoona, in the county of Blair and State of Pennsylvania, have invented certain new and useful Improvements in Low-Water Alarms for Steam-Boilers, of which the following is a specification.

The present invention relates in general to low water alarms for steam boilers, and more particularly to an improved and novel thermostatic arrangement for automatically causing an alarm to be given when the water in a locomotive or other steam boiler falls below a predetermined level.

The object of the invention is the provision of a thermostatically operated low water alarm for steam boilers which is positive and reliable in its action, which is simple and durable in its construction, and which can be readily mounted upon a locomotive or other steam boiler without necessitating any changes in the construction thereof.

With these and other objects in view, the invention consists in certain novel combinations and arrangements of the parts as will more fully appear as the description proceeds, the novel features thereof being pointed out in the appended claims.

For a full understanding of the invention, reference is to be had to the following description and accompanying drawings, in which:—

Figure 1 is a side elevation of the rear end of a locomotive having the improved thermostatic low water alarm mounted thereon, a portion of the boiler being broken away to illustrate more clearly the manner of mounting the alarm. Fig. 2 is a vertical sectional view through the device, the said view being on an enlarged scale, and Fig. 3 is a side elevation of the device.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

Specifically describing the present embodiment of the invention, the numeral 1 designates the steam boiler of a locomotive which may be of any approved or conventional construction. Projecting into the interior of the boiler 1, preferably from the top thereof, is a pipe 2 which terminates at substantially the low water level, the end of the pipe being open to admit of water or steam passing freely up and down through the pipe. As indicated upon the drawing an elbow 3 is applied to the free end of the pipe so that the said pipe will open laterally. The outer end of the pipe 2 communicates with the base of a Y coupling or casting 4 which is arranged upon the exterior of the boiler, the two branches of the said Y coupling communicating respectively with tubular thermostatic members 5 and 6. The lower ends or bases of these tubular thermostatic members are shown as threaded into the branch openings of the Y coupling and the body portions of the said tubular thermostatic members are preferably flattened and arranged with the major axes thereof parallel to each other. The upper end of the tubular thermostatic member 5 is closed at 7 by pressing opposite sides thereof together, while the upper end of the tubular thermostatic member 6 communicates with the interior of a hollow head or casting 8. This head 8 is formed with a compartment 9 which communicates through an opening 10 with some suitable alarm such as the whistle 11, and communication between the said compartment 9 and the interior of the head is controlled by a valve 12 upon a valve stem 13.

The inner and opposing faces of the thermostatic members 5 and 6 are secured to the limbs of a U shaped thermostatic member 14 in some suitable manner as by means of the U bolts 15, the base of the U shaped thermostatic member being rigidly secured to the Y coupling 4. As indicated upon the drawing the base of this member 14 is clamped between the top of the Y coupling 4 and a plate 16, the said plate being engaged by a nut 17 upon a bolt member 18 which extends through both the plate and the U shaped member 14 and is threaded in the Y coupling 4. The upper end of one arm of the U shaped thermostatic member 14 is returned over the closed end of the tubular member 5 as indicated at 19, while the upper end of the opposite arm of the U shaped member 14 is extended laterally at 20 and engages a shoulder 21 upon the head 8.

The tubular thermostatic members 5 and 6 are constructed of some metal such as copper which has a high co-efficient of expansion, while the U shaped thermostatic member 14 is constructed of some metal such as wrought iron which has a much lower co-efficient of expansion. With this construction it will be obvious that when the thermostatic members

are heated above the normal temperature the copper tubes 5 and 6 will expand much more rapidly than the limbs of the wrought iron member 14, and since the opposite ends of the two copper tubes are engaged by unyielding abutments, this greater expansion of the copper tubes will tend to flex the upper ends of the U shaped member 14 inwardly toward each other.

The valve stem 13 extends outwardly beyond the head 8 where it is surrounded by a coil spring 22, the said coil spring being interposed between the head and a collar 23. A cotter pin 24 is inserted through an opening in the valve stem for holding the collar 23 in position, and the coil spring 22 normally tends to hold the valve 12 upon its seat so as to shut off communication between the compartment 9 and the interior of the head 8. The opposite end of the valve stem 13 is loosely received within the hollow shank of a screw 25 which is threaded in one side of the head 8. When this screw 25 is removed the end of the valve stem can be engaged by a screw driver or other tool for grinding the valve upon its seat, or the valve and valve stem can be slipped out of position by removing the collar 23 and spring 22. An adjusting screw 26 extends through the returned end 19 of the U shaped thermostatic member 14, and also through the closed upper end of the tubular member 5, the extremity of the said adjusting screw normally abutting against the end of the valve stem 13, as indicated in Fig. 2. A pair of clamping nuts 27 are shown as threaded upon this adjusting screw 26 and engaging opposite sides of the returned end 19 of the member 14, the said nuts serving both to hold the screw 26 in an adjusted position and also to tightly close the upper end of the tubular member 5.

Under normal conditions the inner end of the pipe 2 projects below the surface of the water within the boiler and the said water enters the tubular thermostatic members 5 and 6 and is held therein under boiler pressure. Owing to the fact, however, that these tubes are exposed to the atmosphere, the water therein will be considerably cooler than the water within the boiler. The members of the thermostat are so adjusted that under these conditions the valve 12 is held in a closed position and communication shut off between the compartment 9 and the interior of the head 8. However, when the water within the boiler falls below the level of the open end of the pipe 2, the water within the tubular thermostats 5 and 6 will flow back into the boiler and steam will enter the members 5 and 6. This steam will have the same temperature as the steam within the boiler and will heat the copper tubes 5 and 6 in such a manner as to cause a rapid expansion thereof. As has been previously explained, the expansion of these copper tubes will be much greater than that of the thermostatic member 14, and since the ends of the copper tubes are held between unyielding abutments, the expansion thereof will flex the arms of the U shaped member 14 inwardly toward each other. This flexing of the arms will cause the valve stem 13 to be pressed inwardly against the action of the spring 23 by engagement with the adjusting screw 26, and the valve 12 will thus be unseated so as to permit the steam to enter the compartment 9 and pass through the opening 10 and sound the whistle 11 or other alarm mechanism. The engineer being thus notified that the water level is approaching a dangerous height, will start his injector or pumps and force water into the boiler. When the lower end of the pipe 2 is again submerged, the water will be forced into the tubular thermostats 5 and 6 so as to again cool them and cause them to straighten out into normal position. This allows the valve 12 to reseat itself and the device is then ready for another operation.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A thermostatic apparatus for steam boilers comprising a supporting member, a U shaped member formed of metal having a comparatively small co-efficient of expansion and having the base thereof secured to the supporting member, tubular thermostatic members formed of metal having a comparatively large co-efficient of expansion and clamped to the outer sides of the limbs of the U shaped member so that the said limbs of the U shaped member will be flexed inwardly when the tubular thermostatic members are heated to a temperature above the normal, means for causing the tubular thermostatic members to be normally filled with water from the boiler, but to be filled with steam from the boiler when the water falls below a certain level, a head applied to one of the tubular thermostatic members and formed with an outlet, a valve controlling the outlet, a valve stem carrying the valve, and means actuated by the opposite thermostatic member for engaging the valve stem and opening the valve when the limbs of the U shaped member are flexed by the admission of steam to the tubular thermostatic members.

2. A thermostatic apparatus for steam boilers comprising a support, a U shaped member formed with metal having a comparatively small coefficient of expansion and having the base thereof secured to the support, tubular thermostatic members formed of metal having a comparatively large co-efficient of expansion and clamped to the outer sides of the limbs of the U shaped member so that the said limbs of the U

shaped member will be flexed inwardly when the tubular thermostatic members are heated to a temperature above the normal, the inner ends of the tubular thermostatic members engaging the base and one of the limbs of the U shaped member being returned to engage the outer end of the tubular thermostatic member secured thereto, a head applied to the outer end of the opposite thermostatic member and formed with an outlet opening and a shoulder, the end of the limb of the U shaped member to which the said thermostatic member is secured being extended laterally to engage the shoulder of the head, a valve controlling the outlet opening of the head, a valve stem carrying the valve, and means carried by the returned limb of the U shaped member for engaging the valve stem to open the valve when the limbs of the U shaped member are flexed inwardly toward each other.

3. A thermostatic apparatus for steam boilers including a Y coupling, a pipe extending into the interior of the boiler and terminating at the low water level, the said pipe being in communication with the base of the Y coupling, tubular thermostatic members secured in the branches of the Y coupling and formed of metal having a comparatively large co-efficient of expansion, a U shaped member having a smaller co-efficient of expansion, the base of the U shaped member being secured to the Y coupling while the limbs thereof are clamped to the sides of the tubular thermostatic members so as to be flexed laterally when the tubular thermostatic members are heated to a temperature above the normal, the said tubular thermostatic members being normally filled with water from the boiler but being filled with steam from the boiler when the water reaches the low water level, and a valve actuated by the combined flexing of the two limbs of the U shaped member.

4. A thermostatic apparatus for steam boilers comprising a Y coupling, a pipe extending from the base of the Y coupling into the interior of the boiler where it terminates at the low water level, tubular thermostatic members having a comparatively high co-efficient of expansion and secured to the branches of the Y coupling, a U shaped member formed of metal having a comparatively small co-efficient of expansion and having the base thereof secured to the Y coupling, the limbs of the U shaped member being clamped to the respective tubular thermostatic members so as to be flexed inwardly when the tubular thermostatic members are heated to a temperature above the normal, the said tubular thermostatic members being normally filled with water from the boiler, but being filled with steam from the boiler when the water reaches the low water level, a head applied to the outer end of one of the tubular thermostatic members and formed with an outlet opening, a valve normally closing the outlet opening, a valve stem carrying the valve, and means carried by the opposite tubular thermostatic member for engaging the valve stem upon the valve when the limbs of the U shaped member are flexed.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

HARRY A. HOKE.

Witnesses:
N. E. Gee,
D. Lloyd Claycomb.