H. NEVILLE.

SAFETY APPARATUS FOR STEAM BOILERS.

APPLICATION FILED DEC. 8, 1910.

1,015,703.

Patented Jan. 23, 1912.

2 SHEETS—SHEET 1.

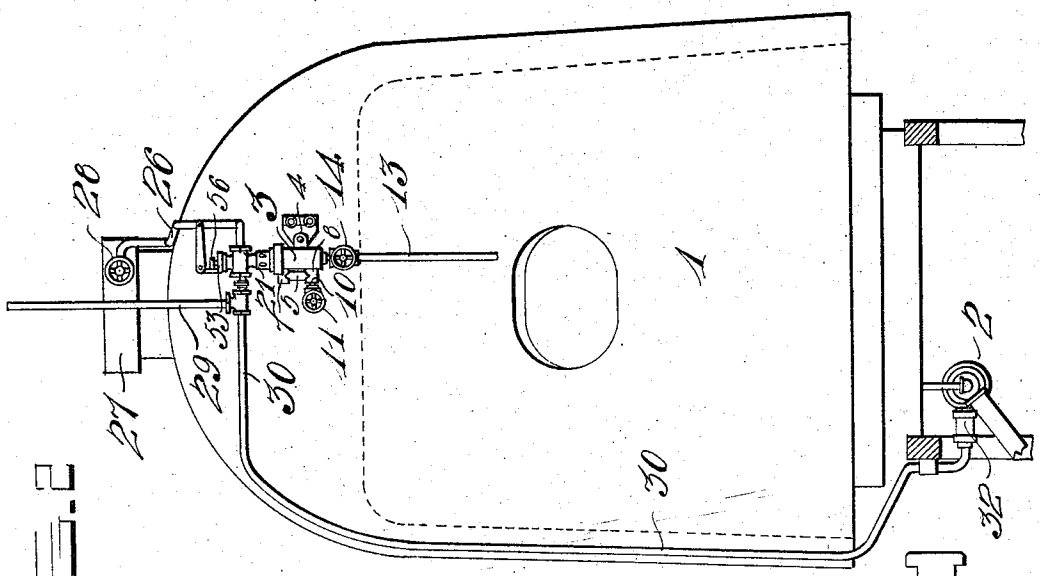
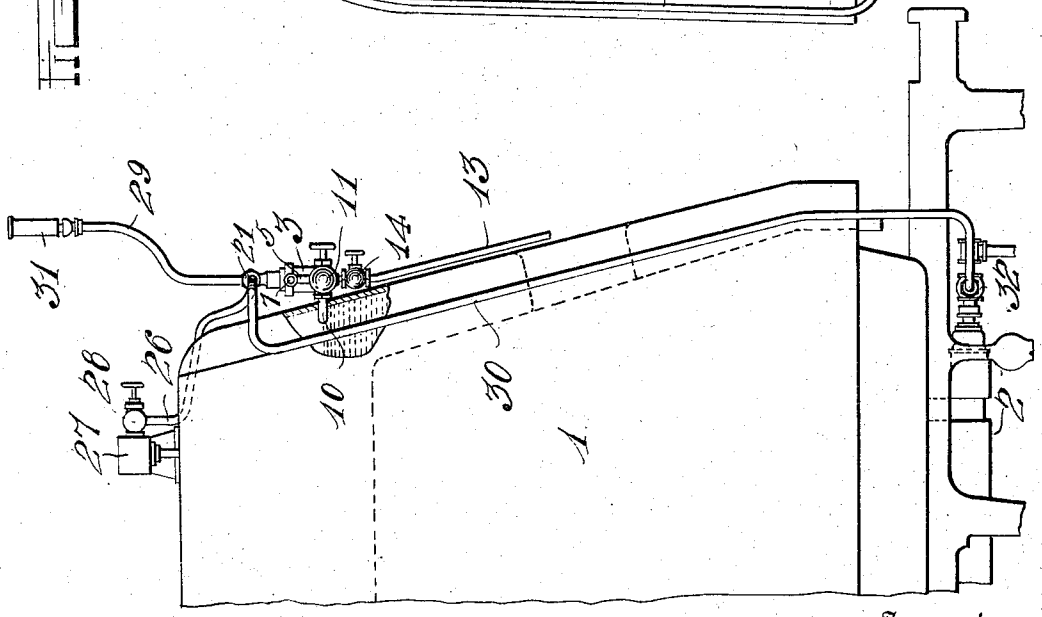


FIG. 2



Witnesses

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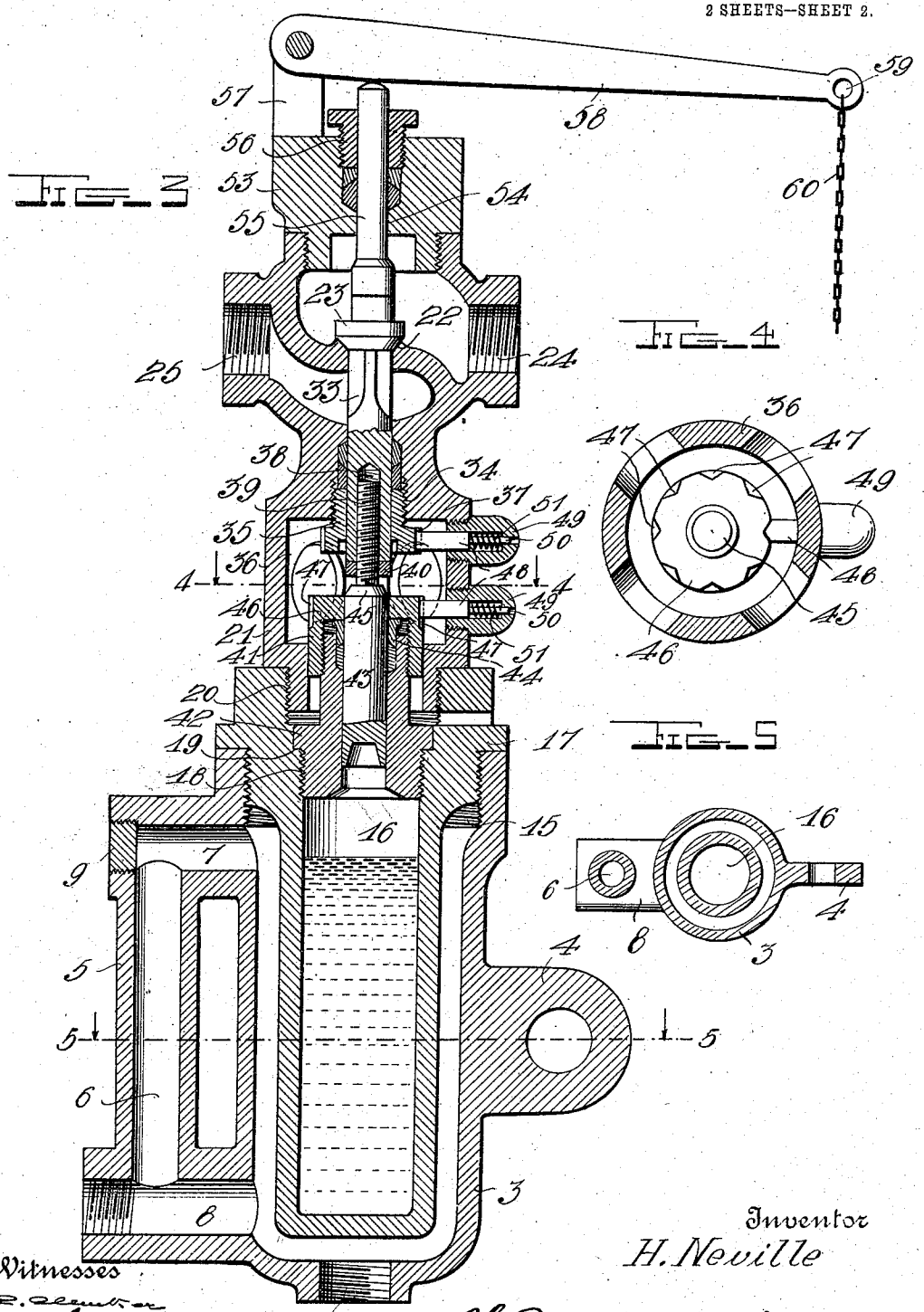

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UNITED STATES PATENT OFFICE.

HARRY NEVILLE, OF LOS ANGELES, CALIFORNIA, ASSIGNOR OF ONE-FIFTH TO GEORGE H. GOODWIN, ONE-FIFTH TO DANIEL P. KELLOGG, ONE-FIFTH TO WILLIAM F. MERRY, AND ONE-FIFTH TO PATRICK SHEEDY, ALL OF LOS ANGELES, CALIFORNIA.

SAFETY APPARATUS FOR STEAM-BOILERS.

1,015,703. Specification of Letters Patent. Patented Jan. 23, 1912.

Application filed December 8, 1910. Serial No. 596,304.

To all whom it may concern:

Be it known that I, HARRY NEVILLE, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented certain new and useful Improvements in Safety Apparatus for Steam-Boilers; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in safety apparatus for steam boilers.

One object of the invention is to improve the construction of the safety apparatus shown and described in my pending application, Serial No. 564,616, filed June 2, 1910 whereby the same is simplified and rendered more efficient.

With these and other objects in view, the invention consists of certain novel features of construction, combination and arrangement of parts as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings: Figure 1 is a front view of a portion of a locomotive boiler showing the invention applied thereto; Fig. 2 is a side view of the same with parts broken away and in section; Fig. 3 is an enlarged central vertical section of the steam controlling valve and means for automatically opening the same to admit steam to the alarm and fire controlling mechanism; Fig. 4 is a cross sectional view on the line 4—4 of Fig. 3; Fig. 5 is a similar view on the line 5—5 of Fig. 3.

Referring more particularly to the drawings, 1 denotes a steam boiler which is here shown as being heated by an oil burner 2. Arranged on the boiler at any suitable point is my improved automatic alarm mechanism, said mechanism being shown in the present instance as arranged on the front of the boiler and connected thereto at a point which has been determined upon as a low-water level.

My improved alarm mechanism comprises a steam and water cylinder 3 having on one side an apertured lug 4 whereby the cylinder may be bolted or otherwise secured to the boiler. On the opposite side of the cylinder from the lug 4 is formed a wing or extension 5 having formed therein a vertically disposed water and steam circulating passage 6 which is connected at its upper end to the cylinder 3 by a passage 7 and at its lower end is connected to the cylinder by a passage 8. The passages 7 and 8 open through the outer sides of the wing and are interiorly threaded as shown. In the threaded end of the passage 7 is arranged a plug 9 while to the threaded end of the passage 8 is connected a steam and water pipe 10 leading to and connected with the boiler at its low water point. In the pipe 10 is arranged a valve 11 whereby the apparatus may be cut off from the boiler. The lower end of the cylinder 3 is closed and has formed therein a threaded blow off passage 12 with which is connected the upper end of a blow off pipe 13 in which is arranged a valve 14. The blow off port and pipe are provided to permit any sediment or foreign matter to be blown out of the cylinder and the latter thus kept clean. The passage 6 serves as a receiving chamber for such steam as may escape when by reason of the swaying of the locomotive the water momentarily uncovers the pipe 8. This steam will pass into the annular space around the mercury cup 16 but owing to the presence of the air space between the duct 6 and the cup, the temperature of the steam will be reduced sufficiently to prevent expansion of the mercury until the water has uncovered the pipe 8 for a sufficiently long period to warrant action. The upper open end of the cylinder is threaded and in the same is screwed the enlarged open upper end 15 of a mercury holding cup 16 which projects downwardly in the cylinder 3 to near the lower end thereof. The cup 16 is of less diameter than the cylinder thereby forming a passage or space around between the same and the cylinder. On the head 15 of the cylinder is formed an annular flange 17 which when the head is screwed down into the cylinder comes into engagement with the upper end of the latter and thus forms a tight joint between the head of the cup and the cylinder. The cup 16 is threaded near its upper end as at 18 and above said threaded portion is enlarged to form a shoulder 19 above which the upper end of the cup is still further enlarged and said enlarged bore threaded as at 20. Screwed into engagement with the threaded bore 20 of the upper end of the cup is the

reduced threaded lower end of a steam valve casing 21 in which is arranged a valve seat 22 adapted to be engaged by a steam controlling valve 23. The valve casing 21 is provided with a steam inlet passage 24 and a steam discharge passage 25. With the passage 24 is connected a steam conducting pipe 26 leading to and connected with a steam dome 27 or other point from which steam may be taken from the boiler. In the pipe 26 is arranged a cut off valve 28. With the steam discharge passage 25 is connected steam conducting pipes 29 and 30, the pipe 29 of which extends to and is connected with an alarm whistle 31 arranged at any suitable point while the other pipe 30 leads to and is connected with a suitable operating mechanism 32 for controlling the fuel supply valve of the burner. The construction of the valve controlling mechanism 32 forms no part of the present invention and is not therefore illustrated in the drawings.

The stem 33 of the valve 23 projects downwardly in the casing 21 through a stuffing box 34 arranged in said valve casing 21. The head of the packing nut 35 of the stuffing box 34 projects into an open cage 36 formed on the lower portion of the valve casing 21 and in said head of the nut is formed an annular series of vertical notches 37 which may be engaged through the open cage 36 by a spanner to adjust the nut. The lower end of the stem 33 of the valve 23 projects through the packing nut 35 and into the cage 36 as shown. In the lower end of the valve stem is formed a threaded socket 38 into which is fitted an adjusting screw 39 by means of which the stroke of the valve stem is increased or diminished. The screw 39 is locked in its adjusted positions by a jam nut 40 arranged on the lower end thereof as shown.

Arranged in the lower end or cage 36 of the valve casing 21 and having a threaded engagement at its lower end with the upper portion 18 of the mercury cup 16 is a plunger or piston cylinder 41 on which is formed an annular flange 42 which, when the cylinder 41 is screwed down into the upper end of the cup 16, engages the shoulder 19 formed at the end of the threaded portion 18 of the cup as shown. Slidably mounted in the cylinder 41 is a piston or plunger 43 the upper end of which works through a stuffing box 44 arranged on the upper end of the cylinder 41. On the upper end of the plunger or piston 43 is arranged a brass bushing 45 the upper end of which projects through the stuffing box 44 and engages the lower end of the valve stem adjusting screw 39 whereby when the plunger 43 is forced upwardly in the cylinder 41 the valve 23 will be lifted from its seat 22 and steam thus permitted to pass through the valve casing from the steam conducting pipe 26 to the steam conducting pipes 29 and 30 to sound the alarm and actuate the fuel valve operating mechanism.

It will be observed that between the piston 43 and the body of mercury is an unoccupied space whereby the mercury is permitted to expand somewhat without actuating the piston. The time expansion provided for by the peculiar arrangement of the passages 6, 7 and 8 is thus accentuated so that there will be no frequent and unnecessary sounding of the alarm as the water fitfully uncovers the pipe 8 under the swaying of the locomotive.

The stuffing box 44 is provided with an adjusting cap nut 46 in which is formed an annular series of vertically disposed notches 47 which, through the open cage 36, may be engaged by a spanner to effect adjustment of the nut. With the notches 37 of the packing adjusting nut 35 of the stuffing box 34 and the notches 47 of the adjusting cap 46 are engaged spring projected locking dogs 48 which are slidably mounted hollow plugs 49 arranged in one side of the cage 36 as shown. The dogs 48 are provided with reduced stems 50 around which are coiled projecting springs 51 arranged in the outer ends of the plugs 49 whereby said dogs are forced inwardly into engagement with the notches 37 and 47 of the packing adjusting nuts 35 and 46 to lock the same against casual loosening or unscrewing. In the upper end of the cup 16 is formed a drain passage 52 which communicates with the space between the upper end of the cup and the valve casing 21 thus permitting any water which might otherwise accumulate in this space to escape therefrom.

In the upper end of the valve casing 21 is formed a threaded opening in which is screwed a cap 53 having formed therein a centrally disposed guide passage 54 in which is slidably mounted a valve closing plunger 55 the upper end of which works through a stuffing box 56, arranged in the upper end of the cap, and projects a suitable distance above the stuffing box as shown. On the upper end of the cap 53 is arranged a bearing bracket 57 with which is pivotally connected the inner end of a plunger operating lever 58 which extends across the upper end of the valve closing plunger 55 whereby when said lever is pulled downwardly the valve 23 will be closed against its seat 22 thereby cutting off the supply of steam to the whistle and fuel controlling mechanism. In the outer end of the lever 58 is formed a hole 59 in which is connected the upper end of an operating chain 60, said chain extending downwardly to within convenient reach of the attendant whereby he may close the valve 23 after the parts have been operated to sound the alarm.

It will be noted that the apparatus is lo-

cated entirely outside the boiler and exposed to the atmosphere which arrangement is an important feature in connection with the operation of the device.

In the operation of the apparatus a sufficient quantity of mercury is placed in the mercury holding cup 16 and the valve 10 opened which, under normal conditions, will permit the water from the boiler to pass through the passage 8 into the cylinder 3 to fill the latter and the passages 6 and 7. The water thus let into the cylinder 3 will be cooled by the exposed position of the cylinder and the heat thereof will thus be insufficient to cause the mercury in the cup to rise to an operative position. As soon as the water in the boiler reaches a point below the passages 8, the cylinder 3 will be drained and steam from the boiler will enter the cylinder. The arrangement of the passages 6, 7 and 8 facilitate this changing and circulation of the steam and water in the cylinder. When the steam has thus entered the cylinder the heat thereof will be sufficient to cause the mercury in the cup 16 to rise into engagement with the piston or plunger 43 thereby forcing the latter upwardly into engagement with the adjusting screw 39 of the valve stem 33 and consequently lifting the valve 23 out of engagement with its seat 22 whereupon steam from the boiler will pass through the valve casing for the purpose described.

From the foregoing description taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of the invention as defined in the appended claims.

Having thus described my invention, what I claim is:

1. A device for the purpose set forth comprising a cylinder having a single port communicating with a steam boiler at the low water level to both admit and discharge water and steam, a cup arranged in said cylinder closed against the same and arranged to be acted upon by both the water and the steam, a heat expansible liquid in the cup, a steam valve and a plunger acted upon by said heat expansible liquid to actuate the valve.

2. A device for the purpose set forth comprising a cylinder having a single port communicating with a steam boiler at the low water level to both admit and discharge water and steam, a cup arranged in said cylinder closed against the same and arranged to be acted upon by both the water and the steam, a heat expansible liquid in the cup, a valve casing threaded in the upper end of the cup, a valve in the casing having a depending stem, a piston casing in the cup below the valve casing, and a piston in said casing above the expansive liquid and engaging the valve stem.

3. A device for the purpose set forth comprising a cylinder having a port to admit steam and water, a cup arranged in said cylinder and closed thereto, said cup having on its upper end an interiorly and exteriorly threaded head, the exteriorly threaded portion of said head engaging the upper end of the cylinder, a heat-responsive element in the cup, a valve casing having an open cage on its lower end, said cage having a threaded engagement with the interiorly threaded end of the cup, a valve arranged in said casing and having a downwardly projecting stem, an adjusting screw in the lower end of said stem, a cylinder having a threaded engagement in the upper end of the cup, and a piston controlled by the heat-responsive element and slidably mounted in said cylinder to engage the adjusting screw in said valve stem whereby to lift said stem and its valve.

4. A device for the purpose set forth comprising a cylinder having a port to admit a heating medium, a cup engaged therein and closed thereto, said cup having an exteriorly and interiorly threaded head engaging the upper end of the cylinder, a heat-responsive element in the cup, a valve casing provided on its lower end with an open cage engaging the interiorly threaded end of the cup, a valve in said valve casing having a downwardly projecting stem provided in its lower extremity with a threaded socket, a regulating screw fitted in said socket, a cylinder secured in the upper end of the cup and projecting into the cage, a stuffing box arranged on the upper end of said cylinder, a piston slidably mounted in said cylinder and stuffing box and controlled by the heat-responsive element, a bushing arranged on the upper end of said piston to engage the regulating screw whereby to lift said stem and valve, an adjustable packing nut in said stuffing box provided with an annular series of notches, and a spring-projected locking pin engaged in said cage and adapted to engage said notches whereby to hold the nut in its adjusted position.

5. A device for the purpose set forth comprising a cylinder adapted to receive a heating medium, a cup arranged therein and closed thereto, a heat-responsive element in said cup, a valve casing connected to the upper end of said cup, a cut off valve arranged in said casing and having a downwardly projecting stem, a cylinder arranged in the upper end of said cup and within the valve casing, a piston slidably mounted in said cylinder in position to engage said stem and controlled by the heat-responsive ele-

ment, a cap arranged in the upper end of said valve casing, a plunger slidably mounted in said cap and adapted to engage the upper side of said valve, and a manually operable lever pivoted on said cap and bearing upon the upper end of said plunger.

6. A device of the character described, comprising a cylinder, a cup in the cylinder arranged to provide a jacket space surrounding the cup, a circulating space being provided outside the jacket space, a steam-and-water pipe from a steam boiler at low water level leading into the jacket space and communicating with the circulating space and the jacket space at its lower end, a passage being also provided connecting the two spaces at the top, a superposed valve casing, a steam valve therein, a depending stem, and a plunger acting on said stem being arranged in vertical alinement above the cup and the cup being provided with an expansive liquid to act on the lower end of the plunger.

7. The combination of a steam casing, a cup secured in said casing and closed thereto, an expansive fluid in said cup, a valve casing rising from the steam casing, a cut-off valve within the valve casing, a stem depending from the valve and mounted to slide within the valve casing, means whereby the expansive fluid will reciprocate said stem, a packing box fixed within the casing and forming a guide for the reciprocation of said stem, a nut on said box having notches in its outer surface, and a holding pin mounted in the side of the valve casing and movable laterally thereto to engage said notches.

8. The combination of a steam cylinder having but a single port leading from a boiler at low water level to admit and discharge steam or water, a cup secured in and closing the upper end of the cylinder and closed to the steam or water in the cylinder, a heat responsive liquid in the cup, a valve casing rising from the cup in axial alinement therewith, a guiding cylinder secured in the upper end of the cup and projecting into the lower end of the valve casing, a lifting pin in said guiding cylinder actuated by the heat responsive element, a normally seated valve in the valve casing, and a stem depending from said valve and having its end in proximity to the upper end of the lifting pin to be operated thereby.

9. In mechanism of the character described, a shell containing therein a heat expanding element and connected up with a boiler at its normal low water line, a valve in a steam line operatively connected up with the heat expanding element, and a valve stem, adjusting screw and plunger between said heat expanding element and valve for adjusting the said valve and timing its operation.

10. In mechanism of the character described, a shell containing therein a heat expanding element and connected up with a boiler at its normal low water line, a stem actuated by said heat expanding element, a valve provided with a stem operatively in engagement with said heat actuated stem, a valve stem, adjusting screw and plunger between the valve and heat expanding element for adjusting said valve, and means for locking the valve stem.

11. In mechanism of the character described, a shell containing therein a heat expanding element and connected up with a boiler at its normal low water line, a stem actuated by said heat expanding element, the shell having openings above the heat expanding element, a valve in the shell above the openings, a stem projecting downwardly from the valve in line with the stem of the heat expanding element, and a screw projecting from one and contacting with the end of the other of said stems, whereby the valve may be adjusted.

12. The combination with a locomotive boiler, of a shell, a cup within the shell spaced annularly therefrom, a heat-responsive element in said cup, a valve actuated by said element, a pipe leading from the lower end of the shell to the boiler, a pipe leading from the upper end of the shell, and a branch pipe connecting the pipes leading from the upper and lower ends of the shell and spaced from the shell.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HARRY NEVILLE.

Witnesses:
ARTHUR S. PRENTICE,
EDWARD I. BRYANT.