

954,764.

Fig. 1. Fig. 2.

Witnesses:
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UNITED STATES PATENT OFFICE.

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SAFETY APPLIANCE FOR STEAM-BOILERS.

954,764.

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To all whom it may concern:

Be it known that I, EUGEN ROTH, engineer, subject of the King of Prussia, residing at 12 Feuvigstrasse, Schöneberg, near Berlin, Germany, have invented new and useful Improvements in Safety Appliances for Steam-Boilers, of which the following is a specification.

This invention consists of a new and improved safety appliance for steam boilers and the like, which differs in working from other devices of the kind previously known and has for its purpose to bring into operation an automatic signal both upon the water sinking below its normal level and upon the pressure exceeding its proper limits, and further the signal is operated if the safety device should refuse to work or become disabled on account of an accident or any other reason.

The desired object is obtained mainly by withdrawing water in small quantities from the boiler, preferably in drops by means of suitable apparatus, such water causing by its heat or by its weight, or by both, the signal device to be normally kept out of action, the latter, however, always being brought into operation when the flow of water to the safety device ceases or when there is an excess of steam pressure.

Reference will hereinafter be made to the accompanying drawings illustrating one form of the invention, wherein—

Figure 1 is a diagrammatic sectional view of the apparatus, shown partly in elevation, and Fig. 2 is a modified form of a detail thereof.

Below the minimum level of water which is permitted in the boiler 1 is inserted one end of a U shaped tube 2 carrying at the top of its other end a small receptacle 3, which communicates by means of a pipe 4 with the interior of the vessel 5 forming part of the actual purifying apparatus. The steam space of the boiler 1 communicates with a small chamber 6 to which is connected a slender serpentine tube 7 constituting a condenser, said condenser having external ribs or radiation plates 7'. The lower extremity of this tube 7 leads into the receptacle 3 in which the water stands at the same level as in the boiler after the manner of a water level gage.

By means of the ribs or radiation plates 7', a portion of the steam in the serpentine tube 7 condenses and drops into the recep-

tacle 3 in larger quantities than can escape through the outlet pipe 4.

Inside the vessel 5 is arranged a filter 10 of clay or like material, the bottom of which is open but is kept pressed upon a plate 9 by means of a spring 8 so that the filter is completely closed on all sides. The water in the vessel 5 is therefore compelled to force itself through the pores of the clay filter and collects in said filter free from pressure, from whence it is drawn off through a thin spirally wound tube 11 and outlet 12 into the open air. The bottom 9 of the filter 10 seats against a screw stud 9' secured in the bottom of the receptacle 5.

In order to prevent the choking of the purifying device (namely the tube 11 and the filter 10) condensation water is preferably introduced into the vessel 5 this being done in the following manner:—As already mentioned, the water in the receptacle stands at the same level as in the boiler, and as the apparatus is so arranged that more condensation water always reaches the receptacle 3 than is taken from the vessel 5, the entire receptacle 3 and also the tube 2 are filled with condensation water. Circulation of water through the U shaped tube 2 is prevented.

The thoroughly purified water of condensation falls in drops from filter outlet 12 into a funnel or other suitable receptacle 13, and thence passes through a small pipe into a thermostatic tube 14 constituting the controlling device mounted upon a support 18 by means of a number of plates 17, which guide said thermostatic tube 14 as it expands and contracts longitudinally under variations in temperature. A valve chamber 16 containing a valve 15 is fastened on the support 18 above the thermostatic tube 14. The stem 15^a of the valve 15 passes out of the chamber 16 and is connected to the upper end of a thermostatic rod. The lower end of the thermostatic tube 14 is provided with a collar 21 which is normally held against the under side of the lower plate or guide 36 by means of a rocking lever 23 fulcrumed at 22 and provided with an adjustable weight 24. In place of the tube 14 the valve stem 15^a may be made of suitable material and proper length down the outer surface of which the water from the boiler can flow. A pipe 34 connects the steam space of the boiler with the valve chamber 16 above the valve 15, and a continuation 19 of said pipe

leads from said valve chamber below the valve.

When the boiler is not in operation the thermostatic tube 14 will be cold relatively and shorter than when in a heated condition, the valve 15 therefore will be unseated as the lower end of said tube cannot rise because the collar 21 bears against the plate 36; but when the boiler is active the water of condensation expands the thermostatic tube and closes the valve, the lower end of said tube being held in place by the weighted rocking lever 23. If at any time the pressure in the boiler should exceed the maximum desired, steam, passing from the boiler through the pipe 34 will open the valve 15, the pressure overcoming the weight 24 on the rocking lever 23, and pass through the pipe 19 to an apparatus 40 which may actuate either a visual or an audible signal or both.

When the water in the boiler falls to the minimum level, the receptacle 3 will be emptied of water and no more can pass to the vessel 5. The outflow through the small tube 11 and outlet 12 will therefore cease and the temperature of the thermostatic bar 14 not being kept up by the constant supply of hot water, it will contract and open the valve 15 and permit steam from the boiler to operate the signal apparatus 40. The thermostatic tube 14 is hollow throughout its length and open at the bottom, so that water passing into said tube may escape. For example, the steam can be made to sound a steam whistle in any known manner or it could be arranged to set in action any suitable apparatus by the motion of a plunger or an electrical contact device and in some cases even to actuate a feed-pump for the water in the boiler.

If desired, an electrical contact device can be operated directly by the motion of the tube 14 and an electric current set up in order to bring the signaling device into action.

In the form shown in Fig. 2 the water flows out of the pipe 12' into a container 29 and remains therein normally at the level 33. An adjustable overflow pipe 32 enables the quantity of water in the container to be regulated in such a manner that only a particular given weight of water will collect. A small branch tube 35 enters the side 31 of the container for the purpose of carrying away a small portion of the water in an uninterrupted stream, while the overflow escapes through the pipe 32 already mentioned.

The container 29 rests upon a two armed elbow lever 26 pivoted to swing upon a fixed pin 25. An arm 28 carrying an adjustable weight 28' is fixed to the overflow pipes 32 of the container 29, such weight assisting the water weight and in conjunction

with the latter acting against the tension of a spring 27.

Immediately the water in the boiler falls to a minimum level, it ceases to flow therefrom as hereinbefore described, and the container 29 no longer receiving a further supply of water will gradually become emptied by the tube 35. The spring 27 is then strong enough to swing the elbow-lever 26 around as far as the stud 30 will allow, thus enabling the tube or rod 14' to lower and open a valve similar to the valve 15 in the manner described with reference to Fig. 1.

Should the steam pressure exceed the required limit when the container is filled to the level shown, the pressure of said steam will open a valve on the upper end of the tube or rod 14' and permit said steam to pass to an indicator operating the same or in the manner as heretofore described. The depression of the rod or tube 14' will cause the elbow lever 26 to swing notwithstanding the weight 28' and the working weight of water within the container 29.

In the modified form shown in Fig. 2, moreover, it is not the temperature of the water but solely the weight of the same which is utilized to set in action a signaling device immediately the water in the boiler is insufficient or in case there should happen to be too great a steam pressure in the boiler. This form of the invention is chiefly intended to operate a signaling device which is at such a distance from the boiler that the water in traveling such a long way would not retain sufficient heat to enable the steam valve to be kept closed by the expansion of the tube 14 utilized in Fig. 1.

Both of the forms illustrated not only come into action reliably when there is no longer sufficient water in the boiler or where the pressure is excessive but they operate continually, (which is of especial importance), even when through any cause they may have got into disorder, for in the latter case no water can reach the tube 14 or the container 29, the result being that the controlling valve opens itself automatically. It is also a substantial advantage that the apparatus can always be tested without any further or special operation.

Although the invention is herein described in connection with a steam boiler it can be applied with advantage to other different purposes, where it is desired to prevent liquid under pressure from going below a certain level. In place of the arrangement shown in Fig. 1 any other purifying device may obviously be used.

I claim:

1. A device for controlling the operation of boiler indicators, comprising in combination with a boiler a condenser, an indicating apparatus, a live steam pipe leading to said indicating apparatus, a valve for controlling

the flow of steam through said pipe, means for closing said valve by condensation water, and means for receiving condensation water under pressure from said condenser and delivering said water without pressure to the valve controlling means.

2. A device for controlling the operation of boiler indicators comprising in combination with a boiler, an indicating apparatus, a condenser connected to the steam space and to the water space of said boiler, a live steam pipe leading to said indicating apparatus, a valve for controlling the flow of steam through said pipe, means for closing said valve by condensation water, means for permitting the valve to be opened by excessive steam pressure, and means for receiving condensation water under pressure from said condenser and delivering said water without pressure to the valve closing means.

3. A device for controlling the operation of boiler indicators comprising in combination with a boiler, an indicating apparatus, a condenser connected at one end to the steam space and at the other end to the water space of said boiler just above the minimum water level, a live steam pipe leading to said indicating apparatus, a valve for controlling the flow of steam through said pipe, means for closing said valve by condensation water, means for opening said valves when the water in said boiler falls below a predetermined point, and means for receiving condensation water under pressure from said condenser and delivering said water without pressure to the valve closing means.

4. A device for controlling the operation of boiler indicators comprising in combination with a boiler, an indicating apparatus, a condenser connected to the steam space and to the water space of said boiler, a live steam pipe leading to said indicating apparatus, a valve for controlling the flow of steam through said pipe, means for closing said valve by condensation water, means for permitting the valve to be opened by excessive steam pressure, and a filter for receiving condensation water under pressure and delivering the same without pressure to the valve closing means, said water passing through the walls of the filter before being distributed.

5. A boiler indicator controlling the operation of boiler indicators comprising a valve chamber provided with a valve seat, a live steam pipe connected to said chamber on opposite sides of said valve seat, a valve within said chamber, means for seating said valve by condensation water, means for permitting said valve to open under excessive pressure in the live steam pipe, and other means for causing said valve to open when the water in the boiler falls to minimum level.

6. A device for controlling the operation

of boiler indicators comprising in combination with a boiler, an indicator apparatus, a live steam pipe leading from said boiler to said apparatus, a valve in said pipe, a thermostat adapted to close said valve by the heat of condensation water, and means for permitting said valve to be opened when the pressure in the boiler becomes excessive.

7. A boiler indicator comprising in combination with a boiler, a valve, a thermostat governing the same, and means for controlling said thermostat by water from the boiler, said means comprising a condenser connected to the steam space of the boiler through which steam from said boiler passes and condenses and then flows through said thermostat.

8. A boiler indicator comprising in combination with a boiler, a valve, means for governing said valve, said means comprising a condenser, a filter, and a thermostat, and means for communication therebetween and with the boiler.

9. A boiler indicator comprising in combination with a boiler, a valve, a thermostat governing the same, means for controlling said thermostat by water of condensation from the boiler, said means comprising a condenser, a reservoir, and a filter through which said water passes.

10. A boiler indicator comprising in combination with a boiler, a valve, means governing said valve, said means comprising a vessel adapted to receive water of condensation from the boiler, means for keeping the water in said vessel at a constant level, said vessel adapted to normally hold said valve seated when filled and to unseat the same when empty, and means whereby said valve is actuated by direct pressure from the boiler.

11. A boiler indicator comprising in combination with a boiler, a valve, a thermostat governing the same, means for actuating said thermostat, said means comprising a condenser and a filter through which water of condensation from the boiler passes, and means whereby said valve is actuated by direct pressure from the boiler.

12. A boiler indicator comprising in combination with a boiler, a valve, a thermostat governing the same, and means for actuating said thermostat by water of condensation from the boiler, said means comprising a reservoir adapted to receive water from a condenser, and means for constantly feeding said water of condensation to said thermostat at a constant temperature.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EUGEN ROTH.

Witnesses:

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