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LIQUID LEVEL INDICATOR

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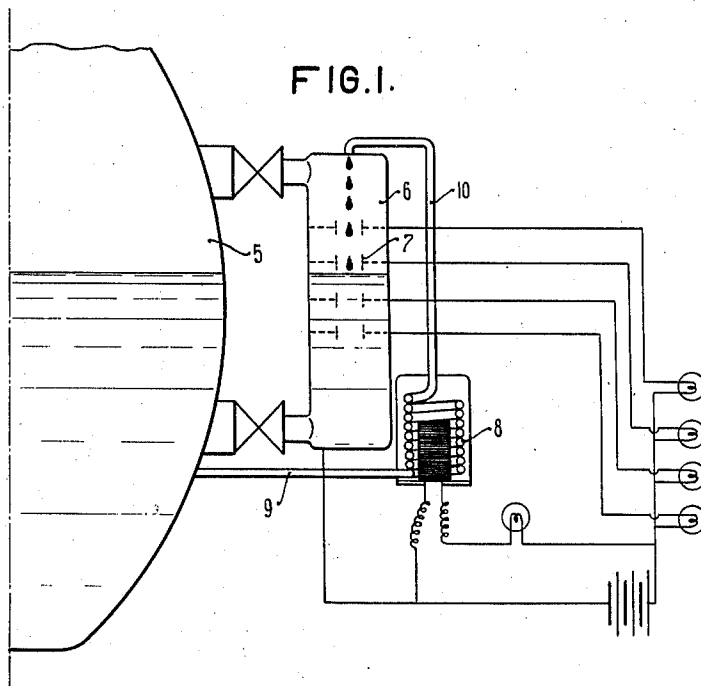
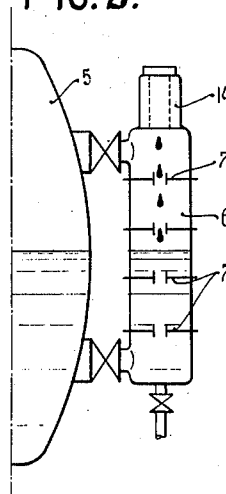


FIG. 2.



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UNITED STATES PATENT OFFICE

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LIQUID-LEVEL INDICATOR

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1 Claim. (Cl. 177—311)

My present invention relates to means for indicating or controlling, or both indicating and controlling, the liquid level in a boiler or like appliance, and has particular reference to improvements in means for this purpose of the type comprising a stand pipe connected at or near its lower and upper ends with the liquid and the vapor spaces of the boiler, respectively, and provided with a plurality of electrical contacts disposed at different elevations and included in individual circuits to be closed through the liquid in the standpipe, liquid level indicating and/or controlling means being included in the circuits.

Liquid level indicating and/or controlling means of the type mentioned are advantageous for various different reasons and, broadly considered, are old. It has been found, however, that such means as heretofore constructed and used fail to function accurately after being in operation only a comparatively short period of time, for reasons which have not heretofore been understood or appreciated.

I have discovered the cause of the unsatisfactory operation and thereby am enabled to furnish a solution of the problem, this constituting the purpose of my invention.

Although the boiler and the stand pipe are in permanently open communication with each other so that it appears reasonable to expect that the same conditions will prevail in the liquid and vapour spaces of both vessels, this is actually not so. Since the stand pipe transmits heat to the atmosphere, its wall cools down so that the vapour in said pipe gradually condenses and is replaced by vapour from the boiler. In a sense, therefore, the stand pipe functions as a very slowly operating condenser. The vapour condensed therein is free from the salts dissolved in the liquid within the boiler, and as this condensate flows down along the walls of the stand pipe and accumulates on the mass of liquid already present therein, said liquid is gradually forced back into the boiler, it being understood that necessarily the liquids in both vessels have substantially the same levels. Obviously, therefore, vapour from the boiler flows into the stand pipe, and liquid from the stand pipe flows into the boiler, the consequence being that the value of the salt concentration of the liquid in the stand pipe is gradually reduced and that, responsive thereto, the electric conductivity of said liquid gradually becomes insufficient to close the circuits through the contacts. This accounts for

the unreliability in the operation of the indicator.

With this teaching, which is the basis of my invention, in mind, the remedy is easy to be found. The only thing left to be done is to provide means whereby sufficient conductivity of the liquid in the stand pipe is insured with a view to the required passage of the electrical current therethrough. For instance, water from the steam boiler may be supplied to the stand pipe. Alternatively, a suitable substance, such as a salt, may be added to the liquid within the stand pipe, or automatic means may be employed for periodically draining off liquid from the stand pipe so as to cause liquid from the boiler to replace it, or the stand pipe may be provided with a heat insulating cover, or it may be heated in order to suppress condensation therein. In practice, various other means may be used for realizing the object in view.

In the drawing, which by way of example shows various embodiments of my invention:

Figure 1 is a diagrammatic view of the first embodiment.

Figure 2 is a diagrammatic view of the second embodiment.

In all of the embodiments, the boiler is indicated by 5, the stand pipe by 6 and the electrodes, arranged in the stand pipe, by 7.

Fig. 1 illustrates the use of a so-called steam-bubble pump, there being continually supplied a small quantity of boiler water at the top of stand pipe 6 by means of the steam-bubble pump 8 through the pipes 9 and 10. In this manner, a small flow of boiler-water to the steam-bubble pump 8 is maintained.

In the embodiment shown in Figure 2, the stand pipe is provided near its top with a cartridge 14 containing a soluble salt, for instance bicarbonate of sodium. By reason of the fact that continuously some steam condenses and the condensate formed, together with a small quantity of salt, drips into the water in the stand pipe 6, the desired effect is obtained.

It goes without saying that the said embodiments are merely examples and that the invention is not restricted thereto.

The foregoing examples merely illustrate the adaptability of the device, and in so far as their exact structural details are concerned, do not in themselves form the essential spirit of the invention.

What I claim is:

A steam boiler or the like having a liquid space and a vapor space, a stand pipe connected

near its bottom with the liquid space and near its top with the vapor space, whereby the liquid level therein is the same as the liquid level in the boiler, the liquid comprising an electrical
5 conductive solution, the stand pipe being located outside of the boiler in a position where it is subjected, in the absence of means to prevent condensation therein, to a temperature lower
10 than the boiler temperature with the result that in the absence of condensation preventing means, condensation takes place therein with consequent weakening of the electrical conductivity of the liquid therein without any change
15 in the level of the liquid, a plurality of terminals disposed at different elevations within the stand pipe, related electrical circuits which are closed by contact of the liquid in the stand pipe with said terminals provided the liquid within the stand pipe is of sufficient electrical conductive
20 strength to carry the current, and means operable independently of any change of level of the liquid within the stand pipe and without manual attention to maintain the electrical conductive value of the liquid in the stand pipe sufficient to
25 assure closing of any of said circuits when the liquid in the stand pipe contacts with a related terminal.

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