



# UNITED STATES PATENT OFFICE

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## LOW LIQUID LEVEL INDICATOR AND PROTECTION DEVICE

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This invention relates to an improvement in level indicators, that is to say, to devices for indicating the level of a material and while it has many applications it will be described in connection with a low liquid level indicator and protection device for boilers and in connection with oil burning apparatus.

One of the objects of this invention is the provision of means operating automatically and adapted to be inserted into the water in a boiler whereby when the water level drops to a point below that for which the apparatus is set the circuit to the blower motor will be automatically opened.

An embodiment of our invention is shown in the accompanying drawing.

Referring to this drawing, 1 designates the wall of a boiler and 2 a plug adapted to be inserted therein to provide a water-tight connection. 3 designates an insulating plug mounted in the plug 2 and held in place in any suitable manner.

Passing through the insulating plug 3 are conducting rods 4 and 5. These rods at their inner ends, as shown at 6 and 7, project beyond the inner end of the insulating plug 4 and carry a fusible conductor 8.

The entire apparatus is so mounted in the wall 1 of the boiler that the fusible wire or conductor 8 is submerged in and in contact with the water 9 in the boiler when the water level is at or above the point for which the apparatus is set.

10 designates a low voltage transformer, 11 the primary of this transformer and 12 the secondary, one side of the secondary being connected by conductor 13 to the conducting rod 4, the other side being connected through conductor 14 to the conducting rod 5, a relay 15 being inserted in this conductor and hence in series with the secondary.

16 designates a motor which, for example, may be the blower motor of an oil burning apparatus. One side of this motor is connected by conductor 17 to a fixed contact 18. The other side is connected by conductor 19 to one side 20 of an outside source of power.

21 is a switch held closed by energizing of the relay 15 and opened automatically by a spring 22.

The operation of this apparatus is as follows: When the level of the water 9 in the boiler 1 is at the proper height, i. e., so that the fusible conductor 8 is completely submerged and the switch 23 is closed a circuit will be closed to the primary 11 of transformer 10 and current will be induced in the secondary 12. This current will flow from one side of the secondary by way of conductor 13, conducting rod 4, fusible conductor 8, conducting rod 5, conductor 24, the winding of the relay 15, conductor 14 to the other side of the secondary 12 of transformer 10. This energizes the relay 15 and the same will draw the switch arm 21 to the right, as viewed in the drawing, against the action of the spring 22 to close at the contact 18. Accordingly, a circuit is now closed to the motor 16 by way of conductors 20, 19, motor 16, conductor 17, fixed contact 18, switch arm 21, conductor 25 to the other side of the line.

As long as the water level remains at the necessary height to maintain the fusible conductor 8 completely submerged the motor circuit 16 remains closed so far as the operation of this device is concerned. Assuming, however, that for some reason the water level 9 drops sufficiently so that the conductor 8 is no longer completely submerged the current passing through this conductor will fuse the same and accordingly this will open the circuit of the secondary 12 of the low voltage transformer 10, thereby opening the circuit of the relay 15 and the switch 21 will swing to open position under the action of the spring 22 to open the circuit of the motor 16. This condition will remain until a new length of fusible conductor 8 has been applied to the device and until the water level 9 has been again raised to the point where the fusible conductor will be again completely submerged.

It will be understood that if desired burning out or fusing of the electric conductor 8 could close a circuit instead of opening a circuit, thereby to ring a bell or light or give some other indication that the water level has dropped below the safety point or point for which the device is set.

It will be understood also that this apparatus is applicable to uses other than controlling or giving indication of the level of water in the boiler, this having been shown merely by way of example. The primary feature of this invention is the provision in an electric circuit of a fusible conductor adapted to be inserted into a liquid and which conductor will be fused by the current passing there-  
10 through when the fusible conductor is not completely submerged in said liquid, and the means for carrying the same into effect.

What we claim is:—

A thermal switch for opening an electric  
15 circuit, comprising in combination a plug adapted to be attached to a boiler by inserting the same through the wall thereof, an insulator mounted in said plug and projecting from the inner end thereof into contact with  
20 the water in the boiler, spaced removable conducting rods extending through said insulator and projecting from each end of the insulator, the inner ends of said rods extending into the water in the boiler, and a conductor  
25 submerged in the water of the boiler and attached to the inner projecting ends of the spaced conducting rods and bridging the space between them, said last mentioned conductor being fusible to open an electric cir-  
30 cuit upon lowering the water level of the boiler so that the said fusible conductor is incompletely submerged.

This specification signed this 23rd day of September, 1929.

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This specification signed this 23rd day of September, 1929.

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