Nov. 25, 1952 C. F. MAHONEY 2,619,566

ACTUATING APPARATUS RESPONSIVE TO CHANGE IN LIQUID LEVEL

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Fig. 1.

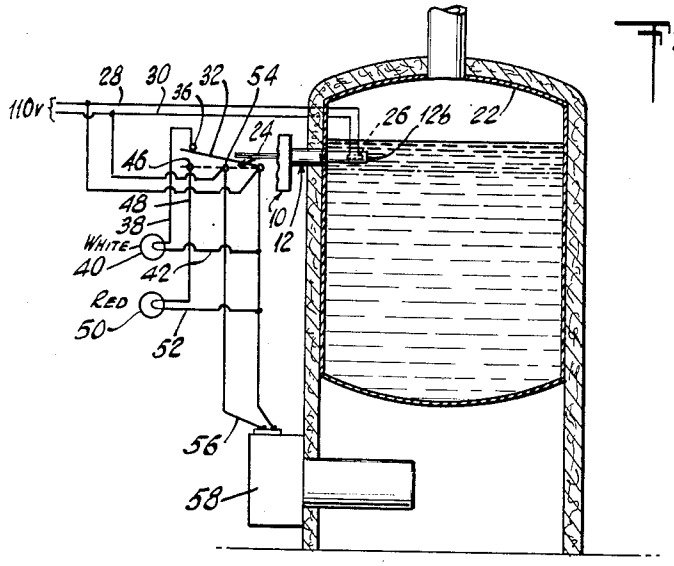
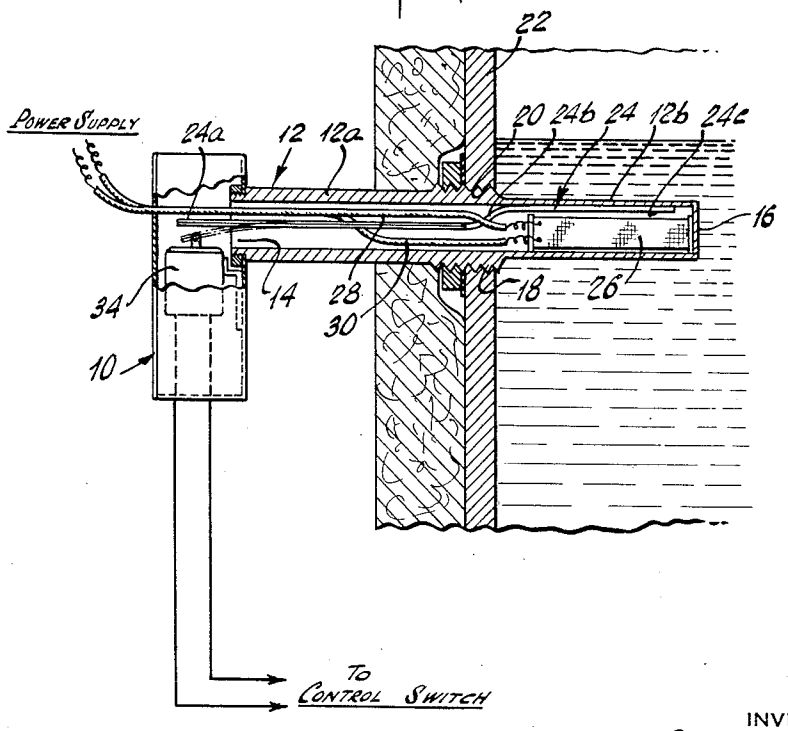


Fig. 2.



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ACTUATING APPARATUS RESPONSIVE TO CHANGE IN LIQUID LEVEL

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2 Claims. (Cl. 200—122)

1

This invention relates to apparatus adapted to be actuated in response to a change in liquid level, to mechanically move a related element to give notice of the change, as by causing a visual or audible signal, or by causing a source of heat for a boiler to be turned on or off, or by actuating controls to cause a lowering water level to be raised or a rising water level to be lowered etc.

An object of the invention is to provide a simple, practical and durable apparatus of the above mentioned kind.

Another object of the invention is to provide apparatus of the above mentioned kind which will react promptly to a change in water level.

Another object of the invention is to provide apparatus of the kind described which will be easy to make and to install and maintain.

Other objects of the invention will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangement of parts, and in the several steps and relation and order of each of said steps to one or more of the others thereof, all as will be pointed out in the following description, and the scope of the application of which will be indicated in the following claims.

The invention will best be understood if the following description is read in connection with the drawings, in which,

Figure 1 is a view partly in cross section and partly schematic showing an apparatus embodying the invention applied to the boiler of a furnace; and

Figure 2 is a detail view showing the apparatus and part of the furnace wall in cross section.

In the embodiment of the apparatus as shown herein my apparatus comprises a control box 10 from the rear end of which protrudes the hollow metallic finger 12. The inner end of the finger is open and communicates with a port 14 in the inner face of control box 10, but the outer end 16 of finger 12 is closed.

Finger 12 comprises the portions 12^a and 12^b, the latter portion being of reduced diameter. On portion 12^a adjacent its inner end the screw threads 18 are provided by which the device is firmly engaged within the bore 20 extending through furnace wall 22, the bore being grooved to receive the threads 18. Preferably finger 12 is made long enough so that its inner end will protrude into the fluid container or boiler in connection with which it is employed, and control box 10 will be spaced outwardly from the outer

2

surface of the furnace wall a substantial distance, to reduce the effect on the controls in box 10 of radiant heat from the furnace wall, making the controls substantially dependent upon heat transmitted to the control box by conduction through strip 24.

Strip 24 is a heat conductive metal strip which may be of bimetal, or of a thermostat metal which is available on the market under the trade name "Truflex." It will be noted that strip 24 comprises an inner portion 24^a, an intermediate reversely curved portion 24^b, and an outer portion 24^c. Portion 24^c is disposed along, and in abutting relation to, the inner surface of finger 12, and being highly heat sensitive and conductive it readily conducts to its inner portion 24^a heat transmitted to its portion 24^c by contact with finger 12.

Positioned within finger 12 adjacent its closed inner end 16 is a heating unit 26 which may be energized from any suitable source as for example by the conductors 28 and 30 which may lead to any convenient source of electric energy such for example as the house supply.

By means of heating element 26 the metal shell comprising finger 12 is continuously supplied with heat, but so long as fluid, such for example as the water of a furnace boiler is in contact with the shell of finger 12 a substantial portion of the heat thus transmitted from heating element 26 is transferred to the water. However, when the liquid level falls so that it is no longer in contact with finger 12 the temperature of the metal shell rises quickly under the influence of heating element 26 with the result that sufficient heat is transferred to portion 24^c of strip 24 to cause portion 24^a to be heated to above a critical temperature thereby causing the strip to bend and in so doing to actuate some associated element or instrumentality such for example as the switch bar 32 shown in Figure 1, or the microswitch indicated generally by the numeral 34 in Figure 2.

The instrumentalities which may thus be actuated by movement of strip 24 are many and varied and will not be described in detail since they form no part of the present invention. As an illustration of one such instrumentality there is shown in Figure 1 in connection with movable switch bar 32 a circuit through said switch bar, contact 36, lead 38, white lamp 40, lead 42 to lead 44 and back to switch bar 32, which is closed when strip 12 has not been heated above its critical point and thus is not moved to contact switch bar 32. When, however, strip 12 is heated above

its critical point and moves against switch bar **32** thus causing it to move against contact **46**, a circuit is closed through lead **48**, the red lamp **50**, and lead **52** to lead **44** and back to the switch bar **32**. As shown in Figure 1 when switch bar **32** is moved against contact **46** it is also moved against contact **54** and closes a circuit through leads **56** and **44** interconnecting switch bar **32** and contact **54** with a heat source control, such for example as the control of an oil burner unit indicated generally by the numeral **58**.

In Figure 2 the instrumentality which is actuated by movement of strip **24** is illustrated as micro-switch **34** from which leads are shown running to a control means which is not identified.

It will be understood that cooling of the metal shell comprising finger **12**, as by the rising of liquid into contact with the shell will also cause movement of portion **24a** of the strip **24** when the contact of the liquid with the shell causes a heat change in portion **24a** of the strip sufficient to cause a contraction and movement of strip **24** opposite to that caused by heating of said strip.

My actuating apparatus has the advantages of simplicity and durability coupled with positive quick response.

It will thus be seen that there has been provided by this invention an apparatus in which the various objects hereinabove set forth together with many thoroughly practical advantages are successfully achieved. As various possible embodiments might be made of the mechanical features of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

What I claim is:

1. Apparatus for actuating boiler fuel control means in response to a change in fluid level in the boiler which comprises a heat conductive envelope extending through the boiler wall with a portion thereof outside the boiler and a portion thereof inside the boiler, a heat conductive strip largely contained within said envelope and extending beyond the end of the envelope which is outside of the boiler, the end of said strip which extends beyond said envelope being movable in response to change in the temperature of said strip, and being positioned with respect to said control means to cause by its movement change of position of said control means, said strip comprising two portions, the first of which is disposed substantially along the median line of said envelope and includes the end which projects beyond said envelope, the second portion of said strip being disposed parallel with and in contact with said envelope, to receive heat directly from said envelope, a source of heat within said envelope the effect of which on said envelope is normally offset by the fluid in said boiler but which serves to heat said envelope sufficiently to cause said envelope to transmit sufficient heat to said strip to cause movement of the projecting end of said strip when the fluid level in said boiler changes so as to be out of contact with said envelope.

2. A low-water power cut-off for a boiler comprising a bimetal strip, a housing for the strip adapted to extend through the wall of a boiler, a source of heat within said housing the effect of which on said housing is normally offset by the fluid in said boiler, said bimetal strip having a portion parallel to, and in contact with said housing within said housing, and a portion extending beyond said housing outside of said boiler and adapted to bend when the temperature in the housing rises above a predetermined range due to being uncovered by water in the boiler, and an electrical circuit including a switch positioned to be actuated when said bimetal strip bends.

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