March 9, 1937. W. A. RAY ET AL 2,073,268

LOW WATER CUT-OUT

Filed May 20, 1936

FIG_1_

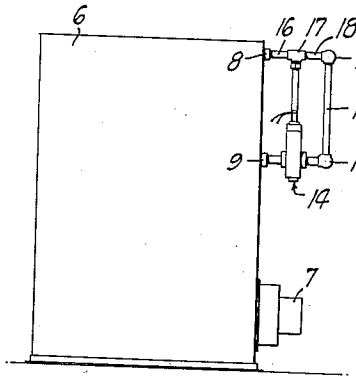


FIG_2_

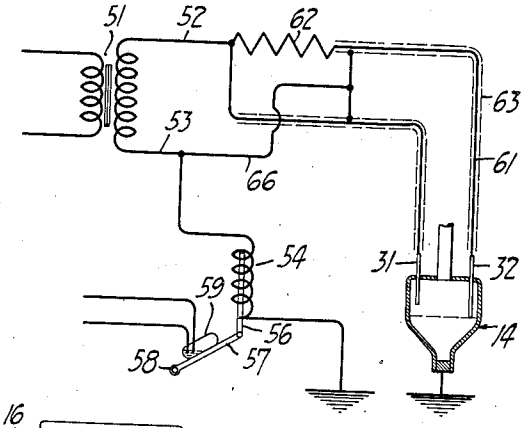


FIG_3_

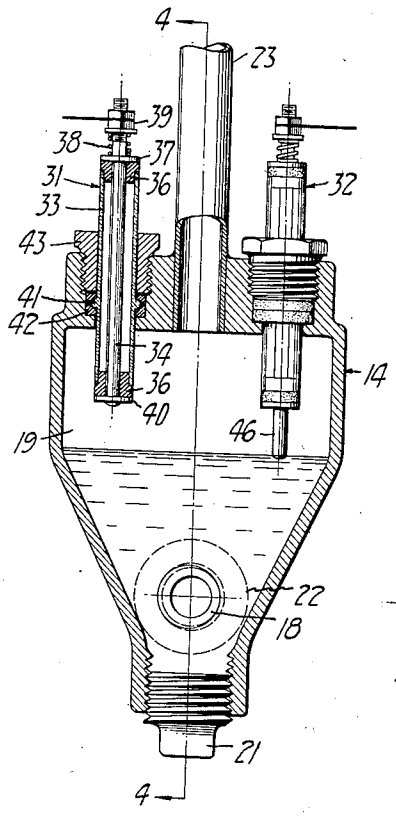
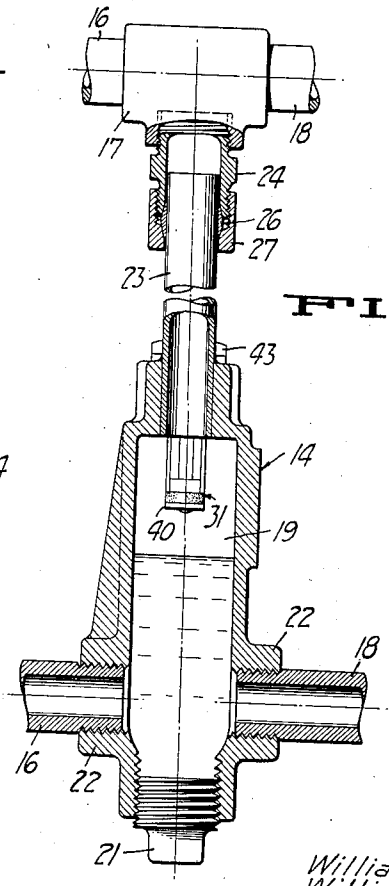


FIG_4_



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LOW WATER CUT-OUT

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6 Claims. (Cl. 122—504)

The invention relates to a low water cut out. Heretofore numerous schemes and devices have been proposed to care for that condition in a boiler or water heater of low water. One broad classification of such devices depends upon completion of an electrical circuit through an electrode positioned in the boiler or gauge glass and connected in a circuit with a relay or some other form of control device. However, even though numerous schemes and devices have been proposed, so far as we are aware not one of them has ever enjoyed any commercial success. We have investigated a goodly number of these and found them most impractical for a variety of reasons including failure due to electrolysis and erratic operation due to rapid fluctuations in the water level.

It is in general the broad object of the present invention to provide a suitable and practical low water cut out device particularly characterized by its structural ruggedness and its ease of installation.

Another object of the present invention is to provide a suitable control system for use in conjunction with the low water cut out device of our invention.

A further objection to the devices present in the prior art is the cost of installation, maintenance and component parts. For example, that structure shown in the patent to Bower No. 1,924,907 of August 29, 1933 includes a relay, a transformer, a special electrode structure and a special vacuum rectifier tube. This tube alone costs more than the trade is ordinarily willing to spend for a low water cut out device in domestic installations.

It is therefore a further object of our invention to provide a simple low water cut out device and system which can be installed at very low initial cost.

The invention includes other objects and features of advantage, some of which, together with the foregoing, will appear hereinafter, wherein we have set forth the preferred form of device and system of our invention.

In the drawing accompanying and forming a part hereof Figure 1 is a side elevation of a water heater or boiler upon which the structure of our invention has been mounted.

Figure 2 is a diagrammatic view illustrating the circuit and component parts of our system.

Figure 3 is a plan view, partly in section, through the low water device.

Figure 4 is a section taken along the line 4—4 of Figure 3.

In Figure 1 we have shown a water heater 6 which can be a steam boiler or device for merely raising water to a temperature below boiling. This device is ordinarily heated by a burner indicated at 7 and herein referred to, in the specification and in the claims, as a boiler conditioning device, the burner thus being exemplary of various devices that can be used to control and affect the condition of the water heater.

The heater includes fittings 8 and 9. It is the usual practice to mount gauge glass cocks 11 and 12 in fittings 8 and 9, respectively, and to position gauge glass 13 between the gauge glass cocks. However, in accordance with this invention, we preferably mount the low water device indicated generally by numeral 14, between the fittings 8 and 9 by means of nipples 16 and T-fitting 17. The gauge glass cocks are mounted by means of nipples 18 upon the T-fitting 17 and the low water device 14. We thus do not have to modify or change the gauge glass, nor do we depend upon any electrode structure being placed within it. At the same time, installation is particularly facilitated.

The low water device 14 includes a casing made up in the form of a casting of a suitable material to provide a chamber 19. This chamber preferably tapers toward the bottom thereof and a plug 21 is screwed into the bottom of the casing to provide a suitable drain. Threaded bosses 22 are provided at the base of the casting to receive nipples 16 and 18 while a pipe 23 is secured in the casing in communication with the chamber 19. This pipe extends into a suitable nipple 24 which is positioned in the T-17. The sleeve 26 slips over the pipe and partly into nipple 24, a nut 27 engaging the nipple and forcing the sleeve into a secure engagement with the pipe so that a tight joint is secured. This type of joint enables the pipe 23 to be made extra long in length so that it can be cut off to provide for attachment to any boiler or water heater even though the fittings 8 and 9 are various distances apart on different heaters or boilers.

Mounted upon casing 14 and extending into chamber 19 are electrodes 31 and 32. Each of these electrodes is substantially identical with the other and description of one will suffice for the other, the difference between them being specifically noted hereinafter.

Each electrode includes a glass tube 33 through which extends a metal rod 34. Plugs 36 are in-

serted in each end of the glass tube and serve to seal the tube and the rod therein, a washer 37 is provided at one end of the rod and a spring 38 bears upon this washer under the tension provided by nuts 39. A washer 40 is usually secured at the other end of the rod to bear against the adjacent plug 36.

Each tube 33 carries a flange 41. This flange is received between two washers 42 provided in a suitable receptacle in the top of the casting 14. Plugs 43 are screwed down into the casting to compress the washers and to make up a fluid tight connection capable of resisting the pressure under which the water heater or boiler is placed.

The electrodes, so far described, are substantially identical. However, as appears in the drawing, one of them is slightly longer than the other; thus, in Figure 3 the one on the right hand side includes an extension 46 which is engaged by the water level before the water rises to engage the other electrode. It is to be noted that the extension 46 and the end of the other electrode 31 are rather large in size and are not at all comparable physically to electrodes heretofore used. We preferably make these electrodes of the same material as the casing so that electrolysis between the electrodes and the casing and each electrode is avoided. While at first glance this may appear to present only an insignificant problem, nevertheless it is one that has proven most troublesome in practice.

In utilizing the low water cut out device described, electrode 32 is preferably connected to means which will control the operation of the boiler conditioning means but includes in conjunction with it such other means that mere contact of the water with the electrode 32 and its extension 46 will not suffice to initiate operation of the boiler conditioning device if it is not then in operation. Electrode 31, on the contrary, is connected to such control means for the boiler conditioning device that as soon as the water contacts it initiation of operation of the boiler conditioning device results. As appears in Figure 2 we provide a transformer 51, the primary of which is connected to suitable source of supply while the secondary is connected by connector 52 to electrode 31.

The other side of the secondary is connected by connector 53 to a solenoid coil 54 and then to ground. The solenoid coil carries a cooperative plunger 56 which is engaged with a member 57 hinged as at 58 and carrying a mercury switch of a well known type indicated at 59. This mercury switch is utilized to control a boiler condition device such as burner 7.

Electrode 32 is connected by conductor 61 to resistance 62 which is in turn connected to conductor 52. This resistance is of such a size that when the water engages electrode 32 sufficient current does not pass to raise the solenoid core or plunger 56. However, when the water engages electrode 31 resistance 62 is by-passed, in effect, and the solenoid plunger is raised into that position in which it appears in Figure 2 and the circuit to the burner, for example, is completed. If and when the water level falls below electrode 31 sufficient current is passed by the resistance 62 to maintain the solenoid plunger in the position in which it appears in Figure 2 and the circuit is not broken. However, once the water falls out of engagement with electrode 32 the solenoid plunger drops and the circuit to the burner is opened.

To avoid any possibility of a short circuit in either connector 52 or 61 maintaining the plunger 56 in its raised position we preferably surround each conductor with a metal shield 63, the shields being each connected by connector 66 to connector 53 on one side of the secondary of the transformer. If a short circuit occurs and either conductor 52 or 61 engages the metal shield the secondary of the transformer will be short circuited, possibly destroying the transformer but nevertheless protecting the heating device proper.

It is to be noted that the operation of the low water cut out and the associated system is not one of a time delay for if the water level in the casing 14 falls instantly out of contact with both the electrodes 31 and 32, then the circuit would be immediately opened. Instead the control effected is one of a difference in level, the resistance 62 serving to hold the solenoid plunger in its raised position but not having sufficient, or rather having such a high resistance, that sufficient current to initiate operation of the boiler condition device does not flow.

We claim:

1. In combination, a water heater, a first electrode positioned at a first level in said heater, a second electrode positioned at a second level in said heater and above said first level, relay means, a source of current in series with said second electrode and said relay means, a resistance, and means connecting said resistance and said first electrode in series with said source of current.

2. In combination, a water heater, a first electrode positioned at a first level in said heater, a second electrode positioned at a second level in said heater and above said first level, a heater condition control device, means for controlling operation of said device operable to discontinue and initiate operation of said device, a source of current, means connecting said controlling means to one of said electrodes and said source of current to provide a first circuit, means connecting said other electrode to said source of current and said controlling means to provide a second circuit, and means in said second circuit rendering said circuit incapable of energizing said controlling means to initiate operation of said device but effective to continue operation thereof during continuance of said second circuit.

3. In combination, a water heater, a first electrode positioned at a first level in said heater, a second electrode positioned at a second level in said heater and above said first level, a heater condition control device, means for controlling operation of said device operable to discontinue and initiate operation of said device, a source of current, means connecting said controlling means to one of said electrodes and said source of current to provide a first circuit, means connecting said other electrode to said source of current and said controlling means to provide a second circuit, and means in said second circuit rendering said circuit incapable of energizing said controlling means to initiate operation of said device but effective to continue operation thereof during continuance of said second circuit, both said connecting means including a conductor in a metal shield, and means connecting said shield to one side of said source of current.

4. In combination with a device for controlling a condition in a heater in which the level of water is subject to fluctuations, a first electrode positioned to be engaged by water from said heater at a first level, means connected to said electrode and a source of current for starting

and continuing operation of said device when water is in engagement with said electrode, a second electrode positioned to be engaged by water from said heater at a second level below said first level, and means connected to said second electrode and said source of current for only continuing operation of said device.

5. In combination with a device for controlling a condition in a heater in which the level of water is subject to fluctuations, a first electrode positioned to be engaged by water from said heater at a first level, means connected to said electrode and a source of current for starting and continuing operation of said device when water is in engagement with said electrode, a second electrode positioned to be engaged by water from said heater at a second level below said first level, and means connected to said second electrode and said source of current for continuing operation of said device so long as water engages said second electrode.

6. In combination with a device for controlling a condition in a heater in which the level of water is subject to fluctuations, a first electrode positioned to be engaged by water from said heater at a first level, means connected to said electrode and a source of current for starting and continuing operation of said device when water is in engagement with said electrode, a second electrode positioned to be engaged by water from said heater at a second level below said first level, and means connected to said second electrode and said source of current for continuing operation of said device so long as water engages said second electrode, said continuing means rendering the circuit completed through said second electrode incapable of initiating said operation of said device.

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