Oct. 11, 1927. 1,644,935

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COMBINED PRESSURE AND FLOAT ACTUATED SWITCH

Filed Aug. 11, 1925

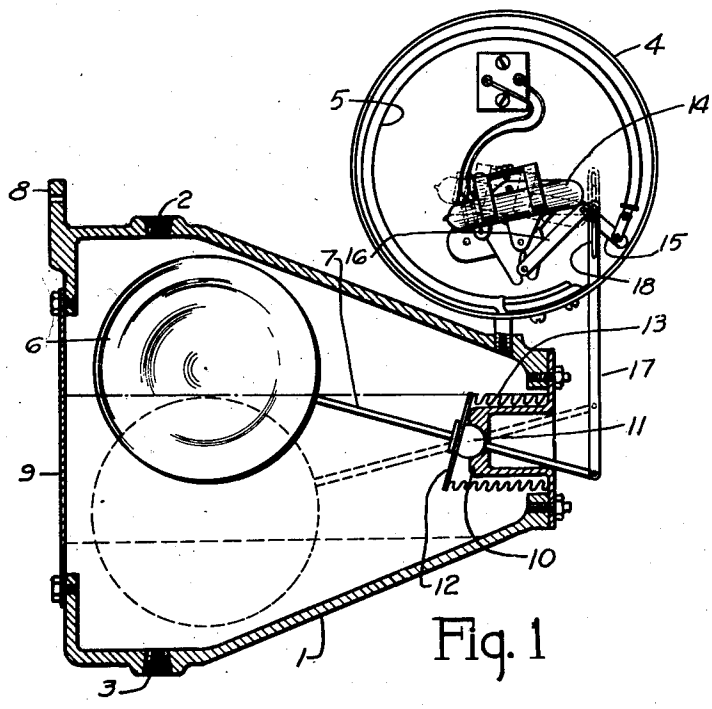


Fig. 1

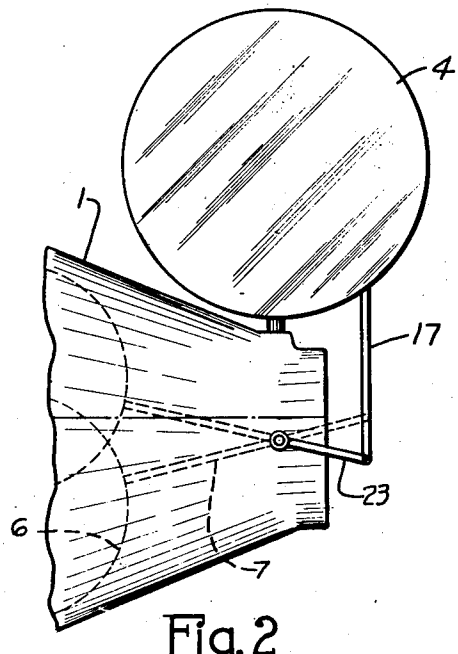
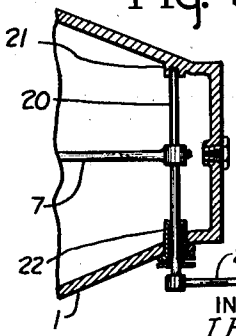


Fig. 2

Fig. 3



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Patented Oct. 11, 1927. 1,644,935

UNITED STATES PATENT OFFICE.

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COMBINED PRESSURE AND FLOAT ACTUATED SWITCH.

Application filed August 11, 1925. Serial No. 49,554.

This invention relates to improvements in electrical control devices, and more particularly to a combined pressure and float actuated switch mechanism.

It has been customary to employ gauges to indicate the pressure on the interior of boilers and also to employ an electric switch-operating mechanism actuated by the interior pressure of boilers for various purposes, as well as indicators for showing the height of water within the boilers. It is an object of this invention to provide, in one instrument, an electrical switch which, when the pressure and water level within the boiler are normal an electrical circuit will be closed, and upon an increase of pressure approaching the danger limit the switch will be operated to break the circuit, or upon the decrease of the water level approaching the danger limit the circuit will be broken. The electrical circuit mentioned may be used to operate an alarm, to operate dampers in furnaces, or to control a liquid fuel burner so that when the pressure in the boiler or the water level, singly or together, approach the danger limits of either the switch will be actuated to operate an alarm, reduce or cut out the source of heat within the furnace under the boiler.

While a preferred form of this invention is illustrated on the accompanying sheet of drawing, yet it is to be understood that minor detail changes may be made without departing from the scope thereof.

In the drawings:

Figure 1 is a view in vertical section through a device illustrating an embodiment of this invention.

Figure 2 is a view in side elevation, partly broken away, illustrating a modified form of this device.

Figure 3 is a view in horizontal section, taken on the line 3—3 Figure 2, looking in the direction of the arrows.

The embodiment of this invention as illustrated in Figure 1 includes a casing or enclosed receptacle for containing and supporting the operating mechanism of this device, which casing may be either supported upon the boiler or mounted at a distance therefrom, having pipes leading from the apertures 2 and 3 in the top and bottom of the casing to the interior of the boiler, entering therein above the normal water level and below the lower danger line water level, whereby the pressure within the boiler is transmitted through the pipe leading from above the normal water level to the upper side of the mechanism contained in the casing and the lower pipe conducts water from the boiler to the said casing through the lower aperture therein.

A pressure control, 4, sometimes called a pressurestat, is mounted upon the casing adjacent to the extremity or front, containing a Bourdon tube 5 communicating with the interior of the casing 1. It is preferable to secure this casing 1 to the side of the boiler in such a position that the normal level of the water within the boiler will be communicated to the interior of the casing a sufficient distance below the opening leading to the Bourdon tube so that under all operating conditions of the boiler the pressure within the casing above the water level will be communicated to the pressure control. A float 6 is mounted within the casing having an arm 7 extending therethrough adapted to communicate the movement of the float through variations in the water level within the casing to the exterior of the casing for the purpose hereinafter described. In the form shown in Figure 1 the casing 1 is provided with a flange 8 extending above the surface farthest from the operating mechanism providing means to attach the casing either to the boiler side or some other fixed part. Below this flange that end of the casing is provided with an opening through which the float is inserted in assembling, which opening is provided with a water-tight cover 9. The pressure control is mounted at the other end of the casing which, in this instance, is provided with an opening for the insertion of a stuffing box through which the float arm 7 passes. In this instance the stuffing box comprises a plate having a sleeve 10 extending into the interior of the casing provided with an inner closure with a central opening and a cut out portion on the interior side, allowing the arm 7 to pass therethrough and adapted to seat a cylindrical bearing 11 carried upon the arm, the inner side of this bearing being provided with a circular plate 12 having a watertight attachment to the shaft and connected about its periphery to a cylindrical bellows 13, the opposite end of

which is connected to said stuffing box plate, whereby the exterior end of the float arm is caused to reciprocate in proportion to the rise or fall of the water level within the casing.

The switch mechanism within the casing containing the pressure control is constructed in accordance with my prior pending application, Serial No. 585,698, filed September 1, 1922, and includes an electric mercury tube switch member 14 having two spaced apart terminals entering near one end, having mechanism for tilting the tube with a snap movement and holding the tube in that position, causing the mercury to flow into the lower end about said terminals and close the circuit therethrough, which mechanism is adapted to also throw the switch into a position with the other end lowermost and hold the switch in that position, in which the mercury flows into the end opposite said terminals and breaks the circuit therethrough. This mechanism is actuated by a lever 15 pivoted at one end having a link 16 pivoted thereto and to the operating mechanism of the switch. The free end of this actuating lever 15 is pivotally connected to the free end of a Bourdon tube 5 communicating with the casing above the water level therein, whereby the pressure from the interior of the boiler is transmitted to the interior of the Bourdon tube. The Bourdon tube is normally in the contracted position and the switch mechanism has tilted the mercury tube switch into the closed position. As the pressure in the boiler increases and is transmitted to the Bourdon tube the tube will expand, moving the free end thereof away from the switch mechanism actuating lever and as the pressure approaches the danger limit the actuating lever connected to the free end of the Bourdon tube will actuate the operating mechanism of the switch to throw the mercury tube into the opposite position and break the circuit therethrough until the pressure decreases sufficiently for the contraction of the Bourdon tube to throw the actuating lever into its normal position and close the circuit. The exterior end of the float arm 7 extends beyond that end of the casing and is provided with an actuating link 17 pivoted thereto which extends upward through the control casing 4 and engages a pin on the actuating lever 15 with a lost motion connection, preferably in the form of a slot 18 in the link allowing upward movement of the link as the float in the casing descends with the lowering of the water level therein and is so constructed that as the water level approaches the danger limit the lower end of the slot will engage the pin and upon further movement in the direction of the danger limit the actuating lever will be operated to actuate the operating mechanism of the switch to throw the mercury tube into the open position and break the electric circuit therethrough and maintain the switch tube in this position until the water level has risen to normal, and when the float is in the lowermost position the Bourdon tube can not actuate the switch. The relation between the Bourdon tube and the float is such that the upward pressure applied to the connecting link between the float and actuating lever is sufficient to overcome the normal tension of the Bourdon tube to allow the actuating of the operating mechanism of the switch when the water level descends to the danger limit.

Figures 2 and 3 illustrate a modified form in which the float arm 7 is secured upon a transverse shaft 20, rotatably mounted in a bearing 21 formed upon the interior of the casing and passing through a stuffing box 22 on the opposite side of the casing with a crank arm 23 secured upon the exterior end of the shaft to which is jointed the actuating link 17 whereby the movement of the float 6 up and down with the fluctuation of the water level will be transmitted through the rotating shaft and crank arm to the actuating link to cause the switch mechanism to operate as above described.

It is readily seen that a device of this character combines in a single instrument two safety devices which will operate independently of each other, or in unison, to break the electric circuit as either the pressure within the boiler or the level of the water within the boiler approaches their respective danger limits and which will automatically return to the normal position when the pressure or water level return to normal.

What I claim is:

1. A combined pressure and float actuated switch mechanism for steam boilers, comprising a casing communicating with the interior of the boiler above and below the water line thereof, an electric switch mechanism including a mercury switch tube and operating means for throwing and holding the switch tube in open and closed positions, means communicating with the interior of the casing whereby the boiler pressure actuates such switch operating means, in combination with means within the casing whereby changes in water level in the boiler actuate the said switch operating means.

2. A combined pressure and float actuated switch mechanism for steam boilers, comprising a casing communicating with the interior of the boiler above and below the water line thereof, an electric switch mechanism including a mercury switch tube and operating means for throwing and holding the switch tube in open and closed positions, means communicating with the interior of the casing whereby the boiler pressure actuates such switch operating means, in combination with means within the casing

whereby changes in water level in the boiler actuate the said switch operating means independently of the boiler pressure.

3. A combined pressure and switch actuated mechanism for steam boilers, comprising a casing communicating with the interior of the boiler above and below the water level thereof, an electric switch mechanism including a mercury switch tube and operating means for throwing and holding the switch tube in open and closed positions, means communicating with the interior of the casing, including a Bourdon tube having its free end connected to the switch operating means, whereby the boiler pressure actuates the said switch operating means, in combination with means within the casing whereby the changes in the water level of the boiler actuate said switch operating means independently of the boiler pressure.

4. A combined pressure and actuated switch mechanism for steam boilers comprising a casing communicating with the interior of boiler above and below the water level thereof, an electric switch mechanism including a mercury switch tube and operating means for throwing and holding the switch tube in open and closed positions, means communicating with the interior of the casing whereby the boiler pressure actuates the said switch operating means, in combination with means within the casing including a float, means communicating the movement thereof to the exterior of the casing, and a link connecting such exterior means to the switch operating means whereby the changes in the water level in the boiler actuate the said switch operating means.

5. A combined pressure and float actuated switch mechanism for steam boilers comprising a casing communicating with the interior of boiler above and below the water level thereof, an electric switch mechanism including a mercury switch tube and operating means for throwing and holding the switch tube in open and closed positions, means communicating with the interior of the casing including a Bourdon tube having its free end connected to the switch operating means, whereby the boiler pressure actuates the said switch operating means, in combination with means within the casing including a float, means communicating the movement thereof to the exterior of the casing, and a link connecting such exterior means to the switch operating means, whereby the changes in the water level in the boiler actuate the said switch operating means independently of the boiler pressure.

6. A combined pressure and float actuated switch mechanism for steam boilers, comprising a casing communicating with the interior of the boiler above and below the water line thereof, an electric switch mechanism and operating means for throwing and holding the switch in open and closed positions, an expansible and contractable member communicating with the interior of the casing and engaging said switch operating means whereby the boiler pressure actuates such switch operating means, in combination with means within the casing whereby changes in water level in the boiler actuate the said switch operating means.

7. A combined pressure and float actuated switch mechanism for steam boilers, comprising a casing communicating with the interior of the boiler above and below the water line thereof, an electric switch mechanism and operating means for throwing and holding the switch in open and closed position, an expansible and contractable member communicating with the interior of the casing and engaged with said switch operating means whereby the boiler pressure actuates such switch operating means, in combination with means within the casing whereby changes in water level in the boiler actuate the said switch operating means independently of the boiler pressure.

8. A combined pressure actuated switch mechanism for steam boilers, comprising a casing communicating with the interior of the boiler above and below the water level thereof, an electric switch mechanism including a mercury tube switch and operating means for throwing and holding the switch tube in open and closed positions, an expansible and contractable member communicating with the interior of the casing and engaging said switch operating means whereby the boiler pressure actuates the switch actuating means, in combination with means within the casing including a float, means communicating the movement thereof to the exterior of the casing and a link connecting said exterior means to the switch operating means whereby the changes in the water level in the boiler actuate the said switch operating means.

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