Dec. 6, 1927. 1,651,972

E. L. SMALLEY

CUT-OUT FOR ELECTRIC FURNACES

Filed Dec. 29, 1923

Fig. 1.

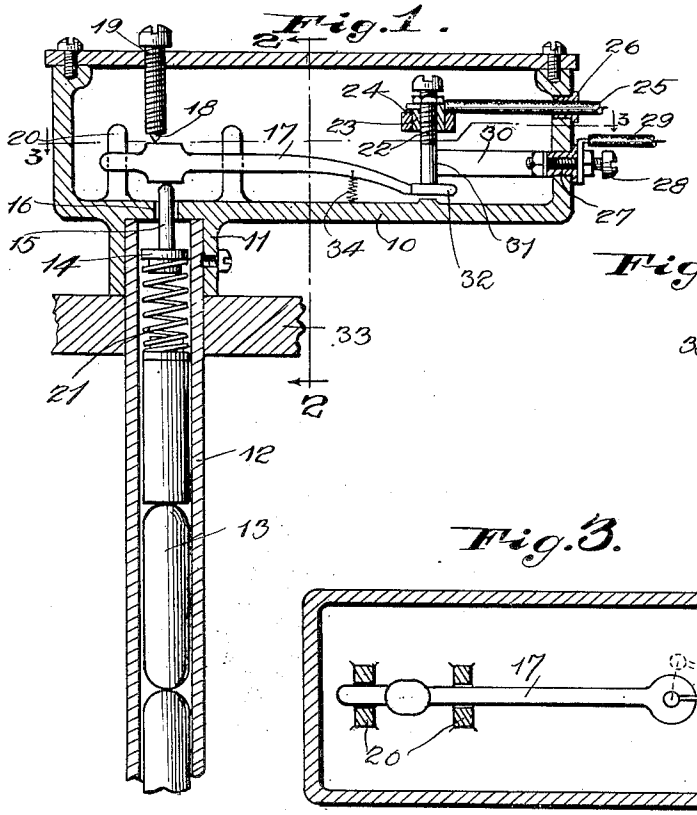


Fig. 2.

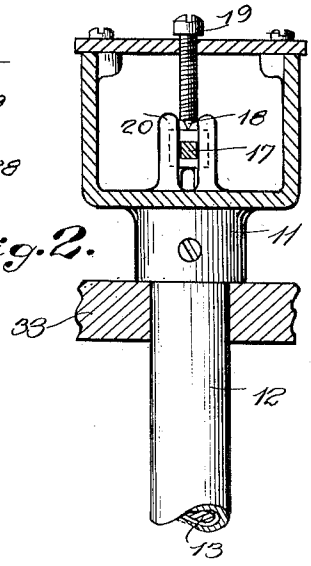


Fig. 3.

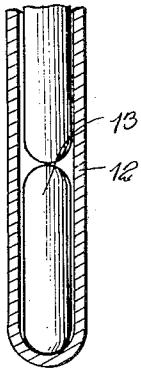
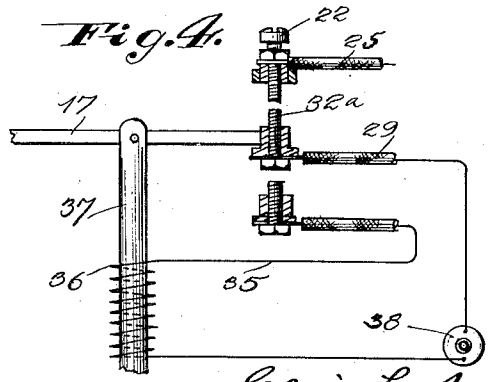


Fig. 4.



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UNITED STATES PATENT OFFICE.

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CUT-OUT FOR ELECTRIC FURNACES.

Application filed December 29, 1923. Serial No. 683,313.

This invention relates to furnace controlling devices and has special reference to devices such as are used for controlling the temperatures in high temperature furnaces, lehrs, heat treating furnaces, and other like furnaces wherein it is desirable to keep the temperature within certain limits by automatic control of the heating element of electrically heated furnaces.

In the automatic control of such furnaces with the apparatus ordinarily used it is found that conditions arise with considerable frequency in which the control, for one cause or another, fails to function properly with the result that the maximum permissible temperature is exceeded and the contents of the furnace are ruined, the furnace itself being sometimes burnt out.

The principal and most important objects of this invention are to provide a novel and positive cut-out so controlled by the temperature of the furnace as to operate without failure whenever a maximum permissible temperature has been reached in the furnace; to provide such a cut-out constructed in a manner which requires the intervention of the operator to restore the operating circuit after it has been opened by the cut-out; and to provide an improved circuit arrangement including such a cut-out.

With the above and other objects in view as will be hereinafter apparent, the invention consists in general of certain novel details of construction and combinations of parts hereinafter fully described, illustrated in the accompanying drawings and specifically claimed.

In the accompanying drawings like characters of reference indicate like parts in the several views, and:

Figure 1 is a longitudinal median section through a cut-out constructed in accordance with one form of the invention.

Fig. 2 is a section on the line 2—2 of Figure 1.

Fig. 3 is a section on the line 3—3 of Figure 1.

Fig. 4 is a detail showing a modified form of control.

In the present embodiment of the cut-out there is provided a casing or head 10 having on its under side a hollow boss 11 wherein is mounted the open end of a tube 12 having its other end closed. Within this tube is carried a relatively inexpansible element or device which is here shown as a series of rods 13. The tube 12 is preferably formed of some material having a high linear coefficient of expansion under heat while the device 13 is formed of material having either no expansion under heat or a very low expansion. For instance the outer tube may be made of steel while the inner element may be made of rods of quartz or a single rod of fused silica, or suitable equivalent means. In the upper end of the tube 12 is a plunger having a head 14 and stem 15, the latter projecting through an opening 16 in the casing 10 and engaged on the under side of a lever 17. This lever engages a fulcrum point 18 on an adjusting screw 19 extending downward through the top of the casing. Depressing this screw 19 causes greater compression on spring 21, thus requiring greater expansion of tube 12 to overcome the compression of spring 21. This affords a means of setting for any desired temperature operation. Guide fingers 20 are arranged in pairs in the casing 10 and the lever 17 is received between these guide fingers so that it is permitted to have free guided movement. Between the upper end of the member 13 and the head 14 is a coil spring 21. The lever 17 has one end extending forward in the casing 10 beneath and in spaced relation to an adjusting screw 22 which is supported in an insulating bushing 23 mounted in a cross bar 24. This screw also forms a contact terminal to which is connected an electric conductor wire 25 which passes through a bushing 26 in the end of the casing. At 27 is a second bushing through which passes a terminal screw 28 having the conductor 29 connected thereto. Inside of the casing the screw 28 supports a spring arm 30 carrying a head 31 which swings laterally into and out of engagement with the screw 22, being held in such engagement by the friction pressure of the lever head 32 on the under side of the head 31.

In operation the tube 12 is inserted through the furnace top 33. So long as the furnace is cold the tube 12 will be contracted and will consequently cause pressure to be exerted by the spring 21 on the plunger head 14. This will hold the lever head 32 up in such position as to clamp the contact head 31 against the screw 22. As the furnace heats up the tube 12 expands longitudinally under the increased temperature and, since the

member 13 is practically inexpansible the pressure on the spring 21 will decrease until such time as the frictional engagement between lever 17 and head 31 is relaxed sufficiently to permit the tension of spring 30 to perform its function by retracting and thereby positively moving the head 31 out of contact with the screw 22, (see Fig. 3). In this operation the small spring 34 assists the gravity action whereby lever 17 falls toward the base of the casing.

As hereinafter described this will have the effect of breaking the heating circuit and the furnace will cool off. It will be observed that as the furnace cools off the head 32 will tend to rise but in order to restore the circuit it is necessary that the head 31 be manually restored to its operative position between the head 32 and the screw 22.

In Fig. 4 there is shown a device wherein the contact is broken in a somewhat different manner. In this arrangement the lever 17 carries a contact screw 32^a in place of the head 32, and wire 29 is connected directly to this contact screw. A branch circuit 35 including a solenoid core 37 and push button switch 38 may be employed for restoring the circuit.

Variations within the spirit and scope of my invention are equally comprehended by the foregoing disclosure.

I claim:

1. A cut-out of the class described including a fixed contact, a movable contact arranged to swing laterally into and out of alignment with the fixed contact, said movable contact constantly tending to swing out of such alignment, an adjustable lever having one end movable toward and from the fixed contact and arranged to engage the movable contact upon alignment of the latter with the fixed contact, and thermally controlled means for moving said lever.

2. A cut-out of the class described including a fixed contact, a movable contact arranged to swing laterally into and out of alignment with the fixed contact, said movable contact constantly tending to swing out of such alignment, a lever having one end movable toward and from the fixed contact and arranged to engage the movable contact upon alignment of the latter with the fixed contact, an adjustable fulcrum for said lever, a pushing element engaging the lever adjacent the fulcrum, and a thermal expansion member controlling the movement of said element.

3. A cut-out of the class described consisting of a fixed contact, a tensioned contact normally out of alinement with said fixed contact, a lever of the third class having one end adapted to contact said tensioned contact and maintain engagement with the latter and said fixed contact, means for vertically adjusting the fulcrum of said lever, guide means for said lever and thermally-controlled means for moving said lever.

Executed December 27th, 1923.

EDWIN L. SMALLEY.