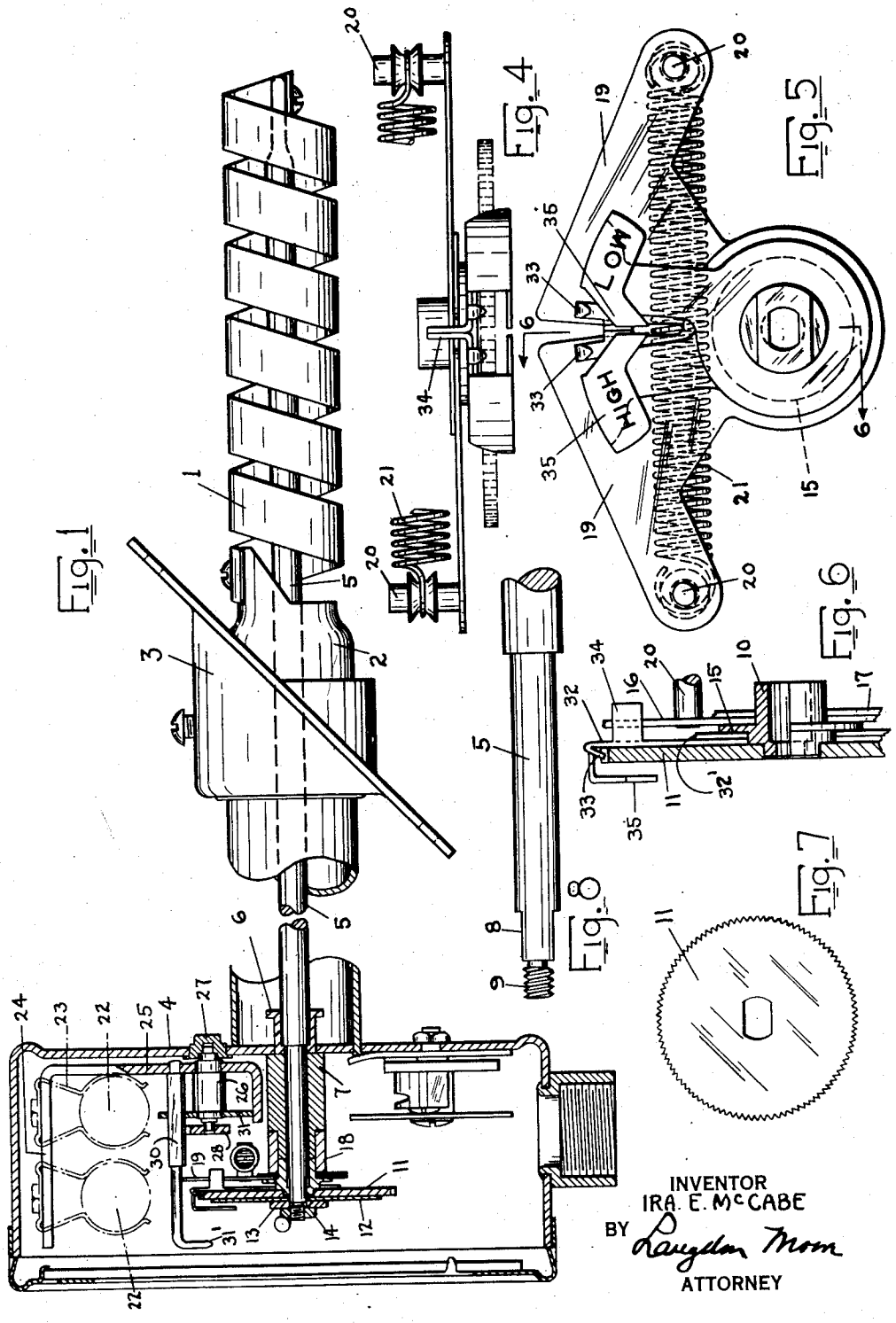
Dec. 1, 1931. I. E. McCABE 1,834,288

ELECTRIC SWITCH MECHANISM

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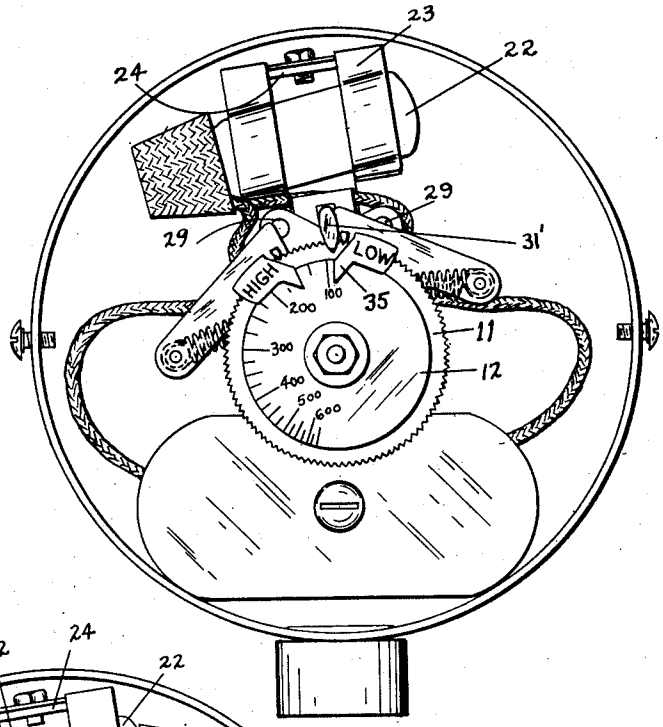


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ELECTRIC SWITCH MECHANISM

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Fig 2



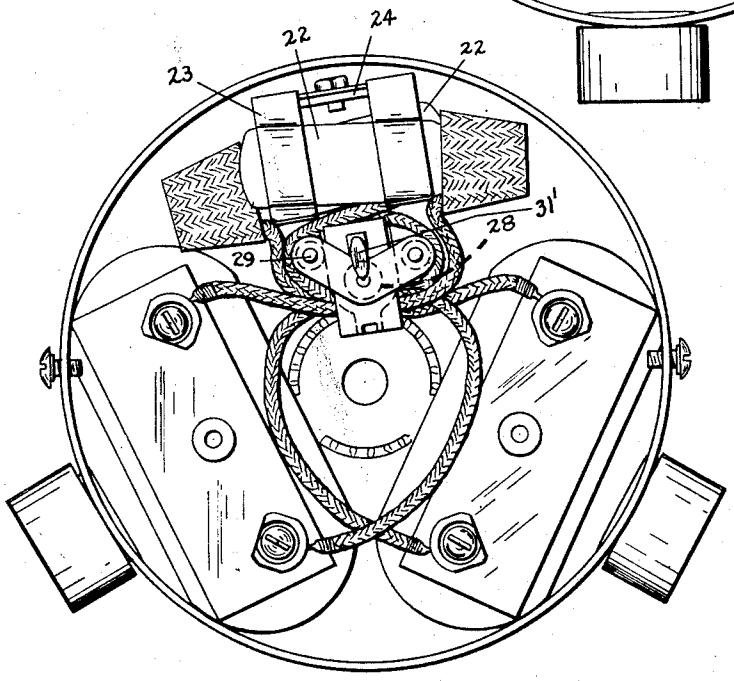


Fig 3

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UNITED STATES PATENT OFFICE

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ELECTRIC SWITCH MECHANISM

Application filed August 5, 1929. Serial No. 383,568.

This invention relates to improvements in electric switch mechanism and in particular to an electric switch mechanism which is responsive to temperature changes.

It is an object of this invention to provide a device of this character which is actuated by changes in temperature to make and break an electric circuit, and is advantageously employed as a safety device in electrically operated oil burning heating systems. The purpose of this device is to break the motor circuit of the oil burner and thereby discontinue the combustion in the furnace or heater when the temperature of the combustion reaches a degree which is dangerous to the furnace or heater. In order to produce a device of this kind which will be readily adapted to various types and sizes of heaters in which the degrees of heat produced by the combustion without endangering the furnace or heater may vary, in accordance with the respective types or sizes, it is necessary that the device be adjustable, and further desirable to have at hand indicating means showing the actual temperature of the furnace or heater in which the device is installed. It is another object of this invention to provide a safety device of this character which may be set on the job to break the motor circuit when the degree of temperature dangerous to the particular type or size of heater or furnace is approached.

This invention provides means for indicating the actual temperatures of the furnace and means for indicating the temperature at which the control will operate to make or break the circuits, together with means for quickly and conveniently adjusting the instrument to operate at the desired temperatures.

With these and other objects in view reference is made to the accompanying sheets of drawings which illustrate a preferred form of this invention with the understanding that minor detail changes may be made therein without departing from the scope thereof.

In the drawings:

Figure 1 is a view partly in side elevation and partly in vertical central longitudinal section illustrating the application of this invention with the mercury tube switches omitted.

Figure 2 is a view in end elevation of Figure 1 with the cover of the switch mechanism casing removed, illustrating the use of a single mercury tube switch.

Figure 3 is a view similar to Figure 2, illustrating the application of two mercury tube switches, and with the operating shaft and mechanism carrier thereby omitted.

Figure 4 is an enlarged detailed top plan view, with parts broken away, of the adjusting mechanism.

Figure 5 is a view in front elevation of Figure 4.

Figure 6 is a fragmentary detailed view in section taken on the line 6—6 Figure 5.

Figure 7 is a detailed view in front elevation of the toothed disc shown in Figures 1 and 2.

Figure 8 is an enlarged detailed view of that end of the operating shaft which mounts the operating mechanism.

In the embodiment of this invention illustrated upon the accompanying drawings, the thermostatic element is illustrated as a helical coil 1 of bi-metallic material, one end of which is secured to a housing 2 adapted to be inserted through the duct or casing of a furnace or heater employing an electrically controlled oil burner mechanism. The housing 2 is preferably held in position in the hot air duct or casing by an adjustable clamping member 3 and it is preferable to extend the housing through this member to engage the rear wall of the switch mechanism casing 4. The other end of the helical coil 1 is rigidly secured to an operating shaft 5 which passes through a bearing 6 in the rear wall of the casing 4, the shaft passing through this bearing also passes through a shouldered spacing member 7. The end of the shaft 5 terminating within the casing 4 is provided with oppositely deposed parallel flat cut-away surfaces 8, as shown in Figure 8, and at this extremity is screw threaded, as at 9. A flanged sleeve 10 is keyed upon the flat surfaced portion of the shaft 5 and a toothed disc 11 is keyed upon the sleeve 10, as shown in Figure

6. A disc 12, of less diameter than the disc 11, is preferably mounted on the end of the shaft 5 and held in engagement with the disc 11 by a washer 13 and nut 14 upon the screw threaded portion 9 of the shaft 5. The flanged sleeve 10 engages the spacing member 7 and is provided with an outstanding circular flange 15. Two plates 16 and 17 are rotatively mounted upon the sleeve 10 and are held against the flange 15 by a sleeve 18 interposed between said plates and the shoulder of the spacing member 7. The plates 16 and 17 are each provided with radial extensions 19, as shown in Figure 5, the extensions 19 of the plates 16 and 17 are provided with adjacent substantially radial edges with angular portions extending away therefrom. The ends of these angular portions opposite the respective radial edges are each provided with anchors 20 for engaging the opposite ends of a coil spring 21, the tension of which is sufficient to normally maintain the radial edges adjacent each other.

One or more mercury tube switches 22 are secured by clips 23 to a carrying arm 24 bent at right angles to a switch operating plate 25 which is pivotally mounted upon the pivot pin 26, mounted in the bearing 27 secured to the rear wall of the casing 4 and a bearing plate 28, held in spaced relation to the rear wall of the casing 4 by the posts 29, which also serve as stops limiting the movement of the operating plate 25 in either direction. An operating arm 30 is secured to the switch carrying plate 25 above its pivot 26 and held in parallel relation to said pivot by the plate 31 mounted thereon between the bearing plate 28 and switch carrier plate 25. The operating arm 30 extends beyond the bearing plate 28, passing over a cut-away portion thereof, and terminating in a downwardly extending finger or indicator 31^1 in advance of the toothed disc 11, said finger or indicator providing means of showing the actual temperature of the furnace or heater in which the device is installed.

The radial extensions 19 are of such proportions that the radial edges thereof may be brought into engagement with the switch operating arm 30. Between the toothed disc 11 and flange 15 two plates 32 and 32^1 are loosely mounted upon the sleeve 10. These plates are each provided with upwardly extending portions and each provided with bent down finger 33 adapted to engage in the teeth of the toothed disc 11, that portion of the plate directly below the toothed finger is provided with a bent back portion 34 adapted to pass between the radial edges of the extensions 19 of the plates 16 and 17, and that portion of the plate next above the finger is bent outwardly over the circumference of the toothed disc and then downwardly parallel to the surface of said disc and terminated in pointers 35, the edges of which are in line with the bent back portions 34 and each of these pointers are adapted to pass over the plate 12, as shown in Figure 2.

The fingers 33 are slidable over the toothed disc 11 and will normally hold the plates 32 and 32^1 of the fingers in contact with the toothed plate 11. The spring 21 of the radial extensions 19 of plates 16 and 17 will normally hold their respective radial edges against the backward extensions 34 of the finger carrying plates. The radial edges of the plates 19 upon rotation of the shaft 5 will, through the connection of the fingers 33 to the toothed disc 11 and portions 34, engage the switch operating arm 30 when the shaft 5 is rotated in one direction to move the arm 30 in that direction and tilt the switch carrying plate 28, thereby making or breaking, as the case may be, the circuit through the mercury tube 22, and when the shaft 5 is rotated in the opposite direction the radial extension 19 of the other plate will in the same manner engage the opposite side of the switch operating arm 30 and tilt the switch in the opposite direction. The fingers 33 may be manually moved to slide over the teeth of the disc 11 so that the relative relation of the radial edges of the plates 19 may be adjusted independently of each other and cause them to engage the opposite side of the switch operating shaft 30 as desired. The plate 12 on the outer side of the toothed disc 11 may be calibrated to display a temperature scale and, as seen in Figure 2, the pointers 35 are adapted to travel over such scale and by the proper manual adjustment of the fingers 33 upon the toothed disc 11 their respective radial extensions 19 may be so adjusted that the radial edges thereof upon rotation of the shaft 5 in one direction will engage the switch operating arm 30 and tilt the switch at a predetermined temperature and upon rotation in the opposite direction the other radial extension may be caused to engage the switch operating arm 30 at a predetermined temperature and tilt the switch in the opposite direction.

While Figure 2 illustrates a single mercury tube switch 22 it is obvious that two or more mercury tube switches might be supported as indicated in Figure 1. Figure 3 does illustrate two mercury tube switches mounted upon the switch carrying plate 25 tilted in one direction with a circuit closed in one switch and broken in the other, and it is obvious that when the switch carrying plate 25 is tilted in the opposite direction the closed circuit will be broken and the open circuit will be closed.

The fingers 33, while described as being slidable over the toothed disc 11 do not actually ride over the teeth of this disc but actually engage the teeth, when positioned, forming a lock between the finger carrying plates and toothed disc. The adjustment of the

fingers upon the toothed disc is performed by pressing the portion carrying the pointer 35 in the direction of the disc which will move the fingers out of engagement with the teeth so that the plates 32 and 32^1 may be rotated to the proper position and when the pressure is released upon the pointer 35 the resiliency of the plate will cause the fingers 33 to move forward and engage between two teeth of the disc. It is seen that by this construction an easy operable adjustment of the positions of the fingers is readily made and when the fingers are positioned the plates 32 and 32^1 are rigidly fixed to the toothed disc 11.

The coil spring 21 not only urges the abutment of the plates 16 and 17 toward the switch operating arm 30 but also allows a further movement of the operating shaft and toothed disc after the switch carrying plate has been tilted if the bi-metallic coil should expand or contract a greater degree than that required to tilt the switch plate, thereby preventing the possibility of the bi-metallic coil from taking a set.

What I claim is:

1. In a mercury switch mechanism, a thermal actuating member, an operating shaft actuated thereby, a tiltable switch carrying plate, means for tilting said plate, and means mounted upon the operating shaft for engaging said tilting means, and means for adjusting the time of said engagement.

2. In a switch operating mechanism, a thermal actuating member, a tiltable switch carrying plate, means upon the plate for tilting the same, an operating shaft actuated by the said thermal member, an operating disc fixed upon said shaft, adjustable abutments rotatably mounted upon said shaft adapted to engage the switch plate tilting means, and means for adjustably positioning and securing said abutments to said operating disc.

3. In a mercury tube switch operating mechanism, a tiltable mercury switch carrying plate, means thereon for tilting said plate, a thermal actuating member, an operating shaft actuated thereby, an operating disc secured thereon, abutment members rotatively mounted upon said shaft adapted to engage the switch plate tilting means, resilient means normally drawing said abutment members toward the tilting means, adjusting members rotatively mounted upon said shaft provided with means for engaging the abutment members and having means adapted to removably engage the operating disc, whereby said adjusting means may be manually positioned at predetermined points upon the operating disc and thereby position the abutment members to tilt the switch plate through the thermal actuating member at predetermined temperatures.

4. In a mercury tube switch operating mechanism, a tiltable mercury switch carrying plate, means thereon for tilting said plate, a thermal actuating member, an operating shaft actuated thereby, an operating disc secured thereon, abutment members rotatively mounted upon said shaft adapted to engage the switch plate tilting means, resilient means normally drawing said abutment members toward the tilting means, adjusting members rotatively mounted upon said shaft provided with means for engaging the abutment members and having means adapted to removably engage the operating disc, whereby said adjusting means may be manually positioned at predetermined points upon the operating disc and thereby position the abutment members to tilt the switch plate through the thermal actuating member at predetermined temperatures, said resilient means acting upon said abutment members providing means after the said abutment has tilted the switch plate to allow further movement of the operating shaft in the same direction.

5. In a mercury tube switch operating mechanism, a tiltable mercury switch carrying plate, means thereon for tilting said plate, a movable actuating member, an operating shaft actuated thereby, an operating disc secured thereon, abutment members rotatively mounted upon said shaft adapted to engage the switch plate tilting means, resilient means normally drawing said abutment members toward the tilting means, adjusting members rotatively mounted upon said shaft provided with means for engaging the abutment members and having means adapted to removably engage the operating disc, whereby said adjusting means may be manually positioned at predetermined points upon the operating disc and thereby position the abutment members to tilt the switch plate through the actuating member upon predetermined movements thereof, said resilient means acting upon said abutment members providing means after the said abutment has tilted the switch plate to allow further movement of the operating shaft in the same direction.

6. In a mercury tube switch operating mechanism, a tiltable mercury switch carrying plate, means thereon for tilting said plate, a thermal actuating member, an operating shaft actuated thereby, an operating disc secured thereon, a temperature scaled disc also fixed upon the said shaft, abutment members rotatively mounted upon said shaft adapted to be engaged to the switch plate tilting means, resilient means normally drawing said abutment members toward the tilting means, adjusting members rotatively mounted upon said shaft provided with means for engaging the abutment members and having means adapted to removably engage the operating disc and provided with pointers adapted to coact with the temperature sealed disc to indicate the temperature

to which the thermal actuating member is subjected, whereby said adjusting means may be manually positioned at predetermined temperatures indicated upon said temperature scaled disc and thereby position the abutment members to tilt the switch plate through the thermal actuating member at predetermined temperatures.

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