March 29, 1932. E. K. CLARK 1,851,564

THERMOSTATIC DEVICE

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Fig. 1.

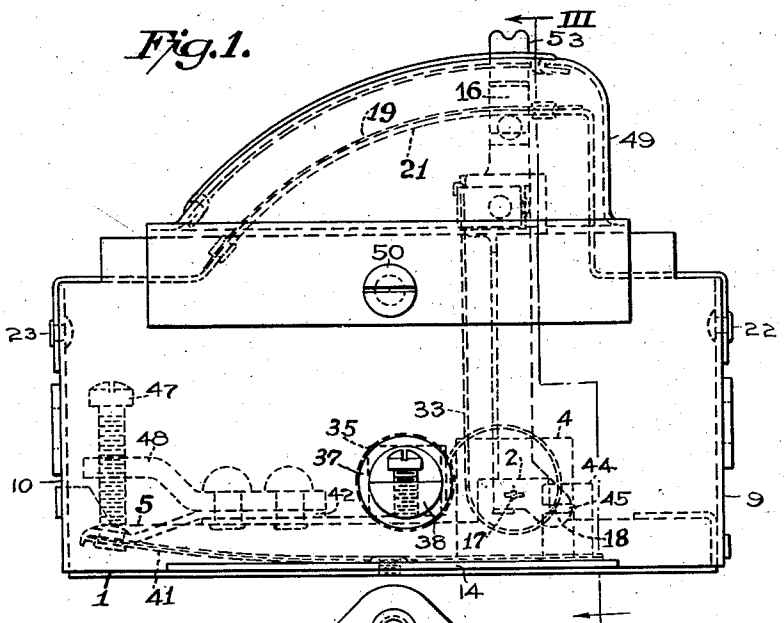
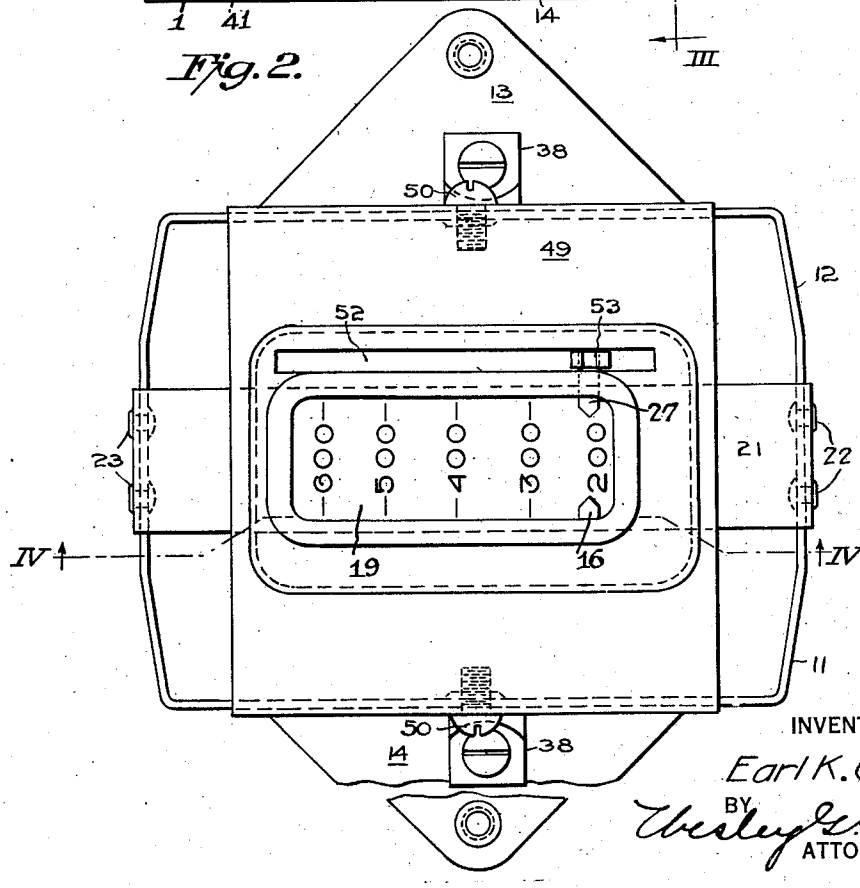


Fig. 2.



INVENTOR

Earl K. Clark

BY

Wesley S. Barr

ATTORNEY

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THERMOSTATIC DEVICE

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Fig. 3.

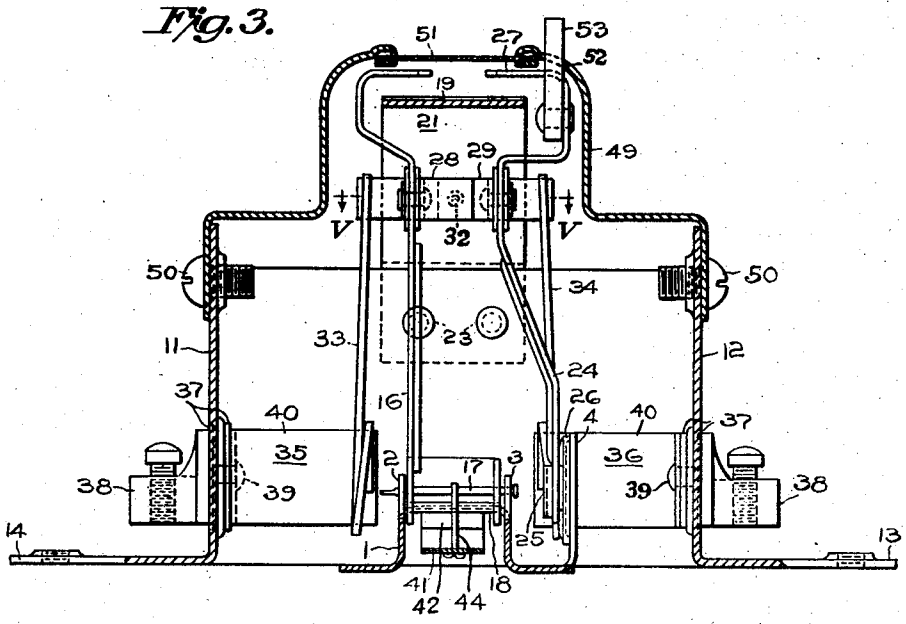


Fig. 4.

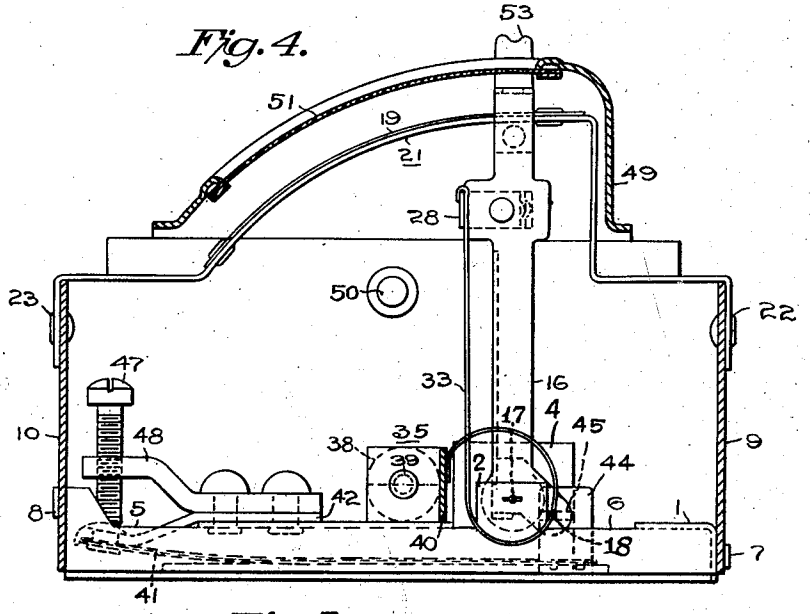
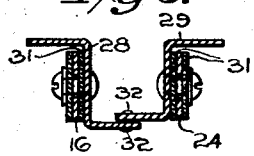


Fig 5.



INVENTOR

Earl K. Clark

BY

ATTORNEY

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Fig. 6.

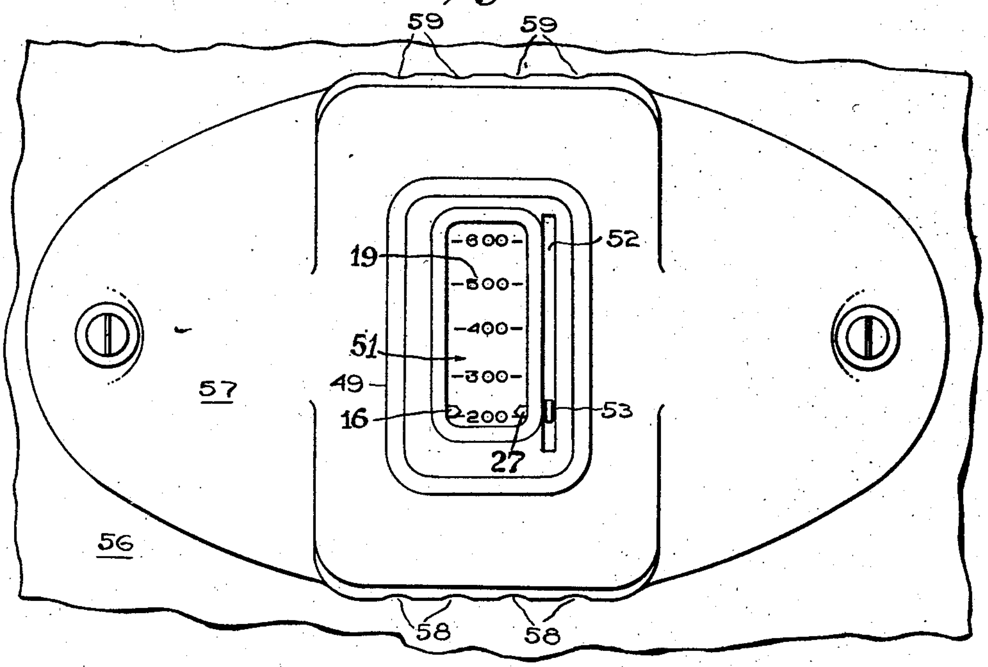
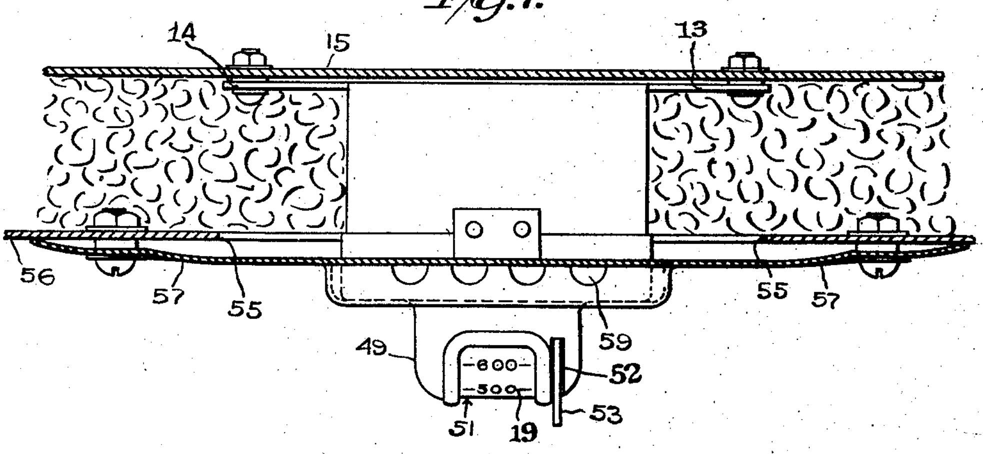


Fig. 7.



INVENTOR
Earl K. Clark
BY
Wesley G. Carr
ATTORNEY

Patented Mar. 29, 1932 1,851,564

UNITED STATES PATENT OFFICE

EARL K. CLARK, OF MANSFIELD, OHIO, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA

THERMOSTATIC DEVICE

Application filed October 20, 1927. Serial No. 227,441.

My invention relates to thermostatic devices and particularly to temperature indicating and controlling devices.

An object of my invention is to provide a thermostatic device that shall be simple in construction and efficient in its operation.

And a further object of my invention is to provide a temperature indicator and controlling device that shall closely follow the temperature of a body, whether that temperature is increasing or decreasing.

In practicing my invention, I provide a support on which an indicator and an adjustable control pointer are pivotally mounted. The indicator and pointer may be equipped with cooperating contact members in order that an electric circuit may be controlled thereby.

A bimetallic strip is provided for actuating the indicator in accordance with the temperature of a body to be controlled, the strip being yieldingly supported, at one end, by the support and having a pivotal connection to the indicator.

For a fuller understanding of my invention, reference may be had to the following description, taken in conjunction with the accompanying drawings, in which

Figure 1 is a view, in side elevation, of a thermostatic device embodying my invention,

Fig. 2 is a view in front elevation of the same device,

Fig. 3 is a view, in section, taken on the line III—III of Fig. 1,

Fig. 4 is a view, in section, taken on the line IV—IV of Fig. 2,

Fig. 5 is a view, in section, taken on the line V—V of Fig. 3,

Fig. 6 is a partial front plan view of the device shown in Figs. 1 to 4, inclusive, embodied in the door of an oven, and

Fig. 7 is a top plan view, partially in section, of the showing in Fig. 6.

In the drawings, a support 1, of substantially channel shape, is provided with integral upturned lugs 2, 3 and 4 and openings 5 and 6 located at the ends thereof. The ends of the support are provided with lugs or tongues 7 and 8 that extend through end walls 9 and 10 of an open-end casing comprising two substantially similar sheet-metal stampings 11 and 12 of substantially U-shape.

Each of the U-shape stampings is provided with a laterally extending flange 13 and 14 having screw-threaded openings therein, whereby the casing may be secured to an inner wall 15 of an oven door by bolts or other suitable means.

An indicating pointer 16, having a lower end portion of substantially L-shape, is pivotally supported on a pin 17 that extends through the portion of L-shape and the lugs 2 and 3. In order that a lever arm may be provided for turning the indicator 16 on its pivot pin 17, a pin 18 is provided that passes through the L-shaped portion of the indicator to the right of, and below, the pin 17, as viewed from Fig. 1.

The upper end of the indicator is provided with an offset portion of substantially U-shape that cooperates with a scale 19 of arcuate shape that is secured to a scale support 21, which, in turn, is secured to, and supported by, the casing at 22 and 23 by rivets or other suitable means.

The indicator is provided with a cooperating control pointer 24 that is pivotally secured to the lug 4 by a rivet 25. In order that the pointer 24 may be frictionally held in a predetermined position, a spring lock washer 26 is provided that is located between the lower end of the pointer 24 and the lug. As in the case of the indicating pointer 16, the control pointer is provided with an offset portion 27 of substantially U-shape at its upper end which cooperates with the scale 19.

In order that an electric circuit may be controlled by the indicating and control pointers 16 and 24, the pointers may be provided with contacts 28 and 29, respectively (see Figs. 3 and 5). The contacts are secured to the pointers by rivets or other suitable means and are insulated therefrom by washers 31 of insulating material.

In order that the point of contact between the contacts 28 and 29 may be protected from oxidation resulting from electric arcs, their engaging ends may be provided with silvered rivets 32. The outer ends of the contacts 28 and 29 are provided with flexible conductors

33 and 34 that are electrically connected to terminals 35 and 36, respectively, the latter being secured to the casing portions 11 and 12. The terminals 35 and 36 may be insulated from the casing by washers 37 of insulating material.

The terminals 35 and 36 being substantially similar, like parts will be designated by the same reference characters. These terminals comprise a substantially cylindrical connector 38 having a rivet portion 39, extending through the walls of the casing, and a strip 40 of substantially L-shape to which the flexible leads 33 and 34 may be connected either by brazing or other suitable methods.

The connectors 38 may be insulated from the casing by the mica washers 37, one of which fits into a depression in the casing and the other of which is located between the casing and the strip 40. As shown, the connectors 38 and the strips 40 are held securely together against the casing walls by the rivet portions 39.

In order that the indicating pointer 16 may be actuated in accordance with a thermal condition to be controlled, a bimetallic strip 41 is provided. One end of the strip 41 is secured to the free end of a cantilever spring 42 which, in turn, is secured to the support 1 by rivets or other suitable means. As shown in Fig. 1 of the drawings, the free end of the cantilever spring extends downwardly through the opening 5 in the support.

The free end of the bimetallic strip 41 is provided with a lug 44 having a recess 45 therein, in which the pin 18 of the pointer 16 is located. If the bimetallic strip 41 is deflected, either in an upward or in a downward direction, as viewed from Fig. 1, the pin 18 slides in the recess 45, depending upon the direction of the deflection. As the strip is deflected, the pointer 16 is caused to turn on its pivot pin 17. As is evident from Fig. 2 of the drawings, if the temperature of the strip 41 is increasing, the pointer 16 is caused to move up the scale 19, and if decreasing, the pointer moves in the opposite direction.

Since the point of contact between the lug 44 and the pin 18 changes as the strip 41 is deflected, the variation in the distance between the supported end of the strip and the point of contact between the pin 18 and the lug 44 is so compensated for that the indicating pointer 16 moves uniformly and substantially in direct proportion to the change in temperature of the strip.

Because the strip 41 is so secured to the spring 42 that the broad face or edge thereof is adjacent to the wall 15 of the oven door, the maximum area of the strip is subjected to the temperature of the oven wall or lining 15, which, of course, is at a temperature proportional to the temperature of the interior of the oven. As the maximum area of the strip is utilized for absorbing heat conducted to it from the oven wall, the strip will be sensitive and will respond quickly to temperature changes within the oven.

It is to be noted that, by supporting the bimetallic strip 41, as shown in the drawings, the strip may be positioned closely to the inner wall 15 of the oven; therefore, the strip will be subjected to a temperature substantially equal to that of the oven wall at all times. Because of its position, the bimetallic strip will follow closely temperature changes within the oven.

In order to adjust the zero position of the indicating pointer 16, an adjusting screw 47 is provided for adjusting the position of the free end of the spring 42, whereby adjustment of the position of the supported end of the bimetallic strip 41 may be effected also. The adjusting screw 47 has screw-thread engagement with a supporting member 48 that is secured to the support 1. For convenience in manufacturing, the spring 42 may be disposed between the support 1 and the supporting member 48 so that both the spring and the supporting member may be secured to the support 1 by the same rivets or securing means.

By adjusting the supported end of the bimetallic strip 41, the pointer 16 may be caused to indicate a temperature on the scale 19 that corresponds substantially to the actual temperature of the strip 41. Adjustment of the position of the pointer 16 obtained in this manner imposes no strains or initial stresses upon the strip, because only the position of the supported end of the bimetallic strip 41 is changed. The strip is not strained by adjusting it, because it is evident that the stress imposed is merely that of the weight of the pointer 16, which remains substantially constant over its range of travel.

In order that the temperature at which contact is made between the contacts 28 and 29 may be regulated, the control pointer 24 is moved manually to a position on the scale 19 indicating the actual temperature desired within the oven (not shown) of which the door (see Figs. 6 and 7) is a part. As the temperature of the oven increases, the strip 41 is caused to deflect and to actuate the pointer 16 up the scale until the contacts 28 and 29 engage each other, thus causing an electric circuit (not shown) for energizing heating elements located in an electric oven (not shown) which are well-known to those skilled in the art, to be deenergized.

The indicating and control pointers and operating mechanism disposed in the casing may be protected from external forces by a cover 49 that is secured to the top end of the casing by screws 50. The cover is provided with a window 51, in order that the scale 19 may be visible to the operator, and a slot 52 through which a handle 53 extends. The handle is secured to the upper end of the

control pointer 24, in order that it may be moved to any predetermined position from without the casing.

As shown in Figs. 6 and 7 of the drawings, the thermostatic device illustrated in Figs. 1 to 4, inclusive, is inserted through an opening 55 in an outer wall 56 of the oven door, the thermostat being secured to the inner wall 15, as previously set forth herein. When the thermostatic device is in place, an escutcheon plate 57, having an opening through which the cover 49 extends, is secured to the outer wall 56 of the door.

The middle portion of the escutcheon plate and the outer wall of the oven door so interfit with the upper end of the thermostat casing that the openings between the ends of the cover and the end walls of the casing are closed, thereby preventing insulating material, located between the oven walls, from getting into the thermostat (see Figs. 6 and 7).

The escutcheon plate is provided with openings 58 and 59 at its bottom and top edges, through which air currents may circulate; therefore, the thermo-responsive bimetallic element 41 will not be located in a dead air space as a result of the "chimney effect" produced by the escutcheon plate. The forwardly extending part of the casing is maintained at a relatively low temperature, thus making accidental burning of an operator practically impossible.

Since the air circulates continually about the bimetallic element, the element will follow closely the temperature changes which take place within the oven. By properly proportioning the dimensions of the bimetallic element and properly adjusting the pivotal connections between its free end and the indicating pointer, the thermostatic device may be caused to follow substantially the exact temperature within the oven, that is, if the oven is being heated, the pointer 16 will indicate a temperature on the scale 19 that is substantially equal to the exact temperature within the oven and, if the temperature is decreasing, the pointer will indicate on the scale substantially the exact temperature of the oven as it cools. Therefore, it is seen that the "chimney effect" produced by the openings in the escutcheon plate and the open casing structure in which the bimetallic strip is located causes the bimetallic member 41 to follow substantially the exact temperature within the oven.

Various modifications may be made in the device embodying my invention without departing from the spirit and the scope thereof. I desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art and the appended claims.

I claim as my invention:

1. In combination, a casing, a support therein adjacent to an open end thereof, an indicator pivotally mounted on the support, and a substantially straight flat bimetallic strip having one end yieldingly and adjustably mounted on said support and the other end pivotally connected to said indicator, said strip having its broad side located closely adjacent to the open end of the casing.

2. In combination, an elongated support of substantially channel shape in lateral section, an indicator pivotally mounted thereon, and a substantially straight flat bimetallic strip located within the channel portion of the support and having one end yieldingly mounted thereon and the other end having a pin-and-slot connection with said indicator, said strip having its broad side adjacent to the support.

3. In a thermostatic device, in combination, a casing having an open end adapted to be located closely adjacent to a heat-receiving member whose temperature is to be indicated, an elongated support extending along, and spaced from, said open end of the casing, an indicator of substantially L-shape and having legs of unequal length, pivotally mounted adjacent to one end of the elongated support, the longer leg extending away from the plane of the elongated support at substantially right angles thereto, a pin adjacent to the end of the shorter leg, a bimetallic strip located between the support and the adjacent open end of the casing, a resilient and adjustable mounting means for one end of the bimetallic strip and located near the other end of the support, and a slotted lug at the other end of the bimetallic strip for receiving the pin, whereby a substantially uniform movement of the end of the longer leg of the indicator is obtained for equal changes in temperature over a wide range.

4. In a thermostatic device adapted to be mounted in an opening in an outer wall of a double-wall oven structure, in combination, a casing having a portion adapted to extend in front of the front wall of the oven structure, an elongated support of channel shape in lateral section located adjacent to the rear end of the casing, a substantially straight flat bimetallic strip adjustably and resiliently secured to the elongated support near one end of the support, an indicator pivotally mounted on the elongated support near the other end of the support, a pin-and-slot connection between the indicator and the free end of the bimetallic strip, and an arcuate scale over which the movable end of the indicator may move, said scale being located in that part of the casing adapted to extend in front of the front wall of the oven structure.

5. A thermostatic device for a heated appliance, including an elongated support, an indicator pivotally mounted near one end of the support, and a substantially straight flat

bimetallic member having one end yieldingly mounted near the other end of said support and its other end having a pin and slot connection with said indicator, the support being arranged to present a broad face of the bimetal to an appliance with which the thermostatic device may be associated.

6. A thermostatic device including an elongated support having a plane surface, an indicator pivotally mounted near one end of the support, a substantially straight flat bimetallic member having one end yieldingly mounted near the other end of the support and its other end operatively engaging the indicator, and means mounted on said support for adjusting the position of the yieldingly mounted end of said bimetallic member in a direction at right angles to its flat surface.

7. A thermostatic device including an elongated support having a plane surface, an indicator pivotally mounted near one end of said support and extending laterally away from the plane surface, a leaf spring having one end secured near the other end of the support and the other end unsupported, a substantially straight flat bimetallic member having one of its ends secured to the unsupported end of said spring, a pin and slot connection between the other end of the bimetallic member and the indicator, and means mounted near said other end of said support and engaging the unsupported end of the leaf spring for adjusting the position of that end of the spring and one end of the bimetallic member in a direction at right angles to its flat surface.

8. A thermostatic device including an elongated support having a plane surface, an indicating member pivotally mounted near one end of the support and extending laterally therefrom, said indicating member having a lever arm extending from the pivotal mounting in a direction longitudinally of the plane surface of the support, a pin extending through said lever arm, a substantially straight flat bimetallic member having one of its ends supported near the other end of the support, and a lug secured to the other end of the bimetallic member, said lug having a slot therein extending in a direction longitudinally of the bimetallic member, through which said pin extends.

In testimony whereof I have hereunto subscribed my name this 6th day of October, 1927.

EARL K. CLARK.