

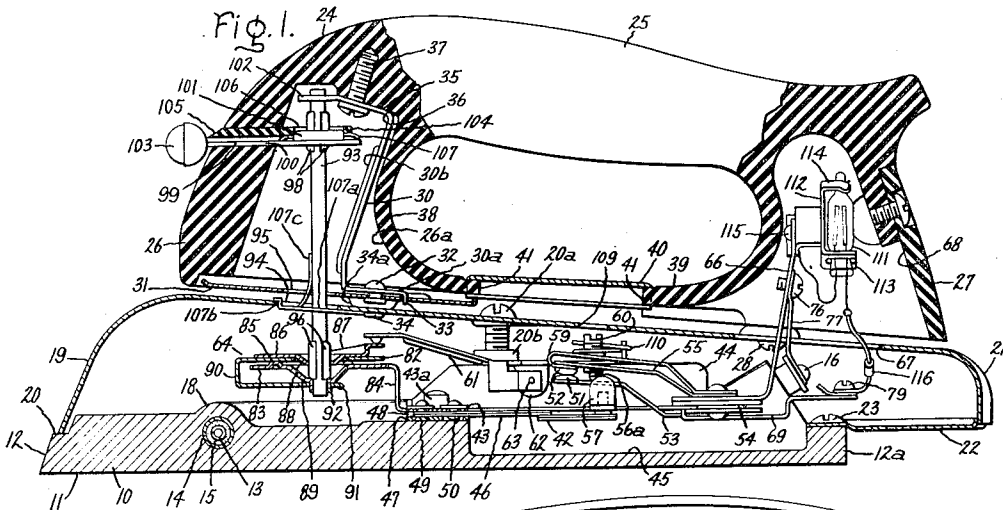
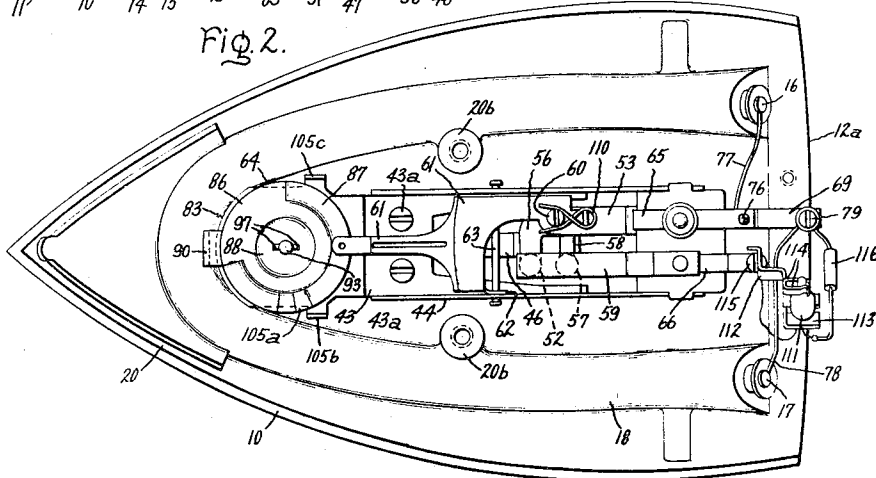
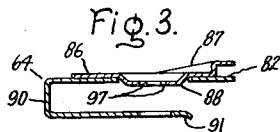
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THERMOSTAT CONTROL CAM FOR AUTOMATIC FLATIRONS

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2,602,352

THERMOSTAT CONTROL CAM FOR
AUTOMATIC FLATIRONS

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676,909. Divided and this application May 31,
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4 Claims. (Cl. 74-567)

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This invention relates to flatirons, more particularly to electrically heated flatirons, and it has for its object the provision of improved means for controlling the flatiron temperature.

More particularly, this invention contemplates improvements in thermostatic means for controlling the iron heating means to hold pre-selected soleplate temperatures, and it contemplates an improved organization of elements resulting in an inexpensive, reliable and easily adjustable thermal control device; more especially one which includes a manually operable adjustable control element located at the front upper part of the iron.

The present application is a division of my earlier application, Serial No. 676,909, filed June 15, 1946, now Patent No. 2,543,736, and assigned to the same assignee as the present application. The control cam for the thermostat, and its mounting in the flatiron, will be claimed here.

For a more complete understanding of this invention, reference should be had to the accompanying drawings in which Fig. 1 is a vertical side elevation of an electrically heated flatiron embodying this invention, parts shown in section so as to illustrate certain structural details; Fig. 2 is a plan view of certain of the elements shown in Fig. 1; and Figs. 3 and 4 are elevations of the cam elements used in the thermal control, parts being broken away for clarity.

Referring to the drawings, this invention has been shown in one form as applied to an electrically heated flatiron comprising a soleplate 10 having at its bottom the usual pressing surface 11, which plate will be made of any suitable metal, such as aluminum, and which preferably will be cast from the metal. The soleplate has the usual shape provided with a point 12 at the forward end, and having a slightly rounded heel edge 12a opposite the point. The soleplate is heated by means of an electrical heating element which preferably is of the sheathed type, and comprises a helical electrical resistance conductor 13 (Fig. 1) mounted within a tubular sheath 14 and imbedded in and held in spaced relation to the sheath by a compacted mass 15 of electrically insulating and heat conducting material, such as compacted granular magnesium oxide. Connected to opposite ends of the resistance conductor 13 and projecting from the two ends of the sheath are terminals 16 and 17. The heating element has roughly the shape of a U (Fig. 2), and it is arranged in the soleplate 10 with its bight located at the pointed end 12 of the iron and its terminals 16 and 17 at the heel end of the

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iron. Preferably, the heating element is cast within the body of the soleplate, as shown, the metal of the plate cast about the upper part of the element forming an upright rib 18.

The soleplate is covered by means of a shell 19, which has its lower edge resting upon a ledge 20 formed on the opposite sides of the soleplate, and which is secured by means of a pair of transversely-spaced screws 29a tapped into upright bosses 20b formed on the soleplate. The shell slopes downwardly from its forward end to the rear, and at the rear it is provided with a downturned wall 21 which is spaced to the rear of the soleplate heel edge 12a, as shown, and which constitutes a heel rest for the iron. The space between the heel edge 12a and the downturned wall 21 is closed by means of a plate 22 attached to the soleplate by means of screws 23 and projecting outwardly therefrom to engage the inner surface of the wall 21.

Mounted on the top of the shell is a handle 24 formed of any suitable material, but preferably it will be molded of an electrically insulating material such as a phenolic condensation product. The handle is provided with a hand-grasping portion 25 running from the front to the rear of the iron, and with a forward skirt section 26 and a rear upright section 27 formed integrally with the handgrasping portion. The rear section 27 constitutes a support for the rear end of the hand-grasping portion 25 and is secured to the rear end of the shell by a pair of screws 28 spaced apart transversely of the shell (only one being shown in Fig. 1); preferably, and as shown, the screws will pass through upright bosses 29 (Fig. 1) formed upwardly from the material of the shell and which function to space the rear handle support 27 from the shell, and thereby thermally insulate it from the shell.

The forward end of the hand-grasping portion 25 is supported by means of a metallic upright bracket 30 having roughly the shape of a Z. This bracket, as shown, extends upwardly into a cavity 26a provided by the skirt 26. The lower arm 30a of this bracket rests upon a baffle plate 31 which is mounted on the top wall of the shell 19. It is secured to the baffle plate by means of a rivet 32 and is prevented from moving about the axis of the rivet by means of a downturned section 33 which is received in an aperture provided for it in the baffle plate. The baffle plate 31, in turn, is secured to the top wall of the shell by means of a pair of transversely spaced rivets 34 (only one shown) positioned on opposite sides of rivet 32, and extending through downwardly extending

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bosses 34a formed in the baffle and spacing it from the shell. The baffle is held in spaced relation with the shell by means of the down-turned bosses 34a around the rivets and which are formed from the material of which the baffle is made. The upper arm 35 of the Z-shaped bracket 30 bears against a seat 36 provided at the top of the recess 26a and it is secured to the handle by means of a self-tapping screw 37. The bracket is provided with a vertical strengthening rib 30b extending along its length, as shown.

The function of the forward skirt section 26 of the handle is to conceal the front handle support 30; it is, as shown, in the form of an apron extending downwardly from the forward end of the hand grasping portion 25. This apron at its lower rear end 38 curves back over the top of the shell, as shown. The rear handle section 27 is provided with a similar apron 39 extending forwardly toward the apron 38, as shown, and the space between the ends of the two aprons 38 and 39 is filled by means of a metallic plate 40. The plate 40 is formed of a metal which is inherently resilient, and it is caused to resiliently engage the two aprons 38 and 39, whereby it is secured to the handle; each apron preferably and as shown is provided with reduced end extensions 41, while the baffle plate 40 is given a complementary shape in cross section whereby it may be snapped over the two reduced sections. To remove the plate, it is merely necessary to insert a screw driver—or some other similar instrument—under one side and pry it up to spring it away. When the plate is assembled, as shown in Fig. 1, its top surface merges in a smooth line with the curved aprons.

The handle and baffle plate structure just described is described and claimed in my Patent 2,443,448, assigned to the assignee of the instant application.

The thermostatic control switch and its mounting in the flatiron as described below is the subject of my patent application, Serial No. 165,216, filed concurrently herewith, and also a division of my application, Serial No. 676,909, now Patent No. 2,543,736.

The heating element is controlled by means of a thermostat 42 which is arranged to respond to the temperature of the soleplate so as to hold a substantially constant temperature in the plate. This thermostat comprises a supporting frame having a U-shaped base plate 43. The bight of the base is secured to the top surface of the soleplate by means of a pair of screw 43a (Fig. 2). At the outer edges of the two legs of the base plate are upright walls 44 which extend rearwardly from the bight, across the top of the soleplate. Preferably, the section of the soleplate under these rearwardly extending walls is cored out so as to form a cavity 45 (Fig. 1).

Secured under the bight of the base plate 43 is a bimetallic temperature responsive bar 46 formed of two metals having dissimilar temperature coefficients of expansion rigidly secured together lengthwise in any suitable way, as by welding. Preferably, and as shown, this bar will be formed of two reversed sections in order to minimize temperature overshoot in the fashion described and claimed in the U. S. patent to R. A. Winborne No. 2,128,869, dated August 30, 1938. The thermostat bar 46 has its left-hand end, as viewed in Fig. 1, secured to the base plate 43 and its opposite end extended over the cavity 45. Clamping the thermostat bar 46 to the base plate 43 is a clamping block 47 formed of a material

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having a very good heat conductivity, such as aluminum. This block is provided with a central longitudinal channel-like passageway 48 in which the bimetal bar is mounted. The forward part of this block is clamped to the bimetallic bar 46 and to the base plate 43 by means of a rivet 49. The thermostat bar is further secured to the base plate by a rivet 50 spaced rearwardly from the rivet 49, and which is not fastened in any way to the block.

The thermostatic switch further comprises a switch having a contact 51 and a cooperating contact 52. The contact 51 is mounted upon an electrically conducting arm 53 formed of a relatively stiff spring material. This arm, at its rear end, is rigidly secured by means of a rivet to and under a transverse section 54 of the supporting frame which joins the rear ends of the upright walls 44 of the base plate, and it is electrically insulated from this plate by suitable material such as sheet mica. The contact 52 is mounted upon a switch arm 55, likewise made of spring material, but which has not the spring strength of the arm 53. The arm 55 is supported at the rear upon the top of the plate section 54 by means of a rivet and is electrically insulated from the plate by mica. The two switch arms 53 and 55 are spaced apart transversely and are in substantially parallel relation, but the forward end of the arm 53 is provided with a lateral offset 56 extending to the arm 55 so as to bring its contact 51 into abutting relation with the contact 52.

The switch arm 53 biases its contact 51 upwardly, whereas the arm 55 biases its contact 52 downwardly; but the switch arm 53 bears against an adjustable stop 56a so that the contact 51 normally is a fixed or stationary contact; the contact 52 is the movable one and is operated to open and close the switch responsively to the deflection of the bimetal bar 46 as it heats and cools. The bar 46 is constructed and arranged so that its free end moves upwardly as it heats up and moves downwardly when it cools. Mounted on this free end of the bimetal bar is an upright switch actuator 57. This actuator is laterally positioned with reference to the bimetal bar so that it lies directly under the spring arm 55. The actuator 57 is in the form of a tube closed at its upper end and is mounted upon the upright arm of a right angle bracket 58, the other arm of which is secured in any suitable way to the end of the thermostat, as by welding. The actuator 57 is formed of a suitable refractory electrically insulating material, and it is secured to the bracket 58 by means of a suitable cement.

The switch contacts 51 and 52 are connected in the iron heating circuit to control its energization by opening and closing. When the iron is energized but has not as yet been heated up, the top of the actuator 57 is spaced below switch arm 55, as shown in Fig. 1. But when the thermostat moves upwardly as its temperature rises, it will move the actuator upwardly to close this space and engage the switch arm 55 to move it upwardly against its downward bias and thereby open the contacts 51 and 52, whereas when the thermostat cools and deflects downwardly it permits the switch arm 55 to return the contact 52 to re-engage contact 51 and thereby reclose the switch.

In operation, therefore, the switch arms 53 and 55 carry current for the iron heating element. These arms preferably will be made of stainless steel or other suitable heat resisting alloy. Such materials which may be used at flatiron tempera-

tures have high specific resistances. This causes some heating of the springs due to the passage of current. In the case of spring 53, this is not too important, because it is relatively thicker than spring 55 and its resistance, therefore, is less. However, in the case of spring 55, this is important, both because with its higher resistance it tends to heat to higher temperatures and because it may conduct heat to the thermal bar through the switch actuator 57. This switch arm, if heated too high, would act as an auxiliary booster heater for the thermostat bar, and cause it to operate with too narrow a temperature amplitude. To obviate this, I shunt the spring arm 55 with a good heat conducting strip 59 which, as shown, overlies and is connected at one end with the switch arm and terminal 65 by the rivet fastening these members together, and at its other end is fastened between the other end of the switch arm and its contact 52. The shunt is made of brass, aluminum or other suitable good electrical conductor.

It will be remembered that the switch arm 53 holds the contact 51 in a stationary position, and further that the spring arm 53 is stronger than is the spring of the arm 55. The arm 53, however, is prevented from moving upwardly by means of the aforementioned stop 56a, which is made of electrically insulating material and is mounted within adjusting screw 60 which, in turn, is threaded in one end of a lever 61. This lever intermediate its ends and at the sides is provided with down-turned ears 62 which are journaled upon a transverse shaft 63 which passes through the ears and the side walls 44 of the base plate and which has its ends pinched or squeezed, as shown in Fig. 2, to prevent the shaft from working loose. The end of the lever 61 opposite the adjusting screw 60 rests upon an adjusting cam 64 (claimed in the present application) by means of which the position of the lever and thereby the position of the stop screw 60 may be adjusted. This adjustment varies the position of the stop 56a and this varies the positional relationship between the switch arm 53 and, consequently, the arm 55 and the actuator 57. This changes the temperature setting of the control device.

As described more fully in my application Serial No. 676,909, the switch 51, 52 is electrically connected in series with the circuit of the heating resistance 13 of the heating element, and for this purpose there is provided a terminal structure comprising a pair of rigid terminals 65 and 66 of roughly L-shape having their horizontal legs mounted on the top of the transverse plate 54 of the thermostat frame and their upright legs extended upwardly through an opening 67 in the top wall of the shell 19 and into a relatively large cavity 68 provided in the rear handle section 27, as shown. The terminal 65 is electrically insulated from the plate 54 and from both switch arms 53 and 55, whereas the terminal 66, while it is electrically insulated from the plate 54 and the terminal 65, is in electrical contact with the switch arm 55. The terminal structure further comprises a third rigid terminal bar 69 which is mounted under the plate 54 and projects outwardly toward the rear of the shell from the plate. This terminal 69 also is electrically insulated from the other two terminals and the plate 54, but is in direct electrical engagement with the switch arm 53. The three terminals 65, 66, 69 are secured by means of the rivets which hold the two switch arms on the plate 54.

The terminals are adapted to be electrically

connected to an electrical supply source by means of a twin supply conductor (not shown) entering into the recess 68 in the rear handle section 27 through an aperture in a side wall of this recess, as shown in my application, Serial No. 676,909. One conductor of the supply cord is connected to the terminal 65 by means of a screw 76 and by means of the same screw and a conductor 77 is electrically connected with the terminal 16 of the heating element. The other terminal 17 of the heating element is connected with the terminal 69, which is in electrical engagement with the switch arm 53, by means of a conductor 78 connected at one end to the terminal 17 and at its other end with the terminal 69 by means of a screw 79. The terminal 66, which is in electrical engagement with the switch arm 55, is electrically connected with the other conductor of the supply cord by suitable means.

In view of these connections, it will be observed that the switch contacts 51 and 52 are electrically connected in series with the heating element resistance 13 and with the supply source so that when the switch contacts are in engagement the heating element is energized, whereas when they are opened the heating element is deenergized. The thermostat 46, in operating the switch contact 52 away from and to return into engagement with contact 51 in response to rise and fall in temperature, operates to hold the desired temperature in the soleplate.

The thermostat switch mechanism and mounting just described is more fully described and claimed in my concurrently filed application, Serial No. 165,216.

As has been explained previously, the temperature held in the soleplate may be varied by varying the position of the contact 51 which varies the space between the switch actuator 57 and the switch arm 55 and this is accomplished by changing the position of the abutment 56a; this, in turn, is accomplished by setting the cam 64, which varies the position of the lever 61. The cam 64 comprises a circular disc-like base plate 82 which is arranged to rotate upon a support 83 which is formed as an extension of the base plate 43 of the support frame, this support 83 being positioned in elevated relation from the plate 43 by a vertically offset section 84. The part 83 not only supports the cam, but it functions as a bearing for the cam base plate 82, and for this purpose it is provided with a plurality of upright rounded bosses 85 which engage the under surface of the cam plate. Superimposed upon and secured to the cam plate 82 is a circular cam member 86 shaped to define a cam rise 87 on its periphery. It is secured to the cam base plate in any suitable way, as by spot welding. At the center the cam member 86 is provided with a cone-shaped depression 88 which extends downwardly through a central aperture provided for it in the base plate 82; and the cam bearing 83 likewise is provided with a cone-shaped depression 89 at the center. The cam 64 is secured to the extension 83 by means of a spring 90 which is formed integrally with the cam base 82 and extends outwardly from one edge thereof and, thence, is folded thereunder, as shown in Fig. 1. On the end of the spring 90 there is formed a lip 91 and also an aperture which is received by an extrusion 92 formed on the frame at the lower end of the depression 89. To assemble the cam with the extension 83, the assembly of the cam and spring is slipped over one edge of the ex-

tension and the spring snapped over the extrusion with the aperture in its end receiving the extrusion. The lip helps to snap the spring over the extrusion. The action of the spring 90 holds the cam plate 32 against the protuberances 85 upon which it rides.

The cam 64 is rotated by means of a rod 93 which is vertically positioned in the forward end of the iron, and which extends upwardly from the cam structure through openings 94 and 95 provided for it in the top wall of the shell and in the baffle plate 31, respectively, and thence extends upwardly into the recess 26a provided by the skirt 26 at the forward end of handle 25. At its lower end, this shaft is provided with a pair of keys 96 positioned on opposite sides of the shaft and which preferably will be formed by squeezing or pinching out sections of the shaft. These keys are arranged to operate in complementary slots 97 provided in the cam plate 86. They also function to ride upon the top surface of the bottom wall of the conical depression 89 in the support 83 and thereby support the shaft in its vertical position.

As described and claimed more fully in my aforesaid application, Serial No. 676,909, at the top of the shaft 93 there is a pair of oppositely positioned keys 98 similar to the keys 96 and preferably arranged in the same angular relation with reference to the shaft as are the keys 96. The keys 98 at the top of the shaft effect a driving connection with an operating lever 99 which is positioned at right angles to the shaft and which extends outwardly through the front wall of the recess 25a, the wall being provided with an elongated transverse slot 100 for this purpose. The lever 99 on its inner end is provided with an upwardly extending inverted cup-shaped protuberance 101 which is provided in its upper wall with slots (not shown, but similar to slots 97) and which receive the keys 98 to effect a driving connection between the lever and the shaft. Thus, when the lever 99 is operated transversely in the slot 100, the shaft 93 is rotated in order to adjust the cam.

The upper end of the shaft 93 is journaled in a bearing provided for it in an extension 102 provided on the forward end of the upper arm 35 of the handle support 30.

On the forward end of the lever 99 which projects from the slot 100, there is attached an operating knob 103.

Also mounted within slot 100 is a temperature indication plate 104 which is roughly semi-circular in shape and which is so constructed and arranged that when it is inserted in the slot 100 a peripheral portion 105 thereof is exposed to view, and upon this exposed portion there are suitable indications for soleplate temperature settings for ironing various materials, such as rayon, silk, wool, cotton and linen. Also, it has an indication for "off," in which position of the lever 99 the cam is so positioned that it moves the contact 51 downwardly so far that it leaves the contact 52 which will be held in an upper open position by the actuator 57. The cam rise surface 87 gradually rises from a high temperature setting position corresponding to "linen" to a low temperature position corresponding to "rayon" and then has an abrupt rise 105a which is the "off" position; in this position of the cam, the lever 61 is operated to depress the abutment 56a so far downwardly that switch arm 53 separates its contact 51 from contact 52, which latter contact is supported by the actuator

57 on the thermostat. As the cam is rotated from the "off" position, it first permits the arm 53 to rise to reclose the contacts and, thence, as it continues to move, increases the space between actuator 57 and switch arm 55, and thereby increases the temperature setting. Upright ears 105b and 105c function to limit motion of cam 86 in assembly and insure proper positioning of the cam.

The indicator plate 104 is provided with a circular opening 106 which receives the upwardly extending boss 101 of the lever 99, and around this boss and sandwiched between the lever 99 and the plate 104 is a cup-shaped spring 107 which biases the two members apart and which holds them firmly in the iron assembly by forcing them against the upper and lower walls of the slot 100 respectively.

It will be understood that to assemble the shaft 93, the lever 99 and the indicating plate 104 with their associated parts, first the shell 19 with the handle attached will be separated from the soleplate, then the lever 99 will be assembled with the spring 107 and with the temperature plate 104 in their proper relative positions shown in Fig. 1. This assembly will then be inserted into the slot 100. Then the shaft 93 will be inserted through the chamber 26a so that its upper end passes through the apertures in the lever and indicating plate and so that its keys 98 are received in the slots provided for them in the protuberance 101. The shaft, of course, is forced inwardly until its upper end is received in the opening provided for it in the bracket extension 102. Preferably, means will be provided for holding the shaft up in its assembled position. This means comprises a spring member 107a of roughly U-shape positioned under and against the lower surface of the top wall of the shell. The legs of this member straddle the shaft 93, and at the outer edge of the bight of the U there is an upwardly and outwardly offset tongue 107b which has its top outwardly extending part overlying the top wall of the shell. Formed on the inner edge of the bight between the two legs is an upright flexible spring arm 107c which bears against the shaft and holds it in place. The spring also functions to prevent rattling of the shaft when the iron is in use. After the shaft is assembled, as described, and the spring 107a applied, the handle and shell are moved into assembled relation with the soleplate, while the lower end of the rod 93 is moved into the conical protuberance 88 of cam 86 which guides it to the central slots 97 therein, and, thence, into the conical projection 89 of frame 83 which guides it to its central aperture. If, when the shell is assembled, the keys 96 do not register with the slots 97, the knob 103 will be moved back and forth until they do; and when they do the shell may be lowered in position on the soleplate, and then secured by the screws 20a. After this, the cover plate 40 may be snapped in place to cover the screws.

While the knob 103 is used by the operator to adjust the temperature setting, at times it may be desired to change the basic calibration of the thermostat. This may be done readily by adjusting the screw 60 in which the insulator 56a is supported. This may be done conveniently through an opening 109 provided in the top wall of the shell 19 immediately above the screw and through which a suitable instrument, such as a screw driver may be inserted to set the screw.

It will be observed that the screw 60 is accessible when the plate 40 is removed. Preferably, a spring 110 will be provided to hold the screw 60 in any position in which it is adjusted.

Suitable signal means are provided for indicating when the thermostat is closed and when it is opened. This means comprises a gas glow lamp 111 located within the chamber 68 of the rear handle section 27. This lamp is mounted in a U-shaped bracket 112 having a base 113 at the bottom supporting the base of the lamp, and a pair of prongs 114 at the top resiliently engaging and holding the other end of the lamp. The bracket 112 is attached to the terminal 66 by means of a rivet 115. One terminal of the lamp is electrically connected with the terminal 66 and thereby to the supply conductor by being clamped between the terminal and the bracket. The other terminal of the lamp is connected with the terminal 69 through a current limiting resistance 116. In view of this arrangement, it will be observed that when the switch is closed the lamp will be short-circuited and thereby be de-energized whereas when the switch is open the lamp will be connected in series with heater 13 and across the supply source and thereby energized to light. The lamp is viewed through a window or opening (not shown) located in the side wall of the chamber 68 opposite the lamp.

While I have shown and described a particular embodiment of my invention, it will be obvious to those skilled in the art that various changes and modifications may be made without departing from my invention in its broader aspects and I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In an adjustable cam structure a bearing plate having on one side a bearing surface provided with an opening therein, said plate having a cylindrical protuberance on the other side extending from said opening, a cam mounted on said bearing surface for rotation thereon, a spring retaining element attached thereto and directed about the edge of said plate to said other side where it rotatably engages said protuberance to retain said cam in engagement with said bearing surface.

2. In an adjustable cam structure, a bearing plate having on one side a bearing surface provided with a central opening therein and a plurality of circumferentially spaced upright bear-

ing bosses thereon, said plate having on its other side a cylindrical protuberance extending outwardly from around said opening, said cam resting on said plurality of bosses for rotation thereon on the axis of said opening, and a U-shaped spring arm attached to said cam and passed over the peripheral edge of said plate to said other side where it rotatably engages said protuberance to hold said cam on said plate.

3. In a cam structure, a horizontal plate having an opening from which depends an inwardly tapered protuberance having therein a central circular aperture, a horizontal cam rotatable on the upper surface of said plate in the axis of said opening, said cam having an inwardly tapered protuberance having a central circular opening, a vertical shaft for operating said cam having its lower end directed through both said central circular openings, said lower end having thereon a key which bears against said first-named protuberance to support said shaft and which key is received in a slot provided for it in said second-named protuberance to effect a driving connection between said cam and shaft.

4. In a cam structure, a horizontal plate having an opening from which depends an inwardly tapered protuberance having therein a central circular aperture, a horizontal cam rotatably mounted on the upper surface of said plate in the axis of said opening, a cam having an inwardly tapered protuberance having a central circular opening, a vertical shaft for operating said cam having its lower end directed through both said central openings, said lower end having thereon a key which bears against said first-named protuberance to support said shaft and which key is received in a slot provided for it in said second-named protuberance to effect a driving connection between said cam and shaft, and a U-shaped spring retaining member having one arm attached to said cam and the other arm rotatably engaging the under side of said plate for holding the cam in position on the plate.

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