Dec. 23, 1924. 1,520,496

H. E. HEINZ

FURNACE REGULATOR

Filed March 5, 1921 2 Sheets-Sheet 1

Fig. 2

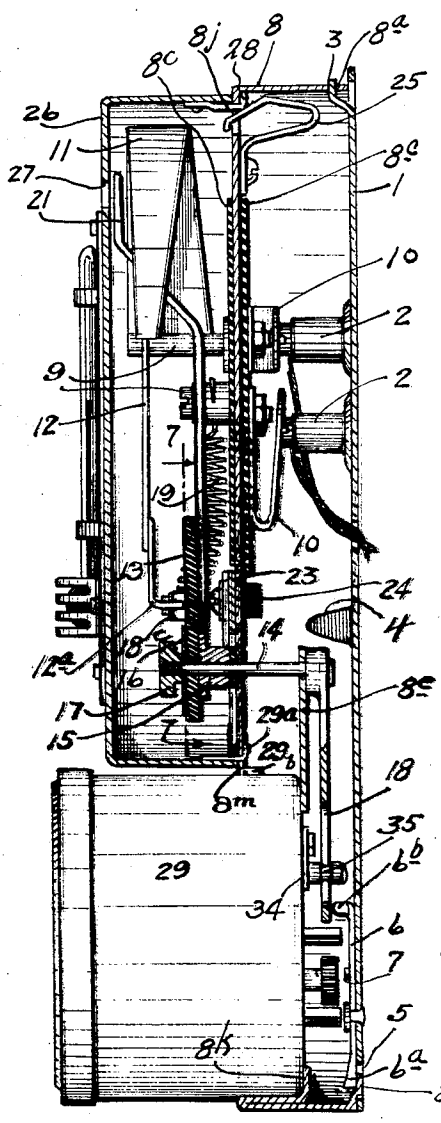


Fig. 1

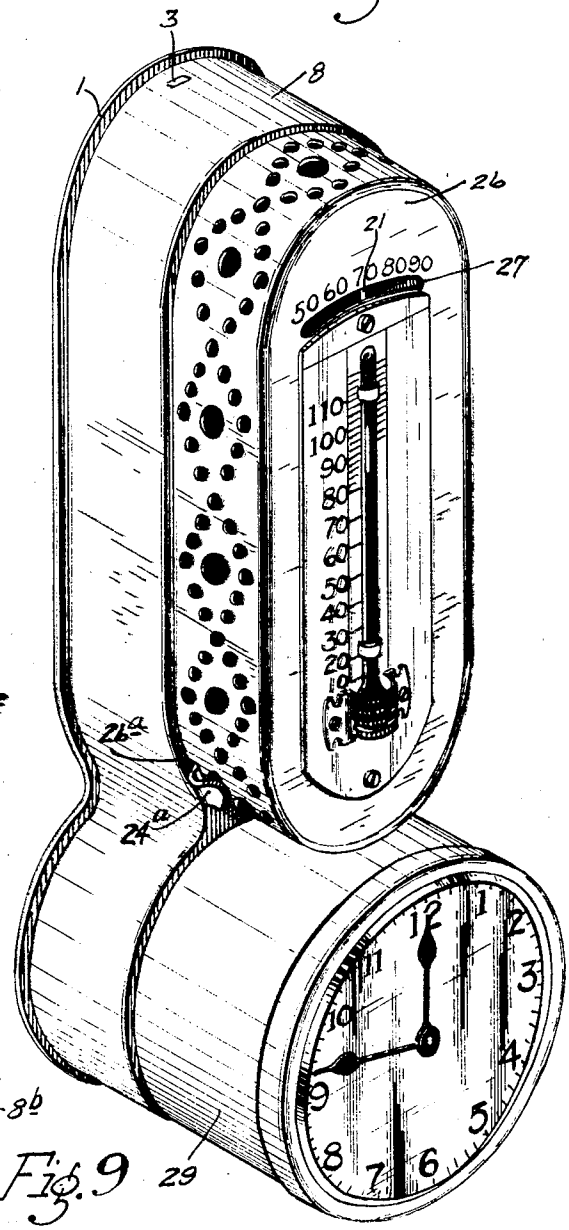
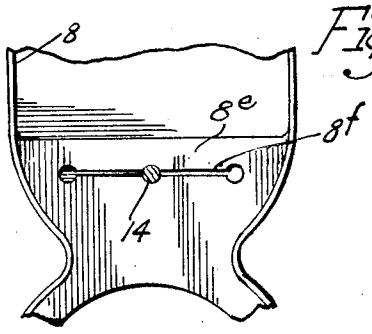


Fig. 9



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Fig. 3

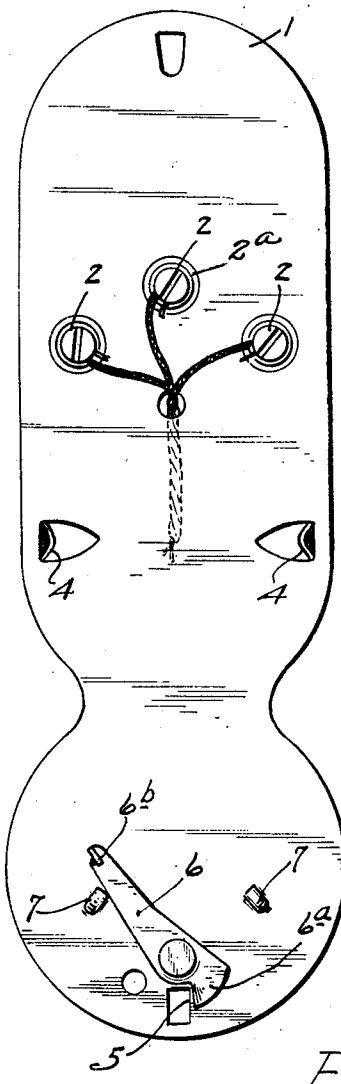


Fig. 4

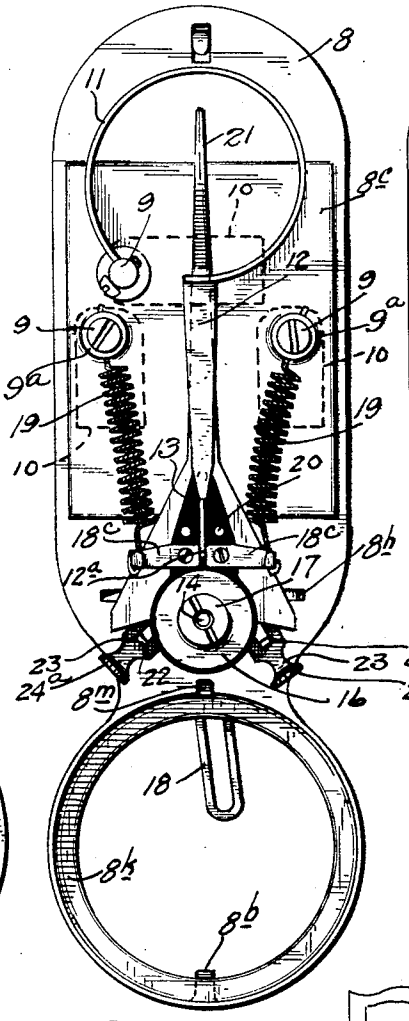


Fig. 5

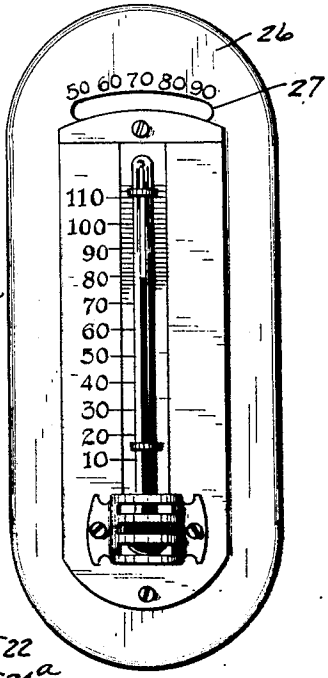


Fig. 6

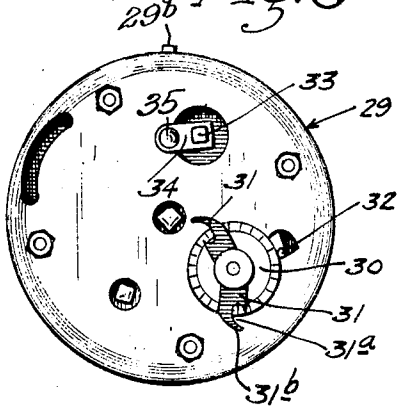


Fig. 8

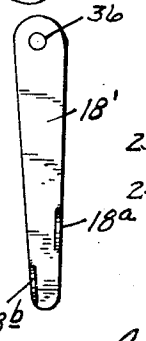
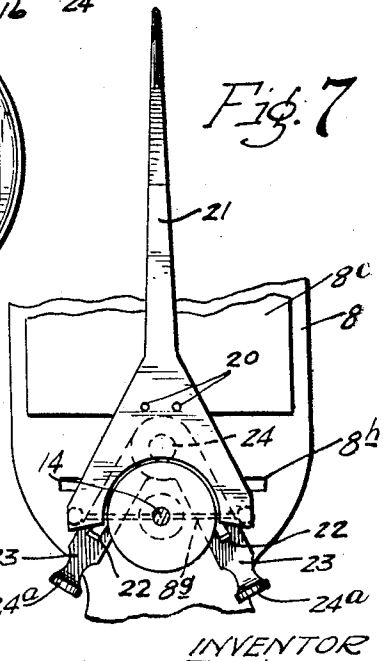


Fig. 7



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UNITED STATES PATENT OFFICE.

HARRY E. HEINZ, OF MINNEAPOLIS, MINNESOTA.

FURNACE REGULATOR.

Application filed March 5, 1921. Serial No. 449,680.

To all whom it may concern:

Be it known that I, HARRY E. HEINZ, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Furnace Regulators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a thermostatic regulator, and particularly to such a regulator designed for use in a building to automatically regulate a furnace or other heat supplying medium therefor. The device comprises the terminals of an electric circuit, which circuit is controlled by a member connected to a thermostat, which alternately contacts with the terminals to close a circuit through an electrically operated device, which, in turn, moves the parts of the furnace or heat supplying means to furnish more or less heat.

It is an object of this invention to produce such a regulator, the parts of which are simple in construction and so arranged that the regulator can be quickly disassembled into three or four parts, each containing a portion of the regulator, which sections are provided with readily detachable fastening means by which they are secured together and by the operation of which they can be quickly and entirely separated.

It is another object of this invention to provide such a regulator with clock operated means to adjust the regulator at different periods, such means being arranged in combination with a clock having a time-controlled disk and a crank connected to an alarm shaft, said crank constituting the actuator for the adjusting means.

It is a further object of this invention to simplify the construction of the regulator, and to render the same capable of very fine and accurate adjustment.

These and other objects and advantages of the invention will be apparent from the following description made in connection with the accompanying drawings in which like reference characters refer to the same parts throughout the different views, and in which

Fig. 1 is a perspective view of the assembled regulator;

Fig. 2 is a central vertical section through the regulator, the clock being shown in side elevation;

Fig. 3 is a view in front elevation of the back plate of the regulator;

Fig. 4 is a view in front elevation of the intermediate section and the parts carried thereby;

Fig. 5 is a view of the front casing which carries a thermometer;

Fig. 6 is a view in elevation of the rear of the clock used;

Fig. 7 is a sectional plan view taken on the line 7—7 of Fig. 2;

Fig. 8 is a detail in elevation showing a modified form of adjusting arm; and

Fig. 9 is a partial view of the rear side of the intermediate section.

Referring to the drawings, the regulator comprises a back plate 1 of substantially the shape shown in Fig. 3; and this plate carries a plurality of binding posts 2 shown as three in number, to which posts are attached the leads or electrical conductors for the controlling circuit. The posts are surrounded and insulated by insulating bushings 2^a and thus have no electrical connection with plate 1. These conductors pass from the posts through an opening shown in the plate 1 and will be connected to an automatic switch device usually located in the basement or adjacent the heat supplying medium. The plate 1 has centrally disposed thereon at its upper portion a small tongue 3 punched out of and bent up from the plate. Tongues 4 are also punched out of the plate and bent up into oppositely disposed positions at the sides thereof substantially midway of the length of the same. The plate 1 has a small opening 5 formed centrally therein at its lower edge and a lever 6 having a flat portion 6^a at its lower end is pivoted immediately above said opening. The lever has an upturned portion 6^b at its upper end constituting a small handle, and stops 7 are provided for limiting the movement of the lever. The members 3, 4 and 6 form fastening means for detachably holding the intermediate casing 8 onto the plate 1. This casing is provided with a small hole 8^a at the top thereof through which the tongue 3 projects, as shown in Fig. 2. The sides of the casing press against the tongues 4 which are more or less resilient and hold the casing in place. A lug 8^b projects upwardly from the central portion of the lower inside edge of the casing 8 and

has projections extending into the opening 5 when the casing 8 is placed upon the plate 1. The lever 6 is then swung to the right from the position shown in Fig. 3 and the portion 6^a swings in front of the lug 8^b securely holding and locking the casing 8 to the plate 1. The casing 8 carries in its upper rear portion a layer of insulating material 8^c and three binding posts 9 extend through the front portion of said casing and through a layer of insulating material 8^c disposed on said front portion these posts being surrounded by insulating bushings 9^a so as to have no electrical contact with said casing. Flat U-shaped spring clips 10 are disposed under the nuts on the binding posts 9 in contact with the insulation sheet 8^c and these clips are disposed in plan, as shown by the dotted lines in Fig. 4. When the casing 8 is placed on the plate 1, the heads of the binding screws in posts 2 contact with the outer surface of the clips 10 and thus form an electrical connection between the posts 2 and the posts 9. With this construction, the casing 8 can be readily and entirely detached from the plate 1 and the electrical connection between posts 2 and 9 is made when the casing 8 is replaced on the said plate. The upper binding post 9 on the front of the casing 8, as shown in Fig. 4, is connected to a thermostat ring 11 preferably constructed of different metals on its inner and outer circumferences, so that the ring will expand and contract with change of temperature. To the free end of the ring 11 an arm 12 is connected and has its lower portion provided with or formed as a cylindrical rod or wire 12^a, the end of which is bent rearwardly and is in contact with a fiber or other insulating plate 13. The casing 8 is provided with an intermediate transversely extending web 8^e and this web has a transversely extending small slot 8^f formed thereacross and a shaft or post member 14 has its lower end passing through an aperture formed centrally of said slot and extends forwardly through the front plate of the casing 8 through another opening in a similar slot 8^g formed in said front plate. The thin portion of the metal above the slot 8^f forms a spring bar and a slot 8^h is formed in the front plate of the casing 8 to give a similar spring effect in the slot 8^g. The post 14 is held frictionally in the apertures in the plate by this resiliency of the metal adjacent said apertures. The post 14 extends forwardly through the front plate of the casing 8 and a small metal washer is placed thereon immediately adjacent the said plate. The disk member 15 is placed on the post adjacent the washer and a fiber or other insulating block or plate 13 is placed on the post adjacent the disk member 15. A spring washer 16 surrounds the post adjacent the fiber plate 13 and this spring washer is pressed frictionally against the said plate by a thumb screw 17 threaded onto the end of the post 14. At its rear end, the post has rigidly secured thereto a depending arm 18 having an elongated slot formed centrally in its lower portion. The member 13 immediately adjacent the upper portion of the washer 16 is provided with raised portions at each side thereof having an opening or channel extending therebetween and flat contact members 18^c are secured to these raised portions by small headed screws. The outer ends of the contacts 18^c are connected to the lower binding posts 9 by wires 19 shown as formed in coils at each side of the casing 8. It will be noted that the inturned end of the lower portion of member 12 is located between the edges of the contact members 18^c. At its rear portion, the fiber plate 13 has secured thereto by small rivets 20, or other suitable fastening means, the pointer member 21. This member, as shown in Fig. 2, extends upwardly and forwardly so that its upper end, which is formed as an indicating pointer, projects through the thermostat ring 11 and swings in a plane immediately in front of the outer circumference of said ring. The lower portion of the member 21 is bifurcated to extend down on either side of the washer 16, the arms thereof being provided with flat ends. These ends are arranged to contact with lugs 22 which are struck up from the body of stop plates 23 which are pivoted at 24 for frictional swinging movement about said pivot. The ends of the stop members 23 are provided with upturned and knurled handle portions 24^a, which portions extend outside of the casing of the regulator, as shown in Fig. 1. The casing 8 is provided at its upper front portion with an opening 8^j and the spring 25 is secured to the rear of the front plate of said casing and bent into U-shape and having its free end bent to extend downwardly through the opening 8^j in contact with the upper side thereof.

A front casing 26 is provided for the regulator and is provided on its front surface with a thermometer of standard type. This casing is provided at its rear edge with slots 26^a through which project the stop members 23. The casing has an arcuate slot 27 at its upper portion above the thermometer and is marked with certain temperature designations adjacent the upper side of this slot. As shown, the central or normal designation is marked 70 and the other designations increase and decrease therefrom. The pointed end of member 21 is visible through the slot 27 and moves adjacent thereto inside the casing 26 and is adapted to co-operate with the designations above described. The casing 26 is provided at its upper inner edge with an outwardly and upwardly extending small lug or tongue 28 and is also provided

with a small spring lug 29^a at its lower side edge which is adapted to enter an opening formed in the lower front portion of the casing 8. By means of the lugs or tongues 28 and 29^a the casing 26 can be quickly attached to and detached from the casing 8. The upper lug 28 will be pressed against the spring member 25 pressing the same down and entering under the edge of the casing 8. The casing 26 will then be swung inwardly and the lug 29^a will resiliently snap into the opening provided therefor and the casing will then be firmly fixed in place.

The casing 8, at its lower portion, as shown in Fig. 4, is circular in form and carries an intermediate circular flange or shelf 8^k. A clock member 29 forms part of the regulator and this clock member, as shown in Fig. 6, is provided with a time-controlled disk 30 which is preferably constructed to make one revolution in twenty-four hours and which is graduated to indicate time. Arms 31 are clamped to the front of this disk by a suitable thumb nut so that said arms 31 can be adjusted about the disk 30. As shown, the arms 31 are provided with lateral recesses 31^a forming curved projecting fingers 31^b. An alarm tripping member such as usually provided with an alarm clock is shown designated as 32 and comprises a pin adapted to be cammed outwardly by the fingers 31^b and to drop into the recess 31^a when the end of the finger has moved past the same. The clock is also provided with an alarm shaft 33 which is arranged to make one-half of a revolution each time the alarm is tripped, and this shaft is equipped with a crank arm 34 from which projects a crank pin 35, which, when the clock is placed in position passes through the slot in the member 18. The clock is inserted into the lower circular portion of the casing 8 and rests against the shelf 8^k, being held in position by the friction of its sides with the sides of the casing. A lug 29^b is secured to the top of the clock casing and adapted to enter a recess 8^m formed at the bottom of the front portion of the casing 8 to keep the clock from turning when placed in position. It is seen that the clock can be easily and quickly removed by merely withdrawing the same from the casing.

The operation of the device is as follows: The back plate 1 will be secured in position on a wall or other fixed support in a building, the electrical contacts being brought therethrough and attached to the binding posts 2. As above stated, these conductors lead to an automatic switch adapted to cause a one hundred and eighty degree turn of a motor which is connected to the dampers of a furnace or other parts of the heat supplying means. The regulator being assembled, as described and as shown in Fig. 1, the pointer member 21 will be moved to the proper designation on the casing 26 which will indicate the temperature which it is desired to maintain in the room or building. The arm 21 is rigidly secured to the insulating plate 13 and is frictionally carried on the post 14. When the pointer 21 is moved therefore, the plate 13 will be moved and the contacts 18^c will be moved therewith. The space between the contact members 18^c will be slightly larger than the diameter of the member 12^a. When the member 12^a contacts with one of the contact members 18^c the heat supplying means will be moved to position to increase or continue the heat supply, and when the temperature in the room is raised to the point desired and passes above the point, the thermostat ring 11 will expand and move the member 12^a into contact with the other member 18^c and the circuit will then be closed to shut off the supply of heat. It will, of course, be understood that the plate 13 and the arm 18 are moved about the post 14 as a center when the pointer 21 is moved. The post 14 as described, is frictionally held so that it can easily be oscillated but will be frictionally retained in the position to which it is moved.

In order to automatically adjust the pointer 21, the clock 29 is provided. The arms 31 which form designating members will be set to operate the alarm stop at suitable times designated by their position relative to disk 30, and this operation will rotate the crank arm 34. This will, in turn, swing the arm 18 to one side or the other which will turn the post 14 and thus swing the pointer 21. Thus, if it be desired at 11 p. m. to switch the pointer 21 to maintain a temperature of fifty degrees and at 5 a. m. it is desired to have the temperature raised and maintained at eighty degrees, the stop member 23 will be moved so that when the pointer 21 is moved to the left it will contact with the lug 22 thereon, when it registers with numeral 50 and the other stop member 23 will be adjusted so that the lower part of the pointer 21 will contact with the stop 22 thereon when it registers with numeral 80. The arm 31 will then be adjusted to operate the alarm trip 32 at 11 p. m. and 5 a. m. At 11 p. m. the crank 34 will swing arm 18 and, as described will adjust the pointer 21 until the same engages the lug 22 on stop member 23. The pointer will then be held and the further movement of the crank will swing arm 18 and post 14 relatively to the plate 13. At 5 a. m. the alarm will be again operated and the pointer 21 moved in a similar manner to engage the other stop lug 22 and register with the numeral 80 on the casing 26. It will be observed that when the arm 18 is swung it will normally carry the member 21 therewith, but when the member 21 is held for movement, the arm 18 can

continue its movement by moving the post 14 relatively to the plate 13.

In Fig. 8 is shown a modified form of the arm 18. In this form the arm 18′ is provided with an aperture 36 by which it will be secured to the post 14, as is the arm 18. The arm 18′ is made of a flat plate and this plate has upwardly projecting lugs 18^a and 18^b at its lower portion, the lug 18^a extending upwardly from one edge of the plate and the lug 18^b extending upwardly from the other edge thereof, the lug 18^a being spaced some distance above the lug 18^b. With this construction, the crank pin 35 when given a half revolution, will contact with lug 18^a and move the lever 18′ to the right. This will throw the member 21 to the left. When the crank pin is given its next half revolution it will contact with the lug 18^b and move the arm 18′ to the left and the member 21 to the right. After having moved the lever 18′ one way or the other, the crank pin will pass by the lugs and through the space between the same and will thus have free movement for part of each half revolution.

The structure described is quite simple in comparison with the regulators in the prior art. In the first place, it is often necessary to have the regulator re-adjusted or returned to the factory for some change or repair. With applicant's construction, the casing 8, which carries the operating portion of the regulator, can be readily removed by an inexperienced person without detaching any wires and this portion of the regulator can then be sent back to the factory.

The structure for swinging the pointer 21 and the contact members 18^c is obviously extremely simple and, furthermore, is rugged and rigid in construction. In regulators of the prior art, considerable trouble has been experienced by the vibration or trembling of the thermostat arm 12 resulting in the making and breaking of the circuit unnecessarily, this vibration being often caused by the jarring or vibration of the building. By having the end of member 12^a bent to engage lightly with the plate 13, the friction between these parts will effectively prevent this trembling or vibration of this part of the device. This not only avoids the unnecessary make and break of the circuit causing the audible operation of the regulator, but also makes it possible to have the space between the contact members 18 of smaller dimension. This space can also be constantly uniform.

The use of the arms 31 and the alarm crank shaft enables the regulator herein disclosed to be adjusted to much finer regulation than has been heretofore possible. It has been the practice to have a time controlled gear wheel as a part of the regulator, which gear wheel has spaced lugs bent upwardly therefrom which engaged with a trip member at the side of the gear. These lugs invariably became bent out of true position and thus caused a variation in the adjustment. The trip member has heretofore been equipped with a small downwardly extending arm which was operated by arms projecting from the time-controlled disk similar to the disk 30 herein disclosed. The bending of these arms and the trip arm invariably occurred, thus rendering the adjustment more inaccurate. It has been impossible, heretofore to adjust a regulator within a twenty minute interval. The regulator herein disclosed can be adjusted within an interval of three minutes. It will be noted that the trip pin 32 will quickly and instantly drop past the end of the arm 31 and the member 21 will be accurately and positively moved to its position. There are no parts to become bent and thus distort the adjustment.

The extreme simplicity of the regulator will be appreciated by anyone familiar with the devices of similar type which have been heretofore constructed.

It will, of course, be understood that various changes may be made in the form, details and arrangement of the device without departing from the scope of applicant's invention, which, generally stated, consists in the matter shown and described and set forth in the appended claims.

What is claimed is:

1. A regulator for heating devices having in combination a back plate adapted to be attached to a support, binding posts carried thereby and insulated therefrom, a casing member adapted to be attached to said plate and readily detachable therefrom, binding posts carried by and insulated from said casing, spaced contacts and a thermostatically controlled member connected respectively to said last mentioned binding posts, and spring clips on said last mentioned binding posts adapted to contact with the binding posts on the said plate when the casing and plate are connected.

2. A regulating device having in combination a thermostat, a contact member connected thereto, an insulating plate, contacts carried thereby between which the end of said contact member is disposed, said contact member having a portion in contact with the insulating plate whereby vibration of said member will be prevented.

3. A regulator device having in combination a thermally-controlled contact member, an insulating plate, flat contact members carried by said plate having thin substantially parallel edges spaced from each other and from said plate, the said thermally controlled contact member having a portion extending between the edges of said flat contact members and normal to said edges and alternately movable into contact therewith.

4. A regulator device having in combina-

tion, a casing, a thermally controlled contact member carried by and insulated from said casing, an insulating plate pivotally mounted for oscillatory movement and frictionally held in the position to which it is moved, and spaced contact members carried by said plate, the thermally controlled contact member having its end portion disposed between the last mentioned contact members.

5. A regulator device having in combination a movable thermally controlled contact member, an insulating plate mounted for oscillatory movement and to be frictionally held in the position to which it is moved, spaced contact members carried by said plate, the end of the thermally controlled contact member being disposed between said last mentioned contact members, and a member secured to said plate adapted to co-operate with a temperature scale on said regulator.

6. A regulator device having in combination an adjustable member constituting a pointer adapted to co-operate with a temperature scale on the regulator, an insulating plate to which the said member is secured, spaced contacts carried by said plate, a thermally controlled contact disposed between said contact members, and a frictionally held post on which said insulating plate is carried.

7. A regulator device having in combination an adjustable member constituting a pointer adapted to co-operate with a temperature scale on the regulator, an insulating plate to which said member is secured, an oscillating post on which said plate is carried, said post being frictionally mounted to be held in the position to which it is moved, an arm connected to said post, a time controlled member for moving said arm to move said adjustable member, said plate and post being frictionally connected for relative movement.

8. The combination set forth in claim 7 and stop members for limiting the movement of said adjustable member.

9. A regulating device comprising an insulating plate, electrical contact members thereon, an oscillatory frictionally mounted post on which said plate is carried, said plate being frictionally connected to said post normally movable therewith, but capable of having adjustable movement relative thereto.

10. A regulator having in combination an adjustable member adapted to co-operate with a temperature scale on the regulator, an arm for moving said member, a clock mechanism having an alarm device including an alarm shaft, means on said shaft for moving said arm, and a time-controlled disk in said clock mechanism having arms thereon for tripping the alarm device.

11. A regulator having in combination an adjustable member adapted to co-operate with a temperature scale and to be moved to adjust the regulator, an insulating plate to which said member is connected, a frictionally mounted post on which said insulating plate is carried, said plate being frictionally connected to said post for movement relative thereto, and time controlled means for swinging said adjustable member.

12. The combination set forth in claim 11 and stop members for limiting the movement of said adjustable member.

13. The combination set forth in claim 11 and independently adjustable stop members for limiting the movement of said adjustable member in either direction.

14. A regulator having in combination an adjustable member adapted to co-operate with a temperature scale and to be moved to adjust the regulator, an insulating plate to which said member is secured, a frictionally held post on which said plate is carried and to which it is frictionally connected, an arm secured to said post, clock actuated means for swinging said arm to move said adjustable member, and stop means for limiting the movement of said adjustable member, said arms and post being movable relatively to the insulating plate after the adjustable member contacts with the stop.

15. A regulator device having in combination a thermostatically controlled contact, adjustable contacts with which said contact co-operates, an insulating plate by which the last mentioned contacts are carried, an adjustable member for moving said plate and connected to the same, an oscillating post on which said plate is carried, and means for frictionally connecting said plate to said post.

16. The combination set forth in claim 15, said frictional means comprising a spring washer and a nut threaded onto said post to clamp the washer against said plate and to adjust the friction.

17. A regulator device comprising a back plate having electrical contacts thereon, an intermediate casing having electrical connections thereon and thermostatic means for controlling the same, a top casing having a temperature scale thereon, and a clock device having means for adjusting the thermally controlled means on the intermediate casing, said plate, intermediate casing, top casing and clock device being adapted to be connected together, and readily detachable means for connecting the same together, whereby they can be quickly and entirely separated.

18. The structure set forth in claim 3, the end of said portion being in contact with the insulating plate.

19. A regulator for a heating device having in combination a back plate adapted to be attached to a support, binding posts car-

ried thereby and insulated therefrom, a casing member adapted to be attached to said plate and readily detached therefrom, binding posts carried by and insulated from said casing, spaced contacts and a thermally controlled member connected respectively to said last mentioned binding posts, and a separable connection between the binding posts on the plate and the binding posts on the casing adapted to be connected when said plate and casing are connected.

20. A device of the class described comprising a comparatively long swinging member disposed and movable between contact members to control the circuit and movable adjacent and substantially parallel to a surface and having a free end bent to lightly contact with said surface to prevent vibration of said end.

21. A device of the class described, comprising a time controlled indicating member, a clock mechanism having an alarm shaft, an alarm tripping member controlling said shaft and tripping means for said tripping member comprising a member movable relatively thereto, and having a recess cut therein forming a sharp pointed projection adapted to pass said tripping member and to allow the same to drop into the recess.

22. A regulator device having in combination, a thermally controlled contact member, an insulating plate having thereon flat contact members having thin substantially parallel edges spaced from and parallel to said plate, said first mentioned member having a portion extending substantially parallel to said plate, and a portion bent to extend substantially normal thereto and between said edges, said member being movable to alternately bring said last mentioned portion into contact with said edges.

In testimony whereof I affix my signature.

HARRY E. HEINZ.