Nov. 5, 1935. M. H. WELLS 2,019,945

ELECTRIC CLOCK THERMOSTAT

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Fig. 1.

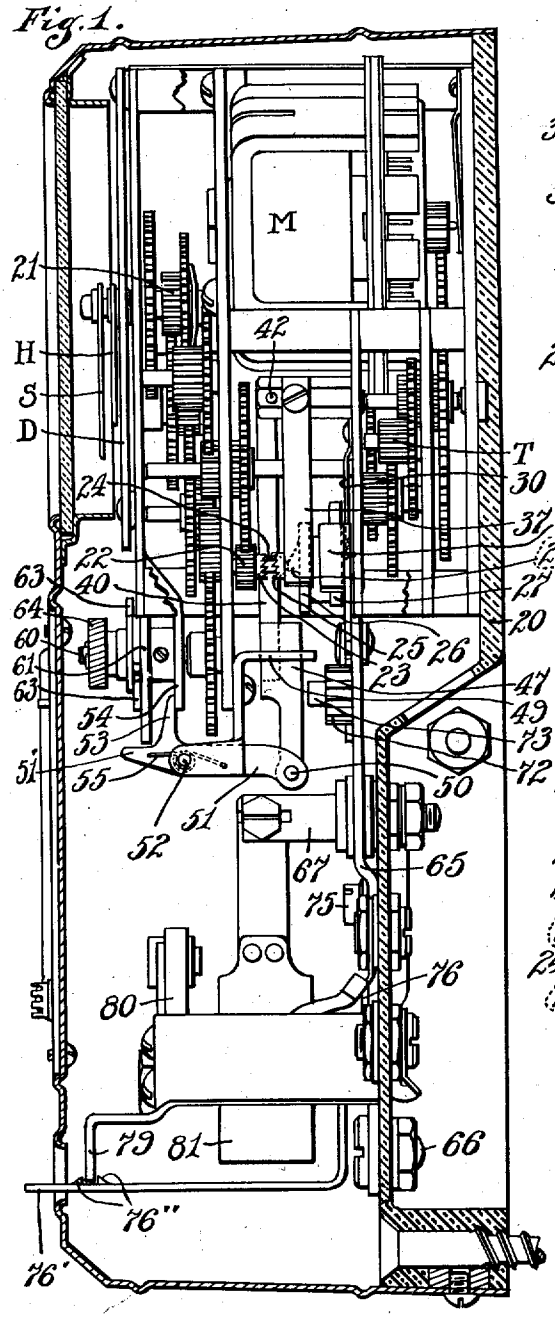


Fig. 3.

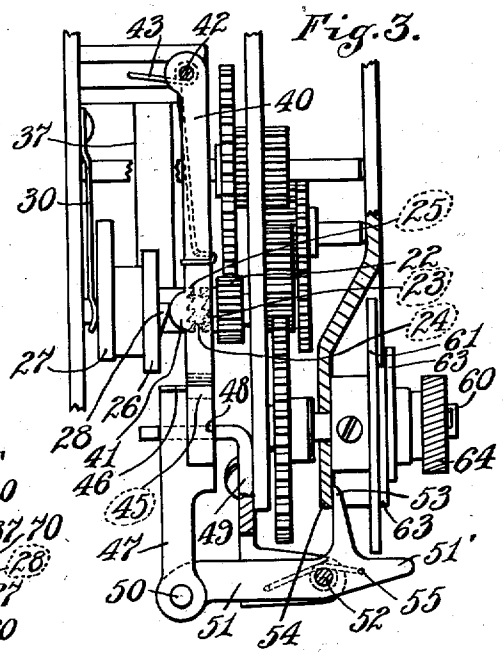
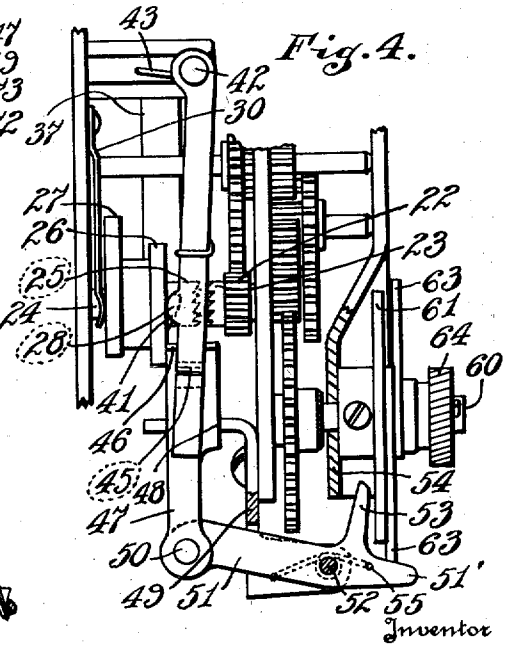


Fig. 4.



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ELECTRIC CLOCK THERMOSTAT

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Fig. 2.

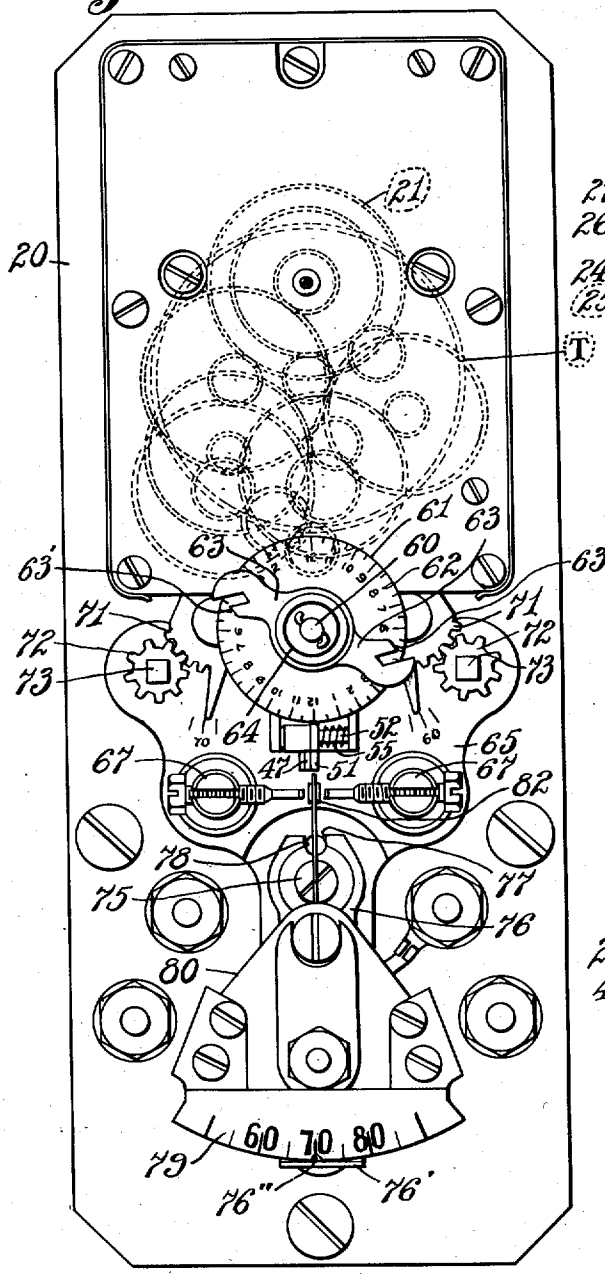

Fig. 5.

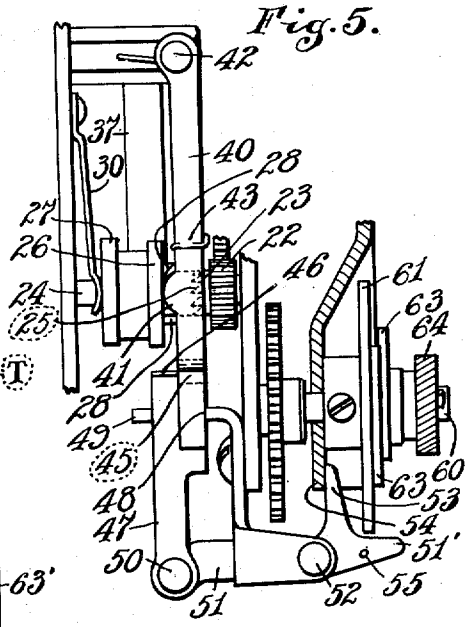

Fig. 6.

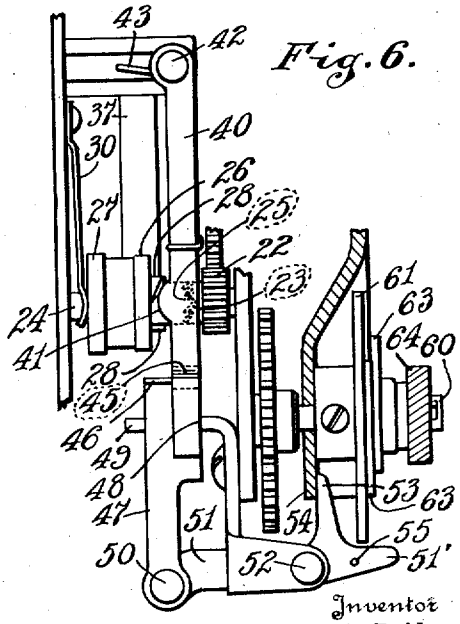

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Fig. 7.

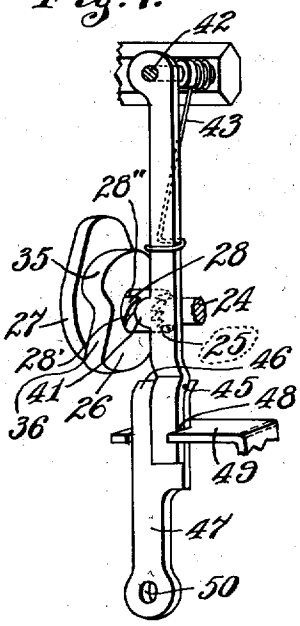


Fig. 9.

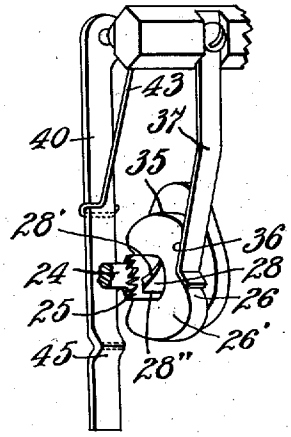


Fig. 10.

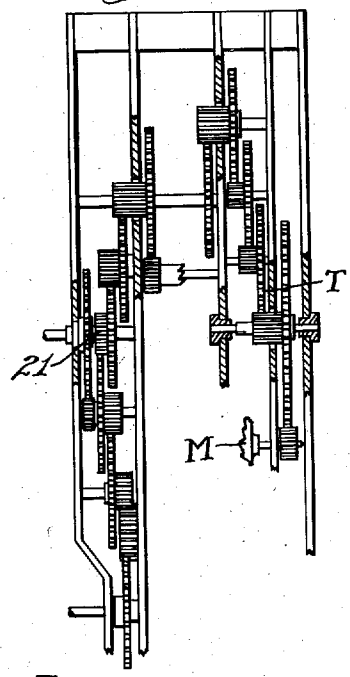


Fig. 8.

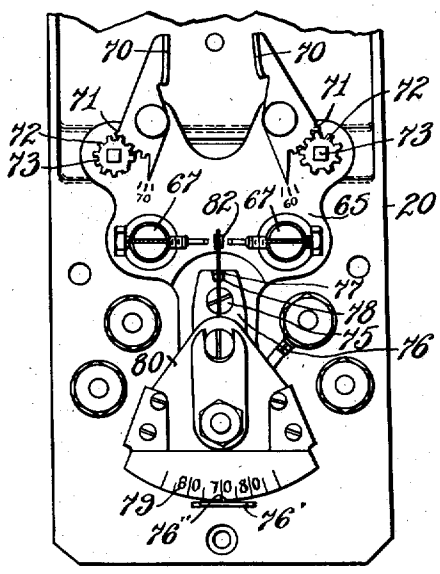
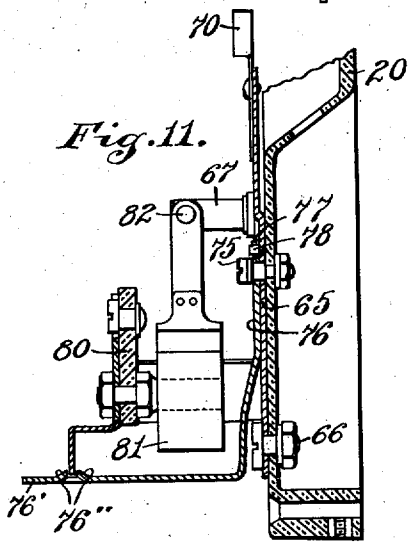


Fig. 11.



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Patented Nov. 5, 1935

2,019,945

UNITED STATES PATENT OFFICE

2,019,945

ELECTRIC CLOCK THERMOSTAT

Milton H. Wells, Wabash, Ind., assignor to Minneapolis-Honeywell Regulator Company, Minneapolis, Minn., a corporation of Delaware

Application June 8, 1931, Serial No. 542,797

24 Claims. (Cl. 200—139)

Part of the equipment of house-heating units commonly in use at the present time is an instrument commonly called a "clock thermostat" comprising circuit-changing terminals responsive to temperature variations, and a spring-driven time train indicating time and embodying mechanism which, twice in each twenty-four hours, varies the relation of the circuit-changing terminals in such manner that in alternate periods of operation circuit changes will be automatically produced at different temperature ranges, the arrangement being such that the heater will be automatically controlled to maintain a lower room temperature at night and a higher room temperature during the day.

In all such devices, so far as I am aware, the direct time train adjustment of the circuit terminal relationship requires a very considerable time interval.

The object of my present invention is to produce an instrument of the character described, and more particularly one embodying an electrically-driven time train, in which the timed periodic adjustment of the circuit-controlling elements is accomplished rapidly.

The accompanying drawings illustrate my invention.

Fig. 1 is a longitudinal section of an embodiment of my invention;

Fig. 2 a front elevation with the enclosing casing and clock dial omitted;

Fig. 3 a fragmentary side elevation, in partial section, of the automatic separable connection between the time train, or time train motor, and the circuit terminal-adjusting mechanism with the parts in declutched positions;

Fig. 4 a view similar to Fig. 3 in the positions occupied at the beginning of the clutching operation;

Fig. 5 a view similar to Fig. 4 with the parts in the positions occupied at an intermediate period of clutching;

Fig. 6 a view similar to Fig. 5 with the parts in the positions occupied at the beginning of the declutching operation;

Fig. 7 a fragmentary perspective of portions of the clutching mechanism in the positions occupied just prior to completion of declutching;

Fig. 8 an elevation showing the terminal-carrying plate, the temperature-responsive associated terminal and the time-train-actuated cams for periodically varying terminal relations;

Fig. 9 a perspective of portions of the clutching mechanism;

Fig. 10 a stretch-out of the time train, and

Fig. 11 a section through the terminal-carrying plate and adjacent parts.

In the drawings 20 indicates a suitable base plate, conveniently of bakelite or some other similar non-conductor of electricity and heat. This base plate may be metallic but in that case, of course, suitable insulations will have to be provided to preserve the electrical circuits.

Mounted upon the base plate is a time train T ending in the hour hand H and the minute hand S arranged to sweep the dial plate D. The precise arrangement of gears forming the time train T may, of course, be varied greatly and will be dependent upon the character of the motor M by which it is to be driven, said time train, however, embodying a continuously driven shaft or gear unit 21. Power is transmitted through unit 21 to the hour and minute hands to give a proper time indication, and to a gear 22 at such speed as to actuate the circuit-terminal shifting mechanism in a very short time interval, say a few seconds.

Gear 22 carries a clutch element 23 and is conveniently rotatable upon the fixed shaft 24, which shaft also supports a co-acting clutch element 25 axially shiftable, on shaft 24, into and out of mesh with its companion clutch element 23.

Clutch element 25 is integral with, or secured to, a cam 26, a cam 27 and two cams 28, 28, the unit being axially biased toward clutch element 23 by spring 30.

Cam 26 has two diametrically opposite similar lobes each of which is formed by the converging surfaces 35 and 36 engaged by a spring 37, the surfaces 35 and 36 being so related that rotation of the cam beneath the spring 37 will cause surface 35 to stress spring 37 so that, when surface 36 is advanced to position beneath said spring, the stressed spring, co-acting with the surface 36, will cause an advancement of the cam through a substantial angle.

The two cams 28, 28 are similar and diametrically opposed. These cams flank the radial face of the inner surface 26' of cam 26 and each is provided with an active face 28' which is an annular segment extending around the circumference of the clutch element 25 about ninety degrees, the initial end of each of these surfaces 28' starting at the surface 26', and ending, with a sudden drop-off 28'', at a distance axially spaced from the surface 26' somewhat more than the depth of the teeth of the clutch elements 23 and 25.

Overlying clutch element 25 is a trip lever 40

the thickness of which is substantially equal to the radial dimension of the cams 28 and this lever is provided with a finger 41 adapted to engage the cam surfaces 28' 28' of the cams 28.

Trip lever 40 is pivoted at 42 in such manner that its finger 41 may be radially displaced from the axis of clutch element 25 enough to carry finger 41 radially beyond cams 28, and in such manner that the lever 40 may swing in planes parallel with the axis of clutch element 25. This is accomplished by providing a fairly loose fit in the pivotal mounting of the lever, and the lever is spring-biased, by spring 43, so that its finger 41 will be biased, relative to the clutch element 25, both radially toward the axis of such clutch element and axially toward surface 26' of cam 26.

Trip lever 40 near its lower end is provided with a cam surface 45 adapted to be engaged by a cam surface 46 at the end of a pusher 47 slidably guided in a notch 48 formed in a guide plate 49. Pusher 47 is pivotally supported at 50 upon a lever 51 which is fulcrumed at 52 and is provided with a stop finger 53 which, by engagement with a stationary portion 54, limits movement of lever 51 in one direction to prevent its end 51' from contacting with disc 61. A spring 55 is attached to the lever 51 to bias finger 53 toward plate 54. The lower end of trip lever 40 is projected into notch 48, alongside the pusher, the notch being of sufficient width to permit sufficient lateral movement of the free end of trip lever 40 to permit its finger 41 to clear cams 28 radially under the action of pusher 47, one side wall of the notch forming an abutment to restrain lateral movement of the pusher under the the resistance of the trip lever.

A shaft 60 is geared to the time train T so as to rotate once in twenty-four hours and this shaft carries a disc 61 the exposed face of which bears a dial 62 divided into two equal portions, one indicating hours between noon and midnight and the other indicating hours between midnight and noon. Independently rotatably mounted upon shaft 60 are two cam fingers 63, 63 the tip of each of which is adapted to engage the arm 51' of lever 51 to shift pusher 47 against cam 45, and each of these cam fingers is provided with a pointer portion 63' which, by coordination with dial 62, will indicate a positioning of the cam fingers for desired time of activity of the cams. These cam fingers, after adjustment, may be clamped in position by a nut 64 threaded upon the outer end of shaft 60.

A plate 65 pivoted at 66 on the base 20 carries terminal posts 67, 67 (as many and in such arrangement as may be desired, depending upon the circuits to be controlled) and these posts are rearwardly projected through a suitable perforation in the base plate to permit freedom of movement of the plate 65.

Journaled upon plate 65, on opposite sides of the middle of said plate, are two cam fingers 70, 70 arranged upon diametrically opposite sides of cam 27, the ends of said cam fingers being wide enough to permit the necessary axial movement of the cam 27 without dissociation. Each cam finger 70 is provided with a segmental gear 71 meshing with a pinion 72 rather tightly journaled upon plate 65 and having a polygonal teat 73 by which it may be key-turned.

A pin 75, attached to base 20 and projected through a perforation in plate 65, forms a fulcrum for a manually-operable adjusting lever 76 having a notch 77 in one arm receiving a pin 78 carried by plate 65. The other arm of lever 76 is projected to form a finger piece 76' by means of which it may be manipulated and this arm has a pointer portion 76'' arranged to traverse an indicator scale 79 carried by a support 80. The support 80 forms the anchorage for a thermostatic element 81 which, in the present instance, is a bimetallic volute carrying a contact terminal 82 arranged to coact with the contact terminals carried by the posts 67, 67.

Half rotations of cam 27, acting upon cam fingers 70, 70, serve to shift plate 65 alternately from one extreme position to the other, thereby changing the relation between the terminals carried by said plate and the temperature-responsive terminal 82.

Normally one of cams 28 engages finger 41 of trip lever 40, as shown in Fig. 3, and clutch element 25 is thus held well clear of clutch element 23. When one of the cam fingers 63 engages arm 51' of lever 51, pusher 47 will be moved upwardly and its cam surface 46, engaging cam 45 of the trip lever 40, will swing said trip lever radially away from clutch element 25 so as to withdraw finger 41 away from blocking position relative to one of the cams 28, but just before this occurs the upper end of pusher 47 moves into position to block axial movement of cam 26, as shown in Fig. 4, and spring 43 causes trip lever 40 to move to the position shown in Fig. 4, finger 41 lying upon the circumferential surface of the adjacent cam 28 and engaging surface 26' of cam 26. The instant the active cam finger 63 passes beyond arm 51' of lever 51 the spring 55 causes pusher 47 to drop to its initial position, limited by the engagement of finger 53 with stop 54, thus releasing the clutch element 25 and permitting it to be driven by spring 30 into clutching engagement with the clutch element 23 which is under motion imparted by motor M. Clutch element 25, and its associated cams 26, 27 and 28 are thereupon rotated, cam 27 acting upon cam fingers 70 in the manner already described. Shortly after the initiation of rotation of the clutch element 25 the end of the cam 28 which has underlaid lever 40 will be withdrawn from beneath that lever and spring 43 will serve to draw the lever down upon the circumferential surface of clutch element 25 so that continued angular movement of the clutch element 25 will bring the cam surface 28' of the other cam 28 into engagement with finger 41 of lever 40 which, because of the preceding axial movement of the clutch element 25, has had its lower end shifted so as to engage the bottom of notch 48 (Fig. 6) so that continued angular movement of clutch element 25, due to the action of cam surface 28' upon finger 41, will cause an axial withdrawal of clutch element 25 from clutch element 23. During this time movement of cam 26 beneath spring 37 will stress that spring and just before the teeth of element 25 are cleared from the teeth of element 23 the junction between surfaces 35 and 36 of one of the lobes of cam 26 passes beneath spring 37 so that said spring, acting upon one of the surfaces 37 of cam 26, serves to produce further rapid angular movement of clutch element 25, independent of clutch element 23, this further angular movement carrying cam 28 further beneath finger 41 so that clutch element 25 is definitely separated from clutch element 23 and the parts are restored to their normal position shown in Fig. 3.

It should be understood that contact elements of the mercury tube or potentiometer resistance type might be substituted for the open contact

terminals shown without departing from my invention.

The motor M, if electric, may be either of a type which is self-starting or non-self-starting (in which case a starting knob would be required) and may be either of the subsynchronous or synchronous type, proper modifications, as previously stated, being made in the gear train so that proper time relationships will be established, as stated.

The operation of the electric motor M results in a constant generation of heat and for that reason the motor is placed as far above the thermally-responsive element 81 as possible and heat-insulated therefrom. Use of a bakelite base 20 and avoidance of direct metallic connection between the motor and the thermostatic element 81 is of decided advantage in maintaining accuracy of response of element 81.

I claim as my invention:

1. A clock thermostat comprising circuit-controlling elements, a temperature-responsive element co-related with said circuit-controlling elements for modifying circuit condition upon temperature change, means for changing the active temperature-range of said temperature-responsive element relative to the circuit-controlling elements comprising a normally stationary actuating element, an electric motor, separable clutching means between said motor and actuating element, a time train driven by said motor, and means actuated by said time train for activating said clutching means at predetermined time intervals, and means for de-activating said clutching means.

2. A clock thermostat comprising, circuit-controlling elements, a temperature-responsive element co-related with said circuit-controlling elements for modifying circuit condition upon temperature change, means for changing the active temperature-range of said temperature-responsive element relative to the circuit-controlling elements comprising a normally stationary actuating element, an electric motor, separable clutching means between said motor and actuating element, a time train driven by said motor, and means actuated by said time train for activating said clutching means at predetermined time intervals, and means actuated by the delivery end of said clutching means for de-activating said clutching means.

3. A clock thermostat comprising, circuit-controlling elements, a temperature-responsive element co-related with said circuit-controlling elements for modifying circuit condition upon temperature change, means for changing the active temperature-range of said temperature-responsive element relative to the circuit-controlling elements comprising a normally stationary actuating element, separable clutching means the driven element of which is connected to said actuating element, a motorized time train drivin the driving element of said clutching means at an elapsed time rate, and means actuated by said time train for activating said clutching means at predetermined time intervals, and means for de-activating said clutching means.

4. A clock thermostat comprising, circuit-controlling elements, a temperature-responsive element co-related with said circuit-controlling element for modifying circuit condition upon temperature change, means for changing the active temperature-range of said temperature-responsive element relative to the circuit-controlling elements comprising a normally stationary actuating element, separable clutching means the driven element of which is connected to said actuating element, a motorized time train driving the driving element of said clutching means at an elapsed-time rate, and means actuated by said time train for activating said clutching means at predetermined time intervals, and means actuated by the driven element of said clutching means for de-activating said clutching means.

5. A clock thermostat comprising, a circuit-controlling terminals, a temperature-responsive element co-related with said circuit-controlling terminals for modifying terminal relation upon temperature change, means for changing the active temperature-range of said temperature-responsive element relative to the terminals comprising, a shiftable carrier for one of said terminals, a normally stationary actuating element for said carrier, separable clutching means the driven element of which is connected to said actuating element, a time train having a portion connected to the driving element of the clutching means, and means actuated by said time train for activating said clutching means at predetermined time intervals, and means for de-activating said clutching means.

6. A clock thermostat comprising, circuit-controlling terminals, a temperature-responsive element co-related with said circuit-controlling terminals for modifying terminal relation upon temperature change, means for changing the active temperature-range of said temperature-responsive element relative to the terminals comprising a shiftable carrier for one of said terminals, a normally stationary actuating element for said carrier, separable clutching means the driven element of which is connected to said actuating element, a time train comprising an electric motor and a portion connected to the driving element of the clutching means, and means actuated by said time train for activating said clutching means at predetermined time intervals, and means for de-activating said clutching means.

7. A clock thermostat comprising, circuit-controlling terminals, a temperature-responsive element co-related with said circuit-controlling terminals for modifying terminal relation upon temperature change, means for changing the active temperature-range of said temperature-responsive element relative to the terminals comprising a shiftable carrier for one of said terminals, a normally stationary actuating element for said carrier, separable clutching means the driven element of which is connected to said actuating element, a time train having a portion connected to the driving element of the clutching means, means actuated by said time train for activating said clutching means at predetermined time intervals, and means actuated by the driven element of said clutching means for de-activating said clutching means.

8. A clock thermostat comprising, circuit-controlling terminals, a temperature-responsive element co-related with said circuit-controlling terminals for modifying terminal relation upon temperature change, means for changing the active temperature-range of said temperature-responsive element relative to the terminals comprising a shiftable carrier for one of said terminals, a normally stationary actuating element for said carrier, separable clutching means the driven element of which is connected to said actuating element, a time train comprising an electric motor and a portion connected to the

driving element of the clutching means, and means actuated by said time train for activating said clutching means at predetermined time intervals, and means actuated by the driven element of said clutching means for de-activating said clutching means.

9. A clock thermostat comprising a time train, circuit-controlling elements, a temperature-responsive element co-related with said circuit-controlling elements for modifying circuit condition upon temperature change, means for changing the active temperature-range of said temperature-responsive element relative to the circuit-controlling elements comprising a clutch element driven by the time train, a second clutch element co-axial with the first-mentioned clutch element and axially-separable therefrom, a cam carried by said second-mentioned clutch element, a trip lever movable both radially and axially relative to the second-mentioned clutch element and engageable by said cam, an abutment for said trip lever limiting its movement in one direction axially relative to the second-mentioned clutch element, means for biasing said trip lever relative to the second-mentioned clutch element radially toward said element and axially away from the abutment, means actuated at predetermined time intervals by the time train for moving said trip lever axially away from the second-mentioned clutch element and for momentarily blocking movement of the second-mentioned clutch element toward its fellow, means connected with the second-mentioned clutch element for modifying the relation between the circuit-controlling elements and temperature-responsive element by rotation of the second-mentioned clutch element, a second cam rotatably connected with said second clutch element and a spring coacting with said last-mentioned cam, said cam and spring being so formed and co-related that rotation of the second-mentioned clutch element will first stress the spring and then permit the spring to rotatively advance said second-mentioned clutch element.

10. A clock thermostat comprising a time train, circuit-controlling elements, a temperature-responsive element co-related with said circuit-controlling elements for modifying circuit condition upon temperature change, means for changing the active temperature-range of said temperature-responsive elements relative to the circuit-controlling elements comprising a clutch element driven by the time train, a second clutch element co-axial with the first-mentioned clutch element and axially-separable therefrom, a cam carried by said second-mentioned clutch element, a trip lever movable both radially and axially relative to the second-mentioned clutch element and engageable by said cam, an abutment for said trip lever limiting its movement in one direction axially relative to the second-mentioned clutch element, means for biasing said trip lever relative to the second-mentioned clutch element radially toward said element and axially away from the abutment, a pusher slidably mounted adjacent the trip lever to position to limit axial movement of the second-mentioned clutch element toward the first-mentioned clutch element short of clutching engagement and formed to engage the trip lever and shift the same radially of the second-mentioned clutch member out of co-active engagement with the cam, means connected with the second-mentioned clutch element for modifying relation between the circuit-controlling elements and temperature-responsive element by rotation of the second-mentioned clutch element, a second cam connected with said second clutch element for rotation thereby, and a spring co-acting with said last-mentioned cam, said cam and spring being so formed and co-related that rotation of the second-mentioned clutch element will first stress the spring and then permit the spring to rotatively advance said last-mentioned cam and means actuated by the time train for periodically manipulating said pusher.

11. A clock thermostat comprising, circuit-controlling terminals, a temperature-responsive element co-related with said circuit-controlling terminals for modifying terminal relation upon temperature change, means for changing the active temperature-range of said temperature-responsive element relative to the terminals comprising a shiftable carrier for one of said terminals, a normally stationary actuating element for said carrier, separable clutching means the driven element of which is connected to said actuating element, a time train having a portion connected to the driving element of the clutching means, means actuated by said time train for activating said clutching means at predetermined time intervals, means actuated by the driven element of said clutching means for initiating de-clutching of the clutch elements and additional motor means for completing the de-clutching action.

12. A clock thermostat comprising, circuit-controlling terminals, a temperature-responsive element co-related with said circuit-controlling terminals for modifying terminal relation upon temperature change, means for changing the active temperature-range of said temperature-responsive element relative to the terminals comprising a shiftable carrier for one of said terminals, a normally stationary actuating element for said carrier, separable clutching means the driven element of which is connected to said actuating element, a time train having a portion connected to the driving element of the clutching means, means actuated by said time train for activating said clutching means at predetermined time intervals, means driven by the time-train motor for initiating declutching action of the clutch elements, and additional motor means for completing the declutching action.

13. A clock thermostat comprising, circuit-controlling terminals, a temperature-responsive element co-related with said circuit-controlling terminals for modifying terminal relation upon temperature change, means for changing the active temperature-range of said temperature-responsive element relative to the terminals comprising a shiftable carrier for one of said terminals, a normally stationary actuating element for said carrrier, separable clutching means the driven element of which is connected to said actuating element, a time train having a portion connected to the driving element of the clutching means, means actuated by said time train for activating said clutching means at predetermined time intervals, a supplemental motor, means dependent upon movement of the clutching means for intermittently energizing said supplemental motor, and means dependent upon movement of the clutching means by which the supplemental motor causes de-clutching of the clutching means.

14. In a clock-thermostat, a base, a thermo-responsive member associated with said base, an element shiftably mounted on said base and carrying a contact adapted to be contacted, at times, by said thermo-responsive member, a pair

of oppositely disposed fingers shiftably mounted on said element, a pair of graduated scales carried by said element, an indicator for each of said fingers cooperating with one of said scales to indicate the adjusted position of its finger, an actuator cooperable with said pair of fingers to shift said first-named element in opposite directions at predetermined intervals, a time-train carried by the base, and means controlled by the time-train for temporarily connecting said actuator to the time-train to cause successive relatively high-speed movements of said actuator through successive portions of its complete cycle.

15. In a clock thermostat, a base, a thermo-responsive member associated with said base, an element loosely pivoted on said base and carrying a contact adapted to be contacted, at times, by said thermo-responsive member, a pair of oppositely disposed fingers tightly pivoted on said element, a pair of graduated scales carried by said element, an indicator for each of said fingers cooperating with one of said scales to indicate the adjusted position of its finger, an actuator cooperable with said pair of fingers to shift said first-named element in opposite directions about the loose pivot thereof at predetermined intervals, a time-train carried by the base, and means controlled by the time-train for temporarily connecting said actuator to the time-train to cause successive relatively high-speed movements of said actuator through successive portions of its complete cycle.

16. In combination, control means comprising two cooperative elements one of which is movable to and from coacting relation to its fellow in response to changes in a predetermined physical condition, range-modifying means by which one of said elements may be shifted relative to its fellow to shift the coaction thereof in the range of change of said physical condition, motor means comprising an element actuated at a predetermined speed, and means driven by said motor means and synchronized with said last-mentioned element for temporarily connecting and disconnecting said range-modifying means with the motor means.

17. In combination, control means comprising two cooperative elements one of which is movable to and from coacting relation to its fellow in response to changes in a predetermined physical condition, range-modifying means by which one of said elements may be shifted relative to its fellow to shift the coaction thereof in the range of change of said physical condition, motor means comprising an element constantly actuated thereby, and means driven by said motor means for alternately connecting and disconnecting said range-modifying means and said constantly-actuated element.

18. In combination, control means comprising two cooperative elements one of which is movable to and from coacting relation to its fellow in response to changes in a predetermined physical condition, range-modifying means by which one of said elements may be shifted relative to its fellow to shift the coaction thereof in the range of change of said physical condition, motor means, a dial driven by said motor means, a pair of adjustable fingers on said dial, an actuator for shifting said range-modifying means in opposite directions, means for connecting said actuator to the motor means, means for automatically disconnecting said actuator from said motor means, and means actuated by said adjustable fingers for initiating connection between said actuator and the motor means.

19. In combination, control means comprising two cooperative elements one of which is movable to and from coacting relation to its fellow in response to changes in a predetermined physical condition, range-modifying means by which one of said elements may be shifted relative to its fellow to shift the coaction thereof in the range of change of said physical condition, motor means comprising a constantly-driven clutch element, an actuator for said range-modifying means, means cooperable with said clutch element for connecting said actuator with the motor means and automatically causing disconnection upon a predetermined movement of the actuator, and means actuated by the motor means for intermittently connecting said clutch element and actuator.

20. An electric clock thermostat comprising in combination, a temperature-responsive element, a switch controlled thereby, a time-train, an activator for said time-train comprising an electric motor, means comprising a movable element by which the switch-response to temperature changes in the temperature-responsive element may be varied, two members constantly driven in synchronism with the time-train, means actuated by either of said two members for connecting said movable element with the time train, and means for automatically disconnecting said movable element from the time-train upon a predetermined movement of said movable element.

21. In combination, control means comprising a switch controlling a circuit, said switch including an element movable into and out of circuit-closing position in response to changes in a predetermined physical condition, range-modifying means operable to vary the value in the range of change of said condition at which said element will be moved to change the condition of said circuit, motor means comprising an element actuated at a predetermined speed, and means driven by said motor means and synchronized with said last-mentioned element for temporarily connecting and disconnecting said range-modifying means with said motor.

22. In combination, control means comprising a switch controlling a circuit, said switch including an element movable into and out of circuit-closing position in response to changes in a predetermined physical condition, range-modifying means operable to vary the value in the range of change of said condition at which said element will be moved to change the condition of said circuit, motor means comprising an element constantly actuated thereby, and means driven by said motor means for alternately connecting and disconnecting said range-modifying means and said constantly-actuated element.

23. In combination, control means comprising a switch controlling a circuit, said switch including an element movable into and out of circuit-closing position in response to changes in a predetermined physical condition, range-modifying means operable to vary the value in the range of change of said condition at which said element will be moved to change the condition of said circuit, motor means, a dial driven by said motor means, a pair of adjustable fingers on said dial, an actuator for shifting said range-modifying means in opposite directions, means for connecting said actuator to said motor means, means for automatically disconnecting said actuator from said motor means, and means actuated by

said adjustable fingers for initiating connection between said actuator and the motor means.

24. In combination, control means comprising a switch controlling a circuit, said switch including an element movable into and out of circuit-closing position in response to changes in a predetermined physical condition, range-modifying means operable to vary the value in the range of change of said condition at which said element will be moved to change the condition of said circuit, motor means comprising a constantly driven clutch element, an actuator for said range-modifying means, means cooperable with said clutch element for connecting said actuator with the motor means and automatically causing disconnection upon a predetermined movement of the actuator, and means actuated by the motor means for intermittently connecting said clutch element and actuator.

MILTON H. WELLS.

CERTIFICATE OF CORRECTION.

Patent No. 2,019,945. November 5, 1935.

MILTON H. WELLS.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, first column, line 64, claim 3, for the syllable "in" read ing; and second column, line 11, claim 5, strike out the article "a"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of December, A. D. 1935.

(Seal)

Leslie Frazer
Acting Commissioner of Patents.

said adjustable fingers for initiating connection between said actuator and the motor means.

24. In combination, control means comprising a switch controlling a circuit, said switch including an element movable into and out of circuit-closing position in response to changes in a predetermined physical condition, range-modifying means operable to vary the value in the range of change of said condition at which said element will be moved to change the condition of said circuit, motor means comprising a constantly driven clutch element, an actuator for said range-modifying means, means cooperable with said clutch element for connecting said actuator with the motor means and automatically causing disconnection upon a predetermined movement of the actuator, and means actuated by the motor means for intermittently connecting said clutch element and actuator.

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