April 15, 1947. S. G. ISSERSTEDT 2,419,077

TIME OPERATED SWITCH

Filed March 26, 1943 2 Sheets-Sheet 1

Fig. 1.

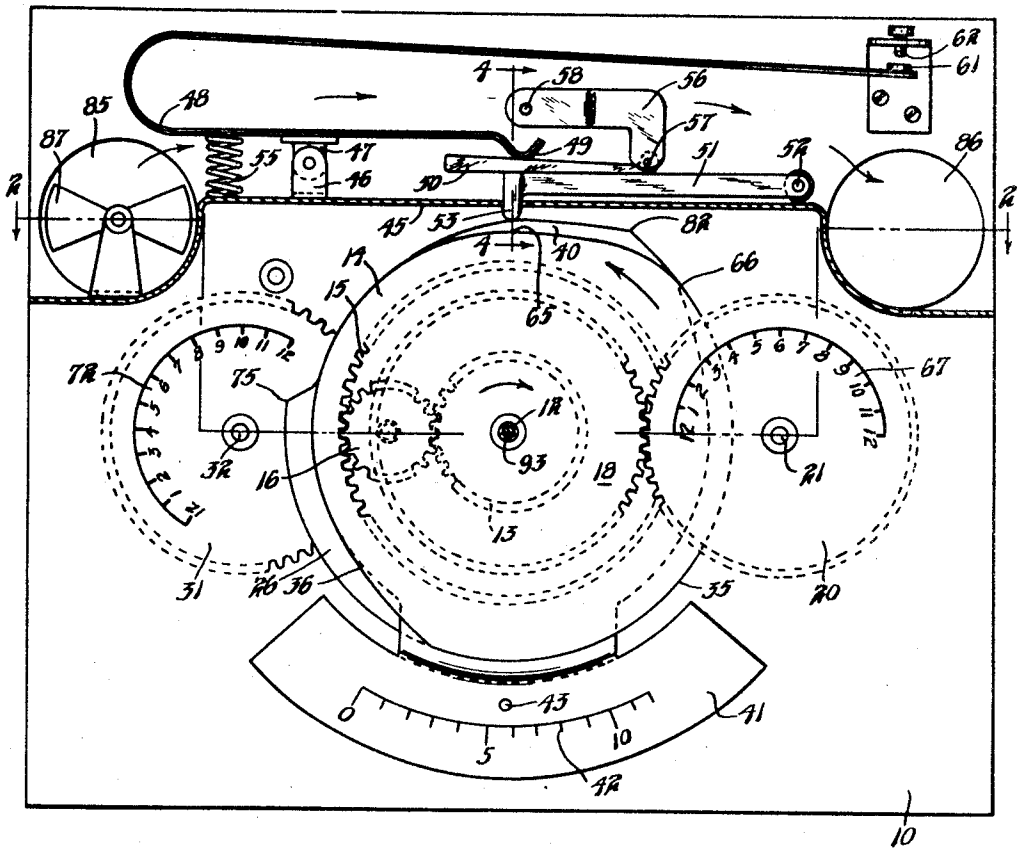
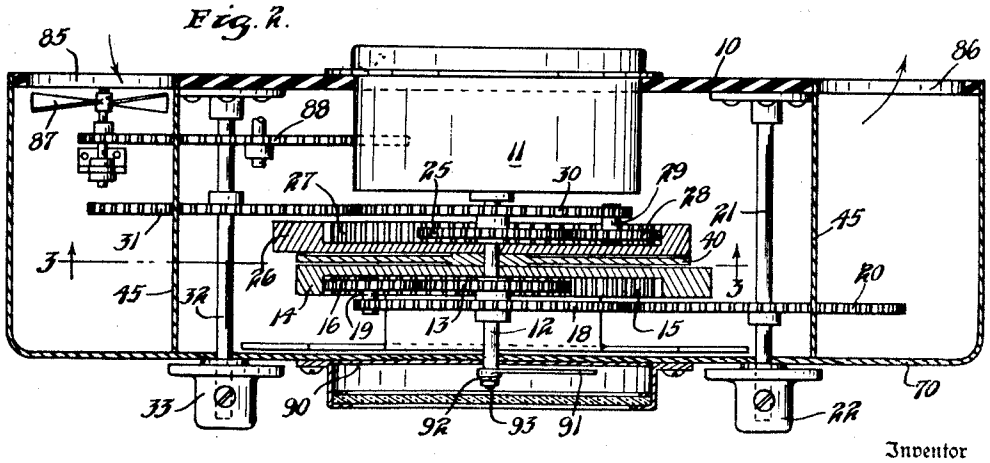


Fig. 2.



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Fig. 5.

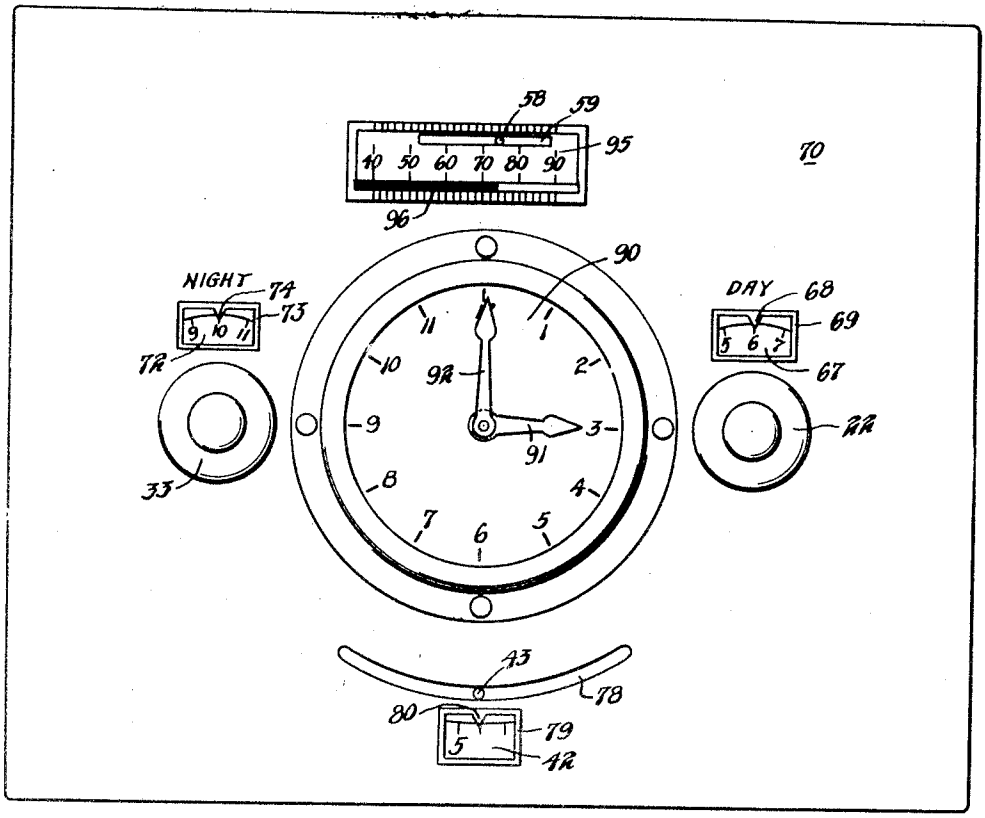


Fig. 3

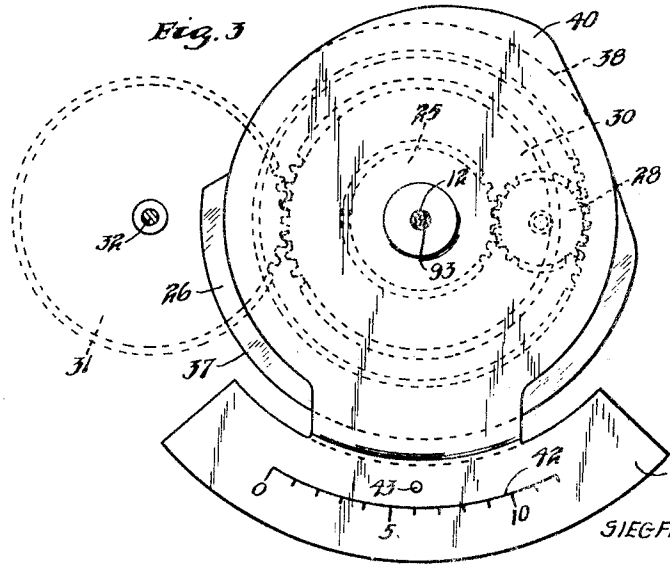
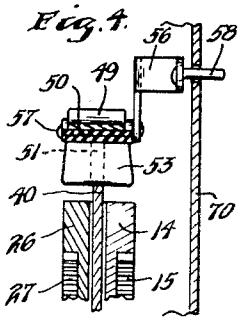


Fig. 4.



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UNITED STATES PATENT OFFICE

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TIME OPERATED SWITCH

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Application March 26, 1943, Serial No. 480,676

25 Claims. (Cl. 200—139)

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The present invention is directed broadly to a timing mechanism for adjusting the setting of a condition responsive element, and is more particularly concerned with an arrangement by which the time at which the adjustments are made may be easily varied.

In prior art devices wherein a timing motor has been utilized for adjusting the setting of a condition responsive element, such as a bimetallic thermostat, at predetermined times during the day, difficulty has been experienced in designing a mechanism so that the time at which the adjustments are made may be readily and easily varied. In such prior art devices it has been necessary to make these adjustments directly upon some portion of the motion transmitting mechanism between the timing motor and the condition responsive element. Such adjustments have often been very difficult to get at and furthermore the motion transmitting mechanism is frequently quite delicate and therefore easy to injure while making the adjustments, and also easy to get out of step with the timing motor.

One of the main objects of the present invention is therefore to design a mechanism of the above type in which the adjusting members for varying the time at which the condition responsive element shall be reset are readily accessible and are mounted upon a fixed portion of the device so there will be no danger of injury to the mechanism and no danger of getting the mechanism out of step.

A more specific object of the invention is to adjust the condition responsive element by an adjusting means which is driven by the clock motor through a planetary gear system, one element of which normally remains stationary, but which may be manually moved in order to vary the relationship between the clock motor and the adjusting mechanism for varying the time at which the adjustment takes place. A further object is to utilize two such planetary gear systems so that the time at which the setting of the condition responsive element is raised and the time at which the setting of the condition responsive element is lowered may each be individually adjusted, both planetary gear systems be driven by the same clock motor.

An additional object of the invention is to provide a two to one gear reduction between the shaft driven by the clock motor and a cam means rotated by the ring gear of the planetary gear system so that the shaft may be rotated once every twelve hours and provided with an indicator for indicating the hour of the day and the cam

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means rotated once every twenty-four hours to provide a means for raising the setting of the condition responsive element in the morning and lowering the setting at night. This is particularly useful where the condition responsive element is in the form of the usual bimetallic thermostat and the device is utilized for adjusting it to a day setting and a night setting in the usual manner.

A further object of the invention is to provide a manual adjusting means for adjusting the setting of the condition responsive element when the high portion of the adjusting cam is effective and to provide an adjustable night stop for determining the night setting when the low portion of the cam is effective. In this case the adjustment means for the night stop indicates the difference between the day setting and the night setting.

Where a thermostatic element is used which is enclosed in a casing, it is a further object of the invention to provide a fan for causing a draft of air from outside of the casing to flow across the thermostatic element and to drive this fan from the clock motor.

These and other objects will readily become apparent as the following specification is read in the light of the accompanying drawings in which,

Figure 1 is a front elevation of a device embodying my invention with the cover removed,

Figure 2 is a sectional view taken along the line 2—2 of Figure 1,

Figure 3 is a sectional view taken along the line 3—3 of Figure 2,

Figure 4 is a detailed view of the cams, night stop and manual adjustment, and is taken along the line 4—4 of Figure 1, and

Figure 5 is a front elevation of the device with the cover in place.

Referring now to Figures 1 and 2 of the drawing, a base member 10, preferably of insulating material, supports my usual type of electrical clock motor 11 which drives a shaft 12 one revolution every 12 hours. The shaft 12 drives two separate planetary gear systems the first of which comprises a sun gear 13 which is fixed to the shaft 12, and a ring gear 14 which is freely rotatable on the shaft 12 and which has a hollowed out portion housing the sun gear 13 and internally geared as shown at 15. An idler gear in the form of the planet gear 16 meshes with both the sun gear 13 and the ring gear 14 so that the ring gear is driven by the sun gear. The number of teeth on the ring gear is double that on the sun gear so that the ring gear 14 will have one revolution for every two revolutions of the sun gear 13. The

sun gear, it will be remembered, is fixed to the shaft 12 and therefore has one revolution every 12 hours so that the ring gear 14 will therefore have one revolution for every 24 hours.

A gear wheel 18 is mounted to rotate freely on the shaft 12 and carries the planet gear 16 by means of the stem 19 at a point adjacent the circumference of the gear wheel 18. The gear wheel 18 meshes with an adjusting gear 20 which is in turn fixed upon the shaft 21, the shaft 21 being rotatably mounted in the base 10.

The gear wheel 18 and the adjusting gear 20 are normally stationary so that the normal function of the planet gear 16 is merely to act as an idler for driving the ring gear 14 upon rotation of the sun gear 13. If the sun gear 13 rotates in a clockwise direction as shown by the arrow in Figure 1, it will be seen that the idler gear 16 will rotate in a counter-clockwise direction and will drive the ring gear in a counter-clockwise direction. Thus as the sun gear 13 is rotated in a clockwise direction once every 12 hours the ring gear 14 will be rotated in a counter-clockwise direction once every 24 hours. The shaft 21 is provided with a knob or handle 22 by means of which the adjusting gear 20 may be manually rotated. Manual rotation of the adjusting gear 20 will cause a corresponding rotation of the gear wheel 18 and a resultant rotation of the planet gear 16 about the shaft 12 which will produce a component of rotation of the ring gear 14 which is independent of the rotation of the shaft 12 and sun gear 13. In other words, by manually rotating this adjusting gear 20 the positional or angular relationship between the ring gear 14 and the sun gear 13 is changed so that the ring gear will occupy a different position for a corresponding position of the sun gear 13. The purpose of this adjustment will appear later.

The other planetary gear system operated by the shaft 12 comprises a sun gear 25, a ring gear 26 which is hollowed out in the same manner as the ring gear 14 and provided with internal gear teeth 27, and an idler gear in the form of the planet gear 28. The sun gear 25 is fixed to the shaft 12 and has a two to one gear reduction ratio with respect to the ring gear 26 and hence rotates this gear once every 24 hours in the same manner as the sun gear 13 rotates the ring gear 14 once every 24 hours. The planet gear 28 is carried by a pin 29 of a gear wheel 30 adjacent the circumference thereof. The gear wheel 30 is mounted to rotate freely upon the shaft 12 and meshes with an adjusting gear 31 which is fixed to a shaft 32, said shaft 32 being rotatably mounted in the base 10. The shaft 32 is provided with a knob or handle 33 similar to the knob 22 for manually rotating the adjusting gear 31 which in turn rotates the gear wheel 30 and hence rotates the planet gear 28 about the shaft 12. This in turn causes a component of rotation of the ring gear 26 with respect to the sun gear 25 and hence adjusts its rotational position with respect to the sun gear in the same manner in which the ring gear 14 is adjusted with respect to the sun gear 13.

The circumference of the ring gear 14 is in the form of a cam having a high portion 35 and a low portion 36, as seen in Figure 1. The circumference of the ring gear 26 is also in the form of a cam having a high portion 37 and a low portion 38 best seen in Figure 3. An adjustable stop in the form of a cam 40 is mounted to rotate freely on the shaft 12 directly between the two ring gears 14 and 26. The lower end of this

cam projects downwardly beyond the two ring gears and has an arcuate forward extension 41 which carries a scale plate 42 and a pin 43 by means of which the cam may be manually rotated about the shaft 12. The purpose of the stop 40 will appear later.

Referring now to Figure 1 it will be seen that a partition 45 extends across the upper portion of the casing dividing the casing into a lower portion in which the clock motor and gearing mechanism are held, and an upper portion. Mounted on the partition 45 is a bracket 46 which extends into the upper chamber and pivotally carries the member 47 which is fixed to an intermediate portion of a bimetallic thermostatic blade 48. One end of the blade 48 extends downwardly as indicated at 49 and this downwardly bent portion engages the wedge shaped member 50, which in turn lies upon a lever 51 which is pivotally mounted on the base member as indicated as 52. The free end of the lever 51 has a downwardly extending portion 53 which passes through an opening in the partition 45 and which is of sufficient width to cooperate with each of the ring gears 14 and 26 as well as the adjustable cam stop 40. This construction is shown more clearly in Figure 4. The biasing spring 55 reacts between the partition 45 and the blade 48 to bias the blade for rotation in a clockwise direction and hence bias the portion 53 of the lever 51 downwardly into engagement with the various cam members. A link 56 is pivotally connected to the wedge shaped member 50 as indicated at 57 for the purpose of moving this wedge shaped member back and forth longitudinally thereby adjusting the position of the blade 48 by causing it to rotate about the bracket 46. The link 56 is manually movable by means of a pin 58 which is adapted to extend through a slot 59 in the cover of the instrument shown in Figure 5. The free end of the bimetallic blade 48 carries a movable contact 61 which is adapted to cooperate with a stationary contact 62. The active side of the bimetal blade 48 is on the outside so that the two contacts 61 and 62 will move to closed circuit position upon a decrease in temperature to which the thermostat responds. It will therefore be seen that when the bimetallic blade 48 is rotated in a counter-clockwise direction about the bracket 46, the temperature at which the contacts will engage is increased. It therefore follows that when the extension 53 on the lever 51 is in engagement with the stop 40 or with the low portion of the cam surface of either of the ring gears the thermostat 48 is set for a relatively low temperature and when the extension 53 is in engagement with the high portion of one of the cam surfaces, the thermostat 48 is set for a relatively high temperature. It will further be seen that when the wedge 50 is moved toward the right the temperature setting of the thermostat is increased and when moved toward the left the temperature setting is decreased.

The parts are shown in Figure 1 in the positions which they will occupy at approximately three o'clock in the morning. At this time the extension 53 on the lever 51 is in engagement with the night stop 40, which means that the thermostat 48 is at its low or night setting. The shaft 12 is rotated by the clock motor in a clockwise direction, which means that the two ring gears 14 and 26 will be rotated in a counter-clockwise direction. The ring gear 14 presents a very slow rise from its low portion, starting at the point

65 directly beneath the extension 53 and continuing to the point 66. The manual adjusting gear 20 is provided with a scale 67 to indicate the relative adjustment of the ring gear 14 with respect to its sun gear 13. The number 6 is in a position to cooperate with a pointer 68 which may be seen in Figure 5 in connection with a window 69 cut through the cover 70 so that the scale 67 can be viewed through the cover. This means that at six o'clock in the morning, the ring gear 14 which produces the day adjustment will have just returned the thermostat 48 to its day adjustment by moving the high portion of the cam surface 66 to a point beneath the extension 53.

The adjusting gear 31 is provided with a scale 72, a portion of which may be viewed through the window 73 in the cover as seen in Figure 5. The window 73 is also provided with a pointer 74 for cooperation with the scale 72 to indicate the relative setting of the ring gear 26, whose cam surface determines when the night adjustment of the thermostat 48 shall be made. The numeral 10 of the scale 72 is opposite the pointer 74 which means that at 10 o'clock at night the high point 75 of the cam surface of the ring gear 26 will pass from beneath the extension 53 to permit the movement of the thermostat 48 to its night setting under the influence of the biasing spring 55. The extent to which the thermostat 48 is adjusted for its night setting will depend first upon the adjustment of the wedge 50 and also upon the adjustment of the night stop cam 40. As explained above the night stop cam 40 is rotatable about the shaft 12 by means of the pin 43 which extends through a slot 78 in the cover 70. The cover 70 is provided with a window 79 through which a portion of the scale 42 on the arcuate extension 41 of the night stop cam 40 may be viewed. The window 79 is provided with a pointer 80 which cooperates with the scale 42 as seen in Figure 5. The scale 42 indicates the extent to which the extension 53 is permitted to move toward the low portion of the cam surface on the ring gear 26. For example if the pin 43 were moved to the right as far as it would go it would rotate the cam 40 in a counter-clockwise direction and move the high point 82 of this cam beneath the extension 53. The point 82 coincides with the high portion of the cam surfaces of the two ring gears 14 and 26 with the result that when the high portion 75 of the ring gear 26 moves from beneath the extension 53, no movement of the thermostat 48 would take place due to the fact that it would be held by the high point 82 of the stop cam 40. At this time the pointer 80 would point to the number "0" on the scale 42 which would indicate that the night setting is 0° below the day setting, or in other words, that the two settings were the same. As the pin 43 is swung progressively toward the left, the cam 40 will permit the extension 53 to drop down lower and lower when it is opposite the low portion of the cam surfaces of the ring gears 14 and 26. The scale 42 is calibrated in degrees and indicates the number of degrees difference between the day and night setting of the thermostat 48. Thus in the position shown in Figure 1, the cam 40 is positioned so that the thermostat 48 will be adjusted to maintain a temperature 6° below the day setting when the thermostat is at its night setting. If the pin 43 were moved all the way to the left the cam 40 would permit the thermostat 48 to be adjusted to 12° below the day setting.

It will be noted that the rise of the cam surface on the ring gear 14 is very gradual and takes place between the two points 65 and 66 on this gear. The pointer 68 which cooperates with the numerals on the adjusting gear 20 will indicate the time at which the high point 66 will be beneath the extension 53, or in other words, it will indicate the time at which the ring gear 14 will have completed its adjustment of the thermostat 48 to its day setting. It will be noted, however, that the time at which this adjustment is started will depend upon the position of the stop cam 40. For example, as indicated in Figure 1, this cam 40 is adjusted to a position where the night setting is 6° below the day setting. Thus the gradual slope on the ring gear 14 will pick up the extension 53 about half way between the two points 65 and 66, or in other words, will start adjusting the thermostat 48 to its day setting approximately an hour and a half before it has returned the thermostat to its day setting. If the cam 40 were returned to a position where the night setting was 12° below the day setting, then the ring gear 14 would start to adjust the thermostat 48 just as the point 65 has passed beneath the extension 53 and will therefore require three full hours to raise the thermostat 48 from its night setting to its day setting. In other words, the time required for this device to adjust the thermostat 48 from its night setting to its day setting depends upon the difference between these two settings, the greater the difference, the greater the period of time required to make the adjustment. As set forth above, the numerals on the adjusting gear 20 indicate the time at which this adjustment is completed.

It will be understood, of course, that the cams formed by the two ring gears 14 and 26 cooperate to produce in effect a single adjustable cam means. Thus the gradual rise on the cam surface on the ring gear 14 determines the time at which the thermostat 48 is adjusted to its day setting and that the high surface on the ring gear 26 then takes over and maintains the thermostat 48 in the day setting until the high point 75 of the cam surface passed from beneath extension 53 to permit the thermostat 48 to return to its night setting. This is in effect a single cam means with the time at which the extension 53 is picked up and the time at which it is permitted to return to its lower position being individually adjustable.

As set forth above, the partition 45 separates the device into an upper and lower chamber, the upper chamber housing the bimetallic thermostatic blade 48. In order to render the thermostat 48 more accurately responsive to the temperature of the air in the space in which the device is located, the casing may be provided with a pair of openings 85 and 86 which communicate with the upper or thermostatic chamber. A fan 87 may be provided for causing a draft of air from the space to flow across the thermostat 48 and this fan may conveniently be geared to the clock motor by any suitable gearing means as indicated as 88. It is pointed out that a strong draft of air is not desired but that the fan 87 should be given a very slow movement to cause a slight flow of air across the thermostat.

The cover for the device may be provided with the usual clock face with which an hour hand 91 and a minute hand 92 cooperate. The hour

hand 91 will obviously be connected to the shaft 12 which rotates once every 12 hours and the minute hand may be connected to the usual shaft which rotates once an hour within the shaft 12. This shaft has been indicated as 93 in Figure 1 of the drawing.

The pin 58 which adjusts the wedge 50 for varying the setting of the thermostat 48 extends through the slot 59 in the cover and may cooperate with the scale 95 for indicating the temperature for which the thermostat is set during the day time. In order to read the setting of the thermostat during the night time, the number of degrees indicated on the scale 42, associated with the night stop cam 40, must be subtracted from the reading on the scale 95. If desired, a thermometer 96 may also cooperate with the scale 95 for indicating the actual temperature.

It will therefore be seen that I have designed a clock operated device such as a bimetallic thermostat, which is relatively compact and easy to manufacture and which provides readily accessible adjustments for varying the time at which the night and day settings of the thermostat occur. It will also be seen that the various other objects of my invention are accomplished by this design.

As many changes and modifications of this device may be made within the scope of my invention, I wish it to be understood that I intend to be limited only by the appended claims and not by the specific embodiment disclosed herein, which has been disclosed merely for the purposes of illustration.

I claim as my invention:

1. A device of the character described comprising in combination, a condition responsive element, motor means, a member driven by said motor means, an adjusting member, operating means between said driven member and said adjusting member whereby a given movement of said driven member will produce a corresponding movement of said adjusting member, said adjusting member adjusting the setting of said condition responsive element upon a predetermined movement of said driven member, a fixed support, and means mounted on said fixed support for moving said operating means to cause a movement of said adjusting member independently of said driven member.

2. A device of the character described comprising in combination, a condition responsive element, motor means, a member driven by said motor means, a first adjusting member for raising the setting of said condition responsive element, a second adjusting member for lowering the setting of said condition responsive element, a first operating means between said driven member and said first adjusting member and a second operating means between said driven member and said second adjusting member whereby upon a given movement of said driven member each of said adjusting members is given a corresponding movement, a fixed support, a first means mounted on said fixed support for moving said first operating means to cause movement of said first adjusting member independently of said driven member, and a second means mounted on said fixed support for moving said second operating means to cause movement of said second adjusting member independently of said driven member.

3. A device of the character described comprising in combination, a condition responsive element, a motor, a shaft rotated thereby, adjusting means operatively connected to said shaft for adjusting the setting of said condition responsive element upon rotation of said shaft, a fixed support and means mounted on said fixed support for varying the angular relationship between said adjusting means and said shaft.

4. A device of the character described comprising in combination, a condition responsive element, a motor, a shaft rotated thereby, adjusting means operatively connected to said shaft for adjusting the setting of said condition responsive element upon rotation of said shaft, and means for varying the angular relationship between the adjusting means and shaft, said varying means comprising a normally stationary member and connecting means between said stationary member and adjusting means for moving said adjusting means with respect to said shaft upon movement of said normally stationary member.

5. A device of the character described comprising in combination, a condition responsive element, a motor, a shaft rotated thereby, adjusting means operatively connected to said shaft for alternately raising and lowering the setting of said condition responsive element upon rotation of said shaft, a fixed support, and means mounted on said fixed support for varying the angular relationship between a portion of said adjusting means and said shaft for varying the time of one of said setting adjustments with respect to the other.

6. A device of the character described comprising in combination, a condition responsive element, a clock motor, a shaft rotated thereby, a first adjusting means operatively connected to said shaft for raising the setting of said condition responsive element at a predetermined time, a second adjusting means operatively connected to said shaft for lowering the setting of said condition responsive element at a different predetermined time, and means for varying the angular relationship between at least one of said adjusting means and shaft, said varying means comprising a normally stationary member, and connecting means between said stationary member and said one adjusting means for changing its angular relationship with respect to said shaft.

7. A device of the character described comprising in combination, a condition responsive element, a clock motor, a shaft rotated thereby, a first adjusting means operatively connected to said shaft for raising the setting of said condition responsive element at a predetermined time, a second adjusting means operatively connected to said shaft for lowering the setting of said condition responsive element at a different predetermined time, first and second normally stationary members, connections between said first member and first adjusting means for shifting the angular relationship between said first adjusting means and shaft upon movement of said first member for changing the time at which the setting of said condition responsive element is raised, and connections between said second member and second adjusting means for shifting the angular relationship between said second adjusting means and shaft upon movement of said second member for changing the time at which the setting of said condition responsive element is lowered.

8. A device of the character described comprising in combination, a timing motor, a condition responsive element, gear means including a sun gear, planet gear, and ring gear all rotat-

able about a common axis, said planet gear meshing with said sun and ring gears, one of said gears being driven by said timing motor for rotation about said axis, a second of said gears being operatively connected to said condition responsive element for changing its setting at a predetermined hour each day, the third of said gears being normally stationary with respect to its rotation about said axis, manual means for rotating said third gear about said axis to cause rotation of said second gear independently of said one gear and hence vary the hour at which the setting of said condition responsive element is varied, and indicating means associated with said third gear for visually indicating the hour at which said setting will be varied.

9. A device of the character described comprising in combination, a timing motor, a condition responsive element, gear means including a sun gear, planet gear, and ring gear all rotatable about a common axis, said planet gear meshing with said sun and ring gears, said sun gear being driven by said timing motor, said ring gear being operatively connected to said condition responsive element for changing its setting at a predetermined hour each day, said planet gear being normally stationary with respect to its rotation about said axis, manual means for rotating said planet gear about said axis for causing rotation of said ring gear independently of said sun gear and hence varying the hour at which the setting of said condition responsive element is varied, and indicating means associated with said planet gear for visually indicating the hour at which said setting will be varied.

10. A device of the character described comprising in combination, a timing motor, a condition responsive element, gear means including a sun gear, planet gear, and ring gear, a fourth gear, said planet gear being rotatably mounted on said fourth gear, said sun gear, ring gear and fourth gear being rotatable about a common axis, one of said sun, ring, or fourth gears being driven by said timing motor, a second of said last named gears being operatively connected to said condition responsive element for changing its setting at a predetermined hour each day, the third of said last named gears being normally stationary, and a manually rotatable gear wheel meshing with the third of said gears for causing rotation of the second of said gears independently of said one of said gears to vary the hour at which the setting of said condition responsive element is varied, and indicia associated with said gear wheel for indicating said hour.

11. A device of the character described comprising in combination, a timing motor, a device to be positioned in either of two positions of operation thereby, two gearing units, each of the units including a sun gear, planet gear, and ring gear, all of the gears in each unit being rotatable about a common axis, the planet gear meshing with the sun and ring gears in its respective unit, one of the gears in each unit being driven by the timing motor, a second of the gears in one unit positioning said device in one of its positions of operation, a second of the gears in the other unit positioning said device in its other position of operation, the third of the gears in each unit being normally stationary with respect to its said axis of rotation, means for manually rotating the third gear in said one of said units about its said axis to vary the time at which said device is positioned in its said one position of operation, and means for manually rotating the third gear in the said other of said units about its said axis to vary the time at which said device is positioned in its said other position of operation.

12. A device of the character described comprising in combination, a timing motor, a condition responsive element, first and second sun gears rotated by said timing motor, a first ring gear, a first planet gear meshing with said first sun and ring gears whereby the latter is driven by the former, said first ring gear being operatively associated with said condition responsive element for raising its setting at a first predetermined hour each day, a second ring gear, a second planet gear meshing with said second sun and ring gears whereby the latter is driven by the former, said second ring gear being operatively associated with said condition responsive element for lowering its setting at a second predetermined hour each day, a first gear wheel rotatable about a common axis with said first sun and ring gears, said first gear wheel carrying said first planet gear, a first manually rotatable adjusting gear in mesh with said first gear wheel for rotating it and hence causing rotation of said first ring gear independently of said first sun gear for varying the hour at which said first ring gear raises the setting of said condition responsive element, indicia associated with said first adjusting gear for indicating the hour at which said setting is raised, a second gear wheel rotatable about a common axis with said second sun and ring gears, said second gear wheel carrying said second planet gear, a second manually rotatable adjusting gear in mesh with said second gear wheel for rotating it and hence causing rotation of said second ring gear independently of said second sun gear for varying the hour at which said second ring gear lowers the setting of said condition responsive element, and indicia associated with said second adjusting gear for indicating the hour at which said setting is lowered.

13. A device of the character described comprising in combination, a condition responsive element, cam means, means for rotating said cam means once every twenty-four hours, said cam means having a high portion and a low portion, means biased into engagement with said cam means for adjusting the setting of said condition responsive element, and stop means pivoted on the same axis as said cam means for limiting the movement of said adjusting means under the influence of its bias when the low portion of said cam means is opposite said adjusting means whereby one setting of said condition responsive element is determined by said high portion of said cam means and the other setting is determined by said stop, and means for adjusting said stop.

14. A device of the character described comprising in combination, a condition responsive element, cam means, means for rotating said cam means once every twenty-four hours, said cam means having a high portion and a low portion, means biased into engagement with said cam means for adjusting the setting of said condition responsive element, stop means for limiting the movement of said adjusting means under the influence of its bias when the low portion of said cam means is opposite said adjusting means whereby one setting of said condition responsive element is determined by said high portion of said cam means and the other setting is determined by said stop, means for adjusting said stop, and means associated with said adjusting means

for simultaneously varying the high and low setting of said condition responsive element.

15. A device of the character described comprising in combination, a thermostatic control device comprising a bimetallic thermostatic blade, a base, means rotatably mounting said blade on said base, a clock motor, twenty-four hour cam means rotated by said clock motor, said cam means having a high portion and a low portion, connecting means between said blade and said cam, said connecting means being biased into engagement with said cam, said connecting means rotating said blade to one position of adjustment when said connecting means is in engagement with the high portion of said cam means, manual means for varying the effective length of said connecting means for varying the adjustment of said blade, stop means for limiting the movement of said connecting means, and hence the rotation of said blade, when the low portion of said cam means moves opposite said connecting means, and means for manually adjusting said stop means.

16. A device of the character described comprising in combination, a thermostatic control device comprising a bimetallic thermostatic blade, a base, means rotatably mounting said blade on said base, a clock motor, twenty-four hour cam means rotated by said clock motor, said cam means having a high portion and a low portion, connecting means between said blade and said cam, said connecting means being biased into engagement with said cam, said connecting means rotating said blade to one position of adjustment when said connecting means is in engagement with the high portion of said cam means, manual means for varying the effective length of said connecting means for varying the adjustment of said blade, means associated with said manual means for indicating the adjustment of said blade, stop means for limiting the movement of said connecting means, and hence the rotation of said blade, when the low portion of said cam means moves opposite said connecting means, means for manually adjusting said stop means, and means associated with said last named manual means for indicating the difference between the adjustment of said blade produced by the high portion of the cam means and that produced by said stop means.

17. A device of the character described comprising in combination, a condition responsive element, a clock motor, a shaft rotated thereby once every twelve hours, a time indicating dial, an hour indicating hand driven by said shaft and cooperating with said dial to indicate the time of day, a planetary gear system comprising a sun gear fixed to said shaft, a ring gear mounted concentrically with respect to said sun gear, and a planet gear meshing with said sun and ring gears whereby the latter is driven by the former, said sun and ring gears having a two to one ratio whereby said ring gear is rotated once every twenty-four hours, connecting means between said ring gear and said condition responsive element for changing the setting of said element at a predetermined hour each day, and means for manually rotating said planet gear around the axis of said sun and ring gears to rotate said ring gear with respect to said sun gear and hence vary the hour at which the setting of said condition responsive element is changed.

18. A device of the character described comprising in combination, a thermostatic control device comprising a bimetallic thermostatic blade, a base, means rotatably mounting said blade on said base, a clock motor, a shaft rotated thereby, a 24-hour cam means mounted on the shaft and rotated by said clock motor, said cam means having a high portion and a low portion, connecting means between said blade and said cam means, said connecting means being biased into engagement with said cam means, the connecting means rotating said blade to one position of adjustment when said connecting means is in engagement with the high portion of said cam means, manual means for varying the effective length of said connecting means for varying the adjustment of said blade, means associated with said manual means for indicating the adjustment of the blade, stop means for limiting the movement of the connecting means, and hence the rotation of said blade, when the low portion of said cam means moves opposite said connecting means, means for manually adjusting said stop means, means associated with said last named manual means for indicating the difference between the adjustment of said blade produced by the high portion of the cam means and that produced by the said stop means, and means for shifting the angular relationship between the high portion of the cam means and the shaft for changing the time at which the setting of the thermostatic blade element is raised.

19. A device of the character described comprising in combination, a thermostatic control device comprising a bimetallic thermostatic blade, a base, means rotatably mounting said blade on said base, a clock motor, a shaft rotated thereby, a 24-hour cam means mounted on the shaft and rotated by said clock motor, said cam means having a high portion and a low portion, connecting means between said blade and said cam means, said connecting means being biased into engagement with said cam means, said connecting means rotating said blade to one position of adjustment when said connecting means is in engagement with the high portion of said cam means, manual means for varying the effective length of said connecting means for varying the adjustment of said blade, means associated with said manual means for indicating the adjustment of said blade, stop means for limiting the movement of said connecting means, and hence the rotation of said blade, when the low portion of said cam means moves opposite said connecting means, means for manually adjusting the said stop means, means associated with said last named manual means for indicating the difference between the adjustment of said blade produced by the high portion of the cam means and that produced by said stop means, and means for shifting the angular relationship between the low portion of the cam means and the shaft for changing the time at which the setting of the thermostatic blade element is lowered.

20. A device of the character described comprising in combination, a thermostatic control device comprising a bimetallic thermostatic blade, a base, means rotatably mounting said blade on said base, a clock motor, a shaft rotated thereby, a 24-hour cam means mounted on the shaft and rotated by said clock motor, said cam means having a high portion and a low portion, connecting means between said blade and said cam means, said connecting means biased into engagement with said cam means, said connecting means rotating said blade to one position of adjustment when said connecting means is in engagement

with the high portion of said cam means, manual means for varying the effective length of said connecting means for varying the adjustment of said blade, means associated with said manual means for indicating the adjustment of said blade, stop means for limiting the movement of said connecting means, and hence the rotation of said blade, when the low portion of said cam means moves opposite said connecting means, means for manually adjusting said stop means, means associated with said last named manual means for indicating the difference between the adjustment of said blade produced by the high portion of the cam means and that produced by said stop means, means for shifting the angular relationship between the high portion of the cam means and the shaft for changing the time at which the setting of the thermostatic blade element is raised, and means for shifting the angular relationship between the low portion of the cam means and the shaft for changing the time at which the setting of the thermostatic blade is lowered.

21. A device of the character described comprising in combination, a thermostatic control device comprising a bimetallic thermostatic blade, a base, means rotatably mounting said blade on said base, a clock motor, a shaft rotated thereby, a 24-hour cam means mounted on the shaft and rotated by said clock motor, said cam means having a high portion and a low portion, connecting means between said blade and said cam means, said connecting means being biased into engagement with said cam means, said connecting means rotating said blade to one position of adjustment when said connecting means is in engagement with high portion of said cam means, manual means for varying the effective length of said connecting means for varying the adjustment of said blade, means associated with said manual means for indicating the adjustment of said blade, stop means for limiting the movement of said connecting means, and hence the rotation of said blade, when the low portion of said cam means moves opposite said connecting means, means for manually adjusting said stop means, means associated with said last named manual means for indicating the difference between the adjustment of said blade produced by the high portion of the cam means and that produced by said stop means, means for shifting the angular relationship between the high portion of the cam means and the shaft for changing the time at which the setting of the thermostatic element is raised, means for shifting the angular relationship between the low portion of the cam means and the shaft for changing the time at which the setting of the thermostatic blade element is lowered, and indicia means associated with the two shifting means for indicating the time at which the setting of the thermostatic blade element is raised, and the time at which the setting of the thermostatic blade element is lowered.

22. A device of the character described comprising in combination, cam means, a movably mounted thermostat, connecting means between said thermostat and the cam, clock means for rotating said cam means once every 24 hours, said cam means having a high portion for determining the day setting of the thermostat and a drop off portion for determining the time at which said thermostat is moved to its night setting, manual means for varying the effective length of said connecting means for varying the adjustment of said thermostat, and an adjustable stop for determining said night setting, said cam means having a gradual rise for gradually raising the thermostat to its day setting, and means for positioning the adjustable stop relative to said gradual rise portion of the cam for regulating the time for raising the thermostat to its day setting.

23. A device of the character described comprising in combination, a support, a condition responsive element, cam means, means for rotating said cam means, said cam means having a high portion and a low portion, means biased into engagement with said cam means for adjusting the setting of said condition responsive element, stop means for limiting the movement of said adjusting means under the influence of its bias when the low portion of said cam means is opposite said adjusting means whereby one setting of said condition responsive element is determined by said high portion of said cam means and the other setting is determined by said stop means, and means having a manually positionable portion normally fixed with respect to said support for shifting the angular relationship of said cam means with respect to said rotating means for changing the time when the condition responsive element is moved from one setting to that of the other setting.

24. A device of the class described, comprising in combination, a condition responsive element, means for changing the setting of the said condition responsive element at predetermined times, the adjusting means changing the condition responsive means from a first setting to a second setting gradually and at a predetermined rate, and means movable linearly for varying the adjustment of the condition responsive element and the linearly movable means being independently adjustable of the first mentioned adjustment means.

25. A device of the class described, comprising in combination, a bimetallic thermostatic element, means for adjusting the setting of said bimetallic element, the adjusting means adjusting the bimetallic element from a first setting to a second setting gradually and at a predetermined rate, a stop means cooperable with the adjusting means, means for adjusting the stop means with respect to the adjusting means to vary the time required for adjusting the bimetallic element from the first setting to the second setting, and means adjustable linearly with respect to the bimetallic element for varying the adjustment of the bimetallic element.

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