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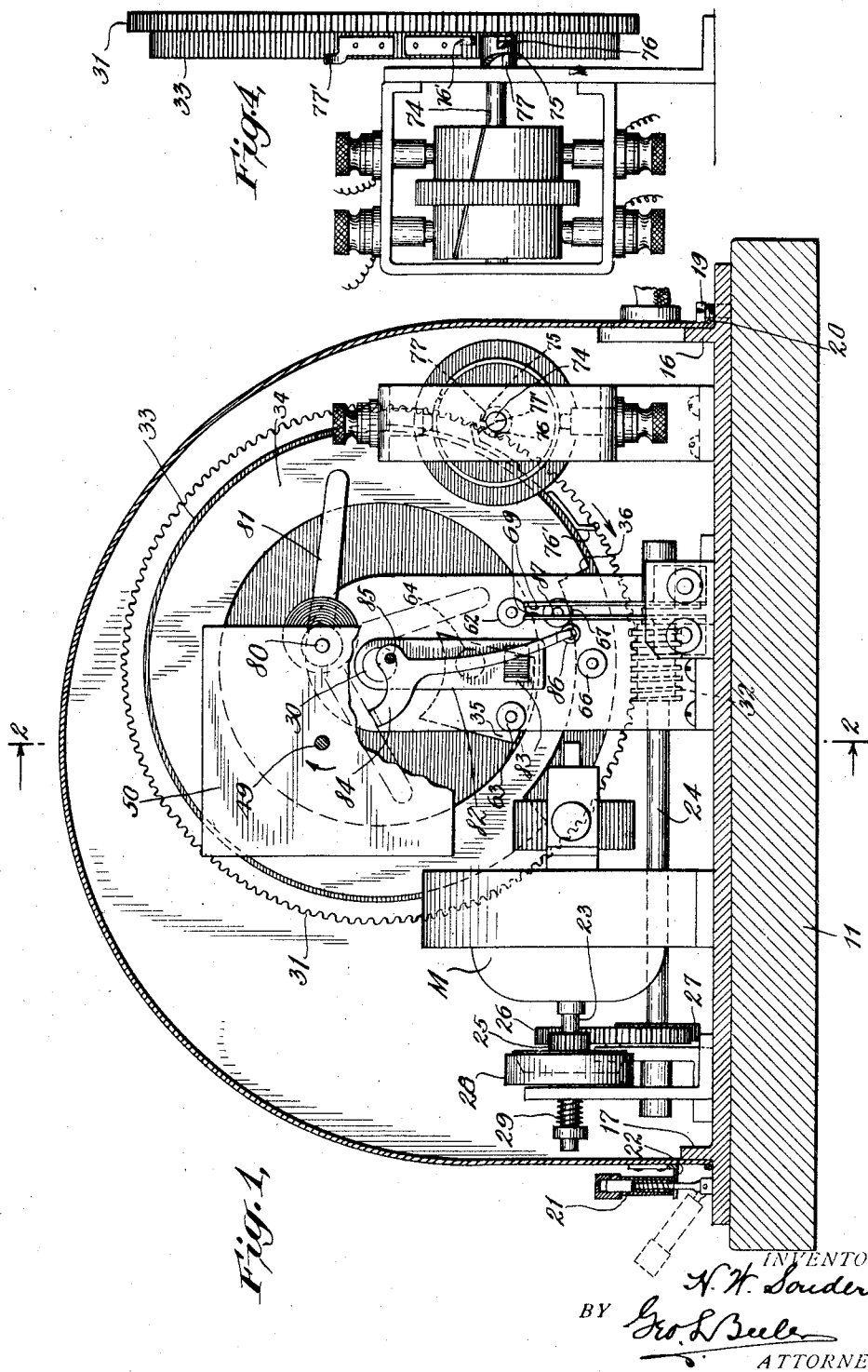
H. W. SOUDER

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AUTOMATIC WINDING MEANS FOR CLOCK MECHANISMS

Filed May 20, 1922

3 Sheets-Sheet 1



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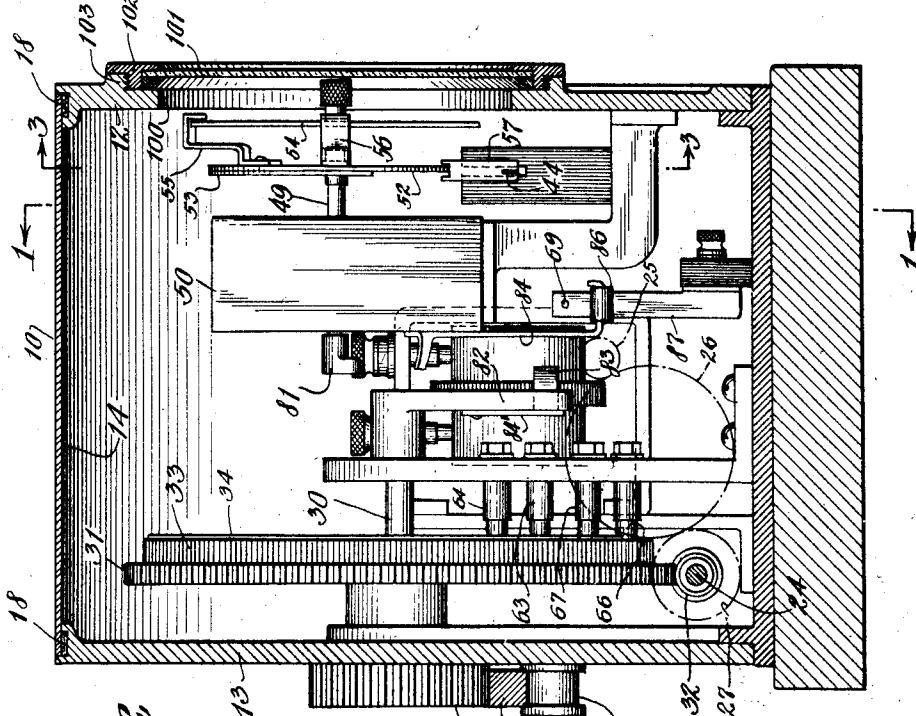
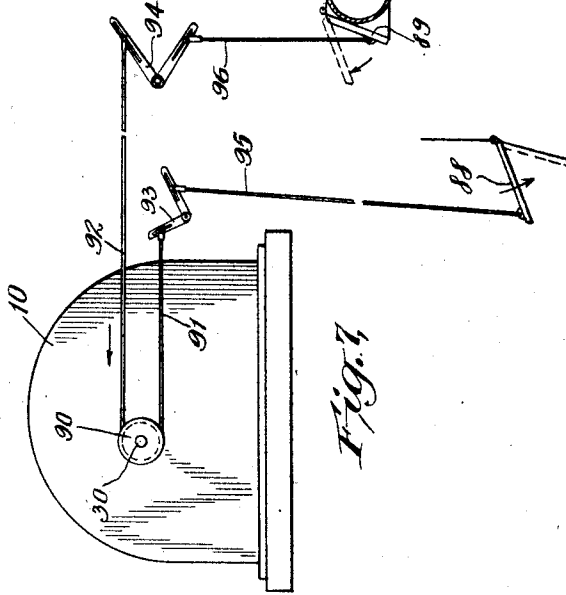
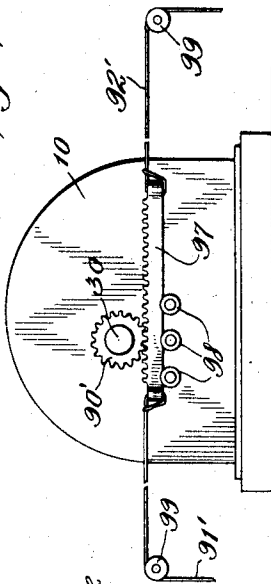
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AUTOMATIC WINDING MEANS FOR CLOCK MECHANISMS

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3 Sheets-Sheet 2

Fig. 6.



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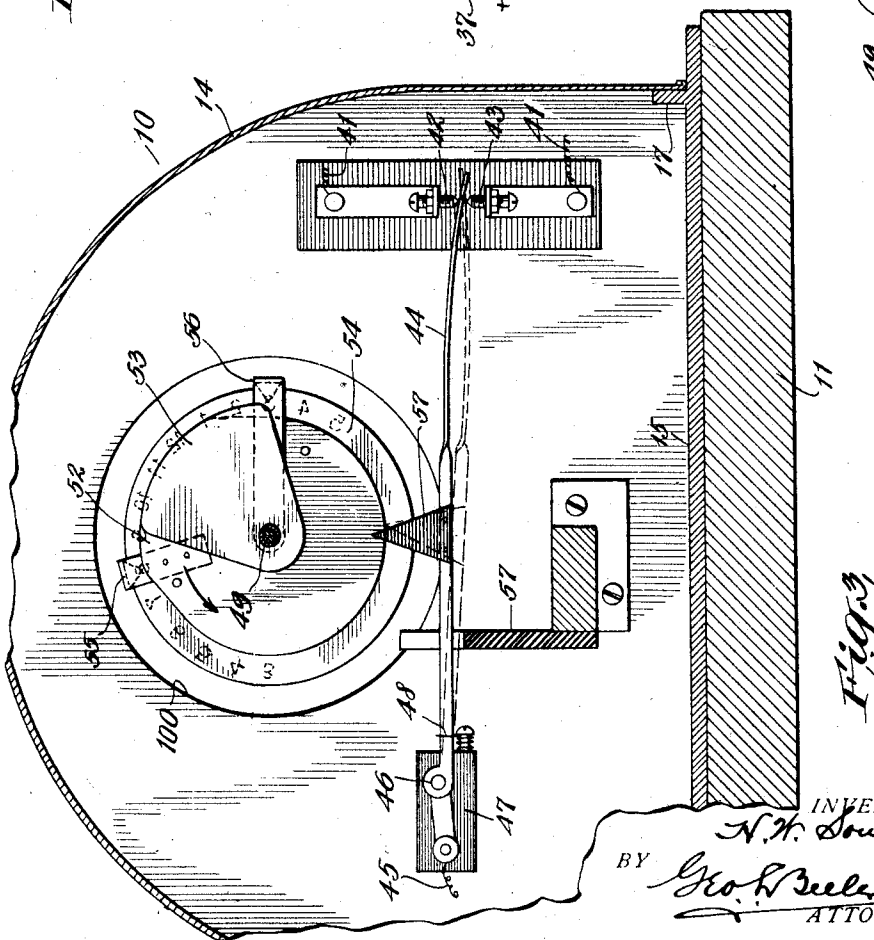
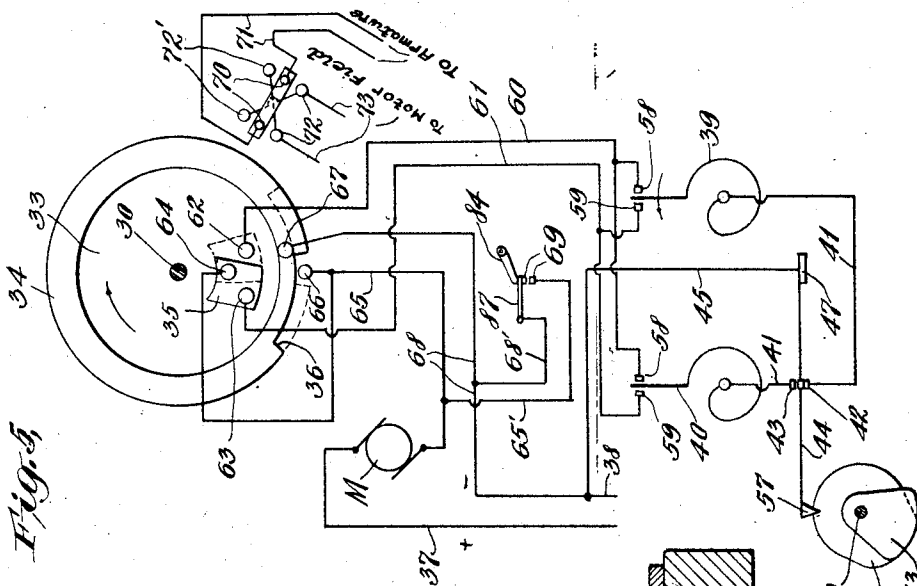
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AUTOMATIC WINDING MEANS FOR CLOCK MECHANISMS

Filed May 20, 1922

3 Sheets-Sheet 3



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AUTOMATIC WINDING MEANS FOR CLOCK MECHANISMS.

Application filed May 20, 1922. Serial No. 562,450.

To all whom it may concern:

Be it known that I, HOWELL W. SOUDER, a citizen of the United States, residing at Tamaqua, in the county of Schuylkill and State of Pennsylvania, have invented certain new and useful Improvements in Automatic Winding Means for Clock Mechanisms, of which the following is a specification.

This invention relates to automatic heat controllers such as are adapted for use particularly with heating apparatus for private dwellings, school rooms, hospitals, and many other analogous types of buildings.

Among the objects of the invention is to provide an automatic apparatus including selective day and night thermostats for alternate operation for control of the draft or other analogous furnace mechanism, with adjustable clock mechanism for shifting from one thermostat to the other at any predetermined time of day or night; to provide improved automatic rewinding mechanism for the clock mechanism, providing for a much longer interval of time between such windings than has been accomplished heretofore; to provide improved controlling devices including an automatically actuated stop mechanism and pole changer for reversing the motor at the end of each operation thereof, and to provide a number of other details of mechanical improvements, having in view the simplification of the mechanism and with the accompaniment of increased reliability and efficiency.

In the accompanying drawings which form a part of this specification references are made to certain specific details of construction, but such references are to be understood as being suggestive rather than for the purpose of limitation to the specific details shown. In said drawings on which similar parts in the several views are referred to by like reference characters,

Figure 1 is a vertical sectional view about on the line 1—1 of Fig. 2.

Fig. 2 is a vertical section about on the line 2—2 of Fig. 1.

Fig. 3 is a vertical section on the broken line 3—3 of Fig. 2.

Fig. 4 is a detail of the motor stopping or pole changing mechanism, certain of the parts being in diagram or shifted from normal position in order to best show the construction.

Fig. 5 is a diagram of the wiring and controlling mechanism.

Fig. 6 is a detail view of one form of motor power operated means for changing the drafts.

Fig. 7 is a similar view of a modification of power mechanism and indicating a preferred manner of connecting the power device with the furnace dampers.

Referring now more specifically to the drawings I show a motor mechanism comprising a casing 10 having a base 11, a pair of side walls 12 and 13, and a removable hood 14. The base includes a plate 15 having upwardly projecting flanges 16 and 17 against which the ends of the hood are tightly fastened. The side walls also are provided with grooves in which are fitted any suitable packing strips 18 of felt or the like against which the parallel edges of the hood are tightly drawn and held in practice.

As a suitable means for fastening the hood in place I show at one end thereof screws 19 having flat sided heads, the axes of the screws being parallel to the adjacent portions of the hood, and the heads in holding position as in Fig. 1 overlapping the bent up lip portion 20 of the hood, but when the screws are turned through half circles the flat sides of the heads thereof will clear the lip 20. After the lip portion is put in place and locked as described, the opposite end of the hood is drawn down toward the position shown in Fig. 1 where it is gripped by means of one or more spring actuated finger pieces at 21 engaging over a like number of clips 22 carried by the end of the hood. Thus the hood is clamped in position and in such a manner as to provide a dust proof casing for the mechanism within the same, and yet the hood may be easily removed in order to give access to the mechanism for any desired or necessary purpose.

Fixed within the casing on the plate 15 is a reversible rotary motor M of any suitable type and having a shaft 23, and parallel to it is shown a worm shaft 24. Between the motor shaft and the worm shaft are speed reducing gears 25, 26, and 27. Associated with the motor shaft 23 is a friction brake or speed controller 28 which prevents over-running of the motor when the current is cut off, by virtue of a spring 29. 30 indicates a power shaft suitably jour-

naled within the casing and to which is fixed a large worm gear 31 in constant mesh with and driven from the worm 32 on the shaft 24.

Fixed to the power shaft 30 and shown as closely associated with the worm gear 31 is a commutator disk 33 having on its exposed face two contact plates,—one a master contact ring 34 and the other a starting plate 35. The latter plate is located within the ring 34 and in the same plane thereof. The plate 35 as well as the ring may be thought of as arc shaped, but the starting plate is of relatively short angle, of say not over 10° or 15°. Directly opposite the plate from the shaft 30 is a cutout or notch 36 reducing the width of the ring to about one-half, but leaving the ring continuous otherwise. By reference to the diagram in Fig. 5 it will be understood that the motor is in circuit with feed wires 37 and 38, but between the feed wires and the motor are several selective branch circuits soon to be described.

For the control of the heating plant automatically according to the temperature of the building or room to which the heat is supplied I employ two thermostats, one 39 for the day service and one 40 for the night service, it being usually desirable for the temperature to be maintained at a higher degree during the day than during the night. Each thermostat blade or expansion member is a part of a wire connection 41 in which are located two spaced contacts 42 and 43, respecting the day connection and night connection respectively, the same being made effective by means of a movable switch 44 which constitutes a part of another connection 45 between the thermostats and the feed wire 38. The switch 44 is shown connected as by a pivot 46 with a suitable anchorage 47 which carries a spring 48 whose tendency is to hold the switch in engagement with the contact point 42.

49 indicates a shaft of a clock mechanism 50. The shaft 49 corresponds in a general way to the shaft of the hour hand of a clock, but the mechanism is so designed that this shaft makes one rotation in twenty-four hours instead of twelve hours for the hour hand. Fixed adjustably upon the shaft 49 is a cam 52, and another cam member 53 whose effective throw or radius corresponds to that of the cam 52. As shown best in Fig. 3 these cams are arranged for adjustment around the axis of the shaft 49 and with the throws thereof coincident in part. In other words, the throw of either cam is adjustable toward or from that of the other. Associated with the cams 52 and 53 is a dial 54 which bears on its face twenty-four hour sub-divisions and with any selected hours of either day or night pointers 55 and 56, attached to the cams 52 and 53 respectively, co-operate. For the purpose of illustration

of the operation of this part of the mechanism, it may be assumed that the cams and dial 54 are rotated by the clock mechanism in the direction of the arrow on Fig. 3 and that the cam 52 and its pointer 55 pertain to day service, while the cam 53 and its pointer 56 pertain to night service. In other words, the dwell of the cam 52 is effective to permit the spring 48 to hold the switch 44 in engagement with the contact 42. If now it be desired for the day thermostat to be cut out and the night thermostat to be cut into action at say 8 o'clock in the evening, the pointer 55 will be adjusted so as to point to the hour 8 on the night side of the disk or dial 54. Hence by this time the cam 52, coming into engagement with a lug 57 connected to the switch 44, will throw the same away from the contact 42 and engage contact 43. The cam 52 together with the cam 53 will continue to coact with the lug 57 to hold the switch in the position just stated until such hour in the morning, say 7 o'clock, as it is desirable for the heat to be increased. This time will be determined by the adjustment of the pointer 56 to that hour in the morning found on the day side of the dial 54 as will correspond to such desired time, when the spring 48 will cause the lug 57 to again approach the axis of the dial and restore connection between the switch 44 and the contact 42. It will be understood that the respective thermostats will be adjusted for such temperatures as may be desired to be maintained during the day and night, so that when either of them comes into use its duty will be to control the heating plant so as to produce the temperature for which it is adjusted, the thermostats being located at any convenient place in the room or apartment whose temperature is to be controlled.

The blade of each thermostat co-operates in succession with two spaced contacts 58 and 59 whose respective functions may be assumed to be to complete the circuit for more heat or less heat. According to this assumption the blade 39 as shown in Fig. 5 was last in contact with the contact point 58 and is now moving under the increase of heat toward the contact 59, the clock mechanism and switch 44 being in position for day service. The contacts 58 and 59 of each thermostat are connected respectively with two branches 60 and 61 leading to two spaced contacts 62 and 63 respectively, and between which is a third contact 64 having a line 65 leading to the motor and associated with which line is a contact point 66 lying normally in the space 36. Spaced from the contact 66 is another contact 67 from which a line 68 leads to the feed wire 38. Connected to the lines 65 and 68 are the wires 65' and 68' of a normally open branch circuit having spaced contacts 69, which when

closed by any means causes the motor to start to rotate and hence the rotation of the disk 33 and contact plates carried thereby.

With the illustration already suggested, the thermostat blade 39 moving toward the left, when the contact 59 is reached thereby the motor will start to rotate and will so initiate the rotation of the disk 33 in a clockwise direction, the circuit being through the line 37, the motor, line 65, starting plate 35, line 61, contact 59, thermostat 39, line 41, contact 42, switch 44, and line 45, to the line 38. Soon after the initiation of the rotation of the disk 33 the plate 35 leaves the contact 64 breaking the circuit just described at this point, but by this time the two contacts 66 and 67 will be bridged by the master plate 34, the circuit being then continued through the wires 65 and 68 to the motor, which new direct circuit will be continued until the disk makes nearly a full rotation or until the contact 66 drops again into the space 36 which will be located at the dotted line position of Fig. 5 and at which time the starting plate 35 will bridge the contacts 64 and 62. In this new position the circuit will include the line 60 from the contact 58 so that when the blade 39 moves again toward the right for the purpose of reducing the heat the commutator 33 will be in a favorable position for the motor to be again started by the thermostat.

The description thus far given presupposes that the motor is reversible, and hence I provide a pole changer to effect the reversing of the motor coincident with its coming to a stop because of the contact point 66 passing into the space 36. The pole changer comprises two contacts 70 from which two lines 71 lead to the armature of the motor, and these two contacts 70 are adapted to bridge two contacts 72 connected directly, or two other contacts 72' indirectly, with the two lines 73 leading to the motor field. The shifting of the contacts 70 is accomplished by the means shown in the Figs. 1 and 4 in which 74 indicates a shaft having at one end a collar 75 having on one side of its axis a pair of notches forming shoulders 76 and 77 respectively. Attached to the periphery of the disk 33 are two spurs 76' and 77' corresponding respectively to the shoulders 76 and 77. In Fig. 1 it is presumed that the spur 77' has been the last to act on the pole changer, having engaged the shoulder 77 and caused the pole changer to rotate toward the right in Fig. 1. When however the disk will have completed its next rotation toward the right the spur 76' will in turn engage the shoulder 76 coincident with the running of the contact 66 relatively into the cut-out 36 and bring the pole changer into the position where the shoulder 77 will be engaged subsequently by the spur 77' after making its next

course toward the left. Thus it will be seen that the rotation of the motor is stopped by reason of the contact 66 coming into the cut-out 36, and the motor will ordinarily not start again because the starting plate 35 is then positioned to bridge the adverse branch circuit or the circuit that is otherwise broken at the thermostat. In other words, so far as the thermostatic action of the motor is concerned it is requisite that a certain lapse of time must take place after the motor has been actuated in one direction before it can be actuated in the other direction, the thermostat blade being required to leave one contact and come into engagement with the other. This return movement however of the thermostat blade is not instantaneous by any means, requiring ordinarily several minutes at least for the temperature of the room to change sufficiently to vary the shape or function of the blade.

80 indicates the winding shaft of the clock mechanism to which is fixed a winding arm 81. The clock mechanism is so designed that the shaft 80 and arm 81 may be moved for storing power in the clock spring through an unusually large arc, approximately 270°. The power shaft 30, as shown in Figure 2, extends over far enough toward the clock mechanism to carry a power arm 82 which sweeps around in a plane close and parallel to the plane of movement of the winding arm 81. The power arm 82 carries a pivoted dog or catch 83 urged outward toward the clock mechanism by a spring 84', said dog thus always being carried forward with the arm 82 so as to engage the arm 81 wherever the latter may be overtaken when the power shaft and arm 82 are rotated clockwise as viewed in Fig. 1. When however the power arm 82 is moving in the opposite direction, meeting the arm 81, the dog 83 simply wipes idly over the arm 81, it being remembered that for the automatic operation of the motor for causing a rotation of the power shaft 30 and parts connected thereto in either a forward or reverse direction, the connection between the thermostat blade and the respective contacts 58 and 59 is relied upon, and that the shaft 30 and commutator disk 33, when the operation of the motor is initiated by the thermostat, make only one rotation or less and then stop. The next normal thermostatic operation of the motor will be in the reverse direction as already explained. Ordinarily the clock is kept wound as a result of the thermostatically initiated movements of the motor while the power shaft is rotating in a clockwise direction in Fig. 1, the normal unwinding movement of the winding arm 81 being toward the left. Should however the thermostatic initiation of the movement of

the motor be delayed for a number of hours, say four or five, said winding arm 81 will itself initiate the operation of the motor as a result of the engagement of said arm 81 against a bell crank lever 84 pivoted at 85 and whose longer arm has a roller 86 bearing against a spring 87 carrying one of the contacts 69, causing it to engage the other circuit 69 and thus closing the branch circuit 65' and 68', as shown in Fig. 5. If the first movement of the motor thus initiated should happen to be toward the left the power arm and its dog 83 will simply wipe idly over the winding arm 81 as it approaches its stopping position, but since the circuit is still completed at the contacts 69 the motor will be immediately reversed and sent in its winding direction. If however the first movement of the motor is in the winding direction, the thermostat will insure its return to the position occupied before the circuit was closed at the contact points 69, and therefore the adaptability of the motor to respond according to the position of the thermostatic devices will never be disturbed by reason of the automatic winding mechanism for the clock. As stated before however, the clock will be kept wound usually by reason of the normal action of the motor in the forward and return directions, due to the activity of the thermostats sufficiently frequently to not require the independent action of the automatic connection through the wires 68' and 65'.

In the diagram of Fig. 7 I show at 88 a front draft damper the opening of which is calculated to increase the heat of the furnace or the like, while at 89 is a cold air check or damper the opening of which is calculated to reduce the temperature. Consequently these two heat controlling members are adapted to be operated simultaneously in opposite directions, or while one is being opened the other is being closed. The automatic controlling means includes therefore connections between the power shaft 30 and said dampers. Because the power shaft is arranged to be oscillated instead of having imparted to it a continuous or repeated rotation in the same direction, it is very easy for the connections between the power shaft and the dampers to be delicately and yet reliably adjusted. Said connections include a rotary member such as a drum 90 or a pinion 90' connected to the power shaft. As shown in Fig. 7 the drum has connected to its periphery either in two separate grooves or in the same groove two flexible connections 91 and 92 leading from opposite sides of the drum 90 to bell cranks 93 and 94 respectively suitably pivoted and from whose opposite arms connections 95 and 96 lead respectively to the dampers 88 and 89. Obviously with the rotation of the drum 90 in

either direction one of the connections 91 or 92 will wind thereon and the other will wind thereoff, and as will be obvious from the diagram whichever connection 91 or 92 is wound upon the drum 90 will cause the opening of the damper to which such connection is related through the corresponding bell crank and other flexible connection. Likewise the opposite damper will be closed at the same time. In Fig. 6 I show a reciprocating member such as a rack 97 having constant mesh with the pinion 90' and supported for its reciprocations upon anti-friction rollers 98. The length of the rack approximates the circumference of the pinion, and since the pinion never makes more than one rotation, being connected to the power shaft 30 as above explained, the rack will be reciprocated in one direction or the other at each operation of the motor.

The furnace damper connections 91' and 92' being connected to the ends of the rack will operate on the dampers as already explained, said connections being either guided over pulleys 99 or connected to bell cranks as already stated, the bell cranks being preferable because there is no possibility for the connections to fail to operate properly, as by running off of a direction pulley or the like.

As indicated in Figs. 2 and 3 the front wall 12 is provided with a window opening 100 over which is fitted a transparent closure 101, the same being fastened preferably by means of a rim 102 screwed into an internally threaded flange 103 formed on the front face of the wall 12. This provides a ready and clear vision of the clock mechanism and yet this part of the casing is dust proof. The wall 12 is connected to the base 15 so as to be readily removable therefrom, and the clock mechanism being supported as by brackets or the like upon said wall 12 may consequently be removable with the wall as a unit.

I claim:

1. In automatic winding mechanism for a clock, a motor, a single revolution mechanism for winding the clock, a second winding mechanism, and means causing the first mentioned winding mechanism to function upon failure of the other winding mechanism.

2. In automatic winding mechanism for a clock, a motor, a single revolution mechanism for winding the clock, a second winding mechanism including a rotary arm, a rotary ratchet arm for moving the winding arm in one direction, and electric means controlled by the movement of the winding arm to set in operation the single revolution winding mechanism.

3. In automatic winding mechanism for a clock, a ratchet arm, a winding arm directly associated with the clock and moved by the

ratchet arm in one direction of travel of the latter, an electric motor, one revolution mechanism operated by the motor, and circuit closing means operated by the winding arm when the latter reaches a predetermined position.

4. A clock winding mechanism including a power shaft, a clock winding member rotatable from the power shaft in the same direction of rotation as the power member rotates while winding, and arm carrying a spring actuated dog and the winding member including an arm into the plane of which the dog normally projects and whereby the power member makes engagement with the winding arm for the winding movement thereof in the same direction of rotation as that of the power member, the axes of the power and winding members being offset or eccentric to each other, whereby at the end of the winding action the dog slips over the end of the winding arm.

5. In automatic winding mechanism for a clock, the combination of a power shaft, an arm fixed thereto, a spring operated dog carried by the arm, a winding shaft parallel to but offset from the power shaft, a winding arm fixed to the winding shaft and lying in the path of movement of the dog whereby the winding arm is engaged by and driven from the power arm and dog for the winding of the clock at each rotation of the winding shaft in one direction.

6. A device as set forth in claim 15 in which the power shaft and arm are oscillatory and hence adapted for rotation either forward for winding or idly in the reverse direction, the dog being so arranged as to wipe idly over the winding arm when the power shaft is rotating in its idle direction.

7. In automatic clock winding mechanism, the combination of an electric motor having a normally opened circuit in which are located two spaced contacts, a power shaft, means to rotate the power shaft from the motor, a winding shaft for the clock mechanism adjacent to but offset from the power shaft, a winding arm connected to the winding shaft, means for engaging the arm for winding the clock while rotating in the same direction as the power shaft, and a member directly engageable by the winding arm due to the normal operation of the clock mechanism, said member acting upon the spaced contacts to close the same to initiate the operation of the motor.

8. A device as set forth in claim 17 in which the member acted upon directly by the winding arm is a bell crank pivoted adjacent to the axis of the power shaft and having a shorter arm engageable directly by the winding arm and also a longer arm acting to close the circuit.

In testimony whereof I affix my signature.
HOWELL W. SOUDER.