March 2, 1943. M. SCHLENKER 2,312,492

TIME SWITCH

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Fig. 1

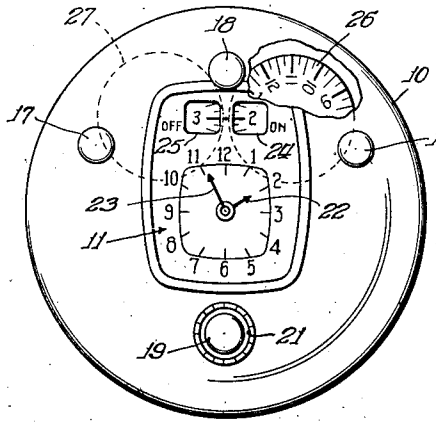


Fig. 5

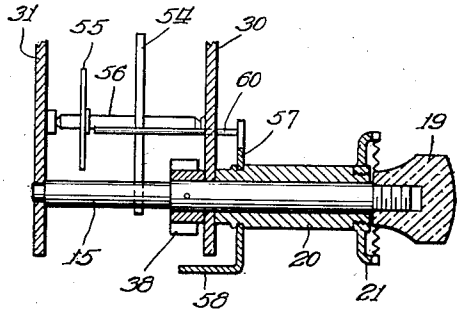
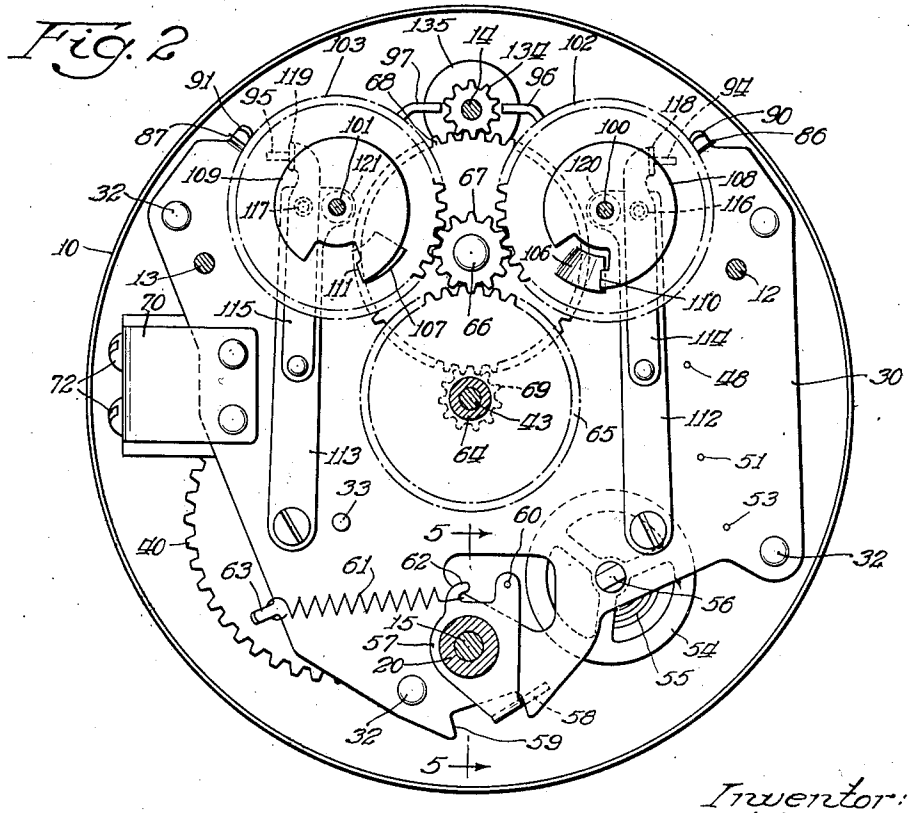


Fig. 2



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TIME SWITCH

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Fig. 3

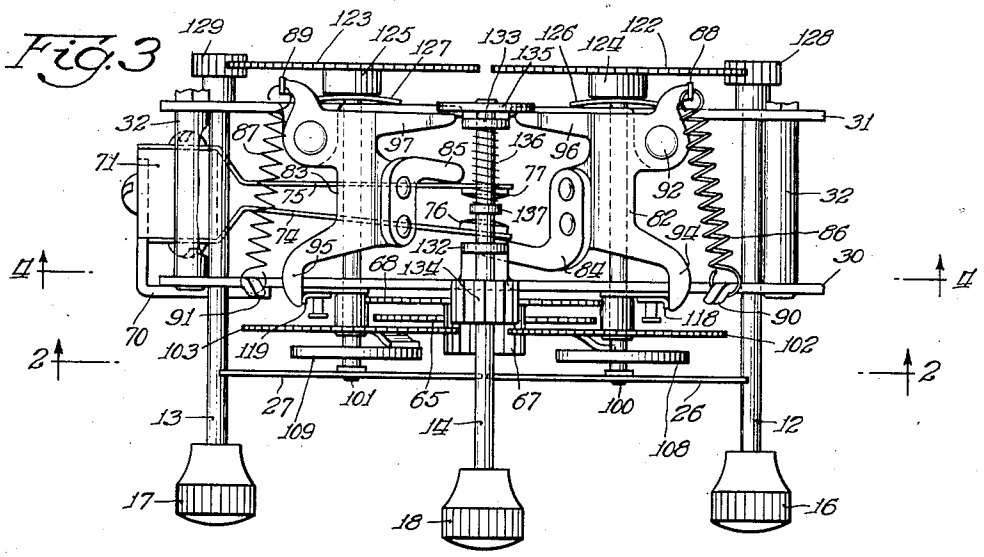
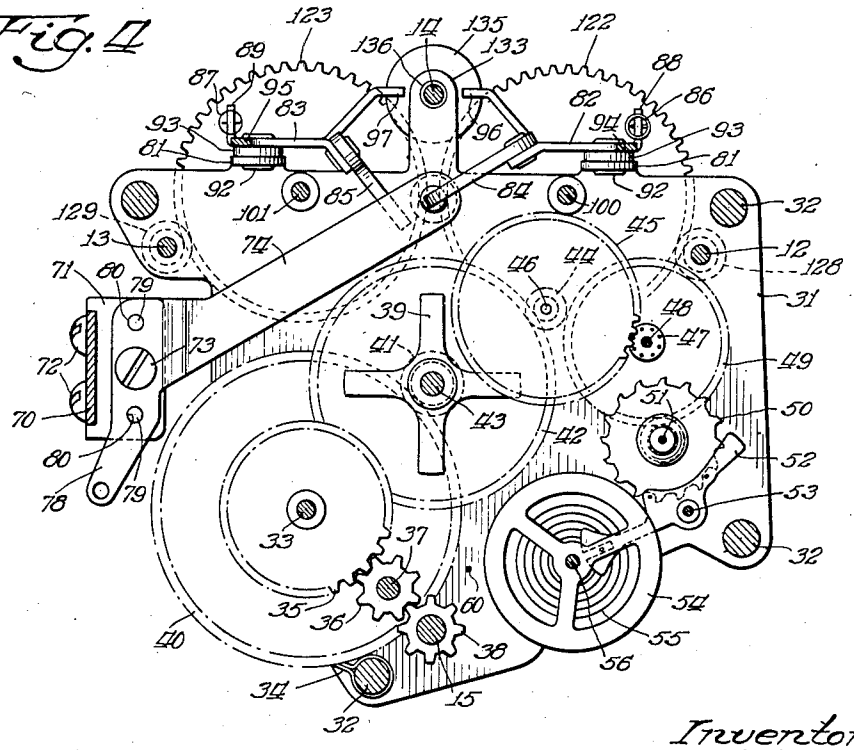


Fig. 4



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Fig. 6

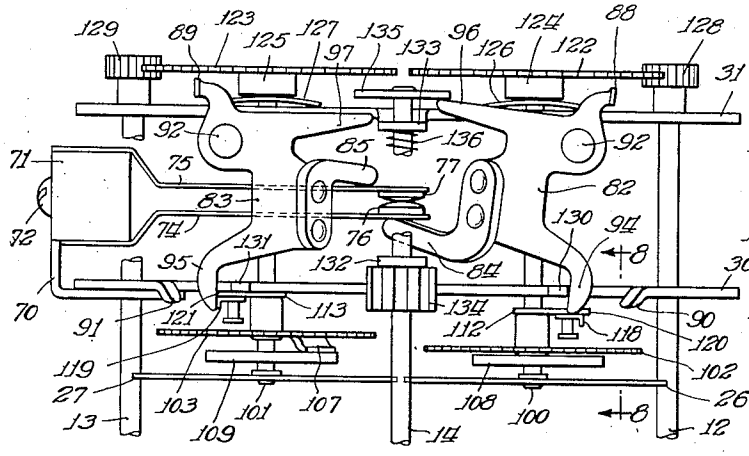


Fig. 8

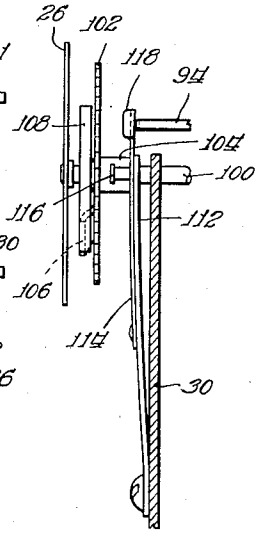


Fig. 7

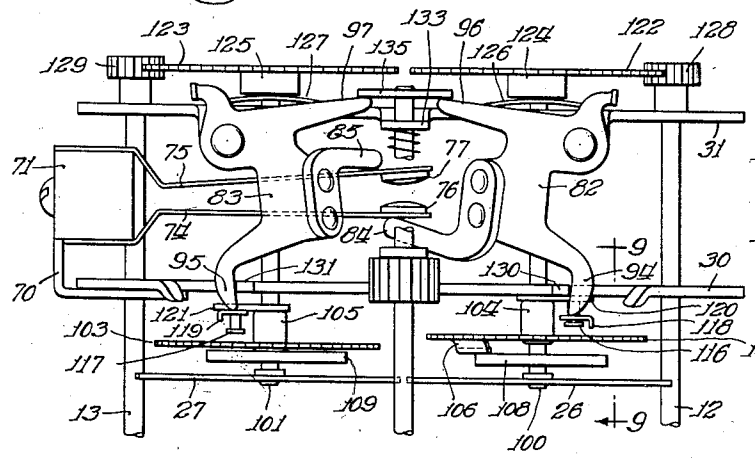
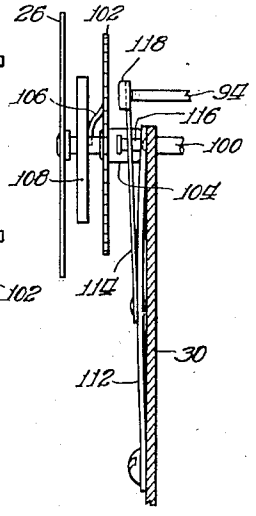


Fig. 9



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Patented Mar. 2, 1943 2,312,492

UNITED STATES PATENT OFFICE

2,312,492

TIME SWITCH

Max Schlenker, Peru, Ill., assignor to General Time Instruments Corporation, New York, N. Y., a corporation of Delaware

Application July 20, 1940, Serial No. 346,480

12 Claims. (Cl. 200—39)

This invention relates to time switches and in particular to time switches which automatically close a circuit at a predetermined time and thereafter open the circuit at a later predetermined time. Such time switches are particularly well adapted for use in connection with electric cooking devices such as ranges or roasters. The embodiment of this invention herein disclosed will be described with reference to its use as a range timer.

Various forms of switching mechanism are used in the range timers now commercially available. In a number of instances the switch mechanism takes up a considerable amount of space and is often housed in a separate compartment. Furthermore, the manufacture of such devices often calls for parts, operation and equipment which are not ordinarily used by a clock maker.

An object of this invention is to provide an improved time switch of such design that it may be readily manufactured by a clock maker.

A further object is to provide for an improved range timer a simple switch contacting means which may be mounted directly on the clock mechanism.

A further object is to provide an improved range timer in which all controls are mounted on the front face thereof and which is easy to operate.

A further object is to provide for an improved range timer contact mechanism which is positively and reliably controlled and which is so positioned with respect to the other parts of the device that no short circuits will take place.

A further object is to provide an improved range timer which can be set without inadvertently closing the circuit therethrough.

A further object is to provide an improved range timer which is adapted for occasional use and is provided with means whereby the clock mechanism may be readily wound and started.

Other objects, features and advantages of this invention will become apparent as the description proceeds.

In the drawings:

Fig. 1 is a reduced elevation of a preferred embodiment of this invention, the range timer being shown in its case, a portion of which is broken away;

Fig. 2 is a sectional elevation along line 2—2 of Fig. 3;

Fig. 3 is a plan view of the range timer shown in Fig. 1, the casing and clock dial being removed;

Fig. 4 is a section along line 4—4 of Fig. 3;

Fig. 5 is a detailed section along line 5—5 of Fig. 2;

Fig. 6 is a view similar to Fig. 3, which shows the parts in changed position, certain parts being broken away for purposes of clarity;

Fig. 7 is a view similar to Fig. 6 but showing the parts in a still different position;

Fig. 8 is a section along line 8—8 of Fig. 6; and

Fig. 9 is a section along line 9—9 of Fig. 7.

Referring now to the drawings, reference numeral 10 indicates a casing which is provided with an opening in the face thereof through which a clock dial 11 is exposed. The front of the casing is provided with other openings through which the "on" shaft 12, the "off" shaft 13, the setting shaft 14 and the winding shaft 15 may extend, each of these shafts being provided with knobs 16, 17, 18 and 19, respectively, to facilitate the manual manipulation. The sleeve 20 surrounds the winding shaft 15 and terminates in a wheel 21 or other suitable means which may be readily grasped by the hand to start the clock, such starting means being hereinafter described in detail.

The dial is provided with the usual indicia thereon with which the hour hand 22 and the minute hand 23 cooperate. The dial 11 is also provided with two apertures, an "on" aperture 24 and an "off" aperture 25 through which are visible indicia which appear on the rotatable "on" dial 26 and "off" dial 17, respectively. In Fig. 1 a portion of the casing is broken away to indicate the position of the "on" dial 26 in relation to the dial 11 and to other parts of the device.

The clock mechanism and the switching mechanism are mounted on or between the usual front and rear plates 30 and 31 which are spaced from each other by a plurality of spacers 32. The plates may be secured to the casing by suitable means not here shown.

The switching mechanism may be actuated by any suitable time-responsive driving means such as the usual spring driven clockwork, or by a synchronous electric clock motor. In the preferred embodiment herein shown spring driven clockwork is employed. Journaled in the front and rear plates is the usual main spring arbor 33 with which is associated the main spring 34, the outer end of which may be secured to one of the spacer members 32. A pinion 35 is staked to the arbor 33 and meshes with an idler pinion 36 mounted on a stub shaft 37. A pinion 38 on winding shaft 15 meshes with the idler pinion 36 so that the main spring may be wound by manually rotating the knob 19 in the usual manner. The usual time train is associated with the

main spring and comprises a wheel 40 staked to the arbor 33 which meshes with a pinion 41 which is secured to the minute wheel 42. Both the pinion 41 and the minute wheel 42 are frictionally associated with the minute shaft 43 by means of a spider 39 or other suitable mechanism as herein shown. The minute wheel 42 drives a pinion 44 which together with the wheel 45 is mounted on the shaft 46. The wheel 45 meshes with a lantern pinion 47 to drive the shaft 48 and the wheel 49 secured thereto. The latter wheel engages a similar pinion, not shown, to drive the escapement wheel 50 which is affixed to a suitable shaft 51. An escapement arm 52 is affixed to a reciprocable shaft 53 and cooperates with the balance wheel 54 in the usual manner. The balance wheel is mounted on a staff 56 and has associated therewith a hair spring 55.

As shown in Fig. 5 a plate 57 is mounted on the sleeve 20 and is provided with a bent over arm 58 which extends into a cutaway portion 59 of the plate 30. A wiper 60 in the form of a short length of steel wire extends inwardly from the plate 57 and is adapted to contact or wipe the periphery of the balance wheel 54. A spring 61 is tensioned between lug 62 on plate 57 and lug 63 on front plate 30. It will be seen that the bent over arm 58 limits the rotation of the plate 57 and sleeve 20. The spring 61 biases the plate assembly to a position wherein the wiper is free of the balance wheel. However, when it is wished to start the clock after winding, manual rotation of the starting wheel 21 in the clockwise direction as shown in Figs. 1 and 2 will cause the wiper to contact the balance wheel and give it sufficient kick to become operative. Range timers are often affixed to the range and consequently such starting means is desirable inasmuch as the clockwork could not be shaken in order to start the balance wheel in the usual manner.

A sleeve 64 is rotatably mounted on the minute shaft 43, to which sleeve the hour hand 22 may be secured. A wheel 65 is affixed to the hour sleeve 64 and meshes with a pinion 67 rotatably mounted on stub shaft 66. The stub shaft may be suitably affixed to the front plate and project forwardly therefrom. A pinion 69 secured to the minute shaft 43 meshes with the wheel 68 which is secured to the pinion 67 so that the wheel 65 and the hour sleeve may be driven at the correct speed from the minute shaft.

A bracket 70 is suitably secured to the front plate 30 by suitable means such as rivets. A block 71 of insulating material is secured to the bracket by means of screws 72. Resilient contact strips 74 and 75 are mounted one on each side of the insulating block 71 by means of screws 73 as shown in Figs. 3 and 4. The inner ends of the contact strips are provided with the usual contact points 76 and 77, respectively, and the outer portions of each comprise a terminal lug 78 to which conductors (not shown herein) may be suitably secured. The terminal lugs may be connected across the heating element of an oven so that the circuit through the oven may be closed when the contact points 76 and 77 are brought together by suitable means hereinafter described.

The insulating block 71 may be provided with one or more projections 79 which extend through corresponding apertures 80 in the base portion of the contact strips 74 and 75 which overlie the block 71. The screws 73 hold the contact strips closely against the faces of the blocks so that the contact strips interlock with the projections 79 thereby preventing the contact strips which extend laterally between the front and rear plates 30 and 31 from inadvertently being vertically displaced from their correct position. The contact strips are the only live parts in the complete assembly and if they are to be positioned between the plates it is essential that they be so mounted that they cannot possibly come in contact with any of the other metallic parts of the device.

It will be noted that in any position of the contact strips there is a considerable clearance between such strips and the plates or other metallic parts. This construction permits a great saving of space and avoids the necessity of placing the contact strips in a separate insulated compartment. The contact strips are sprung apart from one another so that they normally tend to assume a non-contacting position. They are adapted to be urged together by contact actuating members into contacting position against their resiliency.

Lugs 81 are formed on the rear plate 31, which lugs are bent over horizontally and extend inwardly to provide means for mounting contact actuating members 82 and 83, respectively. The contact actuating members are each rotatably secured to their respective lugs by means of a rivet 92, and a washer 93 may be interposed between each lug and contact actuating member to facilitate rotation of the contact actuating members.

The contact actuating member 82 has an arm 84 of insulating material extending therefrom which is adapted to contact the contact strip 74 to urge the same inwardly against the bias or resiliency thereof to contacting position. Similarly the contact actuating member 83 is provided with an insulating arm 85 which serves to hold the contact strip 75 against the bias thereof in contacting position. A heavy coil spring 86 is tensioned between a lug 88 formed on contact actuating member 82 and a lug 90 on front plate 30, which coil spring biases the contact actuating member to its normal position, which corresponds to the "off" position as shown in Fig. 7. In this normal position of the contact actuating member the contact strip 74 is in its contacting position. A light coil spring 87 is tensioned between a lug 89 on the contact actuating member 83 and a lug 91 on the front plate 30 to bias the contact actuating member to its normal position, which corresponds to the "off" position as shown in Fig. 7. In this normal position the contact actuating member permits the contact strip 75 to assume a non-contacting position.

An arm 94 is provided on contact actuating member 82 which cooperates with latching means to hold the contact actuating member in displaced position in which the contact strip is permitted to assume its non-contacting position as shown in Fig. 3. Similarly an arm 95 which cooperates with suitable latching means is provided on contact actuating member 83 to hold the same in displaced position in which the contact strip 75 is maintained against the resiliency thereof in contacting position. The displaced positions of the contact actuating members are shown in Fig. 3 and correspond to the "set" position of the device as shown therein.

Arms 96 and 97 are provided for each of the contact actuating members 82 and 83, respectively, each arm being adapted for cooperation with means for manually displacing the contact actuating members from their normal to their displaced positions.

Time responsive releasing means are provided to release the contact actuating members one after the other from the displaced position in which they are held by the latching means to cause first the circuit to be established through the contact strips and then to cause said circuit to be broken. Such latching and releasing means include shafts 100 and 101 which extend through both the front and rear plates and are journaled therein. Rotatably mounted on each shaft, forward of the front plate, are wheels 102 and 103 which are secured to hubs 104 and 105, respectively. The wheels and hubs are also adapted for axial movement with respect to their respective shafts. Each wheel 102 and 103 is provided with cams 106 and 107, respectively, formed by means of a lug which is stamped out of the wheel.

Discs 108 and 109 are each secured to the respective shafts 100 and 101 and each is formed with a cutaway portion to provide drop edges 110 and 111 to cooperate with the cams 106 and 107. It will be noted in Fig. 2 that the discs are slightly undercut so that the drop edges thereof will project rearwardly. Furthermore, each disc is formed with a spiral periphery to provide a short radius at the point where the respective cams 106, 107 first contact each disc thereby decreasing the frictional drag between each cam and disc and the power necessary to depress the respective wheels 102, 103, and to provide a longer radius at the drop edges 110, 111 in order to obtain greater accuracy. The rearwardly projecting drop edge permits better dropping action.

Heavy leaf springs 112 and 113 are secured at their lower extremities to the front plate 30 as shown in Fig. 2 and the upper end of each terminates in laterally extending portions 120 and 121, respectively, which are apertured for shafts 100 and 101, respectively, and which contact the hubs 104 and 105 to urge the wheels 102 and 103 and their cams 106 and 107 against the discs 108 and 109, respectively. Light leaf springs 114 and 115 are provided for each of the heavy leaf springs 112 and 113 and each light spring is suitably secured at its lower portion to its corresponding heavy spring, as shown in Figs. 8 and 9. Headed pins 116 and 117 are mounted in the heavy leaf springs 112 and 113, respectively, each pin projecting through the corresponding light spring to serve as a guide for the latter. The upper ends of the light springs 114 and 115 each terminate in bent over end portions which serve as latches 118 and 119 for cooperation with the arms 94 and 95, respectively.

Wheels 102 and 103 both mesh with pinion 67 and are driven thereby. Normally the wheel 102 is held spaced apart from the disc 108 by means of cam 106. In this position the heavy leaf spring 112 is urged by the hub 104 into contact with the plate 30. However, when the disc 102 is rotated by the clockwork into such position that the cam 106 drops off the drop edge 110 the heavy leaf spring 112 will cause the wheel 102 to move forwardly or to the left as viewed in Fig. 8. At the same time the light leaf spring 114 is caused to move to the left to unlatch the contact actuating member 82, this position of the parts being shown in Fig. 8. Subsequent rotation of the wheel 102 with respect to the disc 108 will cause the heavy leaf spring 112 to move into the position shown in Fig. 9. However, the arm 94 after it is released does not swing entirely clear of the latch 118 due to the presence of lug 130 which extends upwardly from the upper edge of the front plate 30. Consequently the latch 118 and the light leaf spring 114 are sprung outwardly from the heavy leaf spring 112. A similar lug 131 is provided to limit the motion of arm 95. The latching and releasing mechanism herein described is somewhat similar to that of the usual alarm release with the exception that the additional light leaf spring 114 is provided to permit the contact actuating member to remain in its normal position for any desired length of time; that is, until the apparatus is again set by causing the contact actuating member to again assume its displaced position.

Wheels 122 and 123 are provided with hubs 124 and 125, respectively, and each wheel and hub is affixed to its corresponding shaft 100 and 101. Spiders 126 and 127 or other suitable friction means are located between the hubs and the plate 31, there being a substantial area of contact between each spider and its corresponding hub to hold the shafts 100 and 101 in a predetermined position and to overcome any tendency of the cams 106 and 107 to drag the discs 108 and 109, respectively. A pinion 128 is secured to the rear end of the "on" shaft 12, which pinion meshes with wheel 122 whereby the dial 26 and the disc 108 may be set to any desired position. A similar pinion 129 is secured to the "off" shaft 13.

The setting shaft 14 is journaled in lugs 132 and 133 which project upwardly from the edge of the front and rear plates, respectively. A pinion 134 is secured to the setting shaft and meshes with the wheel 68 whereby the hour and minute hands may be set. The frictional association between the minute wheel 42 and the minute shaft 43 permits the setting of the clock hands. At the same time the rotation of the pinion 67 causes the wheels 102 and 103 and their respective cams 106 and 107 to be set to the desired position for proper release of the latching means.

The setting shaft 14 is also mounted for axial movement and at its rear end is provided with a disc 135 which engages the arms 96 and 97. A compression coil spring 136 surrounds a portion of the setting shaft 14 and is confined between lug 133 and a collar 137 to bias the setting shaft forwardly. Consequently when the contact actuating members have been manually set in their latched or displaced position by means of a pull on the setting shaft 14 the setting shaft will extend outwardly and indicate to the operator that the range timer is in the "set" position as shown in Fig. 3. After either or both of the contact actuating members have been released the setting shaft is urged rearwardly and the position of the knob indicates to the operator that the device is no longer set. The pinion 134 is of sufficient width so that it will always remain in mesh with the wheel 68 whether the set shaft 14 is in the set position or not. As indicated in Fig. 3, the latch 118 is somewhat closer to the central plane of the apparatus than the latch 119. Consequently when the setting shaft is withdrawn the contact actuating member 82 will be latched prior to the latching of contact actuating member 83. By this construction the contacts will not be inadvertently closed during the setting operation.

As shown in Fig. 1, the range timer is set to go on at 2 o'clock and off at 3 o'clock. The position of the parts is shown in Fig. 3 wherein the spring contact strip 75 is held in its contacting position by means of the displaced con-

tact actuating member 83 and the contact strip 74 is permitted to assume its normal non-contacting position by virtue of the displaced position of contact actuating member 82. At 2 o'clock the cam 106, which is rotated by the clockwork, drops off the drop edge 110 thereby permitting the heavy spring 112 and the latch 118 to move forwardly and release the contact actuating member 82. The spring 86 is stronger than the natural bias of the contact strip 74 and it causes the contact strip 74 to be moved inwardly to its contacting position wherein the contact points 76 and 77 are in contact with each other and the circuit is closed through the heating element. This position of the parts is shown in Fig. 6 and may be termed the "on" position.

At 3 o'clock the clockwork will have moved the cam 107 to a position where it drops off the drop edge 111 thereby permitting the heavy leaf spring 113 and the latch 119 to move forwardly and release the contact actuating member 83. The contact strip 75 is then permitted to spring backwardly out of contacting position into its normal non-contacting position thereby opening the circuit through the contact strips and through the heating element. This position or the "off" position of the parts is shown in Fig. 7.

The parts may, at any time thereafter, be changed to the "set" position shown in Fig. 3 in which the contact actuating members 82 and 83 are latched in their displaced position ready for subsequent release. The time of such subsequent release may be readily predetermined by rotating the knobs 16 and 17 to the proper position as indicated by the rotatable dials 26 and 27.

If the range timer is not used every day the main spring will become unwound. Upon winding the main spring and setting the clock the balance wheel may be started by manually rotating the wheel 21 through a portion of a revolution.

While there have been shown and described certain embodiments of the invention, it is to be understood that it is capable of many modifications. Changes, therefore, may be made without departing from the scope of the invention as described in the appended claims, in which it is the intention to claim all novelty inherent in the invention as broadly as possible, in view of the prior art.

I claim:

1. A time switch comprising two spaced parallel plates, time responsive means mounted on said plates, resilient electric contact members mounted on said plates and insulated therefrom and being normally spaced from each other in "set" and "off" positions, and contacting each other in "on" position, spring biased means adapted to be released from displaced positions by said time responsive means to cause said contact members to successively assume "on" and "off" positions at predetermined times, and a single manually actuated means engaging said spring-biased means for restoring the same from "off" to "set" position without changing the relative position of said contact members.

2. A time switch comprising two spaced parallel plates, time responsive means mounted on said plates, resilient electric contact members mounted on said plates and insulated therefrom and being normally spaced from each other in "set" and "off" positions, and contacting each other in "on" position, a contact actuating member for each of said contact members to control the positions thereof, means for biasing each of said contact actuating members into "off" position, common means for manually displacing both of said contact actuating members to "set" position, means for maintaining said contact actuating members in "set" position, and releasing means controlled by said time responsive means for releasing said contact actuating members individually at predetermined times to cause said contact members to assume first "on" and then "off" positions.

3. A time switch comprising a contact member, an actuating member for actuating the same, a latching member for maintaining said actuating member in displaced position, axially displaceable rotatable cam means, time responsive driving means for said cam and adapted to cause axial displacement thereof at a predetermined time, a resilient arm confined by said cam means and associated with said latching member to cause the same to move from latching to unlatching position with said resilient arm at said predetermined time and capable of being restored to confined position independently of said latching member, and manually actuated means for displacing said actuating member and permitting restoration of said latching member to latching position.

4. A time switch comprising a contact member, an actuating member mounted for limited displacement for actuating the same, a resiliently mounted latching member for engaging a portion of said actuating member to maintain said actuating member in displaced position, axially displaceable rotatable cam means, time responsive driving means for said cam and adapted to permit axial displacement thereof at a predetermined time, and a resilient arm confined by said means and urging the same into displaced position, said latching member being mounted on said resilient arm to be moved thereby from latching to unlatching position with said resilient arm at said predetermined time to release said actuating member from displaced position into a position wherein said actuating member maintains said latching member in unlatched position during and after the time that said cam means causes restoration of said resilient arm to confined position.

5. A time switch comprising a timing mechanism, cam operated releasing mechanism controlled thereby, a contact actuating member, a latch cooperating with said contact actuating member in interlocking relationship to maintain the same in displaced position before operation of said cam operated releasing mechanism, and to be maintained in inoperative position by said contact actuating member after said operation, said latch being associated with said releasing mechanism for positive control of said interlocking relationship in one direction only, manually actuated means for positive control of said interlocking relationship in the other direction, and contact means actuated by said contact actuating member.

6. A time switch comprising a timing mechanism, a contact actuating member, a latch cooperating with said contact actuating member in interlocking relationship to maintain the same in displaced position, a latch releasing member, and cam means controlled by said timing mechanism and confining said latch releasing member for controlling the operation of said latch releasing member and the release of said latch, said latch being resiliently mounted on said latch releasing member to permit restoration of said

latch to latching position after restoration of said latch releasing member to confined position and independently thereof.

7. A time switch comprising a timing mechanism, contact means, an actuating member for said contact means adapted to be latched in a displaced position, a periodically oscillating member driven by said timing mechanism, latch means associated with said periodically oscillating means in such a manner as to be actuated thereby only to effect release of said actuating member, and being independent thereof after such release until said actuating member is again set in displaced position.

8. A time switch comprising a timing mechanism, two individually movable contact members, an actuating member for each contact member, means biasing said actuating members to "off" position, latching means to maintain said actuating members in "set" position, in each of which positions, said contact members are separated from each other, means actuated by said timing mechanism for releasing said actuating members from displaced position in a predetermined order at predetermined times whereby said contact members are operated to establish and break a circuit therethrough, and common setting means to displace said actuating members and to cause the same to be latched in displaced position in the same order in which they are released whereby inadvertent release of said common setting means after only one of said actuating members are latched will prevent the establishment of a circuit through said contact members.

9. A time switch comprising two spaced parallel plates, a time train mounted on said plates, resilient contact members mounted between said plates, contact actuating members, separate means controlled by said time train to release said contact actuating members from a "set" position to an "off" position at predetermined times to cause operation of said contact members, a setting shaft rotatably mounted in said plates for axial movement and engaging said contact actuating members for restoring same from "off" position to "set" position, and a pinion secured to said shaft and engaging said time train for setting said time train.

10. A time switch comprising two spaced parallel plates, a time train mounted on said plates, resilient contact members mounted between said plates, contact actuating members, separate means controlled by said time train to release said contact actuating members from a "set" position to an "off" position at predetermined times to cause operation of said contact members, and a setting shaft rotatably mounted in said plates for axial movement and engaging said contact actuating members for restoring same from "off" position to "set" position, said shaft being associated with said contact actuating members so that one axial position thereof indicates that both contact actuating members are in said "set" position and that the apparatus is conditioned for a complete cycle of operations, and so that another axial position thereof indicates that at least one of said contact actuating members is in said "off" position.

11. A time switch comprising two spaced parallel plates, a time train mounted on said plates, resilient contact members mounted between said plates, contact actuating members, separate means controlled by said time train to release said contact actuating members from a "set" position to an "off" position at predetermined times to cause operation of said contact members, a setting shaft rotatably mounted in said plates for axial movement and engaging said contact actuating members for restoring same from "off" position to "set" position, said shaft being capable of assuming one of two extreme axial positions, means for biasing said shaft into that one of said two extreme axial positions which corresponds to the "set" position of both of said contact actuating members to indicate such condition to the operator, and a pinion secured to said shaft and meshing with a portion of said time train for setting the clock hands thereof, said pinion being of a width greater than the length of the axial movement of said shaft whereby said pinion meshes with said time train in either of said extreme axial positions.

12. Releasing means for a time switch comprising a cut away disc, a rotatable cam in axially displaceable operative relationship thereto, and a timing mechanism for causing relative rotation of said disc and cam, said disc being provided with a spiral periphery and a radial drop edge, and said drop edge extending into the cut away portion of said disc and being disposed at a greater distance from the center of said disc than that portion of said disc which initially contacts said cam.

MAX SCHLENKER.