Sept. 20, 1938. E. A. MEYER 2,130,725

TIME SWITCH

Filed June 26, 1935 3 Sheets-Sheet 1

Fig. 2.

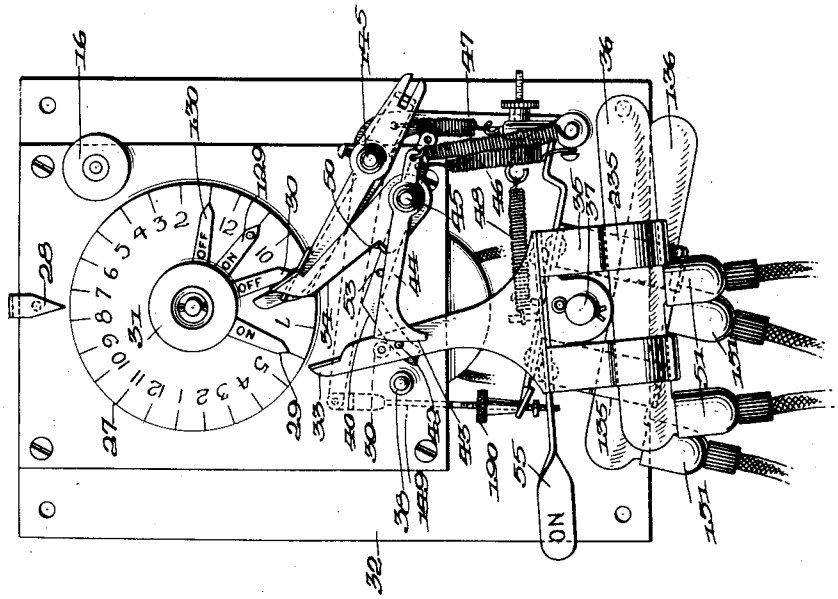
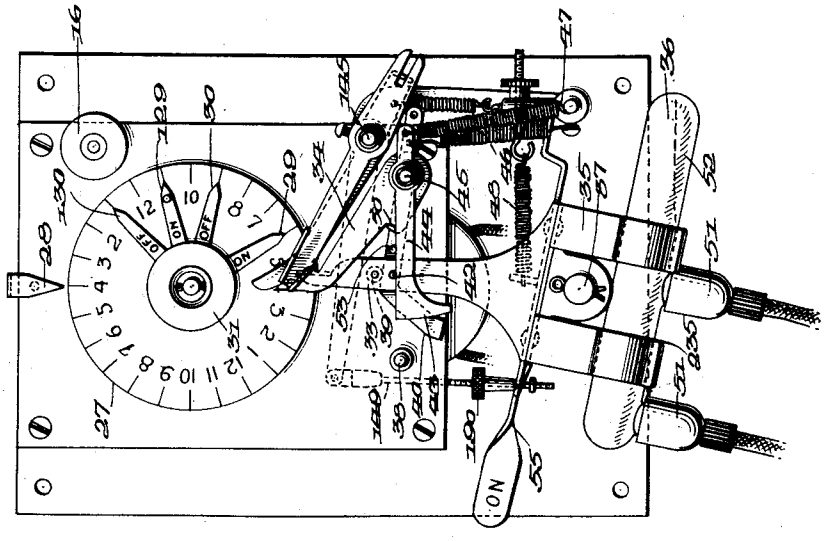


Fig. 1.



Inventor

Emil A. Meyer,

By Milburn & Milburn

Attorneys

Sept. 20, 1938. E. A. MEYER 2,130,725

TIME SWITCH

Filed June 26, 1935 3 Sheets-Sheet 2

Fig. 4.

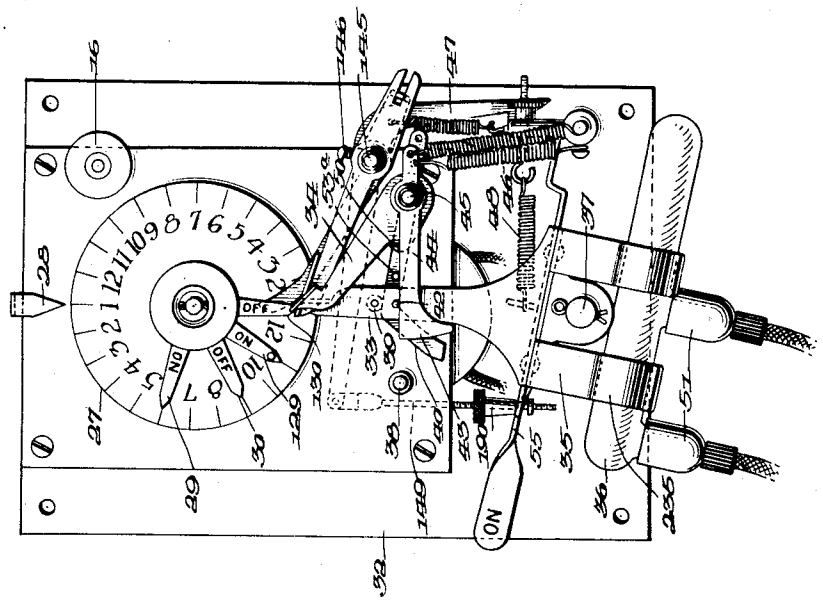
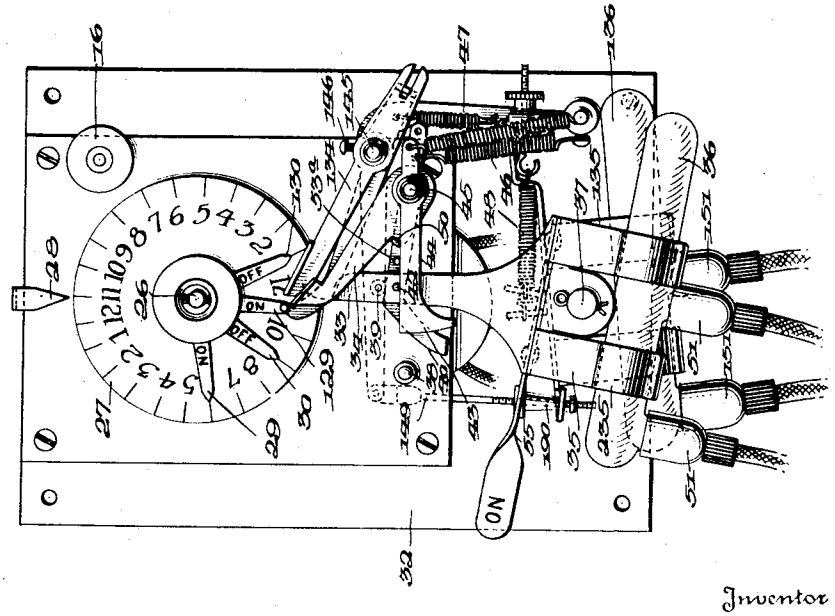


Fig. 3.



Inventor

Emil A. Meyer,

By Kilburn & Kilburn

Attorneys

Sept. 20, 1938. E. A. MEYER 2,130,725

TIME SWITCH

Filed June 26, 1935 3 Sheets-Sheet 3

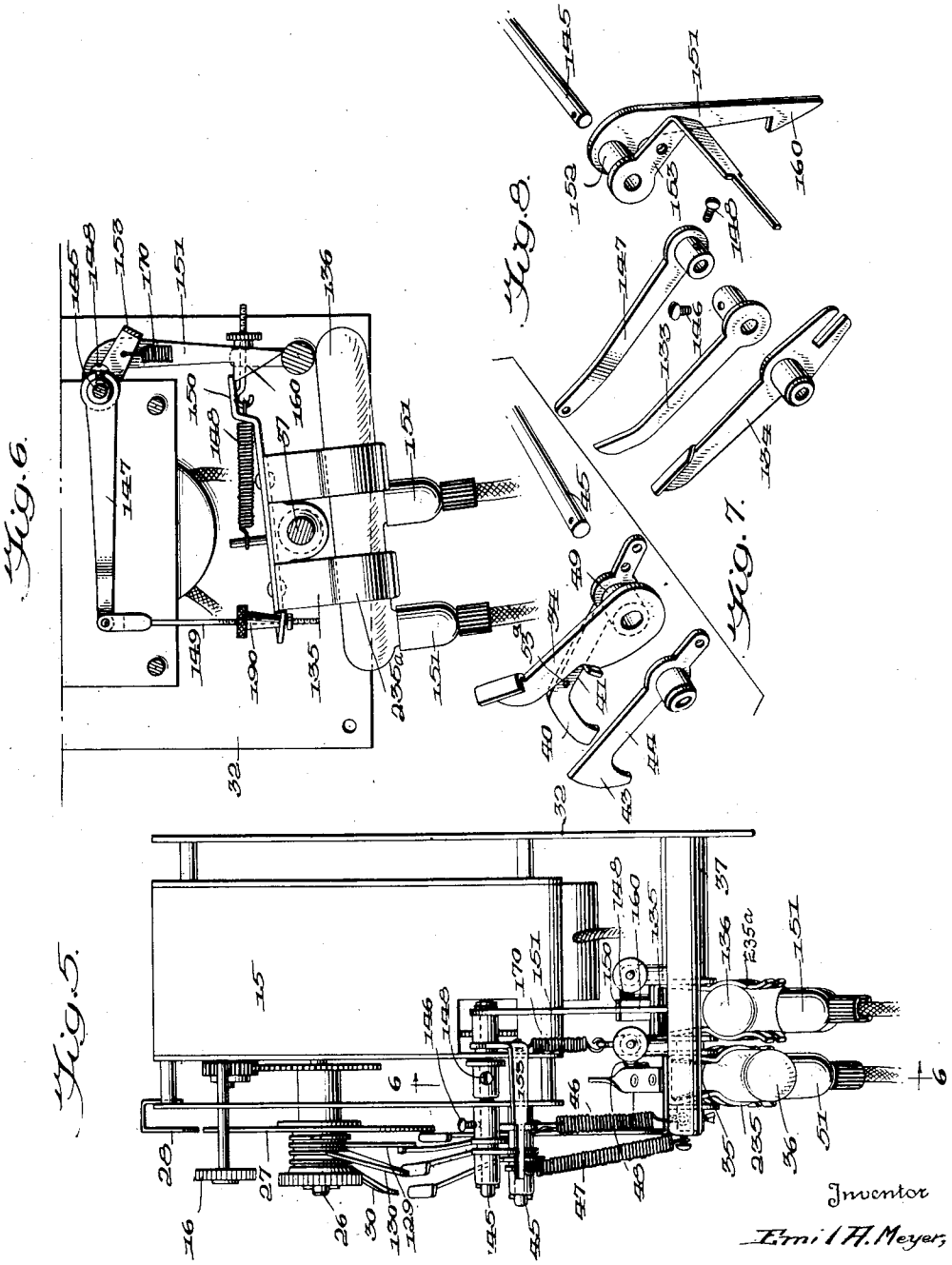


Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Inventor
Emil H. Meyer,

By Milburn & Milburn
Attorneys

Patented Sept. 20, 1938 2,130,725

UNITED STATES PATENT OFFICE

2,130,725

TIME SWITCH

Emil A. Meyer, Springfield, Ohio

Application June 26, 1935, Serial No. 28,566

4 Claims. (Cl. 200—39)

The invention relates to a time switch, and more particularly to a double circuit time switch having snap-operable switch elements and time controlled trip means therefor, all combined in a single unit.

One of the principal objects of my invention is the provision of a pair of tiltable switch supports adapted to detachably and interchangeably support switch elements for a pair of separate circuits and clock controlled mechanism for operating one of the switch supports with a quick snap movement to either open or closed position.

Another object of the invention is the provision of means whereby a quick snap action of either of a pair of switches for different circuits may be effected through the special mechanism for so operating one of the supports for the switches and the interchangeability of the switches in their supports.

A further object is the provision of a single unit double circuit time switch comprising tiltable switch supports with mercury tube switches detachably and interchangeably supported thereby and time controlled switch-actuating mechanism whereby a quick snap action may be given to the switch for either circuit to enable the danger of arcing to be minimized in the circuit more frequently used or in the circuit selected where only one is employed.

Other objects and advantages of the invention will be apparent from the specification and drawings, in which

Figure 1 is a front elevational view of the mechanism as it appears with the switches in open position and the "on" lever for one switch support about to be operated by its trip finger,

Figure 2 is a view similar to Fig. 1 showing the parts after the "on" lever for the same switch support has been operated and the "off" lever for the same support is about to be operated,

Figure 3 is a view similar to Fig. 1 showing the "on" lever for the second switch support about to be operated,

Figure 4 is a view similar to Fig. 1 showing the "on" lever for the second switch support after it has been operated and the "off" lever for the same switch support about to be operated,

Figure 5 is a side elevational view of the mechanism shown in Fig. 1,

Figure 6 is a front elevational view of the operating connections for the second switch support, taken on line 6—6 of Fig. 5, and

Figures 7 and 8 are detail perspective views of parts of the operating mechanism for the switch supports.

The switch mechanism which forms a part of my invention is operated by a clockwork mechanism 15, which may be either electric or mechanical, but is preferably a clock of known construction operated by a synchronous motor. The clock mechanism is not illustrated, since it forms no part of the present invention except as it furnishes timed rotation of a shaft which supports the trip fingers or pointers for engagement with the switch-actuating parts of the time switch mechanism.

The clockwork mechanism 15 includes a shaft 26 which corresponds to the usual hour hand shaft of an ordinary clock. A dial 27, fixed to this shaft and rotatable therewith, is marked to indicate the twenty-four hours of the day. The positioning of these markings relative to a fixed pointer 28 permits the clockwork mechanism to be set as desired, by knob 16.

Trip fingers 29, 30, 129 and 130 are rotatably positioned on shaft 26 and when adjusted to the selected points on the dial may be locked in the desired adjusted positions by means of a knurled thumb screw 31.

The trip fingers have their free ends offset to lie in different planes parallel with the plane of the dial 27, in order to permit each finger, in the course of its rotation with the shaft 26 to contact with and trip the respective switch actuating element with which it is designed to cooperate. These fingers comprise two pair of "on" and "off" members for engagement with the actuating "on" and "off" levers of the switch-actuating mechanism, one pair of trip fingers for each switch and its circuit.

In order to change the timing of one or both of the switches the thumb screw 31 may be loosened and the trip fingers 29, 30, or 129, 130, or both pair of fingers, may then be selectively set relative to the dial 27 so that the switch or switches may be moved to on and off positions at the times desired. The thumb screw is then adjusted to hold the trip fingers in their selected set positions. The fingers, rotating with shaft 26 of the clock, will then trip the respective on and off levers of the switch-actuating mechanism at the times for which they are set.

The switch-actuating mechanism is supported upon a frame 32 which preferably forms a part of the framework of the clock mechanism 15. The actuating mechanism comprises two sets of levers, each set associated with a tiltable support for a switch element, and each switch having contacts for an independent circuit. The set of levers for one of the switch supports com-

prises an "on" lever 33 and an "off" lever 34 which, when in operative position, have their upper end in the path of movement of their respective trip fingers 29 and 30.

Similarly mounted levers 133 and 134 are pivotally arranged with their upper ends in the paths of movement of their respective trip fingers 129 and 130.

The "on" lever 33 is fixedly secured to the tiltable switch support 35, which is pivotally mounted on a stud 37 projecting from the lower portion of the frame 32. The switch member carried by support 35 is preferably a mercury or other liquid contact tube 36 detachably held upon the support by clips 235. The tube 36 is provided with the usual contacts to be bridged by the liquid in the tube to close the circuit in which the contacts are included, and the switch is biased to off position, when attached to support 35, by the spring 48, which tilts the support and consequently the tube held by it to a position in which the liquid is in the end of the tube opposite to that in which the contacts are located.

When the switch support 35 is in "on" or closed switch position, the lever 33 is in the position shown in Fig. 2 of the drawings, at the extreme left hand limit of its movement, as viewed in Fig. 2. In this position lever 33 bears against a stud 38 on frame 32.

Lever 33 is provided, on its rear side, with a roller or similar member 39 which bears against the cam-surfaced end 40 of a push lever 41 designed to push the lever 33 over the make contact.

A stop pin 42, fixed to the front surface of lever 33, is disposed adjacent the end 43 of a stop lever 44. Levers 41 and 44 are pivoted on a stub shaft 45 fixed to frame 32, the levers being independently movable on this shaft. A relatively heavy coil spring 46, secured at one end to frame 32, pulls the right-hand end of lever 41 downwardly, thus holding the cam-surfaced end 40 up against the roller 39 on the "on" lever 33 and holding the latter in the left-hand position shown in Fig. 2.

A relatively light spring 47 attached to the outer end of stop lever 44 pulls the end 43 up adjacent to and in the path of pin 42 on lever 33. Coil spring 48, secured at one end to frame 32, has its other end attached to the switch support 35 at a point above its pivot 37 and thereby tends to pull the support 35 and the attached lever 33 to the right and against lever 41.

The "off" lever 34 is pivotally mounted on stub-shaft 45 and is fixed to lever 41, the two levers being joined by an integral collar 49. Thus the relatively strong spring 46 which holds the end 40 of lever 41 in upward position likewise tends to pull lever 34 upwardly, as shown in Fig. 1.

With the parts as shown in Fig. 2, the switch supported in support 35 is on or closed and the trip fingers 29 and 30 and dial 27 are being rotated clockwise by the clock 15. The "off" trip finger 30, at the end of the set time, will move against "off" lever 34 and will move this lever and its pin 50, the latter engaging and carrying with it the lever 41 to move the latter downwardly. This downward movement of lever 41 will move its cammed end 40 down and away from the roller 39 on the "on" lever 33, which would move freely to the right except that it is prevented from doing so by the end 43 of stop lever being in the path of pin 42 on lever 33. The "on" lever 33 is thus held at the left by lever 44. However, the "off" lever 34 has a forwardly extending projection 50 which, upon the continued movement of lever 34, will contact with and depress lever 44 out of the path of pin 42 on lever 33, with the result that the "on" lever 33 and switch-supporting member 35 will be snapped to the right by spring 48, tilting the mercury tube 36 to the open position wherein the mercury 52 is at the opposite end of the tube from the contacts 51.

The right-hand movement of lever 33 is limited by a stop pin 53*a* on the lever 41. At the moment that the "on" lever 33 is freed to snap to the right, the trip finger 30 is still contacting with the "off" lever 34 and the trip finger continues to press lever 34 downwardly for some minutes after "on" lever 33 has moved to the right and the circuit has been opened. One result of permitting "on" lever 33 to snap to the right before "off" lever 34 is released is that "on" lever 33 is thereby moved to such a position that the roller 39 thereon will be above the lever 41 so that when the trip finger 30 finally moves past the end of "off" lever 34 and permits this lever to spring upwardly under the action of spring 48, its upward movement will be limited by the roller 39 in the path of lever 41, which is integral with "off" lever 34.

At the conclusion of the movements just described the switch actuating parts for the switch held by switch support 35 are in the position shown in Fig. 3, the "on" lever 33 being so held by the pull of spring 48. When the "on" trip finger 29 moves against "on" lever 33 the latter is moved gradually to the left until the roller 39 on lever 33 moves past the point 53 at the angle in lever 41. When this occurs the lever 41 is immediately free to be snapped by spring 46, and since its cam surfaced end is in contact with the roller 39 on the "on" lever 33, the latter lever will be snapped to the left by the camming action and past the end 43 of lever 44, the latter being moved upwardly by spring 47. The mercury tube held by support 35 will be tilted to "on" position, as shown in Fig. 2, and the particular circuit controlled by that tube will be closed. Stop lever 41 carries lever 34 with it in its upward or clockwise movement, so that the position of this lever is again as shown in Fig. 2.

In order to operate manually the switch held in switch support 35, a lever 55 is fixed to the switch support 35. When the member 35 is in the position shown in Fig. 1, downward pressure on lever 55 will move the "on" lever 33 to the left and the parts will assume the position shown in Fig. 2. When the parts are as shown in this figure, manual pressure on lever 34 will move the parts to the Fig. 1 or "off" position.

If desired, a lever similar to lever 55 may be provided for switch support 135.

The tubes 36 and 136 have lead wires 61 and 161, respectively, extending therefrom to their respective circuits. Each of the switches or tubes 36, 136 may be supported in either of the switch supports 35, 135. The operation of either of the switches 36, 136, may thus be effected by the switch-actuating mechanism which includes "on" lever 33 and "off" lever 34 by inserting the particular switch which it is desired to have so operated into the switch support clips 235 or 235*a*.

When two circuits are used, the second circuit may be controlled by the switch (36 or 136) held in support 135 by clips 235*a*, this support being pivotally mounted on the same stud or pivot 37 on which switch support 35 is mounted.

The "on" and "off" levers 133 and 134 for the switch support 135, controlling the second circuit, are mounted on a shaft 145.

The "on" lever 133 is fixed to shaft 145 by screw 146 or other suitable means and is adapted to control switch 136 (or switch 36, when the latter is inserted in switch support 135) through an arm 147, fixed to shaft 145 by screw 148, and a push rod 149, the latter having its opposite ends respectively connected with arm 147 and switch support 135. This connection is capable of adjustment by means of a knurled nut adjusting member 190 in screw-threaded engagement with the threaded end of the push rod 149.

Switch support 135 is retained in its "on" position by the engagement of a lug 150 thereon with a hook 160 carried on the end of a latch arm 151 fixed to a collar 152 pivotally mounted on the shaft 145. Also fixed to collar 152 is an arm 153, the free end of which is engaged within the bifurcated end of "off" lever 134.

Levers 133 and 134 are respectively tripped by trip fingers 129 and 130 which are provided for the second circuit and can be set in any relative positions for "on" and "off" with respect to each other and to the trip fingers 29, 30 of the first circuit control mechanism.

The trip fingers 29, 30, 129 and 130 are mounted on the same shaft 26 and have their free ends offset to lie in different planes parallel to the dial 27, the "on" and "off" levers 33, 34, 133 and 134 being positioned in different planes, each lying in the path of its respective trip finger. Through the interchangeability of the switches 36 and 136 in the switch supports the trip fingers may be used selectively, either pair of fingers 29, 30 or 129, 130, being employed to control either of the circuits in which the switches 36, 136 are included.

In the operation of the control for the circuit in which the switch support 135 is included, the trip finger 129 engages and tilts lever 133 and the shaft 145 to which the latter is fixed, thereby tilting arm 147 and moving push rod 149 downwardly to set the tube held in switch support 135 to closed circuit position, (Figs. 3 and 6) the parts being held in this position by engagement of hook 160 with lug 150. The hook 160 is biased to latching position by a spring 170 secured at one end to the frame 32 and at its opposite end to arm 153, which is fixed to and movable with arm 151.

The hook 160 is removed from lug 150 by the engagement of "off" trip finger 130 with the "off" lever 134, (see Fig. 4), which tilts lever 134 and raises the bifurcated end thereof, thereby raising the arm 153 and lifting the hook 160 free of lug 150. When the hook 160 is thus released the switch support 135 (and the switch 136 or 36 carried by it) is snapped to "off" position by the spring 148 which is provided for this purpose.

I claim:

1. A device of the character described, comprising a pair of switch supports, each being pivotally mounted, a pair of switches each controlling an electric circuit, said switches being interchangeably mountable upon said switch supports, means to maintain one of said switch supports in one position, clockwork actuated members to move said last-mentioned switch support to its opposite position and to restore said last-mentioned switch support after a predetermined time to its original position, means to maintain the other of said switch supports in one position, a clockwork actuated member to initiate movement of the last mentioned switch support to the opposite position, and a spring-actuated cam in operative engagement with a part of the same switch support, said cam being arranged to snap the same said switch support the remainder of the distance to its opposite position when the engaged part of said same switch support has moved a predetermined distance along said cam.

2. A device of the character described comprising a pair of pivotally mounted interchangeable electric switches, means for maintaining each of said switches in open or closed circuit position, a clockwork mechanism, means actuated by said clockwork mechanism for moving one of said switches to its opposite position and for restoring said switch after a predetermined time to its original position, a member actuated by said clockwork mechanism to initiate the movement of the other of said switches to its opposite position, and means in operative engagement with the last mentioned switch and arranged to move said switch the remainder of the distance to its opposite position when said last-mentioned switch has moved a predetermined distance.

3. A device of the character described comprising a pair of pivotally mounted switches, each provided with contacts for an electric circuit, means for maintaining each of said switches in open circuit position, clockwork actuated members to move one of said switches to its opposite position and to restore said switch after a predetermined time to its original position, a clockwork actuated member to initiate the movement of the other of said switches to its opposite position, means in operative engagement with the last-mentioned switch and arranged to move it the remainder of the distance to its opposite position when said last-mentioned switch has moved a predetermined distance, and a clockwork actuated member to release said last-named means to permit said last-mentioned switch to move back to its original position.

4. In a device of the character described, a pair of pivoted electric switches, spring means for maintaining each of said switches in open circuit condition, a pair of switch-actuating levers for each switch, clockwork mechanism including a dial shaft, pointers adjustably secured to said shaft and rotatable therewith, said pointers lying with their free ends in different planes parallel to the dial, and each pointer being adapted to engage and tilt one of said levers, one of said pointers thereby initiating the movement of one of said switches to closed circuit position and another of said pointers initiating the movement of the same switch to open position, and spring-operated cam means in operative engagement with said last-mentioned switch and arranged to move said switch the remainder of the distance when said switch has moved a predetermined distance along said cam.

EMIL A. MEYER.