

March 17, 1936.

F. W. FLEGEL

2,034,178

AUTOMATIC TIME SWITCH

Filed Jan. 30, 1935

2 Sheets-Sheet 1

Fig. 7.

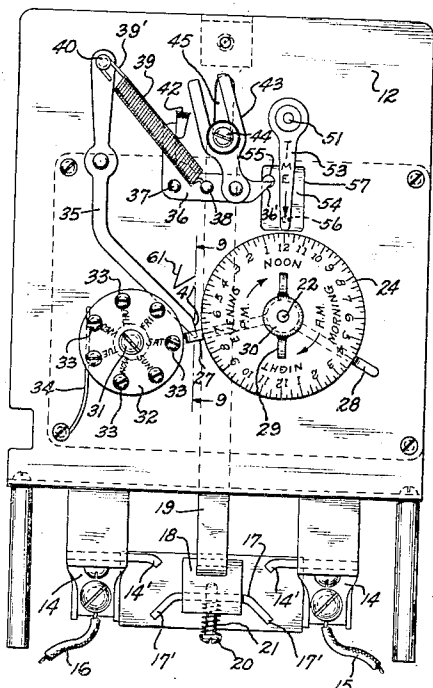


Fig. 2.

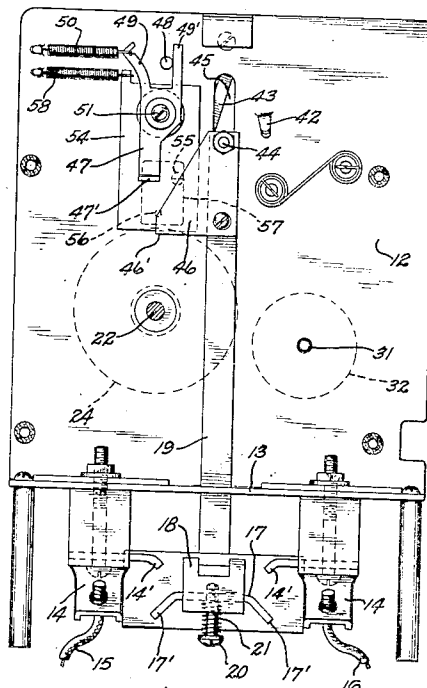
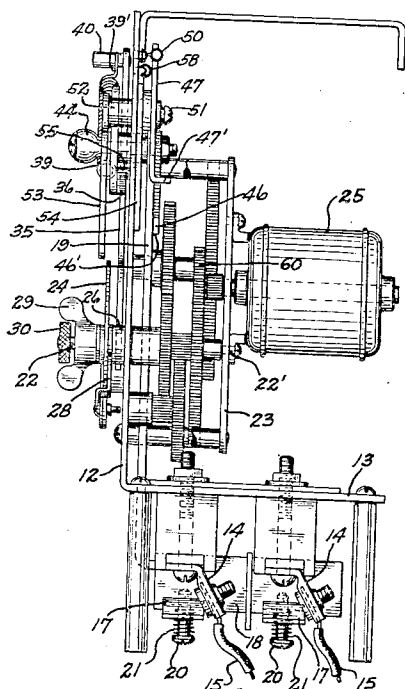


Fig. 7.

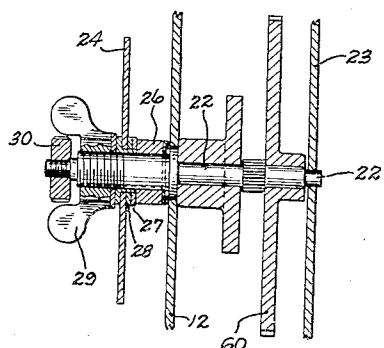


Fig. 8.

INVENTOR.
Frederick W. Flegel,

BY

Morsell, Lieber & Morsell
ATTORNEYS.

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F. W. FLEGEL

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Fig. 3.

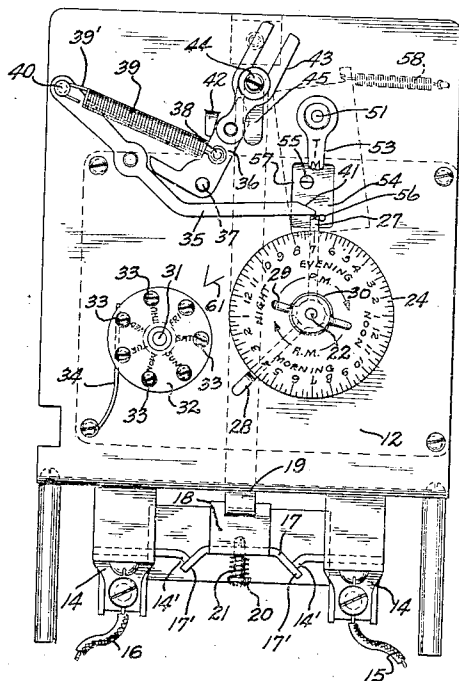


Fig. 4.

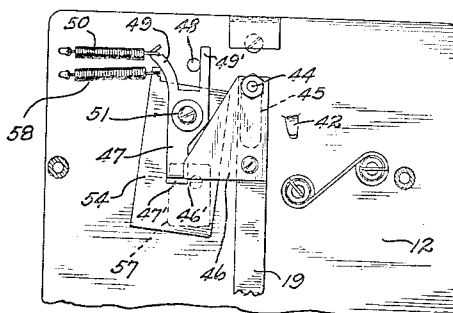


Fig. 5.

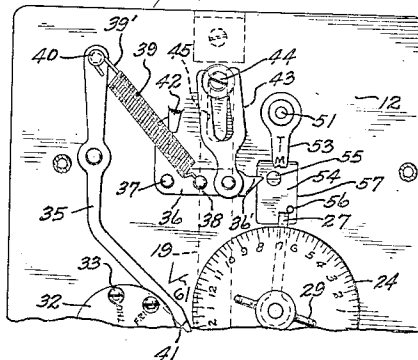


Fig. 6.

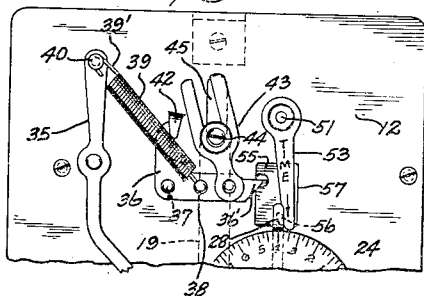


Fig. 10.

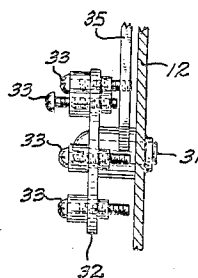
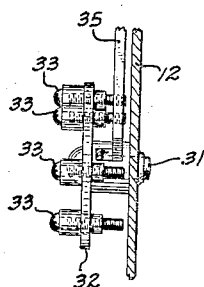


Fig. 9.



INVENTOR.
Frederick W. Flegel,
BY
Morsell, Lieber & Morsell
ATTORNEYS.

UNITED STATES PATENT OFFICE

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AUTOMATIC TIME SWITCH

Frederick W. Flegel, Racine, Wis.

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5 Claims. (Cl. 200—39)

The present invention relates to improvements in automatic time switches.

A general object of the present invention is to provide an improved form of time switch adapted to be included in an electric circuit for the purpose of automatically turning the electric lights on and off in store show windows, sign boards, and so forth, at certain selected periods of time.

A further object of the invention is to provide a time switch wherein the switch, which may include one or more poles for one or more circuits, is located below the operating mechanism, rendering it extremely accessible and convenient to wire.

A further object of the invention is to provide a time switch in which the switch element consists of three specially designed, properly insulated current carrying members including a pair of fixed outer members and a central movable member to bridge the fixed members. The movable member is moved by an operating rod and is resiliently and yieldingly mounted with respect thereto with the result that when the switch is closed the movable member will seat evenly and firmly on the fixed members and also, when the circuit is to be broken, the force of the spring mounting for the movable member aids in urging the movable member away from the fixed members.

A further specific object of the present invention is to provide a simple and compact time switch of much greater current carrying capacity than those now in use, and with an operating mechanism which will produce greater power, by a unique application of leverage, which power may be held in reserve and released with a minimum of effort and wear on the moving parts.

Another specific object is to provide a time switch having a movable, twenty-four hour dial from which power is transmitted to actuate the switching mechanism, the dial being susceptible of being driven by any convenient means of motive power.

A further object of the invention is to provide an automatic time switch which may, when desired, be operated or manipulated manually without interference with the automatic control mechanism, the device also having simple means to permit movement of the mechanism to a raised, out-of-the-way position for access to and convenient setting of the dial and hands.

A further object of the invention is to provide a time switch having simple and effective adjustable means for rendering the switching mechanism inoperative for any selected day or days.

A further object of the invention is to provide an automatic time switch in which the adjustable hands travel in different planes for actuating different portions of the mechanism.

A further object of the invention is to provide an automatic time switch which is of very simple construction, which is strong and durable and efficient in its operation, which is inexpensive to manufacture and install, and which is well adapted for the purposes described.

With the above and other objects in view the invention consists of the improved automatic time switch, and its parts and combinations as set forth in the claims, and all equivalents thereof.

In the accompanying drawings in which the same reference characters indicate the same parts in all of the views:

Fig. 1 is a front view of the improved time switch mechanism with the parts in one position of adjustment;

Fig. 2 is a rear view thereof with the parts arranged according to the setting or adjustment of Fig. 1;

Fig. 3 is a front view showing the position of the mechanism immediately upon automatic closure of the switch elements;

Fig. 4 is a fragmentary rear view of the mechanism corresponding with the arrangement in Fig. 3;

Fig. 5 is a fragmentary front view of the device showing the position of the levers upon a slight movement of the dial beyond the position of Fig. 3;

Fig. 6 is a fragmentary front view showing the position of the parts after the circuit breaking hand on the dial has tripped the mechanism;

Fig. 7 is a side view of the time switch according to the adjustment of Fig. 1;

Fig. 8 is an enlarged fragmentary, detail sectional view through the frame of the mechanism showing the dial shaft and parts associated therewith;

Fig. 9 is an enlarged fragmentary, detail sectional view taken on line 9—9 of Fig. 1; and

Fig. 10 is a similar view only showing a different setting of the day "cut-out disc."

Referring to the drawings the numeral 12 indicates the vertical portion and the numeral 13 the horizontal portion of a supporting plate or frame on and through which the improved switch mechanism is mounted. In practice the entire frame and mechanism carried thereby may be enclosed by a suitable casing (not shown) and the casing is mounted vertically wherever convenient,

Depended below the horizontal portion 13 of the plate are one or more pairs of spaced-apart fixed current carrying switch elements 14. Each of the elements 14 is mounted on a suitable insulating block and the circuit wires 15 and 16 of a circuit are connected respectively to a pair of opposite elements 14. The contact portions of the elements 14 have downwardly angled contact ends 14'. In order to bridge each pair of fixed elements 14 there is a movable switch element 17 spanning the lower portion of an insulating block 18 affixed to the lower end portion of a reciprocal bar 19. An element 17 is centrally yielding mounted with respect to its block 18 by being loosely mounted on the shank of a screw 20 and between the head of the screw and the member 17 there is a coiled spring 21 which exerts a yieldable expansive force against the mid-portion of the member 17. The outer end portions of each member 17 are angled downwardly, as at 17', and when the switch is closed said portions 17' are adapted to engage the downturned ends 14' of the fixed elements 14, as in Fig. 3. Due to the yielding mounting of the element 17 and the respective angled ends of the members, the member 17 will always adjust itself so as to firmly engage the members 14, and there is substantial surface contact between the portions 17' and 14', insuring excellent electrical connections. The yielding mounting of a member 17 also aids in the breaking of a circuit when the bar 19 moves to lower a member 17 from its fixed contact members.

Extending through the plate 12 and having a reduced inner end portion 22' journaled in a rear bracket 23 is a dial shaft 22. Said dial shaft 22 is adapted to be revolved in a clockwise direction with respect to Fig. 1 at a proper speed to advance a dial 24 in synchrony with a standard time piece. For this purpose the shaft 22 may be connected directly with a clock movement (not shown) or, as illustrated, it may receive its power from a small electric motor 25 and the speed of rotation is reduced by means of a series of reduction gears, shown in Fig. 7. Adjacent the outer face of the plate 12 the shaft 22 has fast thereon a collar 26 and the dial 24, as well as the inner enlarged, apertured ends of a pair of switch hands 27 and 28 are frictionally held in engagement with the collar 26, so as to turn with the shaft, by means of a winged clamping nut 29 threaded onto the outer end portion of the shaft. When it is desired to adjust or set the dial, or to adjust or set either or both of the hands 27 and 28, then the nut 29 is loosened, whereby said elements may be turned independently of the shaft, but if the nut is tightened, said members 24, 27 and 28 are clamped against the collar 26 and turn with the shaft. The extreme outer end portion of the shaft carries a knurled knob 30 whereby the shaft and parts thereon may be manually turned, if desired.

The dial 24 has the hours from six to six delineated on the face thereof on each front half section. Suitable delineations also appear on the face, on certain sections thereof to represent morning, noon, evening and night and also "A. M." and "P. M." Both of the hands 27 and 28 have their major portions extended radially adjacent inner surface portions of the dial. At the periphery of the dial the outer end portion of the hand 27 is bent at right angles inwardly and terminates adjacent the plate 12. The hand 28, however, adjacent the periphery of the

dial is offset outwardly to move in a plane forwardly of the plane of the face of the dial.

Rotatably mounted on a stud shaft 31, spaced from one side portion of the dial 24, is a day "cut-out" disc 32. The outer face of said disc, near its periphery, is formed with seven equally spaced apart internally threaded bored bosses. A screw 33 is adjustably threaded through each boss and through the disc. Normally the screws 33 project inwardly beyond the inner face of the disc. However, for a purpose hereinafter to be described, any selected screw may be turned outwardly so as not to project inwardly of the inner face of the disc. Each boss and its screw bears a designation on the face of the disc corresponding to a different day of the week. The disc 32 is intended to be turned in a counterclockwise direction, and retrograde movement thereof is prevented by a band spring 34 whose free end portion bears against the inwardly projecting portions of two of the bored bosses.

An elongated bell-crank lever 35 is pivotally attached, intermediate its ends, to the front face of the plate 12 a considerable distance above the disc 24. Adjacent the bell-crank lever 35 there is a pivotally mounted smaller bell-crank lever 36. The arm of said latter bell-crank lever on the side of the pivot point 37 away from the lever 35, carries a stud 38 to which one end of a coiled spring 39 is attached. The other end of said coiled spring is formed with a loop 39' to provide play under certain conditions, and engages a stud 40 at the upper end of the bell-crank lever 35. The opposite end portion of the lever 35 is provided with a tapered engaging surface 41. Movement of the bell-crank lever 36 in one direction is limited by a stop 42 which is engaged by an end of an arm of said lever. The other arm of said lever, outwardly of the stud 38, has pivotally attached thereto the lower end of a fork 43. The other end portion of said fork embraces a reduced portion of a rod 44 which is affixed to the upper end of the bar 19 and projects forwardly through a slot 45 in the plate 12, in which it is vertically movable. The outer end portion of said rod 44 is provided with a knob for manual manipulation.

An angular plate 46 is secured to the upper end portion of the bar 19 and its lower outer shouldered portion 46' is adapted under certain conditions when the bar 19 is raised, to seat on and be engaged by the lower flanged end 47' of a pivotal lever 47. Said lever 47 is pivotally mounted intermediate its ends, against the rear face of an upper portion of the plate 12. Movement of said lever in both directions is limited by a pin 48 spacedly positioned between both arms 49 and 49' of the bifurcated end portion of said lever. Said lever is urged in one direction by a coiled spring 50 attached to the arm 49 and to the plate 12. The lever 47 is fast on a pivot pin 51 which is journaled through the plate and in a front bearing boss 52. Forwardly of the plate a time arm 53 depends so as to overlie the upper edge of the dial 24 and to be in the path of movement of the end portions of the hand 28. The upper end portion of the time arm 53 is fast on the outer end of the pivot pin 51.

The upper portion of a lug plate 54 is freely pivotally mounted on the inner portion of the pivot pin 51 adjacent an inner face portion of the plate 12. Said plate 54 carries a pair of spaced-apart forwardly projecting lugs 55 and 75

56 which project forwardly through a rectangular opening 57 in the plate 12. Under certain conditions the lug 55 is adapted to be engaged by the tapered end 36' of the bell-crank lever 36 and the lug 56 is adapted to be engaged by the intumed end of the hand 27 to swing the plate 54 to the right in Fig. 5 and thereby cause disengagement between the lower end 36' and the lug 55. Swinging movement of the plate 54 is against the force of an anchored spring 58.

When the improved time switch is to be utilized for the making and breaking of two electrical circuits, for instance, for the electric lights in a pair of show windows, the circuit wires 15 and 16 are connected with the proper switch members 14, as previously described. The dial 24 should be set so that the proper time delineation appears under the time arm 53. Next the hand 27 should be set for the time the lights are to go on and the hand 28 should be set for the time the lights are to be extinguished. As illustrated, the circuit is to be completed at seven P. M. and is to be broken at four A. M. As previously mentioned the main shaft 22 and the parts mounted thereon including the dial 24 and the hands 27 and 28 are driven by a clock movement or by an electric motor with interposed reduction gearing.

The dial 24 is turned clockwise and eventually the intumed end of the hand 27 will engage the lower end of the bell-crank lever 35 (see Fig. 1). Upon further movement of the dial and hand, the lever 35 will be lifted and turned counter-clockwise, against the tension of the spring 42 until the position of Fig. 3 is reached, which is just before closure of the switch to light the lights. This movement of the lever is performed slowly.

Prior to the hand 27 reaching the time arm 53, the small bell-crank lever 36 is in the position of Fig. 1 and is retained in said position by the engagement of its end portion 36' under the lug 55 of the swinging plate 54. As soon as the hand 27 coincides with the arm 53 it engages the lug 56 of the swinging plate and pushes said plate to the right in Fig. 1 sufficiently far so that the lug 55 will move clear of the lever portion 36', whereupon the extended spring 39 will pull the bell-crank lever 36 to the left and to the position shown in Fig. 3. This is the movement which causes closure of the switch elements, because the movement just described causes the fork 43 to elevate the rod 44 in the slot 45, raising the bar 19, and lifting the movable switch elements 17 into engagement with the portions 14' of the fixed elements, all as shown in Fig. 3, the position of the mechanism on the reverse side of the plate 12 being shown in Fig. 4. The snap action to close the switch is very rapid and powerful due to the unique application of leverage afforded by the bell-crank levers 35 and 36. Immediately upon closure of the switch at the proper time and before the hand 27 moves away from the time arm, its turned-in portion serves to support the free end of the bell-crank lever 35 and to hold said lever in "cocked" position. As soon as the hand 27 moves sufficiently far to clear the lever end, the spring 39 causes said lever 35 to swing clock-wise to its original position ready for a subsequent "pick-up", and the small bell-crank lever 36 is returned to its original position, this arrangement of the parts being shown in Fig. 5. The rod 44 and bar 19 are, however, maintained in their elevated positions due to the engage-

ment of the angular plate 46 on the flange of the member 47 (see Fig. 4) whereby the switch will remain closed.

The dial 24 advances and the hand 27 eventually moves free of the lug 56, whereupon the spring 58 will return the lug plate 54 to its original position.

As time passes the dial 24 continues to advance until the time when the circuit is to be broken is reached. The hand 28 is coincident with this time on the dial and when it reaches the top position its end portion engages the time arm 53 and swings it toward the right in Fig. 6. As said time arm is fast on the shaft 51, this movement will cause the lever 47 to swing sufficiently far to cause its flange 47' to disengage the portion 46' of the plate 46, whereupon the bar 19 will drop and the movable switch elements 17 will be moved away from the fixed elements 14' to break the circuit or circuits and extinguish the lights. The spring 50 will return the lever 47 to normal position, and the rod 44 will drop to the lower end of the slot 45, as in Fig. 6. The cycle repeats itself with each revolution of the dial when the lever 35 is in operative position.

An important feature of the invention is the mechanism which makes it possible to automatically render the device inoperative for any selected day or days. For this purpose the revoluble disc 32 is provided. Normally the screws 33 carried thereby are adjusted inwardly and if the disc is properly set, each twenty-four hours, the disc will be turned counter-clockwise one-seventh of a revolution. This is accomplished by the hand 28 which, in moving, engages one of the bosses on the disc. If a screw 33 adjacent a marker 61 is turned inwardly, the lower portion of the bell-crank lever 35 will rest against it, when said lever is in normal position, and the lever is held thereby in a position to be picked up by the hand 27. To render the mechanism inoperative for a selected day, the screw 33 bearing the designation for the selected day is turned outwardly as in Fig. 10. When the disc has been advanced so as to bring this screw opposite the marker 61, the withdrawn screw does not offer support for the bell-crank lever and it lodges in a more inwardly position below the disc. The loop 39' at the end of the spring 39 provides play to permit this disposition of said lever end portion. As thus disposed the lever end portion is out of the path of the hand 27, so when said hand advances it does not engage and move the lever and the switch is not ultimately closed during the twenty-four hour period under consideration. During the next period the hand 28 turns the disc so as to bring an intumed screw into position, so thereafter, the device functions normally, as previously described.

The improved time switch is also susceptible of manual operation, whenever desired, to permit opening or closing of the switch irrespective of the automatic mechanism. For instance, if it becomes desirable to close the switch to light the lights prior to the time for which the device is set, this may be easily accomplished by merely lifting upwardly on the rod 44 to raise the bar 19 and bring the switch elements into engagement with one another. If the switch is closed and it is desired to trip it to open the circuit before the specified time, this may be accomplished by moving the time arm 53 to the right, to unseat the plate 46, whereby the bar 19 drops to open the circuit.

From the foregoing it will be evident that the

improved time switch is automatic in its operation, but is also susceptible of manual manipulation when it becomes desirable. The switch tripping mechanism makes use of a novel arrangement of levers whereby tripping is instantaneous and with the application of considerable power and force. The device may be easily set and when access to the dial or hands is desired for this purpose, the depending arm of the lever 35 may be readily moved and held in a raised, out-of-the-way position. The switch elements firmly contact one another over substantial surface areas and insure excellent current flow, and also separate readily when the circuit is to be broken. Simple and effective means are also arranged for rendering the device inoperative for a selected day or days. The time switch is of unique and simple construction, and is well adapted for the purposes described.

20 What is claimed as the invention is:

1. An automatic time switch, comprising a time mechanism having a movable time indicating dial, adjustable hands moving with said dial and projecting beyond the periphery thereof, a switch, 25 a revoluble disc having fixed projections on one side and retractable projections on the other side, compound lever means having a projecting member supportable by a retractable projection on said disc in the path of movement of one 30 of said hands to be engaged and moved thereby to close the switch, means for releasing said projecting member upon closure of the switch, and means operated by the other of said hands for opening the switch, one of said hands periodically engaging a fixed projection on said disc to turn 35 it a portion of its circumference.

2. An automatic time switch, comprising a time mechanism having a movable time indicating dial, adjustable hands moving with said dial and projecting beyond the periphery thereof, a switch, 40 a revoluble disc having fixed projections on one side and retractable projections on the other side, compound lever means having a projecting member supportable by a retractable projection 45 on said disc in the path of movement of one of said hands to be engaged and moved thereby to close the switch, means for releasing said projecting member upon closure of the switch, and means operated by the other of said hands 50 for opening the switch, one of said hands periodically engaging a fixed projection on said disc to turn it a portion of its circumference, the retracting of a selected retractable member and the advancement of the disc to bring said 55 retracted member adjacent the projecting member causing withdrawal of normal support for said latter member whereby it is temporarily positioned out of the path of movement of a hand to render the switch closing mechanism inoperative for a predetermined time period. 60

3. An automatic time switch, comprising a time mechanism having a movable time indicating dial, adjustable hands moving with said dial and projecting beyond the periphery thereof, a switch having a movable element to open 5 and close the switch, a revoluble disc having seven fixed projections on one face thereof and seven retractable projections extending from the other face thereof, compound lever means having a projecting member normally supportable by a 10 retractable projection in the path of movement of one of said hands to be engaged and moved thereby during a revolution of the dial to actuate the movable element of the switch to close the switch, the retraction of a projection adjacent 15 the projecting member causing disposition of said latter member out of the path of the hand whereby movement of the lever means during that revolution of the disc is prevented, latch means for retaining the switch in closed position for a period following movement of the lever 20 means, and means for tripping the latch mechanism to open the switch and to periodically engage a fixed projection on the disc and turn the disc one-seventh of its circumference to advance another retractable projection into juxtaposition to the projecting member of the lever 25 means.

4. In an automatic switch including a movable time mechanism and a switch, means interposed 30 between the switch and the time mechanism and operated by the latter for closing the switch comprising, a movable bar connected to a switch element, and means for throwing said bar in one direction including an arm engaging the bar, 35 a pivotally mounted bell-crank lever on which said arm is mounted, another pivotally mounted bell-crank lever, and a spring connected between arms of said bell-crank levers, the other arm of said last-mentioned bell-crank lever being engageable with the time mechanism. 40

5. In an automatic time switch, in combination, a movable time mechanism, a switch, means interposed between the switch and the time mechanism and operated by the latter for closing the 45 switch, said means including a movable bar connected to a switch element, an arm connected to the bar for throwing it in one direction, a small pivotally mounted bell-crank lever on which said arm is mounted, an elongated bell-crank lever adapted to be engaged and moved 50 by said time mechanism, a spring connected between said bell-crank levers, latch means for releasably retaining the bar in one position, and means operated by the time mechanism for tripping said latch mechanism to release the bar to open the switch. 55

FREDERICK W. FLEGEL. 60