

July 22, 1941.

L. A. PFLEGER

2,250,168

TIME SWITCH

Filed Aug. 29, 1938

2 Sheets-Sheet 1

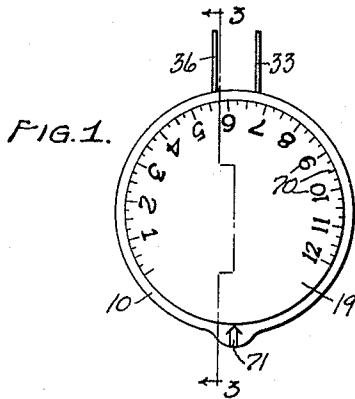


FIG. 2.

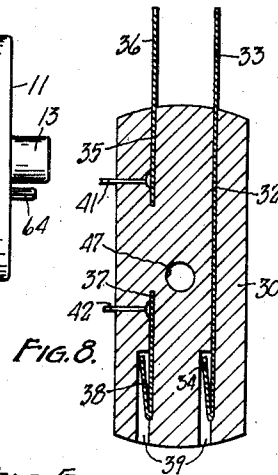
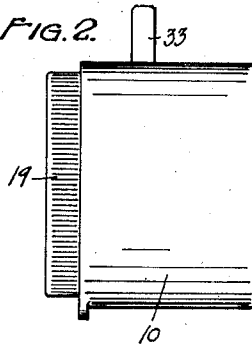


FIG. 4.

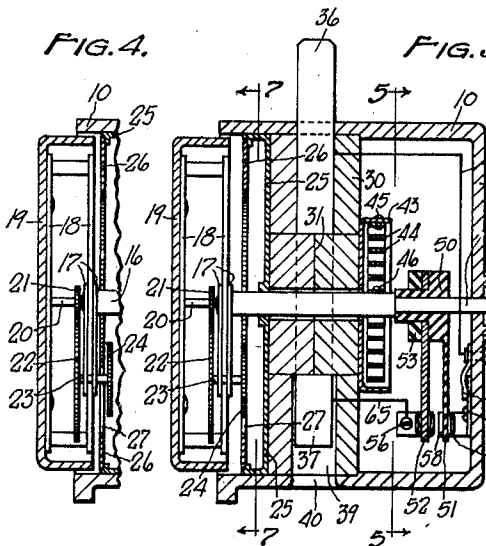


FIG. 5.

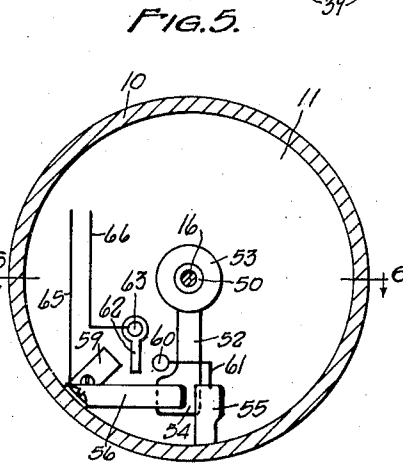


FIG. 6.

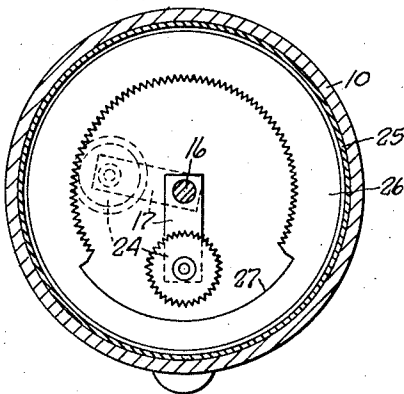
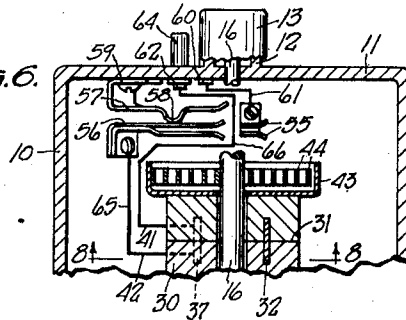


FIG. 7.



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FIG. 9.

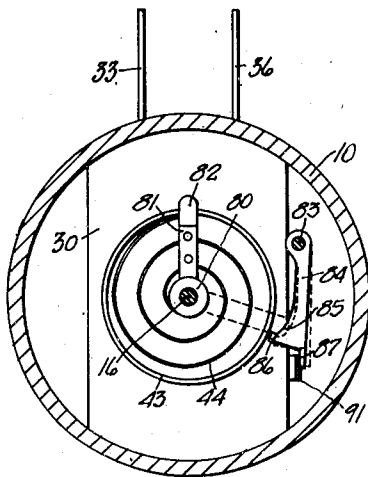


FIG. 10.

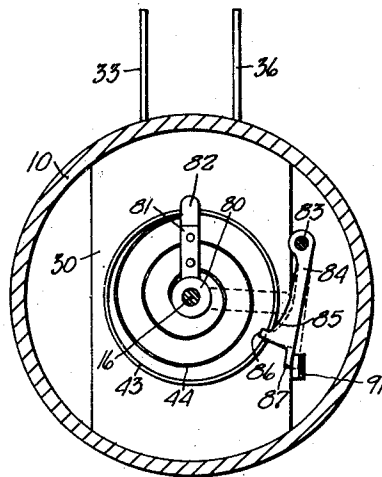
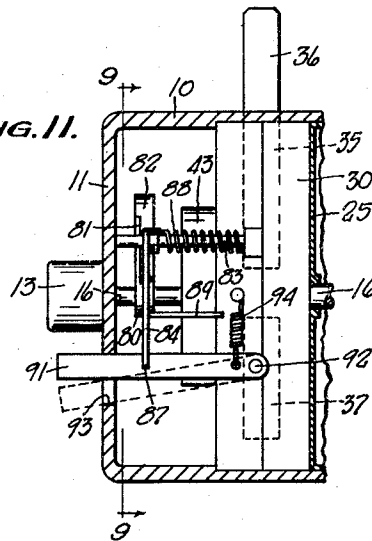


FIG. 11.



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TIME SWITCH

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Application August 29, 1938, Serial No. 227,323

15 Claims. (Cl. 200—38)

This invention relates to improvements in time switches, and particularly to time switches adapted to make or break an electrical circuit at a definite time for which the device may be set.

The primary object of the invention is to provide a simple, novel and inexpensive device of this character.

A further object is to provide a device wherein a spring serves as a driving means for clockwork mechanism and for switch operation, said clockwork serving to restrain switch operation by said spring until a predetermined time interval has elapsed.

A further object is to provide a switch housing mounting a driving spring and having a rotatable control shaft mounting clockwork which rotates therewith, rotation of said shaft energizing the spring to condition the parts for timed operation controlled by the clockwork.

A further object is to provide a device of this character having a shiftable contact and a plurality of stationary contacts, and adjustable means associated with said stationary contacts and having two operating positions for controlling the operation of the device for selectively making or breaking a circuit.

A further object is to provide a spring actuated rotatable shaft for controlling a switch, and clockwork mounted on said shaft and including a pinion normally meshing with a stationary annular gear for restraining said shaft, said annular gear having an interruption therein accommodating a quick throw of said switch by said shaft upon disengagement of said pinion at said interruption.

Other objects will be apparent from the description and appended claims.

In the drawings:

Fig. 1 is a view of the device in front elevation.

Fig. 2 is a view of the device in side elevation.

Fig. 3 is a longitudinal sectional view taken on line 3—3 of Fig. 1.

Fig. 4 is a fragmentary sectional view similar to Fig. 3 illustrating the parts in position for setting the device preparatory to timed operation.

Fig. 5 is a transverse sectional view taken on line 5—5 of Fig. 3.

Fig. 6 is a fragmentary longitudinal sectional view taken on line 6—6 of Fig. 5.

Fig. 7 is a transverse sectional view taken on line 7—7 of Fig. 3.

Fig. 8 is a longitudinal sectional view of a contact assembly taken on line 8—8 of Fig. 6.

Fig. 9 is a transverse sectional view of a modified

embodiment of the device in circuit-breaking arrangement, taken on line 9—9 of Fig. 11.

Fig. 10 is a transverse sectional view similar to Fig. 9 and illustrating the circuit-making arrangement.

Fig. 11 is a side view of the modified embodiment, with parts shown in section.

Referring to the drawings, and particularly to Figs. 1 to 8, inclusive, the numeral 10 designates a cylindrical housing open at one end and having an end wall 11 at its opposite end, said housing preferably being formed of insulating material. Centrally of end wall 11 is provided an annular collar 12 mounting a cap 13. A transverse bearing plate 14 is slidable in collar 12, and a coil spring 15 is interposed between plate 14 and cap 13 to normally urge said plate to predetermined position toward the left in Fig. 3. A rotatable shaft 16 is journaled adjacent one end in end wall 11 centrally of collar 12, said shaft being adapted for longitudinal sliding relative to wall 11, and the end of shaft 16 bears against plate 14. The opposite end of shaft 16 terminates substantially in the plane of the open end of housing 10 and carries clamping plates 17 gripping frame 18 for suitable clockwork (not shown). Clockwork frame 18 is fixedly mounted in a cap 19 which projects from the open casing end with its open end fitting in the end of said casing with a slight clearance.

The clockwork may be of any particular type desired; however, for purposes of reducing the size of the device to small compass, the conventional mechanism of a watch is preferred. This clockwork comprises the conventional arbor 20 for the hour or minute hand of the watch, depending upon the purpose and time range desired for the device, and a pinion 21 is mounted thereon. A second pinion 22 meshes with pinion 21 and is mounted on an arbor 23 journaled in clamp 17. A pinion 24 is mounted on arbor 23 exteriorly of frame 18.

Within the housing 10 adjacent the open end thereof is fixedly mounted a cup shaped member 25 which fixedly mounts a gear ring 26 at its open end. Gear ring 26 is provided with internal teeth, and is of reduced dimension at 27 to provide an interruption in the toothed inner periphery as best illustrated in Fig. 7. The spring 15 normally urges shaft 16 and associated parts thereof in position illustrated in Fig. 3 with pinion 24 in coplanar relation with gear ring 26. The shaft 16 passes through cup member 25 and has a combined bearing and longitudinally slid-

ing fit therein to support the forward end of the shaft in housing 10.

A two-part block of insulation material is fixedly mounted transversely within housing 10, preferably abutting the rear wall of cup member 25. The parting plane 31 of block 30 extends transversely of the axis of housing 10. The block is provided with a plurality of longitudinal passages therein, preferably formed by complementary grooves opening at the parting plane of each part of the block. Electrical conductors in the form of elongated metal strips are mounted in said passages. One conductor 32 has one end 33 projecting from one end of the block and its opposite end return bent at 34 adjacent and within the opposite end of the block. Another conductor 35 has a projecting end 36 parallel and complementary to end 33 of conductor 32, and terminates within the block at an intermediate point of the block. A third conductor 37 is aligned with but spaced from conductor 35 within the block, and terminates in a return bent end 38 complementary to end 34 of conductor 32. Suitable openings are provided in housing 10 for passage of projecting conductor ends 33 and 36. Spaced parallel longitudinal sockets 39 are formed in block 30, and these sockets receive the return bent conductor ends 34 and 38 which may have a limited movement therein as is conventional in the art when a contact is forced into said socket against the resilient action of said return bent portions. Openings 40 are provided in housing 10 in register with sockets 39. A conductor 41 is electrically connected with conductor 35 and projects from block 30, and a similar conductor 42 is electrically connected with conductor 37.

Fixedly mounted on the rear of block 30 centrally of housing 10 is a mounting 43 for a coil spring 44. Coil spring is fixed to the mounting at 45 and to shaft 16 at 46. A passage 47 extends centrally through the block 30 and spring mounting 43 and is of a size sufficient for clearance of shaft 16 which extends therethrough.

The spring mounting 43 is spaced from housing end wall 11, and this space constitutes a switch chamber. Fixedly mounted on shaft 16 in this chamber is a collar 50 of insulating material mounting a radially projecting arm 51 also of insulating material. An arm 52, parallel to arm 51, and constituting an electrical conductor, is mounted on collar 50 for insulation from shaft 16. A second collar 53 fitting on collar 50 serves to hold conductor arm 52 in proper position. The outer end 54 of conductor arm 52 is preferably enlarged for purposes to be hereinafter set forth.

A pair of closely spaced spring contact arms 55 are fixedly mounted in housing 10 in substantially coplanar relation to the rotational plane of conductor arm 52. A second pair of closely spaced spring contact arms 56 are fixedly mounted in the housing 10 in alignment with but slightly spaced from contacts 55. The contacts 55 and 56 are so arranged and positioned in reference to the shaft 16 and conductor arm 52, that when the shaft is freely rotated by spring 44, the enlarged end 54 of arm 52 will pass between the contacts of each pair and will be stopped thereby in the position illustrated in Fig. 5, with head 54 forming an electrical connector between said contact pairs 55 and 56. Another spring conductor 57 is fixedly mounted in housing 10 in parallel relation to contact pair 56, and is provided with an off-set 58 normally spring pressed

against the adjacent contact of pair 56. Conductor 57 is so positioned with reference to the plane of rotation of insulator arm 51, that said insulator arm engages and laterally shifts the same to break the contact of off-set 58 with contact pair 56.

Conductor 57 is preferably a metal strip, and extends to the end wall 11 of the housing to constitute a contact 59. A stationary contact member 60 is also mounted on the housing end wall in spaced relation to contact 58. A suitable electrical connector 61 extends between contact 59 and the contact pair 55. A switch 62 is pivoted to the housing end wall 11 at 63, and is provided with an operating hand piece 64 extending exteriorly of the housing 10.

The contact pair 56 is connected by conductor 65 with lead 42 of conductor 37 in block 30. The switch 62 is connected by conductor 66 with lead 41 of conductor 35 in block 30. Switch 62 is adapted to be adjusted by hand piece 64 for selective engagement with one of contacts 59 and 60 for purposes to be hereinafter set forth.

In the normal or inoperative position of the device, i. e., the position wherein the spring 44 has rotated shaft 16 to the full extent permitted by the stationary contact members 55, 56, 57 acting in reference to rotating arms 51, 52 on said shaft, the clockwork frame 18 and associated parts are so positioned that pinion 24 is opposite the interruption 27 of gear ring 26.

The device is interposed in the electrical circuit to be controlled thereby, by means of contact arms 33, 36 which fit into a conventional electric socket member (not shown), and with sockets 39 receiving a conventional connector member (not shown) as is well understood in the art.

When the device is to be conditioned for operation, cap 19 is pressed inwardly as illustrated in Fig. 4, against the action of spring 15, and thereupon rotated counter-clockwise to the necessary extent, followed by release of the cap for meshing of pinion 24 with gear ring 26. The cap preferably carries indicia 70 at its margin to designate the length of time for which the clockwork is set by rotation thereof; and the edge of the housing 10 is provided with a suitable indicator 71 with respect to which indicia 70 may be read; or the arrangement of indicia and indicator may be reversed from that shown. The rotation of the cap 19 causes equal rotation of spring 44 to tension the same, and also rotates arms 51, 52 therewith into spaced relation to contacts 55, 56, 57. The contacts 55, 56 and 57 are sufficiently resilient to flex laterally incident to the longitudinal sliding of shaft 16 by cap 19 as illustrated in Fig. 4 preparatory to shaft rotation. When the pinion 24 is meshed with gear ring 26, the tension of spring 44 acting on the shaft 16 serves to operate the clockwork (not shown) which in turn serves to restrain the rotation of shaft 16 as long as the said pinion and gear ring remain in mesh. Thus, the rotation of shaft 16 and movement of arms 51 and 52 is timed. The interruption 27 of gear 26 is so positioned that when pinion 24 reaches the same, the arms 51 and 52 are still substantially spaced from their cooperating spring contacts 55, 56, 57. Thus, after the pinion has traversed the portion of gear ring 26 over which it has been set, and then becomes disengaged therefrom, the full tension of spring 44 is applied to rotate shaft 16 without restraint, and consequently produces a quick rotative throw of arms 51, 52 which

brings them into full operative engagement with contacts 55, 56, 57. The contacts 55, 56, 57 are so constructed and arranged that they serve to stop the rotating arms 51, 52 with head 54 of conductor arm 52 in engagement with and forming an electrical connection between contact sets 55 and 56. The quick throw action of the switch renders the device accurate in operation, and avoids arcing of contacts and the like.

Before the device is set for operation by spring 44 as above described, the switch 62 is first conditioned by manipulation of hand piece 64 to cause the device to either make or break the circuit being controlled upon elapse of the time interval for which the device is to be set. When it is desired to cause the device to make a circuit after the desired time interval, the switch 62 is shifted into engagement with contact member 60. After the device operates as above described, a circuit is closed as follows: conductor 35, connectors 41 and 66, switch 62, connector 61 contacts 55, head 54 of conductor arm 52, contacts 56, connectors 65 and 42 to conductor 37. When switch 62 is set in engagement with contact 59, and the device has been set with pinion 24 meshing with gear 26, a circuit is closed as follows: conductor 35, connectors 41 and 66, switch 62, contacts 59 and 57, off-set 58, contacts 56, connectors 65 and 42, to conductor 37. As will be obvious, the last named circuit is broken when the time interval for which the device has been set elapses with resultant positioning of insulator arm 51 in biasing engagement with contact 57 to space the off-set 58 thereof away from adjacent contact 56, as illustrated in Fig. 3. It will be understood that, while the device has been illustrated as breaking the circuit on only one side of the line, it may be made to break the circuit on both sides of the line by duplicating the rotating arms and stationary contacts, and by replacing conductor 32 with separated conductors similar to conductors 35 and 37.

One of the important advantages of the device resides in the ability to change the setting thereof at will. As will be seen, this is accomplished by simply pressing the cap 19 inwardly to disengage pinion 24 from gear ring 26, followed by rotation to effect the changed setting, or to permit return of the arms 51, 52 to inoperative or normal position engaging the stationary contacts.

While the device is here illustrated as associated with the hour arbor of the clockwork, to afford operation of the device within a range of from 10 minutes to 12 hours or more, it can be so associated with the clockwork to give other ranges of operation. Thus by mounting the pinion 21 upon the arbor for the minute hand of the clockwork, an operating range of from one minute to one hour or more may be obtained; or by mounting pinion 21 upon the arbor for the second hand of the clockwork, an operating range of from one second to one minute may be obtained.

The arrangement of the parts, together with the use of the clockwork of a conventional pocket watch, renders the device small in size, and the simplicity of the construction renders the device inexpensive. The use of block 30 with its respective conductors renders the device convenient for installation and removal from a circuit as desired. The arrangement of the circuits as described to eliminate connection with the movable parts of the switch device also simplifies the construction by avoiding the use of

sliding contacts or flexible connectors and hence renders the device substantially free from service difficulties and failures.

A modified embodiment of the device, in reference to the switch parts, is illustrated in Figs. 9 to 11 inclusive. In this embodiment the block 30 carrying conductors 32, 35 and 37 is arranged within housing 10 in substantially the same arrangement as above described and carries spring mounting 43 for spring 44 acting upon shaft 16. Upon shaft 16 between spring mounting 43 and rear housing wall 11 is mounted a collar 80 having a radially projecting arm 81 carrying an insulation element 82 which extends beyond the end of the arm. A shaft 83 extends parallel to shaft 16 and is preferably suitably supported at its ends by block 30 and end wall 11. Shaft 83 has a suitable electrical connection with conductor 35 of block 30. Shaft 83 journals one end of an elongated switch element 84 positioned in the plane of rotation of insulator arm 82. Element 84 is provided with a cam face 85 adjacent its free end and defined in part by a stop 86. A contact projection 87 is formed at the free end of element 84. A coil spring 88 encircling shaft 83 normally urges element 84 to the left toward arm 82 as viewed in Fig. 9, and a pin 89 projects from the rear of said element for engagement with block 30 to limit rotation of the element by said spring. A switch element 91 is pivoted to block 30 at 92, and has electrical connection with conductor 37 of said block. Switch element 91 constitutes an elongated arm which projects through an elongated slot 93 in housing end wall 11. A spring 94 carried by a block 30 normally urges switch element 91 at the innermost end of slot 94 as illustrated in full lines in Fig. 11.

This embodiment of the device operates as follows: When the device is to open a circuit after a predetermined time interval, the parts are arranged as illustrated in full lines in Fig. 9, with contact 87 of element 84 pressed against element 91 by the action of spring 88. When the free rotation of the shaft 16 occurs after release of the clockwork at interruption 27 of gear 26 as heretofore described, arm 82 rotates and traverses cam surface 85 of element 84 into engagement with stop 86, thereby shifting contact 87 out of engagement with element 91 to break the circuit. When the device is to close a circuit after a predetermined time interval, the parts are arranged as illustrated in Fig. 10, with element 83 urged to full forward position permitted by stop pin 89. This results in an open circuit between contact 87 and element 91. When the time interval has elapsed, insulator arm 82 rotates as before, striking cam surface 85 and shifting contact 87 into engagement with element 91 to make a circuit. It will be observed that the throw of arm 82 is less in the last named operation, but this can readily be accommodated by making gear interruption 27 of a length to permit both operations. The pivot of element 91 accommodates change of the arrangement between the circuit-making and breaking positions. For the purpose of adjusting the parts from circuit-making to circuit-breaking positions, the element 84 is pivoted by rotation of shaft 16 to swing arm 82. The upper end of slot 93 serves to limit the inward position of element 91 to prevent contact thereof with element 91 except at contact projection 87.

I claim:

1. A time switch comprising a housing, a shaft journaled in said housing and adapted for tim-

ited endwise movement, a switch in said housing, a switch actuator fixed on said shaft and normally engaging said switch, a spring for rotating said shaft in one direction, a gear ring fixed in said housing and having an interruption therein, and clockwork fixed on said shaft and including a pinion normally positioned in the plane of said gear ring at said interruption, said shaft being longitudinally shiftable to permit free rotation of said shaft to bring said pinion into mesh with said gear at any selected portion of said gear and to simultaneously tension said spring, said clockwork controlling rotation of said shaft until said pinion reaches said gear interruption, said actuator being spaced from said switch when said pinion disengages said gear whereby the concluding movement of said actuator is produced by unrestrained action of said spring.

2. In a time switch comprising a housing, a shaft journaled in said housing and adapted for limited endwise movement against the action of a spring, a drive spring for rotating said shaft in one direction, a gear ring fixed in said housing and having an interruption, clockwork fixed on said shaft and including a pinion adapted to mesh with said gear ring and normally positioned in the plane of said gear ring at said interruption, said shaft being longitudinally shiftable against the action of said first spring to position said pinion in laterally spaced relation to said gear ring to permit free rotation of said shaft to tension said driving spring, and means for stopping rotation of said shaft under the influence of said drive spring at a predetermined normal position when said pinion is disengaged from said gear ring at said interruption.

3. A time switch comprising a housing, a rotatable shaft journaled in said housing, a drive spring for said shaft, clockwork, means associated with said clockwork, housing and shaft for establishing a driving connection between said drive spring and clockwork within a predetermined range of shaft rotation, said means including a planetary gear arrangement wherein one gear has an interruption at which said gear arrangement becomes inoperative, and a switch having parts carried by said housing and shaft and so positioned that the switch is operated only after predetermined free shaft movement by said spring upon disengagement of said gears at said interruption.

4. In a time switch, a housing, a spring pressed socket carried by said housing, shaft journaled in said housing and bearing against said socket, clockwork fixed on said shaft and including a drive pinion, an annular internally toothed gear having a portion of its inner periphery outwardly off-set from said teeth, said pinion being normally held in the plane of said gear and being shiftable to off-set relation to said gear by endwise movement of said shaft in said spring pressed socket, and a spring for rotating said shaft, said spring serving to drive said clockwork and time the rotation of said shaft when said pinion meshes with said gear.

5. In a time switch, a housing, an annular gear carried by said housing and having gear teeth for the major portion of its inner periphery and a smooth inner peripheral portion of increased radius interrupting said gear teeth, a shaft journaled in said housing, clockwork fixed on said shaft and having a pinion normally in the plane of said gear, said pinion being shiftable axially of said gear, and means for rotating

said shaft, said clockwork timing rotation of said shaft when said pinion meshes with said gear.

6. A time switch comprising a housing, spaced electrical conductors carried by said housing, a shaft rotatable in said housing, means for rotating said shaft, clockwork carried by said shaft, means carried by said housing engageable by said clockwork to restrain rotation of said clockwork until said shaft reaches a predetermined releasing position relative thereto, said clockwork being actuated by said shaft rotating means, a pair of switch elements in said housing connected with said conductors, and a switch actuator carried by said shaft and positioned to rotate under the influence of said first named means actuate said switch elements after said shaft has rotated past releasing position.

7. A time switch as defined in claim 6, wherein one of said switch elements includes a portion projecting outwardly of said housing for manual manipulation.

8. A time switch as defined in claim 6, wherein one of said switch elements is pivoted for movement in the plane of said actuator, and the other member is normally positioned in the path of pivotal movement of said first element.

9. A time switch as defined in claim 6, wherein one of said switch elements is positioned in the plane of rotation of said actuator and includes a cam face engageable by said actuator, and the other element extends at an angle to said first element to intercept the first element.

10. A time switch comprising a rotatable shaft, a stationary member adjacent said shaft, means for rotating said shaft, clockwork on said shaft having a part engaging said member to control rotation of said shaft until the same reaches a predetermined position, said shaft being freely rotatable after said part disengages said member at a predetermined position, a pair of switch elements, and an actuator carried by said shaft and engaging one of said switch elements after predetermined free rotation of said shaft to operate said switch and stop rotation of said shaft.

11. In a time switch, a rotatable shaft, an arm carried by said shaft, a switch element pivoted on an axis parallel to said shaft and lying in the rotational plane of said arm, a spring normally urging said element toward said arm, and a second switch element extending substantially parallel to said shaft and intercepting the path of movement of said first element, rotation of said arm pivoting said first element relative to said second element and against the action of said spring.

12. The construction defined in claim 11, wherein said second switch element is pivoted for movement out of the path of movement of said first element to accommodate positioning of said second element in either open or closed circuit relation to said first element.

13. The construction defined in claim 11, wherein the switch elements are manually adjustable between open and closed circuit positions.

14. In a time switch, a housing, a shaft rotatable in said housing in timed relation, a plurality of spring contacts mounted in said housing with two of said contacts normally in interengagement, a conductor arm on said shaft adapted to establish electrical connection between two of the normally spaced contacts, an insulating arm on said shaft adapted to separate

the normally interengaging contacts, a selector shiftable in said housing for selective engagement with the spaced contact and one of the normally interengaging contacts, the other of the normally interengaging contacts and said selector, each having electrical connection with a source of electrical energy.

15. A time switch comprising a housing, a rotatable shaft journaled in said housing, means for rotating said shaft, timing means carried by said shaft, planetary gearing associated with

said timing means, shaft and housing wherein one gear has an interruption at which said gearing disengages, said timing means being driven by said shaft rotating means and driving said gearing to restrain rotation of said shaft until said gearing disengages at said interruption, and impact means having parts carried by said shaft and housing and actuated by said shaft upon disengagement of said gearing.

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CERTIFICATE OF CORRECTION.

Patent No. 2,250,168.

July 22, 1941.

LEONARD A. PFLEGER.

It is hereby certified that error appears in the above numbered patent requiring correction as follows: In the grant, line 2, for "assignor of one-third to ANDREW KEKKO" read --assignor of one-half to ANDREW KEKKO--, as shown by the record of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of September, A. D. 1941.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.

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