June 21, 1932. E. S. FLARSHEIM 1,864,487

TIME SWITCH

Filed May 19, 1927 2 Sheets-Sheet 1

Fig. 1

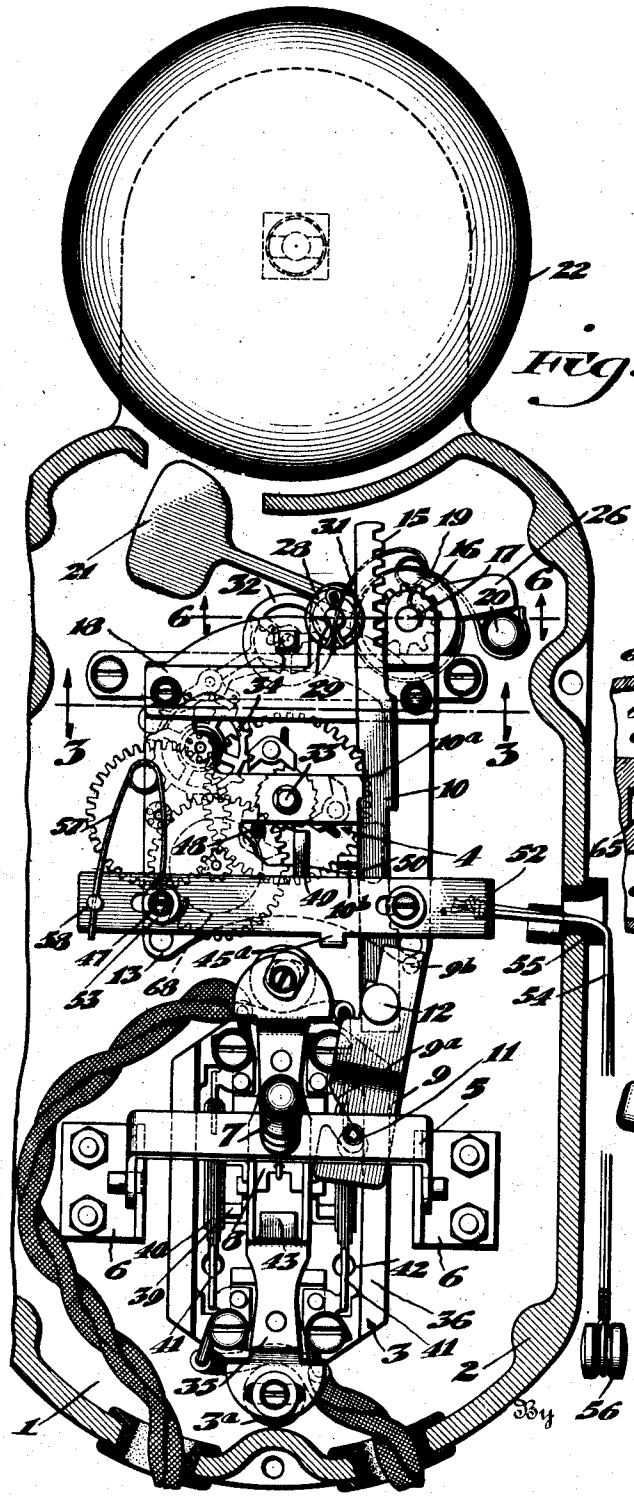
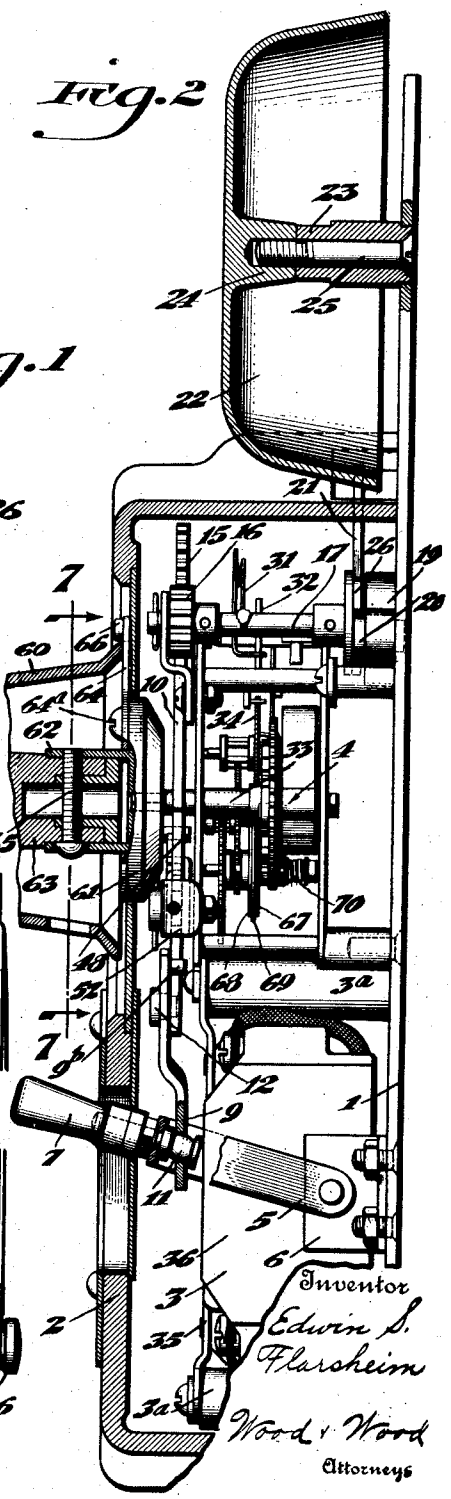


Fig. 2



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TIME SWITCH

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Fig. 3

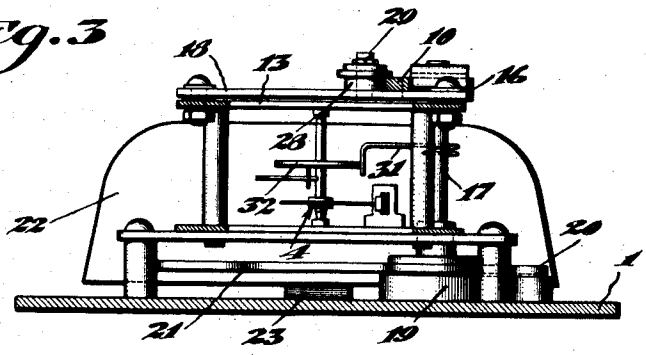
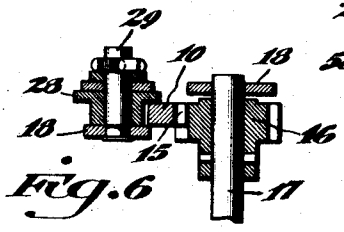


Fig. 6



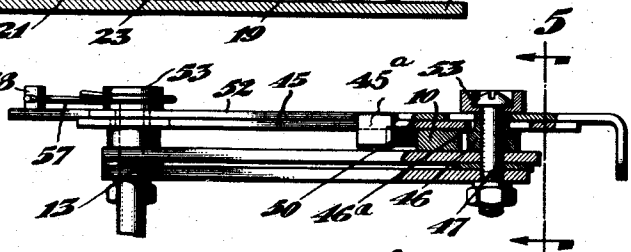
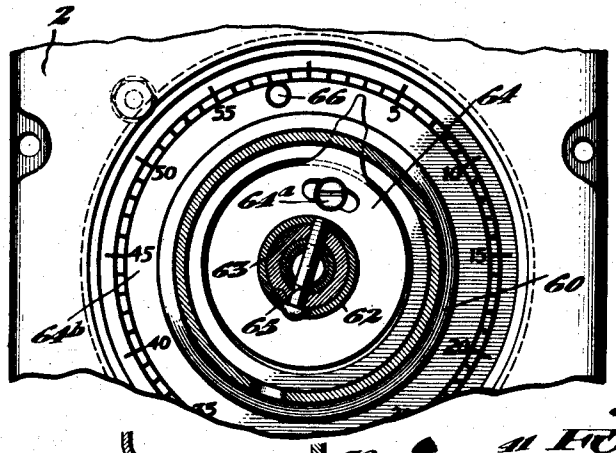


Fig. 4



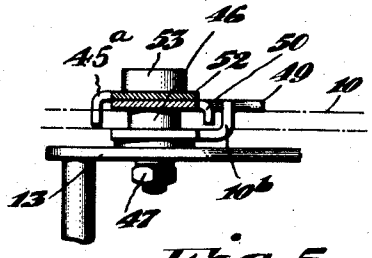


Fig. 5

Fig. 7

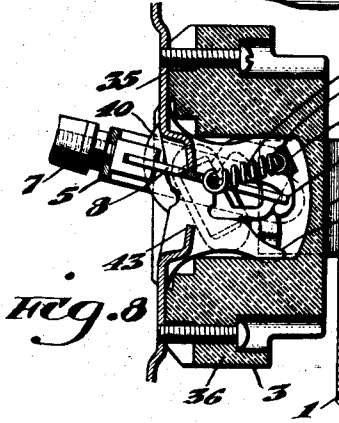


Fig. 8

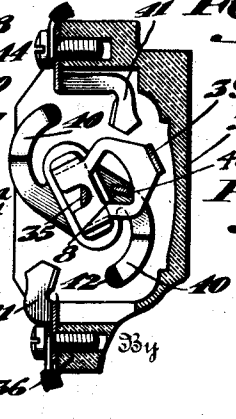


Fig. 9

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Patented June 21, 1932 1,864,487

UNITED STATES PATENT OFFICE

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TIME SWITCH

Application filed May 19, 1927. Serial No. 192,748.

This invention relates to time switches, and is particularly directed to the class of time switch in which a clock mechanism and an electric switch are coordinated to break an electric circuit a predetermined length of time after the circuit is made.

The object of the invention is to provide a time switch of wide utility.

Another object of the invention is to provide a time switch which tends variously to insure safety in connection with electrical treatments.

Another object of this invention is to coordinate an audible signal device with clock mechanism and an associated electric switch so that the signal device is operated coincidentally with the breaking of the electric circuit.

Another object of this invention is to coordinate with clock mechanism and an associated switch means for arbitrarily breaking the electric circuit so that the electric circuit is automatically terminated at the conclusion of the predetermined interval, or arbitrarily and easily at the will of the operator or the patient.

Another object of the invention is to coordinate a clock mechanism and an electric switch, an audible signal device, and emergency circuit breaking means to perform the functions specified in the preceding paragraphs, and to provide the utilities described in the paragraphs immediately following.

A time switch of the type above specified is particularly adapted for use as a treatment timer in conjunction with electrical apparatus, such as ultra violet ray lamps and other therapeutic lamps and machines, permanent wave machines and electrical devices of the like nature. In all of these cases the treatment may extend over a period of from a very few minutes to an hour or more. It is often necessary for the doctor or person administering the treatment to leave the patient alone either for reasons unexpected or as a matter of practice, and during these times of solitude the patient often becomes nervous or apprehensive, or in some cases hysterical. It also occasionally happens that some part of the apparatus breaks or fails to function properly during the treatment. It is therefore very expedient to provide the patient with means to arbitrarily and easily turn off the treatment mechanism. The sounding of an audible signal coincidentally with the breaking of the circuit recalls the person giving the treatment whether the device is turned off arbitrarily before the treatment has been completed, or automatically when the treatment has been completed.

Under all conditions, the use of the timer of the nature described in conjunction with treatment apparatus of the nature described, obviates the danger of inadvertently prolonged treatment, the hazard which might result from breaking of apparatus, and the possibility of injury which might result from unanticipated sensibility of the patient to the particular treatment.

This time switch is also adapted for use in connection with photographers' arc lights, dough mixing machines and a wide variety of commercial devices.

Other objects and certain advantages of the invention will be more fully developed in the description of the accompanying drawings forming a part of this specification, in which:

Figure 1 is a front view of the timer with the casing shown in section for the purpose of disclosing a complete view of the mechanism.

Figure 2 is a side elevation of Figure 1, showing the casing and the indicated arrangement in section, and also showing the gong in section in order to disclose the mounting thereof.

Figure 3 is a sectional view taken on line 3—3, Figure 1, showing the gong ringing device and the means for preventing movement of the balance wheel of the clock mechanism.

Figure 4 is a view taken from the lower end of the clock mechanism showing the control elements mounted on the frame thereof with a portion at one end broken away.

Figure 5 is a sectional view taken on line 5—5, Figure 4, further illustrating the construction of the control elements.

Figure 6 is a sectional view taken on line 6—6, Figure 1.

Figure 7 is a sectional view taken on line 7—7, Figure 2, illustrating the indicator on the face of the dial.

Figure 8 is a view taken longitudinally and centrally of the switch detailing the mechanism for imparting the snap action thereto.

Figure 9 is a sectional view taken at one side of the switch but in the same direction as Figure 8 showing one side of the rotatable contact element for the switch.

This invention comprises, clock escapement mechanism or other time measuring mechanisms, and a switch mechanism co-related for simultaneous functioning or idleness, a member manually and arbitrarily operable for stopping said mechanisms, and an audible signal device automatically operated as said mechanisms terminate their active period.

The clock escapement mechanism and switch are co-related by a flexible link adapted to be straightened by the closing of the switch. One end of the flexible link is attached to the switch and the other end confined between a roller and pinion, the latter meshing with a rack on the end of the link. This pinion is mounted on a shaft with which a strong spring is associated. This spring exerts its power through the pinion rack, and flexible link and tends to hold the switch normally in open position. The rotation of the pinion shaft controls a brake which is held normally applied to the balance wheel of the clock escapement mechanism.

The switch is closed manually and so latched by a notch on one flexible link which engages a stop against which it is held by the spring pressure. This latch is broken by a lateral movement of the link. This lateral movement is affected in three selective ways:

(1) Manual throw-out of the switch as a result of which the link is cammed laterally after its center pivot has reached the limit of its movement.

(2) Arbitrary pull of a cord which is attached to a member slidable transversely of the link to engage it.

(3) Automatic actuation of a second member, also slidable transversely of the link, by a trip on the clock escapement mechanism.

The clock mechanism is of a type to be set to run a predetermined time at the end of which the trip engages the slidable member to unlatch the link and permit the switch to open. A dial is associated with the clock mechanism to facilitate setting.

The pinion shaft swings a hammer against a gong so positioned in relation thereto that a signal is sounded as the balance wheel of the clock mechanism is braked and the switch opened.

Referring to the drawings, the various elements of the time switch are shown mounted upon a base 1. A casing 2 is provided for housing the operating mechanism and as a mounting for the time indicator and dial. A switch 3 is shown mounted at the lower end of the base 1 on standards 3^a. The switch used herein is of a commercial type so that the description thereof need only be general to the extent of showing the connection of the control thereto, and the action of the switch in moving the control. The clock mechanism indicated generally at 4 is mounted above the switch 3.

The control connection for coordinating the switch, the gong striking device, and the clock mechanism is arranged in the following manner:

A U-shaped lever 5 is pivoted on brackets 6 so as to straddle the switch, the lever being provided with a handle 7. The handle portion 7 has an extension 8 depending into the switch proper and operatively connected to the moving contacts of the switch, so as to actuate the same upon movement of the lever.

A pair of pivoted links 9 and 10, forming a unitary flexible link, connect the U-shaped lever and the gong ringing device at the top of the time switch. The lower member 9 of these links has a universal joint connection 11 to the U-shaped lever at its lower end, and a pivot pin 12 connecting it to its companion link 10. The description of the construction, control and operation of these links will follow at a later point. The link 10 is slidably mounted on the face of the frame 13 of the clock mechanism and translates longitudinal motion into rotary through a rack portion 15 at its upper end engaging a gear 16 mounted on a shaft 17. The outer end of the shaft 17 is mounted in a bracket 18 on the frame of the clock mechanism and the lower end is mounted in the base 1, the gear 16 being located at the outer end of the shaft.

A heavy coil spring 19 is attached to and coiled about the lower end of the shaft 17 and has its outer end attached to an anchor stud 20 secured in the base 1. This shaft 17 also has pinned thereto a hammer 21 adapted to swing against a gong 22.

The hammer 21 is attached to the shaft between the base 1 and the clock mechanism frame so as to have a free swing. The gong 22 is mounted on the base 1 at the upper end thereof, not being enclosed within the time switch casing. An aperture is provided in the casing adjacent the point of hammer engagement with the gong. The gong is mounted, for proper reverberation upon a stud 23 engaging a centrally disposed hub 24 integrally formed on the inside of the gong. The stud 23 is screwed into the base 1 and a screw 25 traverses the stud and is screwed into the hub of the gong. The gong is thus disposed slightly away from the base 1 so as to obviate any interference with vibration. The outer end of the hammer is of consid-

erably increased area so as to give the necessary weight to the blow on the gong. A projection 26 extends radially from the shaft 17 for engagement with the stud 20. This radial projection is disposed so as to strike the stud 20 just before the hammer strikes the gong, the hammer in normal set-off position standing slightly away from the gong. The inertia of the hammer due to its spring urged stroking action springs the hammer handle sufficiently to allow the head to strike the gong despite the previous engagement of the radial projection. The link 10 is suitably guided at its edge opposite the gear 16 by means of engagement with a flanged roller 28 (detailed in Figure 6) rotatable on a stud shaft 29 extending outwardly from the bracket 18.

The shaft 17 has attached thereto a hair spring 31 extending out therefrom so as to be in engagement with the periphery of the balance wheel 32 of the clock mechanism. This engagement of the hair spring with the balance wheel is effected at the time when the hammer is in set-off position, that is to say, when the time switch is in inoperative position, thereby maintaining the clock mechanism inactive. The clock mechanism from the point of the balance wheel on through the train of gears to the main shaft 33 is an ordinary conventional structure except as described hereafter, so that this intermediate mechanism will be referred to merely as a clock mechanism. The teeth of the escapement wheel 34 are so constructed that the clock mechanism always acts upon release of the balance wheel, there being no point at which escapement lever movement is prevented by the escapement wheel teeth. This positive starting, however, may be taken care of variously.

Referring to Figures 8 and 9 of the drawings, the general construction of the switch is as follows: A frame 35, as the mounting for the switch attached to the standards 3^a at each end, extends down into the body 36 of the switch. The frame 35 provides a pivot point 37 for the lower end of the extension 8. The pivot point is aligned with the pivot points of the U-shaped lever 5. The lower end of the extension 8 is split and a coil spring 38 under tension is attached to the crotch of the split portion at one end and at the other end is attached centrally to the rotatable contact member 39. The rotatable contact member 39 is U-shaped, straddling the frame 35 from its underside and pivoted at each side of the frame. The contact member carries pairs of contacts 40 one pair on each side. Disposed within the path of the respective pairs of contacts are the stationary contacts 41 attached to the body of the switch. The rotating contacts are of the knife type providing blades 42 adapted to straddle the respective contacts. Movement of the rotatable switch member between the stops 43 on the frame 35 either makes or breaks all contacts simultaneously. It will be readily understood that the switch may control any number of contacts, and electrical connection may be made in any desired manner.

The action of the switch is as follows: As the U-shaped lever is swung the spring 38 is put under increased tension and the lugs 43^a on the lever 8 engage the rotatable contact member 39 giving sufficient movement to the member 39 to pull the switch blades from the stationary contacts. The spring then acts to rotate the member 39 suddenly from its position against a stop 44 on the frame 35 to an opposite position against another stop 44^a. This type switch affords a rapid making and breaking of the circuit. In cocking the device through the lever 7 the rotatable switch member is moved in the described manner into engagement with the contacts and the circuit is made. At the same time the U-shaped lever moves the links against the tension of the coil spring acting upon the shaft 17.

A detent or latching arrangement is provided for maintaining the links in this cocked position. A notch 10^a is provided in the side of the link 10, the lower end of this notch adapted to engage a stationary stop 10^b on the frame. The links are disaligned at all times but tend to straighten out as pull is exerted thereon through the lever 5. The result is that the lower end of the notch is held over the stop 10^b. It is then disengaged only by lateral forces applied as hereinafter described. The automatic control for imparting this slight lateral release movement to the U-shaped lever is in the nature of a sliding bar 45 mounted on the frame of the clock mechanism at right angles to the flexible link and engaging the same at substantially the point of their connection. This engagement buckles the links and pushes the link 10 out of engagement with the stop 10^b. This allows the coil spring 19 to rapidly set off the switch. The bar (as shown in Figure 4) is mounted for sliding movement on a pair of studs 46 secured by bolts 47 attached to the frame of the clock mechanism. The studs 46 are shouldered so as to provide a rest for the bar 45 and to allow the link 10 to slide easily under the same, the bar having slots 46^a engaging about the studs for allowing longitudinal movement of the bar 45. The bar 45 is moved laterally against the link 10 by the engagement of a downwardly disposed trip pin 48 on the time indicator knob. This downwardly extending trip-pin 48 swings against an extension 49 from the edge of the bar 45 and causes a downwardly disposed extension 50 on the bar 45 to be moved laterally against the link 10. This movement of the bar 45 against the link 10 is effective for setting off the switch at just the moment that

the indicator on the knob has reached the zero point. The link 10 is slidable between the stop 10^b and the stud 46, there being sufficient clearance for a lateral movement of the link toward the stud to effect the release.

A manual release bar 52 is superposed above the member 45 moving and mounted in the same manner, but actuated by different means. The bars 45 and 52 are slidable upon each other and operate independently. They are held on the shoulders of the studs 46 by means of head members 53 held down against the studs by the heads of the bolts 47 countersunk within them. This bar is actuated by means of a cord 54 attached to its turned outer end. The cord 54 passes from this connection through a bushing 55 in the side of the casing and has a knob 56 secured on its outer end adapted to be clasped by the operator or patient. The bar 52 is held in retracted or normal position by means of a spring 57, the spring being attached to the bar 52 at the opposite end from the cord attachment. The spring fastened to a pin 58 on the bar 52 is coiled under tension, and has its opposite end attached to one of the members 53. The manual release bar is adapted to function independently of the automatically operated bar 45, and has a downwardly depending lug 45^a thereon adapted to engage the link 10 to laterally move the same. This lateral movement dislodges the link 10 from the stop 10^b and the link 10 is moved by the coil spring in the same manner as upon an automatic release.

It is possible to unlatch the links my moving the lever 5 in the direction to open the switch and thereby camming the links laterally. The link 9 has a slot 9^a extending upward at an angle. The ball of the universal joint mounted on the lever 5 moves against and along the upper edge of the slot and swings the link 9 toward alignment with link 10. A pin 9^b on the lower side of the link 9 engages with the outside edge of the link 10 above the pivot, thus converting the pivoted link 9 into a rigid link. The cam action of the universal joint ball then moves the entire rigid link laterally and disengages the notch 10^a of the same from the stop 10^b.

The setting of the indicator is accomplished by means of a knob 60 non-rotatably attached to a disk 61 mounted on the squared outer end of the main shaft 33 of the clock mechanism. From this disk extends the trip-pin 48. A sleeve 62 extends outwardly from the disk to receive the hub 63 of the manipulating knob. A time indicator element 64 having a circular body and a finger portion surrounds the sleeve portion and is secured to the face of the disk by means of a set screw 64^a. The set screw passes through a slot in the indicator so as to render the indicator adjustable on the disk. The hub of the knob is held within the sleeve portion by means of a screw 65. The finger portion of the indicator extends slightly out beyond the knob edge and is adapted to be selectively registered with a series of graduations on a circular dial 64^b secured in the casing 2. A pin 66 extending from the face of the graduated dial provides the necessary stop for the finger slightly after it reaches the zero point.

The clockwise movement of the manipulating knob moves the finger to any desired setting on the dial, this setting movement additionally winding the clock spring. In the event that the operator turns the knob beyond the desired setting it is possible to return the knob merely by reversing the movement thereof without damaging the mechanism. This is made possible through the insertion of a friction slip device in the train of clock gears. This slip device comprises merely a pair of plates 67, 68, one 67 loose upon a shaft so as to rotate about it, and the other 68 secured to the shaft, said plates having a driving disk 69 loosely disposed therebetween and a spring 70 holding the plates and disks in friction engagement for normal operation.

The setting and release of the device is as follows: The operator turns the manipulating knob to the desired setting, as selected on the graduated dial. He then, in order to start the treatment and throw in the electrical contacts to the apparatus, pulls down on the lever 7, this movement of the lever 7 doing three things. First of all, it throws in the contacts in the switch 3, as previously described, the same movement of the lever drawing the links down, rotating the shaft carrying the hammer, thereby drawing the hammer back into a set position for a future ringing of the gong. This movement of the shaft carrying the hammer also releases the clock escapement and allows the clock mechanism to function, the clock mechanism driving the main shaft and rotating the manipulating knob and indicator finger in anti-clockwise direction. The rotation of the disk carrying the pin 48 rotates the pin against an extension on the automatic release bar 45, moves the automatic release bar laterally against the links, buckles the same and disengages the link 10 from the stop 10^b releasing the coil spring. This setting off of the mechanism occurs at just the moment that the indicator finger reaches the zero point on the dial and the following things occur simultaneously:

The switch contacts are thrown out, the hammer strikes the gong and the clock mechanism is stopped, the entire mechanism then being at rest awaiting the next operation. On the other hand, if it is desired to release the mechanism before the indicator finger reaches the zero point or before the treatment

is completed, the manual release bar is drawn laterally against the links or the lever 5 retracted directly by grasping the handle 7, and the same effects are achieved as through the automatic release. The mechanisms are all coordinated through these common controls so that the release of the links causes all the previously described results to occur coincidentally.

The time switch is therefore adapted for manifold valuable uses over a wide commercial field.

Having described my invention, I claim:

1. A time switch, comprising, a clock escapement mechanism provided with a trip, a switch having a handle for manipulation thereof, connection for starting or stopping the clock as the switch is closed or opened, a flexible link, one end of which is connected to said switch, a spring tending to straighten the flexible link and open the switch, a latch related to the flexible link to hold the switch in closed position against the spring tension, and a bar slidable transversely to the flexible link to engage it and release said latch, said bar positioned to be engaged by the trip on said clock escapement mechanism.

2. A time switch, comprising, a clock escapement mechanism provided with a trip, a switch having a handle for manipulation thereof, connection for starting or stopping the clock as the switch is closed or opened, a flexible link, one end of which is connected to said switch, a rack on the other end of the flexible link, a roller holding this rack in mesh with a pinion mounted in a shaft, a spring associated with said pinion shaft tending to straighten the flexible link and open the switch, a latch related to the flexible link to hold the switch in closed position against the spring tension, and a bar slidable transversely to the flexible link to engage it and release said latch, said bar positioned to be engaged by the trip on said clock escapement mechanism.

3. A time switch, comprising, a clock escapement mechanism provided with a trip, a switch having a handle for manipulation thereof, a flexible link, one end of which is connected to said switch, a rack on the other end of the flexible link, a roller holding this rack in mesh with a pinion mounted on a shaft, a spring associated with said pinion shaft tending to straighten the flexible link and open the switch, a latch related to the flexible link to hold the switch in closed position against the spring tension, a bar slidable transversely to the flexible link to engage it and release said latch, said bar positioned to be engaged by the trip on said clock escapement mechanism, and a brake controlled by the pinion shaft to stop the balance wheel of the clock as the switch is opened and to start it as the switch is closed.

4. A time switch, comprising, a clock escapement mechanism provided with a trip, a switch having a handle for manipulation thereof, a link, one end of which is connected to said switch, a spring tending to open the switch, a latch associated with said link to hold the switch in closed position, means associated with said link and clock escapement trip to release the latch and permit the switch to open, a shaft extending transversely to said link, means for translating the longitudinal motion of the link to rotary motion of the shaft, and a brake for the balance wheel of the clock mechanism, said brake controlled by the rotation of said shaft to start the clock as the switch is closed, or stop the clock as the switch is opened.

5. A time switch, comprising, a clock escapement mechanism provided with a trip, a switch having a handle for manually throwing the switch, connection between the switch and clock to start the clock as the switch is closed, a spring tending to open the switch, a link adapted to latch the switch in closed position, a cam on the link engageable with the switch mechanism to cam the link into unlatched position as the switch is manually opened by a throw of the handle, and a slidable bar positioned to be moved into engagement with the link by the trip on the clock to unlatch the link automatically at the end of a predetermined period.

In witness whereof, I hereunto subscribe my name.

EDWIN S. FLARSHEIM.