Oct. 8, 1940. F. LUX 2,217,226

TIMER

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Fig.1.

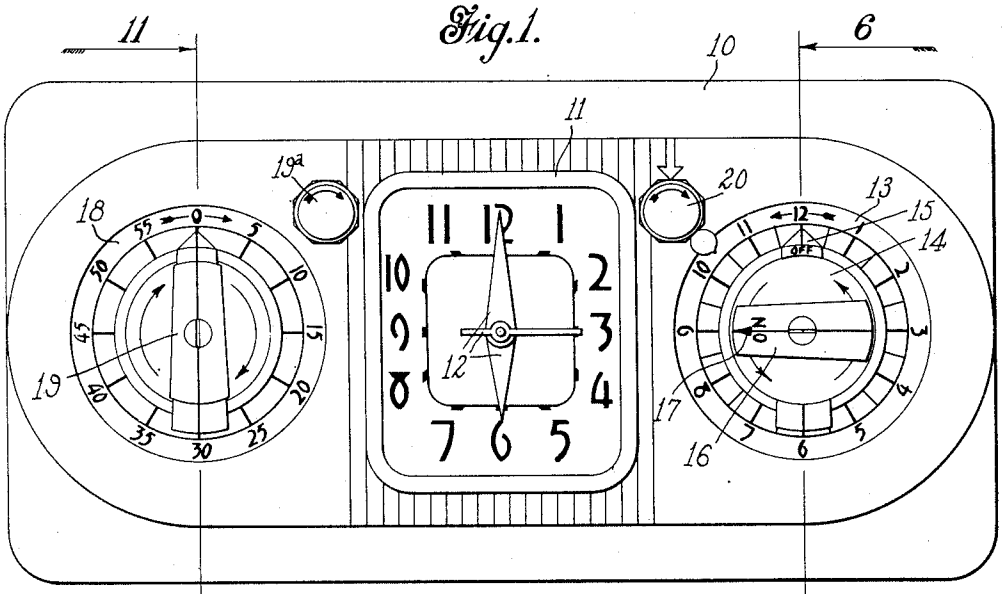


Fig.2.

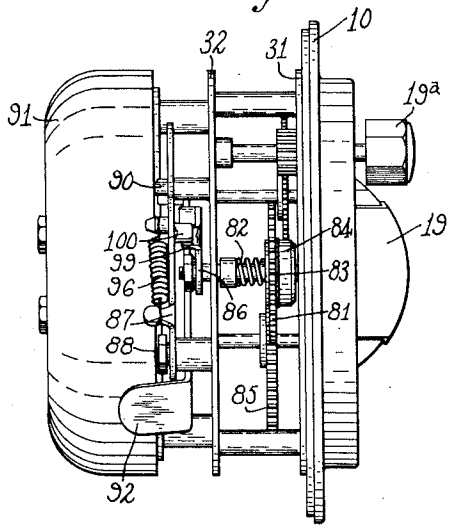


Fig.3.

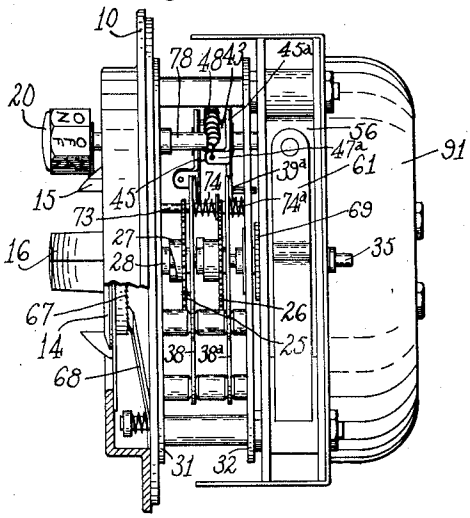


Fig.8.

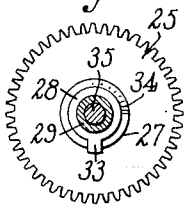
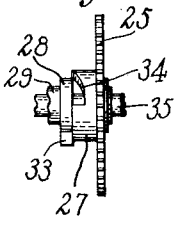


Fig.9.



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TIMER

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Fig. 4.

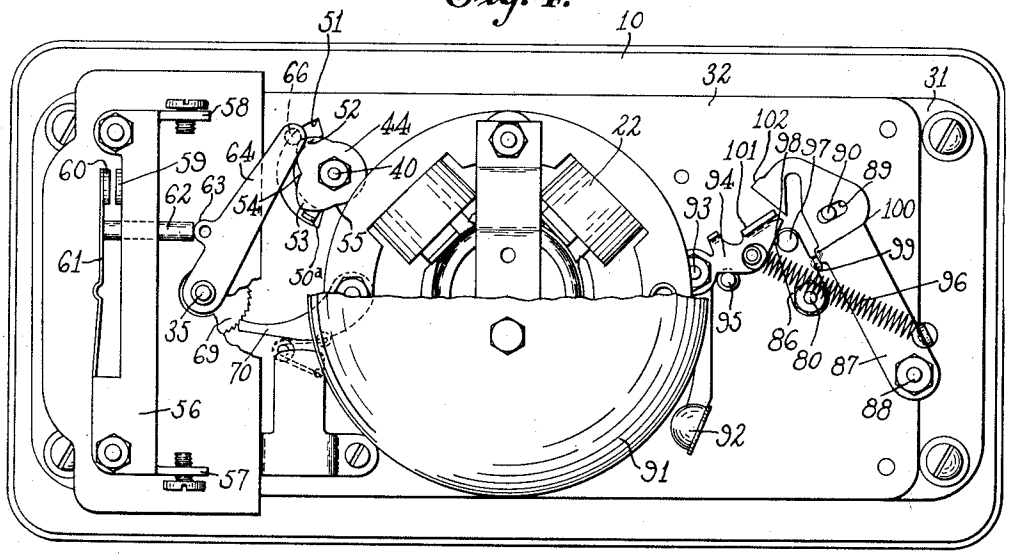


Fig. 5.

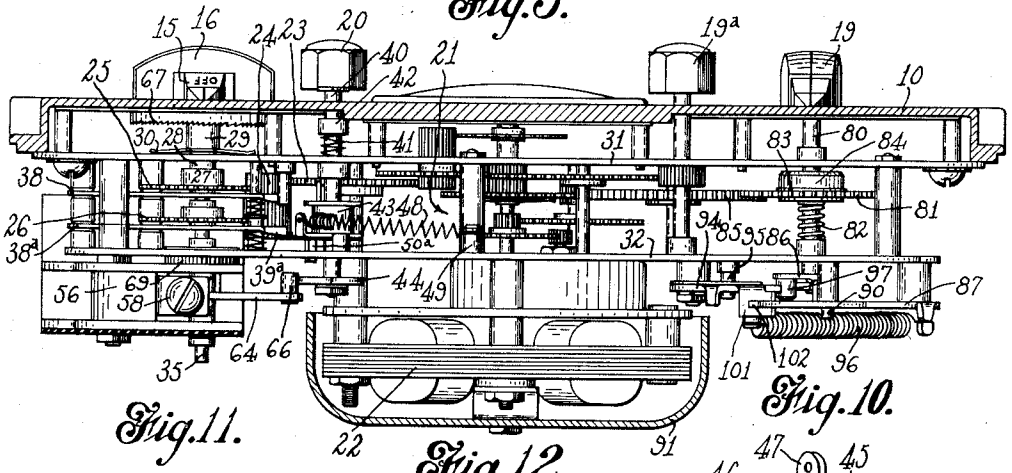


Fig. 11.

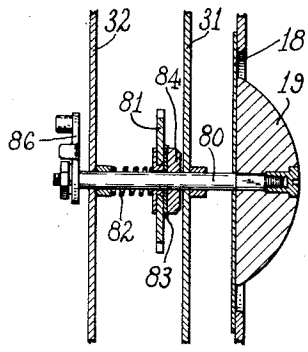


Fig. 12.

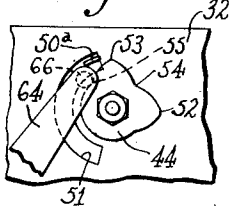
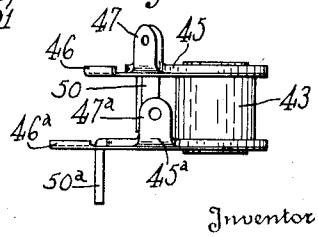


Fig. 10.



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Fig. 7.

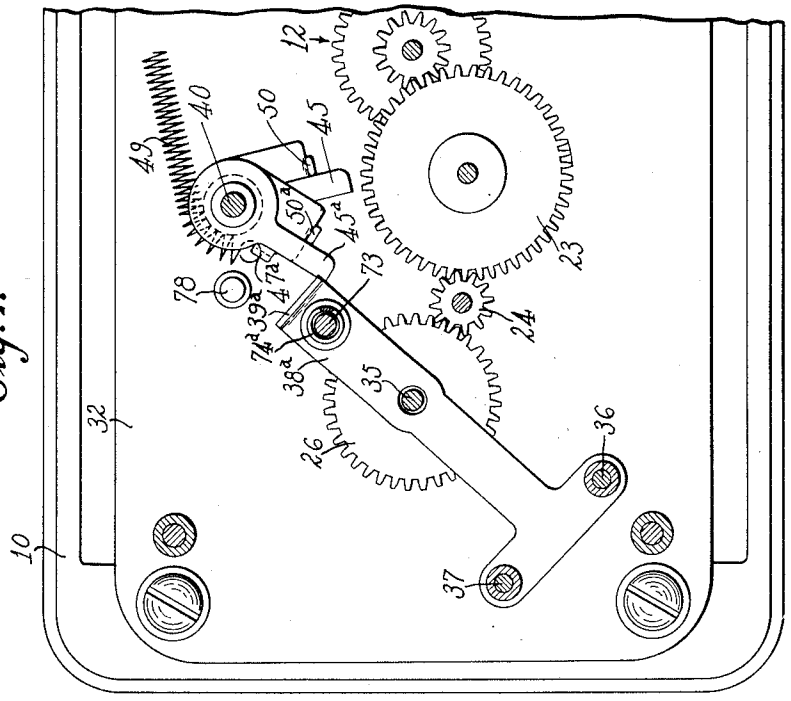
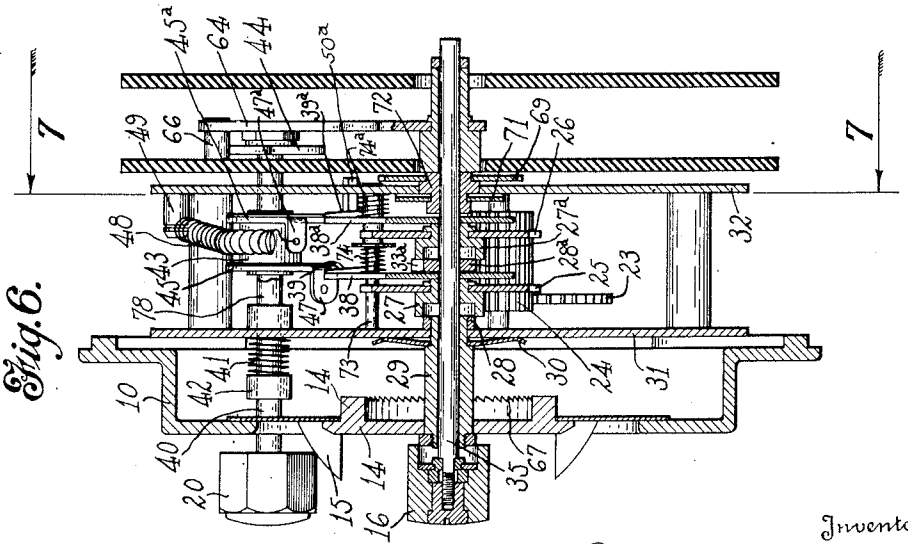


Fig. 6.



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Patented Oct. 8, 1940 2,217,226

UNITED STATES PATENT OFFICE

2,217,226

TIMER

Frederick Lux, Waterbury, Conn., assignor to The Lux Clock Manufacturing Company, Inc., Waterbury, Conn., a corporation of Connecticut

Application February 13, 1939, Serial No. 256,064

13 Claims. (Cl. 200—39)

The present invention relates to time switches, and more particularly to devices of this character designed to be used in connection with an electric range, for example, although the invention is not to be considered as limited in this respect. In the embodiment of the invention shown in the drawings, there is provided in a single case a time or clock mechanism, and a time switch for automatically turning on the heating element of an electric range at any selected time, and for automatically turning off the heating element at a later selected time. Also, in the same case, and operated by the same time or clock mechanism, is a so-called "interval timer" for operating a device such as a signal at the expiration of a definite time interval, which time interval is usually relatively short, and which may be accurately predetermined. It will, of course, be understood that this latter device may be used in relations other than with a gong or signal, if desired.

In the case of the clock-operated time switch, the mechanism may be set to turn on the current at a predetermined time when the hands of the clock mechanism reach that time. The current will then remain on until the clock reaches the time set for the turning off of the current, at which time the switch will be again operated to turn the current off. Also means are provided for changing the device from automatic control to manual control, so that the electric range or other device with which the switch is used may be operated as desired by manual control without the use of the time switch.

One object of the present invention is to provide an improved construction for a time switch mechanism such that the mechanism may be more convenient in operation and at the same time relatively inexpensive to manufacture.

A still further object of the invention is to provide rotatable shafts by which the setting of the mechanism to the "on" and "off" positions may be accomplished, which shafts will be concentric whereby the mechanism may be more compact, and at the same time be simple and positive in operation.

A still further object of the invention is the improvement of the tripping stops which permit intermittent rotation of a spring-actuated switch-controlling member, so that the device may be easily "set," and at the same time will be positive in operation.

A still further object of the invention is the provision of a friction drive for the interval timer, whereby the shaft of this timer may be rotated freely without disturbing the clockwork which drives it, but when released will be rotated by the clockwork due to the frictional engagement therewith.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the drawings:

Fig. 1 is a front elevational view of a range timer embodying my invention;

Fig. 2 is a side elevational view looking toward the right in Fig. 1, with the case removed;

Fig. 3 is a side elevational view looking from the opposite direction to that of Fig. 2, with some parts broken away for the sake of clearness;

Fig. 4 is a rear view of the mechanism with parts broken away for the sake of clearness;

Fig. 5 is a top plan view of the parts shown in Figs. 2 and 3, with certain portions being shown in section;

Fig. 6 is a sectional view on line 6—6 of Fig. 1;

Fig. 7 is a detail sectional view on line 7—7 of Fig. 6;

Figs. 8 and 9 are front and side elevational views, respectively, of the cooperating cam and disk mechanism and associated gear;

Fig. 10 is a detail view of a portion of the rotatable switch control mechanism;

Fig. 11 is a partial sectional view on line 11—11 of Fig. 1, showing the frictional drive of the setting shaft; and

Fig. 12 is a fragmentary detail view of the switch-controlling cam and associated parts.

To illustrate an embodiment of my invention, I have shown a range timer provided with a case 10 having centrally mounted thereon a clock dial 11 with which cooperate the clock hands 12. On one side of the clock dial there is mounted on the front of the case a second dial 13 with which cooperates a setting disk 14 having a pointer 15 designated by the word "off", and a thumb-turn 16 also having a pointer or indicating arrow 17 designated by the word "on". This dial and the cooperating members are designed to be employed with the "on and off" timer, in that they are set to designate and predetermine the time at which the clock mechanism will close the switch to turn the current on, and the time at which it will open the switch to later turn the current off.

Upon the side of the case opposite the clock dial is provided the dial 18 for the interval timer, with which dial cooperates the thumb-turn 19 which may be rotated to indicate the interval of time during which it is desired to use the range. Also on the front of the case appears a knob or

button 19ª by which the clock mechanism may be set, and a knob 20, which may be employed to set the mechanism of the interval timer. These knobs are connected to rotating shafts, as will appear hereinafter.

Referring now to Fig. 5, the clock hands are driven by a clock mechanism designated generally by the numeral 21, which may be operated by an electric motor 22 mounted in the rear of the case. A gear 23 is driven from the gearing of the clock mechanism, which gear meshes with a wide-faced pinion 24, and which pinion in turn drives the gears 25 and 26 of the "on and off" timer. As shown more particularly in Fig. 6, gear 25 is secured to a hollow cam member 27, within which is adapted to be received a disk or collet 28, which is in turn secured to a hollow shaft 29. The setting disk 14 is secured to the shaft 29, and the latter is frictionally retained against movement by a spring 30 which may be secured to the shaft, and bears against a frame member 31, which, with a companion frame member 32, forms the support for the clock and timer mechanism. As shown in Fig. 9, the disk or collet 28 is provided with a projecting finger 33 designed to cooperate with a cam notch 34 in the adjacent face of the hollow cam 27, so that when the notch stands opposite the finger 33, the hollow cam 27 and gear 25 attached thereto are permitted to move toward the collet, or to the left, as shown in Fig. 6.

The thumb-turn or button 16 is secured to a shaft 35, which passes loosely through the shaft 29 and also passes loosely through the hub of the hollow cam 27 to the rear of the case. Loosely mounted upon this shaft is a second hollow cam 27ª, which cooperates with a collet 28ª secured to the shaft and provided with a projecting finger 33ª. This hollow cam and collet are similar to the corresponding parts illustrated in Fig. 9 and just described, so that no further description will be necessary. The gear 26 previously referred to is secured to the hub of the hollow cam 27ª.

The frame members 31 and 32 are connected together by a series of posts upon which are mounted spacing sleeves in the usual manner to hold the plate or frame members apart. Upon two of these posts, 36 and 37, as shown in Fig. 7, are mounted stop or detent members 38 and 38ª, of similar form, one of which is shown in this figure. These members, as shown, loosely embrace the shaft 35, and are provided with bent-over ends which are slightly beveled or cam-shaped, as shown at 39 and 39ª.

The button 20 is secured upon a setting shaft 40 shown more particularly in Fig. 6, which shaft is normally urged outwardly or to the left, as shown in Fig. 6, by a spring 41 acting against a collar 42 on the shaft. This shaft passes loosely through the frame members 31 and 32, and has secured thereto a setting hub 43, and a switch-controlling cam 44, the latter being on the right-hand end of the shaft, as shown in Fig. 6. The setting hub 43, as shown more particularly in Fig. 10, is provided with a pair of crank arms 45 and 45ª, which arms are provided with turned ends 46 and 46ª, and are also provided with laterally projecting arms 47 and 47ª. To the arm 47ª, as shown in Fig. 6, is secured a spring 48 the other end of which is secured to a post 49 attached to the frame member 32, so that the hub 43 and its associated parts, shown in Fig. 10, together with the shaft 40 to which it is secured, is urged to rotate in an anti-clockwise direction as viewed from the front of the case (Fig. 1).

Also secured to the arms 45 and 45ª are laterally projecting stop members 50 and 50ª, one of which stop members cooperates with an arcuate slot 51 in the plate member 32 to limit the rotation of the shaft 40. As shown in Fig. 4, the cam member 44 on this shaft is provided with a pair of switch-operating extensions 52 and 53, which are slightly spaced apart to provide a dwell portion or depression 54, the remainder of the cam member being substantially circular in shape and presenting laterally a dwell portion 55 of considerable extent.

At the rear of the case is mounted an insulating member 56 having contact posts 57 and 58 designed to be connected in series with the circuit leading to the electric range. A switch contact 59 is secured to the member 56, which is designed to cooperate with a similar switch contact member 60 secured on a switch spring arm 61, which is attached at its lower end to the member 56. The latter member is provided with an opening through which loosely passes a pin 62, preferably formed of insulating material, which pin is designed to be actuated by a shoulder 63 on a lever 64 pivoted on shaft 35, and provided at its upper end with a pin 66 designed to ride upon the surface of the switch-controlling cam 44.

It will be noted from Fig. 3 that the disk 14 and the turn button 16 should be turned in a counter-clockwise direction in order to move the fingers 33 and 33ª from the respective cam slots 34 and 34ª. In order to prevent these members from being turned in a clockwise direction, teeth or serrations 67 are provided at the rear face of the disk 14, with which teeth cooperates a detent 68 secured to the frame, and the shaft 35 upon which the thumb-turn 16 is secured is provided with a ratchet wheel 69 with which cooperates a detent 70, as shown in Fig. 4. A frictional drag is provided on the hollow shaft 29 by the spring 30, and a similar drag is provided on the setting shaft 35 by a spring 71 mounted upon a collar 72 secured to this shaft, this spring engaging against the frame member 32 at the rear of the case. The detent members 38 and 38ª are free to swing pivotally to some extent to the right and left, as shown in Fig. 6, about their mountings on the posts 36 and 37. Through openings in these members also passes a post 73, upon which post are mounted the springs 74 and 74ª, which tend to urge the members 38 and 38ª to the left, as shown in this figure.

The operation of the "on and off" timer will now be described. As shown in the drawings, the device is in position for use, or in its set position. Before it is turned to this position, and when the parts are at rest, switch-controlling cam 44 mounted on the shaft 40 is in the position shown in Fig. 12, with the member 50ª at the upper end of the slot 51. The member 66 on the switch-controlling lever 40 rests on the dwell portion 55 of the cam 44, and the switch contacts 59 and 60 will be in engagement. This will be the normal position of the parts when the range is under manual control and the "on and off" timer is not in use. The timer is then set by turning the thumb-turn 16 so that the arrow points to the hour at which time it is desired to turn the circuit on. This movement causes the finger 33ª on the collet 28ª to ride up the cam surface 34ª out of the cam notch, pushing the hollow cam 27ª to the right, as shown in Fig. 6, and likewise moving the detent member 38ª to the right on the shaft 35, as shown in this figure. The disk 14 is then turned until the indicator points to the hour at which

it is desired to have the current turned off. This movement rotates the hollow shaft 29 and the collet 28, and likewise moves the hollow cam 27 and detent 38 to the right, as previously described in connection with the rotation of the shaft 35. The setting of the device is now completed by turning the button 20 to the set position. This rotates the shaft 40 and switch-controlling cam 44 from the position in Fig. 12 to that shown in Fig. 4. At this time the high point 52 of the cam 44 engages the pin 66 and moves the lever 64 to the left, as shown in Fig. 4, so that the pin 62 will be pushed to the left by the shoulder 63 to separate the contacts 59 and 60 and thus open the switch. Rotation of the shaft 40 will likewise rotate the hub 43 and arms 45 and 45a attached thereto. These arms will pass below the turned ends 39 and 39a of the detent members 38 and 38a, camming these members aside in this operation. The arm 45 being set rearwardly of the arm 45a will be carried considerably past the corresponding member 38, but the arm 45a will be carried just past the arm 38a, so that when the button 20 is released the spring 48 will cause this arm to engage against the turned end 39a of the detent member 38a. The device is now set, and when the clock hands reach the hour at which the current is to be turned on, the cam 27a will be rotated to a position in which the finger 33a is opposite the cam opening 34a, and permit this cam, together with the member 38a, to be moved toward the left under influence of its spring 74a. This movement of the member 38a to the left, as shown in Fig. 6, will move the turned end 39a from the path of the arm 45a, and release the shaft 40 so that the spring 49 may rotate this shaft until the arm 45 engages against the turned end 39 of the member 38. At this time the pin 66 will lie within the dwell 54, and the contacts 59 and 60 will be in engagement so that the current will be turned on for operation of the range. This condition will be maintained until the clock hands reach the hour at which the current is to be turned off. At this time the finger 33 will be opposite the cam notch 34, and in a manner similar to that previously described, the member 38 will be moved to the left under influence of the spring 74, thus moving the turned end 39 out of the path of the arm 45 so as to permit the spring 49 to give the shaft 40 a further partial rotation.

The shaft 40 will now be permitted to rotate until the arm 45 strikes a pin 78 secured to the case, at which time the pin 66 will be engaged by the high point 53 of the switch-controlling cam 44, and the plunger or pin 62 will hold the contact members 59 and 60 out of engagement. It will be realized that if the rotation of the shaft 40 were not arrested by the pin 78, this shaft would rotate to its original position under influence of the spring 49, and thus turn the current on again, as in such case the pin 66 would be upon the dwell portion 59. If it is now desired to return to manual operation of the switch for the range, the button 20 is pressed inwardly against the action of the spring 41, and the arm 45 is released from the pin 78. The shaft 40 then completes its reverse rotation to its initial position, at which time the members 59 and 60 are in contact.

The thumb-turn 19 of the interval timer, shown at the left of the case in Fig. 1, is secured to a shaft 80 rotatably mounted in the frame plates 31 and 32, as shown in Figs. 5 and 11. Rotatably mounted upon the shaft 80 is a gear 81 urged by a compression spring 82 against a washer 83 mounted upon the shaft and disposed between the gear and a disk 84 secured to the shaft. This arrangement provides a friction drive between the gear and shaft, so that, while the shaft 80 may be turned independently of the gear when movement of the latter is resisted by the gear train with which it is engaged, when the gear train moves, the shaft will be rotated through this drive. The gear 81 meshes with a gear 85 (Fig. 5) rotatably mounted between the plates 31 and 32, which gear is in turn driven from the clock train. The movement of the clock train moves the shaft 80 in a counter-clockwise direction when it has been moved from its normal or zero position manually. The movement from the normal or zero position is accomplished in a clockwise direction, as shown in Fig. 1, independently of the gear 81 and the connected gear train of the clock mechanism, as permitted by this friction drive.

The shaft 80 projects through the frame plate 32 and upon its rear end is secured a crank arm 86, shown in Fig. 4. Adjacent this arm a detent 87 is pivoted at 88 upon the plate 32, and this detent is provided with a slot 89 receiving a pin 90, so that it is limited to a relatively small pivotal movement. A gong or bell 91 is secured at the back of the plate 32, and may, as shown, surround the motor 22. Cooperating with this gong is a clapper or striker 92 pivoted to the plate 32 at 93, the clapper being carried by a bell crank lever one arm of which 94 extends toward the detent 87. The movement of the clapper is limited in one direction by the pin 95, and a spring 96 is secured to the detent 87 at one end, and to the arm 94 at the other end, so as to normally urge these members toward each other about their pivots 88 and 93.

The crank arm 86 is provided with a pin 97 designed to engage the adjacent beveled surface 98 of the arm 94, and is also provided upon one side with a boss 99 to engage a corresponding boss 100 on the detent lever 87. The lever arm 94 is provided with a laterally turned portion 101 which is designed to be caught over the extreme end 102 of the lever 87 when the arm 94 is raised by the crank 86, so that the arm 94 will be held in elevated position and the clapper held away from the bell.

The operation of the interval timer is as follows: In Figs. 4 and 5 of the drawings the parts are shown in their normal or "unset" position, the thumb-turn 19 pointing to zero at that time, as shown in Fig. 1. When this thumb-turn is rotated in the direction of the arrow on Fig. 1, the crank arm 86 is moved in a counter-clockwise direction, as shown on Fig. 4, thus raising the crank arm 94 against the tension of the spring 96 until the portion 101 on this arm has been moved to a sufficient extent to permit the surface 102 of the detent 87 to be drawn thereunder by the spring 96. The arm 94 will then be held in this upper position by the detent, regardless of continued movement of the crank arm 86, and the clapper 92 will be held away from the gong. This movement of these parts by the shaft 80 is, of course, effected without any rotation of the gear 81 due to the frictional connection between these parts, and the thumb-turn 19 is rotated to the desired position so that it will indicate the number of minutes during which the range is to be used. After the mechanism has been thus set, movement of the shaft 80 in a reverse direction

will be effected by the clock train, and the gear 81 through the friction drive heretofore described. The arm 86 will be moved in a clockwise direction, as shown in Fig. 4, from the position at which it has previously been set. This movement will continue until the boss 99 on the arm 86 strikes the boss 100 on the detent lever 87, and moves this detent to the right, as shown in Fig. 4, until the surface 102 is disengaged from the laterally turned end portion 101 of the arm 94. When the arm 94 is thus released, it is at once moved downwardly by the spring 96, which causes the clapper 92 to strike the gong 91 and indicate to the operator that the time interval has expired. The parts are, of course, so arranged that this release takes place when the thumb-turn 19 points to zero on the dial 18.

While I have shown and described a preferred embodiment of my invention, it will be understood that it is not to be limited to all of the details shown, but is capable of modification and variation within the spirit of the invention and within the scope of the appended claims.

What I claim is:

1. In a time switch, a timing mechanism, a pair of cams rotated by said timing mechanism, said cams being mounted on a common axis and movable in an axial direction, a movable switch-controlling means, a pair of members in the path of a part of said means to successively interrupt movement thereof, and devices operated by the movement of said cams for successively moving said members from said path to permit intermittent movement of said means to operate the switch, said cams being mounted on a common shaft.

2. In a time switch, a timing mechanism, a movable switch-controlling means, a pair of members in the path of said means to successively interrupt motion thereof, a pair of co-axially mounted cams rotated by said timing mechanism, said cams being movable axially, and devices operated by said cams for successively moving said members to release the switch-controlling means and effect operation of the switch.

3. In a time switch, a timing mechanism, a movable switch-controlling means, a pair of members in the path of said means to successively interrupt motion thereof, a pair of co-axially mounted cams rotated by said timing mechanism, and devices operated by said cams for successively moving said members to release the switch-controlling means and effect operation of the switch, and said switch-controlling means being mounted on a longitudinally movable shaft whereby manual release thereof may be effected.

4. In a time switch, a timing mechanism, rotatable switch-controlling means, a pair of members in the path of said means to successively interrupt motion thereof, a pair of co-axially mounted cams rotated by said timing mechanism, devices operated by said cams for successively moving said members to release the switch-controlling means and effect operation of the switch, a stop to arrest rotation of said means after its release by said members, and said means being mounted on a longitudinally movable shaft whereby it may be disengaged from said stop.

5. In a time switch, a timing mechanism, a rotatable switch-operating device, detents arranged in the path of said device to successively interrupt rotation thereof, means to successively move said detents to position to release said switch-operating device and effect operation of the switch, said means including a pair of co-axial rotatable shafts, devices rotated by said timing mechanism and connected one to each of said detents, and members on said shafts controlling said devices to permit movement thereof.

6. In a time switch, a timing mechanism, a rotatable switch-operating device, a pair of detents arranged in the path of said device to successively interrupt rotation thereof, means to successively move said detents to position to release said switch-operating device and effect operation of the switch, said means including a pair of telescoping shafts, a pair of cams rotated by said timing mechanism each of which controls one of said detents, and members on said shafts cooperating with said cams.

7. In a time switch, a timing mechanism, a rotatable switch-operating device, detents arranged in the path of said device to successively interrupt rotation thereof, means to successively move said detents to position to release said switch-operating device and effect operation of the switch, said means including a pair of telescoping shafts, a pair of cams rotated by said timing mechanism each of which controls one of said detents, members on said shafts cooperating with said cams, the inner of said shafts projecting from the outer at one end, manually operable members mounted on said end and the adjacent end of the outer shaft, and a dial cooperating with both of said members.

8. In a time switch, a timing mechanism, a pair of co-axial shafts, a cam slidable with respect to each of said shafts, said cams being rotated by said timing mechanism, a spring-urged rotary switch-operating member, means for normally holding said member against rotation, said means including a pair of detents operated successively, one by each of said cams, for releasing said holding means to permit rotation of said switch-operating member.

9. A time switch comprising a timing mechanism, movable switch-operating means, a pair of co-axial cams rotated by said timing mechanism, said cams being movable in the direction of their axes, and means set into operation successively by the axial movement of said cams to effect successive movements of said switch-operating means to operate the switch.

10. In a time switch, switch-operating means including a shaft, a switch-operating cam on said shaft, and a pair of members projecting from said shaft, means to effect rotation of said shaft, a timing mechanism, a pair of co-axial cams rotated thereby, a detent in the path of each of said projecting members, and means set into operation by the rotation of said co-axial cams to successively release said members from the detents to effect intermittent rotation of said switch-operating cam.

11. In a time switch, switch-operating means including a shaft, a switch-operating cam on said shaft, and a pair of members projecting from said shaft, means to effect rotation of said shaft, a timing mechanism, a pair of co-axial cams rotated thereby, a detent in the path of each of said projecting members, means set into operation by the rotation of said co-axial cams to successively release said members from the detents to effect intermittent rotation of said switch-operating cam, a spring-pressed member engaged with said switch-operating cam, and means connecting said member to the switch.

12. In a time switch, switch-operating means including a shaft, a switch-operating cam on said

shaft, and a pair of members projecting from said shaft, means to effect rotation of said shaft, a timing mechanism, a pair of co-axial cams rotated thereby, a detent in the path of each of said projecting members, means set into operation by the rotation of said co-axial cams to successively release said members from the detents to effect intermittent rotation of said switch-operating cam, a spring-pressed member engaged with said last-named cam, means connecting said member to the switch, and said cam being provided with a plurality of cam surfaces to effect a plurality of switch operations during a partial rotation of said shaft.

13. In a time switch, switch-operating means including a shaft, a switch-operating cam on said shaft, and a pair of members projecting from said shaft, means to effect rotation of said shaft, a timing mechanism, a pair of co-axial cams rotated thereby, a detent in the path of each of said projecting members, means set into operation by the rotation of said co-axial cams to successively release said members from the detents to effect intermittent rotation of said switch-operating cam, and each of said detents comprising a suitably supported member having a free end in the path of one of said projecting members, and a spring acting on the free end thereof for moving the detent.

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