May 30, 1933. R. D. SMITH 1,911,475

SNAP ACTUATING MECHANISM

Filed Nov. 8, 1929 2 Sheets-Sheet 1

Fig. 1

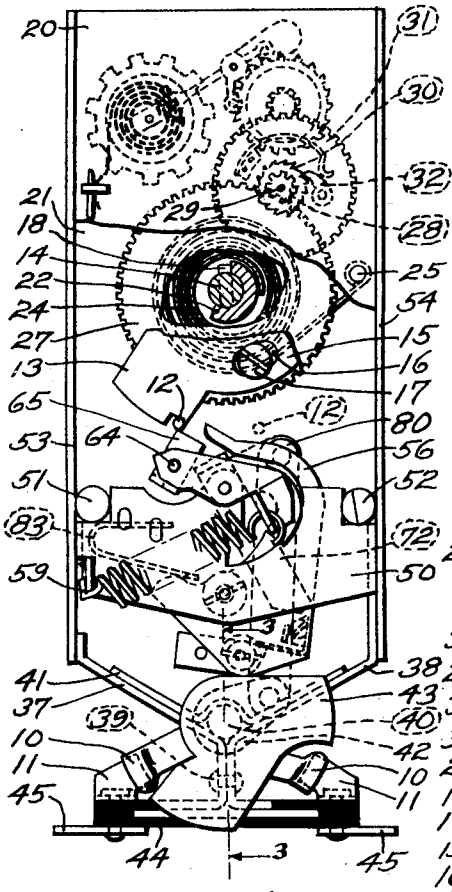
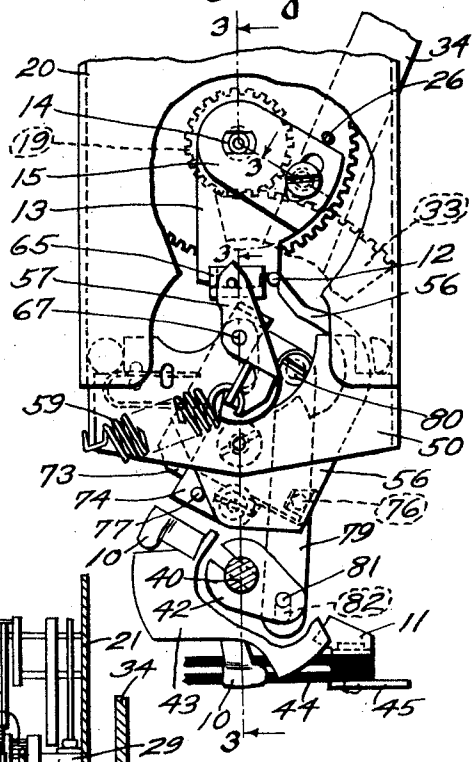


Fig. 2



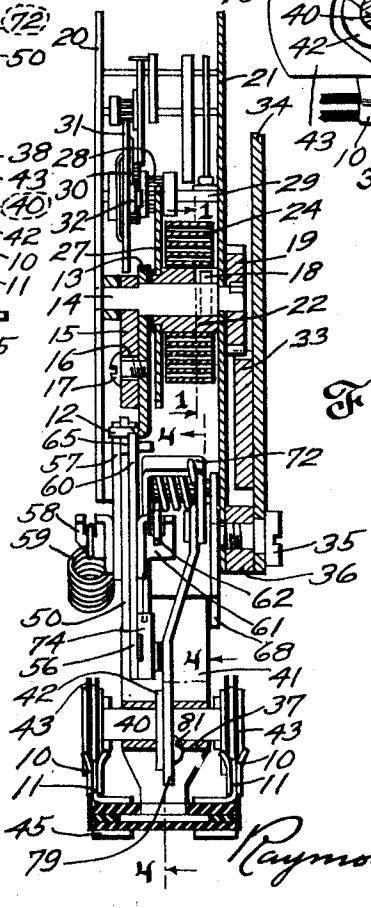


Fig. 3

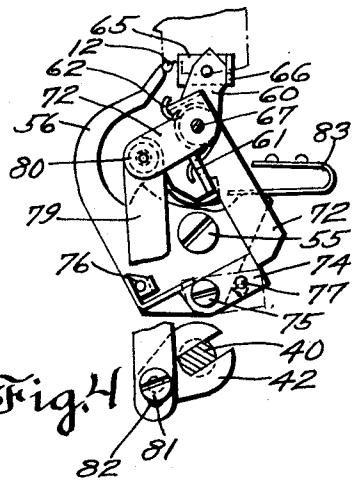


Fig. 4

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Fig. 7

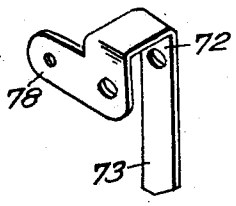


Fig. 8

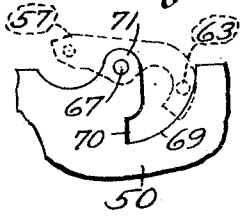


Fig. 6

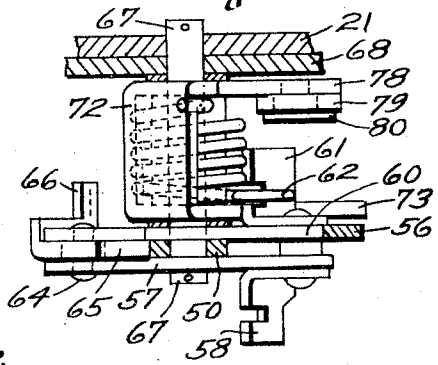


Fig. 9

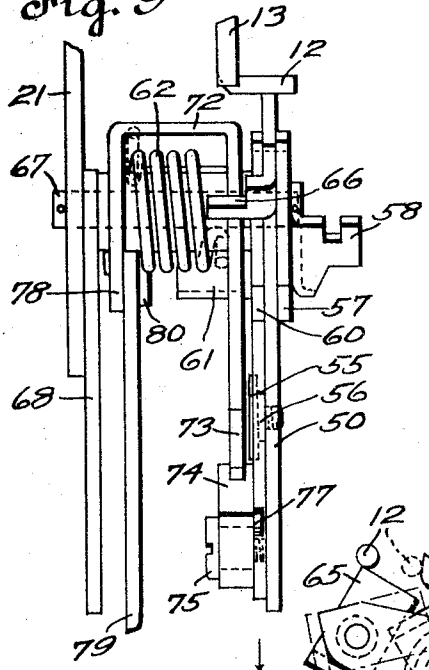


Fig. 5

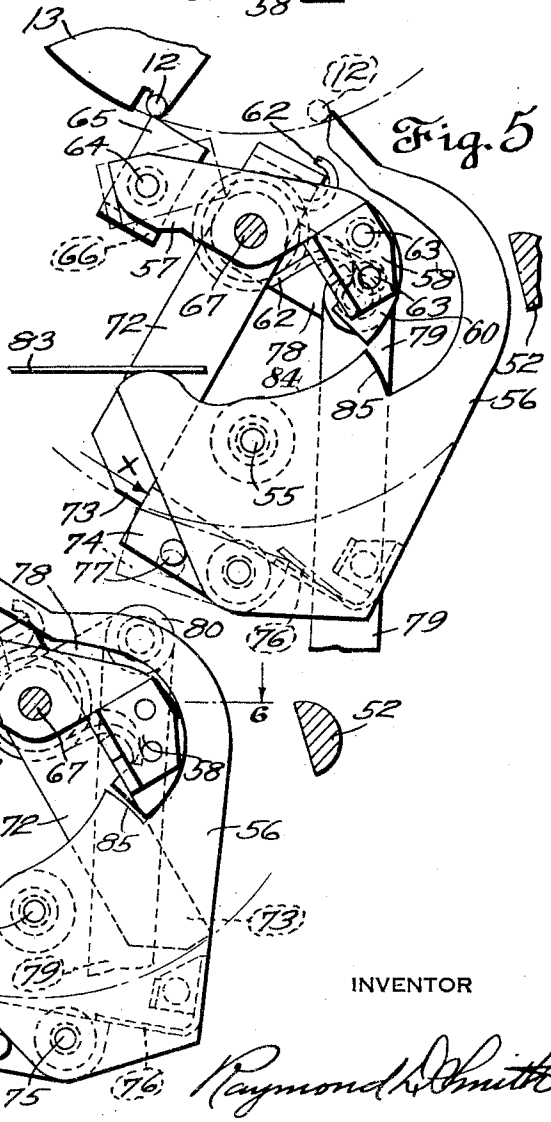


Fig. 10

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Patented May 30, 1933 1,911,475

UNITED STATES PATENT OFFICE

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SNAP ACTUATING MECHANISM

Application filed November 8, 1929. Serial No. 405,765.

This invention relates to improvements in mechanism wherein certain component parts perform reciprocal snap action for any useful purpose and may be employed to good advantage for manually actuating electric switches, or valves, or any device where it is desired to insure that the movement of the device in one or both directions of back-and-forth movement consequent upon manual actuation of the mechanism shall be no movement other than a quick one regardless of how slowly the actuating parts may be moved, and shall be no movement other than a complete movement from one to another of two definitely spaced positions, and that the movement of the actuated device shall take place only at a definitely defined point of the travel of the actuating parts, which is a valuable feature where slow moving time control means constitute a portion of the actuating parts as in my co-pending application Serial No. 255,000, as well as others of my co-pending applications.

The present improvements are characterized by features of positive interlocking construction to insure a positiveness and reliability of the action of a mechanism of this type, and further by an arrangement wherein the interacting parts are rendered suitable for the manual cocking and later time controlled firing of the snap acting mechanism, and wherein, all of the power to be availed of for operating the snap acting mechanism can be exerted by the hand of the operator and stored up at the time of setting the device for its time controlled automatic action and without calling upon the time giving movement (which may be a spring motor or an electric motor or any other slow acting prime mover) to expend any appreciable part of its own power for effecting the time controlled firing of the snap acting mechanism.

There are more particular objects and features of the present invention including the arrangement and formation of certain latching parts permitting the time controlling actuator to be not deprived of any portion of a full circle of rotation as comprising its operative travel; the construction of the mechanical parts to constitute insofar as possible flat shapes or simple metal stampings without bends whereby accuracy is made surer in quantity production and space is saved in the assembled mechanism, and whereby power springs are employed in a method of attachment rendering easy their removal and replacement; and whereby the mechanism as a whole shall be rugged and substantial in proportion to the size of its parts; and whereby the actuating timer and the electric switch or other device to which the time controlled snap action is to be imparted may be structurally separate and remote from the snap actuating mechanism itself.

The above, and other purposes of the invention will be more clearly understood from the following description and drawings wherein:

Fig. 1 is a front view of my improved snap actuating mechanism provided with a time control mechanism for actuating the same and electric switch contacts for actuation thereby; the lower portion of the front cover of the casing being broken away to show the interior parts and the winding shaft of the time movement being shown as sectioned on the plane 1—1 of Fig. 3, the snap actuating mechanism being shown as cocked and ready for firing and the switch contacts being shown in circuit making position.

Fig. 2 shows the actuating cam of the time movement returned to its starting or zero position whereupon it has retracted the latch and fired the snap actuating mechanism for abruptly opening the switch contacts.

Fig. 3 is an edgewise view looking from the right at Fig. 2 and showing the parts which are cross hatched as taken in section on the planes indicated by arrows 3—3—3 in Figs. 1 and 2.

Fig. 4 is a rear view of the snap actuating mechanism with the parts positioned as in Fig. 2 and may be considered as taken in section on the vertical plane 4—4 in Fig. 3 looking in the direction of the arrows.

Fig. 5 is an enlarged view of the co-acting rocker, follower, latch and associated parts showing the position of these parts when the

switch contacts are still broken and when the timer cam has just about fully swung the rocker and when the latch is about to snap into cocking engagement with the rocker thereby to hold the same in cocked position and to permit the follower to escape and follow up the rocker for snapping the switch contacts to circuit making position.

Fig. 6 is a detailed view of the snap acting mechanism looking down on the parts of Fig. 10 with the latch and certain frame and spacer parts shown in section on the horizontal plane 6—6 in Fig. 10.

Fig. 7 is a view in perspective of the bell crank U-shaped follower which transmits the movement of the rocker to the switch contacts or to any other suitable device to be operated thereby.

Fig. 8 is a fragmentary view showing the cut out shape of the upper edge of the frame plate which guides and affords bearing for the rocker structure of Fig. 6 and as this plate would appear in Fig. 1 if stripped of the operating parts there shown.

Fig. 9 is a view looking from the left at Fig. 5.

Fig. 10 is a view like Fig. 5 showing the position of parts after the latch has snapped into cocking engagement with the rocker and after the consequent follow-up movement of the follower relative to the rocker has taken place thereby to switch the electric contacts into circuit making engagement.

An object of the interlocking snap actuating mechanism which I shall now describe with particular reference to the foregoing views of the drawings is to cause quick back and forth movements or quick movement in one direction only of a controlled device such as the pivoted movable contacts 10—10 in relation to corresponding stationary contacts 11—11 resultant respectively upon corresponding but relatively slow displacement and return of the actuating finger 12 of the timer cam 13 from and to its zero or starting position shown in Fig. 2.

I shall first describe how the cam finger 12 is moved selectively by manual actuation and, when desired, by timing mechanism. Cam 13 is, in itself, loose upon the winding shaft 14 but there is fixed to a slabbed portion of this shaft the adjustor plate 15 having the arcuate slot 16 through which extends the screw 17 threading into a tapped hole in the cam 13 rigidly and thereby clamping cam 13 into surface contact with the plate 15 so that cam 13 is likewise caused to travel in unison with shaft 14 having a limited extent of adjustment in its rotative position relative thereto. The shaft 14 carries a radially projecting pin 18 and keyed to its rear end is the pinion 19, the shaft having bearing in the front frame plate 20 and in the rear frame plate 21.

Between the frame plate 21 and the cam 13 a hub 22 is loosely rotatable on shaft 14 except for the engagement of the shaft pin 18 with a segmental cut-away portion of hub 22 the arcuate extent of which cut-away portion may be any suitable number of degrees less than a full circle or which construction of a cut-away hub may, if desired be replaced by a flip-stop member similar to the part 62 in the drawings of my co-pending application Serial No. 150,278 or working on principles similar thereto should it be desired that the rotary movement of hub 22 relative to shaft 14 as limited by pin 18 shall comprise a full 360-degrees of relative rotation. To the hub 22 is secured the inner end of a band spring 24 which furnishes the power for running the time movement and which at its outer end is anchored to a frame post 25. The tendency of this spring is to rotate the hub 22 contra clockwise in Fig. 1 until the cam finger 13 is positioned as in Fig. 2 at which point the travel of the cam may be arrested by a frame stud 26 (see Fig. 2).

The said contraclockwise movement of hub 22 under the power of spring 24 is retarded by the engagement of a gear 27 fixed to hub 22 and in mesh with a pinion 28 on spindle 29 to which is likewise fixed the ratchet wheel 30. Or this ratchet wheel 30 may be frictionally secured to spindle 29 in some types of retarding clockwork where the ability to back-set or to back-wind is of advantage. In any event the second gear 31 may be loose upon spindle 29 and carry the click or pawl 32 spring pressed into engagement with ratchet wheel 30 to permit the free turning of pinion 28 and gear 27 in clockwise direction in Fig. 1 for winding movement spring 24 wherein the ratchet wheel 30 slips freely under the click 32 as is well understood in clock mechanism. Further pinions, gears and retarding means will not be described in detail but have as their object to slow down the turning of the second gear 31 and are here shown for illustrative purposes only, as comprising a conventional clock escapement so well understood in the art that it need not be described.

We therefore have the hub 22 constantly urging the shaft 14 in contraclockwise direction in Fig. 1 to the stop limited position of the cam finger 12 as shown in Fig. 2 by means only, of the shaft pin 18 so that if the shaft 14 be turned clockwise to carry the cam finger 12 as far away from its position in Fig. 2 as it is shown in Fig. 1, or farther, the time retarded return of hub 22 will ultimately restore cam finger 12 to its position in Fig. 2. But in the meantime if it is desired to manually turn the shaft 14 contraclockwise to at once restore the cam finger 12 to its position in Fig. 2 without waiting upon the automatic travel of hub 22, this is permitted by the play which the pin 18 has in the segmental notch

or other engaging device for pin 18 in the hub 22. And, if desired the shaft 14 may be manually turned contraclockwise in Fig. 1 or "back-set" to any extent intermediate the position to which hub 22 was turned in winding spring 24 and the starting position in Fig. 2, and although the drawings herein do not show it, any suitable clutch means may be introduced as, for instance, those comprised in the parts numbered 22 and 35 of my said co-pending application Serial No. 150,278 for enabling the shaft 14 to be impelled by hub 22 in relations thereto independent of the positive engagement of pin 18 by said hub.

For manually turning the shaft 14 in either or both direction of rotation I may employ any kind of handle with or without an associated pointer and time dial carrying graduations with which such pointer may register for indicating and measuring the extent of rotative movement of the shaft 14 but I here employ the before described pinion 19 with which I place in mesh a gear segment 33 fixedly carried on the operating lever 34 pivoted by the screw 35 which secures said lever loosely and the spacer collar 36 tightly to the frame plate 21.

Turning now to the device illustrated as an electric switch, which I have chosen as an example of a useful application for the snap actuating mechanism of the present invention, the switch is seen to be composed of the before mentioned movable contacts 10—10 and of the stationary contacts 11—11 both being supported by, and in insulated relation to a depending bracket composed of two halves, part 37 on the left and part 38 on the right secured together by the screw 39 to form a composite Y-shaped structure as viewed in Fig. 1 in the crotch of which structure is seated the shaft 40 of the switch rotor retained by a cap member 41 which permits the shaft 40 to rotate freely and for rotating which the crank plate 42 engages the shaft 40 by means of its wrench-like, open end fitting into flat bottomed notches cut crosswise the shaft. At each extremity the shaft 40 carries suitable insulating structure designated at 43 but not shown in detail and by means of which the movable contact clips 10—10 are caused to be swung as the shaft rotates, between their full line and dotted line position in Fig. 1, the former said position showing their conductive bridging relation with respect to the stationary contacts 11—11 each of which is fixedly carried by stationary insulation designated at 44 same being rigid with the before described supporting bracket 37—38. Binding post projections or pads 45 serve as means for electrical connection of circuit wires.

This brings us to the few and simple parts comprising my improved snap actuating mechanism by means of which slow movement of the cam finger 12 is enabled to operate the contacts 10—10 with a snap action in both directions. As a subsidiary frame for carrying the assemblage of the snap actuating parts I have shown the plate 50 engaging for locating purposes with the frame posts 51—52 in which relation it may be secured either to said posts or to the edge plates 53 and 54 which help to enclose the mechanism as a whole and which, themselves, may be fastened to frame posts 51—52 and as many others like them as is needed for strengthening the structure as a whole.

The frame plate 50 gives bearing to the rocker structure 57—60 shown in Fig. 6 and to a latch member 56 co-operating therewith and pivoted to plate 50 by the screw stud 55, and urger contra-clockwise in Figs. 1, 2 and 5 by the leaf spring 83. The rocker structure will be best understood from reference to Figs. 5 and 6 wherein it is shown to consist of two irregularly shaped plates fixed to each other in spaced relation, the forward plate 57 carrying the notched bracket piece 58 to which is anchored one end of the power spring 59, and the rear plate 60 carries a similar notched bracket 61 which serves as anchorage for one end of the other power spring 62. The bracket pieces 58 and 61 are shown as riveted solidly to the front and rear faces respectively of the rocker structure as a whole and the two rivets 63, 63 which secure them have a central portion of enlarged diameter to form shoulders for rigidly spacing apart the rocker plates 57 and 60.

At its opposite end, plates 57 and 60 of the rocker are spaced apart and secured together by a pivot stud 64 on which is free to turn a device which I may refer to as a roller dog inasmuch as it serves the anti-friction purposes of a roller in the use to which it is put with respect to its action against cam finger 12 and in addition gives distinct and peculiar advantages that will hereinafter be explained and which could not be obtained with a concentrically pivoted round roller or wheel. The roller dog 65 is here shown as a flat piece rectangular in shape and free to turn upon the stud 64 because the space between the rocker parts 57 and 60 is slightly greater than the thickness of the roller dog 65 and this dog has a rearwardly bent portion including the tongue 66 and which portion engages with a definite shape or obtuse angle formation given to the nose of rocker plate 60 for limiting the movement of dog 65 to points intermediate its extreme positions shown respectively in full and broken lines in Fig. 5.

The rocker structure as a whole is loosely pivoted on the shaft 67 which latter is supported at its forward end in the frame plate 50 and at its rear end in another frame plate 68 which may be secured to the rear frame plate 21 of the movement, and in its portion

traversed by movements of the rocker structure, the frame plate 50 is given a cut out formation most clearly shown in Fig. 8, one edge 69 of which, extends slightly between the two parts 57 and 60 at the heel end of the rocker structure to guide and steady the same in its rocking movement; another edge 70 of which falls in the path of one of the rivets 63 to limit the swing of the rocker structure in a clockwise direction in Fig. 2; and a still further edge 71 of which extends upwardly to occupy the space between the plates 57 and 60 of the rocker structure in its central portion and to support the shaft 67.

On the shaft 67 between the rocker and the plate 68 is a separate pivoted member of bell crank formation and bent in other portions as an inverted U, the nature of which is best seen from the perspective view in Fig. 7 which shows this part as it would appear if viewed from the rear and slightly from the right in Fig. 4. I shall term this member the follower 72. This follower is free to swing in relation to all the other parts heretofore described and is maintained normally in definite rotative relation to the rocker 57—60 because of being urged into abutting contact with the bracket member 61 by means of the spring 62 one end of which hooks over a notch in said bracket member and the other end of which hooks upwardly over the edge of the follower 72, the spring 62 being loosely coiled around the shaft 67 and separated from said shaft by a suitable size sleeve or collar if desired.

The forward depending end 73 of the follower 72 travels in a path to be intercepted under certain conditions by the detent block 74 pivoted to the latch 56 by the screw stud 75 and urged by the spring 76 into a definite position relative to said latch determined by the projecting pin 77 carried by the detent block which engages the edge of the latch.

The opposite crank-like, or free end 78 of the follower 72 may be connected by a link 79 with the crank arm 42 which link preferably is given fixed pivotal connection at one end as it is here shown connected to follower 72 by the pivot screw 80 and given loose play pivotal connection at its other end as it is here shown connected to the crank arm 42 by the pivot screw 81 which rides in the elongated slot 82 in the link 79.

The positive and interlocking action of my improved snap acting mechanism, the parts of which have just above been described, is as follows: The parts with the exception of latch 56 and roller dog 65 possess no possible position of rest other than the positions shown respectively in Figs. 1 and 2, the object of which characteristic of operation is to secure no action of follower 72 taking place other than a full and snap movement back and forth between its extreme positions shown respectively in Figs. 1 and 2. If, for instance, the position of this follower, as shown in Fig. 2, (and the corresponding circuit breaking position of the switch contacts 10—11) be regarded as the normal condition, it will be possible through travel of the cam finger 12 to the left, as will be caused by clockwise turning of the cam 13 and other parts on the winding spindle 14, to slowly, by action of cam finger 12 upon the roller dog 65, force the rocker 57—60 contraclockwise to its position in Fig. 1, at which time the cam finger 12 can escape the roller dog 65 and be free for further manual turning in clockwise or winding direction to establish any selective time setting for predetermining the interval in which the running of the clockwork will return the finger 12 to its initial position shown in Fig. 2, and which interval of time is proportional to its degree of rotative displacement from its said initial position. But no simultaneous movement of the follower 72, nor of the contacts 10 actuated thereby, nor of the latch 56, nor of detent block 74, takes place until the rocker 57—60 has arrived at the substantial limit of its travel contraclockwise or in the position shown in Figs. 1 and 5. This is because the follower 72, although constantly urged to follow the rocker 57—60 by the spring 62, is prevented from so doing during the moving of the rocker, by interception of follower 72 by detent block 74, it being seen from Fig. 5 that the consequent line of pressure (indicated by arrow X) of the follower 72 upon the block 74 passes above the pivot 75 thus urging the block 74 clockwise about said pivot in Fig. 5 but which force cannot move the block on account of the pin 77 engaging the edge of latch 56. It will further be noted from Fig. 5 that this same line of force X passes below the pivot 55 of the latch 56 and because of the unyielding of detent block 74 clockwise relative to the latch exerts a force on the latch 56 augmenting the action of spring 83 tending to move the latch contraclockwise in Figs. 1, 2 and 5. Obviously, this movement of the latch 56 cannot take place because of its edge 84 (see Fig. 5), in the path of which edge, the convexly curved heel of the rocker 60 lies in all positions of said rocker except that position shown in Fig. 5 where the rocker plate has been so far swung contraclockwise that the latch spur 85 escapes the extreme end of the said heel of the rocker and urged in unison by spring 83 and by the pressure of follower 72 on detent block 74, snaps into its position shown in Figs. 1 and 10. This contraclockwise latching movement of the latch 56 lowers the detent block 74 from its full line position in Fig. 5 to its full line position in Fig. 10, whereupon the follower 72 escapes the detent block and impelled by the spring 62, snaps from its position in Fig. 5 to its position in Figs. 1 and 10 being thereby restored

to its normal abutting relation to the bracket 61 carried by the rocker plate 60.

At this point of the operation, and when the parts are in latched condition as shown in Figure 1, the link 79, pulled upwardly by the follower 72, has swung the contacts 10—10 sharply into circuit-making engagement with the contacts 11—11, and the parts are so retained against the tension of spring 59 so long as the latch 56 remains positioned as in Fig. 1, or as shown in broken lines in Fig. 5.

Return contraclockwise of the cam finger 12 either by hand or by running of the time movement will then act to retract latch 56 for "firing" or delivering the rocker 57—60 to the pull of spring 59. First however, the finger 12 will have to pass the roller dog 65, which, except for its shape and off-center pivoted relation to the rocker 57—60, would be found slightly raised beyond the point to which it had been forced down when the finger 12 passed the said dog in the further clockwise time setting movement from its position shown in Fig. 1, this slight raising representing the excess of travel of the rocker contraclockwise beyond the exact point where it permits the snap-in of latch 56 as is necessary to insure sufficient clearance for the designed latching action of the parts to take place, and the settling back against latch 56 of the rocker 60. The shape and the manner of pivoting dog 65 obviously permits the latter to yield or tip clockwise about its pivot to its broken line position in Fig. 5 before or at the time it is encountered by the finger 12 when the latter is moving in contraclockwise direction in Figs. 1 or 5, so that it offers no resistance whatever to the passage of said finger and removes a requirement for power to be exerted by the time movement to enable finger 12 to force its way past dog 65 which would otherwise be imposed.

After thus freely passing the dog 65 the further contraclockwise travel of finger 12 in Figs. 1 and 5 picks up the top end of latch 56 and slowly forces it against only the tension in spring 83 plus the friction of the latching surfaces from left to right accompanied by no movement of any of the other parts, except those carried on latch 56, until the travel of latch 56 to its extreme right position in Fig. 2, has been effected. Here the latch may be limited against further swing clockwise about its pivot by interference with the frame post 52 in a half cut-out portion thereof. At a very definite point, therefore, in the travel of latch 56, the rocker 60 will be released and under the power of spring 59 will snap sharply from its position in Figs. 1, 5 and 10 to its position in Figs. 2 and 4, and because the follower 72 will travel in unison with the rocker 60 in this direction of movement as caused by spring 62, the switch contacts 10—10 and 11—11 will be pulled smartly out of contact by the downward thrust of the link 79 on the crank arm 42.

When the snap movement of rocker 60 from its position in Fig. 1 to its position in Fig. 2 takes place there are several features of the operation of the mechanism which will now be noted. First it will be apparent that the detent dog 74 has again become lifted into the path of travel of the lower end 73 of follower 72, and that for the latter to pass the detent block, said block must yield relative to the latch 56 and downwardly to its broken line position in Fig. 5 which it is free to do about its pivot 75 against the tension in spring 76. Directly after being passed by the follower, however, the detent block will be restored to its full line position in Fig. 5 ready to intercept said follower for causing the next reverse snap action of same. It will be noted that the corner of the end 73 of the follower which strikes the detent block 74 is cut off on a diagonal to prevent what would otherwise be a sharp corner from striking and digging into the upper surface of the block. It is further reviewed that the detent block can not next be removed from the path of the follower until after a full swing of the rocker 60 contraclockwise has taken place which establishes the latched condition at the opposite extreme of the movement of the parts.

Attention is called to the function of the back-turned ear 66 on roller dog 65 which is to be engaged by the peripheral edge of cam 13 to position the dog substantially horizontally as in position shown in Fig. 2, which is its proper relation to finger 12 for next being forced to the left, in that figure. The rear view in Fig. 4, also shows this function of the said ear for were same not present or some equivalent, the dog 65 which is otherwise free to flip from its full line position to its broken line position in Fig. 5 would not of necessity correctly position itself for its next actuation by the finger 12.

For instance the right vertical edge of the dog might dip too much downwardly so that the finger 12 would strike the top horizontal surface of the edge of the dog rather than the right vertical edge, for it will be understood that this dog in the preferred construction has no springs to position it, although same might be applied, this being considered undesirable on account of the abrupt snap action of the dog each time it moves as carried by the rocker 60. The right angle bend of the metal of which the dog is formed engages the angularly related edges of the nose of the rocker to establish the extreme positions of the swing of the dog but does nothing to determine any position thereof intermediate its extreme positions so some additional expedient such as the engagement of

the ear 66 with the edge of cam 13 is resorted to for at times properly positioning dog 65 as in Fig. 2, and I could as well employ some suitable conformation of a stationary part of the frame, as for instance the edge of the movable cam 13, if preferred.

The object of the oval or elongated hole in the bottom end of link 79 is to increase the sharpness of the action of the link upon the contact 10—10 when the link drops for moving said contacts to break the circuit. The slightly free travel of the link under the impulse of the snap-acting follower 72, and before encountering the resistance or load of the grabbing of contact clips 10—10 upon the contact blades 11—11, gives the moving parts an impetus or momentum which adds itself to the actual power of spring 59 after the manner of a hammer blow to insure dislodging of the contacts from their circuit making engagement.

It will be apparent that I could in place of providing the link 79, mount rotatable switch contacts to be actuated by the follower 72 by some other means of power transmission with or without corresponding provision for lost motion to produce the effect of a hammer blow. Also that in place of electric switch contacts I might provide in structural association with the snap acting mechanism any form of valve or other device to be actuated by the power thereof according to the principles of the present invention. I have chosen a switch as the useful device to be actuated merely because of the common desirability of snap action in the operation of electric switch contacts and the present invention affords the several improvements in simplicity, reliability, and definiteness of action of such switch or any other device whatever, which have been hereinbefore pointed out to reside in the mechanism of this invention.

A word may be said about modifications which might occur to one skilled in the art and departures from the particular forms of the mechanical parts here shown and their exact arrangement. The spring 59 might be arranged as a torsion spring acting by a winding-up movement about the axis of its coil as does the spring 79, and conversely the spring 79 might be arranged as an ordinary axially stretchable coil as does the spring 59 shown. The follower 72 might be fixed to the shaft 67 and cause same to rotate in unison with the follower, whereupon the switch or other ultimately actuated device might derive its propulsion from the shaft 67 rather than from the follower 72 direct. Or in such case the switch rotor shaft 40 might be direct connected to or integral with, the actuator shaft 67. The roller dog 65 may have other contour than that of a substantial rectangle and may be an eccentrically pivoted round roller or otherwise shaped and pivoted to satisfy the claimed principles of the present improvements. The latch 56 is given its peculiar shape here shown partially to accommodate a full circle of rotation of cam finger 12 about the shaft 14 as it will be seen that said finger can progress clockwise from its position shown in Fig. 2 to the identical same position without interference by latch 56 after the same has snapped into latching engagement with the rocker 60. The stop pin 26 would not permit this in the relation shown but for same could be substituted a stop means which would permit a full revolution of the finger such as the stop levers numbered 74 and 74′ in my co-pending application Serial No. 208,547.

I may resort to several safety locking constructions which will be made the subject matter of separate applications for patent but which may be here referred to as requiring the presence of finger 12 at or near the position of same in Fig. 2 before the latch can be moved clockwise to its position shown in Fig. 2 for releasing the rocker, or before the rocker can "fire" even if released by the latch. Or I may cut down and shape the left end of roller dog 65 together with the top nose of the rocker plates 57—60 when same are positioned as in Fig. 2, so that the finger 12 can pass same when traveling to the right in said figure even after the rocker has been fired. The back-turned ear 66 of dog 65 might obviously be resilient or resiliently positioned to accommodate passing of finger 12 from left to right past the nose or upper right corner of the dog in Fig. 2 and thereafter snap up like a latch to assume its position as shown for being subsequently actuated when the finger 12 moves to the left. Or I may merely enclose the several parts to protect the latch 56 from accidental or purposeful tampering so that their actuation is solely by means of movement of the finger 12 and its action upon the roller dog 65 and upon the latch 56. I may provide a spring as hereinbefore stated which would yieldingly position the dog 65 properly in relation to the other parts in Fig. 2, and yet permit the finger 12 to pass the dog 65 from left to right in Fig. 2 by yielding of the latter against the tension of said spring.

I do not confine myself to a transverse finger-like device such as the part 12 shown in the drawings but may if desired make use of the circumferential portion or edge of a cam such as the part 13 to serve the purposes of such finger.

This provision of a latch-like dog which will serve as an anti-friction or roller-like device for rendering as easy as possible the cocking of rocker 60 by finger 12, while yielding to remove all resistance to the passing of finger 12 in the opposite direction of travel has useful application in rotary as well as reciprocal actuating mechanism wherein the

rocker 60 might have a plurality of arms or noses each carrying a separate dog the equivalent of part 65 of the present disclosure. And the advantages of this roller dog 65 will be apparent if same were substituted for the part 104 in my co-pending application Serial No. 208,547.

In place of the simple expedient of the pin 18 engaging a partial hub 22 to permit manual return of the finger 12 to its starting or zero position after a given winding movement of the arbor 14 and without waiting for the set time to run out, I may employ various back-winding constructions well known in the art of spring motor interval timing mechanism as witness various back-setting constructions such as those disclosed in several of my co-pending applications such as Serial No. 150,278.

I do not, therefore, intend the following claims to imply a limitation to any definite elements or arrangements chosen herein to illustrate the principles of the present invention other than will include all fair equivalents and modifications fairly within a mechanic's skill for embodying the substance of the novel improvements herein disclosed.

What I claim is:

1. In cocking mechanism a rocker adapted to be forced to and slightly past a cocked position against the tension of a firing spring, an actuator so to condition said rocker, and an anti-friction member pivoted on said rocker to flip from one to the other of two extreme positions, and so positioned and shaped as to transmit the force of said actuator to said rocker in only one direction of travel of said actuator.

2. In cocking mechanism a rocker adapted to be forced to and slightly past a cocked position against the tension of a firing spring, an actuator so to condition said rocker, and an anti-friction member pivoted on said rocker to flip from one to the other of two extreme positions, and so positioned and shaped as to transmit the force of said actuator to said rocker in only one direction of travel of said actuator, said actuator having one portion thereof formed and disposed to engage and exert a thrust upon said member for motivating said rocker and having another portion adapted to engage said member in a way to limit the rotative movement of said member about its own pivot relative to said rocker.

3. In snap actuating mechanism, a frame, a prime actuator, an ultimate actuator, two power springs one of which urges said ultimate actuator into definite relation to said prime actuator and the other of which urges said prime actuator into definite relation to said frame.

4. In snap actuating mechanism, a frame, a prime actuator, an ultimate actuator, two power springs one of which urges said ultimate actuator into definite relation to said prime actuator and the other of which urges said prime actuator into definite relation to said frame, a main latch to catch and hold said prime actuator when the latter is displaced from its said relation to said frame, and a subsidiary latch arranged to catch and hold said ultimate actuator from movement with said prime actuator when the latter is being displaced from its said relation to said frame.

5. In snap actuating mechanism, a frame, a prime actuator, an ultimate actuator, two power springs one of which urges said ultimate actuator into definite relation to said prime actuator and the other of which urges said prime actuator into definite relation to said frame, a main latch to catch and hold said prime actuator when the latter is displaced from its said relation to said frame, and a subsidiary latch arranged to catch and hold said ultimate actuator from movement with said prime actuator when the latter is being displaced from its said relation to said frame, said subsidiary latch being retractable by movement of said main latch.

6. In a mechanism to be manually cocked and subsequently fired by running of a time movement, in combination with the time movement, a winding spindle for said movement, an actuator adapted to be impelled by said movement in unyielding relation to said winding spindle in one direction, a rocker device tensioned to a normal position and arranged to be engaged by said actuator and thereby displaced to a cocked position by movement of said actuator in the opposite direction, and a latch tensioned to a position to retain said rocker device in its cocked position, said latch being engageable and displaceable by said actuator for firing said rocker device.

7. In a mechanism to be manually cocked and subsequently fired by running of a time movement, an actuator impelled by said movement in one direction, a rocker structure consisting of one part tensioned to a normal position and arranged to be displaced by said actuator to a cocked position, a latch tensioned to a position to retain said rocker in its cocked position, said latch being displaceable by said actuator for firing said rocker, another part of said rocker structure tensioned to a normal definite relation to said first rocker part but displaceable from said relation, and a subsidiary latch for holding said second part of the rocker from moving with said first part of the rocker, said subsidiary latch being retractable by movement of said main latch.

8. A two-way interlocking snap actuating mechanism comprising a rocker member to be actuated, a spring connected to tension said member to rock in one direction, a latch to detain said member against the action of said

spring, a second spring connected to rock said member in the opposite direction, a detent to detain said member against the action of said second spring, said detent being carried by said latch.

9. In a cocking and firing mechanism, an actuated member having limited movement between a cocked and a fired position, an actuator for impelling said member to its cocked position, and a contactor device carried by said member and protruding therefrom into the path of said actuator and arranged by movement relative to said member to annul the operative effect of said actuator upon said member when the former is passing the latter in only one direction.

10. In a cocking and firing mechanism, a cocking member, a device to be cocked thereby, a retractable device for transmitting the force of said cocking member to the said device to be cocked thereby and consisting of a dog so pivoted on the device and of such contour that different points on the working face of said dog designed to be contacted by said cocking member are differently spaced respectively from the pivotal center of said dog during the movement of the parts, and means to limit the pivotal movement of said dog in one direction to a position wherein said cocking member may exert a thrust upon said member for motivating said element, said dog being movable to a different pivotal position on said element wherein said cocking member may exert to thrust upon said member for motivating said element.

11. A two-way interlocking snap actuating mechanism comprising a rocker member to be actuated, a spring connected to tension said member to rock in one direction, a latch to detain said member against the action of said spring, a second spring connected to rock said member in the opposite direction, a detent to detain said member against the action of said second spring, the pressure of said rocker member on said detent urging said first latch toward retaining engagement with said rocker member.

12. A reciprocative actuated agent, a reciprocating actuator adapted through a portion of its path of travel to engage with and to propel said agent and to disengage said agent at a designed point in its travel, and means acting to operatively disrelate said agent and said actuator when the latter passes the said point in its return direction of travel.

13. A rocker propellable to a tension opposed position, a latch to hold said rocker in said position, an actuator movable in one direction to propel said rocker slightly past said position and against the said tension and thereafter adapted to pass out of propelling relation to said rocker, and means preventing the recurrence of propelling relation between said actuator and said rocker when the actuator moves in the opposite direction to pass said rocker upon its return.

14. In a cocking and firing mechanism, in combination with an element to be cocked and an actuator for moving said element to its cocked position, a retractive device for transmitting the force of the actuator to said element including a rockable dog so pivoted on said element and of such contour that different points on the working face of said dog are adapted to be wipingly contacted by said actuator in passing and are differently spaced respectively from the pivotal center of said dog thereby to vary the relationship of effective leverage of said actuator upon said element during the movement of the parts.

15. A mechanism for simultaneously tensioning a reciprocal controlled device to perform two successive spring caused movements in respectively opposite directions, including a spring to urge said device in one direction, a second spring to urge said device in the opposite direction, and an actuator arranged by uni-directional movement to operatively tension both of said springs.

16. A mechanism for simultaneously tensioning a reciprocal controlled device to perform two successive spring caused movements in respectively opposite directions, including a spring to urge said device in one direction, a second spring to urge said device in the opposite direction, and an actuator arranged by uni-directional movement operatively to tension both of said springs, together with means to hold said device against the action of one of said springs and operated upon by movement of said actuator in its opposite direction thereby to deliver said device to the action of the last said spring.

17. A mechanism for simultaneously tensioning a reciprocal controlled device to perform two successive spring caused movements in respectively opposite directions, including a spring to urge said device in one direction, a second spring to urge said device in the opposite direction, an actuator, and means to detain and release said device with respect to the action of one of said springs during movement of said actuator in one direction, and means to detain said device and later to release it to the action of the other of said springs during movement of said actuator in its opposite direction.

18. Snap actuating mechanism including in combination with a controlled device to which a snap action is to be imparted, separate springs to tension said device for snap action in respectively opposite directions, an actuator operatively related to each of said springs to tension both springs simultaneously by a stroke of said actuator in one direction and to release said device to the action of each spring at different points in the travel of the actuator.

19. Snap actuating mechanism including in combination with a controlled device to which a snap action is to be imparted, separate springs to tension said device for snap action in respectively opposite directions, an actuator operatively related to each of said springs to tension both springs by a stroke of said actuator in one direction, and to release said device to the action of one spring by the said tensioning stroke of said actuator and to release the said device to the action of the other spring by a separate and later movement of said actuator.

20. Snap actuating mechanism including in combination with a controlled device to which a snap action is to be imparted, separate springs to tension said device for snap action in respectively opposite directions, an actuator operatively related to each of said springs to tension both springs by a single stroke of said actuator in one direction and to deliver said device to the action of one of said springs by the said actuator stroke and to deliver the device to the action of the other spring by a subsequent stroke in the opposite direction.

21. Snap actuating mechanism including in combination with a controlled device to which a snap action is to be imparted, separate springs to tension said device for snap action in respectively opposite directions, an actuator operatively related to each of said springs to tension both springs by a single stroke of said actuator in one direction and to deliver said device to the action of one of said springs by the said actuator stroke and to deliver the device to the action of the other spring by subsequent movement, and timing mechanism to effect and control the said subsequent movement of said actuator.

22. In combination, a time movement, a controlled device, separate spring means to tension said device to move with a snap action in successively opposite directions, an actuator co-operatively related to one of the spring means to tension same and to release said device therefrom when said actuator is moved in one direction, and co-operatively related to the other spring means to tension same and to cause the release of said device therefrom at a later time controlled by said time movement.

23. In combination, a time movement, a controlled device, separate spring means to tension said device to move with a snap action in successively opposite directions, an actuator co-operatively related to each of the said spring means to tension same and to release said device therefrom at respectively different times governed in part by said time movement, and a power spring for running said time movement with connections whereby said actuator also energizes said power spring.

24. Actuating mechanism for effecting a snap action of a controlled device in successively opposite directions, including in combination with the device, a follower for directly propelling said device, a leader adapted to move in advance of said follower, a spring connecting said leader and said follower, means to retain said follower for quick follow-up movement relative to said leader, and means to tension said leader for quick reverse movement in unison with said follower.

25. Actuating mechanism for effecting a snap action of a controlled device in successively opposite directions, including in combination with the device, a follower for directly propelling said device, a leader adapted to move in advance of said follower, a spring connecting said leader and said follower, means to retain said follower for quick follow-up movement relative to said leader, and means to tension said leader for quick reverse movement in unison with said follower, an actuator movable in one direction to cause the release of said follower to the action of its spring and movable in the reverse direction to cause the release of said leader to the action of its spring.

26. Actuating mechanism for effecting a snap action of a controlled device in successively opposite directions, including in combination with the device, a follower for directly propelling said device, a leader adapted to be moved in advance of said follower, a spring connecting said leader and said follower, means to retain said follower for quick follow-up movement relative to said leader, and means to tension said leader for quick reverse movement in unison with said follower, an actuator movable in one direction to cause the release of said follower to the action of its spring and movable subsequently to release said leader to the action of its tensioning means, together with time giving mechanism to effect and control the time of the said subsequent movement of said actuator.

Signed at Pleasantville in the county of Westchester and State of New York, this 3rd day of November, 1929.

RAYMOND D. SMITH.

CERTIFICATE OF CORRECTION.

Patent No. 1,911,475. May 30, 1933.

RAYMOND D. SMITH.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 8, line 34, claim 10, for "to" read no; 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 11th day of June, A. D. 1935.

Leslie Frazer
Acting Commissioner of Patents.

(Seal)

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