March 28, 1939.

C. M. HIRN

2,152,258

TIME DELAY COMBINATION LOCK

Filed Feb. 23, 1938

2 Sheets-Sheet 1

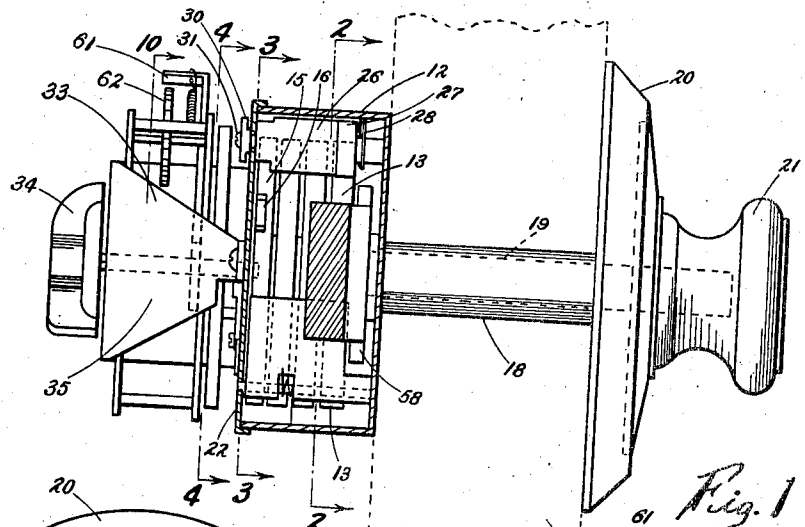

Fig. 1

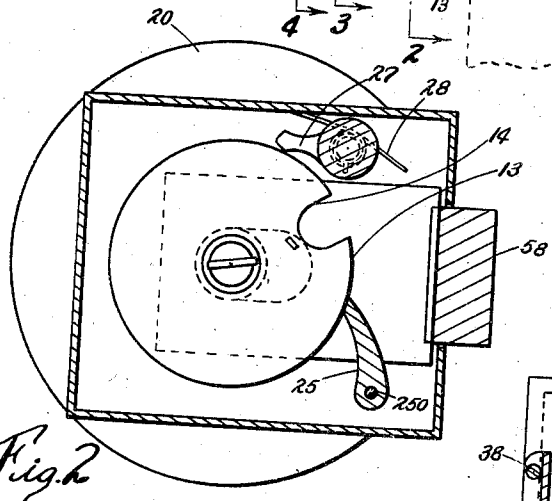

Fig. 2

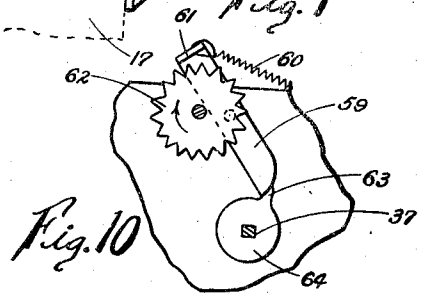

Fig. 10

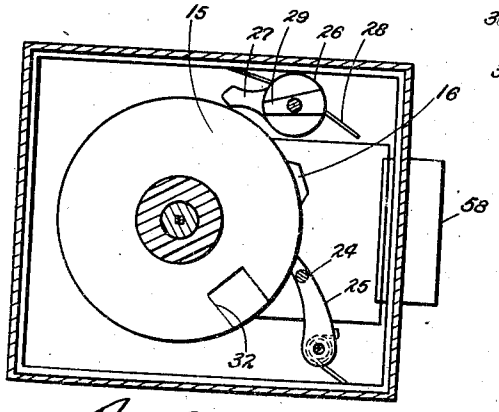

Fig. 3

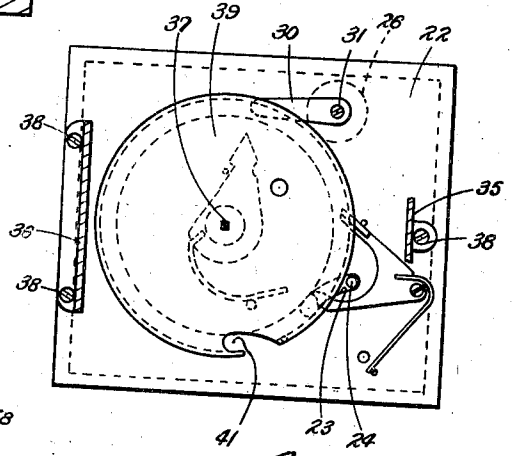

Fig. 4

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TIME DELAY COMBINATION LOCK

Filed Feb. 23, 1938 2 Sheets-Sheet 2

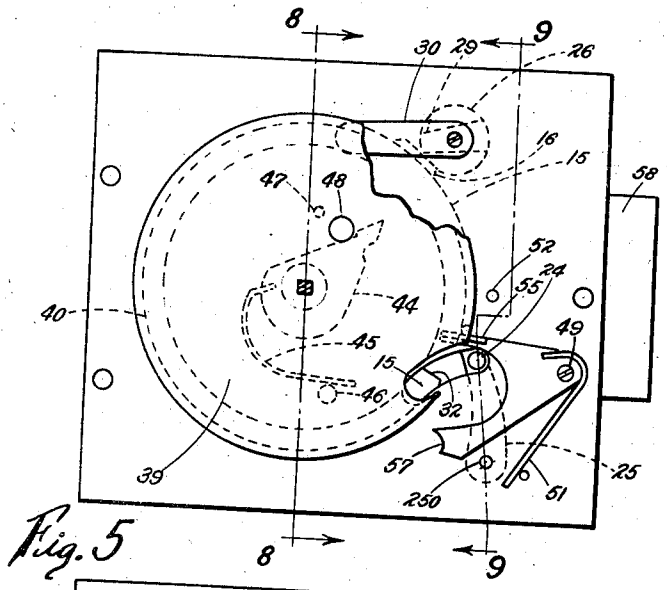

Fig. 5

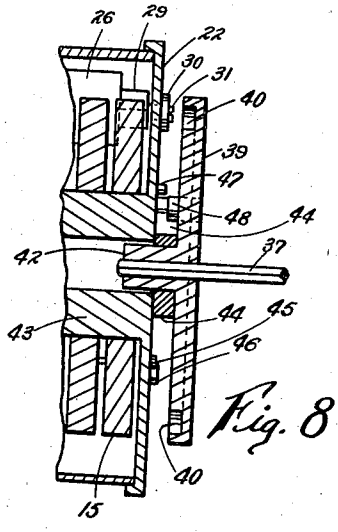

Fig. 8

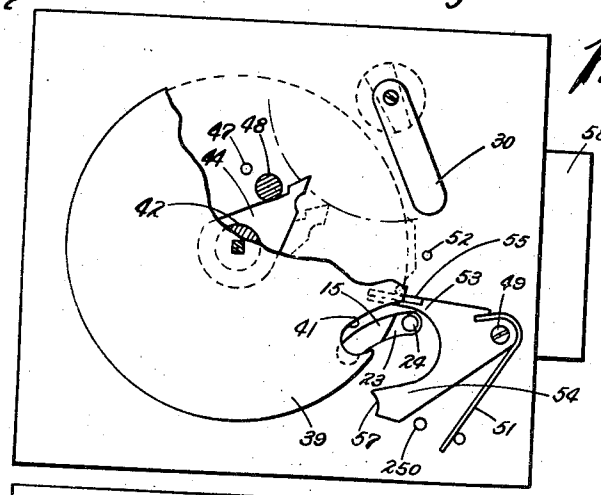

Fig. 6

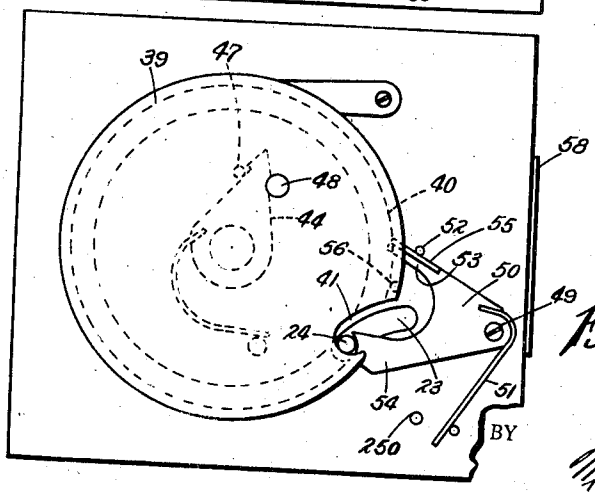

Fig. 7

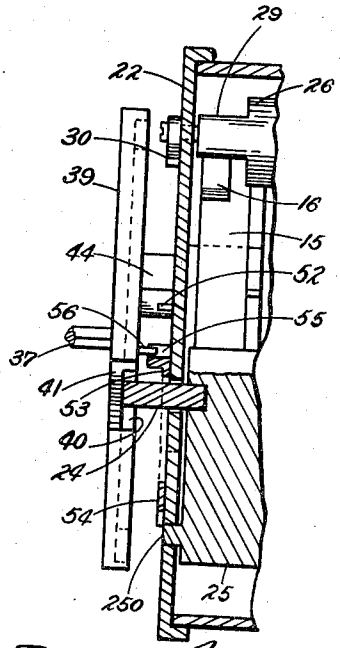

Fig. 9

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TIME DELAY COMBINATION LOCK

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Application February 23, 1938, Serial No. 192,171

8 Claims. (Cl. 70—269)

The present invention relates to a time delay combination lock and has for an object the provision of an inexpensive but highly efficient device permitting selective operation as an ordinary combination lock or as a time delay lock.

A further object of the invention is to provide a locking device of the character referred to which affords a suitable time delay interval when desired without requiring any ostensible preliminary action on the part of the operator and which furthermore may alternatively be conditioned in advance so that routine operation of the combination lock will enforce the protective delay before opening of the lock can be completed.

A further object of the invention is to provide a locking device, which, in normal use cannot be left in condition to disable the potential time delay mechanism.

Still another object is to provide particularly simple and inexpensive means whereby effective delayed opening control of a combination lock may be accomplished with inexpensive timing mechanism which is available commercially for a wide variety of purposes.

These and other objects are attained by the means described herein and disclosed in the accompanying drawings, in which:

Fig. 1 is a side elevational view, partly in cross-section, showing a device of the invention as operatively mounted upon a door.

Fig. 2 is a view taken on line 2—2 of Fig. 1.

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

Fig. 4 is a view taken on line 4—4 of Fig. 1.

Fig. 5 is a view of the cover end of the combination used, with the simple mechanism of the invention in the position assumed when the lock is ready for selective operation as a simple combination lock or as a delayed opening lock.

Fig. 6 is a view showing the relation assumed by the parts of Fig. 1 after conditioning the lock for the time delay interval.

Fig. 7 is a view similar to Fig. 6 but showing the bolt latched in retracted position after operation of the time delay mechanism.

Fig. 8 is a view taken on line 8—8 of Fig. 5.

Fig. 9 is an enlarged view taken on line 9—9 of Fig. 5.

Fig. 10 is a fragmental view taken on line 10—10 of Fig. 1.

Delayed opening locking devices have heretofore been of relatively complicated and expensive construction and the field of use thereof has been somewhat limited.

By the present invention, it is possible to produce a simple, smaller and less expensive device of this character affording protection from daylight hold-ups and surreptitious opening of the structure controlled thereby.

The invention consists essentially in providing a suitable combination lock and a simple time movement with an inexpensive mechanism placing the time mechanism and lock in cooperative relation whenever desired by having the operator introduce a predetermined preliminary setting operation of the dial when attempting to open the lock.

Referring to the drawings, 12 is a combination lock of ordinary construction, but in which the usual driver 13 is notched at 14, and the first tumbler 15 carries an extrusion or peripheral lug 16. The lock has the well known facilities for mounting it upon a door 17 and includes the sleeve 18, arbor 19, fixed ring 20 and operating knob and dial 21. The tumbler mechanism may include a suitable number of tumblers adapted by well known procedure to the changing of combination numbers.

A removable cover 22 for the casing of lock 12 has an arcuate slot 23 therethrough to accommodate a time-locking-pin 24 which is fixed in the existing gate 25 of the lock. The gate is pivoted at 250 and has the usual light spring urging it to enter the tumbler slots when the latter are aligned.

In the casing of the lock there is also provided a pivoted time setting post 26 which is spring urged in either direction so as to normally preclude radial alignment of the lever 27 on the post with the driver 13. The wire spring member 28 serves this purpose.

The top of the post 26 is cut away to form a cam 29 which is engageable by the extrusion or lug 16 on the first or No. 1 tumbler of the lock under conditions hereinafter explained. The extreme end of post 26 passes through a hole in the cover 22 of the lock casing and has an angularly reduced extension on which the angularly apertured finger 30 seats and is secured by a screw 31 extending endwise into the reduced end of the post 26.

The time delay mechanism is indicated generally as 33 and is of the manually wound spring type such as is commonly employed for short timing control purposes for electric apparatus and for the control of show window display lighting. The particular construction of the time mechanism or clock work forms no part of the present invention and is not described in detail beyond its provision of a manually operative

winding key 34, a U-shaped mounting frame with flanged legs 35 and 36, and its adaptability to connect with a square drive rod 37 which may be driven through one revolution in a predetermined time interval before the timing mechanism 33 runs down. The time mechanism includes detent means, as shown in Fig. 10, so that the device may be held inoperative but in a fully wound condition until it is desired to release the detent means for initiating the time delay movement of the lock for protective or test purposes.

The legs 35 and 36 of the clock work or time mechanism are removably mounted on the cover 22 by means of screws 38 so that an open space is provided between said legs and between said timing mechanism and said cover. In this open space is mounted the control disk 39 and the cooperating elements for the selective operation of the lock 12. The control disk 39 is mounted on drive rod 37 and has an annular groove 40 on the face thereof adjacent the cover 22 of the lock casing, so that the time locking pin 24 may assume a position wherein it projects into said groove without retarding rotation of the disk. An edge notch 41 in the disk intersects the groove 40 and affords the only point of entry and exit for pin 24 under the influence of the gate 25 of the lock. The gate 25 is thus effectively retained by the disk against entry into the tumbler slots except where the notch 41 is in substantial registry with the arcuate slot 23 in the cover 22 and said tumbler slots are properly aligned by manipulation of the combination.

As is clearly shown in Fig. 8, the disk 39 has a hub 42 which is freely rotatable in the hollow sleeve 43 upon which the lock tumblers are supported. A spring pawl 44 is mounted for free movement upon hub 42 between the casing cover 22 and the disk 39. A spring 45 is anchored at one end in a slot in pawl 44 and has its opposite end placed against a fixed abutment 46 on the cover 22 so that the pawl 44 is yieldably urged toward a stop pin 47 which is also fixed in cover 22.

Projecting from the under side of disk 39 is a pin 48 which is adapted to engage the pawl 44 but which will clear the fixed stop pin 47, as can be seen in Fig. 8. The spring pawl 44 cooperating with pins 47 and 48 constitutes a lost motion mechanism that is subject to the influence of finger 30.

Pivoted at 49 on cover 22 is a latch body 50 which is yieldably urged by spring 51, toward a stop 52. The latch body 50 has a pair of arms 53 and 54 which extend beneath the disk 39 and between which the pin 24 is normally disposed. An upturned lug 55 is formed on arm 53 and this lug is engageable by a pin 56 which is fixed in the lower face of disk 39 outside groove 40 and closely adjacent notch 41 of said disk. The end of arm 54 provides an abutment head 57 which serves to block pin 24 when the lock bolt 58 is retracted and the time mechanism 33 is run down. It will be apparent then that it is impossible to shoot bolt 58 when the time mechanism is run down because the gate 25 is restrained by the blocked pin 24. This provides a simple and effective means to warn the authorized operator of the device if he forgets to manually wind the time mechanism before closing the door 17.

The operation of the device is as follows. Assuming that the time mechanism 33 is run down, and the bolt 58 retracted and held in that position by arm 54 blocking pin 24 in the gate to preclude projection of the bolt by the usual operation of knob 21, the operator would proceed as follows. With the door 17 open, the operator would turn winding key 34 in a clock-wise direction through one complete revolution. Disk 39 would move with the winding key and its stem from the position shown in Fig. 7 without initially disturbing the blocking relationship of arm 54 on pin 24, the groove 40 permitting such movement of the disk. Pin 48 on the disk moves away from the right-hand side of spring pawl 44 (Fig. 7) and describes a circumference as it moves around with the disk until pin 48 contacts the left-hand side of pawl 44 whereupon the final movement of the winding operation and said disk 39 causes pin 48 to move the spring pawl 44 away from stop pin 47 against the yielding resistance of spring 45. By the same movement, pin 56 on the under side of disk 39, completes its circumferential travel and picks up the upstanding lug 55 and pushes the latch body away from stop pin 52 and unseats the end 57 of arm 54 from pin 24 so that the parts assume a relation substantially as shown in Fig. 5. The spring of time mechanism 33 is fully wound and the detent mechanism shown in Fig. 10 comes into operation to hold the time mechanism at least in fully wound condition. The detent means is part of the time mechanism and comprises a lever 59 pivoted intermediate its ends and yieldingly urged by spring 60 to retract a turned up lug 61 of the lever away from cog wheel 62 which is operated by the normal gear train of the mechanism. During the winding movement, the lever 59 was engaged by detent pawl 63 on a member 64 that is fixed for manual rotation with the winding stem of which rod 37 is a continuation. The spring 60 is placed under tension as lever 59 pivoted under the influence of pawl 63 moving in a clock-wise direction whereupon lug 61 was moved into blocking relation with the cog wheel 62. The force of the spring motor of the time mechanism is thus blocked by reason of the position of pawl 63 holding lever 59 against the resistance of spring 60. To release the detent it is necessary to exert a counterclock-wise pressure on pawl 63 sufficient to move lever 59 about its pivot and release it from the cog wheel 62 whereupon lever 59 is completely withdrawn from the cog wheel by the spring 60.

In the present device the pressure of springs 45 and 51 of the spring pawl 44 and latch member 50 respectively are also held under tension ultimately by the detent mechanism just described along with the normal clock spring (not shown) of the time mechanism 33.

With the time mechanism fully wound, the operating knob 21 of the lock may be turned in the usual manner whereupon the bolt is shot and the gate 25 is withdrawn from the tumbler slots 32 and the combination is destroyed in the customary fashion.

With the lock in an operative position and the time mechanism arrested in fully wound condition, the parts are disposed substantially as shown in Fig. 5.

When it is desired to open the lock forthwith after the fashion of the ordinary combination lock, the operator proceeds to turn the knob 21 to the right a suitable number of times and stops on the first number of the combination. In doing this, the first tumbler 15, as viewed in Fig. 5, moves only in a counterclock-wise direction and the extrusion 16 thereon engages the cam 29 of the time setting post 26 and on arresting it at the proper number, positions the post so that finger

30 and lever 27 are in the positions shown in Figs. 5 and 3 respectively. The lever 27 is now definitely held out of possible engagement of the notch 14 of the driver so that when the knob 21 is turned in the opposite direction for setting up the next number for the combination, the post 26 and the parts attached thereto will not move. The remainder of the combination is then set up whereupon the gate 25 drops into the properly aligned slots 32 of the tumblers and the bolt 58 can be retracted in the usual fashion. Disk 39 and all its associated parts have, during this operation, remained in the position which they assumed at the completion of the winding of the time mechanism. The notch 41 remained in registry with slot 23 and the pin 24 on the gate 25 was free to move in the registered slot and notch. When the operator again locks the device, he merely turns the dial knob the requisite number of times to the right only and stops on any number except the first number of the combination. Thereafter the lock is again in condition for selective operation either as a combination lock or as a time delayed opening lock. The delayed period operation can be brought into action by the operator at any time by giving the dial knob one or more complete turns to the left and allowing the dial to stand on any number. The operation of turning initially to the left causes the driver slot 14 engaging lever 27 to turn post 26 counterclock-wise and thus bringing both the finger 30 and the lever 27, which is substantially parallel thereto, to a position approximately as shown in Fig. 6. In this movement, the finger 30 pushes the spring pawl 44 to the left as shown in dotted lines in Fig. 6 whereupon said spring pawl assumes the position against pin 48 on dial 49. When the operator now desires to open the lock, he turns the dial knob 21 one or more complete revolutions to the right. On the first revolution, the driver 13 picks up the lever 27 in the notch 14 thereof and imparts a rotating motion to the post 26 which causes finger 30 to engage the spring pawl 44 which is now held by the pin 48 on the disk. The movement of the knob 21 through the driver is thus imparted to finger 30 and spring pawl 44 to move the disk and its shaft which is the driver rod 37. The pawl 63 now forcibly unseats lug 61 from the cog wheel 62 which is now free to operate under the influence of the normal clock spring and the escapement which forms a part of the time mechanism. This slide movement also moves the notch 41 of disk 39 out of registry with the slot 23 so that the pin 24 is now precluded from its normal movement, until the disk 39 makes a complete revolution to a stop in registry with the slot 23 which it can assume only after the time mechanism has run down. It is preferred that the combination be not set up in the lock until the time mechanism has run down, this period being preferably a matter of twenty minutes, more or less, according to the particular adaptation of the time mechanism. If the combination is set up before the time delay period has run off, the time mechanism operates under slightly greater load, but the bolt cannot be retracted until the delay period has passed.

It will be apparent then that so long as the dial is turned only to the right when beginning to set up the combination, the delayed interval mechanism remains inoperative. Turning the dial to the left when beginning to set up the combination, introduces the delay period mechanism and sets it ready to release when the combination numbers are properly set up as hereinbefore indicated. In the event of a hold-up, and remembering that the delayed period mechanism is always wound, it is only necessary to turn the dial one full revolution to the left before setting up the combination lock numbers or to deliberately misset the first combination number by at least five digits so that in the completion of the attempt to open the lock, said delayed period mechanism is brought into play.

As previously indicated, the time mechanism or clockwork is of the kind that is commercially available for various purposes and is relatively inexpensive. It has been noted that the clockwork is readily visible when the door controlled thereby is open, and that the clockwork must have the attention of the operator, at least to the extent of winding the same before the bolt can again be shot after the lock has functioned as a delayed opening lock. This simple, inexpensive clockwork is thus subject to frequent observation by the operator who may readily and quickly have a new clockwork applied to replace one that may appear to him doubtful in its operation, or definitely out of order. The replacement of one clockwork for another is accomplished by merely removing screws 38 whereupon the clockwork may be withdrawn from the squared drive rod 37. The assembly of the new clockwork on the combination lock is equally simple.

I claim:

1. In a device of the class described the combination of a clockwork selectively rendered operative and inoperative from the exterior of the device, a combination lock including cooperating tumbler mechanism and a gate controlling operation of the lock, and means operable by the clockwork for withholding the gate from the tumbler mechanism during unwinding movement of the clockwork.

2. In a device of the class described the combination of a clockwork, a combination lock including cooperating tumbler mechanism and a gate controlling normal operation of said combination lock, means operable by the clockwork for withholding the gate from the tumbler mechanism during unwinding movement of the clockwork, means normally holding the clockwork at rest in fully wound condition, and means selectively operable according to the direction of initial movement of the combination lock for releasing said holding means.

3. A delayed opening lock comprising a combination lock including tumbler mechanism and a gate, a normally wound clockwork mounted on said lock, a member forming an extension at the side of the gate, means normally holding the clockwork at rest in wound condition, means to render said holding means inoperative upon initial movement of a tumbler mechanism in one direction, said last-mentioned means being inoperative when the tumbler mechanism is initially adjusted in the opposite direction, and a disk operable by the clockwork and having a notch therein to receive said extension on said gate.

4. A delayed opening lock comprising a combination lock including a gate, a clockwork mounted on said lock, means controlled by the initial direction of operation of the combination lock for selectively initiating running movement of the clockwork and means controlled by the clockwork and operative directly upon the gate of the lock for precluding the normal operation of the gate in the lock during running movement of the clockwork.

5. A delayed opening lock comprising a com-

bination lock including slotted tumbler mechanism, a gate and a manually operable driver, a clockwork, a peripherally notched disk operable by said clockwork, an extension on the lock gate adapted to enter said notch when the slotted tumbler mechanism is set up and aligned with said notch, the clockwork being normally arrested in wound condition, means operable by initial movement of the driver in a predetermined direction for releasing the clockwork for rotating the notched disk, and means controlled by a tumbler of the lock when initially moved in the opposite direction for rendering the last mentioned means inoperative.

6. In combination a normally wound clockwork including detent means holding the clockwork at rest in wound condition, a combination lock comprising a bolt, tumbler mechanism, a gate and a driver for normal operation of the combination lock, time setting post means associated with the lock and operable by the driver to release the detent means of said clockwork, means comprising a notched disk operable by the clockwork and a pin on the gate, whereby the periphery of the disk precludes movement of said pin, and means carried by the tumbler mechanism for holding the time-setting post means in inoperative condition whereby the disk is held at rest with the notch thereof in position to receive the pin on the gate during normal operation of the lock.

7. In combination a normally wound clockwork including detent means holding the clockwork at rest in wound condition, a combination lock comprising a bolt, tumbler mechanism, a gate and a driver for normal operation of the combination lock, time setting post means associated with the lock and operable by the driver to release the detent means of the clockwork, means comprising a notched disk operable by the clockwork and a pin on the gate for cooperation therewith, whereby the periphery of the disk precludes movement of the gate and pin when the notch in the disk is held out of the path of the pin, means carried by the tumbler mechanism for holding the time setting post means in inoperative condition whereby the disk is held at rest with the notch thereof in a position to receive said pin, latch means yieldably urged to a position in the path of said pin, means carried by the disk for holding said latch means out of the path of said pin and releasable by movement of the disk under the influence of the clockwork.

8. In a delayed opening lock the combination of a normally wound clockwork including detent mechanism holding the same in inoperative position, a combination lock including a bolt, a tumbler mechanism and a gate cooperating therewith for operation of the lock, a pin on the gate, a peripherally notched disk operable by the clockwork and having on one face thereof an annular groove intersected by the peripheral notch, the pin on the gate adapted for entry into the peripheral notch in the disk when the bolt is retracted, and a latch means normally held inoperative and adapted for release by operation of the disk to yieldingly admit the pin into the notch and to preclude withdrawal of the pin from the notch, said disk being manually operable by winding movement of the clockwork whereby the latch is released from the pin, the groove in the disk providing clearance for the pin during said winding movement.

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