

July 12, 1938.

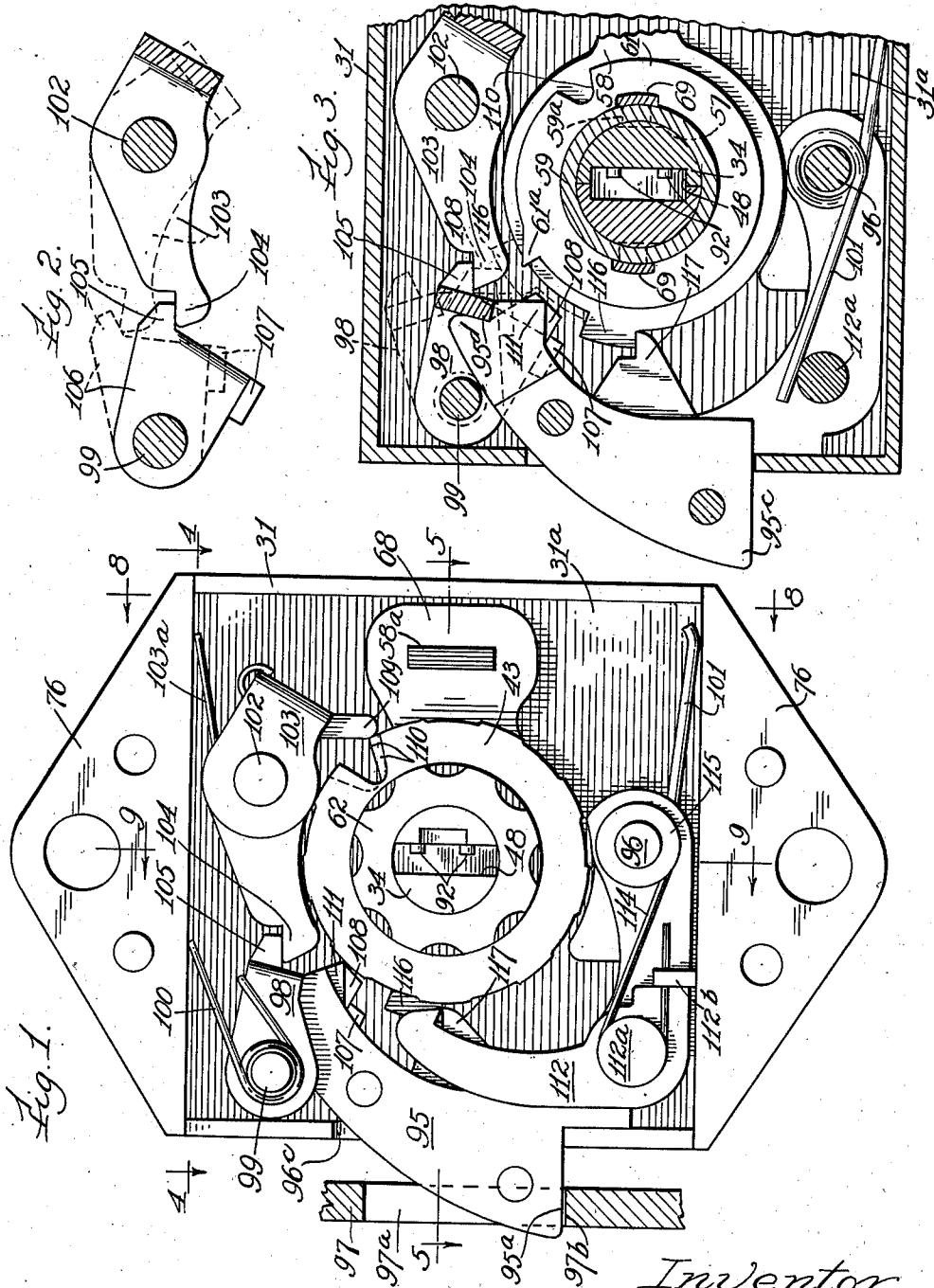
D. M. BELL

2,123,270

## PERMUTATION LOCK

Original Filed Nov. 28, 1933

3 Sheets-Sheet 1



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July 12, 1938.

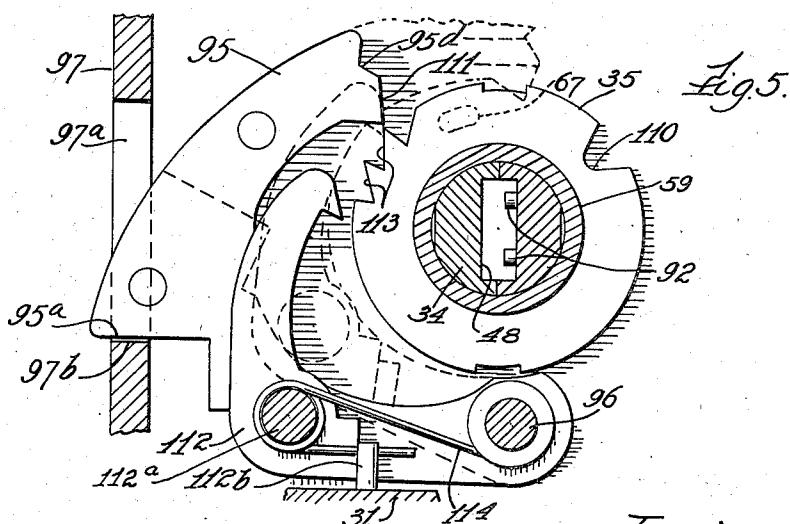
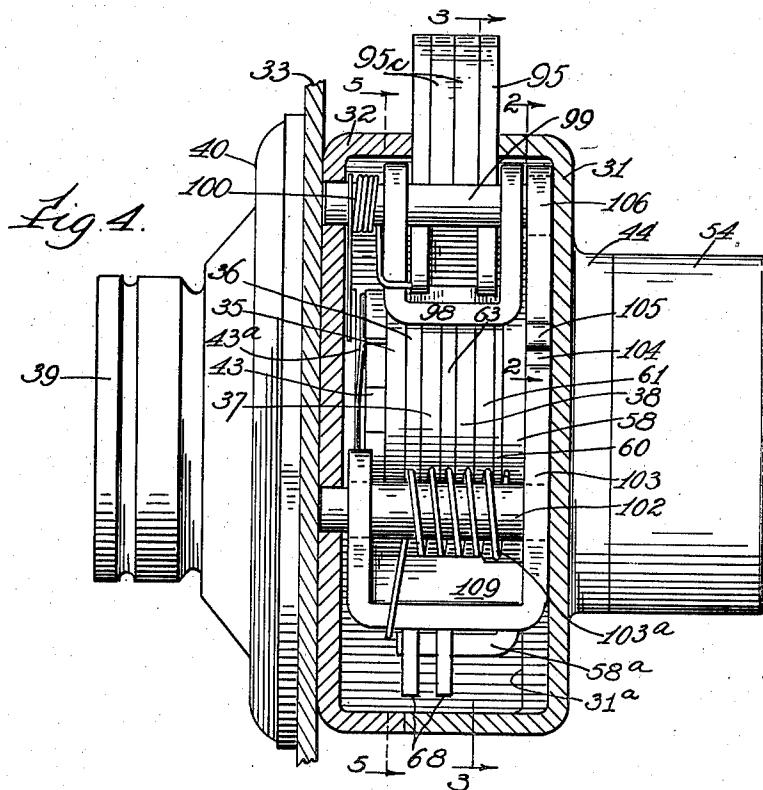
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PERMUTATION LOCK

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3 Sheets-Sheet 2



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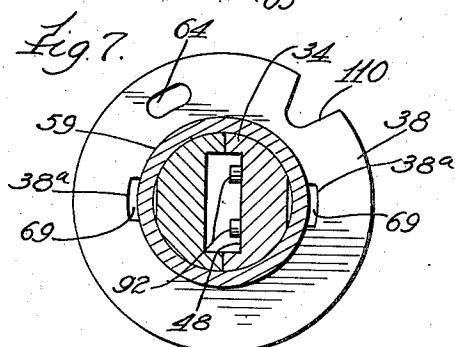
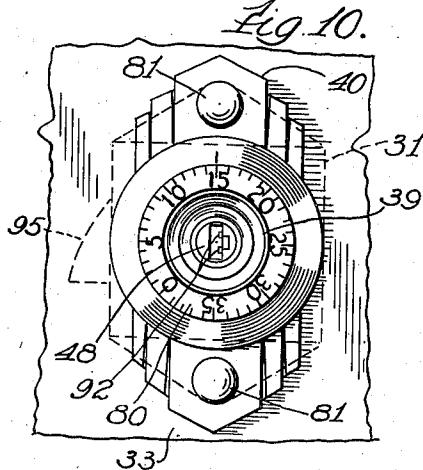
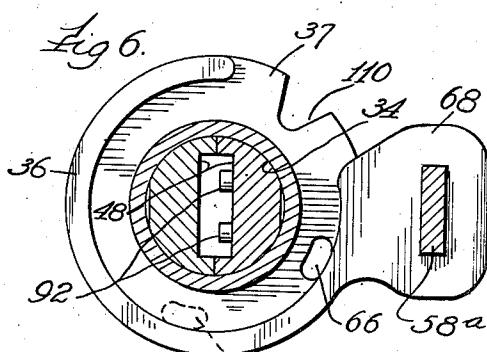
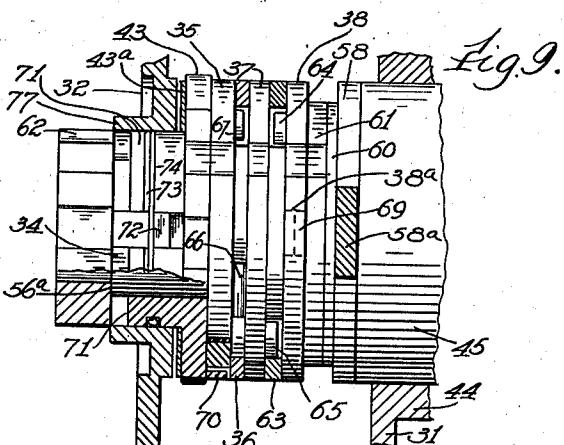
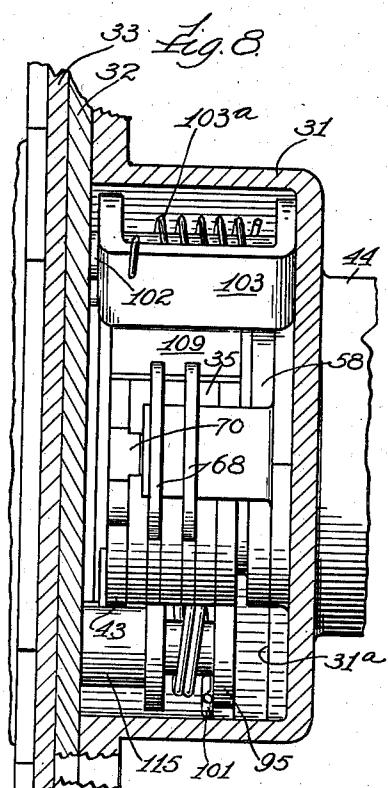
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D. M. BELL

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PERMUTATION LOCK

Original Filed Nov. 28, 1933 3 Sheets-Sheet 3



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Patented July 12, 1938

2,123,270

# UNITED STATES PATENT OFFICE

2,123,270

## PERMUTATION LOCK

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Original application November 28, 1933, Serial No. 700,104, now Patent No. 2,083,358. Divided and this application October 12, 1936, Serial No. 105,212

9 Claims. (Cl. 70—314)

This application is a division of my application Serial No. 700,104, filed November 28, 1933, and it relates to improvements in door locks in which the bolt is under the control of a permutation mechanism,—this type of lock being commonly termed a "combination lock". One object of the invention is to provide means for disarranging or upsetting the tumblers of the permutation mechanism as promptly as possible after their adjustment has served its purpose in releasing the bolt for movement to withdrawn position; a further object is to arrange such means so that it shall also automatically displace the dial or index element on the outside of the lock casing so that the last significant number of the combination will not be disclosed; another object is to provide particularly sturdy means under control of the tumbler disks for holding the bolt at locked position. The invention consists of certain features and elements of construction in combination as herein shown and described and as indicated by the claims.

In the drawings:

Figure 1 is a front elevation of a lock case with the cover removed to show the interior mechanism embodying this invention.

Figure 2 is a detail view taken as a section on the line 2—2 on Figure 4.

Figure 3 is a partial section taken as indicated at line 3—3 on Figure 4.

Figure 4 is an internal plan section of the complete lock as installed on a relatively thin door panel, section being taken at line 4—4 on Figure 1.

Figure 5 is a sectional detail view looking from the front of the case, showing certain parts involved in the upsetting or disarranging action, and being taken substantially at line 5—5 on Figure 4.

Figure 6 is a detail view showing one of the tumblers and a spacer member, being taken as a transaxial section.

Figure 7 is a similar detail view showing another one of the tumblers.

Figure 8 is a sectional view looking from the right-hand side of the case on the line 8—8 on Figure 1.

Figure 9 is a sectional view at line 9—9 on Figure 1, with certain parts shown in full lines.

Figure 10 is a front view of the complete lock mounted on a door, 33, of which a fragment is shown.

In my said application Serial No. 700,104 this combination lock mechanism is shown associated with a key-operated cylinder lock which is

arranged as an alternative means for actuating the bolt, and whose cylinder is disposed co-axially with respect to the tumbler disks of the combination lock. Some portions of this key-operated lock therefore appear in the drawings but need not be described in detail herein since they are not concerned with the present invention. The case 31 is made with a cylindrical boss, 44, in the rear wall thereof, and in this boss is fixedly mounted a cylinder lock housing in which 5 is rotatably mounted the key lock barrel or cylinder, seen at 34. The barrel or cylinder, 34, of the key lock extends through a sleeve, 59, on which are loosely mounted a plain spacing washer, 60; and a toothed disk, 61; the first, second and third combination disks, 38, 37 and 35 respectively, enumerated in the order in which they are set for unlocking; driving disk, 43; and a fluted connecting or clutch ring, 62. The ring, 62, has a shouldered bore, and seats directly over the end of the barrel, 34, as seen in Figure 1.

The combination disks are separated by hook-shaped spacers, 36 and 63, which provide annular spaces around the barrel for the rotation 25 of the interconnecting lugs,—lug, 64, formed on the outer surface of the first disk, 38 (Fig. 7), lug, 65, formed in the inner surface of the second disk, 37, lug, 66, on the front surface of the second disk, 37 (Fig. 6) and lug, 67, on the 30 inner surface of the third disk, 35 (see Fig. 5).

The spacers are supported and held in position by a forwardly projecting finger, 58<sup>a</sup>, which, for convenience, is integrally formed on the cam disk, 58, and projects through conforming rectangular apertures in the ear portions, 68, of the spacers, 36 and 63, as seen in Figure 4.

The toothed disk, 61, is connected to the first disk by means of lugs, 69, formed on the toothed disk, which engage in suitable notches, 38<sup>a</sup>, in 40 the bore of the first disk, 38, as best shown in Figures 3 and 7. The combination disks are rotatably connected when their lugs are in contact, and the driving disk, 43, is connected to the third combination disk, 35, by peripheral 45 lugs, 70, formed on the driving disk, which engage in suitable notches provided in the margins of the third disk, 35. The hub, 71, of the driving disk is transversely slotted to receive lugs, 72, see Figure 9, which are integral with 50 and project inwardly from the connecting ring, 62, the medial portions of the lugs, 72, being relieved, and the hub, 71, being encircled by a wire, 73, disposed in a peripheral groove, 74, formed near the end of the hub so that the 55

ring, 62, and driving disk are extensibly connected. The case is enclosed by the cover, 32, and on the cover is provided a hub, 71, in which the boss, 71, of the driving disk, is rotatably supported.

The case is mounted on the rear of the door, 33, with the hub, 71, projecting therethrough; and on the outer side of the door there is secured the annular knob 39 and dial flange, 80. The disk or flange, 80, which may be made integral with the knob, 39, and which carries the dial graduations, is overlapped by the door plate, 40, which has a central recessed annulus accommodating the periphery of the dial flange and engages in a circumferential groove provided in this portion of the conical dial surface, 80. Through the plate 40, door 33 and flanges, 76, are inserted bolts, 81, secured by nuts on the inner ends, to secure the lock to the door.

20 The lock is provided with a bolt, 95, which is arcuate in form and is pivotally mounted on a post, 96, which extends rigidly from the bottom of the case, directly below the stack of disks described above. The bolt has a portion which projects through an aperture, 96<sup>c</sup>, in the side of the case, and engages with an operating member of the door-fastening mechanism, such as a lock bar, 97, indicated in Figure 1. The bolt is built up of four plates riveted together, the two middle plates, 95<sup>c</sup>, being shortened, as shown in Figure 3, and the upper and lower plates each having a notch, 95<sup>d</sup>, formed in their upper ends for locking engagement with the transverse portion of a stirrup-shaped latch, 98, which is pivotally mounted on a post, 99, rigidly projecting from the rear wall of the case, the latch being urged into such engagement by a coil spring, 100. The bolt is normally urged outward by a coil spring, 101, as shown in Figure 3.

40 Adjacent the combination disks is a post, 102, rising from the bottom of the case, on which is pivotally mounted a U-shaped unlocking lever, 103, which has a finger, 104, formed on the inner leg portion which strikes against a lug, 105, 45 formed on a trigger plate, 106, pivotally mounted on the post, 99, behind the latch, 98. The plate, 106, has a transverse lug, 107, which strikes against the lower edge of a projecting arm, 108, of the latch, 98, to rotate the latch out of locking 50 engagement with the bolt when the lever and trigger plate are rotated into the position shown in broken lines in Figure 2.

On the transverse portion of the lever, 103, is provided a wide finger, 109, which is pressed 55 against the edges of the combination disks by the action of a coil spring, 103<sup>a</sup>, which urges the lever, 103, in clockwise direction. Each of the combination disks is provided with a peripheral notch, 110, so that when the disks are rotated by correctly operating the dial to bring the notches all into registering relation with the finger, 109, the lever, 103, is released for rotation by its spring, 103<sup>a</sup>, to move the latch, 98, away from the bolt, and when any one or all of the disks are again turned out of said 65 relation the finger, 109, is cammed out and the lever is thereby rotated to release the latch for re-engagement in the notch, 95<sup>d</sup>, when the bolt is returned to locking position.

It will be understood that in the lock illustrated 70 the bolt, 95, is returned to locking position simply by the action of its spring, 101, and that its movement to unlocking position is effected by manipulation of a member such as the lock bar, 97, shown in Figure 1. As illustrated, this bar is vertically slidable on the door, 33, and is formed

with a notch, 97<sup>a</sup>, providing a shoulder, 97<sup>b</sup>, which engages with the face, 95<sup>a</sup> of the bolt, 95. When the bar is lifted by a handle, not shown, it swings the bolt, 95, upwardly, provided the latching stirrup member, 98, has been swung to bolt-releasing position. And usually in connection with a locking mechanism of this type the lock bar, 97, is provided with an automatic detent which holds it in raised or unlocked position, and thus holds the bolt in unlocked position until the door is closed, whereupon the bar, 97, automatically falls to locking position and the bolt is swung downwardly by its spring, 101. Such detent mechanism is familiar in the art, (see, for example, Patent No. 1,387,643, to Erickson et al.) and there is no need to illustrate it in detail.

It is manifest that the door may be opened at any time after the combination has been set, and provision is made for throwing off the combination setting and moving the dial away from its last position, as follows:—when the bolt, 95, is moved inward in its unlocking movement, its projection, 111, strikes the tooth, 61<sup>a</sup>, formed on the disk, 61, and rotates said disk, and with it the first combination disk, 38, which is connected to disk, 61, 25 by lugs, 69. On the bolt there is pivotally mounted a pawl, 112, which catches in teeth, 113, formed in the third disk, 35, shown more clearly in Figure 5, and causes the displacement of the third disk, and hence the dial, on the return or 30 outward movement of the bolt.

The pawl, 112, is pivotally mounted on a pin, 112<sup>a</sup>, which is riveted to the bolt plates, and the pawl is urged in clockwise direction by a coil spring, 114, one end of which engages a bushing, 35, 115, placed on the upper end of the post, 96. The other end of the spring presses against an upturned lug, 112<sup>b</sup>, formed on the pawl, which projects downwardly to strike the wall of the case and rotate the upper end of the pawl away from 40 contact with the disks when the bolt is projected in locked position, as shown in Figure 1.

Thus the combination is broken when the door is opened; the dial is displaced when the door is closed; the door is always in locking condition unless the combination is set; hence, it is nearly impossible to unintentionally leave the door unlocked.

While there is shown and described herein certain specific structure embodying this invention, 50 it will be manifest to those skilled in the art that various modifications and re-arrangements of the parts may be made without departing from the spirit and the scope of the invention, and that the same is not limited to the particular form herein 55 shown and described, except in so far as indicated by the appended claims.

I claim:

1. In a combination lock including a case, a bolt mounted movably therein for projection and withdrawal, a plurality of combination disks in the case normally serving to maintain the bolt in projected position but adjustable to permit its movement to withdrawn position, means actuated by movement of the bolt in one direction for shifting one of said disks out of such adjustment, and means actuated by movement of said bolt in the other direction for shifting another of said disks out of adjustment.

2. In a combination lock including a case, a bolt mounted movably therein for projection and withdrawal, a plurality of combination disks in the case normally serving to maintain the bolt in projected position but adjustable to permit its movement to withdrawn position, means car- 70

ried by the bolt in its movement in one direction engageable with one of said disks for shifting it out of adjustment, and means carried by the bolt in its movement in the other direction engageable with another of said disks for shifting it out of adjustment.

3. In a combination lock including a case, a locking member having a portion extending outside the case and a portion movable therein for shifting the external portion from locking to unlocking position, a plurality of combination disks in the case normally serving to maintain said member in locking position but adjustable to permit its movement to unlocking position, means actuated by the movement of said locking member in one direction for shifting one of said disks out of such adjustment, and means actuated by the movement of said member in the other direction for shifting another of said disks out of adjustment.

4. In a combination lock including a case, a locking member having a portion extending outside the case and a portion movable therein for shifting the external portion from locking to unlocking position, a plurality of combination disks in the case normally serving to maintain said member in locking position but adjustable to permit its movement to unlocking position, means carried by the locking member in its movement in one direction engageable with one of said disks for shifting it out of adjustment, and means carried by said member in its movement in the other direction engageable with another of said disks for shifting it out of adjustment.

5. In a combination lock including a case, a bolt pivotally mounted therein for projection and withdrawal, a plurality of combination disks in the case normally serving to maintain the bolt in projected position, but adjustable to permit it to swing to withdrawn position, said bolt including a tooth formed to engage one of the disks for shifting it out of adjusted position when the bolt is withdrawn, and a spring-pressed pawl car-

ried by the bolt having a tooth formed for driving another of said disks in the opposite direction when the bolt is swung to projected position.

6. In a combination lock, a case, a bolt mounted movably therein for projection and withdrawal, said bolt having an abutment surface, a latch member of stirrup formation comprising spaced arms pivoted in the case and straddling a portion of the bolt with the cross-bar positioned to engage said abutment surface for holding the bolt in projected position, and a plurality of combination disks journaled in the case and normally serving to prevent release of the bolt from the latch, but adjustable to permit swinging said latch about its pivot to free the abutment from the cross member of said stirrup form.

7. In a combination lock, a case, a bolt mounted movably therein for projection and withdrawal, said bolt having an abutment surface, a latch member of stirrup formation comprising spaced arms pivoted in the case and straddling a portion of the bolt with the cross-bar positioned to engage said abutment surface for holding the bolt in projected position, a lever pivoted in the case for actuating said latch member, a plurality of combination disks journaled adjacent said lever and each having a notch, said lever having a portion adapted to enter the notches of the disks when the same are adjusted in registration, whereby the lever is permitted to rock and swing a latch clear of the abutment surface of the bolt.

8. In the combination defined in claim 6, spring means engaged with the bolt and urging it yieldingly toward projected position.

9. In the combination defined in claim 7, spring means associated with said latch member normally holding it in position to engage the abutment surface of the bolt and a stronger spring connected to said lever adapted to overcome the spring of the latch when said portion of the lever enters the notches of the disks.

DILLWYN M. BELL.