March 15, 1927. 1,620,757

W. C. FERRIS

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Fig. 1.

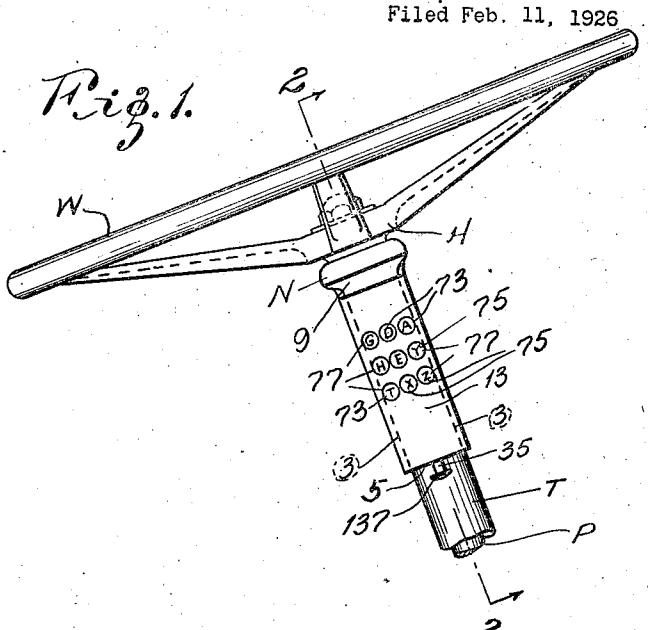
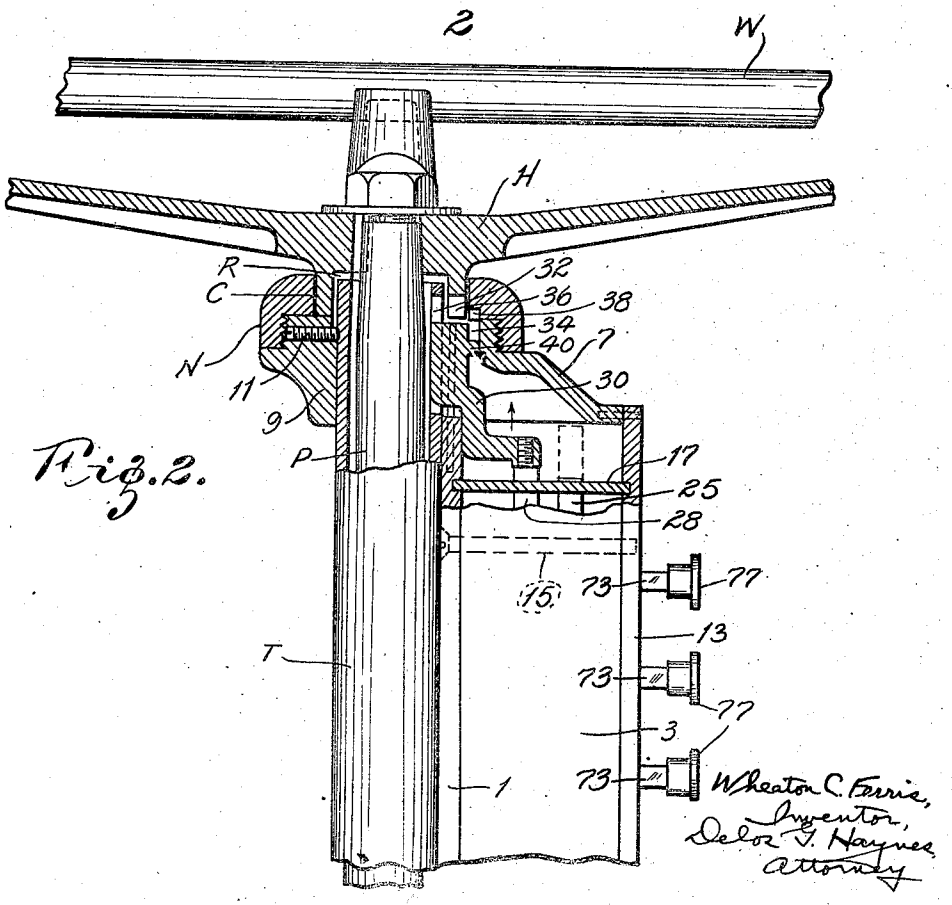


Fig. 2.



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Fig. 3.

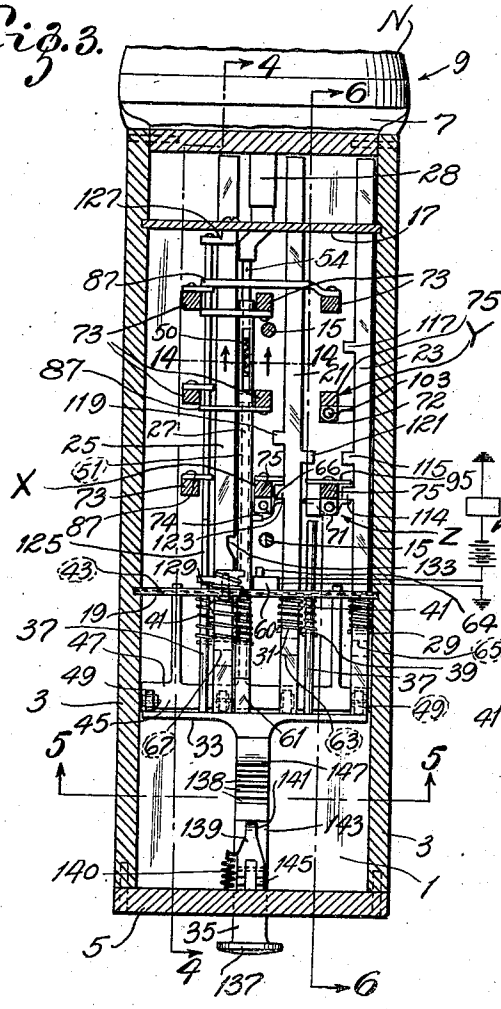


Fig. 4.

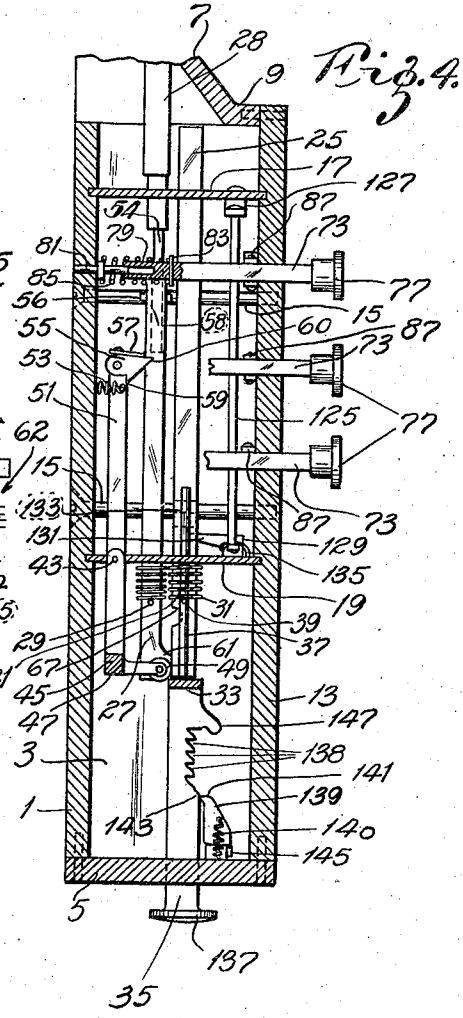
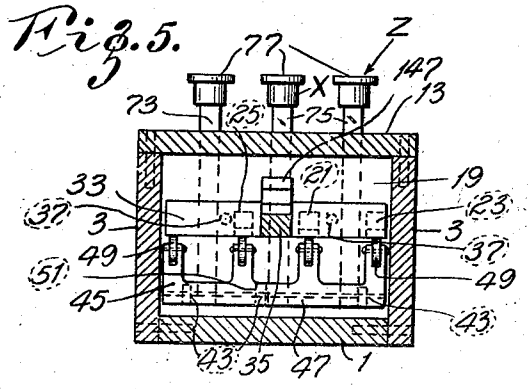


Fig. 5.



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Fig. 6.

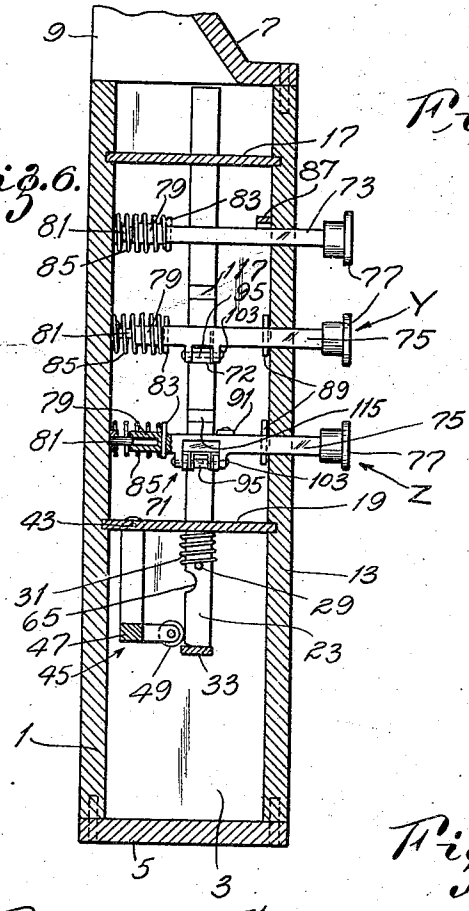


Fig. 9.

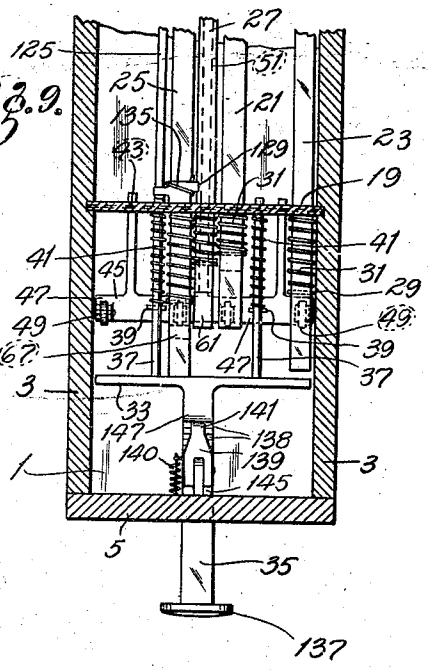


Fig. 7.

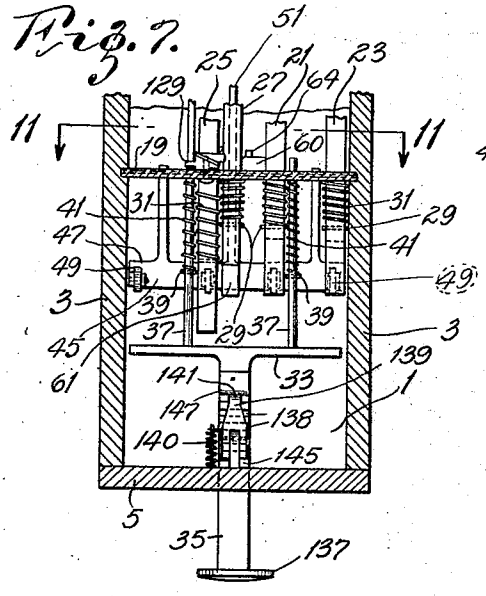
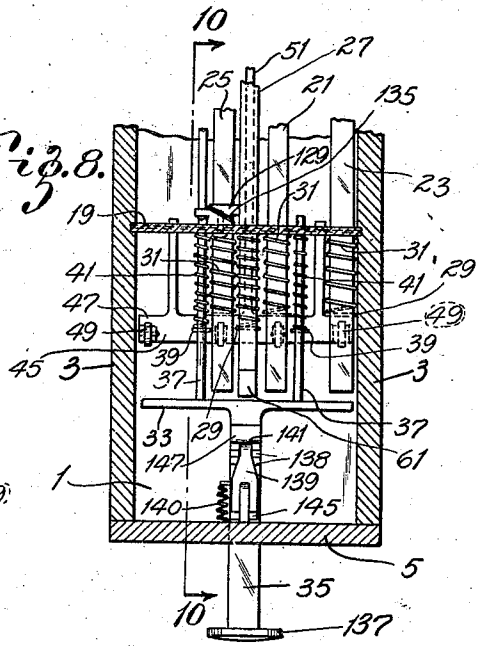


Fig. 8.



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Fig. 10.

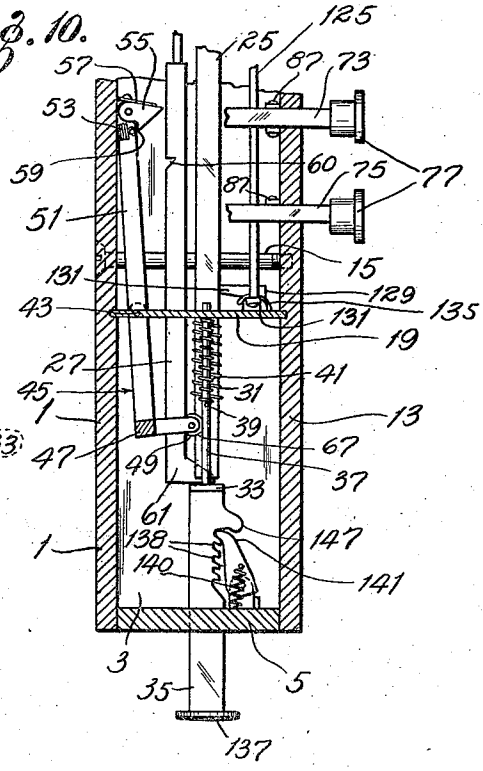


Fig. 11.

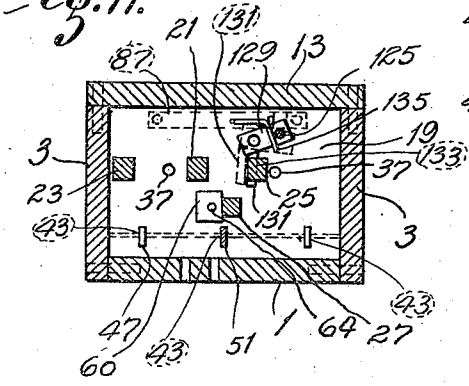


Fig. 12.

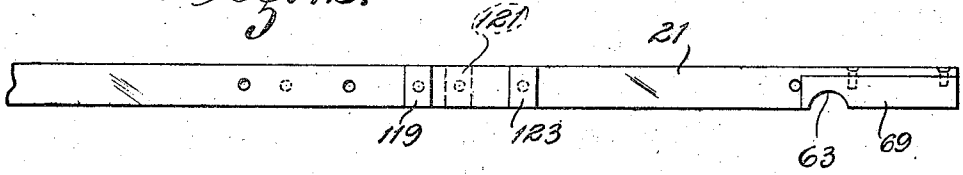


Fig. 13.

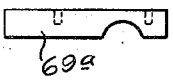
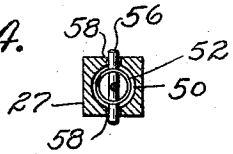


Fig. 14.



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Fig. 15.

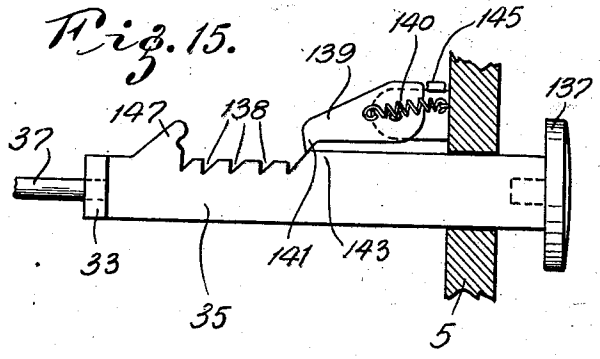


Fig. 21.

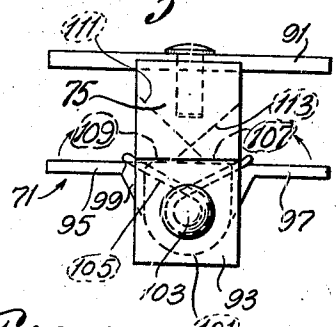


Fig. 16.

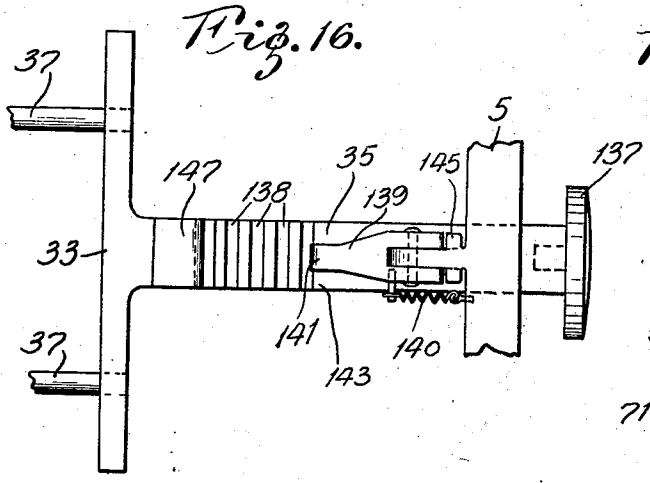


Fig. 20.

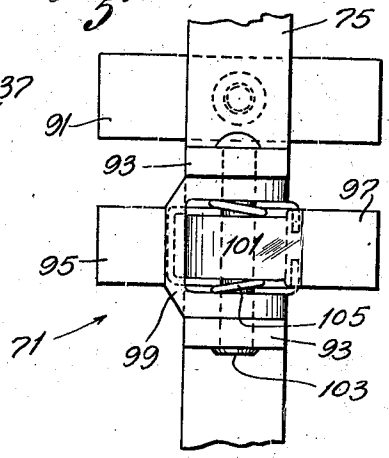


Fig. 17.

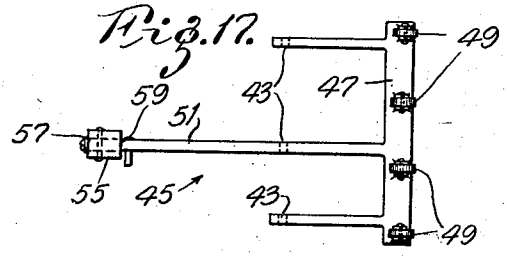


Fig. 19

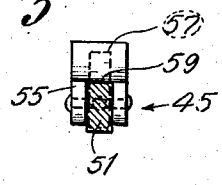
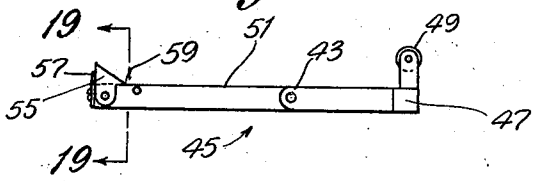


Fig. 18.



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Patented Mar. 15, 1927. 1,620,757

UNITED STATES PATENT OFFICE.

WHEATON C. FERRIS, OF UNIVERSITY CITY, MISSOURI.

LOCK.

Application filed February 11, 1926. Serial No. 87,568.

This invention relates to locks and with regard to certain more specific features to escapement locks of the combination type.

Among the several objects of the invention may be noted the provision of a lock having combination features and operable to open by pressure upon a series of buttons or the like; the provision of a lock of the type described which is completely inoperable to open when certain false movements are made with regard thereto; the provision of a lock of the type described requiring the working of a particular combination for opening but which combination may readily be changed after the lock has been put into use; the provision of a device of the type described employing improved clearing means; and the provision of a lock of the type described which may be ruggedly and economically fabricated and readily applied to various structures requiring a locking feature. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combination of elements, features of construction, and arrangements of parts which will be exemplified in the structure hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, in which is illustrated one of various possible embodiments of the invention,

Fig. 1 is a side elevation of a conventional automobile steering gear showing an application of the lock;

Fig. 2 is a section taken on line 2—2 of Fig. 1, certain parts being shown in full and showing an unlocked position;

Fig. 3 is a horizontal section of the lock taken just below the cover thereof and shows the parts in semi-cleared or semi-reset position;

Fig. 4 is a vertical section taken on line 4—4 of Fig. 3;

Fig. 5 is a lateral section taken on line 5—5 of Fig. 3;

Fig. 6 is a longitudinal vertical section taken on line 6—6 of Fig. 3;

Fig. 7 is a fragmentary section similar to Fig. 3 showing the lock completely cleared or reset and ready for reopening;

Fig. 8 is a view similar to Fig. 7 showing certain parts in opening position.

Fig. 9 is a view similar to Fig. 7 and shows certain parts in a non-opening position after a false setting of the combination;

Fig. 10 is a vertical longitudinal section taken on line 10—10 of Fig. 8;

Fig. 11 is a vertical lateral section taken on line 11—11 of Fig. 7 but shows a locked position in solid lines;

Fig. 12 is a side elevation of a modified form of escapement bar;

Fig. 13 is a side elevation of a certain part for the assembled bar shown in Fig. 12;

Fig. 14 is a vertical lateral section taken on line 14—14 of Fig. 3;

Fig. 15 is an enlarged side elevation of the resetting mechanism shown almost in resetting position;

Fig. 16 is a plan view of the parts shown in Fig. 15;

Fig. 17 is a plan view of a tumbler and releasing bar assembly;

Fig. 18 is a side elevation of the parts shown in Fig. 17;

Fig. 19 is an enlarged section taken on line 19—19 of Fig. 18;

Fig. 20 is an enlarged front elevation of an escapement mechanism; and,

Fig. 21 is a plan view of Fig. 20.

Similar reference characters indicate corresponding parts throughout the several views of the drawings.

Referring now more particularly to Fig. 1, there is illustrated a steering wheel W. This wheel is mounted upon a conventional steering post P by means of the usual key and taper combination. Around the post P is formed the conventional tube T reaching to a point within a recess R of the hub H of said wheel. The wheel W, hub H and post P rotate independently of the tube T which is stationary. The edges of the recess R are machined as a crown portion C.

The conventional mechanical steering combination above described will serve hereinafter as an example of one of the various possible devices to which the present improved lock may be applied for locking purposes.

The lock proper, as distinct from its application, (Figs. 1 to 11) comprises a base 1 to which is held side walls 3 and an end plate 5 for enclosing purposes. The box-like structure thus formed is closed at its opposite end either by a wall similar to the plate 5, that is, when the lock is used for general purposes, or by a form of flange such as indicated at numeral 7 in the pres-

ent application of said lock. The flange 7 forms an integral part of a ring member 9 formed around and fastened to the said steering wheel tube T. The member 9 is preferably fastened to the tube T by means of a set screw 11, or like fastener.

The box-like structure thus formed is provided with a cover 13. All of the walls thus far described are provided with proper drive pins or other fasteners and alignment pins. A pair of clamping screws 15 serve to hold the cover 13 in place.

The interior of the lock is provided with two bearing walls 17 and 19, located rearwardly and forwardly respectively. These walls 17 and 19 slidably support (from front to rear) a pair of escapement bars 21 and 23, a safety bar 25 and a latch bar 27. These four bars 21, 23, 25 and 27 are provided with laterally arranged pins 29 ahead of the said front bearing wall 19. Springs 31 reacting between said pins 29 and said wall 19, and formed loosely around their respective bars, serve to press the bars toward the front end of the lock, that is, toward the plate 5. Proper apertures in the walls 17 and 19 for the respective bars permit the said slidable movement.

At their front ends the said spring pressed bars 21, 23, 25 and 27 normally engage a cross member 33 (see also Figs. 15 and 16), that is they engage the member 33 when the lock is open or being reset to locking position. The said engagement is merely by abutment.

The cross member 33 is a component member of a resetting or clearing bar 35 which is slidably held in an aperture of the wall 5. The member 33 and bar 35 are also slidably supported rearwardly by means of guide pins 37. The rods or pins 37 are slidably supported at and through the front wall 19 and are provided with cross pins 39 similar to said pins 29 of the escapement and safety bars. Springs 41 located on the rods 37 between the cross pins 39 and the wall 19 have a tendency to force the resetting mechanism forwardly, regardless of whether said bars 21, 23, 25 and 27 follow or not.

Horizontally pivoted to the front wall 19 at three downward points 43 is a tumbler 45. This tumbler comprises a frame 47 which is pivoted as described, and which carries a set of four tumbler wheels 49. The provision of four wheels is an example of only one of any number of wheels that might be used, as will hereinafter be made clear. Three of the tumbler wheels 49 are formed directly beneath the lower surface of the said escapement bars 21 and 23 and the said safety bar 25. The other fourth wheel 49 is placed in a position that would be under a third escapement bar if such were used to change the combination of the lock at any time. (Figs. 3 to 10, 17 and 18.)

Reaching rearwardly from the more or less central pivot point 43, beneath the latch bar 25, is an extension or reach rod 51 (Figs. 4 and 10). This rod tends to be held downwardly by means of a tension coil spring 53 attached to said rod at one of its ends and the plate 1 at its other end. When the lock is in locked position this rod 51 is not drawn downwardly despite the tension of the spring 53. This is because the three active rollers 49 bear upwardly against the lower surfaces of the escapement and safety bars 21, 23 and 25 respectively. It will be noted from Fig. 17 that none of the rollers 49 are in direct alignment with the reach rod 51. They are however, directly in alignment with the respective bars upon which they ride.

Referring again to Fig. 4 it may be noted that the rear end of the reach rod 51 is provided with an upwardly extending dog 55 pivoted thereto (see also Figs. 17 to 19). The dog 55 is held in a forward position by means of a rearward leaf spring 57. The spring 57 is made fast to the rear end of the reach rod 51 and tends to press the dog 55 forwardly. A stop 59 on said dog prevents its being positioned any farther forward than indicated in Figs. 4 and 17 to 19. This dog 55 is adapted to engage a downwardly formed notch 60 in the latch bar 27 when said rollers 49 ride on the lower surface of their respective bars 21, 23, and 25, that is, when the reach rod 51 is in an upward position. The notch 60 of the latch bar 27 is so placed longitudinally that the said engagement between it and the dog 55 takes place only when the latch bar 27 is in its extreme rearward or locked position illustrated in Fig. 4. The spring 31 on the latch bar 27 is then completely compressed.

At its forward end the latch bar 27 has formed an upwardly extending dog 61. This dog 61 engages the cross-member 33 of the resetting member 35 at certain movements of the resetting member. It will be seen from the above (Fig. 4) that in the horizontal position of the tumbler member 47, that is, when the rollers 49 ride on the underside of their respective bars, that the latch bar 27 is held in locked position by the dog 55. The last statement holds true if the latch bar 27 has been returned to a position such that the dog 55 may engage the notch 60. The return event is accomplished by rearward movement of the resetting bar. The dog 55 under action of its spring 57 acts as a pawl for the notch of the latch bar 27.

In order to permit depression of the reach rod 51 so that the dog 55 may clear the notch 60, notches 63, 65 and 67 are formed on the bottom surfaces of said bars 21, 23 and 25 respectively. These notches are formed at pre-

determined points on the escapement and safety bars. Hence if the said bars 21, 23 and 25 are correctly positioned forwardly (from their Figs. 3 and 4 positions) then the tumbler rollers 49 will engage with said notches upwardly. This will permit depression of said reach rod 51 under action of the tension spring 53, whereupon the dog 55 will be withdrawn from its notch 60 in the latch bar 27. Now, if the resetting mechanism 35 is in its forward position, then it is evident that the latch bar 27 may spring forwardly under action of its spring 31. Hence a latch associated with a latch bar (to be described) will be permitted to open under certain conditions.

In Figs. 12 and 13 are detailed means for repositioning the said notches 63, 65 and 67 at the forward ends of the escapement and safety bars. The construction is one in which the front lower portions of the said bars are rectangularly cut out to receive blocks such as the block 69 illustrated in Fig. 12. This block 69 is tapped out in alignment with tapped holes formed in the bar to which it is fastened, and is thereby fastened to said bar. Now it is evident that any one of a number of blocks 69 may be fastened to a particular bar and that said block may be provided with a lower notch at any one of various positions. Fig. 13 illustrates an alternate block 69[a] which has the notch therein shifted from the position shown for it in the block 69 of Fig. 12. It is evident that after a lock has once been constructed, certain changes in the combination hereinafter to be described, can readily be made by substituting various blocks such as those indicated at 69 and 69[a]. The change in structure at said blocks may be readily made without disassembling the lock itself.

In order to permit escapement action of the escapement bars 21 and 23, so that the notches 63 and 65 thereof respectively, may align with the tumbler wheels 49 (whereby the lock may be opened) certain escapement pawls 71, 72 and 74 are provided (see Figs. 3, 6, 20 and 21). These escapement pawls are positioned on certain of a group of pressure bars now to be described.

Passing slidably through apertures in the upper cover 13 of the lock are nine pressure pins or bars. Six of these pins or bars comprise safety pressure pins or bars 73. The other three comprise escapement pressure pins or bars 75. All of said bars 73 and 75 are provided at their upper ends (outside of the cover 13) with keys or buttons 77. The buttons 77 are arbitrarily lettered or numbered for the purpose of indentification by one who is to have authority to open the lock (see Fig. 1). In effect the six safety pressure bars and keys therewith comprise false opening means, which if inadvertently manipulated, will completely prevent opening of the lock even though a correct combination is thereafter negotiated by the operator.

Referring now to all of the bars 73 and 75 (Figs. 3 and 6) it will be noted that at their lower end each one comprises a socket 79 adapted to slidably engage proper extensions 81 formed with the bottom plate 1. Above the sockets 79, cross pins 83 in the pressure bars are adapted to receive the reaction of springs 85. The springs 85 react against said bottom plate 1 and tend to hold the pressure bars 73 and 75 in normal upward position. The upper movement of the safety pressure bars is limited at the cover 13 by certain cross rods 87. These rods 87 have other functions which will also be made clear hereinafter. The upper movement of the escapement bars 75 is limited by abutment of cross pins 89 against the said cover 13. The pins 89 have a force fit with the pressure bars 75.

Referring now more particularly to the escapement pressure bars 75 (Figs. 3, 6, 20 and 21) it may be seen that each of said bars is provided with a certain escapement mechanism. One of the bars 75 located forwardly between the escapement bars 21 and 23 is provided with a compound mechanism 71 illustrated more particularly in Figs. 20 and 21. This mechanism comprises a rigid cross-member 91 formed at a point on the bar 75 such that its elevation is just above that of the upper surfaces of the escapement bars 21 and 23 when the pressure bar 25 is in its normal upward position. Extending forwardly from the pressure bar 75 are two arms 93 between which are pivoted sidewardly extending wings 95 and 97. It will be noted that the wing 95 has a forked pivoting member 99 while the wing 97 has a single legged pivoting member 101. The said pivoting members 99 and 101 are both adapted to swing on a pin 103 between the arms 93 and have space between them for the provision of a spring 105. The spring 105 is fastened to each of the wings 95 and 97 and is adapted to normally hold the wings 95 and 97 in the positions indicated in Figs. 20 and 21. Flat portions 107 prevent the wing 95 from being thrown farther forwardly and a flat portion 109 prevents the wing 97 from being so thrown. The portions 107 and 109 comprise a part of the front surface of the pressure bar 75. Cut into the said pressure bar 75 are two notches 111 adapted to permit rearward movement of the wing 95 with its pivoting portions 99. Between said notches 111 is cut a third notch 113 adapted to permit rearward movement of the other wing 97. Each of the wings 95 and 97 if pressed rearwardly reacts against the tension of the spring 105. The wings 95 and 97 are located at the same level and intersect in elevation certain projecting portions or lugs 114, 115, 117, 119, 121 and 123 of the escapement bars

21 and 23, that is when the pressure bar 75 is in its normal elevated position.

The purpose of this escapement mechanism is as follows (Figs. 3, 20 and 21):

The escapement bars 21 and 22 have formed sidewardly therefrom the lugs 114, 115, 117, 119, 121, and 123. These lugs are placed at certain predetermined positions longitudinally of the bars 21 and 23. Their exact position is a matter of choice depending upon particular combinations that may be desired for opening the lock. Now if a pressure bar 75, such as the forwardly placed one between the escapement bars 21 and 23 is left in its normally elevated position, then one of the wings 95 or 97 may engage one of the lugs such as lug 114 of said escapement bars as the escapement bars are pressed forwardly, or each of both wings may engage a lug. This last named contingency is not shown. The first named one is shown in Fig. 3.

Now, if the said forward pressure bar 75 is depressed (Fig. 3), then the upper cross member 91 will pass in behind the lug 114 while and before the wing 97 passes from in front thereof. Hence the escapement bar 23 can escape to a position such that the next lug 115 thereon collides with the now depressed cross piece 91. The escapement bar moves under action of its spring 31.

Next, if the pressure bar 75 is released it will rise and before the piece 91 disengages the lug 115, the wing 97 will again be in an intersecting position therewith in elevation. Hence as the pressure bar 75 reaches its final elevated position, the escapement bar 23 moves another slight increment whereby the lug 115 engages the wing 97 as did the lug 114 previously. This action gives a new escape position for the escapement bar 23.

It may be noted that the action traced in the last paragraph could take place similarly between the wing 95 and a lug on the other escapement bar 21. However, the bar 21 is (according to Fig. 3) under control for the time being of a right hand wing of another pressure bar 75 acting on the lug 123 of said escapement bar 21. The explanation of the action of the pressure and escapement bars has now been given by using the said double winged bar 75 as example. It is evident that it is not necessary to provide a pair of wings such as wings 95 and 97, but that only one might be use for use on only one escapement bar. Furthermore, only one wing might be employed without the use of the cross piece 91 if the last of a series of lugs on an escapement bar is being dealt with. It is also evident that in any case, after the escapement bars 21 and 23 are in a forward position, that return of said bars 21 and 23 can be made from the resetting mechanism because the rearwardly ratcheting wings such as wings 95 and 97 are all that oppose such resetting. When a reset is made the pressure bars 75 are in their normal upward position. As the escapement bar lugs strike the said wings, such as 95 and 97, these wings move rearwardly and permit passage of the lugs. The exact required sequence of pressures on the bars 75 for the present embodiment will later be made clear.

As previously stated, the safety pressure bars 73 are provided with cross pieces 87. Each of these pieces 87 extends laterally to and engages downwardly a release rod 125. The rod 125 is upheld between rotatable lugs 127 and 129 pinned to the walls 17 and 19 respectively. The forward lug 129 has integrally formed therewith a downwardly extending pawl 131. This pawl is adapted to engage a notch 133 formed in one side of the said safety bar 25. A coil spring 135 reacting from the wall 19 tends to rotate the lug 129 so that the pawl 131 normally engages said notch 133. Hence the safety bar is normally held in its Figs. 7, 8 and 11 position. In such position the lower notch 67 of the safety bar is in a position to receive its respective tumbler wheel 49, that is if the notches 63 and 65 of the escapement bars are in a position to receive their respective wheels 49. If however, any, some, or all of the safety pressure bars are depressed from their respective buttons, the pawl 131 will be rotated from its notch 133 and the safety bar 25 will spring forwardly to disalign its notch 67 with its respective tumbler wheel 49. The result is that the tumbler 45 can never be moved to disengage the latch bar until the lock is again reset or cleared, even though a correct pressure combination is negotiated on the remaining escapement pressure bars.

The resetting mechanism 35 is externally provided with a push button 137. Within the box, said mechanism is provided with means for preventing only a partial reset. The upper surface of the device 35 is notched at numerals 138 in a rearwardly sloping manner. A pawl 139 is pivoted just above the member 35. An over-centering spring 140 tends to normally hold the nose of the pawl in contact with the notches 138. Hence after rearward movement of the reset device 35 has been started, said movement must be completed before the button 137 will again spring out. As said movement is completed (Fig. 15) the nose 141 of the pawl 139 engages a high portion 143 on the device 35. This action sets the over-centering spring 140 over center and the pawl is pulled up against a stop 145 where it is held. Hence when the button 137 is released after complete pressure thereof, the device 35 may make a return with said button, in so far as the pawl 139 is held away from the notches by the spring 140. As soon as the device 35

completely returns, then a nose 147 located rearwardly of the rack of notches 138 engages the nose 141 to depress it so that the spring 140 again over-centers downwardly and pulls the nose 141 into cooperation with the notches 138. Hence only a complete movement of the device 25 or pressure of the button 137 will suffice to permit a return of the button to normal position. This action is intended to baffle an unauthorized person trying to open the lock and to prevent an authorized person from unknowingly only partially resetting before a combination operation is attempted. If a proper reset is not made, the prescribed combination (the one an authorized person knows) will not open the lock.

Complete operation of the lock will now be described independently of a particular application thereof. The particular pressure combination required to open the illustrated embodiment of the lock will be employed. The three pressure bars 75 will be given supplementary designations, namely X, Y and Z (see buttons of Fig. 1). The correct combination of pressures to be used is on X—Z—Z in order. This is a relatively simple combination and is chosen from many more complicated combinations because it readily adapts itself to purposes of illustration.

First, the device will be considered to have been in locked position and then tampered with. It is still locked but certain of the escapement bars and the safety bar may have been permitted to move under button pressure. Hence the first operation would normally be to press the button 137 in order to clear the mechanism and put it into zero or starting position. The time at which starting position is reached is indicated to the experienced authorized operator by the fact that the button 137 will then spring out to its normal position, otherwise not.

Fig. 3 illustrates the positions of various parts just prior to the springing back of the button 137 into its normal outward position, that is, the figure illustrates events with full pressure on the button 137. It may be seen that the cross member 33 of the clearing mechanism 35 has pressed the escapement bars 21 and 23, the safety bar 25 and the latch bar 27 as far back as they will go against their spring pressures. This action, as far as the escapement bars 21 and 23 is concerned, has caused their lugs 123 and 114 respectively to be notched in behind the movable ratcheting wings of the escapement mechanisms located on the escapement pressure bars of buttons X and Z. The escapement bars 21 and 23 are therefore held in their rearward positions by means of said escapement mechanisms. The safety bar 25 (Fig. 3) has been pushed back until its notch 133 is located some distance behind the lug or dog 131. The lug 131 is now pressed leftwardly against the right side of said bar 25. The releasing rod 125 is in an upward position. None of the safety pressure bars or stems 73 are depressed. The pawl 139 has engaged a high portion 143 of the device 35 and is now held away from the notches 138 by the action of the over-centering spring 140 (see also Fig. 15). Hence, if the button 137 is released the clearing device 35 may take its Figure 10 position regardless of what is otherwise done at any of the buttons. Fig. 4 indicates positions of parts similar to the position shown in Fig. 3. It may be noted in said Figure 4 that the latch bar 27 has been returned to such a position that the lug 55 has been able to engage the notch 60, thus preventing forward movement of the latch bar 27. It is to be understood that the latch bar was put in its Figure 4 position before the clearing operation was manipulated, that is, at the last locking operation. The rollers 49 in Figs. 3 and 4 positions are not in alignment with any of the notches 63, 65 or 67.

If the button 137 is now released the mechanism will take up the position illustrated in Fig. 7, that is, the clearing mechanism 35 will spring forwardly out of engagement with all of the bars 21, 23, 25 and 27. The safety bar 25, under action of its spring 31 will automatically spring forward until the lug 131 engages the notch 133. When this engagement takes place the notch 67 of this safety bar is adapted to be positioned directly over its respective tumbler wheel 49. Hence, if this safety bar is not further disturbed, the lock will be in a position for opening as soon as the proper escapement events have been permitted at the escapement bars 21 and 23.

Next, to open lock first the button X is pressed and then the button Z is pressed twice in succession. This manipulation of the buttons X and Z causes the following order of events:

(1) The escapement mechanism 74 on the bar 75 associated with the button X permits the lug 123 to pass from said escapement mechanism, that is, to escape.

(2) The lug 121 on the escapement bar 21 strikes the wing 95 of the escapement mechanism 71 located on the bar 75 connected with the button Z.

(3) Now the button Z is depressed, whereupon the lugs 114 and 121 leave the escapement associated with the button Z. The lug 115 on the escapement bar 23 is then stopped by the wing 97, while the lug 119 of the escapement bar 21 is stopped by the wing of the said escapement associated with the button X. This particular positioning of the bar 21 is adapted to set its notch 63 directly over its respective tumbler wheel 49.

(4) Next, the button Z is again depressed,

whereupon the lug 115 leaves its escapement mechanism, that is, the wing 97, and the lug 117 strikes the wing associated with the escapement mechanism 72 of the button Y. This action stops the escapement bar 23 in a position adapted to place its notch 65 directly over the third tumbler wheel 49. It is now evident that notches 63, 65 and 67 are aligned with the three operative wheels 49 of the tumbler 45, whereat the tension spring 53 located on the reach rod 51 pulls said reach rod down and presses said wheels 49 upwardly into their respective notches (see Figs. 8 and 10). At this action the latch bar 27 immediately springs forwardly under action of its compression spring 31 in so far as the dog 55 becomes disengaged from the notch 59. Hence the lock is in an open position.

Fig. 9 illustrates the positioning of various parts after certain false movements have been made. For instance, the figure indicates that one of the buttons associated with the safety pressure bars 73 has been pressed. This means that the rod 125 was depressed by means of any one or more of the cross members 87, whereby the dog 131 was taken from the notch 133 of the safety bar 25, with the result that the previously aligned notch 67 was permitted to escape past its corresponding tumbler wheel 49. Hence, no matter how the remainder of the buttons are manipulated, correctly or otherwise, the lock can never be opened, because the safety bar 25 will never permit the roller 49 there beneath to rise. This means that the latch bar can never be released by the dog 55 until a clearing operation has been performed again at the button 137.

Likewise, had either of the buttons X or Z been pressed out of order or too many times, the result would have been that the notches 63 and 65 would not have been brought into alignment with their respective rollers 49 at one time. Hence, even though the safety bar buttons had not been touched, the lock could not be opened for the same reasons as above given.

It is evident that even though the correct combination is gone through but then a superfluous manipulation is made on any button, including the escapement buttons, that one of the notches 63, 65 or 67 will be permitted to go too far.

The lock is shown in its opened positions in Fig. 10. The nose 141 of the dog 139 has been depressed and downwardly over-centered by the nose 147. Hence it is in a position to prevent any return movement of the device 35 until a complete pressure movement has been accomplished at the button 137. Now, if it is desired to lock the device, it is only necessary to fully and completely press the button 137. The resetting or clearing device 35 will then push the escapement bars 21 and 23, the safety bar 25 and the latch bar 27 back again. It will be noted that the wheels 49 are immediately forced to descend out of their notches and that the dog 55 is thrown rearwardly when it strikes the said rearwardly moving bar 27. This dog 55 then acts as a lost motion engagement between the reach rod 51 and the bar 27 as well as acting as a pawl. After completely pressing the button 137 it is again released and the Fig. 7 positioning of parts again prevails. The device is locked.

To the left of Fig. 3 is visible the unused tumbler roller 49. If, after using the lock for a period, it should be found that unauthorized persons are in possession of the combination it is an easy matter to slidably insert another escapement bar between the wall 17 and 19. A new cover 13 may then be provided with additional buttons thereon. These may be offset in the present embodiment to clear the buttons already shown. It is evident that the number of escapement and safety bars may be multiplied indefinitely in the original construction. Of course changes might also be made at the insert blocks 69 and 69a illustrated in Figs. 12 and 13. It is to be further understood that the lugs such as the lugs 119, 121, 123 and the like on the escapement bars may be removably pinned to said bars so that changes in the combination can readily be made by this added means (Fig. 12). It is evident that the permutations and combination of manipulations available with this lock at the cost of only slight changes are great in number.

It is herein understood that any escapement may comprise a twin escapement such as illustrated in Figs. 20 and 21, a one-sided escapement such as illustrated as associated with the button X, and a mere reversible stop such as illustrated for the button Y (Fig. 3). The escapement for button X is similar to the one shown in Figs. 20 and 21 except that one wing such as wing 95 has been removed as well as one side of the bar 91. The corresponding wing 97 is spring pressed forwardly as before. The reversible stop associated with the button Y comprises the escapement illustrated in Figs. 20 and 21 with the wing 95 removed and the whole bar 91 also removed.

Referring now again to the particular application of the lock to an automobile steering gear as herein set forth, it may be seen at Fig. 2 that an extension 28 of the latch bar has provided thereon a latch 30. This latch engages a slotted portion 32 of the steering tube T. The slotted portion is laterally extended into the ring 9 by means of a second slot 34. The latch 30 is adapted to ride in both of said slots at once, and thereby prevent twisting off of the ring 9. The crown piece C formed at the bottom of the steering hub H (hereinbefore described) is

provided with a plurality of notches 36 equal in width to the said slots 32 and 34 and adapted to alternately align therewith as the steering wheel W may be turned. If therefore, the latch 30 is resiliently pressed upwardly against the lower edge of the crown piece C and the wheel is turned, then at the first alignment of a notch 36 with the slot 32, the latch 30 will drop into said notch 36 to lock the wheel to the stationary tube T.

A nut N is screwed over the upper rim of the ring 9 in order to cover any fastenings such as the set screw 11. In order to prevent unauthorized removal of this protecting nut N while the lock is in locked position, said nut N is provided with a notch 38 aligning with the slots 32 and 34. A lug 40 of the same width as the latch 30 is adapted to engage this notch 38 when the device is in locked position. Hence the nut N can not be removed for purposes of tampering and the like, that is, while the lock is closed.

In the present embodiment the latch 30 is resiliently pressed up against the crown piece C so that the lock may be put in locked position regardless of the position of wheel W. The wheel may then be turned until the latch automatically springs into a notch 36. This locks the wheel W. It can only be unlocked by opening the device herein described and not by further turning the wheel as no component of force exists whereby the latch 30 may be forced from a notch 36, that is, from the wheel itself.

In order to resiliently mount the latch 30 as above described, the said latch bar 27 is bored out at its rear end by means of a hole 50. This hole 50 is provided with a compression coil spring 52 (see Figs. 3, 4 and 14). A stem 54 of the said extension 28 (Figs. 2, 3 and 4) slidably engages a rearward portion of said bore 50. This stem 54 is provided at the end thereof, which is in the bore 50, with a T head 56. This T head is fastened to said stem 54 by ordinary riveting means or other conventional manner. The cross portion of said T head 56 reach sidewardly to slidably engage sideward slots 58 in the said bar 27. They also engage one end of the said spring 52 which spring reacts against the forward end of the bore 50. By this means the T head 56 is normally held at the rear ends of the slots 58 and the latch 30 held in the position that it would have if the latch bar 27 were made solidly out to said latch 30. The solid construction would be used if no lost motion engagement were desired between the latch 30 and the notch into which it is pressed for locking. With this improved resilient construction however, the closing operation (pressure on the button 137) may be accomplished without the latch 30 immediately dropping into an aligned slot such as slot 36. In other words energy is stored in the spring 52 when the button 137 is pressed and this energy is released when a slot such as 36 is in alignment to receive a latch 30. The spring 52 serves to directly put the lock into locking position when it has had indirect locking movements performed thereon previously, such as pressing the button 137 upwardly.

The locking operation for the device is extremely simple. Taking the case of the automobile for example, after a stop has been made, all that is necessary for setting the lock is to press the button 137 completely upwardly, regardless of how the parts within the lock were previously arranged. The steering wheel W is then given a slight twist until the latch 30 drops into one of the notches 36 whereby theft of the automobile is automatically prevented. If the operator accidently fails to push the button 137 enough, the pressure of other buttons will have no effect as the cross piece 33 (in the partially moved position of the device 35) will prevent the bars 21, 23 and 25 from moving. As he will hear no clicking of the escapement, he will then immediately be aware that something is amiss, and can correct the resetting difficulty without irritating experimentation at the combination buttons. In other words, the full stroke feature on the resetting device 35 clearly indicates an incorrect resetting; from whence it would ordinarily be difficult to ascertain why the lock was not opening, that is, when operated upon with the proper combination.

In Fig. 3 is illustrated a conventional electric switch 60 in connection with the lock. This switch is connected in circuit with the ignition circuit 62 of the automotive engine and is adapted to permit ignition upon depression of a conventional stem 64 of said switch 60. It is mounted on the wall 19. A lug 66 associated with the latch bar 27 is adapted to spring against and depress the said stem 64 so that ignition is permitted. This action takes place when the lock is in open position, that is, when the said latch or locking bar 27 is permitted to spring forwardly.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A lock comprising a latch bar, a tumbler adapted normally to hold the latch bar in locked position, a plurality of escapement bars adapted in particular positions to permit movement of the tumbler to release said

latch bar to open position, and escapement means associated with the escapement bars for permitting movement of said escapement bars to said particular positions, said escapement means being alternately operable on various of said escapement bars.

2. A lock comprising a latch bar, a tumbler adapted normally to hold the latch bar in locked position, a plurality of escapement bars adapted in particular positions to permit movement of the tumbler to release said latch bar to open position, and escapement means associated with the escapement bars for permitting movement of said escapement bars to said particular positions, a safety bar adapted in a normal position to permit movement of the tumbler to open and in any other position to prevent it.

3. A lock comprising a latch bar, a tumbler adapted normally to hold the latch bar in locked position, a plurality of escapement bars adapted in particular positions to permit movement of the tumbler to release said latch bar to open position, and escapement means associated with the escapement bars for permitting movement of said escapement bars to said particular positions, a safety bar adapted in a normal position to permit movement of the tumbler to open and in any other position to prevent it, said other positions of the safety bar being brought about from pressure devices similar in operation to pressure devices for causing the said particular positioning of the escapement bars.

4. A lock comprising a latch bar, a tumbler adapted normally to hold the latch bar in locked position, a plurality of escapement bars adapted in particular positions to permit movement of the tumbler to release said latch bar to open position, escapement means for permitting a particular positioning of the escapement bars, and resetting means for returning the bars to a starting position and set the latch bar to its original position.

5. A lock comprising a latch bar, a tumbler adapted normally to hold the latch bar in locked position, a plurality of escapement bars adapted in particular positions to permit movement of the tumbler to release said latch bar to open position escapement means for permitting a particular positioning of the escapement bars, and resetting means for returning the bars to a starting position, said resetting means being provided with a full stroking mechanism whereby a correct starting position of said bars is assured.

6. A lock comprising a tumbler, a latch bar adapted to be released to move by movement of the tumbler, escapement mechanism adapted to move from a set to a predetermined open position whereby the tumbler moves to release the latch bar, a safety mechanism adapted to move from a set position for releasing the tumbler to another non-release position, and similar pressure operated means for operating both the escapement and safety mechanism to move.

7. A lock comprising a tumbler, a latch bar adapted to be released to move by movement of the tumbler, escapement mechanism adapted to move from a set to a predetermined open position whereby the tumbler moves to release the latch bar, a safety mechanism adapted to move from a set position for releasing the tumbler to another non-release position, said escapement mechanism comprising a plurality of escapement bars notched to permit said tumbler movement at a predetermined position of the escapement bars, and means for moving said escapement bars by increments, said safety mechanism comprising a safety bar notched to permit said tumbler movement at a normal position, and means for releasing said safety bar.

8. A lock comprising a tumbler, a latch bar adapted to be released to move by movement of the tumbler, escapement mechanism adapted to move from a set to a predetermined open position whereby the tumbler moves to release the latch bar, a safety mechanism adapted to move from a set position for releasing the tumbler to another non-release position, said escapement mechanism comprising a plurality of escapement bars notched to permit said tumbler movement at a predetermined position and means for moving said escapement bars by increments, said safety mechanism comprising a safety bar notched to permit said tumbler movement at a normal position and means for releasing said safety bar, and pressure buttons on the lock adapted under pressure of certain buttons to move releasing means controlling the safety bar, and adapted under pressure of certain other like buttons to move releasing means controlling the escapement bars.

9. A lock comprising a tumbler, a latch bar adapted to be released to move by movement of the tumbler, escapement mechanism adapted to move from a set to a predetermined open position whereby the tumbler moves to release the latch bar, a safety mechanism adapted to move from a set position for releasing the tumbler to another non-release position, said escapement mechanism comprising a plurality of escapement bars notched to permit said tumbler movement at a predetermined position and means for moving said escapement bars by increments, said safety mechanism comprising a safety bar notched to permit said tumbler movement at a normal position and means for releasing said safety bar, and pressure buttons on the lock adapted under pressure of certain buttons to move releasing means controlling the safety bar, and adapted under

pressure of certain other like buttons to move releasing means controlling the escapement bars, the releasing means for said escapement bars being operable on any and all of said escapement bars by increments.

10. A lock comprising a latch bar, a tumbler adapted normally to hold the latch bar in locked position, a plurality of escapement bars adapted in particular positions to permit movement of the tumbler to release said latch bar to open position, and escapement means associated with the escapement bars for permitting movement of said escapement bars to said particular positions, a safety bar adapted to permit movement of the tumbler to release said latch bar, means for holding the safety bar in normal position, means for releasing the safety bar from normal position whereby the tumbler is positively prevented from moving.

11. A lock comprising a latch bar, a tumbler adapted normally to hold the latch bar in locked position, a plurality of escapement bars adapted in particular positions to permit movement of the tumbler to release said latch bar to open position, and escapement means associated with the escapement bars for permitting movement of said escapement bars to said particular positions, a safety bar adapted to permit movement of the tumbler to release said latch bar, means for holding the safety bar in normal position, means for releasing the safety bar from normal position whereby the tumbler is positively prevented from moving, means for setting the escapement bars in unescaped positions, the safety bar in normal position and the latch bar to a locked position at a single movement of an operator.

12. A lock comprising a latch bar, a tumbler adapted normally to hold the latch bar in locked position, a plurality of escapement bars adapted in particular positions to permit movement of the tumbler to release said latch bar to open position, and escapement means associated with the escapement bars for permitting movement of said escapement bars to said particular positions, a safety bar adapted to permit movement of the tumbler to release said latch bar, means for holding the safety bar in normal position, means for releasing the safety bar from normal position whereby the tumbler is positively prevented from moving, means for setting the escapement bars in unescaped positions, the safety bar in normal position and the latch bar to a locked position at a single movement of an operator, and a resiliently mounted latch on the latch bar whereby the said bars may be set to the last stated positions independently of a locking position for the said latch.

In testimony whereof, I have signed my name to this specification this ninth day of February, 1926.

WHEATON C. FERRIS.