Sept. 1, 1953 R. STREETER 2,650,491

SELF-RELOCKING COMBINATION LOCK

Filed April 12, 1951 2 Sheets-Sheet 1

Fig. 1.

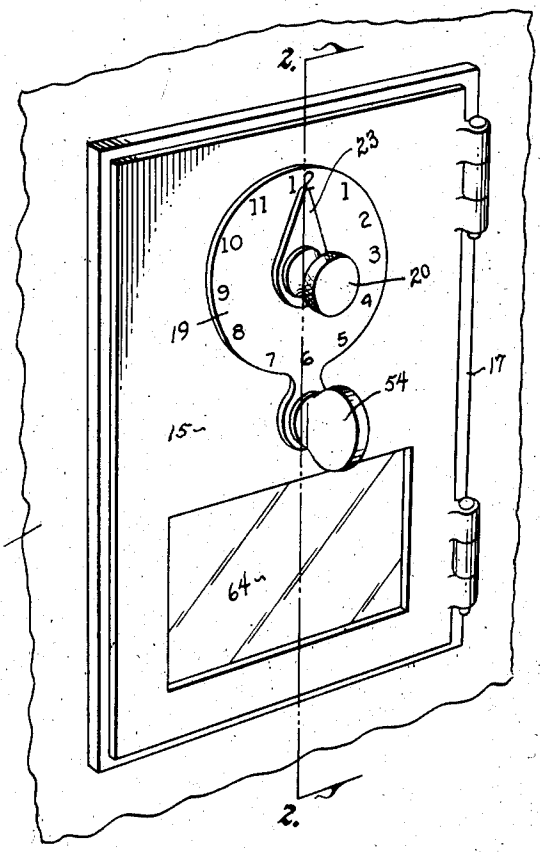


Fig. 2.

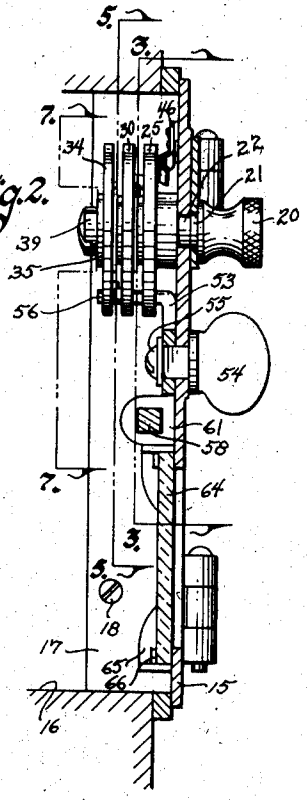


Fig. 3.

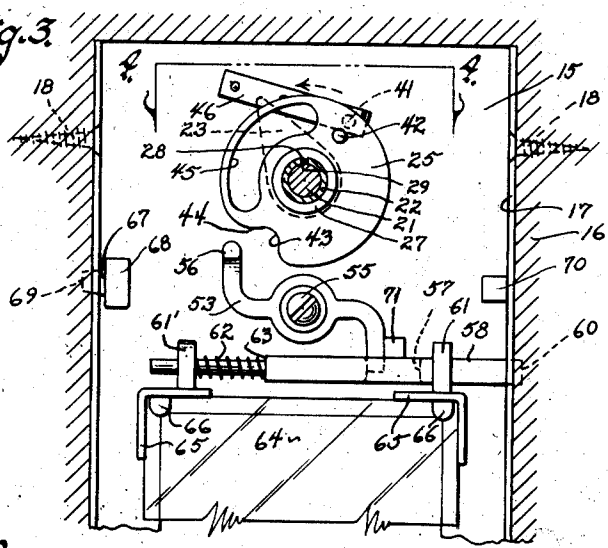
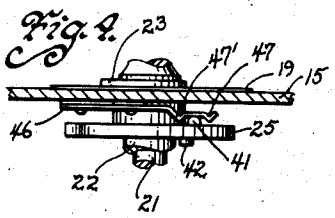


Fig. 4.



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Fig. 5.

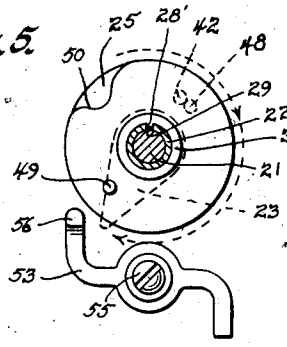


Fig. 6.

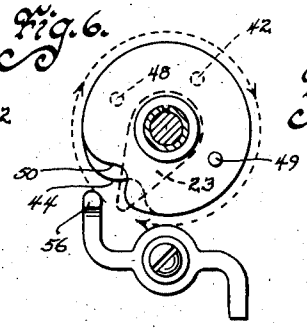


Fig. 7.

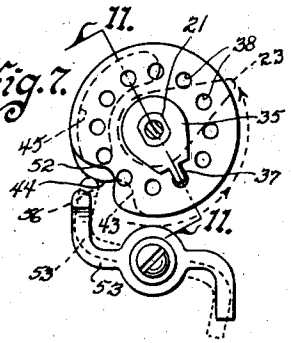


Fig. 8.

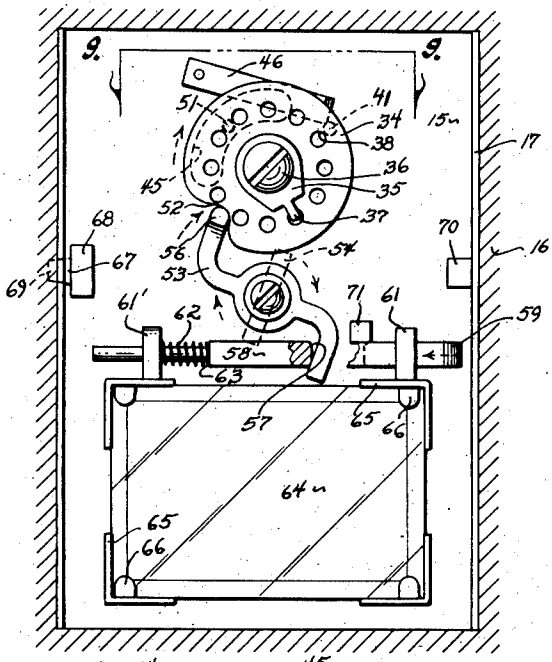


Fig. 9.

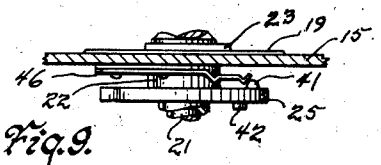


Fig. 10.

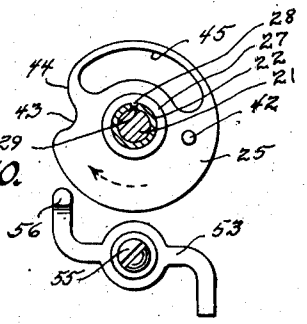
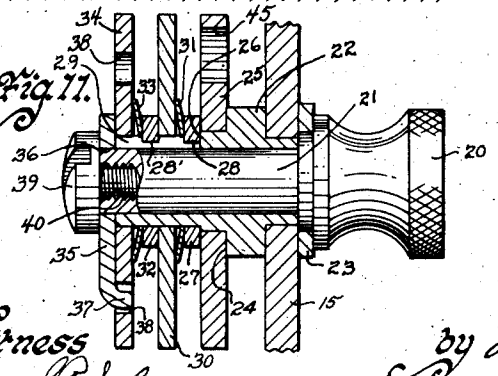


Fig. 11.



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UNITED STATES PATENT OFFICE

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SELF-RELOCKING COMBINATION LOCK

Ray Streeter, Sturgeon, Mo.

Application April 12, 1951, Serial No. 220,620

6 Claims. (Cl. 70—148)

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My invention is a combination lock in which the releasing of the locked latch frees at least one of the tumblers and thereby causes it to move to a locked position under the influence of gravity.

Combination locks on compartments such as safes and postal boxes to cite but two examples are well known. Most of these combination locks require that the dial be turned after the compartment door is relatched in order to relock the lock. Failure to rotate the dial a revolution or two leaves the compartment in a relatively vulnerable position with respect to being opened by an unauthorized person. Unless the tumblers are completely disturbed, such a lock may be opened by merely returning the dial to the last number in the combination series and releasing the latch.

Normally a person who is locking such a compartment would rotate the dial sufficiently to insure the positive locking of the door. People are prone to error, however, which results in the failure of people to lock such compartments properly at times even when they intend to relock the door properly. Sometimes these doors are improperly locked intentionally. An example of failure by design to relock such compartments results from the rush of present day life. Some persons who have postoffice lock boxes collect their mail at a time of day when they are rushed as at noon, for example. Because time is short and probably also because people are inclined toward laziness, some people do not really lock these postoffice lock boxes. After the combination has been worked once, the lock is never properly relocked. After the mail has been removed from the box the door is closed and the dial rotated a few numbers away from the last number in the combination series which gives the door the appearance of being locked as far as casual observation is concerned. When the door is so closed and latched, however, all of the tumblers are aligned to the unlock position except one. If this one tumbler is properly aligned, the latch may be moved to release the door and permit it to swing open. Such false locking of the door does not afford the mail proper protection There are instances of such false locking of safes and other combination locked compartments of a similar nature. In order to protect a person having such a postoffice lock box against his own laziness, it is desirable to have a box that automatically relocks itself when the door is returned to a latched position.

In view of the preceding discussion, therefore,

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it is the principal object of my invention to provide a self-relocking combination lock that has its operating movement initiated by the unlatching of a compartment door and completed by the force of gravity.

It is a further object of my invention to provide a self-relocking combination lock that is reliable in operation.

It is a further object of my invention to provide a self-relocking combination lock that is of extremely simple construction.

It is a further object of my invention to provide a self-relocking combination lock that is durable in use and inexpensive to manufacture.

These and other objects will be apparent to those skilled in the art.

My invention consists in the construction, arrangement, and combination of the various parts of the device, whereby the objects contemplated are attained as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Fig. 1 is a perspective view of a compartment exterior equipped with my combination lock,

Fig. 2 is a sectional view of a fragment of a compartment and my lock mechanism taken on the line 2—2 of Fig. 1,

Fig. 3 is a rear sectional fragmentary view of the door and lock mechanism taken on the line 3—3 of Fig. 2,

Fig. 4 is a top fragmentary view of the door and free tumbler taken on the line 4—4 of Fig. 3,

Fig. 5 is a fragmentary rear view of the free tumbler and middle tumbler and illustrating a portion of the movement of the dial knob made to cause alignment of the middle tumbler. The bosses on the middle and free tumblers are shown as they would be on the dialing of the first number of the combination. This view is taken on the line 5—5 of Fig. 2,

Fig. 6 is a view similar to that in Fig. 5 and taken on the line 5—5 of Fig. 2 but showing the middle tumbler adjusted to the unlocked position. The bosses shown are those of the middle and free tumblers,

Fig. 7 is a rear fragmentary view of the tumblers showing them all aligned to the unlock position and taken on the line 7—7 of Fig. 2,

Fig. 8 is a rear view of the compartment door and my lock mechanism with the latch released prior to opening the door of the compartment. A portion of the latch is broken away to more fully illustrate its construction,

Fig. 9 is a fragmentary top view of the compartment door and the free tumbler showing the

release of the boss from its retaining spring and taken on the line 9—9 of Fig. 8,

Fig. 10 is a fragmentary rear view of my lock mechanism illustrating how the free tumbler rotates to a locked position when the latch is released, and

Fig. 11 is a sectional view of the tumbler mechnism taken on the line 11—11 of Fig. 7.

Referring to the drawings, I have used the numeral 15 to designate the hinged door of a compartment 16 which is shown as having the door secured to a mounting frame 17. The frame is secured to the compartment in any suitable manner as by the screws 18 or the like. While I have shown the frame 17 as being separate from the compartment wall, these parts could be made integrally and for purposes of this discussion may be so regarded. The face of the door carries an ordinary dial face designated 19 which is marked off by a series of reference marks or, as shown in Fig. 1, numerals. An operating knob designated 20 is rigidly secured to a shaft designated 21 that is rotatably journaled in the spool or sleeve 22. A pointer 23 is rigidly secured to the shaft 21 and is of the usual type to provide a guide in conjunction with the reference numerals to permit the rotation of the shaft 21 according to a predetermined plan to actuate the lock. As is most clearly shown in Fig. 11, the spool or sleeve designated 22 is fixed in relation to the door 15 and the shaft 21 extends through a center bore in the spool and is freely rotatable therein. There is a shoulder 24 on the sleeve to separate the free tumbler 25 from the door 15. A second shoulder 26 holds the washer 27 from contacting the free tumbler 25. The hole in the free tumbler through which the spool 22 extends is of sufficient diameter to permit the free tumbler to rotate freely about the shaft. The washer 27 is held against rotary movement as a result of rotating shaft 21 by any suitable means such as having the washer and spool fit tightly or by keying the washer to the spool. As shown the washer is provided with key boss 28 that fits key way 29. Some means of providing rotation resisting friction for the middle tumbler designated 30 is provided and here shown as the spring washer 31. A washer designated 32 which is similar to washer 27 is adjacent tumbler 30 on its rear side. This washer 32 must be positively held against rotational movement in order for the lock to operate consistently. A most positive form of securing this washer that still permits the easy removal of the parts for repair and the like is to key the washer to the spool in the same manner as washer 27 by means of a key boss 28' that extends into the key way 29 milled in the spool 22. A second spring washer designated 33 provides rotation resisting friction to the directly driven tumbler numbered 34. The direct drive between tumbler 34 and the shaft 21 is provided by the key 35 which has a hole 36 in it that is flattened on at least one side to match a similarly flattened portion on the shaft 21. As shown in the drawings, the hole 36 is flattened on two sides as is the end of shaft 21, but it is necessary for the operability of the tumbler 34 that the key 35 be held in non-rotational relation to the shaft 21. The key 35 has a boss finger 37 which is bent near its end to enter and engage one of the holes 38 in tumbler 34. Some suitable means such as cap screw 39 screwed into threaded well 40 in shaft 21 is used to hold the key 35 engaged on the flattened end of shaft 21 and simultaneously holds the boss finger 37 in the selected one of holes 38. The holes 38 are spaced from each other a distance equal to the distance between reference marks on the dial 19 unless it is intended to make at least some of the possible combinations of the lock include fractions of distances between reference marks. The combination of numbers to which the dial is turned to arrange the tumblers so that the latch may be actuated is determined in part by the one of the holes 38 in which boss finger 37 is inserted.

The free tumbler has bosses thereon designated 41 and 42, the former being on the side of tumbler 25 that is adjacent door 15 and the latter being on the opposite side of the tumbler. This tumbler has a notch 43 formed in it which has one shoulder designated 44 that curves more gradually than the shoulder on the other side of the notch. The purpose of this difference in the shoulders of notch 43 will be more apparent from the discussion under the heading of operation. One side of tumbler 25 is lighter in weight than the other which may be readily accomplished by merely cutting away a portion of the tumbler to leave the opening 45. The boss 41 is preferably smooth and rounded as may be seen clearly from Figs. 4 and 9 so that it will more readily engage the tensioning device for the free tumbler such as the flat spring 46 that has a pair of spaced apart raised bumps or boss like formations designated 47 and 47'. The tumbler 30 has a pair of bosses on it also and these are designated 48 on the front of the tumbler and 49 on the back of it. As shown here for purposes of illustration they are angularly spaced 180° from each other on the tumbler but such spacing is optional within limits as will appear more clearly from the discussion under the heading operation. The tumbler 30 is also provided with a notch 50 that is similar in nature to notch 43 on tumbler 25 except that it is not necessary to have the sloping shoulder of notch 43 as on the free tumbler. The tumbler 34 has only one boss designated 51 on it which is on the front side of the tumbler in a properly assembled unit. This last tumbler also has a notch therein designated 52 which is substantially identical to the notch 50 in tumbler 30. The bosses 42, 48, 49 and 51 are all of such a length that bosses of opposed tumbler faces will engage each other but will not strike the adjacent tumbler.

Below the tumbler assembly is the S-shaped latch lever 53 and is rigidly mounted on the operating handle 54 by means of the screw 55 or any other suitable means. The operating handle is rotatably mounted in the door 15. A boss 56 projects outwardly from the top of S-shaped lever 53 to a distance slightly greater than the distance from the inside face of door 15 to the innermost plane of tumbler 34. The lower end of the S-shaped lever engages an elongated milled out portion or wide groove designated 57 in the sliding latch bolt 58. The bolt has a slanted end designated 59 at its latching end to permit the closing of door 15 without actuating handle 54. The frame 17 is provided with a well 60 into which the end of the latch bolt 58 extends to latch the door 15. When an all metal compartment is used, the bolt may merely extend behind the rear of the edge of the compartment adjacent the bolt end. The pierced ears 61 and 61' slidably support the bolt on the door 15. A resilient element such as the coil spring 62 yieldingly holds the bolt in the position shown in Fig. 3 by exerting a force on the shoulder 63 of bolt 58 and the pierced ear 61'. I have illustrated

my lock on a postoffice lock box and have therefore shown the box as having the transparent panel 64 mounted in the door 15 by any suitable means as by the four identical aligning angle members 65. The glass is actually held in place by the tabs 66 which all may be substantially alike. A hinge side securing boss 67 of the usual form is rigidly secured to door 15 by boss block 68 and extends into boss well 69 when the door is closed. Boss 67 serves the purpose of preventing anyone from opening the compartment by removing the hinge pins from the hinges. A stop block 70 is rigidly secured to the door 15 to prevent lateral movement of the door. The stop 71 limits the movement of S-shaped lever 53 and also bolt 58 against the efforts of spring 62. I turn now to a description of the operation of my device.

With the door closed and latch bolt 58 engaging the well 60 as shown in Fig. 1 any arrangement of the tumblers which will prevent the necessary movement of the S-shaped lever 53 to actuate the bolt 58 locks the door. To unlock the door, the combination must be worked by rotating knob 20 according to a predetermined pattern. As here shown, the knob is rotated in a clockwise direction which must rotate tumbler 34 that is keyed directly to shaft 21. The boss 51 will in time engage boss 49 of tumbler 30 and cause that tumbler to be carried along in a clockwise direction of movement. In a similar manner, boss 48 will engage boss 42 and cause the tumbler 25 to be carried along also in a clockwise direction of movement. With the parts constructed and arranged as shown in the accompanying drawings, the boss 41 will engage the spring 46 and depress it sufficiently to permit boss 41 to pass bump 47 and be lodged between bosses 47 and 47' as illustrated in Figs. 3 and 4. The free tumbler is thus aligned when the pointer 23 is stopped on the numeral 1 on dial 19 with the lock parts constructed and arranged as shown. The knob 20 is then rotated in a counterclockwise direction carrying the tumbler 34 with it. The other tumblers are unaffected by the first substantially 360° of rotation in a counterclockwise direction because the boss 51 must go entirely around before striking the boss 49 on the opposite side from that which it engaged during clockwise rotation. As shown in Fig. 5 the pointer has been rotated through the arc shown by the broken line arrow without disturbing tumbler 30. Continued counterclockwise rotation of tumbler 34 by rotating knob 20 will cause the boss 51 to engage boss 49 to carry tumbler 30 to the position shown in Fig. 6. Although the light side of tumbler 25 is eccentrically positioned, the tumbler 25 remains in its unlock position because of the co-action of boss 41 and spring 46. The fact that notches 43 and 50 do not align exactly is important as will be explained hereinafter. The proper alignment of tumbler 28 results from the positioning of the pointer 23 on the numeral 5 on dial 19. This correct adjustment of tumbler 30 occurs only after one complete revolution of the tumbler 34 has been made to bring the bosses 51 and 49 into contact for counterclockwise rotation. As shown in Figs. 5 and 6, the pointer is turned from 1 to 5 on the dial face in Fig. 3 and then through an additional 360° to 5 again. Obviously it is not necessary to have the bosses 48 and 49 angularly spaced 180° in order to permit correct operation of the lock. The only limits placed on the arrangement of these bosses is that they

should avoid being so spaced as to cause boss 48 to re-engage boss 42 and cause tumbler 25 to be moved and thereby displace boss 41 from spring 46.

To adjust the lock as shown to align tumbler 34 it is necessary to turn the pointer to the numeral 10 on the dial face which causes notch 52 to align with notch 50. Two of the tumblers, i. e. 30 and 34, are now arranged to permit boss 56 of S-shaped lever 53 to move to the deepest portions of the notches of those tumblers. The tumbler 25 is slightly out of adjustment, however, for a reason which will now be explained. As operating handle 54 is turned to move the S-shaped lever 53 to take the position shown by the broken lines in Fig. 7, the boss 56 strikes sloping shoulder 44 of the notch 43 in tumbler 25. The only resistance to further movement of S-shaped lever is the engagement of boss 41 with spring 46. The resistance offered by the spring engaging the boss is so slight that no difficulty is had in moving tumbler 25 by the further movement of handle 54 to unlatch the door 15 as shown in Fig. 8. In so moving the S-shaped lever 53, however, it is necessary to move tumbler 25 sufficiently to cause boss 41 to be disengaged from spring 46 as shown by Fig. 9. As soon as the door is open and handle 54 is released, spring 62 causes bolt 58 to return to a latching position and the S-shaped lever is also returned to the position shown by Fig. 3. When boss 56 is moved out of the notches of the tumblers, there is no longer any force resisting the natural tendency of the light side of tumbler 25 as represented by the opening 45 to move to the top center position as shown in Fig. 10. With the tumbler 25 in this position, the boss 56 cannot enter the notches of the tumblers and the whole combination must be reworked in order to unlock the latch.

The door 15 may be closed, however, by merely slamming it. The slanted end 59 of bolt 58 will engage the frame 17 and cause the bolt to move enough to permit the door 15 to be closed. Spring 62 is compressed when the door is so closed, but the S-shaped lever is undisturbed. This closing of the door 15 when the tumbler 25 is in a lock position is the reason for the wide groove 57. This slamming of the door causes a jar or vibration of the tumbler assembly merely because it is mounted on the door. This jar may serve the purpose of assuring correct movement of the tumbler 25 should it have any tendency to stick. Thus the tumbler 25 will be certain to operate as intended within the ability of a mechanism to be infallible.

Twelve different combinations may be had with the construction shown here by placing the boss 37 of key 35 in various ones of the holes designated 38. Because the end of shaft 21 is not round, the shaft and pointer will have to be moved with respect to tumbler 34 in order to change the one of holes 38 into which the boss finger 37 of key 35 is inserted. A change in location of one of the bosses 42, 48, 49 or 51 will offer a new series of twelve combinations. A nearly unlimited number of different combinations is possible, therefore.

Some changes may be made in the construction and arrangement of my self-relocking combination lock without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equiva-

lents which may be reasonably included within their scope.

I claim:

1. In a combination lock; a bolt, at least one circular tumbler rotatably supported on a horizontal axis; said tumbler having a heavy point that normally seeks a bottom center position under the influence of gravity; said tumbler having a notch therein, a boss on said tumbler, a spring fixedly supported near said tumbler and engaging said boss of said tumbler to hold said tumbler with its heavy point in a position substantially removed from a bottom center position, and a means associated with said bolt that must enter the notch in said tumbler when said bolt is retracted; said means associated with said bolt capable of entering the notch of said tumbler only when said spring engages said boss; said means associated with said bolt as it enters the notch in said tumbler moving said tumbler to disengage said boss from said spring; whereby when said bolt is moved to locked position said means associated with said bolt is removed from the notch in said tumbler and the heavy point on said tumbler seeks a bottom center position thus shifting said tumbler.

2. In combination with a compartment having a door thereon, a bolt movably mounted on said door and capable of securing said door in a closed condition, a lever for moving said bolt to release said door, at least one disc tumbler rotatably mounted near said lever on said door; a notch in said tumbler, a boss on said lever; the unnotched periphery of said tumbler lying closely adjacent the boss on said lever to prevent bolt moving action of said lever, a boss fixed on said tumbler, a spring fixed to said door; said boss on said tumbler engaging said spring to yieldingly hold said tumbler with its notch partially aligned with the boss on said lever; said tumbler being freely rotatable when said boss on said tumbler is free from said spring, and a means for rotating said tumbler to cause said boss on said tumbler to engage said spring; said tumbler being weighted to cause it to move so that an unnotched portion of its periphery is opposite said boss on said lever whenever said boss on said tumbler is free from said spring; said boss on said lever, when said lever is moved to actuate said bolt to release said door, forcibly entering said notch and moving said tumbler to free said boss on said tumbler from said spring.

3. In a hinged compartment door and a combination lock therefor, a bolt movably mounted on said door for securing the door in a closed position, a lever for moving said bolt to release said door from a closed secured condition, a boss on said lever, a notched circular tumbler freely journaled to said door about a horizontal axis and having its unnotched periphery lying closely adjacent said boss on said lever; said tumbler having one side heavier than the other which heavy side under gravitational force seeks a position below the axis about which said tumbler is journaled when said tumbler is unrestrained; a yielding means for holding said tumbler with a portion of its notch adjacent the boss on said lever and with the heavy side of said tumbler displaced from the position sought by said heavy side under gravitational force, and a means for moving said tumbler into engagement with said yielding means; said boss on said lever striking the side of said notch and rotatably moving said tumbler out of engagement with said yielding means whenever said lever is moved to move said bolt to release said door; whereby when the door of said compartment is resecured said lever is moved to a position carrying said boss of said lever away from said tumbler placing said tumbler in an unrestrained condition.

4. In a hinged compartment door and a combination lock therefor, a bolt movably mounted on said door for securing the door in a closed position, a lever for moving said bolt to release said door from a closed secured condition, a boss on said lever, a spool having a central longitudinal bore rigidly secured to the inside of said door and extending horizontally therefrom, a first notched circular tumbler freely rotatable on said spool; a second notched circular tumbler rotatably mounted on said spool, a means for frictionally holding said second tumbler in any given position; said second tumbler having a plurality of regularly angularly spaced holes therein, a shaft rotatably mounted in the bore of said spool and extending from both ends thereof, a member detachably keyed to the end of said shaft and having a portion thereof extending into one of the holes in said second tumbler, a pointer fixed to the other end of said shaft, a circular reference scale fixed in relation to said pointer, means for operatively associating said tumblers at times to cause rotation of said second tumbler to produce rotation of said first tumbler; said lever capable of being actuated to move said bolt and release said door only when said tumblers are positioned so that said boss on said lever can enter the notches in said tumblers; said first tumbler being eccentrically weighted to cause it to assume a position in which an unnotched portion of its periphery is adjacent said boss on said lever when said first tumbler is unrestrained, a yielding means fixed in relation to said first tumbler, and a boss on said first tumbler constructed and arranged to engage said yielding means when said first tumbler is positioned with its notch partially aligned with said boss on said lever and to frictionally hold said first tumbler so positioned; said boss on said lever when said lever is actuated to move said bolt and release the door of a compartment striking and moving said first tumbler sufficiently to disengage said boss on said tumbler from said resilient means to place said tumbler in an unrestrained condition relative to said resilient means.

5. In combination with a door of a compartment, a movable bolt for securing the door of said compartment in a closed position, at least one tumbler movably mounted on said door, said tumbler is normally under the influence of gravity, interfering with the moving of said bolt to release the door of said compartment; a means for moving said tumbler to relieve said bolt from the interference of said tumbler when said tumbler is in its normal position, a yielding means for releasably holding said tumbler in its noninterfering position, and a means associated with said bolt for engaging said tumbler; said means associated with said bolt engaging and moving said tumbler when said bolt is moved to unsecure said compartment door to release said tumbler from said yielding means.

6. In a lock for a bolt moving lever, a frame supporting said lever in a movable condition, at least one tumbler movably mounted on said frame and adjacent a portion of said lever; said tumbler, normally under the influence of gravity interfering with the movement of said lever, a means for moving said tumbler to relieve said

lever from the interference of said tumbler when said tumbler is in its normal position, a yielding means for releasably holding said tumbler in its noninterfering position; said lever engaging and moving said tumbler whenever said lever is moved to actuate a bolt; said tumbler when moved by said lever being released from said yielding means and shifting under the influence of gravity to its normal lever interfering position when said lever is retracted from tumbler.

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