

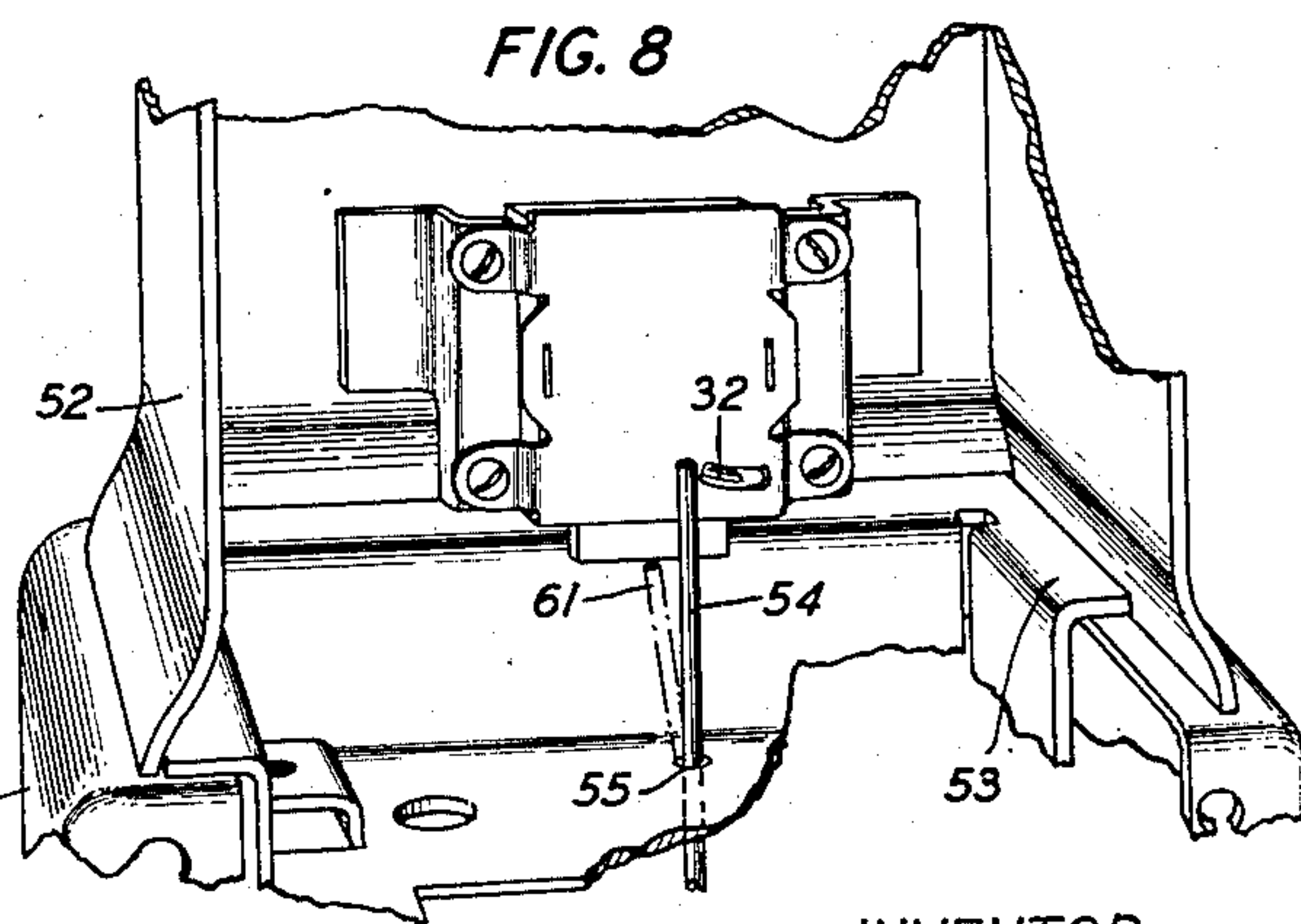
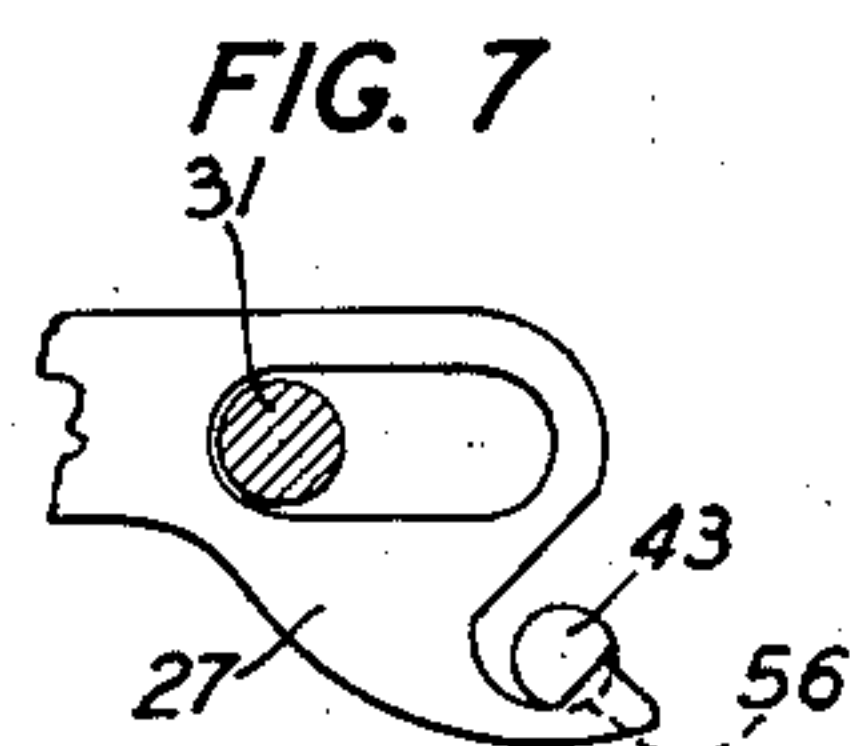
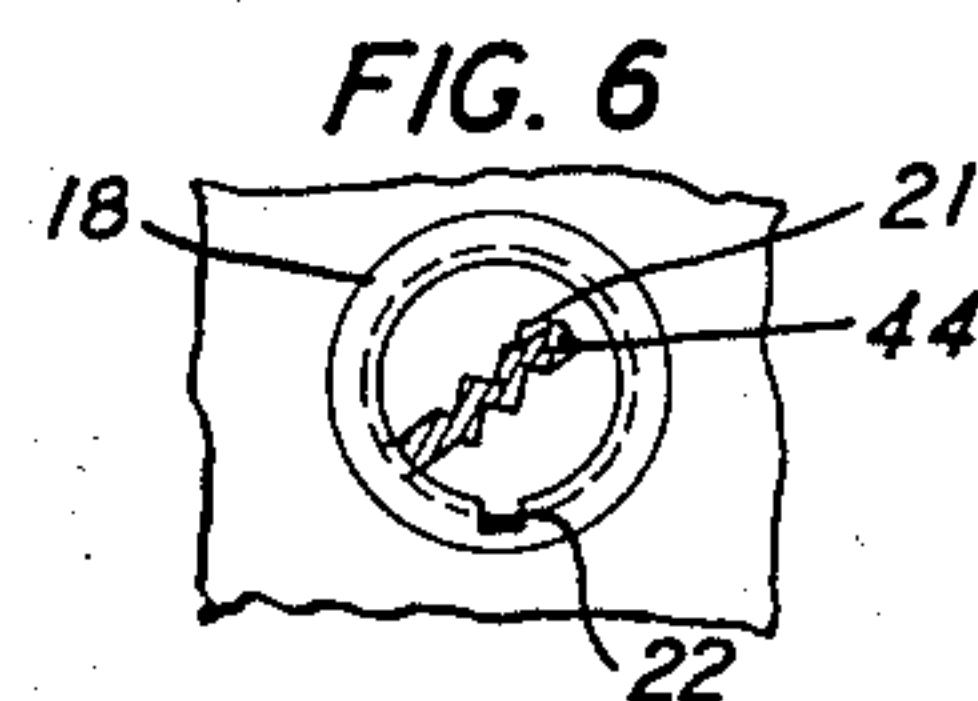
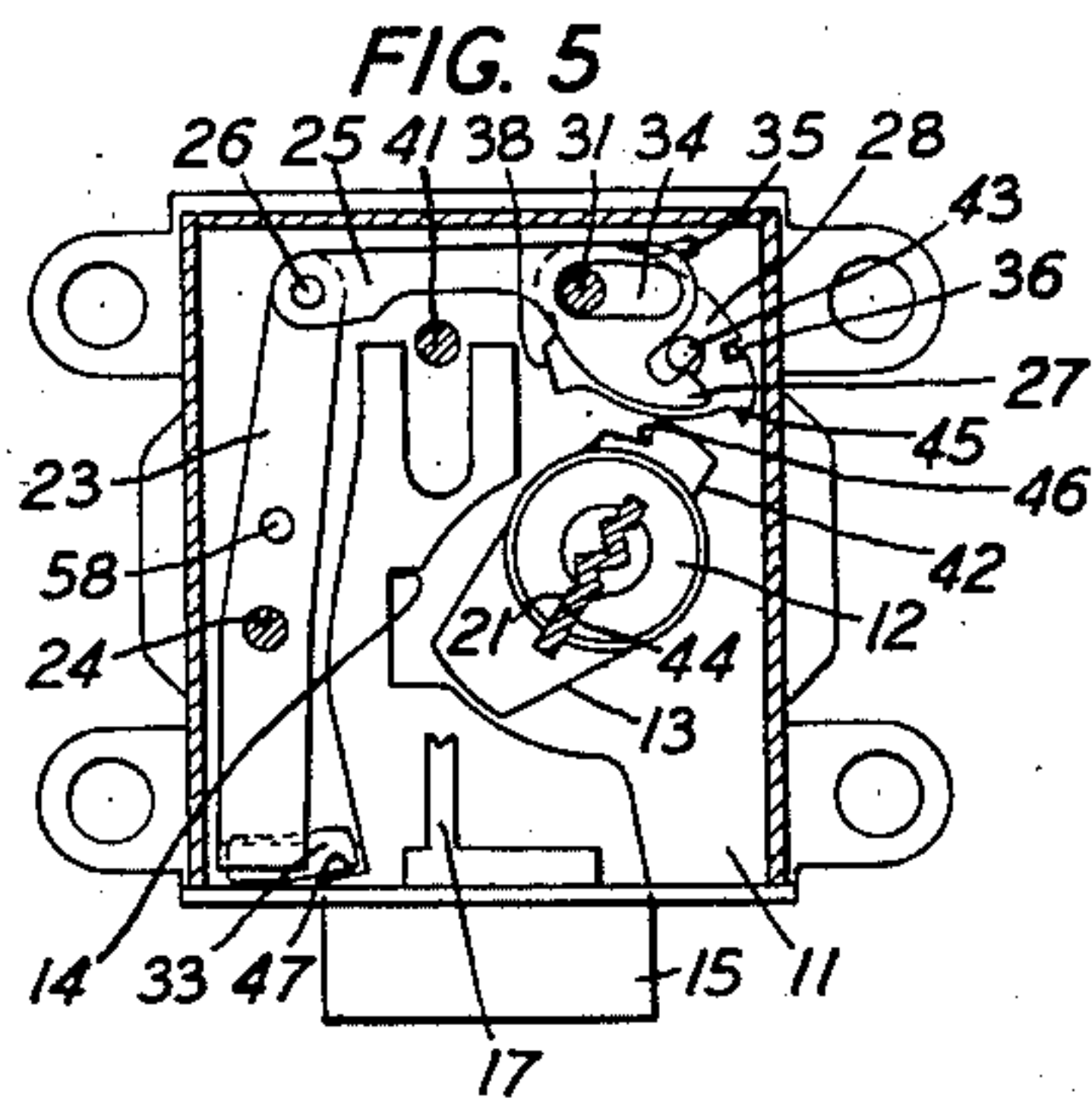
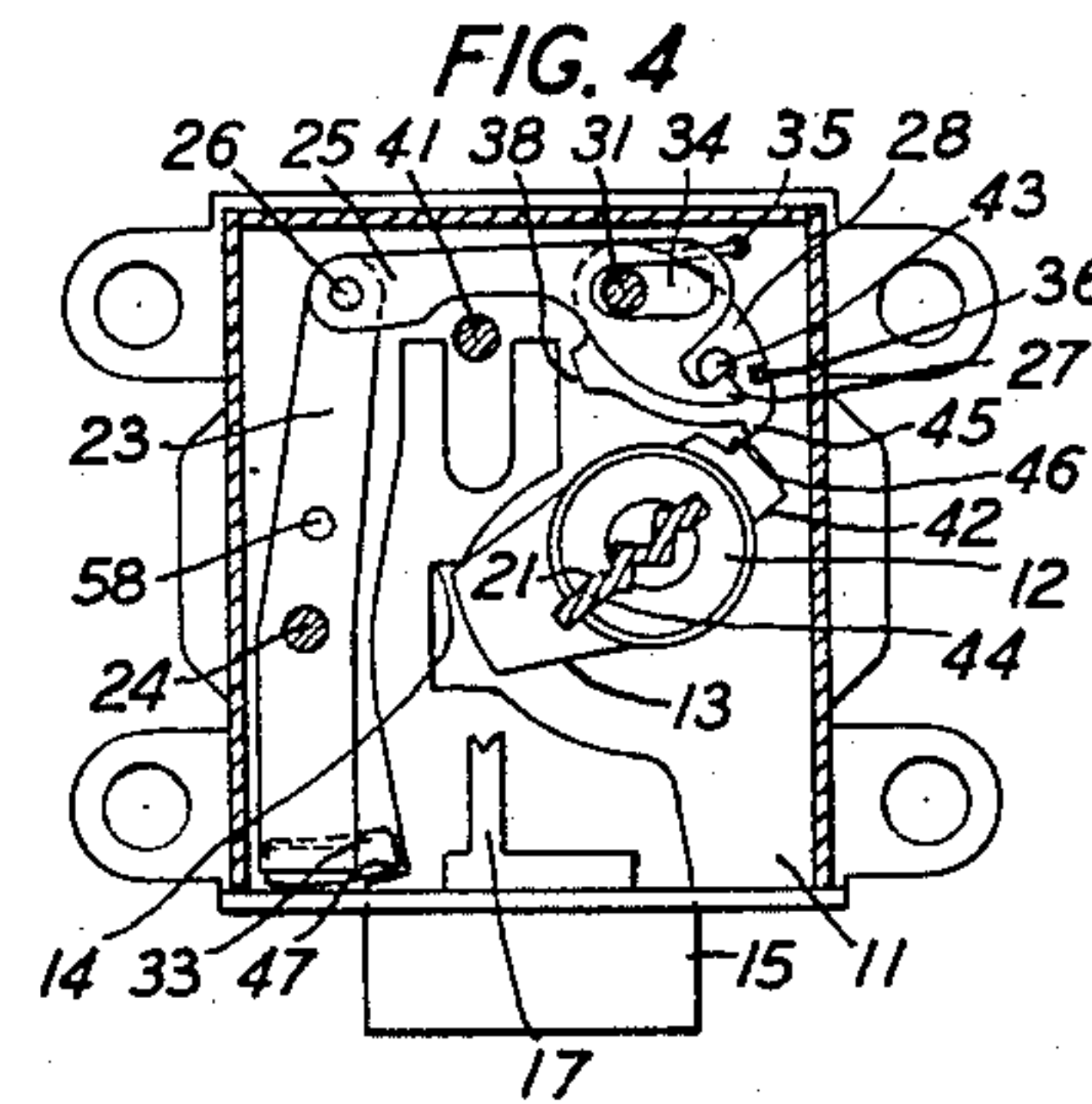
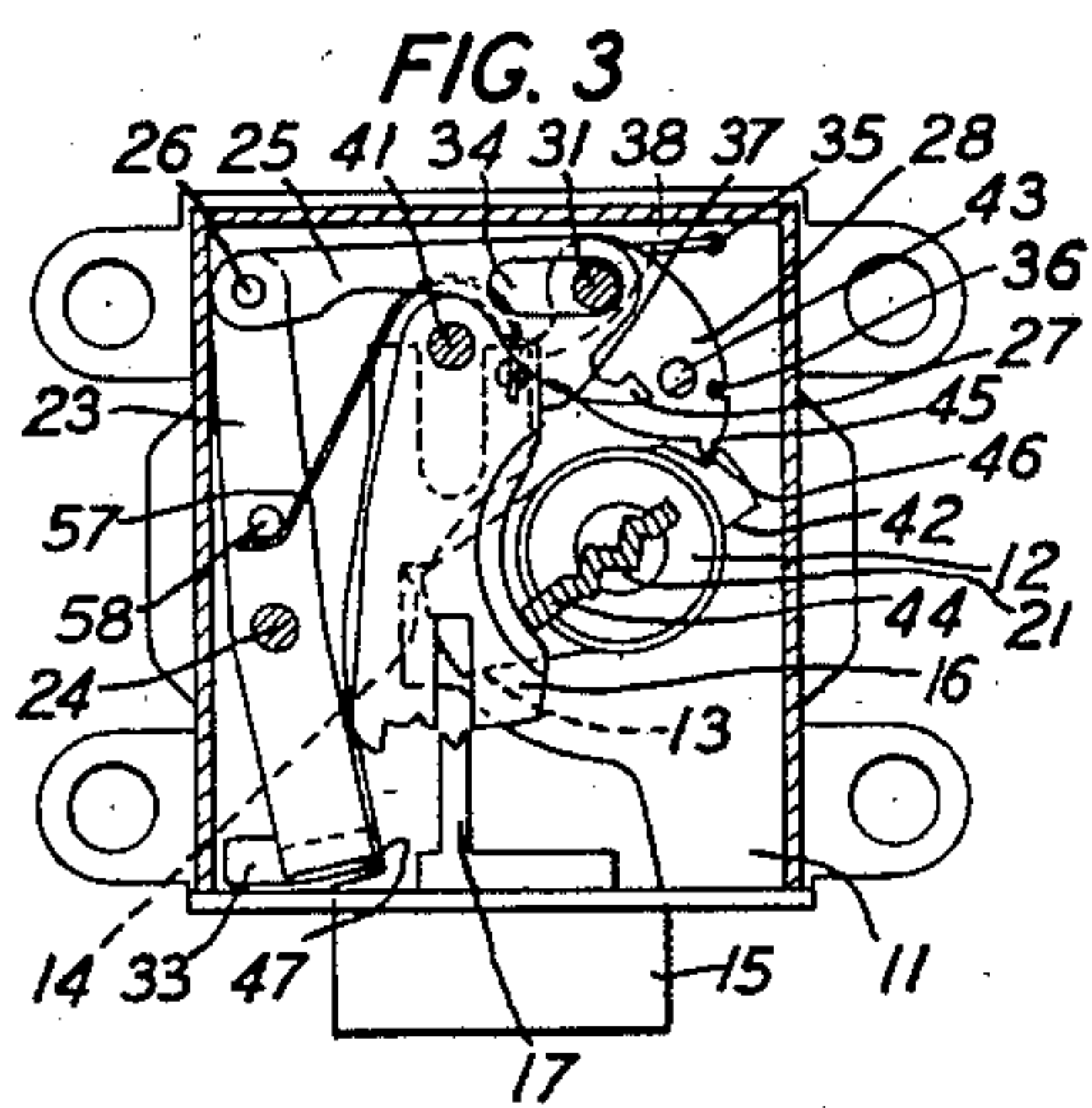
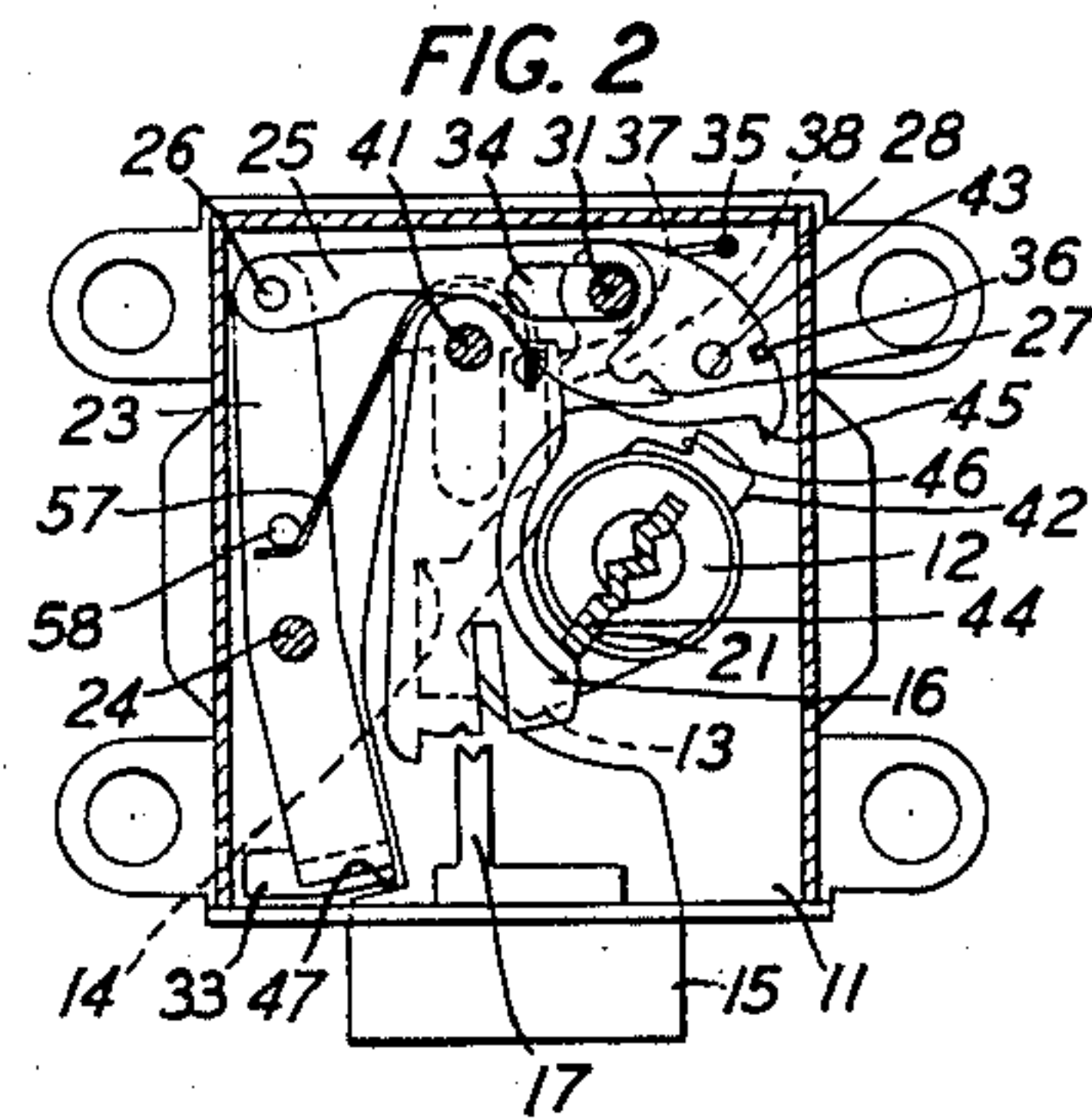
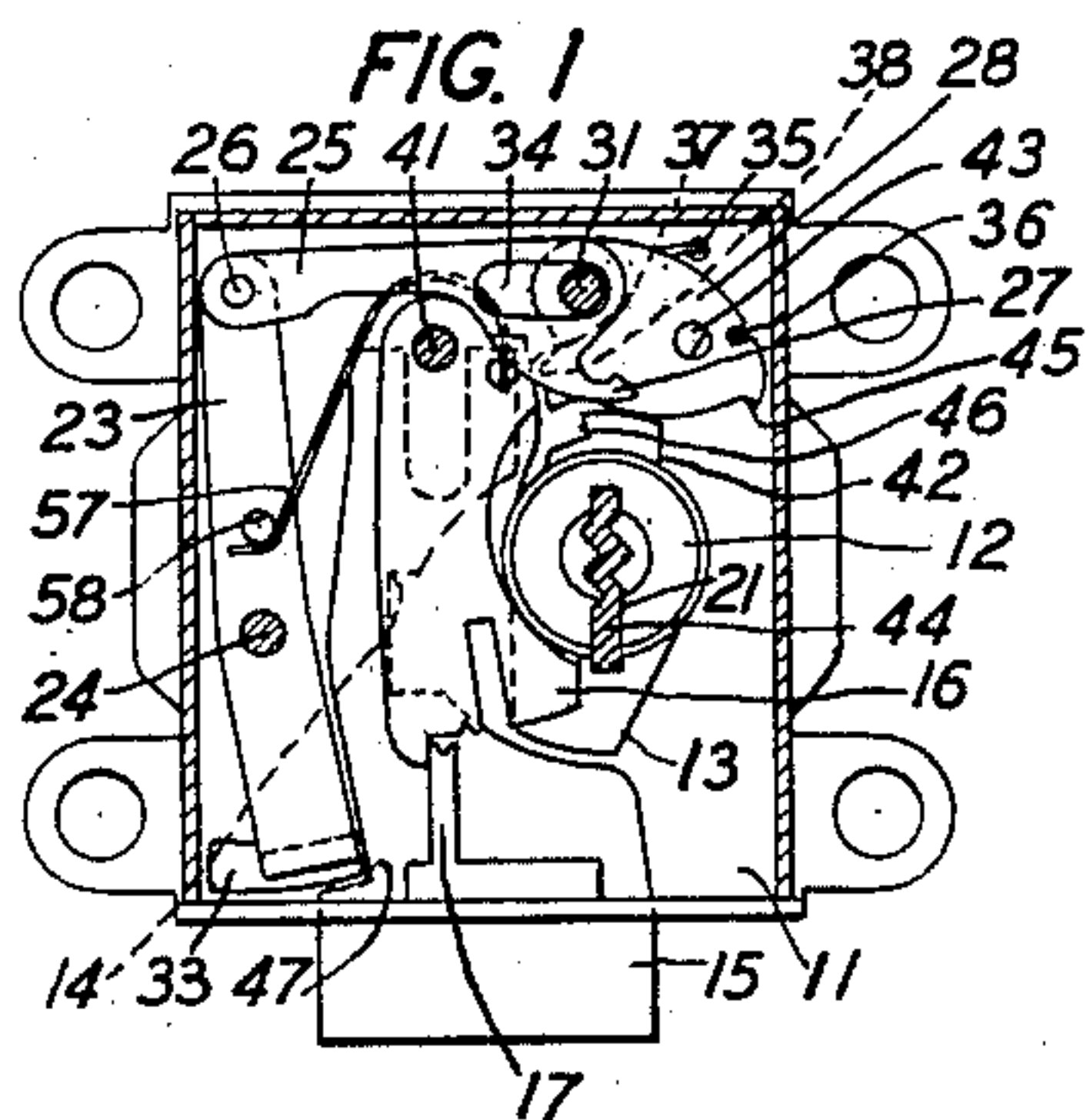
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2,028,525

LOCK

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2,028,525

LOCK

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14 Claims. (Cl. 70—73)

This invention relates to locks and particularly to locks of the key operated type.

An object of the invention is to trap keys, by means of which unauthorized persons may be attempting to operate the lock, and to prevent the removal of the key from the lock by such unauthorized persons.

Another object of the invention is to permit the removal of the trapped keys by authorized persons without necessitating dismantling the lock or in any way damaging the lock itself or the enclosure.

It is, of course, well known that unscrupulous persons often attempt to gain access to locked enclosures for fraudulent purposes by "picking" the lock. In order to defeat such attempts improvements in the lock mechanisms, in order to render them as nearly as possible "pick-proof" have been made from time to time. It quite often happens, however, that unscrupulous persons come into possession of the proper key for unlocking a certain lock and "pick-proofing" arrangements are, of course, no protection against such persons.

According to a feature of the invention, should an unauthorized person, who has come into possession of a key as above mentioned, attempt to utilize such key to operate the associated lock, not only is the lock held in a locked condition but the key itself is trapped in the lock and its removal by the unauthorized holder is prevented. Means are included, however, whereby an authorized person may "collect" the key, that is, remove it from the lock, without damaging the lock or the enclosure in any way. The "collected" key is then, of course, returned to the proper authorities.

Locks of the nature contemplated by the invention may be used, to mention one specific application, on telephone coin collectors of the general type disclosed in Forsberg U. S. Patent No. 1,043,219 of November 5, 1912.

In accordance with a preferred arrangement of the lock contemplated by the invention, means are provided whereby, upon an attempt to rotate the key to unlock the lock, the key-barrel, after it has been rotated a comparatively slight distance by the key, is arrested in its movement and further rotation in either direction is prevented. Rotation in a clockwise direction is prevented by contact of the barrel with a shoulder provided on the bolt, the bolt in turn being prevented from moving by a lever member contacting a second shoulder of the bolt, while counter-clockwise rotation of the barrel is prevented by a dog

contacting a notch in the barrel. The unauthorized holder of the key is therefore prevented both from rotating the barrel in one direction to unlock the lock and from rotating the barrel in the other direction to its normal position at which removal of the key would be possible.

In order that authorized persons may be able to remove the trapped key without damaging the lock, the lever member is provided with a projection extending through an opening in the case of the lock. An authorized person may, by inserting and manipulating a tool in a manner to be described subsequently, move the lever which results in freeing the bolt from the arresting action of the lever member and also in freeing the barrel from the arresting action of the dog, whereupon rotation in a clockwise and also in a counter-clockwise direction may take place. The barrel may now be rotated in a direction to unlock the lock or in the other direction to remove the key.

In order that the barrel may be manipulated by the authorized person after it has been "freed" as above described, a latching arrangement is provided which, upon the lever having been moved by the tool as above mentioned, holds the dog free of the barrel and the lever free of the bolt. As the barrel is rotated in a counter-clockwise direction, however, the latching arrangement is tripped before the point at which the key may be removed has been reached and the trapping means is again made effective to trap a key subsequently inserted.

A thorough understanding of the operation of the arrangement contemplated by the invention and an appreciation of its various features may be gained from consideration of the following detailed description in connection with the attached drawing in which:

Figure 1 is a top view of a lock provided with key trapping means in accordance with the invention, the cover of the lock being removed to show the internal mechanism;

Fig. 2 is a similar view of the lock showing the key-barrel partially rotated;

Fig. 3 is a similar view showing the key-barrel in trapped position;

Fig. 4 is a similar view showing the trapping mechanism operated to free the key-barrel, the tumblers being omitted;

Fig. 5 is a similar view of the lock showing the key-barrel just short of the position where the key can be removed, the tumblers being omitted in this view also;

Fig. 6 is a view of a portion of the cover of

the lock showing particularly the key slot arrangement;

Fig. 7 is a detail view of a part of the latching mechanism, and

5 Fig. 8 is a rear view of a portion of a coin collector housing showing the lock in use and showing also a tool in position to free a trapped key.

Referring now to the drawing, a lock 11 is shown which may be, so far as the bolt, key operated 10 tumblers, key-barrel, etc. are concerned, of ordinary construction, for example, of the type fully described in Shann U. S. Patent No. 1,793,254 of February 17, 1931.

While it is not believed necessary to describe 15 these parts of the lock or their operation in detail, it might be pointed out in order to aid in the understanding of the key trapping means with which the present invention is concerned, that key-barrel 12 is provided with a projection 13 20 which, when the barrel is rotated, strikes shoulder 14 provided on bolt 15 and causes retraction thereof. A plurality of similarly shaped key operated tumblers or levers are arranged adjacent the key-barrel having faces of different lengths 25 to correspond to notches in the operating key (only one tumbler is shown in order to avoid unnecessary complication of the drawing). The lower portions of the tumblers have projections which extend into the path of lug 17 provided 30 on bolt 15 and prevent retraction thereof unless the projections are aligned and withdrawn from the path of the lug by rotation of a properly designed key in the key-barrel.

As usual in locks of this general construction 35 and as shown in Fig. 6, a portion 18 of the cover is extended and encloses key-barrel 12, the edge of the extended portion overlapping the end of key slot 21 in such a manner that a key designed to operate the lock can be inserted into the key 40 slot, or withdrawn therefrom, only if the barrel is rotated to the point at which the end of the key slot registers with recess 22 provided in the extended portion of the cover. This point of rotation of the key-barrel corresponds to the fully 45 extended position of the bolt. The key cannot, therefore, be removed when the bolt is partially or fully retracted but only when the bolt is fully projected.

In addition to the parts referred to above of 50 more or less standard construction, the lock is provided with a release lever 23 which is rotatably mounted on pivot 24, a link 25 one end of which is attached to lever 23 by pivot 26 and the other end of which is provided with a hook-shaped extension 27, and a dog 28 which is ro- 55 tatably mounted on pivot 31.

A portion 32 of lever 23 (Fig. 8) is bent at right angles to the major length of the lever and projects through slot 33 provided in the case of 60 the lock. A slot 34 is provided in link 25 which cooperates with pivot 31 to guide link 25 when movement thereof is caused by movement of lever 23. A coiled spring 35 is associated with dog 28 65 and tends to cause clockwise rotation of the dog about its pivot, one end of the spring being attached to the case of the lock and the other end being positioned in notch 36 provided in the dog. This rotation of the dog is retarded, how- 70 ever, due to the camming contact between edge 37 of tumbler 16 and edge 38 of the dog so that rotation of the dog in a clockwise direction about the pivot can take place only as the tumbler is rotated by means of a key above its pivot 41. At certain points in the rotation of key-barrel 12, the 75 extension 42 thereof also retards the motion of

the dog. A pin 43 is carried by dog 28 and cooperates with the hook-shaped extension of link 25 in a manner to be subsequently described, to latch the trapping mechanism in neutral position.

Let us now assume, for purposes of description, 8 that a key 44, shown in cross-section in the drawing, be inserted in key slot 21 preparatory to unlocking the lock. The mechanism is in the position shown in Fig. 1.

Assuming that the key be rotated in a clockwise 10 direction and referring particularly to Figs. 2 and 3, the tumblers will be moved by the action of the key, in the manner described in the Shann patent referred to above until the point of maximum deflection, shown in Fig. 3, is reached. As the 15 tumblers rotate about their pivot 41, dog 28 is caused to rotate in a clockwise direction about its pivot 31, this motion caused by the action of spring 35 being, as pointed out above, controlled by the motion of tumbler 16. Dog 28 rotates 20 therefore until it reaches the position shown in Fig. 3 (an intermediate point in the motion of tumbler 16 and dog 28 being shown in Fig. 2) wherein projection 45 is, as shown, in contact with notch 46 of barrel projection 42. 25

Now while the tumblers are, as pointed out 30 above, in their position of maximum deflection, that is, the projections on their faces have been moved out of the path of lug 17 of bolt 15 to permit retraction of the bolt, this retraction is nevertheless prevented as extension 32 of lever 23 is positioned in contact with shoulder 47 of 35 bolt 15. This fact, that the bolt cannot be retracted, means of course, that further rotation of the key-barrel in a clockwise direction is prevented due to the contact of barrel extension 13 40 and shoulder 14 of the bolt. Counterclockwise rotation of the key-barrel is likewise prevented due to the contact of extension 45 and notch 46. The user of the key is therefore not only prevented 45 from unlocking the lock but also from removing the key as the position in which the key-barrel is held (see Fig. 6) is such that the end of the key slot is not in registry with recess 22.

Let us assume now that an authorized person 45 visits the station and, finding the trapped key, wishes to remove it. Referring to Fig. 8 a part of a telephone coin collector, which may be of the general type described in Forsberg U. S. Patent No. 1,043,219, is shown. The view is taken from 50 the rear of the collector, the usual back plate being omitted to facilitate illustration of the invention. It will be understood, however, that this back plate is provided as usual and that it acts to close the rear openings of lower housing 55 51 and upper housing 52 and also cooperates with portions of these housings to prevent the removal of the upper housing from the lower housing unless bolt 15 of lock 11 is fully retracted. It will be understood that wall 53 is rigidly at- 60 tached, for example by welding, to lower housing 51.

The authorized person in order to free the 65 trapped key first gains access to the interior of the lower housing 51 by unlocking and removing the door of the cash receptacle housing which comprises the greater portion of the lower housing. He next inserts the end of the tool 54 70 through the cash receptacle housing and up through hole 55 provided in the upper wall thereof and then manipulates the tool to push end 32 of lever 23 sideways.

It will be remembered that before the above operation of tool 54, that is, when the key was 75 trapped, the trapping mechanism was in the

position shown in Fig. 3. As lever end 32 is moved sideways by tool 54, however, the mechanism assumes the position shown in Fig. 4. That is, movement of lever end 32 to the left, looking at the front of the lock as in Figs. 1 to 5, causes a movement of link 25 to the right due to the pivoted connection at 26. This brings the cam edge of hook-shaped extension 27 of link 25 into contact with pin 43 of dog 28, and, as the movement of the link continues, dog 28 is raised against the action of spring 35, the cam surface passes under pin 43 and the pin thereupon drops into the recessed portion of extension 27. As more clearly shown in Fig. 7, a shoulder 56 is provided on pin 43 and the frictional contact between this shoulder and the inner surface of the hook-shaped extension of link 25 results (spring 35, of course, tending to rotate dog 28 in a clockwise direction while the pressure of tumbler spring 57 on pin 58 tends to move the link 25 to the left) in the mechanism being held or latched in the neutral position of Fig. 4.

As shown in Fig. 4, point 45 of dog 28 has now been raised out of contact with notch 46 thereby permitting counter-clockwise rotation of key-barrel 12 while end 32 of lever 23 has been moved out of contact with shoulder 47 thereby permitting clockwise rotation of the key-barrel and consequent retraction of bolt 15. The authorized person is now able, therefore, to unlock the lock (if he wishes to) and to rotate the key-barrel back to the point at which the trapped key may be removed which point, as described above, corresponds to the fully projected position of the bolt. Approximately half-way between the position illustrated in Fig. 3 and the position at which the key can be removed (the position of Fig. 1), the latched trapping mechanism is "tripped" to bring it into position to trap another key subsequently inserted, this action being shown in Fig. 5. As shown in Fig. 5, the edge of projection 42 is brought into contact with the adjacent edge of dog 28 as the key-barrel is rotated in a counter-clockwise direction from the position of Fig. 4 and as rotation of the barrel continues, dog 28 is forced upward by this contact, raising pin 43 out of engagement with extension 27 of link 25 whereupon dog 28, link 25 and lever 23 all move back to their normal positions as shown in Fig. 1. It will be understood, of course, that tumbler spring 57 is effective in returning lever 23 to its normal position and that lever 23, in turn, is effective in returning link 25 to its normal position. This spring also causes tumbler 16 to return to its normal position when released from key pressure and the contact of edge 37 of the tumbler and edge 38 of the dog forces the dog back to its normal position, the edge of extension 42 also being effective, through contact with the edge of dog 28 to return the dog to its normal position.

It may sometimes happen that an unauthorized holder of a key, upon having it trapped in the lock, will in his efforts to release the key, break off the exposed part leaving the body portion in the key slot. The authorized person is enabled in such an instance to use a tool 61 as shown by dotted lines (Fig. 8) to push back bolt 15 of the lock after lever 23 has been moved as above described for, as pointed out, the tumblers are at the point of maximum deflection when the key is trapped, that is, the projections on their faces have been moved out of the path of lug 17 on bolt 15. Upon pushing back bolt 15, the upper housing 52 may be removed from lower hous-

ing 51 thereby exposing the lock which may then be dismantled for removal of the key.

While certain embodiments of the invention have been selected for detailed description the invention is not, of course, limited in its application to the embodiments described. These embodiments should be considered as illustrative of the invention rather than restrictive thereof.

What is claimed is:

1. A lock comprising a casing, a bolt, a barrel having a slot for the reception of a key, a key operated tumbler for controlling the retraction of the bolt, means acting directly on the barrel and effective upon partial rotation of said barrel in one direction for preventing rotation of the barrel in the opposite direction, and means projecting outside the casing and operable from the exterior of said casing for controlling said preventing means.

2. A lock comprising a casing, a bolt, a barrel having a slot for the reception of a key, a key operated tumbler for controlling the retraction of the bolt, means acting directly on the barrel and effective upon partial rotation of the barrel in one direction for preventing rotation of said barrel in the opposite direction and additional means for preventing further rotation of the barrel in the first mentioned direction.

3. A lock comprising a casing, a bolt, a barrel having a slot for the reception of a key, a key operated tumbler for controlling the retraction of the bolt, means effective upon partial rotation of the barrel in one direction for preventing rotation of the barrel in the opposite direction, additional means for preventing further rotation of the barrel in the first mentioned direction, and a single means projecting outside the casing and operable from the exterior of said casing for controlling both of said preventing means.

4. A lock comprising a casing, a bolt, a barrel having a slot for the reception of a key and having a portion for engaging the bolt and causing its retraction as the barrel is rotated, a key operated tumbler for controlling the retraction of the bolt, a pivoted member, and means effective after partial rotation of the barrel for preventing further rotation thereof in either direction, said means preventing rotation of the barrel in one direction by preventing retraction of the bolt and preventing rotation in the other direction by causing engagement of said pivoted member with the barrel.

5. In a lock of the type comprising a casing, a bolt, a barrel having a slot for the reception of a key, a portion of the casing being so arranged with respect to the barrel that a key can be inserted therein or removed therefrom only when the slot registers with a certain definite point in said portion of the casing, a key operated tumbler for controlling the retraction of the bolt, a pivoted member and means for locking the barrel after partial rotation thereof against further rotation in either direction, said means preventing rotation in one direction by causing engagement of said pivoted member with the barrel, the point at which the barrel is locked being so chosen that the slot in the barrel is out of registry with the point in the portion of the casing at which a key may be removed.

6. In a lock of the type comprising a casing, a bolt, a barrel having a slot for the reception of a key, a portion of the casing being so arranged with respect to the barrel that a key can be inserted therein or removed therefrom only when the slot registers with a certain definite point in

said portion of the casing, a key operated tumbler for controlling the retraction of the bolt, a pivoted member and means for locking the barrel after partial rotation thereof against further rotation in either direction, said means preventing rotation in one direction by preventing retraction of the bolt and preventing rotation in the other direction by causing engagement of said pivoted member with the barrel, the point at which the barrel is locked being so chosen that the slot in the barrel is out of registry with the point in the portion of the casing at which a key may be removed.

7. A lock comprising a casing, a bolt, a barrel having a slot for the reception of a key, a key operated tumbler for controlling the retraction of the bolt, means effective upon partial rotation of the barrel in one direction for preventing rotation of the barrel in the opposite direction, additional means for preventing further rotation of the barrel in the first mentioned direction, a single means for controlling both of said preventing means projecting outside the casing and operable from the exterior of said casing to release the barrel and permit further rotation thereof and means effective upon the release of the barrel for holding said preventing means in neutral position.

8. A lock comprising a bolt, a barrel having a slot for the reception of a key, a key operated tumbler for controlling retraction of the bolt, and means effective after rotation of a key in said barrel sufficient to move said tumbler to non-restrictive position with respect to said bolt for preventing further rotation of the key.

9. A lock comprising a casing, a bolt, a barrel having a slot for the reception of a key, a key operated tumbler for controlling retraction of the bolt, a shoulder on said bolt, a movable member normally positioned in contact with said shoulder, a shoulder on said barrel, a second movable member, and means for controlling the movement of said second movable member whereby rotation of said barrel causes contact of said second member and the shoulder on the barrel, said two movable members being so linked that movement of the first member out of contact with the shoulder on the bolt results in movement of the second member out of contact with the shoulder on the barrel.

10. A lock comprising a casing, a bolt, a barrel having a slot for the reception of a key and having an extension arm, a key operated tumbler for controlling retraction of the bolt, a shoulder on said extension arm and a movable member acting in conjunction with said shoulder upon partial rotation of said barrel in one direction to prevent rotation of the barrel in the opposite direction, the movement of said member being controlled partially by said tumbler and partially by said extension arm.

11. A lock comprising a casing, a bolt, a barrel having a slot for reception of a key, a key operated tumbler for controlling the retraction of the bolt, a shoulder on the bolt, a lever pivotally mounted within the casing, one end of said lever being normally in contact with said shoulder, a dog pivotally mounted within the casing and a link member pivotally connected at one end to said lever and slidably connected at the other end to said dog, said key-barrel being provided with an extension arm, a shoulder on said extension arm, movement of said dog in one direction being so controlled by said key operated tumbler and said key-barrel that rotation of said barrel in

one direction by means of a key and the resulting movement of the key operated tumbler results in movement of said dog into engagement with the shoulder on said extension arm thereby preventing movement of the key-barrel in the opposite direction.

12. A lock comprising a casing, a bolt, a barrel having a slot for reception of a key, a key operated tumbler for controlling the retraction of the bolt, a shoulder on the bolt, a lever pivotally mounted within the casing, one end of said lever being normally in contact with said shoulder, a dog pivotally mounted within the casing and a link member pivotally connected at one end to said lever and slidably connected at the other end to said dog, said key-barrel being provided with an extension arm, a shoulder on said extension arm, movement of said dog in one direction being so controlled by said key operated tumbler and said key-barrel that rotation of said barrel in one direction by means of a key and the resulting movement of the key operated tumbler results in movement of said dog into engagement with the shoulder on said extension arm thereby preventing movement of the key-barrel in the opposite direction, movement of the first mentioned lever out of engagement with the shoulder on the bolt being effective to move the dog out of engagement with the shoulder on the extension arm.

13. A lock comprising a casing, a bolt, a barrel having a slot for reception of a key, a key operated tumbler for controlling the retraction of the bolt, a shoulder on the bolt, a lever pivotally mounted within the casing, one end of said lever being normally in contact with said shoulder, a dog pivotally mounted within the casing, a link member pivotally connected at one end to said lever and slidably connected at the other end to said dog, a hook-shaped extension on said link member and a pin provided with a shoulder on said dog, said key-barrel being provided with an extension arm, a shoulder on said extension arm, movement of said dog in one direction being so controlled by said key operated tumbler and said key-barrel that rotation of said barrel in one direction by means of a key and the resulting movement of the key operated tumbler results in movement of said dog into engagement with the shoulder on said extension arm, thereby preventing movement of the key-barrel in the opposite direction, movement of the first mentioned lever out of engagement with the shoulder on the bolt being effective to move the dog out of engagement with the shoulder on the extension arm and to position said pin in said hook-shaped extension whereby said lever and said dog are held out of contact with the respective shoulders.

14. A lock comprising a casing, a bolt, a barrel having a slot for reception of a key, a key operated tumbler for controlling the retraction of the bolt, a shoulder on the bolt, a lever pivotally mounted within the casing, one end of said lever being normally in contact with said shoulder, a dog pivotally mounted within the casing, a link member pivotally connected at one end with said lever and slidably connected at the other end to said dog, a hook-shaped extension on said link member and a pin provided with a shoulder on said dog, said key-barrel being provided with an extension arm, a shoulder on said extension arm, movement of said dog in one direction being so controlled by said key operated tumbler and said key-barrel that rotation of said barrel in one direction by means of a key and the resulting

movement of the key operated tumbler results in movement of said dog into engagement with the shoulder on said extension arm thereby preventing movement of the key-barrel in the opposite
5 direction, movement of the first mentioned lever out of engagement with the shoulder on the bolt being effective to move the dog out of engagement with the shoulder on the extension arm and

to position said pin in said hook-shaped extension whereby said lever and said dog are held out of contact with the respective shoulders, contact between said extension arm and said dog resulting from rotation of the key-barrel to normal position being effective to disengage said pin from
5 said hook-shaped extension.

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