Dec. 7, 1926. 1,610,224

C. DALBONI ET AL

LOCK

Original Filed Jan. 4, 1924 2 Sheets-Sheet 1

Fig. 1

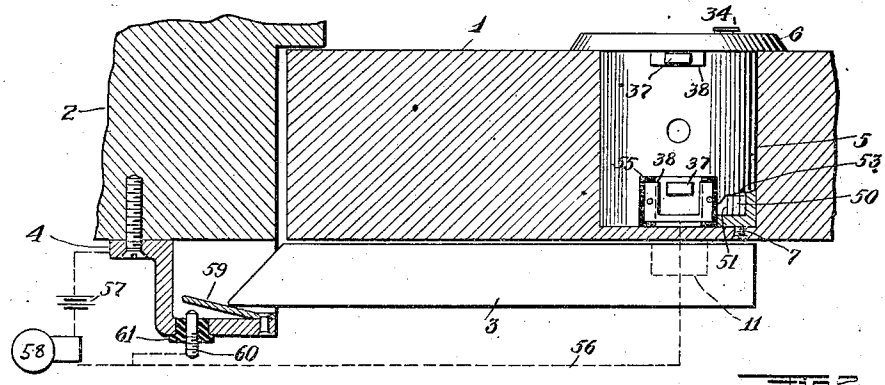


Fig. 2

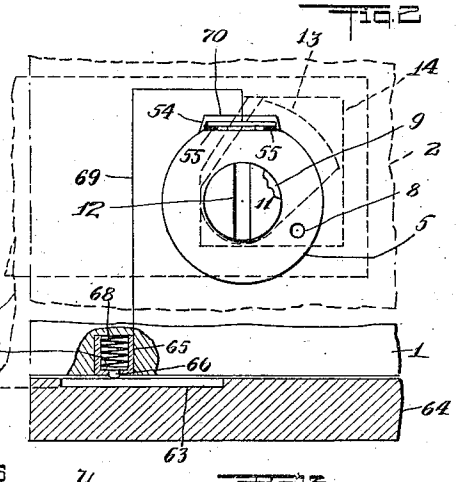


Fig. 3

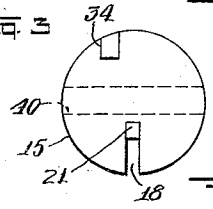


Fig. 10

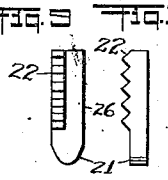


Fig. 4

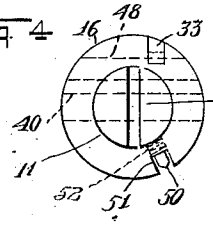


Fig. 11 Fig. 12

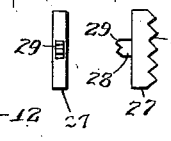


Fig. 5

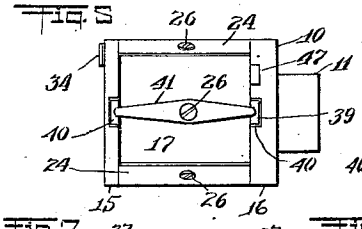


Fig. 6

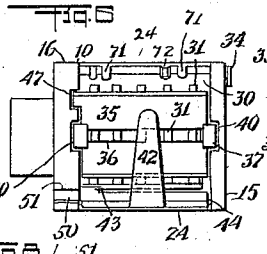


Fig. 13

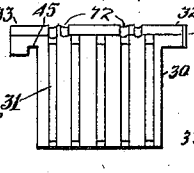


Fig. 15

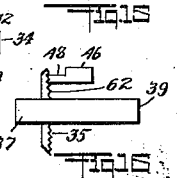


Fig. 16

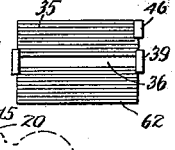


Fig. 7

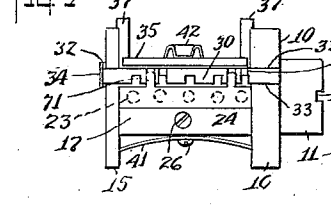


Fig. 8

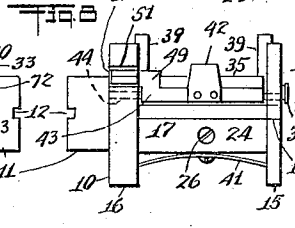
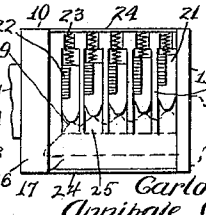


Fig. 14



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LOCK

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Fig. 17

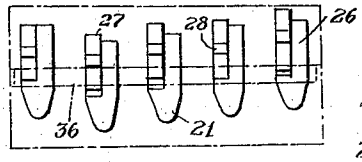
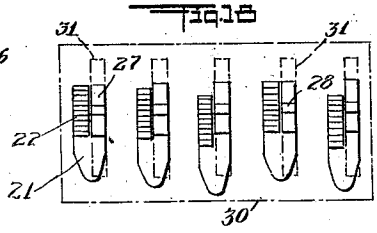


Fig. 18



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Patented Dec. 7, 1926. 1,610,224

UNITED STATES PATENT OFFICE.

CARLO DALBONI AND ANNIBALE GASPERETTI, OF NEW YORK, N. Y., ASSIGNORS TO ACE LOCK COMPANY, OF NEW HAVEN, CONNECTICUT, A CORPORATION OF CONNECTICUT.

LOCK.

Application filed January 4, 1924. Serial No. 684,349. Renewed October 14, 1926.

Our invention relates to improvements in locks of the combination type including a plurality of tumblers, to each of which a predetermined movement must be given to withdraw a bolt from operative position.

An object of the invention is to provide a lock in which the distance through which the tumblers must be actuated to allow a bolt to be retracted, can be altered at will by means of the key employed to operate the bolt, which the parts of the lock control. The lock is therefore so constructed that, when the parts are moved to retract the bolt, the tumblers are set by the key so that, after the parts are moved to throw the bolt again to securing position, the exact distances through which the tumblers must be moved to enable the lock to draw the bolt back, are thus automatically fixed. Hence, when one buys such a lock and has it mounted, he may use any key to project the bolt, and that key will withdraw the same; but no other key, unless it is exactly like the key already mentioned can move the bolt, or other fastening member which the lock controls, to retracted position.

A further object of the invention is to provide a lock having tumblers for enabling a bolt to be shot, and to withdraw such bolt; and of such design that the lock cannot be picked or the tumblers moved to release position by any other implement than the proper key.

Still another object of our invention is to provide a lock comprising parts that can be so adjusted that the bolt cannot be withdrawn, except by the use of the proper key, either from the inside or the outside of the space secured by the lock.

Other objects and advantages of this invention are described in the following specification taken with the drawings, which show how the inventive principle of our improvement can be employed in practice; and the novel features of our invention are pointed out in the claims. This disclosure, however, is illustrative only, and we may change the details of what is actually shown herein; without departing from the nature and scope of the invention, as the same are indicated by the broad and general meanings of the terms in which the claims are expressed.

Figure 1 is a view, more or less diagrammatic and partly in section, showing a lock according to our invention, mounted in position and connected to an alarm device.

Figure 2 is a diagrammatic view, partly in section, showing a portion of the electrical connections and the casing in which are contained the principal parts of our improved lock.

Figure 3 is a front elevation of the key-plug of our improved lock.

Figure 4 is a rear elevation of same.

Figure 5 is a view of one side of said plug.

Figure 6 is a view of the opposite side thereof.

Figure 7 is a top view of same.

Figure 8 is a bottom view of same.

Figure 9 is a front view, and Figure 10 is a side view of a portion of a tumbler.

Figures 11 and 12 are a rear view and a side view, respectively, of another member which helps to form each tumbler.

Figure 13 is a side view of a controlling element.

Figure 14 is a side view of the key plug, showing the manner in which the tumblers are carried.

Figure 15 is a side view, and Figure 16 an inner face view of a keeper plate for our lock.

Figures 17 and 18 are diagrammatic views showing how the tumblers alter the combination.

The same numerals identify the same parts throughout.

In the particular description of the drawings we show at 1 a portion of a door and part of a frame indicated at 2. The lock is carried by the door and it comprises a bolt 3 which enters a strike plate 4 on the frame 2 to hold the door shut. The lock can of course be mounted upon a window, the drawer of a desk, or some other movable member to be kept closed, and the part indicated by the numeral 2 can just as well be a window frame or frame work of a desk, etc. In this description, however, the part 1 will be hereinafter termed a door and the part 2 a frame for the sake of convenience.

The operative parts of our lock are mounted in a cylindrical casing 5 carried by the door, this casing being partly closed

at its inner end, and open at its opposite end, which is presented to the outside of the door, so as to permit the room or other space, entrance to which the door controls, to be entered by manipulating the lock from without. The casing has a flange 6 at its outer end to abut against the outside of the door around the edge of the recess that receives it. We may use a screw 7, passing through the inner end of the recess into a hole 8 in the inner end of the casing to make the casing fast. This inner end has an aperture 9 to give passage to a projection on a key plug 10, the projection indicated at 11. This projection may be grooved at 12 to receive a rib on a cam 13 (Figure 2) to be fastened to the plug 10, and moved in an opening shown diagrammatically at 14 in the bolt 3, so that when the plug 10 is turned in the casing 5, the bolt can be projected or drawn back.

The key-plug or barrel 10 comprises a front or outer end 15 and a rear or inner end 16, connected by a core or body 17 of reduced thickness and placed a little to one side of the center or long axis of the plug. In the front end is a key-hole 18 (Figure 3) leading to a key-way in the bottom of the body. In the inner face of the core are transverse recesses 19, separated by ribs 20, and receiving pin tumblers 21 (Figures 9, 10 and 14). Each tumbler has a row of teeth 22 along one edge, and presents these teeth outwardly through the open sides of the recesses. The recesses are open at the tops to receive springs 23 which tend to press the tumblers down against the lower ends of the recesses 19. On the top of the core is a cover or retaining plate 24 to hold the springs in and a similar plate closes the bottom of the key-way along the under side of the core 17. The recesses 19 communicate with the key-way past their lower ends 25, so that a key can raise the tumblers and screws 24ª hold the cover 24 in position.

Each tumbler also comprises not only a member having teeth 22, and a smooth surface 26 beside the teeth, but also a member 27, having similar teeth 22 on one face, and a projection 28, bearing serrations 29 on its opposite face. The teeth of the member 27 can mesh with the teeth 22, on the other member, and by varying the engagement of the two members, the effective length of each tumbler can be altered. At 30 is a controlling element having slots 31. The element fits against the core 17, over the tumblers, and the projections 28 enter the slots; when the teeth 22 of the two members of each tumbler are engaging one another. Therefore, one member of each tumbler can slide up and down in its recess 19, and the other member can move up and down with it, the projection 28, sliding in the adjacent slot 31, but none of the members 27 can move sideways over upon the smooth surface 26, unless the element 30 is moved. This element is not as long as the core 17. It has a projection 32 at one end to enter a notch in the head 15, and a projection 33 at its opposite end to enter a similar notch in the head 16. On the projection 32 may be a small knob 34 to allow the element to be pulled forward a little till its front edge strikes the inside face of the end 15. Normally the rear edge of the element is held against the head 16 and the front edge away from the head 15. It is retained in such position by a keeper 35, which can release the element. This keeper is a plate, to overlie the element 30, and has a longitudinal slot 36. It also has projections 37 at each end on one face, to extend out beyond the periphery of the ends 15 and 16 into apertures 38 of the casing 6 (Figure 1). In line with projections 37 are guide arms 39 projecting from the opposite face of the keeper 36, to move in guideways 40 in the inner faces of the ends 15 and 16 and through the core 17. On the opposite or outer face of the core is a leaf spring 41, pressing at its ends on the ends of the arms 39 and held fast by a screw 26 in the center. The keeper 35 is also pressed upon by a spring part 42, opposed to spring 41, and mounted on a shaft 43 having journals 44 at its ends to engage the heads 15 and 16.

The members 27 are wider than the slots 31, except for the projections 28.

On the lower side of the projection 33 is a notch 45. The plate 35 has at its adjacent end above one arm 39, a third arm 46 to move in a guide way 47 in the head 16 and core 17. This arm has a notch 48 in its upper edge. When the tumblers are all moved to bring the projections 28 into registry with the slot 36, the spring 42, which is stronger than the spring part 41, forces the keeper 35 against the element 30, and arm 46 moves its notch 48 into line with the lower edge of the projection 33. Then the head 34 can be drawn out to pull the element forward and disengage the members 27.

When the lock is in such position that the bolt 3 is in the strike plate 4, the tumblers will be in various positions, with the projections 28 out of registry with the slot 36. See Figure 17. These projections 28 now hold the keeper 35 away from the element 30 forcing the projections or dogs 37 into the opening 38. Hence the plug or tumbler carrier 10 cannot turn. The arm 46 has its upper edge, beyond the notch 48, in the notch 45 of the element 30, and the element is held in. When the right key is pushed into the hole 18, the tumblers are pushed up in the core 17 till all the projections 28 register with the slot 36. Then the spring 42 overcomes the spring 41, and the dogs 37 are withdrawn from the openings 38 in the

casing 6, so that the plug can be turned to move the cam 13 and retract the bolt. To project the bolt again the plug is turned back to original position and the key withdrawn.

To change the combination, one first pulls out the key used to withdraw the bolt 3. Then he pulls the head 34 to move the members 27 into the positions shown in Figure 18, the element drawing the members 27 sideways with the projections 28 sliding in the slot 36. If a new key is inserted into the plug 10, the members of the tumblers 21 having the teeth 22 and smooth surfaces will now be forced into positions corresponding to the height of the teeth on the new key. Then the element 20 is pushed back, and the new key made to turn the plug to shoot the bolt out again before the new key is removed.

For this purpose shaft 43 has at one end an arm 49 with a wrist projection 50, forming a crank, received in a notch 51 in the end 16. In the notch is a spring 52 pressing outward. This crank normally presses against the keeper 35. When the plug is first turned to withdraw the bolt, this crank is carried to an opening such as the opening 38 adjacent the head 16, after the adjacent dog 37 leaves this opening, and the spring 52 then moves the crank to rotate the shaft 43 and relax the spring 42. Hence the spring 41 can act again to push the guides 37 and move back the keeper 35 far enough to exert no pressure on the element 30, but not far enough for the slot 36 to release the projections 28. Then the new key can shift the members having the teeth 22 and surfaces 26 in the recesses 19, and when the head 34 is pushed to return the element 30, these members and the members 27 reengage and are held by their teeth in their new relative positions and after the bolt 3 is projected once more the new key must be used to open the lock.

The dogs 37 project far enough from the keeper 35 to enter the apertures 38 when the projections 28 do not register with the slot 36, but are within the compass of the heads 15 and 16 when the spring 42 forces the keeper 35 against element 30. When the crank 50 is released, the spring 41 can move the arms 39 to move the dogs 37 and keeper 35 outward just a little before the dogs strike the inside of casing 5.

If the cam 13 and opening 14 were shaped to require movement to the left instead of to the right (Figures 1 and 2) to withdraw a bolt, the wrist projection 50 would turn with the adjacent dog 37 away from the adjacent opening 38. Then another opening would be provided in the casing 5 to receive the wrist projection 50 when the plug 10 has been rotated as far as needed. This projection 50 may stick out beyond the rim of the head 16, but not the arm 19. The position of this projection in Figure 1 is indicated at 53 where the casing 6 is shown broken away.

At 54 are pieces of insulation on each side of the opening 38 at the inner end of the casing 5 (Figure 1) and on these pieces is made fast a U-shaped contact element 55 connected by a wire 56 to a battery 57 through a bell or alarm device 58; the battery being grounded on the strike plate 4. If one should insert the wrong key and turn the plug 10 without drawing back the dogs 37, the innermost dog would touch one side or the other of the element 55. A circuit would then be completed through the battery bell wire 56 and metal parts of the lock, and an alarm given. In the strike plate is a spring leaf 59, and at 60 is a binding post, insulated by a sleeve or bushing 61. When the door 2 is fastened the bolt 3 touches the spring 59, and if one tries to force the door open, the spring 59 is made to touch the inner end of the post 60. An alarm will again result. Hence the lock cannot be picked nor the door "jimmied" open without a warning being automatically given.

The projections 28 may be smooth on their ends and so may the inside face of the keeper 35; but we show the ends of the projections with serrations 28 and the plate with similar serrations 62. With these serrations the lock cannot be picked. To pick it, one would have to insert a tool in the key hole 18 and try to move the tumblers sideways to find by sound when the projections come opposite the slot 36. With the serrations, as soon as the tumblers are moved sideways, the members 27 will bind against the keeper 35. At the same time these serrations will not prevent the right key from moving the tumblers upward.

The serrations 62 of the keeper 35, and the teeth 29, may be lower and less abrupt than the teeth 22 of the two members making up each of the tumblers 22, so that when the dogs 37 are in the openings 38, and a key is inserted in the keyslot 18, to move up the tumblers and bring the projections 28 into line with the slot 36, the two members of each tumbler maintain their engagement.

Our lock is very useful because it enables the owner of an apartment, the entrance to which the lock controls, to change the combination of the lock at will merely by changing the key. If the lock is mounted upon door of the owner's home he can use any key he wants to open and close the lock as he goes in and out, and change his key at will. If such a lock is employed for the rooms and windows of hotels, a temporary occupant can enter with the key which is given to him when he engages the room, and as long as he remains in possession he can use his own key, if he desires. The lock

also cannot be picked and always will give warning if tampered with.

The wire 56 can be led from the battery to a metal plate 63 in the door sill 64. The door 1 may have a bushing 65, with a hole for a contact brush 66 having a collar 67, a spring 68 in the bushing pressing the brush down to keep the brush against the plate 63. The collar 67 engages the end of the bushing to hold the brush 66 inside the bushing. From the bushing a wire 69 leads to the element 55. This wire 69 may be on the inner side of the door 1, so as to be projected.

While the dog 37 at the inner end of the plug 10 will strike against the element 55 at one side or the other if the lock is tampered with, the wrist projection will not reach the element 55, even if this projection 50 enters the said opening when the right key opens the lock. The end of the projection 50 and the other parts can easily be so proportioned and shaped as to give this result.

The recess to receive the casing 5 is cut out at 70 (Figure 2) enough to make room for the element 55.

The upper plate 24 may have spring projections 71 to engage shallow notches 72 in the top of the element 30, and positively hold the element in the right position.

Having described our invenion, what we believe to be new and desire to secure and protect by Letters Patent of the United States is:—

1. In a lock, the combination of a reciprocable pin tumbler comprising members having teeth for the adjustable engagement of said members, a controlling element for said tumblers, and a keeper having a slot to be controlled by the tumblers, said keeper having one or more catch projections thereon.

2. In a lock the combination of a reciprocable pin tumbler comprising a member having a projection, a keeper to be controlled by the tumblers, and serrations on the keeper and the projections of the tumbler to prevent the picking of the lock.

3. In a lock the combination of a casing, a key-plug in the casing, tumblers in the key-plug, each tumbler consisting of members for adjustable engagement with each other, one member having a projection serrated at its extremity, a controlling element having slots to receive the projections, a keeper to be controlled by the tumblers, the keeper having a slot to receive said projections when the projections move into alinement, catch projections on the keeper, the casing having openings to receive said projections, a spring to engage the keeper and impel said catch projections into said openings, a shaft to which the spring is attached, a crank on said shaft, the casing having a recess to receive the crank and relax said spring, a second spring on the plug, arms on the keeper to be engaged by said spring in opposition to the first spring, a notched arm on the keeper to hold and release the element, and a knob on the element accessible from the outside of the casing, the keeper being serrated to cooperate with the serrations on the projections of the members of the tumblers and prevent the picking of the lock.

4. A lock comprising a pin tumbler constituted of members adjustable with respect to each other, and including a keeper to hold the members in adjusted position, the keeper being movable when the tumblers have been actuated to predetermined positions.

5. A lock comprising a casing, a plug received in the casing, tumblers in the plug each comprising adjustable members, and a keeper for maintaining the members in adjusted positions, said keeper engaging or releasing the casing according to the position of the tumblers.

6. A lock comprising a tumbler constituted of members adjustable with respect to each other, and a keeper having teeth to hold the members in adjusted position.

7. A lock comprising a pin tumbler constituted of members adjustable with respect to each other, and including a keeper to hold the members in adjusted position, and a part to engage and release the keeper to maintain the adjustment of said members or enable said adjustment to be changed.

8. A lock comprising a tumbler constituted of members arranged to be moved relative to each other, one of said members having a toothed surface, a keeper having teeth to engage said last-named member, and a part to engage said keeper to make the teeth of the keeper mesh with the teeth of said last-named member, to hold said members in adjusted position, or release said keeper to enable the members to be readjusted.

9. A lock comprising a plug carrying one or more tumblers, each tumbler comprising adjustable members, and a controlling element engaging said members and permitting movement thereof by a key, but movable to disengage said members to permit the adjustment thereof to be changed before they are again moved into engagement with each other.

10. A lock comprising a plug, one or more tumblers mounted to reciprocate on said plug, a controlling element having slots to permit the displacement of said members when a key is inserted into said plug, each of said tumblers comprising two members adjustably engaging each other, the element being movable to actuate one member of each of said tumblers sidewise and

disengage it from the other member to enable the adjustment to be changed before said members are reengaged with each other.

11. A lock comprising a plug having one or more tumblers, each of said tumblers comprising members adjustably engaging each other, and a keeper for said tumblers, said keeper having a slot to release one member of each tumbler upon the tumblers being moved by a key into predetermined position with respect to said slot, for readjustment of the relative position of said members.

12. A lock comprising a plug, one or more tumblers reciprocably mounted in said plug, each of said tumblers comprising members adjustably engaging each other, a keeper on the plug for said tumblers, said keeper having a slot and mounted to release said tumblers when the latter are actuated by a key into predetermined position with respect to said slot for readjustment of said members, and a spring on the plug normally engaging the keeper to hold it in operative position with respect to the tumblers, but releasable when the keeper is in position to permit said members to be adjusted and reengaged with each other.

13. A lock comprising a plug, a plurality of tumblers mounted to move in said plug, each tumbler comprising members adjustably engaging each other, a controlling element to actuate the members into and out of engagement with each other, a keeper on the plug, shaped, when the tumblers are actuated to predetermined position by a key, to release the tumblers, and a spring normally causing the keeper to maintain said members in the desired adjustment, but releasable when the tumblers are moved to the aforesaid predetermined position, to liberate said keeper and permit adjustment of said members.

14. A lock comprising a pin tumbler automatically adjustable as to length, constituted of members adjustable with respect to each other, and including a keeper to hold the members in adjusted position.

In testimony whereof, we have signed our names to this specification this 5th day of October, 1923.

CARLO DALBONI.
ANNIBALE GASPERETTI.