J. DE LEEUW.

KEYLESS LOCK.

APPLICATION FILED FEB. 28, 1920.

1,346,080.

Patented July 6, 1920.

2 SHEETS—SHEET 1.

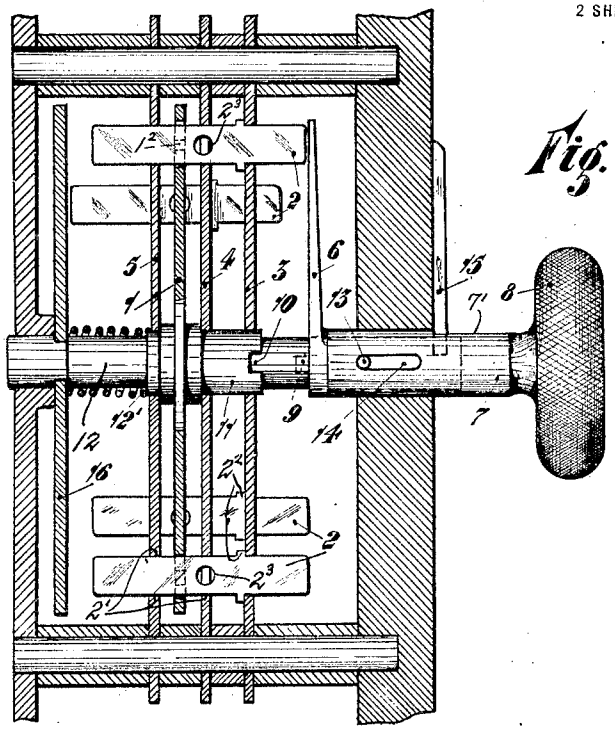


Fig. 1.

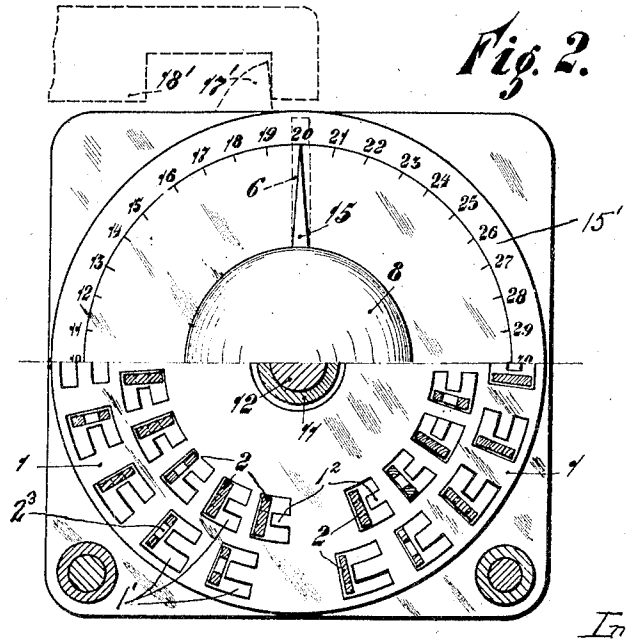


Fig. 2.

Inventor,
Joseph de Leeuw,
by Lawrence Langner
Attorney.

J. DE LEEUW.

KEYLESS LOCK.

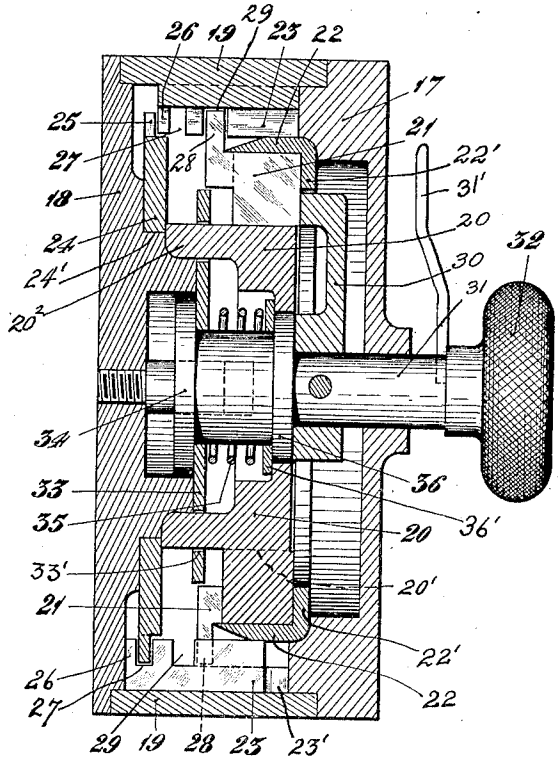
APPLICATION FILED FEB. 28, 1920.

1,346,080.

Patented July 6, 1920.

2 SHEETS—SHEET 2.

Fig. 3.



Inventor,

Joseph de Leeuw

by Lawrence Langner,

Attorney

UNITED STATES PATENT OFFICE.

JOSEPH DE LEEUW, OF THE HAGUE, NETHERLANDS.

KEYLESS LOCK.

1,346,080. Specification of Letters Patent. Patented July 6, 1920.

Application filed February 28, 1920. Serial No. 362,134.

To all whom it may concern:

Be it known that I, JOSEPH DE LEEUW, law student, a subject of the Queen of the Netherlands, residing at The Hague, Malakkastraat 22, the Netherlands, have invented certain new and useful Improvements in Keyless Locks, of which the following is a specification.

This invention relates to keyless locks of the type comprising a key plate controlling the movement of the locking bolt and a plurality of tumblers coöperating with the key-plate, said tumblers being mounted for sliding movement in directions perpendicular to the key-plate. Locks of this type, the tumblers of which can be forced in from the outside, have the drawback that one, in trying to shift the locking bolt, can determine experimentally which tumblers block its movement, so that only these latter tumblers have to be forced in in order to permit the locking bolts to be completely withdrawn.

According to the invention this drawback is overcome by reason of the fact that the tumblers are no longer accessible from the outside, but can only be pressed in by means of a member, that serves at the same time for moving the key-plate coöperating with the locking bolt.

The invention has further for its object to provide means by which the previously-set tumblers may be restored to their initial position. To this end a plate is arranged at the back of the tumblers, said plate being adapted to be coupled with the operating member and to simultaneously shift back all of the pressed in tumblers.

The invention will be more fully understood with reference to the accompanying drawings forming part of my application.

Figure 1 is a cross section of a lock according to the invention, and Fig. 2 is a view of said lock partly in front elevation and partly in section, the section being taken in front of the key plate.

Fig. 3 is a cross section of a modification.

Referring to Figs. 1 and 2, 1 designates the key-plate of the lock, which is mounted on a sleeve 11 which is slidably fitted on a shaft or axle 12 suitably journaled in alining openings provided in the rear member or back of the lock case and in a set of stationary partition plates 3, 4 and 5 arranged in spaced, parallel relation within said case, the key-plate being located between the rear and intermediate partitions 5 and 4. The key-plate is formed with an opening 1′ for each of the lock tumblers 2, which latter extend through said openings and are mounted to slide in openings 2′ formed in said partitions in directions perpendicular to said key-plate, their outward and inward movements being limited by means of stops or lugs 2^2 which co-act with the front and intermediate partitions 3 and 4. The key-plate openings 1′ are considerably wider than the tumblers, and each of them is formed at one side with a tongue 1^2 which is adapted to project through an opening 2^3 in the associated tumbler when the latter is in the correct position therefor, as subsequently explained.

Each of the tumblers corresponds to one of the numbers indicated on a dial 15′ on the front member of the lock case and with which a pointer or finger 15 co-acts, said pointer passing through a longitudinal slot 7′ formed in the upper portion of a sleeve 7 and being secured to the front portion of the shaft 12. The said sleeve 7, which is provided with an operating handle or knob 8 and which fits loosely over the aforesaid front portion of the shaft 12 for endwise sliding movement thereon in opposite directions, is journaled in an opening in the aforesaid front member, as shown in Fig. 1 wherein the sleeve is represented in its outer position. Some of the tumbler openings 2^3 normally register with the tongues 1^2 in the corresponding key-plate openings or recesses 1′; but others of them are normally out of such registration, and, hence, will block the rotation of the key-plate until brought into registration by the shifting of the tumblers from one position to another. It is possible, therefore, to select any particular combination of numbers on the dial and to set the tumblers in such a way that those corresponding to the numbers of the combination chosen will be disposed in advance of their registration positions, while the remaining tumblers will occupy their registration positions. Hence, to unlock the mechanism it will first be necessary to press all of the first-mentioned tumblers inward, after which the key-plate can be rotated by means of the handle 8 in the manner hereinafter explained and, through the intermediary of its peripheral lug 17′ (Fig. 2), withdraw the bolt 18′, it being understood that the lug 17′ projects through an

opening formed in the adjacent portion of the case into position for coöperative engagement with the bolt.

The inward or active movement of the tumblers is here shown as effected by means of a finger 6, which is rigidly secured to sleeve 7 within the lock case in exact alinement with the outer finger or pointer 15, so that its position will always be the same as that of said pointer. The axial sliding movement of said sleeve on shaft 12 enables it to be shifted into and out of position to set the tumblers; and it has a pin-and-slot connection 13—14 with said shaft which limits its movements with relation thereto, the provision of the slot 7′ through which pointer 15 extends preventing said pointer from interfering with the movements of the sleeve. Hence it will be apparent that said sleeve may be turned from one position to another to enable the tumblers corresponding to the numbers of the combination to be successively actuated, the sleeve being pushed in on reaching each such position and then pulled back and turned to the next position.

During the setting operation just described, the shaft 12 turns loosely in sleeve 11 which carries the key-plate, and no movement of the said sleeve takes place; the key-plate being locked until the completion of the operation. To enable the rotation of the key-plate, its carrier sleeve 11 is designed to be coupled to the operating sleeve 7, for which purpose one of said parts is formed with a notch 10 to receive a coupling projection 9 on the other part, the projection 9 being here shown as formed on the inner end of the operating sleeve 7 and the notch 10 as formed in the adjacent end of the carrier sleeve 11, and at an angular distance of 180° from said projection, so that the knob or handle 8 must be turned through half a revolution before the two can be coupled. It is to be observed that the key-plate openings 1′ are arranged in two concentric series, with the openings of one series staggered relatively to those of the other series, and that both series have gaps therein at a point diametrically opposite the normal or vertical position of the finger 6,—in other words, at a distance of 180° from said finger, as shown in Fig. 2. The formation of these gaps is necessary in order to permit the operating sleeve 7 and its knob or handle 8 to be pressed in far enough to couple the two sleeves together, for it will be seen that the coupling notch is located slightly behind or in rear of the ends of the tumbler. Hence, the two coacting parts 9 and 10 are located at angular distances of 90° from the gaps and the normal position of the actuating finger, so that when said parts are in coupling position (which can be readily determined from the dial 15′ and the pointer 15) the actuating finger will be opposite the gaps, and the handle or knob can then be pressed in and turned to open the lock.

To restore those tumblers which have previously been displaced, a plate 16 is provided, which is rigidly connected to shaft 12 and is located adjacent the back of the lock case, against which it is normally held by a spring 12′ which encircles said shaft and bears at opposite ends against the restoring plate and the adjacent end of sleeve 11; said shaft being so mounted as to be capable of a slight axial movement forward and backward. Hence, when the knob 8 is drawn back, it will pull the shaft forward with it, due to the pin-and-slot connection 13—14, and the restoring plate will return the tumblers to their initial position.

In operation, the knob 8 is actuated to press in or set the successive tumblers involved in the combination, and after that operation has been completed, it is again turned to bring the finger 6 opposite the gaps in the series of recesses or openings 1′, at which time the openings 2^3 in all of the tumblers will be opposite the tongues 1^2, and the projection 9 will be in line with the notch 10. The knob is next pressed in, to couple the two sleeves 7 and 11, and then turned in a clockwise direction to withdraw the bolt, thus opening the lock.

To relock the parts, the knob is first turned a slight distance counter-clockwise, in order to withdraw the tongues from the tumbler openings and to release the bolt from the projection 17′; after which, said knob is pulled out to its full extent, during which time the shaft 12 is moved forward by the engagement of its pin 13 with the rear end of slot 14, and the restoring plate 16 pushes out the tumblers which have to be re-positioned. The spring 12′ then returns the shaft to normal position.

Fig. 3 represents a modification of the construction illustrated in Figs. 1 and 2, which operates in the same general manner as that construction, however, and differs therefrom only in the shape and arrangement of certain of its component parts. The showing of this modified construction is, for that reason, more or less diagrammatic, and some of the parts disclosed in the first construction—notably, the bolt and the co-acting projection on the key-plate—are, accordingly, omitted, both for clearness of illustration and because their operation is precisely the same as in the first form.

In the modified construction, the lock case comprises front and back plates 17 and 18 of circular shape and a circumferential or annular wall 19 connecting them. The key-

plate 20 is mounted on shaft 31 which is adapted to be both rotated and shifted axially or endwise by means of its knob or handle 32, and which has fixed to it the pointer 31′ and the operating finger 30 for pressing in the tumblers 21. The pointer, being directly secured to shaft 31, will move backward and forward with it, and, therefore, will be moved away from the dial when the shaft is pulled out. The tumblers 21 are slidably fitted in radial slots 20′ which open through the peripheral edge of the key-plate and, also, through its front and rear faces; and said tumblers are held against displacement by a presser ring 22 of suitable resilient or elastic material which encircles the periphery of said plate and comprises an inwardly-extending annular flange 22′ which is disposed against the front face of the plate.

The rear portion of each tumbler is formed with a nose or tongue 28 which projects radially outward beyond the edge of the key-plate for co-action with the corresponding one of a set of locking slides 23, fitted in transverse slots 23′ formed in the inner face of the annular wall 19 of the lock case. These slides have a slight endwise movement in opposite directions in their slots, in order to bring their central recesses or openings 29 into or out of line with the tumbler tongues 28, in the same way that the tumbler openings 2^3 in the first form are brought into and out of line with the tongues 1^2 of the key-plate 1, and for precisely the same purpose, as will be understood. The slides are adjusted in conformity with the particular lock combination selected and are held in either of their two positions by means of the peripheral teeth 25 formed on a disk 24, which is mounted on a step or bearing 24′ provided on the inner face of the rear plate 18; said disk being adapted to be turned in some suitable manner from the outside of the case through an arc of very limited extent for the purpose of enabling the rear ends 26 of the slides to move into and out of the spaces between the teeth 25. The slides are provided with additional recesses or openings 27 adjacent their said rear ends 26, so that when said slides occupy their rearward or pressed-in position, the teeth 25 will engage in the recesses 27, as indicated in the lower portion of Fig. 3; and when they occupy their forward position, their said rear ends 26 will be engaged by said teeth, as indicated in the upper portion of Fig. 3. In the position last mentioned, the tongue 28 of the tumbler associated with the slide illustrated will be opposite the opening 29 in said slide, and the latter, therefore, will not block the rotation of the key-plate; but in the other position mentioned, the tumbler tongue will be opposite a solid portion of the corresponding slide, with the result that that slide will oppose the movement of the key-plate. Those tumblers whose tongues are in registration or alinement with the slide openings 29, do not have to be shifted, as will be understood, and are not involved in the combination; but the remaining tumblers are set or adjusted by being pushed in by the finger 30, as has already been explained, during which movement their body portions are brought into the zone of action of a restoring plate 33. This plate 33 is loosely mounted on the shaft 31 and is pressed rearwardly by a spring 35 interposed between a pair of collars 34 and 36 on the shaft; said spring bearing at one side immediately against the restoring plate and at the other side immediately against a washer 36′ which slightly overlaps the central portion of the key-plate, the latter being formed with a plurality of lateral projections or guides 20^2 which extend loosely through openings 33′ in the restoring plate so as to control its movements. The aforesaid spring 35 serves to hold the shaft normally in an intermediate position, and to return it to such position after having been pressed in or pulled out.

The operation is substantially as follows:—The tumblers 21 corresponding to the numbers involved in the combination are pressed in by means of the operating finger 30, as before, to unlock the key-plate 20, which is then rotated to withdraw the bolt. Thereafter, the key-plate is turned back to its original position, and all of the tumblers which were previously pressed in are restored by the plate 33, which is itself forced forward by pulling out the knob 32. The spring 35 finally returns the shaft and the restoring plate to their respective normal positions. The combination may be readily changed by first coupling together the slides and tumblers involved in the former combination, and then successively shifting them forward by means of the restoring plate, pressing in the tumblers involved in the new combination, locking said parts by means of the toothed disk 24, and then disengaging the tumblers 21 from the slides and returning them to normal position.

What I claim and desire to secure by Letters Patent is:

1. A keyless lock comprising a key-plate controlling the movement of a locking bolt, a plurality of elements coöperating therewith, and adapted to be pressed in in a direction perpendicular to the key-plate, and means adapted to move the key-plate, said means including a member common to all of said elements adapted to press them in.

2. A keyless lock comprising a shiftable key-plate, a plurality of elements coöperating therewith, and adapted to be pressed in in a direction perpendicular to the key-plate, an operating member which alone effects the inward movement of said elements, said

member serving at the same time for shifting the key-plate, a plate adapted to restore the elements pressed in to their initial position, and a shaft supporting the restoring plate, said shaft carrying also the said operating member.

3. A lock comprising a shiftable key-plate; a series of tumblers coöperating with said plate and adapted to be shifted rearwardly relatively thereto into unlocking position; a rotatable shaft; a case wherein said shaft is journaled and through the front wall of which it projects, said case completely inclosing said key-plate and tumblers to render them inaccessible from the outside; an operating finger common to all of the tumblers mounted to turn with said shaft and arranged inside of the case; a dial on the outer face of the front wall of said case and having graduations thereon corresponding to the position of all of the tumblers; and a pointer secured to the projecting portion of said shaft for coöperation with said dial, said pointer having a position on said shaft directly in front of said finger so as to indicate the position of the latter.

4. A lock comprising a shiftable key-plate; a series of tumblers coöperating with said plate and adapted to be shifted rearwardly relatively thereto into unlocking position; a shaft; a case wherein said shaft is mounted for both rotary and endwise movement and through the front wall of which it projects, said case completely inclosing said key-plate and tumblers to render them inaccessible from the outside; an operating finger common to all of the tumblers mounted in front of the tumblers and adapted to initially rotate with the shaft into a position immediately in front of a selected tumbler and thereafter to move rearwardly with said shaft to press that tumbler inward; a dial on the outer face of the front wall of the case, and having graduations which exactly correspond with the positions of the tumblers, both the tumblers and the graduations being arranged radially of said shaft; and a pointer secured to the projecting portion of said shaft for coöperation with said dial, said pointer having a position on said shaft directly in front of said finger so as to indicate the position of the latter.

5. A lock, comprising a shiftable key-plate adapted, during its shifting movement, to withdraw a locking bolt; a shaft for operating the key-plate; a set of tumblers cooperative with the plate; and a member common to all of the tumblers movable with said shaft relative to the tumblers into position to contact with and press in a selected tumbler; tongue-and-recess means being provided in connection with each tumbler and the key-plate to control the movement of the key-plate.

6. In a lock, the combination of a shaft mounted for both rotary and endwise movement; a rotatable key-plate mounted on the shaft and having an annular series of openings; a set of tumblers coöperative with the key-plate and slidably engaged in said openings, said tumblers adapted to be pressed inward relatively to the key-plate to control its activity; and a member common to all of the tumblers movable with said shaft to initially select a particular tumbler and thereafter press in that tumbler.

In testimony whereof I affix my signature.

JOSEPH DE LEEUW.