

Sept. 4, 1951

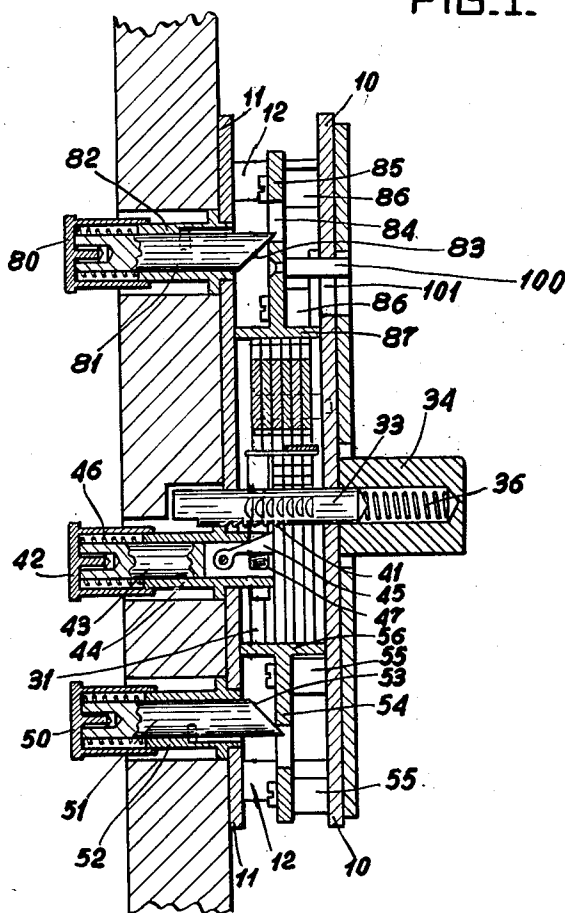
A. SOLER CAPDEVILA
SECRET OR COMBINATION LOCK

2,566,967

Filed April 29, 1947

6 Sheets-Sheet 1

FIG. 1.



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6 Sheets-Sheet 2

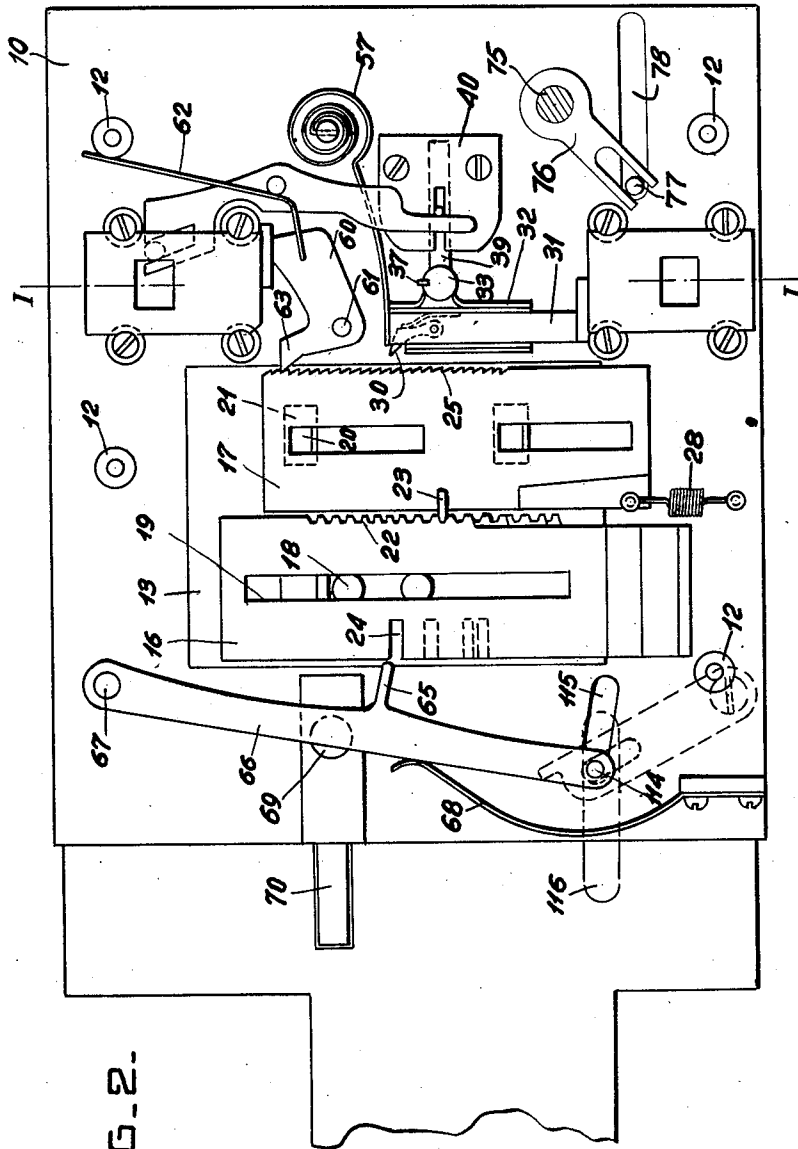


FIG. 2-

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SECRET OR COMBINATION LOCK

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6 Sheets-Sheet 3

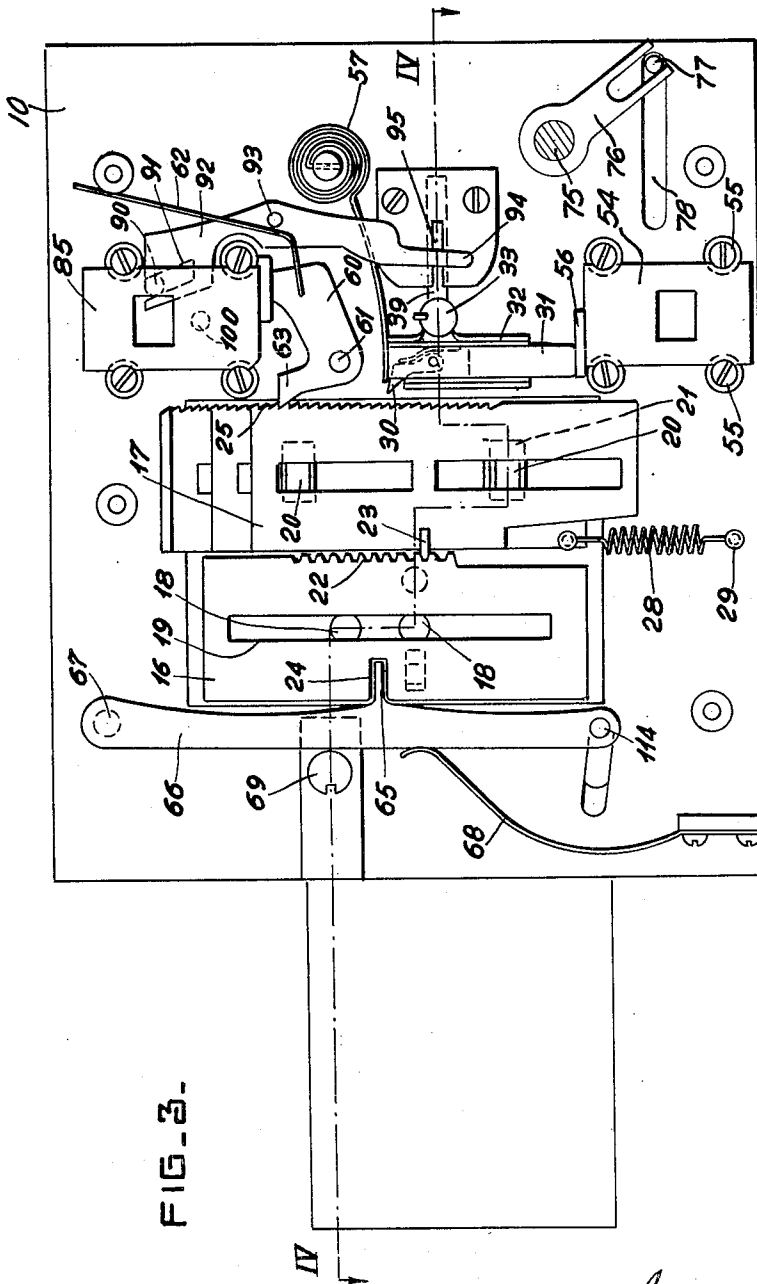


FIG. 3-

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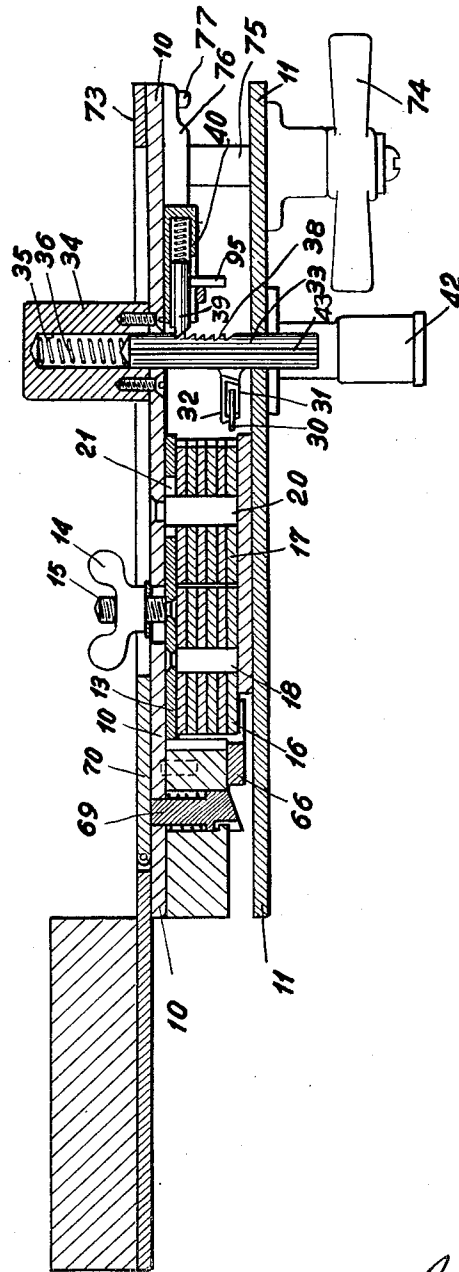
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6 Sheets-Sheet 4

FIG. 4-



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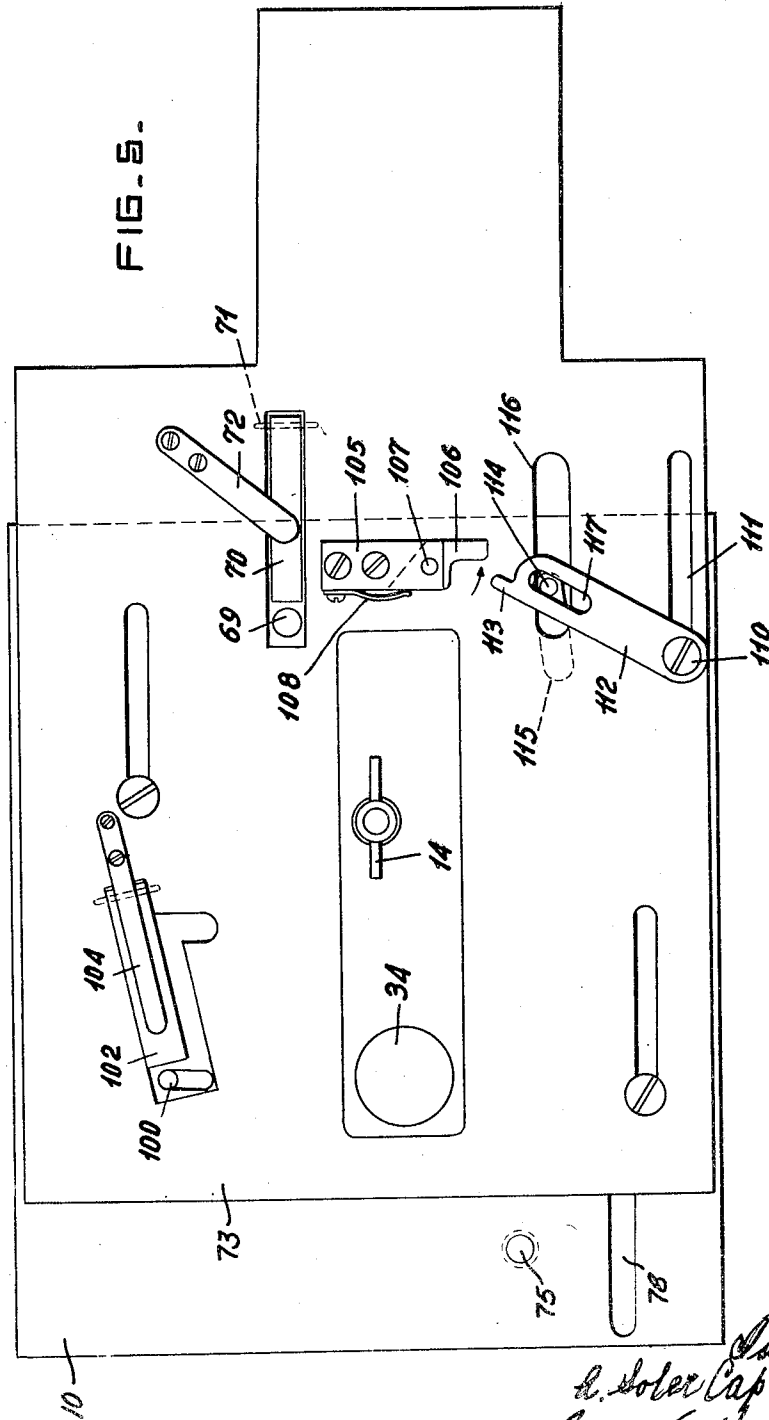
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A. SOLER CAPDEVILA
SECRET OR COMBINATION LOCK

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6 Sheets-Sheet 5



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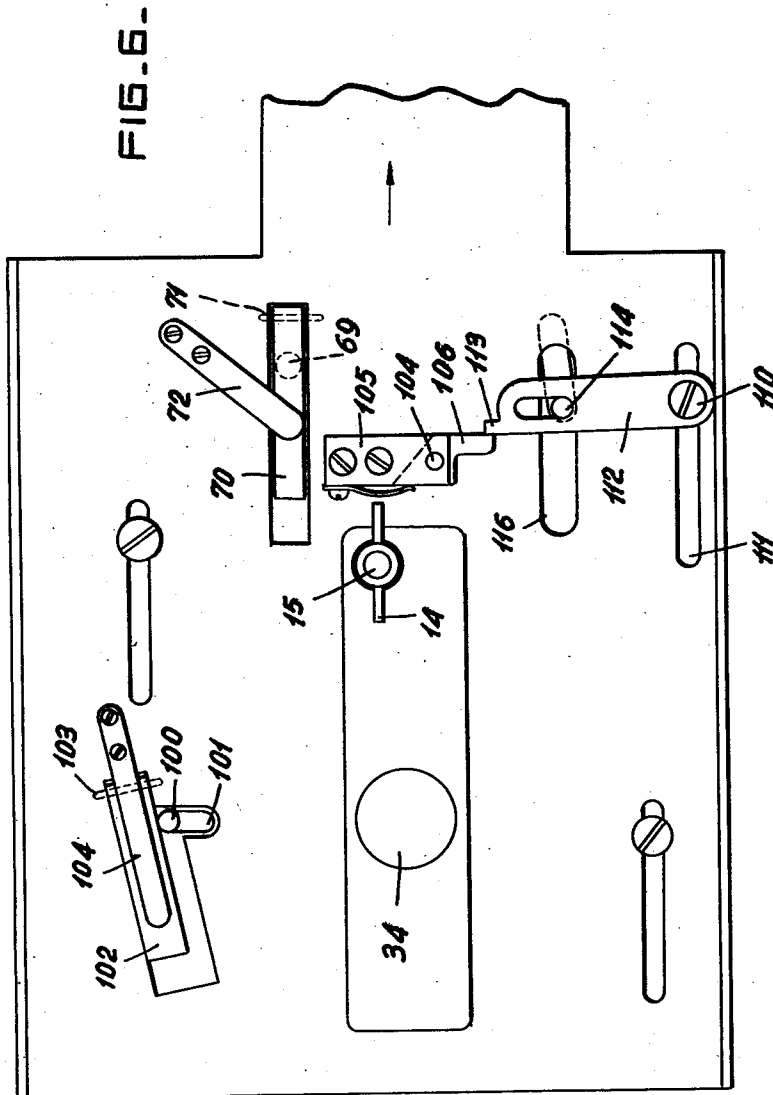
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A. SOLER CAPDEVILA
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6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

2,566,967

SECRET OR COMBINATION LOCK

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Application April 29, 1947, Serial No. 744,707
In Spain October 10, 1944Section 1, Public Law 690, August 8, 1946
Patent expires October 10, 1964

7 Claims. (Cl. 70—299)

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This invention relates to a new type of secret or combination lock, that is to say a keyless lock in which the combination is brought about by the coinciding of various movable elements.

Secret or combination locks comprising a certain number of discs that are made to turn independently and that have to coincide in a position previously decided of before the displacement of the bolt becomes possible are already well known.

The lock that forms the object of this invention differs completely from the above-mentioned well-known type and comprises a certain number of wards that can be displaced vertically or in some other direction, each one of these wards being composed of two pieces or parts coupled together and whose relative position may be changed at will, and one of the two halves or parts of each ward carrying, moreover, a toothed rack by means of which the gradual displacement of the complete or double ward is brought about, the other half bearing a notch or indented groove that permits the displacement of the locking bolt when it coincides with all the wards on one and the same plane. In combination with the wards, and, more precisely, with that half that is provided with a toothed rack, there is a pawl or clutch tooth that brings about the displacement of the wards. This pawl tooth can be displaced in a direction parallel to itself in order to come opposite one or other of the wards, which is brought about by means of a button or feeler, that, on being worked, situates the said pawl opposite the toothed rack of the first ward, or else, on being pressed twice, opposite the second ward, and so on in succession. The pawl is also in combination with a second feeler by means of which the said pawl may be displaced in the direction of its axis, so that it can catch in one of the teeth of the toothed rack of the chosen ward, causing that ward to advance to an extent corresponding to the distance between two teeth.

So, then, when once the pawl or clutch tooth has been brought opposite the toothed rack of the ward it is desired to move, the second feeler is pressed as many times as it is necessary to move the ward in question forward, the ward remaining fixed in the required position by means of a separate retaining pawl or tooth.

In this manner each one of the wards is displaced, independently of each other, to the extent desired and previously determined in accordance with the combination that has been chosen, and when they have all been displaced, the co-

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incidence of the notch or indented groove is brought about, which permits the displacement of the organs that work the locking bolt.

The lock further comprises a mechanism brought into action by a third feeler by means of which all the wards and pawls are left free, the former returning to their original position or point of departure.

This mechanism is worked by hand by means of the feeler whenever this should be desired, and is also worked by the bolt of the lock itself, in such a manner that, on opening the lock, the original position of the wards and pawls are restored.

Finally, the lock further comprises the means of making it possible to change the secret or combination whenever this may be desired, and for this purpose, one of the halves of the wards is mounted on a movable plate capable of being displaced laterally and that may be attached to the rear plate of the lock by means of a bracket bearing or thumb screw in such a way that on loosening the said screw and sliding the movable plate, the two halves of the wards can be separated from each other and the new combination then set up, the two halves then being put together again in accordance with the fresh combination.

The attached drawings show, as an example a constructional form of setting up the lock that is the object of this patent.

Figure 1 is a vertical section taken on the line I—I of Fig. 2 showing the disposition of the feelers or stops.

Figure 2 is a front view of the interior mechanism of the lock, with the rear plate of the safe and certain other elements removed and the lock closed or locked.

Figure 3 is a view similar to that of Fig. 2 which shows the mechanism of the lock after the combination has been brought into action and with the lock opened.

Figure 4 is a transverse section along the line IV—IV of Figure 3 with the rear plate and certain of the other elements replaced.

Figure 5 shows the obverse of the lock with the bolt shot or closed.

Figure 6 shows the obverse of the lock, too, but after it has been opened.

The lock as a whole can be seen in Figures 1, 2 and 3. It is made up of a basic plate 10 and by another parallel front plate 11, kept at a suitable distance apart by the small columns or pillars 12, thus forming an enclosure or case that encloses the mechanism of the lock. On the inside

face of the plate 10 there has been placed another plate 13 (Fig. 4) of lesser dimensions and mounted in such a manner that it may be given a small sideways displacement and capable of being fixed in the requisite position by means of the nut or thumb-screw 14 that screws onto the peg or pin 15 solidly mounted in the plate.

In contact with the said plate 13 there are disposed a certain number of wards, placed one above the other and made up, as has been said above, of two halves 16 and 17. The plate 13 carries two or more pins 18 that serve as guides to the wards 16, being introduced into a slot or groove 19 made longwise in the said wards, in such a manner that the latter may move in a vertical direction, as may be seen in Figures 2 and 3. On the other hand, the other half of the wards or the part 17 is mounted in a similar way on pins 20, fixed to the rear wall 10 of the framework and going through the plate 13 by cuts 21 made for the purpose that extent in a transversal direction.

The parts 16 and 17 are coupled together so that they both are displaced at the same time or in unison, and this coupling is constituted by the placing of a cogged edging 22 on the inside edge of the part 16 and by a tooth or projection 23 fixed in the inside edge of the part 17 and capable of fitting into any point on the cogged edge 22, the relation of height between the parts 16 and 17 then being altered. The part 16 has, moreover, a slot 24 in its outer edge, into which a projecting arm of a retention lever for the locking bolt may be introduced, as will be described later on, and on the other hand, the part 17 has, on its outer edge, a cogged track or ratchet 25, preferably in the shape of the teeth of a saw, by means of which the displacement of the wards is brought about.

It will, then, be understood that with this arrangement of the wards they may be displaced in an upward or downward direction, being suitably guided by the pins 18 fixed to the plate 13 and by the pins 20, fixed to the rear wall 10. The downward movement of the wards is facilitated by the action of a spring 28 stretched between the lower ward and a fixed point in the framework 29.

Parallel to the toothed edges of the wards is a pawl or clutch tooth 30 mounted so as to oscillate at the end of a rod or ruler 31 that can be displaced vertically, sliding on the inside of a guide made for that purpose 32. This guide 32 is attached to a cylindrical pin 33 arranged transversally to the lock and in such a manner that, after going through the rear wall it is introduced into a socket 34 of suitable size attached to the rear wall referred to, and having a cavity 35 that serves as a guide and support to the pin 33. In the said cavity there is lodged a spring 36 that distends so as to force the pin 33 outwards and towards the front of the lock.

The pin 33 has a nerve or cotter 37 that on being introduced into a suitable slot in its support, prevents the said pin from turning, thus assuring the correct position of the tooth of the pawl. The pin 33 has also, on its side, a tooth that works in combination with a retaining tooth or pawl 39 elastically mounted on a suitable support 40, in such a manner that the said retaining tooth serves to fix the position of the pin and, therefore, of the tooth of the pawl exactly opposite the ward it is desired to move.

The pin 33 itself is also provided with another cogged track or ratchet 41 in its lower side (Figure 1), arranged so as to work in combina-

tion with a feeler button that projects beyond the surface on the outside of the lock, the said button being constituted by a socket 42 that is of a solid piece with a pin 43 capable of moving in the direction of its axis or parallel to its axis on the inside of the cylindrical sleeve 44 that passes through the rear wall 11 of the lock underneath the operating pin 33. The pin 43 has at its end a cam or tooth 45 that remains hidden inside the cylindrical sleeve 44 when the pin is displaced towards the outside by the action of the spring 46 situated in the interior of the socket and the said tooth engages in one of the cogs of the ratchet 41 and carries it forward to the extent necessary for the operating rod 31 with clutch tooth 30 to be displaced until it is brought opposite the contiguous ward, moving forward each time a distance equal to that between two wards, the cylindrical pin 33 being held in the required position by the retaining tooth 39, as has been said above.

And so, by means of the feeler button 42 the clutch tooth 30 is moved along and brought opposite the ward it is desired to move.

Once this position has been reached, the operating rod 31 is brought into action by means of the button or feeler 50, which, like the one described above, is in the shape of a socket attached to a central pin 51 that can be displaced in the inside of a cylindrical sleeve 52 attached to the front plate of the lock. The central pin 51 ends in an inclined plane 53 that acts on the movable piece 54 mounted in a suitable manner on the supports 55 in such a way that it may be displaced in a vertical direction. The piece 54 is widened out at its upper end to form a small platform 56 on which the rod or ruler 31 is brought to rest, so that in whatever position the said operating rod 31 may be at the moment, it will be pushed by the piece 54 on being displaced upwards by the button or feeler 50, in such a manner that whenever this button is brought into action the tooth 30 of rod 31 brings about the upward displacement of the selected ward to an extent corresponding to one tooth. The wards are retained in the position they have reached, by means of the retaining teeth 60 (Figures 2 and 3), one for each plate, mounted so as to be able to oscillate on the axis 61 and that, by means of the respective springs 62, engage at the point or tooth 63, in the cogs of the ratchet 25, thus preventing the wards from dropping.

The spiral or other form of spring 57 is intended to push the operating rod 31 towards the lower part, keeping it in contact with the piece 54.

When once the wards have been brought into the desired position the slots or notches 24 coincide on the same plane and into them may now be introduced the nerve or rib 65 of the lever 66 that revolves around the axle 67 and comes under the action of the spring 68 that is intended to bring the nerve or rib 65 alongside the lateral edge of the wards and engage it in the slots or notches 24 as soon as they are in line.

The lever 66 brings pressure to bear sideways on the displaceable stop peg 69 so that whilst the said lever is in the position shown in Figure 2 the stop peg 69 projects on the opposite side (Figure 5) and prevents the displacement of the locking bolt 73, since the said stop peg comes up against the feather or tongue 70 of the same. On the other hand, the stop peg 69 comes under the pressure of a spring that is intended to lift it against the lever 66 so that as soon as the nerve or rib 65 is introduced into the slot 24 the

said stop peg is left free, thus enabling the displacement of the locking bolt 73 in order to unlock it. The displacement of said locking bolt 73 is obtained by any convenient means. In Figs. 2, 3, 4 and 5 there is shown a handle 74 fixed on an axle 75. This axle has a forked arm 76 which embraces a pin 77 fixed on the locking bolt 73 and protruding through a slot 78 cut in the rear plate of the lock. The rotation of handle 74 produces a right or left displacement of locking bolt 73. If a more extensive displacement is desired it can be obtained by means of a toothed rack and pinion arrangement. The tongue 70 is mounted in such a way as to be able to oscillate on the axle 71 and is submitted to the action of a sheet spring 72 in such a manner that, in the reverse movement, on the bolt being locked, the lever 66 once again pushes the stop peg 69, which in its turn lifts up the said tongue 70 until the bolt returns to its closed or locked position. The stop peg 69, on coming up against the end of the tongue 70 constitutes a safety catch that prevents any possible displacement of the bolt.

The mechanism of the lock that constitutes the object of this patent is in combination with an arrangement that enables the position of the wards constituting the combination in respect to one another to be returned to their original position, or the one represented in Figure 2, and this may be convenient or necessary whenever some mistake may have arisen on pressing the buttons or feelers, or if it should be necessary to work the combination again from the beginning.

For this purpose a third feeler button has been provided, situated in the upper part of the lock, and which, like the previously mentioned ones, is constituted by a socket 89 solid with a pin or peg 81 that may be displaced in the direction of its axis in the interior of a tubular sleeve 82 attached to the rear plate of the lock. The pin 83, at its inner end, terminates in an inclined plane 83 that acts on one edge of the opening 84 made in the slide or runner piece 85, that is capable of an upward or a downward displacement, as it is suitably guided by the supports 86. This piece 85 forms, at its lower end, a platform 87 that rests on the rear part of all the retaining teeth 60 in such a way that on the feeler button 80 being pressed, the piece 85 is displaced downwards, and this pushes the retaining teeth 60 and causes them to oscillate around their axis 61 and sets the teeth 63 free from the wards, whereby the said wards all remain free and are displaced towards their extreme lower position by their own weight and with the assistance of the spring 28.

The displaceable piece 85 bears, on one of its faces, an axle 90 that is introduced into a slot of a slanting shape 91 of the lever 92, capable of oscillating around its axle 93, and the said lever terminates, at its other end, in a finger or point 94 that, on oscillating, comes to lie against the pin 95 attached to an extension of the tooth 39, in such a manner that when the piece 85 comes down, the said lever 92 oscillates and comes away from the tooth 39 that was fixing the position of the pin 33, this latter thus being free to return to its original position by virtue of the action of the spring 36, whilst, at the same time, the retaining teeth 63 are also set free. After this combined operation, the mechanism is in a position to bring the feeler buttons into play once more.

This same operation for returning the wards to their original position is brought about auto-

matically by the displacement of the bolt itself in its locking movement. For this purpose the slide piece 85 carries a pin 100 that goes through the rear wall of the lock, through the slot 101.

The locking bolt, as may be seen in Figure 5, has a feather or tongue 102, arranged in a slanting position and lodged in an opening made for this purpose, this tongue being articulated on the axle 103 and submitted to the action of a sheet spring 104 that is intended to bring it to lie against the rear plate 10 of the lock. The pin 100 projects in front of the end of the tongue 102, and this end is cut at an angle or bevelled, so that, when the locking bolt slides in its movement for unlocking, the tongue comes up, passing over the pin 100, the said pin being, at the end of its movement, in the position represented in Figure 6 against the lower sloping edge of the tongue. When the locking bolt is displaced, in its movement for locking, as is shown by the arrow in Figure 6, the tongue obliges the pin 100 to displace itself downwards, and therefore the whole ensemble of the piece 85 described above is brought into action, thus returning the wards to their original position.

The displacement of the locking bolt also acts on the lever 66 that fixes the wards, for the purpose of causing the said lever to return to its original position and leaving the wards free. For this purpose, on the rear face of the locking bolt there is attached the support 105 bearing the oscillating tooth 106, that oscillates around the axle 107 in the direction shown by the arrow in Figure 5, and held in its extreme position possible by the action of the spring 108. On the other hand, the rear plate 19 of the lock bears the pin or axle 110 that goes through the slot 111, made in the locking bolt and serves as axle for a lever 112 to turn on, which lever forms a tooth 113 that can, under certain conditions, come up against the tooth 106. The lever 66 has, at its lower end, a pin 114 that, after going through the rear plate of the lock through the slot or cut 115 and the bolt plate through the slot 116, is introduced into a slot 117 made in the above-mentioned piece 112. Thanks to this arrangement, when the lever 66 oscillates around its axle 67 and the rib 65 is introduced into the slot of the wards, it pulls, in its movement, the lever 112, which takes up a vertical position to the left of the tooth 106, and, in the movement of the unlocking of the locking bolt, this tooth 106 oscillates around the axle 107 and jumps to the other side of the tooth 113, or, in other words, the lever 112 is now to the right of the tooth 106, as may be seen in Figure 6. After this, on bringing about the locking movement of the bolt in the direction shown by the arrow in Figure 6, the tooth 106 comes up against the tooth 113 and causes the lever 112 to oscillate, which, in its turn, pulls the pin 114 which moves the lever 66, causing it to come away from the wards and making it possible to return them to their original position, as has already been explained, and leaving all the elements of the lock in condition to carry out a fresh operation.

The combination or secret of the lock may be modified at will. As has already been said above, the wards 16 are set on an interior plate 13, and this plate is attached to a stem 15 that goes through the rear plate 10 of the lock. This stem by means of a nut or thumb-screw 14 enables the plate to be fixed in the desired position. The wards 17, on the other hand, are guided by the pins 20 that are attached to the rear plate of

the lock, so that the said wards 17 shall not receive any sideways displacement. Thanks to this arrangement, if the thumb-screw 14 is loosened, the plate 13 can be made to slide towards the left, pulling with it the wards 17, that is to say, the teeth 23 become separated from the toothed rack or ratchet 22 and the relative position of the wards may then be changed as desired.

Therefore, to change the combination, it is sufficient to unlock the lock in the usual way, and, when it is unlocked, and when all the wards 16 come to be one above the other, the thumb-screw 14 is loosened and the wards are displaced towards the left by being uncoupled from the wards 17. The combination is then wiped out or annulled by pressing the button 30, whereby the wards 17 will all be displaced to their utmost limit downwards, whereupon the fresh combination desired is marked by means of the buttons 42 and 50, and, once the new combination has been set up as desired, the wards 16 are slid back again and coupled once more with the wards 17 in the new relative position they have acquired, and the lock is once again in position to function with the new combination. As will be seen, all this is carried out without the necessity of taking down either the lock or any of its organs.

The lock that constitutes the object of this patent may also be constructed in such a way that the buttons or feelers do not project beyond the front of the lock, and the whole mechanism is susceptible of being set up in a reduced and compact form, being specially recommended for all those applications in which it is desirable to have a safety lock, such as the doors of flats, safes and others.

The preceding description refers solely to a preferential form of setting up the secret or combination lock that constitutes the object of this present patent, but it will, nevertheless, be understood that all or any of such variations of construction or detail as do not alter the essential characteristics, which will be resumed hereinafter, may be introduced.

I claim:

1. A combination lock comprising a casing, a plurality of superimposed wards placed in such a manner that they may be displaced sideways, each of said wards being composed of two parts placed side by side and mounted on independent guides carried by said casing, said two parts of each ward being movably coupled to each other, a first part of said wards having a toothed rack in its inner edge and a second part having in its inner edge a tooth engaging said rack, the displacement of one of said parts displacing the other, a second toothed rack in the external edge of one of said parts of said wards, clutch pawls operatively contacting said second rack for bringing about the gradual displacement of the complete ward, a lateral indentation in the external edge of the other said part of said wards, a lever pivoted on said casing and being provided with a rib in contact with said external edge of the wards, a laterally displaceable locking bolt supported by said casing, a projecting pin movably mounted in said casing and being normally retained by said lever in a position to dog said bolt, said lever being displaceable in a direction to position said rib in the indentations of all said wards when said indentations coincide on the same transversal plane as regards said rib thereby permitting retracting the projecting pin, and said locking bolt being laterally displaceable

when the projecting pin is allowed of displacement by said lever.

2. A combination lock as claimed in claim 1, said casing comprising a rear plate and having pins secured to said rear plate thereof, the parts of the wards having the second toothed racks thereon being guided in vertical movement of displacement by said pins, a horizontally movable plate in said casing, means for immobilizing said movable plate, pins attached to said horizontally movable plate, the parts of said wards having the lateral indentations being guided in their vertical displacement by said last named pins, said parts of said wards having the indentations thereon also being displaceable by said plate whereby uncoupling of the other part of said wards is effected and enabling the combination of said lock to be varied for another and different one, the two parts of said wards then being capable of being coupled together again for the normal functioning of the lock.

3. A combination lock as claimed in claim 2, a pawl tooth engageable with said second toothed rack of one of said wards, a transversal pin movably mounted in said casing, said pawl being mounted on said transversal pin, a first push button mounted on said casing and adapted to co-act with said transversal pin and projecting outside of said lock, the said transversal pin being capable of being displaced transversally so as to bring the pawl tooth opposite the ward it is desired to move, and a retaining tooth movably mounted in said casing for contacting and retaining said transversal pin in the desired position.

4. A combination lock as claimed in claim 3, a second button mounted on said casing and having an inclined plane, a vertically displaceable plate supported in said casing actuable by said second button, a platform on said plate, said pawl resting on said platform whereby whatever be the position of the said pawl with regard to one or another of said wards, the pressing of said second button brings about vertical movement of the plate and action of said pawl to displace the corresponding ward to the extent of the distance between two teeth thereof, this operation being repeated as many times as may be necessary to displace the ward to a desired extent.

5. A combination lock as claimed in claim 4, an oscillating member rotatably mounted in said casing, a ward retaining tooth on said member for engaging in said second toothed rack of said ward for fixing said ward at the height reached, and a spring in said casing in operable contact with said member, the said member being oscillatable under the action of said spring for maintaining it constantly against the said second toothed rack.

6. A combination lock as claimed in claim 5, a third push button mounted on said casing and having a pin with an inclined plane thereon, a plate member supported in said casing and movable by said pin, said oscillating member having said retaining tooth being contacted by and movable by said last named plate, said last named plate also moving the retaining tooth that fixes the transversal pin attached to the operating pawl in such a manner that when the said push button is brought into action, said wards and the operating pawl are set free from the respective retentions, and springs in said casing to return these members to their original position.

7. A combination lock, as claimed in claim 6, said plate acted on by said third push button be-

ing operatively connected with said locking bolt, whereby upon movement in locking said bolt, said last plate is put into motion, and said retaining tooth, said wards and the other elements are returned to their original position through the displacement of the locking bolt.

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