June 15, 1926. 1,588,896

M. J. LENSKY ET AL

COMBINATION LOCK

Filed May 22, 1922 2 Sheets-Sheet 1

Fig. 1

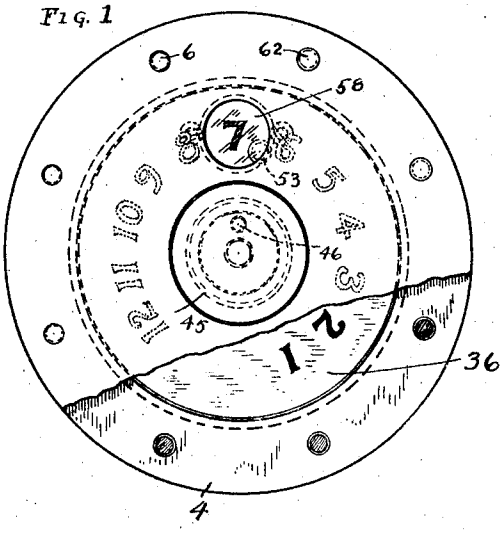


Fig. 2.

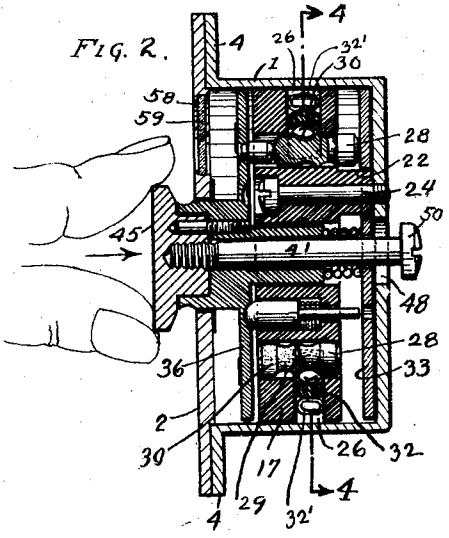


Fig. 3.

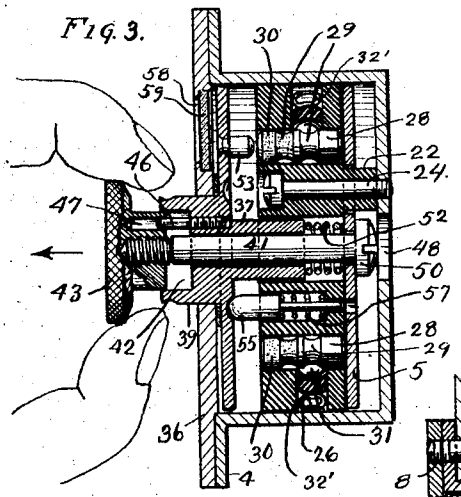


Fig. 4

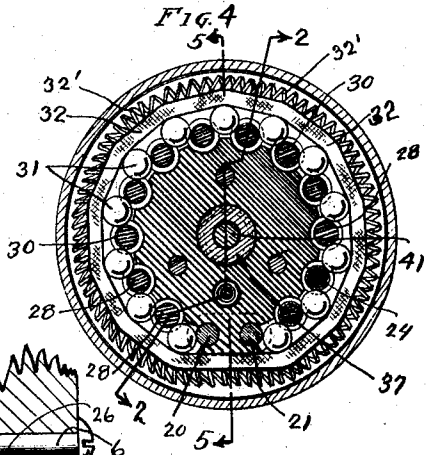
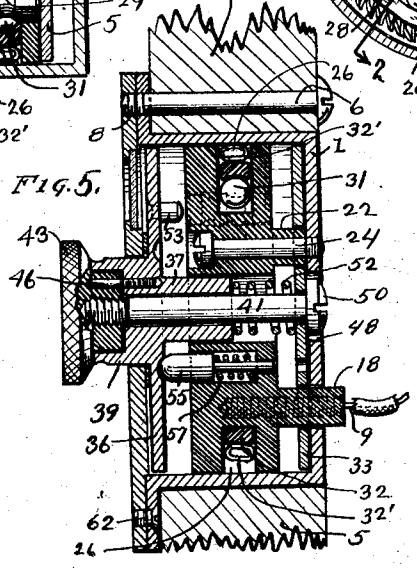


Fig. 5.



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Fig. 6.

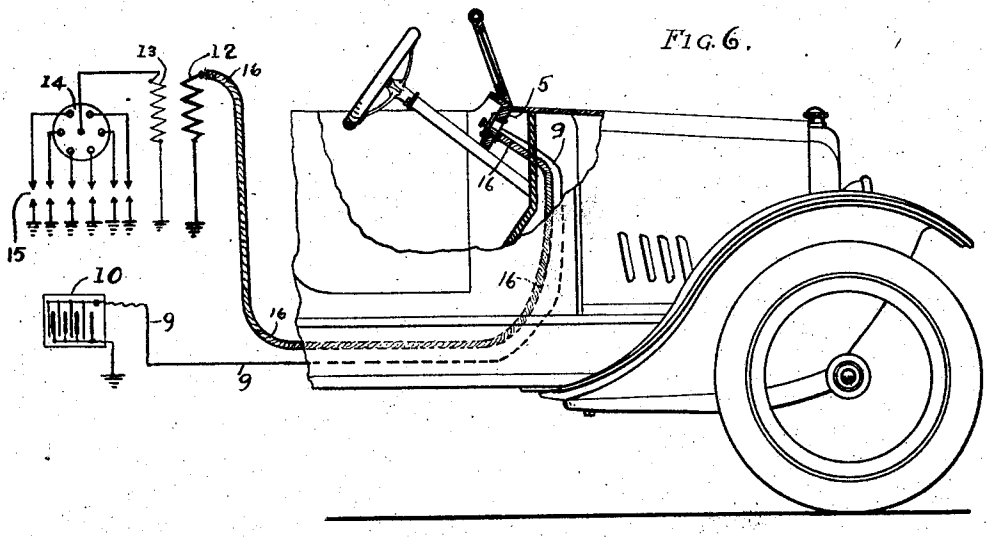


Fig. 8.

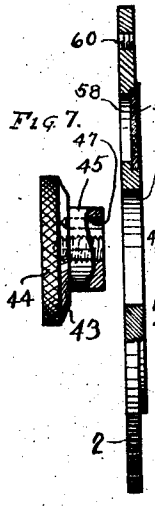


Fig. 9.

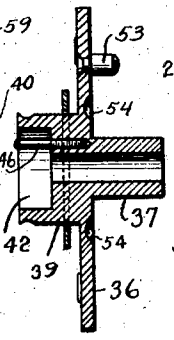


Fig. 10.

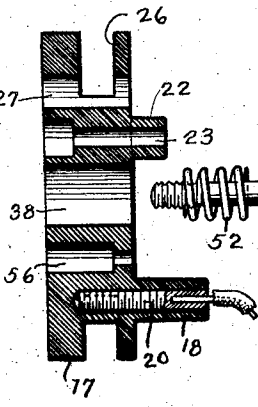


Fig. 11.

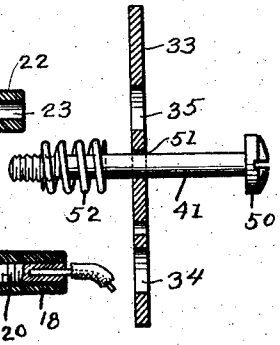


Fig. 12.

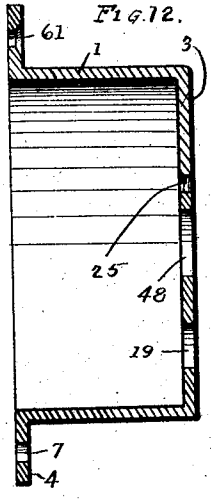


Fig. 13.

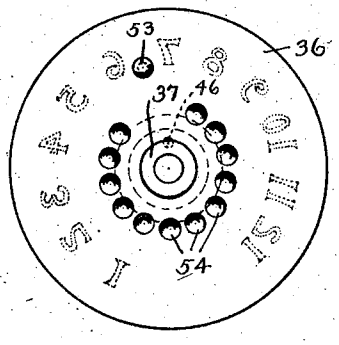
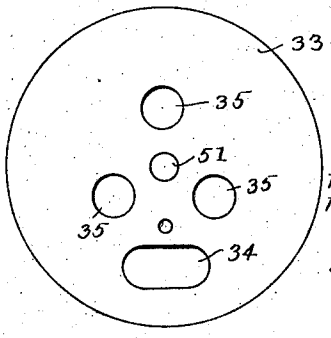


Fig. 14.



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UNITED STATES PATENT OFFICE.

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COMBINATION LOCK.

Application filed May 22, 1922. Serial No. 562,768.

This invention relates to combination locks and more particularly to a combination lock for controlling an electric circuit such as the ignition circuit of an automobile.

An object of the invention is to provide a compact, easily operable lock which is adapted to be set for any one of a large number of combinations and in which the combination can be easily changed whenever desired.

A further object is to provide a lock in which the controlling elements can be individually actuated and reset by a single actuating member.

A further object is to provide a combination lock operated by a rotatable knob which is movable in and out, as well as rotatably to operate individual controlling members and to reset the controlling members.

A further object is to provide a dial movable with the operating knob to actuate the controlling members, and provided with means for automatically positioning the dial with respect to the controlling members.

Other objects will be apparent from the following description in connection with the annexed drawings.

The following description and annexed drawings set forth in detail certain means embodying our invention, the disclosed means, however, constituting but one of the various mechanical forms in which the principle of the invention may be employed.

In said annexed drawings,

Fig. 1 is a plan view of the lock showing a portion of the cover plate broken away to show the dial.

Fig. 2 is a section through the lock taken on line 2—2 of Fig. 4 showing the knob pushed in to shift one of the controlling pins.

Fig. 3 is a section similar to that shown in Fig. 2 showing the knob pulled out to reset all the controlling pins.

Fig. 4 is a section taken on line 4—4 of Fig. 2.

Fig. 5 is a section taken on line 5—5 of Fig. 4 and showing the lock attached to its support.

Fig. 6 is a diagrammatic view showing the manner in which the lock is applied to an automobile ignition system.

Figs. 7, 8, 9, 10, 11 and 12 are sectional views showing the knob, cover plate, dial, insulating block, resetting plate and connecting bolt, and lock casing, respectively, separated but arranged in the order in which they are assembled.

Fig. 13 is a plan view of the inner face of the dial.

Fig. 14 is a plan view of the resetting plate.

Referring to the annexed drawing, the lock housing consists of a cup shaped casing 1 and a cover plate 2. The casing 1 has a flat back wall 3, a cylindrical body and an outturned front flange 4 to which the cover plate 2 is attached. The entire lock mechanism is mounted in the housing and the casing 1 is fitted into an aperture in a support 5, such as the instrument board of an automobile, as shown in Figs. 5 and 6, with the flange 4 resting against the outer face of the support around the aperture. The lock housing is secured to the support 5 by means of bolts 6 passing through the support from the rear and through apertures 7 in the flange 4 and screwed into threaded apertures 8 in the cover plate 2 which register with the apertures 7 in the flange 4.

Figure 6 shows the lock applied to the ignition circuit of an automobile. One terminal is connected to the wire 11 which is connected to the primary 12 of a transformer, the secondary 13 of which is connected to the distributor 14 which delivers the current to the spark plugs 15 in proper succession, as is well understood in the art. The wire 11 is preferably enclosed in an armored conduit 16 secured to the casing enclosing the coil. The conduit is of a well-known type which cannot be easily cut or severed and is suitably secured in any well-known manner to the lock casing and the coil casing, so that it cannot be removed therefrom without destruction or removal of such casings. The wire 9 is preferably not enclosed in the armor casing but leads directly to the battery from one terminal of the lock. With this construction it will be seen that the wire 11 is well protected between the combination lock and the coil casing, so that it cannot be reached and short-circuited outside the lock.

The circuit make and break devices of the lock are mounted in a circular block of insulating material 17, which fits within the casing 1 and is rigidly secured therein. The insulating block 17 is provided with a boss 18 adjacent the edge thereof, which projects through an elongated aperture 19 in the

rear wall 3 of the casing 1. The boss 18 has embedded therein a pair of conductor terminal posts 20 and 21 adapted to be connected to the wires 9 and 11 of the ignition circuit. The body of the insulating block 17 is spaced from the rear wall 3 of the casing 1 by means of a plurality of bosses 22 which abut against the rear wall. Bolt holes 23 extend through the block 17 centrally of the bosses 12 and are counterbored to receive the heads of attaching bolts 24 which are screwed into threaded apertures 25 in the rear wall 3 of the casing, which register with the bolt holes 23 in the insulating block 17. The insulating block 17 has a relatively deep peripheral groove 26 and a series of regularly spaced apertures 27 extending therethrough and intersecting the bottom portion of the groove 26. Fitting in each of the apertures 27 is pin 28 formed of hard rubber or other insulating material, the pins 28 being all of the same size and shape and interchangeable. Each pin 28 has a pair of peripheral round bottom grooves 29 spaced equal distances from the opposite ends thereof and a thin metallic collar 30, preferably of brass, at one end and extending into one of the grooves 29. Mounted in the peripheral groove 26 of the insulating block 17 are a series of metallic balls 31, interposed between the pins 28 and adapted to seat in the rounded grooves 29 of the pins. The balls 31 are held in place by a suitable elastic ring 32 which must have an insulated inner face and may be in the form of a rubber band. The band or ring 32 is preferably superposed by a spring 32' which together with the band gives sufficient tension to hold the balls 31 firmly in place. The terminal posts 20 and 21 each contact with one of the balls and when the pins are so positioned that the metallic collar 30 of each pin 28 is in contact with the adjacent balls 31, current can flow from the terminal post 20 to the other terminal post 21 through the balls 31 and collars 30.

A pin resetting plate 33 is mounted for movement between the rear wall 3 of the casing 1 and the rear face of the insulating block 17. The resetting plate 33 has an elongated aperture 34 through which the boss 18 of the insulating block 17 extends and apertures 35 to receive the spacing bosses 22. The resetting plate 33 is slidable on the bosses 18 and 22 between the rear wall 3 of the casing 1 and the rear face of the insulating block 17. A dial plate 36 has a central cylindrical boss 37 projecting from its inner face and fitting in a central aperture 38 through the insulating block 17. Projecting from the front face of the dial plate 36 is a knob receiving boss 39 which extends through a central aperture 40 in the cover plate. The dial plate 36 is bored axially through the bosses 37 and 39 to receive a connecting bolt 41 and the boss 39 has a counterbore 42 in which the knob is secured. The knob 43 has a knurled head 44 and a cylindrical boss 45 which fits within the counterbore 42. The boss 45 of the knob is bored axially and tapped to receive the threaded end of the connecting bolt 41. A stud 46 is secured in the bottom of the counterbore 42 of the dial plate boss 39 and the boss 45 of the knob 43 has a bore 47, into which the stud 46 projects to prevent rotation of the knob 42 with respect to the dial plate 36. The rear wall 3 of the casing 1 has a central aperture 48 large enough to permit the head 50 of the connecting bolt 40 to freely pass therethrough. The resetting plate 33 has a central aperture 51 to receive the stem of the connecting bolt 40. A coil spring 52 is interposed between the end of the boss 37 of the dial plate 36 and the resetting plate 33, and serves to normally hold the dial plate 36 against the inner face of the cover 2, and the resetting plate 33 against the rear face 3 of the casing 1. When the knob 43, dial plate 36, and resetting plate 33 are connected as above described, the dial plate can be rotated by the knob, the dial plate 36 can be pushed toward the insulating block 17 by pressing inwardly on the knob 43, and the resetting plate 33 can be moved against the rear face of the insulating block 17 by pulling the knob 43 outwardly, the dial plate, resetting plate and knob being returned to normal position by the spring 50 when released. The dial plate 36 carries an inwardly projecting stud 53 which is adapted to register with any one of the apertures 27 in the insulating block and to engage the pin 28 in such aperture when the knob 43 is pressed inwardly.

The pins 28 are of a length equal to the thickness of the insulating block 17, and the peripheral groove 26 is closer to the rear face of the insulating block 17 than to the front face thereof, so that when the pins 28 are positioned with their ends flush with the front and rear faces of the block, the inner of the two grooves 29 in each of the pins registers with the groove 26. The stud 53 is of such length that when the dial plate 36 is pushed against the insulating block 17 the pin 28 engaged by the stud 53 is pushed just far enough to bring the outer of the two grooves 29 thereof into registry with the peripheral groove 27 in the insulating block 17. The balls 31 serve to hold the pins 28 in either of their positions. The resetting plate 33, when against the rear wall 3 of the casing 1, is spaced just far enough to permit the pins to be shifted as above described.

In order to insure registry between the stud 53 and the apertures 28, the inner face of the dial plate 36 is provided with an arcu-

ate row of concave indentations 54, which have the same angular spacing as the apertures 27 in the insulating block 17. A slidable pin 55 provided with a rounded end engageable in the identations 54 in the dial plate 36 is seated in a recess 56 in the insulating block 17 and is pressed outwardly by means of a coil spring 57. The outer face of the dial plate 36 is provided with an arcuate row of suitable characters such as the ordinals 1, 2, 3, etc., which have the same angular spacing as the apertures 28 in the insulating block. The cover 2 has a circular aperture 58 covered by a transparent panel 59, in registry with which the characters on the dial are successively positioned as the dial is rotated. The dial plate 36 is so positioned with respect to the insulating block 17 that when the spring pressed positioning pin 55 clicks into an identation 54 on the inner face of the dial plate, one of the characters on the dial registers with the aperture 58 in the cover 2 and the stud 53 registers with the corresponding aperture 27.

In the drawing, a dial plate bearing the numerals 1 to 12 is shown, corresponding to the twelve apertures 27 in the insulating block 17, in which the pins 28 are mounted. The stud 53 is so positioned that when the numeral 1 on the dial registers with the aperture 58, the stud 53 is in alinement with the first pin 28 on the left hand side of the terminal posts 20. By turning the knob 43 in a clockwise direction, the numerals 1 to 12 are successively brought into view and the dial plate is successively positioned opposite each of the twelve controlling pins 28. It is to be noted that between the numerals 1 and 12 on the dial plate is a space substantially larger than the intervening spaces between the numbers consecutively arranged on the dial. Similarly, the indentations 54 on the inner face of the dial plate have an unusually large space between the first and last indentations. By this arrangement the operator can rotate the knobs 43, listening to the click of the pin 55 until the space is reached between the first and last identations. He will then know that the first clicks after that corresponds to number 1 on the dial, etc. Even in the dark therefore he will be able to operate the correct combination simply by listening to or feeling the clicks as the dial rotates.

The lock may be set for any possible combination of the numbers on the dial by reversing the pins corresponding to the numbers of the selected combination. As shown in Fig. 4, all the pins have their metal covered ends to the rear of the insulating block 17, so as to register with the groove 26, except the pins corresponding to dial numerals 1 and 10 which are reversed with respect to the others. With the pins set as shown in Fig. 4, if the knob 42 is turned to bring the numeral 1 into view and pressed in as shown in Fig. 2, and then turned to 10 and pressed in, the circuit will be completed between the terminals 20. When it is desired to render the circuit inoperative, the knob 42 is pulled outwardly, drawing the resetting plate 33 against the rear face of the insulating block 17 to return the projecting pins to their original position. The circuit can be rendered inoperative if desired by turning the dial to expose one of the numbers not in the combination and pushing in the knob 42. If so locked, it is necessary to pull the knob outwardly to reset the pins before operating the combination. In order to close the circuit it is necessary that only the pins corresponding to the numbers of the combination be actuated. If a wrong pin is actuated, it is impossible to close the circuit without first resetting the pins. Meddling with the lock by an unauthorized person may thus be detected. If the owner has locked the car by resetting the pins and someone has pressed in a pin not one of the combination during his absence, he will know that the lock has been tampered with because when the combination has been operated the circuit will not be closed and it will be necessary for him to reset the pins and reoperate the combination.

In assembling the lock the pins 28 are assembled in the apertures 27 in the insulating block 17 with the pins corresponding to the selected combination reversed with respect to the others, and the balls 31 are assembled within the band 32 in the peripheral groove 26. The resetting plate 33 is fitted upon the bosses 18 and 22 of the insulating block 17 and the block 17 with the resetting plate 33 in place thereon is attached to the rear wall 3 of the casing 1 by means of the bolts 24. The coil spring 52 is inserted in the axial aperture 38 of the insulating block 17, the spring 57 and pin 54 are placed in the recess 56 in the insulating block 17, and the boss 37 of the dial plate 36 is inserted in the aperture 38 of the insulating block. The cover plate 2 is then placed upon the boss 39 of the dial plate, knob boss 45 inserted in the counterbore 42 of the boss 39 with the pin 46 in the bore 47. The connecting bolt 41 is then slipped through from the rear and screwed into the knob 43. The cover plate 2 is then positioned and secured to the flange 4 of the casing 1. For securing the cover plate 2 to the flange 4 before the lock is fitted upon its support the cover plate 2 has threaded apertures 60 alternating with the attaching bolt apertures 8 and the flange 4 has apertures 61 alternating with the apertures 7. The apertures 61 are countersunk on the rear side of the flange 4 to receive the heads of screws 62 which secure the cover plate in

place. With the dial characters and pin operating stud arranged as shown in the drawings, the cover plate 2 should be positioned when attached to the flange 4 with its aperture 58 diametrically opposite the boss 18 of the insulating block 17. The lock will then be positioned on the instrument board 5 with the aperture 58 at the top and the lug 18 at the bottom. When the lock is attached to its support none of the lock attaching devices are accessible except from the rear side of the support, so that it is not possible for anyone to gain access to the lock mechanism from the front thereof.

It will thus be seen that we have devised a simple and efficient mechanism for easily making the electric circuit, for the ignition circuit of an automobile if the lock be applied to this use by simply shifting the proper pins so that their electrically conducting grooves will contact with the balls. As there may be any number of pins to be shifted and as there are a great multiplicity of combinations possible, it will be practically impossible for an unauthorized person to obtain the correct combination.

It will also be noted that if any one of the pins not in the combination to produce an electric circuit be shifted, the shifting of any or all of the remaining pins will not give a continuous electrical circuit through the lock, and all of the pins will have to be reset by pulling the actuating member outwardly and the correct pins in the combination properly shifted.

It will also be noted that as the pins are reversible, the combination may be changed as frequently as desired by simply removing one or more pins and reversing them end for end when returning them to the insulating block.

Furthermore, it is to be understood that the particular forms of apparatus shown and described, and the particular procedure set forth, are presented for the puposes of explanation and illustration, and that various modifications of said apparatus and procedure can be made without departing from our invention, as defined in the appended claims.

What we claim is:

1. In a combination lock, the combination with a series of shiftable controlling members, of a selective operating member mounted for movement into operative relationship with the individual controlling members and operable when so disposed with respect to a controlling member to shift the same and operable in any position to retract all controlling members which have previously been shifted.

2. In a combination lock, an arcuate row of shiftable controlling members, a rotatably and slidably mounted actuating member, said member having means thereon engageable with a controlling member when said actuating member is shifted bodily in one direction, and means for controlling the rotative movement of said actuating member to cause the same to stop with the engaging means in alinement with one of the controlling members.

3. In a combination lock, a casing, a block fixed in said casing, an arcuate row of controlling pins slidably mounted in said block, a rotatable and bodily shiftable dial plate, having a stud on its inner side, means for controlling the rotative movement of said dial to cause said stud to be alined successively with said pins whereby said pins can be successively shifted by a bodily movement of said dial plate, and means for resetting said pins.

4. In a combination lock, a casing, a block fixed in said casing, an arcuate row of controlling pins slidably mounted in said block, a rotatable dial plate movable toward and from said block, said dial plate having a stud projecting from its rear face and an arcuate row of indentations therein, said dial plate having also an arcuate row of characters thereon, the angular spacing of said pins, the indentations in said plate and the characters in said arcuate rows being the same, a detent carried by the block and engageable with said indentations to cause said stud to register with the individual pins, a cover plate for said casing having an aperture with which said characters on said dial plate successively register when said dial plate is rotated and a knob projecting through the cover for actuating said dial plate.

5. In a combination lock, a casing, a block secured in said casing, said block having an arcuate row of apertures therethrough, pins slidably fitting in said apertures, a rotatably actuating member mounted for bodily movement toward and from said block and adapted to shift the individual pins when moved toward the block, a resetting plate upon the opposite side of said block and means for moving said resetting plate toward and from the rear face of said block to reset all pins previously shifted.

6. In a combination lock, a casing, a block secured in said casing, said block having an arcuate row of apertures therethrough, pins slidable in said apertures, a cover plate, a pin actuating member rotatably mounted and slidable between the block and cover plate, a resetting plate slidably mounted between the rear wall of the casing and the rear face of the block, a spring interposed between said resetting plate and actuating member for normally holding them in engagement with the rear wall of the casing and the cover, and a common actuating means for said actuating member and resetting plate for rotating said actuating

member and shifting the same toward the block and for shifting said resetting plate toward the block.

7. In a combination lock, a circular block having a peripheral groove and a series of apertures intersecting the bottom portion of said groove, a series of slidable pins in said apertures, each of said pins having a pair of peripheral grooves, one of said grooves being normally in register with said groove, a series of balls in said block groove, each ball engaging in the grooves of two adjacent pins, resilient means for holding said balls in said groove, and means for shifting said pins to engage either of the grooves thereof with said balls.

8. In a combination lock, a circular insulating block having a peripheral groove and an arcuate series of apertures intersecting the bottom portion of said groove, a series of pins made of insulating material slidably fitting in said apertures, each of said pins having a pair of peripheral grooves and a metal band encircling one of said grooves, said pins each being adapted to be reversely positioned in said apertures, an arcuate row of metallic balls alternating with said pins in said block groove, each of said balls being in engagement with one of the grooves in each of two adjacent pins, conductor terminals in engagement with the end balls of the row, means for yieldingly holding said balls in place, and means for selectively shifting said pins and resetting the same.

9. In a combination lock for making an electric circuit, the combination with an arcuate row of shiftable reversible non-conducting pins having a portion of their surfaces forming an electrical conductor, of electrically conducting members contacting with adjacent pins, and a selective operating member mounted for movement into position to shift any such pin to make or break the electric circuit between such electric conductors.

10. In a combination lock for making an electric circuit, the combination with a casing, of a block fixed in said casing, an arcuate row of controlling pins slidably mounted in said block, said pins having grooves to be engaged by resiliently-pressed, electrically conducting members mounted in a groove in said block to normally tend to hold said pins, one of said grooves of each pin forming an electrical conductor, and a selective actuating member rotatable to individually shift said pins to aline the electrically conducting grooves with said electrically conducting members whereby an electric current can pass through said electrically conducting members and pins.

11. In a combination lock, a circular block having a peripheral groove and a series of apertures intersecting the bottom portion of said groove, a series of slidable pins in said apertures, each of said pins having a peripheral non-conducting groove and a peripheral electrically conducting groove, one of said grooves being normally in register with said groove, a series of electrically conducting balls in said block groove, each ball engaging in the grooves of two adjacent pins, resilient means for holding said balls in said groove, and means for shifting said pins to engage either of the grooves thereof with said balls, whereby an electric current may be transmitted through said pins and balls when said electrically conducting grooves of said pins are in contact with said balls.

12. In a combination lock for completing an electric circuit, the combination with a casing, of an insulating block carried by the casing and having a groove therein, a series of circuit making or breaking members shiftable transversely of said groove, electrical conducting members mounted in said groove to resiliently engage said shiftable members, said shiftable members having portions of their surface electrically conductive, and selective means operable to individually shift said members to make or break the circuit, and means to reset said members.

13. In a combination lock for an electric circuit, the combination with a casing, of an insulating block carried thereby and having a groove therein, a series of pins mounted in said block for movement transversely of said groove, said pins having portions of their surface formed of electrical conductive material and other portions of said pins being non-conductive, electrical conductive members in said groove and resiliently engaging said pins, means to selectively shift said pins individually to make or break the electric circuit, and means to reset said members.

14. In a combination lock, a casing having a cover member, a block fixed in the casing, an arcuate row of controlling pins slidably mounted in the block, said cover member having an aperture therein, a rotatable and bodily shiftable dial plate having a stud on its inner side and having indicating devices on its outer side to be visible successively through said aperture, means for controlling the rotative movement of said dial to cause said stud to be alined successively with said pins indicated by said indicating devices, whereby said pins can be successively shifted by the bodily movement of said dial plate, and means for resetting the pins.

In testimony whereof, we hereunto affix our signatures.

MORRIS J. LENSKY.
FRED A. HENSGER.