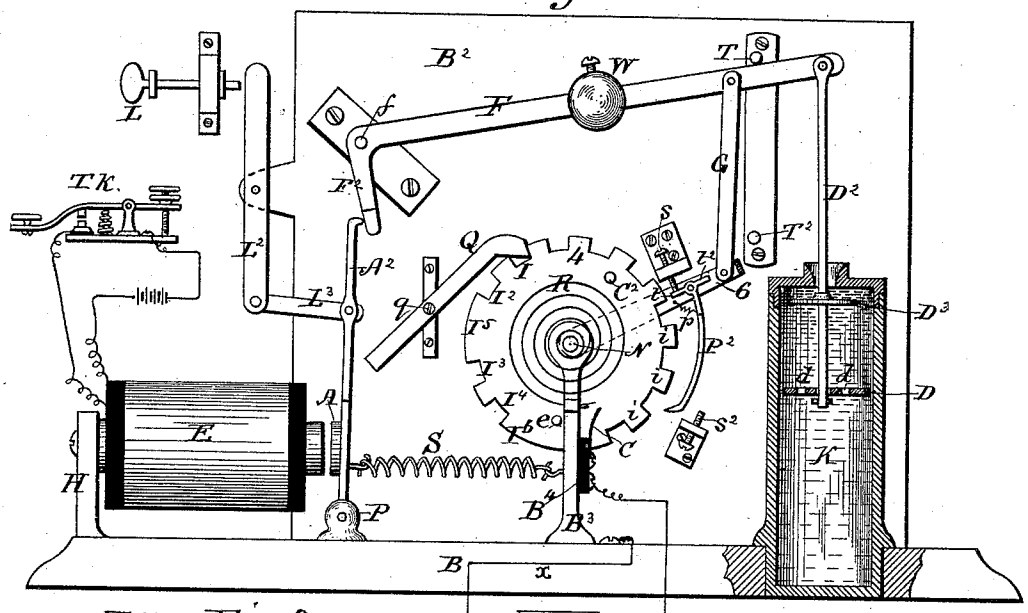
(No Model.)

W. W. ALEXANDER.

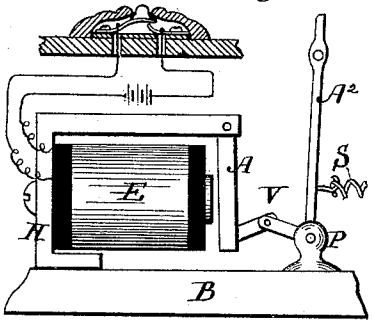
ELECTRO MECHANICAL COMBINATION LOCK.

No. 430,607. Patented June 24, 1890.

Fig. 1



TK. Fig 2.



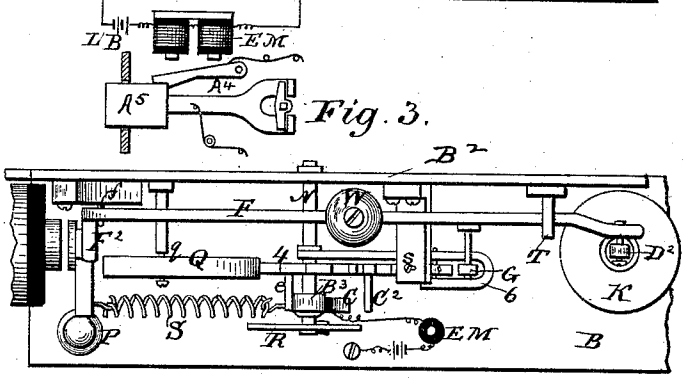


Fig. 3.

Fig. 4.

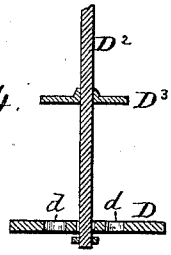
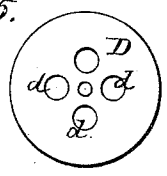


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM W. ALEXANDER, OF KANSAS CITY, MISSOURI, ASSIGNOR TO THE GILL-ALEXANDER ELECTRIC MANUFACTURING COMPANY, OF SAME PLACE.

ELECTRO-MECHANICAL COMBINATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 430,607, dated June 24, 1890.

Application filed May 7, 1889. Serial No. 309,894. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. ALEXANDER, a citizen of the United States of America, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Electro-Mechanical Combination-Locks, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to devices for mechanically operating electric circuits; and the objects of my improvements are to produce a simple and reliable electro-mechanical apparatus adapted to operate various mechanisms by secret or predetermined combinations of short and long impulses made upon a press-button or upon an electric key indirectly acting upon a toothed wheel and pawls and levers, as hereinafter described.

In the accompanying drawings, Figure 1 is a side view of an apparatus constructed in accordance with my invention. Fig. 2 is a modification of the means for connecting the armature with the mechanism. Fig. 3 is a top view of the apparatus. Fig. 4 is a vertical section of the motion-controlling dasher. Fig. 5 is a plan view of said dasher.

In said drawings, B represents a base, upon which is mounted an electro-magnet E, retained by its heel-plate H. Upon said base is placed a post P, to which the armature-lever A^2 is pivoted, the armature A being secured, as usual, to said lever.

To support many of the parts of the device, a back plate B^2 is retained vertically upon the base B. Nearly centrally of the plate B^2 there is pivoted a shaft N, having one end supported by the post B^3. Said shaft N carries a toothed wheel 4, upon the periphery of which the desired combination of notches, as $I' I^2 I^3 I^4$, is formed. Said notches are arranged at irregular intervals, the distance between some of them representing short pulsations of strokes made by the propelling mechanism, while the distances between the others represent long pulsations, and said pulsations may be caused by direct mechanical action or by electro-magnetic action. To rotate the toothed wheel 4 in one direction, a hair-spring R is mounted upon the saft of said wheel, and has one end secured to said shaft, while the other end is secured to the post B^3. To rotate the toothed wheel 4 in the opposite direction, as when a series of strokes is made upon the lever A^2 and permit said wheel 4 to be rotated, an angular lever F is pivoted at *f* upon a pin projecting horizontally from the plate B^2. The opposite end of said lever is united by means of a connecting-rod G with the lever 6. One end of said lever 6 is pivoted upon the shaft N, and it carries adjacent to its outer end a pawl P^2, pivoted thereto. Said pawl is to advance the toothed wheel 4 when the lever F begins to descend. For this purpose the pivoted end of the pawl P^2 has a spring *p*, one end of which is secured to the lever 6, which throws the curved end of the pawl into engagement with propelling-teeth *i* of the toothed wheel and the latter is rotated. Said pawl P^2 has a T-shaped head, the arm *t* of which comes at the upper end of its course in contact with an adjustable stop-pin *s*, secured to the back plate B^2, which throws the curved end of the pawl out of engagement with the wheel 4, and, being out of engagement, it remains in that condition until the lever F is actuated upon and begins to descend. When it has reached the lower end of its course, the arm t^2 of the T-shaped head of the pawl P^2 comes in contact with the stop-pin s^2, adjustably secured to the back plate B^2, which tilts the said pawl out of engagement with the toothed wheel; but before said disengagement a back rotation of said toothed wheel under the impulse of the hair-spring R is prevented by the retaining-pawl Q. Said pawl Q is pivoted to the back plate B^2 at *q*, and one end of said pawl is adapted to drop by gravity into one of the notches of the toothed wheel. The free end of lever F is normally kept elevated by pressure brought to bear against its short arm F^2. Said pressure is produced by the spring S, having one end secured to a stationary part, as the post B^3, and the opposite end to the lever A^2, as the upper end of said lever abuts against the short arm of lever F.

As it is preferred that the free end of said lever F should descend by gravity, a weight W is placed adjustably thereon, so that when the upper end of the lever A^2 is drawn backward, either by the armature A or by pressure upon the push-button L, transmitted by means of the pivoted lever L^2 and connecting-rod L^3, said lever F will descend until arrested by the stop-pin T^2 in a similar manner as a stop-pin T arrests it at the upper end of its course. To prevent the lever F from descending too rapidly by gravity when approaching the end of its course, a dash-pot K is used, into which is placed a liquid, and in said liquid a valve or loose piston D, provided with perforations *d* in said piston, is retained loosely by the piston-rod D^2, the upper end of which is pivoted to the end of the lever F. Upon the piston-rod is also mounted, but rigidly secured thereto, a disk D^3, adapted to close the perforations *d* in the loose piston D when said disk reaches said piston, said disk and piston then acting together as an obstruction against the rapid descent of the free end of the lever F. In the ascent of the piston-rod the perforated piston D offers but little obstruction, as the perforations *d* are opened as soon as said piston starts on its upward course and permit the liquid to pass freely therethrough.

In Fig. 2 the lever A^2 is connected to the armature A by means of a toggle V, the purpose of which is to equalize the magnetic attraction of the electro-magnet for the armature and render the same more uniform during the entire arc of travel of said lever A^2.

In operating the device, if the toothed wheel 4 and the lever F are in normal position, as shown in the drawings, and said lever is allowed to descend, it will traverse very rapidly about half of the distance between the stop-pin T and T^2, and then the disk D^3, secured to the piston-rod D^2, will strike upon the loose disk D, which during said rapid descent has remained almost stationary in the liquid, and then the piston-rod and the lever F will descend more slowly, and as said lever F is united to the lever 6 by means of the connecting-rod G, said lever 6 and its pawl P^2 are also carried downward, and as said pawl P^2 immediately from the start engages the teeth *i* of the wheel 4 said wheel will be propelled against the tension of the spring R the distance of one tooth or one notch, and the retaining-pawl Q will enter the next notch I^2 after a half of the full travel of the lever F, and now if the lever F is made to ascend by the action of the spring S the wheel 4 will be held in that position by the pawl Q; but if the lever F is allowed to descend the entire length of its course (which action will be a false move of the operator) when the pawl Q is in engagement with the notch I, the wheel 4 will be propelled the distance of two teeth or notches and the retaining-pawl will rest on the wide surface I^2, and while the pawl Q is in that position the wheel 4 will immediately turn back under the impulse of the spring R when the lever F reaches the end of its course, the adjustable stop-pin s^2 having met one of the arms of the pawl P^2 and disengaged it from the wheel 4. During this action the retaining-pawl Q, being nearly counterbalanced and acting sluggishly in consequence thereof, will not enter the notches in the wheel and will not arrest its motion. Therefore the wheel will return to its normal position with its pin *e* in contact with the post B^3. Starting from this normal position, if a short pressure or pulsation is made upon the press-button the lever descends only about one-half of its course and the pawl Q will fall into the notch I^2 and prevent a back motion of the wheel. The push-button being then released, the lever F will ascend again to the top of its course. If a long pulsation or pressure is then made upon the press-button and the lever F is thus allowed to descend its whole course, the pawl Q will enter the notch I^3 and prevent a back motion of the wheel. The push-button being released after the long pressure thereon, the lever F ascends to the top of its course against the pin T. Now, if a short pressure is made upon the press-button and the lever F is allowed to descend only one-half of its course, the pawl Q will leave the notch I^3 and enter the notch I^4 and prevent a back motion of the wheel, while the lever F returns again to its normal position. During the forward movement of the wheel 4 it has carried its contact-pin C^2 (which projects from its face) around until said pin is in close proximity to the contact-spring C, secured to ,but insulated from, the post B^3, and if the lever F is then allowed to descend either one-half or the whole of its course the pin C^2 in either case will be brought in contact with the contact-spring C, thereby closing the circuit as follows: from local battery L B to electro-magnet E M to contact-spring C, contact-pin C^2, metallic wheel 4, and thence through its shaft N and hair-spring R to the post B^3, and through the base B and wire X back to the other pole of the battery. Said magnet E M is adapted to attract its armature A^4, which is shown as retaining the lock-bolt A^5 in a locked position. When the device is properly operated, the armature is attracted and allows the lock-bolt to be retracted. By the final movement made by the lever F and the rotation of the wheel 4 the pawl Q will leave the notch I^4 and rest upon the smooth periphery I^6 of the wheel. Now when pawl P^2 is disengaged, the wheel, acting under the tension of spring R, will return to normal position, as the pawl Q cannot enter the notches and arrest it on account of the rapid reverse motion of the wheel, and consequently the circuit will be broken.

If the wheel 4 is propelled the distance of two teeth when the combination of notches is arranged, as represented at I and I^2, with a blank space following, the wheel will not be

prevented from returning to normal position, and if the pawl Q is standing in the notch I^2 and the wheel is propelled the distance of one notch it will also be allowed to return to normal position, and the same results will be obtained for the entire combination.

In Fig. 1 a transmitting-key T K is shown with line and battery to operate the device from a distance, and in Fig. 2 is shown at T K a modification of the transmitter, also with line and battery.

Having now described my invention, I claim—

1. The combination of a wheel having upon its periphery a series of notches at irregular intervals, a lever 6, having one end pivoted upon the shaft of said wheel, a pawl pivoted upon said lever and having one end adapted to engage with the notches of said wheel and the opposite end provided with a T-shaped head, and adjustable stop-pins adapted to engage alternately with the arms of said head with a lever F, connected to the lever 6, a lever A^2, and means to actuate the said lever A^2, substantially as described.

2. The combination of a wheel having upon its periphery a series of notches at irregular intervals and teeth of different widths, a nearly-counterbalanced retaining-pawl, a pivoted lever 6, a pawl pivoted upon said lever, and stop-pins to react upon said pawl with a pivoted lever F, a pivoted lever A^2, and means to actuate said lever A^2, substantially as set forth

3. The combination of a wheel having upon its periphery a series of notches at irregular intervals, a pivoted lever 6, a pawl upon said lever and stop-pins to react upon said pawl, a coiled spring wound upon the shaft of the wheel to propel it in one direction and forming a part of an electric circuit, a contact-pin upon said wheel, and a spring-finger adapted to close the electric circuit by contact with said pin, substantially as and for the purpose described.

4. The combination of a wheel having upon its periphery a series of notches at irregular intervals, a pivoted lever 6, a pawl upon said lever, a coiled spring wound upon the shaft of the wheel to propel it in one direction, a pivoted lever F, connected with the lever 6, a dash-pot piston-rod at one end of the lever F, a disk upon said rod, and a dash-pot to receive said rod and disk with a lever A^2, bearing against the opposite end of the lever F, and means to actuate said lever A^2, substantially as set forth.

5. The combination of a wheel having upon its periphery a series of notches at irregular intervals and teeth of different widths, a pivoted lever 6, a pawl upon said lever, a coiled spring wound upon the shaft of the wheel to propel it in one direction, a pivoted lever F, connected with the lever 6, a dash-pot, a piston-rod connected to one end of the lever F and entering said dash-pot, a perforated movable piston, and a stationary disk upon said rod, substantially as and for the purpose described.

6. The combination of an electric circuit, a wheel, its shaft, and a coiled spring, said wheel, shaft, and spring forming part of said circuit and the wheel carrying a contact to actuate said circuit, and a stationary metallic connection in the path of said contact, whereby the contact forming a part of said wheel is adapted to close the circuit, substantially as and for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM W. ALEXANDER.

Witnesses:

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GARRETT ELLISON.