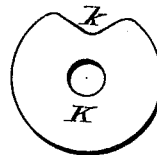
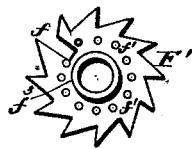
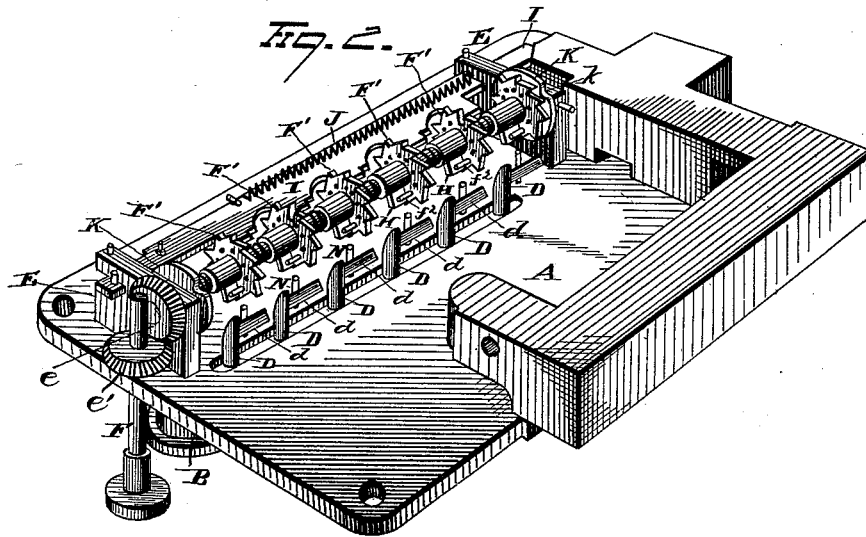
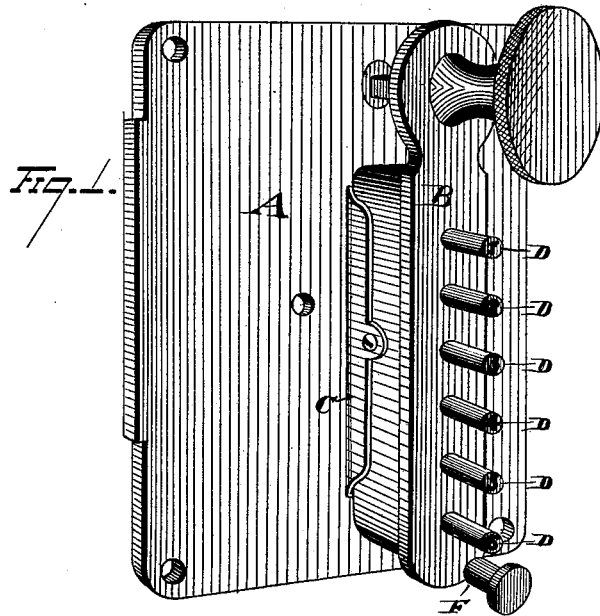


C. S. LEWIS.
Permutation Lock.

No. 215,229.

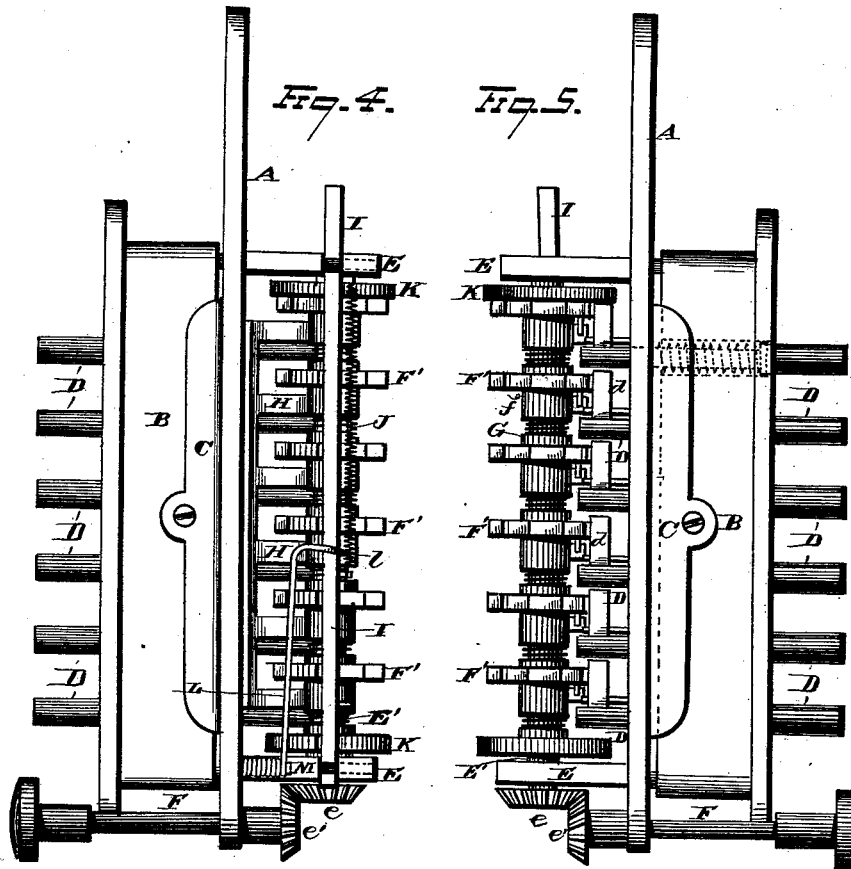
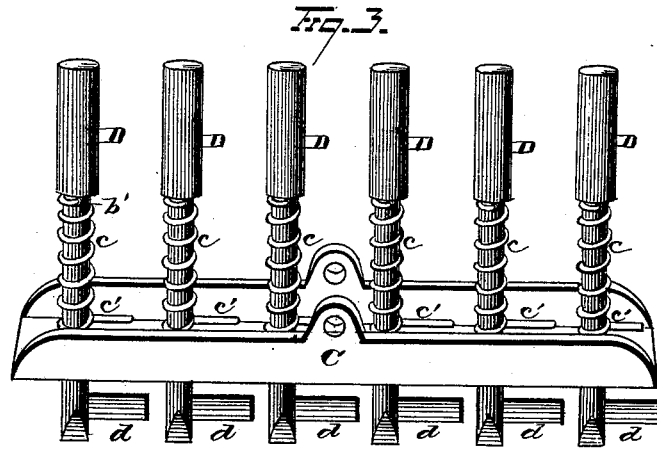
Patented May 13, 1879.



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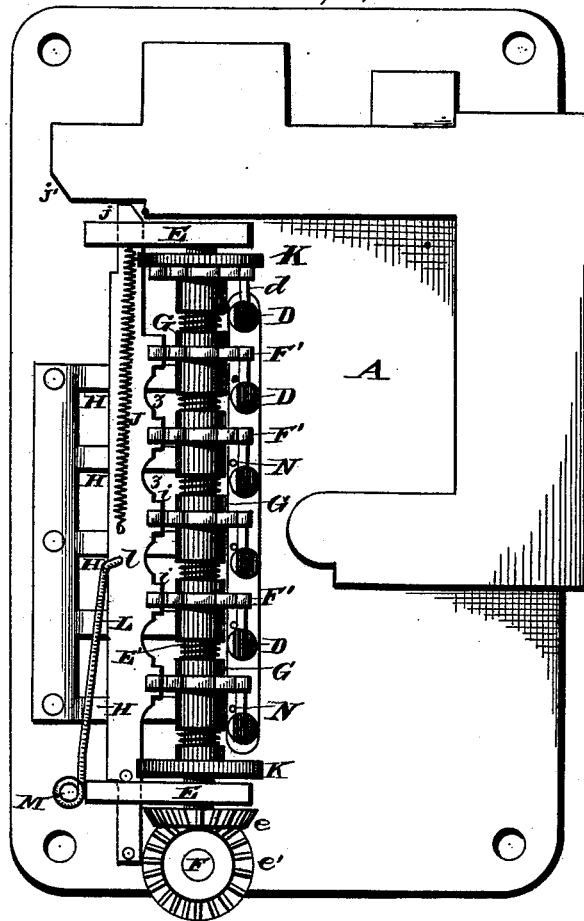
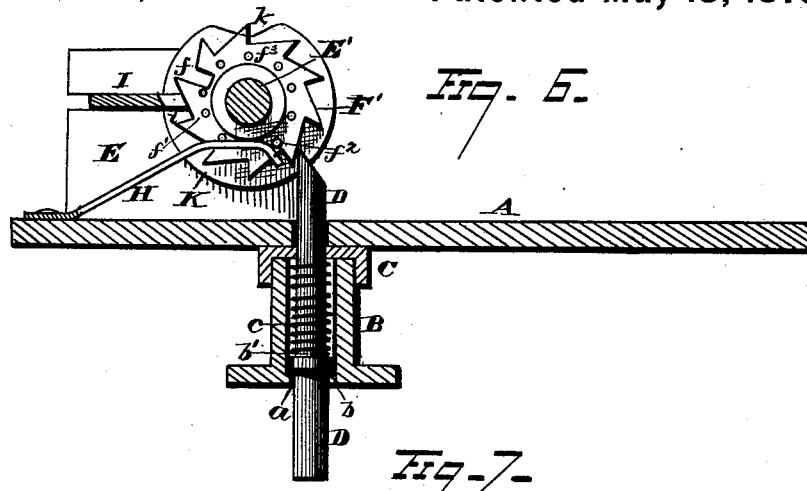
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IMPROVEMENT IN PERMUTATION-LOCKS.

Specification forming part of Letters Patent No. **215,229**, dated May 13, 1879; application filed March 6, 1879.

To all whom it may concern:

Be it known that I, CHARLES S. LEWIS, of Waterbury, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Combination-Locks; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to an improvement in combination-locks, the object being to provide a combination-lock that shall be of small initial cost, of simple and durable construction, not liable to become impaired by use, and adapted to be applied to locks of various constructions and uses; and to these ends my invention consists in the certain details of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view, in perspective, of a lock provided with my improvement. Fig. 2 is a view, in perspective, of the improved combination attachment applied to the inner side of the front plate of a lock; also, there are shown under Fig. 2 attached views, in side elevation, of one of the ratchet-wheels and of one of the cams secured to the end of the ratchet-wheel shaft. Fig. 3 is a view, in perspective, of the escutcheon pins, and springs for operating the same. Figs. 4 and 5 are reverse views, in side elevation, of my improved mechanism. Fig. 6 is a transverse section of the lock, and Fig. 7 is a plan view of the combination attachment.

A represents the front plate of a lock, to which is secured by screws or other suitable devices an escutcheon, B, which latter is provided with any desired number of holes *a*.

To the lower edge of escutcheon B is secured in any desired manner an escutcheon-cap, C, the side edges of which embrace and fit snugly against the sides of the escutcheon.

D are escutcheon-pins, preferably made of metal, the outer ends of which snugly fit within the holes *a* in the escutcheon, and project out-

wardly from the face of the escutcheon any desired distance.

Escutcheon-pins D are each provided with a shoulder, *b*, and in close proximity thereto are drilled, as at *b'*, for the attachment of one end of a spiral spring, *c*, said spiral spring being placed around the reduced and inner portion of the escutcheon-pin and the inner end, *c'*, of the spring extended outward at right angles to the pin a sufficient distance to have a firm bearing against the sides of the escutcheon-cap.

It will be observed that the escutcheon-springs *c* have a twofold function, in that they serve to impart a reciprocating motion to the escutcheon-pin and force the same outwardly, and also serve to impart a rotary movement to said escutcheon-pins when reciprocated, said rotary movement subserving an important function, as will hereinafter be observed.

The inner ends of the escutcheon-pins are each provided with a pawl, *d*, which may be made of steel or other metal, and is beveled or arranged diagonally to the line of direction of the stroke of the escutcheon-pins.

The rotary movement of the escutcheon-pins, caused by the power of the springs connected therewith, as heretofore stated, allows the pawls to oscillate sufficiently to ride over the teeth of the ratchets.

The spring causes the pawl to engage with the ratchet-tooth, and when the escutcheon-pin has been moved through its stroke the spring retracts the escutcheon-pin, and also rotates sufficiently to allow the pawl to ride over and engage with the next succeeding tooth on the ratchet-wheel.

The inner side of the plate A is provided with brackets E, in which are journaled the opposite ends of the shaft E', the latter having a beveled pinion, *e*, secured to one end thereof, with which engages the bevel-gear *e'*, attached to the actuating-shaft F, the latter projecting through the front plate of the lock, whereby the shaft E' may be readily turned by the actuating-shaft F.

This particular arrangement of parts for actuating the shaft E' is simply illustrated to show one of the many methods which may be

resorted to for accomplishing the result, and I would have it understood that I in nowise limit myself to this particular mechanism for this purpose.

The shaft E' may have a thumb-wheel directly attached thereto, and said thumb-wheel may be made of sufficient diameter to project through a slot in the lock-plate, and thus be rotated by hand, or other contrivances may be devised and adopted for this purpose.

Upon shaft E' are placed the ratchets F', which are constructed with any desired number of ratchet-teeth, and each furnished with a slot, f . Ratchet-wheels F' are furnished with any desired number of holes f^1 for the engagement of a removable stop-pin, f^2 , whereby the stop-pins f^2 of the series of ratchets may be located on the sides of the different ratchet-wheels at varying distances from the slots f . Thus the stop-pin f^2 on one ratchet may be placed one ratchet-tooth distant from the slot f , and in the adjacent ratchet it may be placed nine teeth distant from the slot in the latter ratchet. As the combination upon which the lock is set is to be determined by the relative positions of the stop-pins f^2 , it will be observed that I provide a great range of variable combinations for the lock.

Ratchets F are preferably provided with a sleeve, f^3 , to insure an increased bearing on the shaft.

In order that the ratchets may be forced to turn with the shaft when no obstruction is interposed, I secure collets G between each ratchet, and interpose a spiral or other spring between the end of the ratchet-sleeve and said collet. Instead of employing spiral springs, spring-plate washers may be used in lieu thereof.

It will thus be understood that the tension of the spring operates to force the ratchet longitudinally on the shaft and hold the same against the collet on the shaft, so that the frictional contact between the collet and ratchet-sleeve will be amply sufficient to cause the ratchets to turn in unison with the shaft, unless some obstacle is interposed to prevent the revolution of one or of all of said ratchets.

H are stop-springs constructed and secured in any desired manner, the free ends thereof being bent outwardly from the shaft E', and thereby affording an extended stop-surface to receive the stop-pins f^2 on the ratchets. These stop-springs serve to prevent the ratchets from being turned more than a single revolution in one direction; but when the ratchets are turned in the opposite direction by the escutcheon-pins, or by the pawls attached to said escutcheon-pins, the springs will yield and allow the stop-pins to revolve with the ratchet.

Brackets E are furnished with slots for the reception of the opposite ends of the slide-bolt I, which latter is constructed with fingers or lugs i , which overlap the sides of the ratchets, and hence prevent the longitudinal movement of the slide-bolt. Slide-bolt I is con-

structed with curved or angular beveled edges g , which enter between the teeth of the ratchets when the bolt is moved longitudinally toward the ratchets, and thus serves to lock all the ratchets against rotation when the slide-bolt is moved in a direction away from the lock-bolt.

This feature of my lock is important, for the reason that it prevents the picking of the lock, which might be accomplished if no provision were made for retaining the ratchet while end pressure is exerted on the slide-bolt. If one of the slotted ratchets should be in line with the slide-bolt, by applying pressure to the lock-bolt the slide-bolt may be moved slightly away therefrom; and if in such case the ratchets could be turned, an expert might ascertain from the variable friction on the ratchets, by turning the same, when the slot therein is moved to register with the slide-bolt, and thus, by testing all the ratchets, move the entire series to bring the slots in line for retracting the slide-bolt; but all this is effectually prevented by the construction above described, as any end pressure on the slide-bolt causes the beveled faces or edges to interlock with the teeth of the ratchets, and thus prevent the latter from being rotated and the lock tampered with.

J represents a spring, one end of which is attached to the slide-bolt, and the other end to the bracket E, thereby serving to force and retain the outer end, j , of the slide-bolt against the beveled face j' on the lock-bolt. Shaft E' is provided at opposite ends with cam-disks K, which serve to force the slide-bolt laterally outward from the ratchets until the slots k therein register with the slide-bolt, when the latter is again forced toward the ratchets by means of a spring, L, which is placed upon a stud, M, while its free end, l , bears upon the back of the slide-bolt. N are pins or lugs located in close proximity to each ratchet, and serve as rests for the escutcheon-pawls, and retain the latter always in proper position for engagement with the ratchet-teeth.

Having described the construction of my improved combination lock I will now proceed to describe its operation. Assume that it is desired to set the combination so that it will be necessary to impart two strokes to escutcheon-pin No. 2, one stroke each to escutcheon pins numbered 5 and 6. To accomplish this the stop-pin in the ratchet operated by the escutcheon-pin No. 2 is placed in the fourth-hole, counting backward from the slot f in said ratchet, while the stop-pins in ratchets operated by escutcheon-pins numbered 5 and 6 are placed in the fifth-hole, counting backward from the slots f . To set the lock mechanism so that it may be unlocked on the combination above mentioned, the shaft E' is turned backward until all the stop-pins of the several ratchets have been arrested by the stop-springs, and the slots in the cam-disks brought around to register with and receive

the slide-bolt. The escutcheon-pin No. 2 is then forced inwardly twice, which causes the slot in the ratchet operated upon by the pawl attached to said pin to register with the slide-bolt. Escutcheon-pins numbered 5 and 6 are then operated a single time each, and thereby moving the ratchets, so as to carry the slots therein around to register with the slide-bolt. The slide-bolt is then free to move longitudinally within the several slots in the series of ratchets, and thus the lock-bolt when retracted will move the slide-bolt out of the way and not be obstructed thereby. If, now, it is desired to lock the combination only partially it may be done in several ways—as, for instance, by depressing the escutcheon-pin No. 5 the lock-bolt will be securely retained, and it will be necessary to depress said escutcheon-pin nine successive times to again unlock the combination.

In the foregoing explanation I have only set forth one of the simplest combinations of which my lock is susceptible; but, by reason of the fact that the combination may be changed almost without limit by varying the positions of the stop-pins, I am enabled to provide a lock of such construction that it will be, in my opinion, practically impossible either to study out the combination or to pick the same.

I have described one form of construction of combination-lock embodying the principle of my invention, but it is evident that many changes in the construction and arrangement of the several parts may be resorted to without departing from the spirit of my invention, and hence I would have it understood that I do not limit myself to the exact construction shown and described; but,

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a combination-lock, the combination, with a shaft provided with a series of slotted ratchet-wheels and a slide-bolt prevented from longitudinal movement unless the slots in said ratchet-wheels are brought in line with each other, of a series of escutcheon-pins adapted to be reciprocated, and to engage directly with the teeth of said ratchet-wheels and actuate the same, substantially as set forth.

2. In a combination-lock, the combination, with an escutcheon and an escutcheon-cap, of a series of springs, secured at one end to said escutcheon-pins, and their opposite ends arranged to rest upon said escutcheon-cap, substantially as set forth.

3. In a combination-lock, the combination, with an escutcheon and an escutcheon-cap, of a series of escutcheon-pins, each provided with a spiral spring arranged to impart both reciprocatory and rotary motion to said pins, substantially as set forth.

4. In a combination-lock, the combination, with a shaft and a series of slotted ratchet-wheels secured to the shaft and adapted to move therewith by frictional contact of said ratchets with collets secured to the shaft, of a

series of escutcheon-pins which engage directly with said ratchet-teeth, and are adapted to move said ratchets one tooth for every full stroke of the escutcheon-pin, substantially as set forth.

5. In a combination-lock, the combination, with a shaft provided with a series of independent slotted ratchet-wheels and means for revolving said shaft, of a longitudinally-moving slide-bolt and spring, and cams for moving said slide-bolt laterally toward and away from said ratchet-wheels, substantially as set forth.

6. In a combination-lock, the combination, with a shaft provided with a series of independent slotted ratchets, each of said ratchets provided with a stop-pin, of spring-stops arranged and adapted to arrest the stop-pins when the ratchets are turned in one direction and to allow the ratchets to be turned any desired number of times in the opposite direction, substantially as set forth.

7. In a combination-lock, the combination, with a shaft provided with a series of independent slotted ratchet-wheels and with cams secured to opposite ends thereof, of a slide-bolt adapted to be moved laterally away from the shaft by means of said cams and a spring pressing upon the edge of said slide-bolt and adapted to move the same toward the shaft, substantially as set forth.

8. In a combination-lock, the combination, with a shaft provided with a series of independent slotted ratchets, of a slide-bolt constructed with fingers or lugs which overlap the sides of said ratchets, and a series of escutcheon-pins for operating directly upon the teeth of the several ratchets upon said shaft, substantially as set forth.

9. In a combination-lock, the combination, with a series of independent slotted ratchets provided with pins adapted to be adjusted at varying distances from the slots in the ratchets, of a series of spring-stops, a series of escutcheon-pins for imparting motion to said ratchets, and a slide-bolt which is held from longitudinal movement except when the several slots in the series of ratchets are brought in line with each other, substantially as set forth.

10. In a combination-lock, the combination, with a series of slotted ratchets, of a slide-bolt provided with suitable detents, and means, substantially as described, for moving said bolt toward and away from said ratchets, and thereby causing it to act as a pawl to prevent retrograde movement of said ratchets when the combination is set to retract the bolt, substantially as set forth.

11. In a combination-lock, the combination, with a series of toothed slotted wheels, of a series of escutcheon-pins arranged and adapted to be reciprocated to move the ratchets, and to be partly rotated to release the pawls secured thereto from the ratchet-teeth, substantially as set forth.

12. In a combination-lock, the combination, with a series of toothed wheels, of a series of

escutcheon-pins arranged and adapted to engage directly with the teeth of said wheels, and a lock or dogging-bolt suitably arranged and connected with the lock, whereby the relative position of the mechanism of the lock may be varied for locking and unlocking the same, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 4th day of March, 1879.

CHARLES S. LEWIS.

Witnesses:

F. O. McCLEARY,

E. J. NOTTINGHAM.