G. C. MARTIN.

PERMUTATION LOCK.

APPLICATION FILED NOV. 18, 1907.

915,199. Patented Mar. 16, 1909.

MODEL.

Fig. 1.

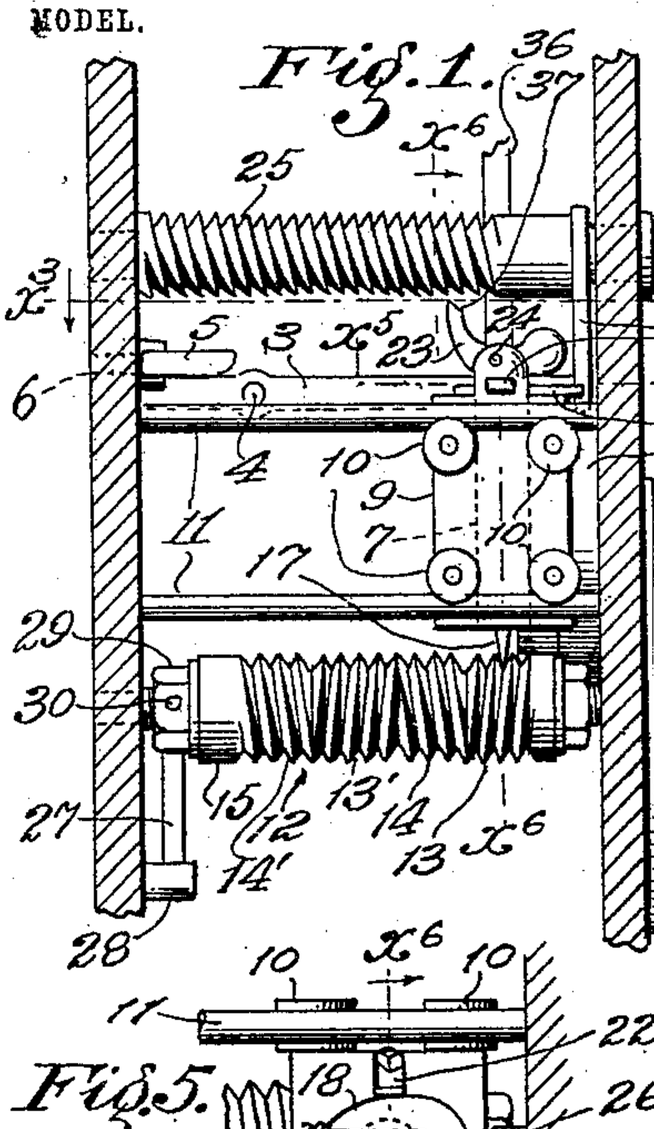

Fig. 2.

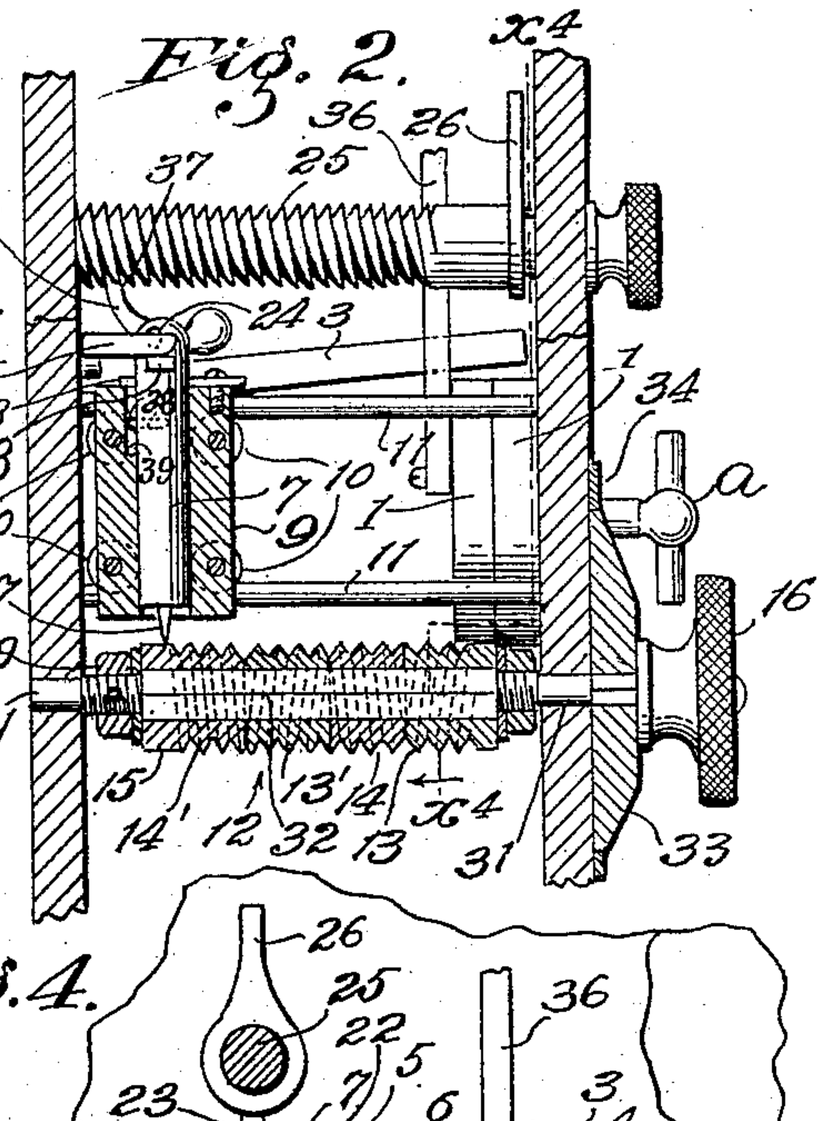

Fig. 5.

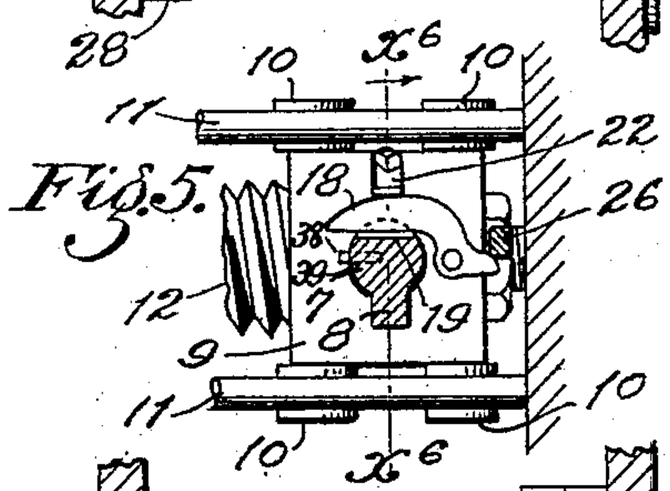

Fig. 4.

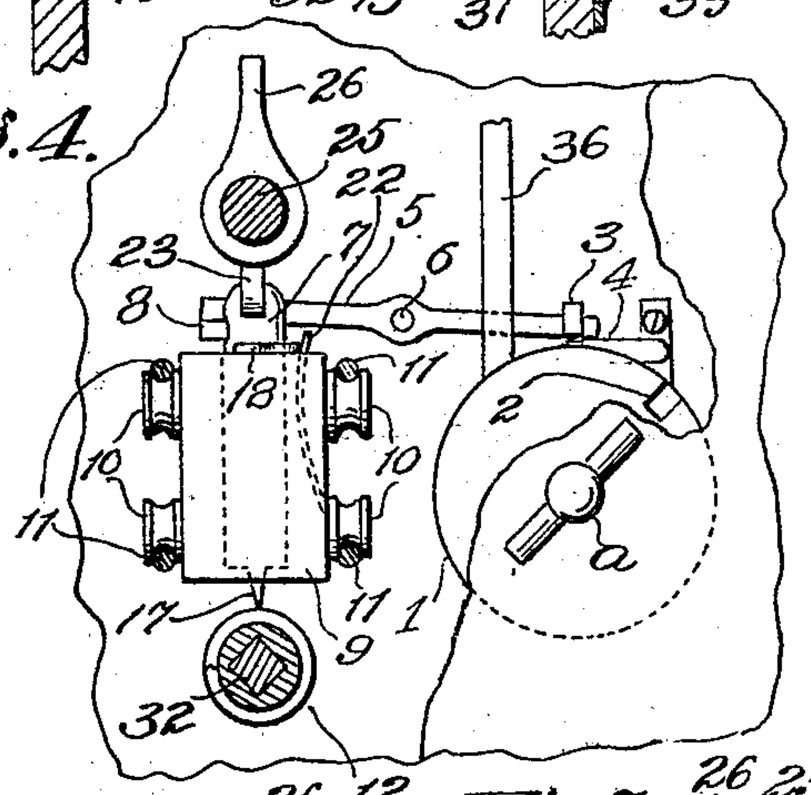

Fig. 3.

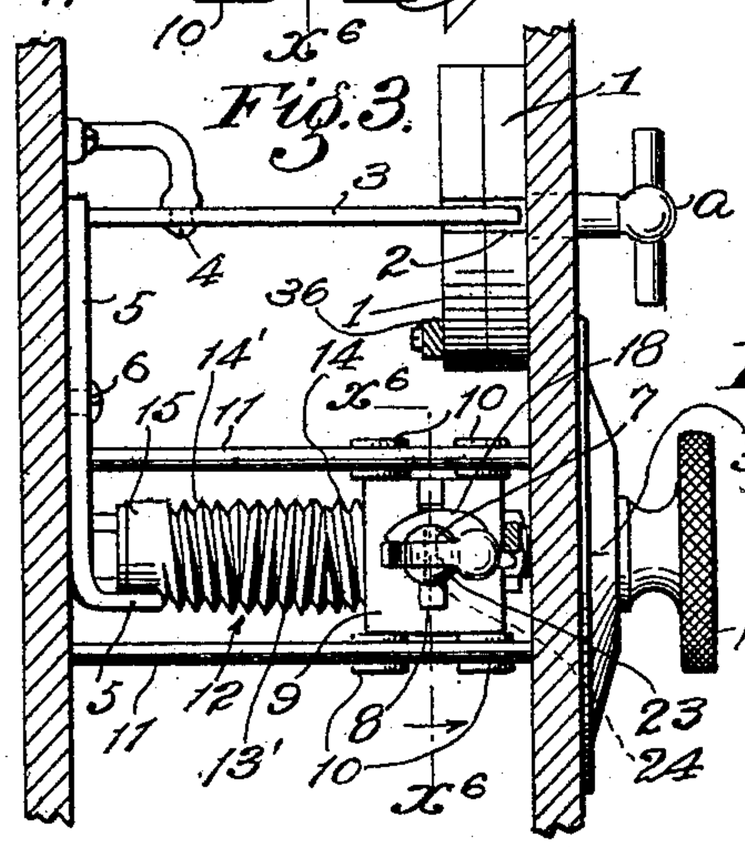

Fig. 6.

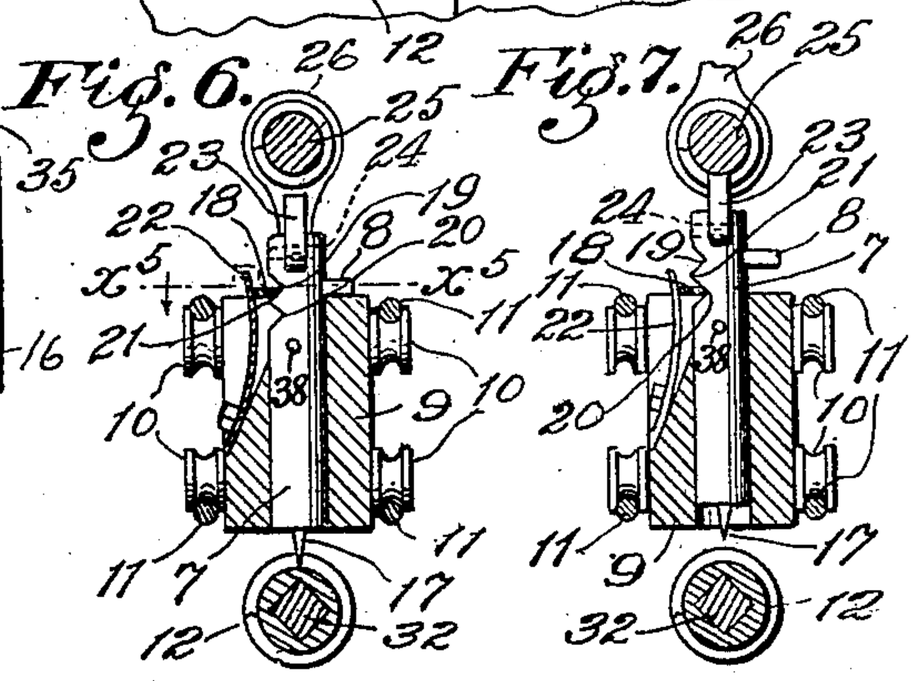

Fig. 7.

Witnesses

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UNITED STATES PATENT OFFICE.

GEORGE CUSHING MARTIN, OF LOS ANGELES, CALIFORNIA.

PERMUTATION-LOCK.

No. 915,199. Specification of Letters Patent. Patented March 16, 1909.

Application filed November 18, 1907. Serial No. 402,730. (Model.)

To all whom it may concern:

Be it known that I, GEORGE CUSHING MARTIN, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Permutation-Lock, of which the following is a specification.

The object of this invention is to provide a simple lock-structure in which the unlocking device is operable by rotary means capable of continuous effective rotation in one direction, to any desired extent from a fraction of a rotation to a full rotation or any excess thereover that may be desired and which is capable of being so constructed as to require a number of full continuous effective rotations in first one direction, and then a number of effective rotations in another direction, and so on a determined number of times whereby to bring the parts into unlocking position.

An object is to so construct a permutation lock that it will not give warning to the manipulator by a click of the mechanism, or by a variation of the resistance thereof, or by any other means whereby an unauthorized person may learn the points at which a reversal of the rotation is required. This object is accomplished in various ways, that is to say, in the first place, the mechanism is so constructed as to avoid liability of clicking, and in the second place, means are provided to disguise or to confuse any sound or any resistance variation that might occur.

Other objects and advantages may appear from the subjoined detailed description.

The invention is pioneer within the scope of the appended claims, and may be applied in various forms. I do not limit myself to any specific form of construction.

It comprises a lock provided with screw-threaded means to operate tumbler releasing means, and also comprises a lock having reversely threaded means for operating tumbler releasing means.

It also comprises the various parts and combinations hereinafter more particularly described and claimed.

The accompanying drawings illustrate the invention in the form I at present deem most desirable.

Figure 1 is a fragmental elevation of a lock constructed in accordance with this invention. The parts are shown in locked position. Fig. 2 is a like elevation showing the carriage and the permutation arbor in vertical section, and the parts in unlocking position. Fig. 3 is a plan section on line indicated by x^3—x^3, Fig. 1, showing the parts in locked position. In Figs. 1, 2 and 3 portions of the lock-casing are shown in section. Fig. 4 is a section on the irregular line x^4—x^4, Fig. 2, showing the parts in unlocked position. Fig. 5 is a fragmental sectional detail on line x^5—x^5, Figs. 1 and 6. Fig. 6 is a sectional detail on line x^6—x^6, Figs. 1, 3 and 5. Fig. 7 is a fragmental section illustrating the position of parts resulting from rotation of the unlocking arbor beyond the first reversal point.

The lock may be provided with a number of tumblers after any usual form of construction.

1 designates the tumblers of the lock two being shown in the drawing; *a*, a handle for the tumblers; 2, a notch in the tumblers to receive a dog 3 by which the tumblers are locked.

4 is a pivotal support for the dog 3. Tumbler-releasing means are provided for operating the dog and comprise a lever 5 pivoted at 6, and a pin 7 having a lug 8 adapted to engage one end of the lever 5, thereby to depress the other end to actuate the dog 3 to withdraw it from the notch 2, thereby to allow the tumblers to be turned. The operable part 5 is thus made to effect the release of the tumbler when the carriage is brought to position for that purpose.

9 is a carrier for the pin 7 having wheels 10 running on a track-way 11 which may be formed of rods. The pin is movable relative to the carriage, and the lug 8 is carried by the carriage through the medium of said pin.

12 is a reversely-threaded shaft provided with right and left hand threaded sections as 13, 13′, 14, 14′. The section 14′ is at the end of the shaft adjacent the lever 5 and is provided with a cylindrical portion 15.

16 is a handle to rotate the shaft 12.

The pin 7 is provided with a point 17 to engage the shaft sections so that when the carrier 9 is at a tumbler locked position, as indicated in Fig. 1, the pin-point 17 will engage the threaded section 13, whereby when the handle 16 and the shaft 12 are appropriately rotated the pin-point 17 and consequently the pin 7 and its carrier 9 will be impelled toward the lever 5 so long as the thread of the first section 13 engages said pin, but at the end of said section further

rotation of the handle 16 and the shaft 12 in the same direction as at first will only serve to lift the pin 17 onto the reverse thread of the next section, and thereupon further rotation of the shaft in the first direction would only result in raising and lowering the pin 7 if provision were not made whereby the pin is caused to remain in its raised position whenever the point is thus lifted to the outer surface of the shaft.

18 is a latch to engage a notched portion of the pin 7. For this purpose two notches 19, 20, are provided having a sloping faced tooth 21 between them.

22 is a spring to hold the latch 18 in engagement with the pin. When the pin-point 17 enters between the threads of the shaft 12, the latch 18 engages in the upper notch 19, but when the point 17 rides on the top of the thread or upon the cylindrical portion 15 of the shaft, the tooth 21 is carried up above the latch 18 and thereupon the spring 22 operates said latch to act on the lower sloping face of the tooth 21, thereby to raise the pin 7 sufficiently to carry the pin-point 17 entirely free from the shaft. See Fig. 7.

23 is a pawl pivoted at 24 to the pin 7 and arranged to engage a screw 25 the threads of which slope inwardly on the rear side and are sharp cut or abrupt on the other side, so that when the pawl is lifted into engagement therewith, rotation of the screw 25 in one direction will operate the pawl to return it, the pin 7 and the carriage 9 to initial position; but rotation in the other direction does not drive the carriage. Said screw is provided at its outer end with an arm 26 adapted to engage the latch 18 to withdraw the same from the lower notch 20 of the pin whenever the screw 25 is sufficiently rotated after the carriage has reached initial position. When the latch is thus withdrawn from under the tooth 21, the pin 7 will descend into an inter-thread space of the initial-threaded section 13, whereupon the appropriate rotation of the handle 16 will again operate to move the carriage toward the lever 5.

27 is a spring fixed in a post 28 and adapted to be engaged by an angular head 29 on the shaft 12, thereby to vary the resistance which may occur in the rotation of the shaft 12. Said head 29 may be hexagonal or other angular nut screwed on the shaft and fixed by a pin 30. It is to be understood that this resistance device or any substitute therefor may be fully dispensed with if desired, for the reason that the resistance to the rotation of the screw caused by the pin 7 and carriage 9 may be disregarded in actual operation. The shaft 12 may comprise an arbor 31 having an angular portion 32 on which any number of reversely threaded sections corresponding to 13′ and 14, may be strung.

33, 34 designate the usual indicator apron and dial-plate by which the manipulator may determine the points at which to reverse the rotation. It is also to be understood that the length of the threaded sections may be varied from less than a single turn of the thread thereon, to many turns of such thread and that the combination of any lock can be readily changed by rearrangement of the sections or by substituting for the section at one time on the spindle, other sections of different lengths, it only being necessary that the sections be appropriately assembled, so that the sections having right threads will alternate with those having left threads, so that it is imperative in order to move the pin to position for engaging lever 5, that the arbor be turned determinately in first one and then another direction.

In practical operation the manipulator will rotate the handle 16 in the usual way, thus turning the indicator apron 33 until the index 35 thereof coincides with the appropriate dial number, not shown, to indicate that the pin point 17 has come to the point between two sections, thereby requiring reversal of the shaft 12. He will then reverse the shaft and turn it appropriately either partly or wholly around for a number of rotations, more or less, until the index 35 comes to the next character indicating a reversal point where the pin point 17 will again be between two sections. The manipulator will then continue rotating the handle 16 turning it first in one direction and then in the other until he reaches the end of the combination, at which time the pin 17 will have come to position between the lever 5 and the threaded member 12 and will have risen to the cylindrical portion 15 at the termination of the last thread and is thereby elevated to operate the lever 5, thus to withdraw the dog 3 from the notch 2 of the tumblers of the lock. Thereupon the manipulator may turn the handle *a* thus turning the tumblers in the usual way and operating the bolt-rods 36, only one of which is shown, to withdraw the usual bolts, not shown, thus effecting the opening of the lock. When it is desired to bring the mechanism again into locking position, the manipulator may rotate the screw 25 to carry the dog 23 and the parts connected therewith back to initial position, shown in Figs. 1, 3 and 5. As soon as the lug 8 of the pin 7 escapes from beneath the lever 5, which it has actuated, the spring 22 forces the latch to fully seat in the notch 20 below the tooth 21, thus forcing the tooth 21 and the pin 7 upward into the position shown in Fig. 7. The pawl 23 is provided with a thread-engaging face 37 between the point and the pivot of the pawl to reach a preceding limb of the screw-thread about the time the tip of the pawl is freed from its limb of the thread on the reverse rotation of the screw 25, so that the pawl is prevented from trip-

ping and clicking when the screw 25 is reversely rotated.

38 designates a lug on the pin 7 to move in a vertical way 39 to prevent any rotation of the pin which might displace the pawl 23 from screw-engaging position. The pressure of the latch 18 on the straight faces of the notches 19 and 20 of the pin tends to prevent any rotation of the pin.

Particular attention is directed to the fact that the invention is not limited by the nature of the operable part which the traveling means are to operate, nor is it necessary that said operable part shall perform a specific function. In the form of the invention shown, the immediate operable part operated by the traveling means is the lever 5 which is merely a medium for translating motion to another part, as the dog 3; and I regard the invention as comprising an organization wherein the lock is provided with an operable part, traveling means to operate said part, reversely-threaded means to move said traveling means to operative position, and means to return said traveling means from operative position regardless of the function or the operation of the said operable part; the character of the motion as translated from said operable part being immaterial to this part of the invention. The operable part in this relation may be regarded as either the final element or as an intermediate element of a novel organization.

I claim:—

1. In a lock, the combination with tumbler-releasing means, of a reversely-threaded member to operate said releasing means; said member being provided with a plurality of threaded sections, the thread of each section being reverse to the thread of the adjacent section.

2. In a lock, the combination with a tumbler, of tumbler-releasing means, and a shaft provided with right and left threaded portions to move said tumbler-releasing means into the releasing position; the right and left threads of said portions respectively being independent of each other and not forming continuations of each other.

3. A lock comprising a tumbler, means to lock the tumbler, means to operate the tumbler-locking means to release the tumbler, and a reversely threaded member to bring said releasing means into position to unlock the tumbler locking means.

4. The combination of a tumbler, means to lock the tumbler, means to move said tumbler-locking means into unlocking position, traveling means to operate said last named means and a reversely threaded member to move said traveling means into operative position.

5. The combination of a reversely threaded member, a pin having a point engaging threads of said member, a carrier for said pin, a tumbler, means to lock said tumbler, and means operable by said pin to withdraw said tumbler-locking means from locking position.

6. In a lock, the combination of operable parts, a traveling pin for moving said parts, and a reversely-threaded member to move said pin to operable position, the threads of said member being so arranged that the threads that run in one direction are not continuations of those running in the other direction.

7. In a lock, a traveling pin, parts operable by said pin, a reversely threaded member to move said pin to position for operating said parts, said member being provided with an unthreaded portion to support said pin in operable position.

8. A lock provided with an operable part, traveling means to operate said part, reversely threaded means to move said traveling means to operative position, and a screw to return said traveling means from operative position.

9. A lock provided with an operable part, traveling means for operating said part, a pawl carried by said traveling means, a reversely threaded member to move said traveling means into operative position, and a screw to engage said pawl to return said traveling means to initial position.

10. In a lock an operable part, a pin to operate such part, a pawl on said pin, a carrier for said pin, a screw, a reversely threaded member to move said pin to operable position, the same being provided with means to move said pin while in operative position to bring said pawl into engagement with said screw.

11. A reversely threaded member provided at one end with a cylindrical portion to which the threads extend, means for rotating said member, a tumbler, a track-way, means to lock the tumbler, a pin to unlock said last named means, the same being operable by said reversely threaded member, and a carrier for said pin, on said track-way.

12. In a lock, a carrier, a pin mounted in said carrier, means to yieldingly hold the pin at different positions in said carrier, and a reversely threaded member to engage said pin, the same being provided with means to shift said pin from one to another position, and means to return the carrier to initial position, while said pin is held in its shifted position.

13. In a lock a carrier, a pin therein provided with notches, and a tooth between said notches, a yielding catch to engage said tooth and notches in different positions of the pin, and threaded means to engage the pin.

14. In a lock a carrier, a pin therein provided with two notches, and a tooth between said notches, a yielding catch to engage said

tooth and notches in different positions of the pin, and reversely threaded means to engage the pin.

15. In a lock, an operable part, a carrier, a pin carried by said carrier and arranged to engage reversely threaded means and to cause the operation of said operable part, a pawl carried by said pin, and a screw to engage said pawl.

16. A lock comprising a tumbler, means to lock the tumbler, means to operate the tumbler-locking means to release the tumbler, a reversely-threaded member to bring said releasing means into position to unlock the tumbler-locking means, and spring-actuated means for varying the resistance in the rotation of said member.

17. The combination of a tumbler, means to lock the tumbler, means to move said tumbler-locking means into unlocking position, traveling means to operate said last-named means, a reversely-threaded member to move said traveling means into operative position, and means for varying the resistance in the rotation of said threaded member.

18. The combination with a tumbler and the bolt-operating mechanism, of a lock for said tumbler, a carriage, an impelling element for said carriage, and means for connecting said carriage with said element to receive motion therefrom and operate said lock.

19. The combination with a tumbler and bolt-mechanism connected therewith, of a lock for said tumbler, a lever for actuating said lock, a carriage, an impelling element for said carriage, an element movable relatively to said carriage for coupling said carriage with said impelling element, and means carried by said carriage for operating said lever to release said tumbler.

20. The combination with a tumbler and bolt operating-mechanism, of a lock for said tumbler, a carriage, an impelling element for said carriage, means carried by said carriage for actuating said lock to release said tumbler, and means for returning said carriage to its initial position.

21. The combination with a tumbler and lock mechanism therefor, of a lever for operating said lock mechanism, a carriage, a lug carried by said carriage and arranged to actuate said lever, an impelling element having a series of opposed convolutions, a pin carried by said carriage to engage said convolutions to cause said carriage to travel for elevating said pin, means for holding said pin in elevated position, a pawl carried by said pin, means engaging said pawl to return said carriage to initial position, and means for releasing said pin from its elevated position to cause same to engage said impelling element.

22. The combination with a tumbler and lock mechanism therefor, of a lever for operating said lock mechanism, a carriage, a lug carried by said carriage and arranged to actuate said lever, an impelling element provided with reversely-arranged threads, a pin carried by said carriage to engage said threads to cause the carriage to travel and bring the lug in engagement with the said lever for actuating the lock, means for elevating said pin, means for holding said pin in elevated position, a pawl carried by said pin, means engaging said pawl to return said carriage to its initial position, and means carried by said return means for the carriage for releasing said pin from its elevated position to bring the same into engagement with the threads of said impelling element, and to cause the disengagement of said pawl with said return means for the carriage.

23. The combination with a tumbler and lock-mechanism therefor, of a lever for operating said lock mechanism, a carriage, a track-way for said carriage, an impelling element, a pin carried by said carriage and arranged to engage said impelling element whereby the carriage is moved on said track-way, a lug on said pin to actuate said lever for operating said lock mechanism, latch mechanism carried by said carriage and engaging said pin for holding the same out of operative position relatively to said impelling element, and also for holding the same in operative position relatively to said element respectively, return mechanism for said carriage comprising a pawl pivoted to said pin, a feed-screw, said pawl being arranged to engage said feed-screw, and means for actuating said latch mechanism upon the return of said carriage to its initial position for causing said pin to drop in engagement with said impelling element.

24. The combination with a tumbler and lock-mechanism therefor, of a lever for operating said lock-mechanism, a carriage, a track-way for said carriage, an impelling element, a pin carried by said carriage and arranged to engage said impelling element whereby the carriage is moved on said track-way, a lug on said pin to actuate said lever for operating said lock mechanism, latch mechanism carried by said carriage and engaging said pin for holding the same out of operative position relatively to said impelling element, and also for holding the same in operative position relatively to said element respectively, return mechanism for said carriage comprising a pawl pivoted to said pin, a feed-screw, said pawl being arranged to engage said feed-screw, and an arm carried by said feed-screw for actuating said latch-mechanism upon the return of said carriage to its initial position for causing said pin to drop in engagement with said impelling element.

25. The combination with a tumbler and lock mechanism therefor, means for operat-

ing said lock mechanism, comprising a carriage, means for operating said carriage, and means for returning said carriage to its initial position.

26. The combination with a tumbler and lock mechanism therefor, of means for operating said lock mechanism comprising a carriage, means for actuating said carriage comprising a reversely threaded member, a pawl carried by said carriage, and means operably engaging said pawl in but one direction to return said carriage to its initial position.

27. The combination with a tumbler and lock mechanism, of a lever for operating said lock mechanism, and means for operating said lever to actuate said lock mechanism, comprising a carriage, means carried by said carriage for operating said lever, a movable element on said carriage, means for operating said carriage, means for actuating said movable element to trip said lever, a return feed-screw, and means carried by said movable element and engaging said feed-screw for returning said carriage to its initial position.

28. The combination with a tumbler, lock mechanism therefor, of a lever for actuating said lock mechanism, means for actuating said lever comprising a carriage, a track-way for said carriage, means for operating said carriage, a member movable relatively to said carriage, a lug carried by said member and engaging said lever, a pawl carried by said movable element, and means engaging said pawl for returning said carriage to its initial position.

29. The combination with a tumbler and lock mechanism therefor, of two rotatable elements, and means engaging said rotatable elements and arranged to be moved in different directions at different times, said means being adapted to unlock said locking mechanism upon reaching a determined position.

30. The combination with a tumbler and lock mechanism therefor, of a carriage for actuating said lock mechanism, and two rotatable elements for actuating said carriage, one in one direction and the other in the opposite direction.

31. In combination with a tumbler and lock mechanism therefor, a lever in operable relation to said lock mechanism, a carriage and two rotatable elements, one to actuate said carriage in one direction to operate said lever and unlock said lock mechanism, and the other to return the carriage to its initial position.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 11th day of November, 1907.

GEO. CUSHING MARTIN.

In presence of—
JAMES R. TOWNSEND,
M. BEULAH TOWNSEND.