

P. ZIRON.
PERMUTATION LOCK.
APPLICATION FILED JUNE 23, 1908

924,871.

Patented June 15, 1909.

Fig. 1.

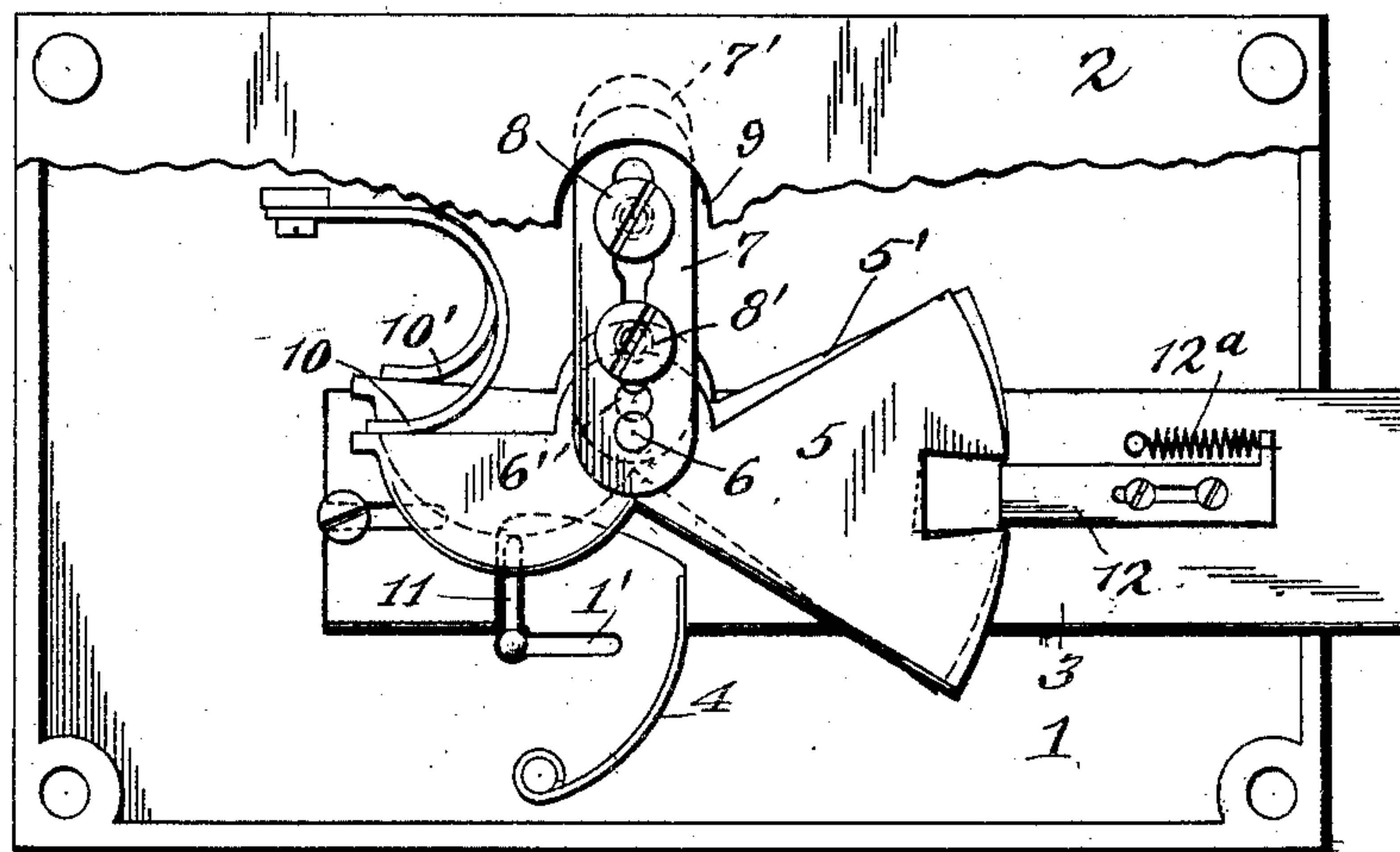


Fig. 2.

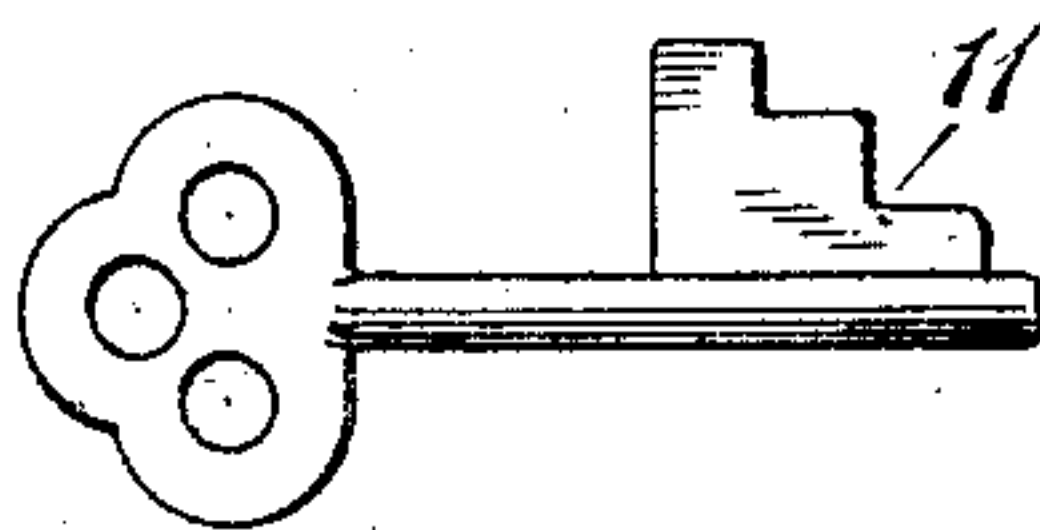


Fig. 3.

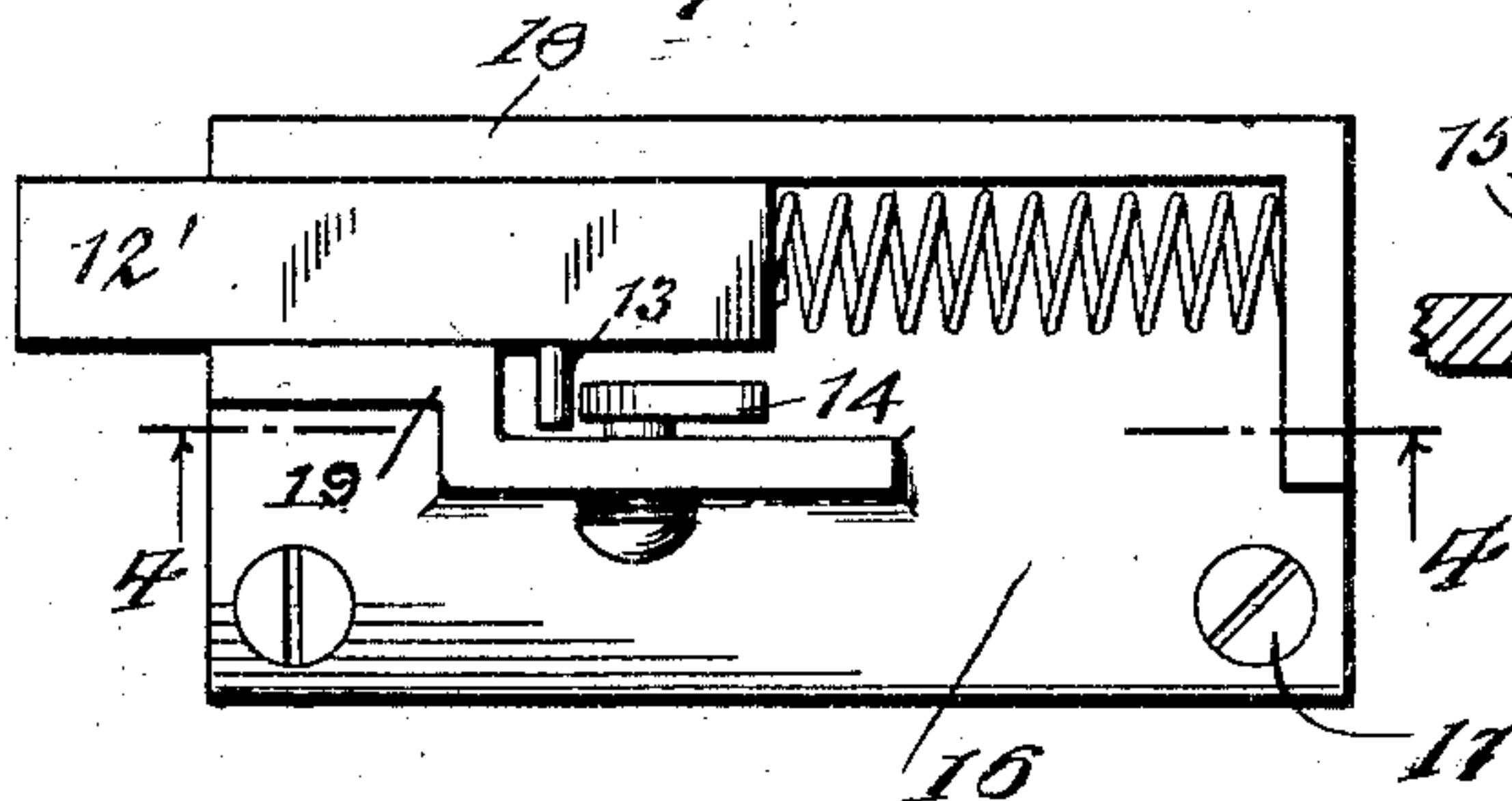


Fig. 4.

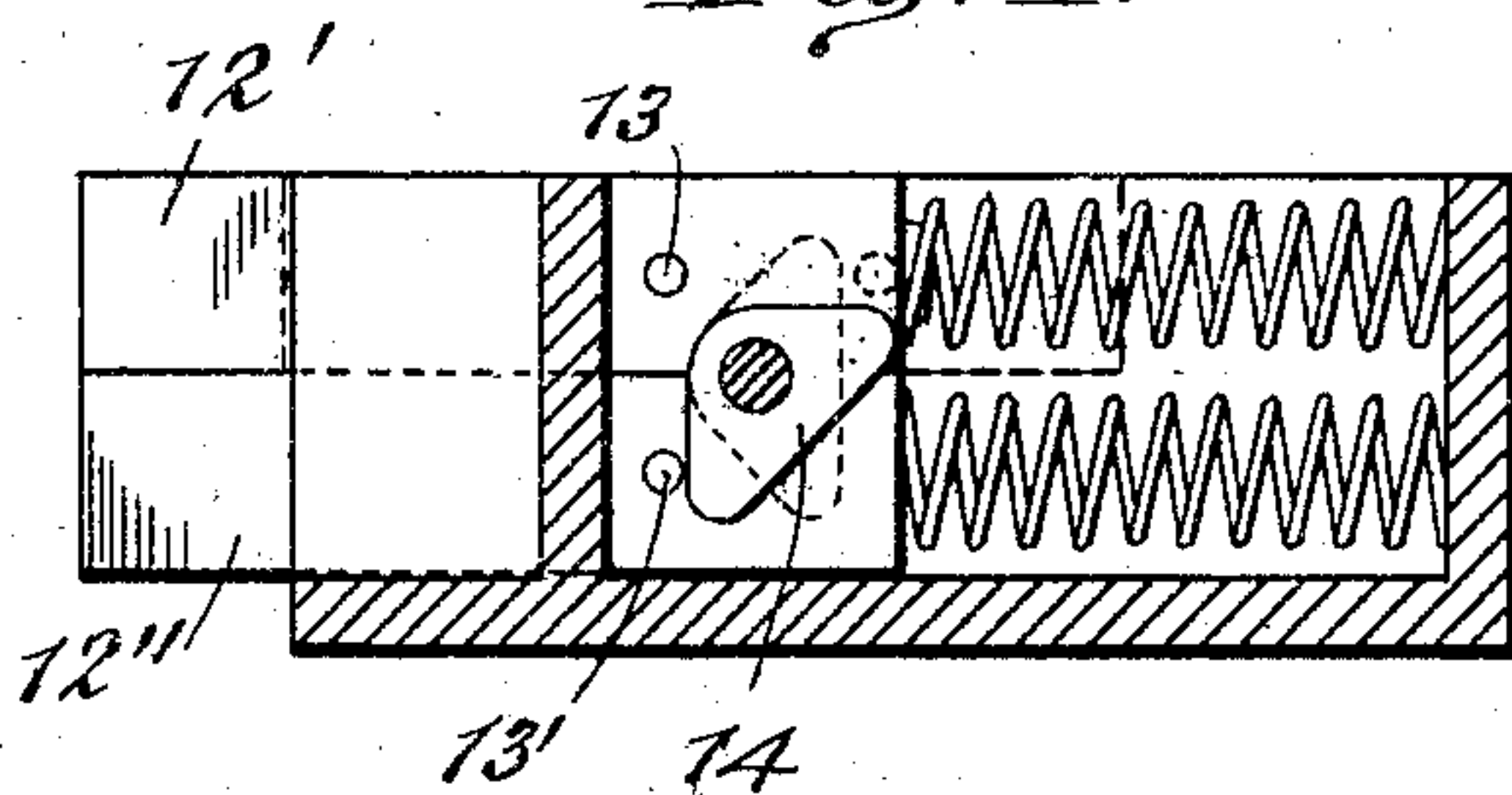


Fig. 5.

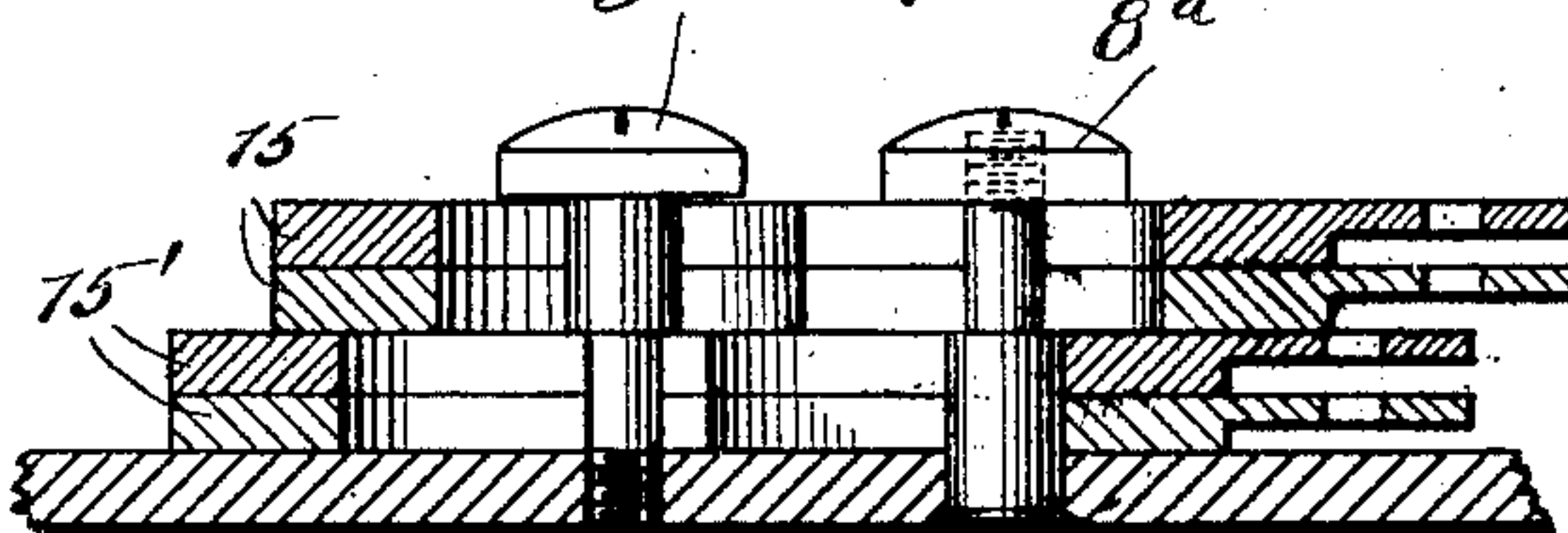
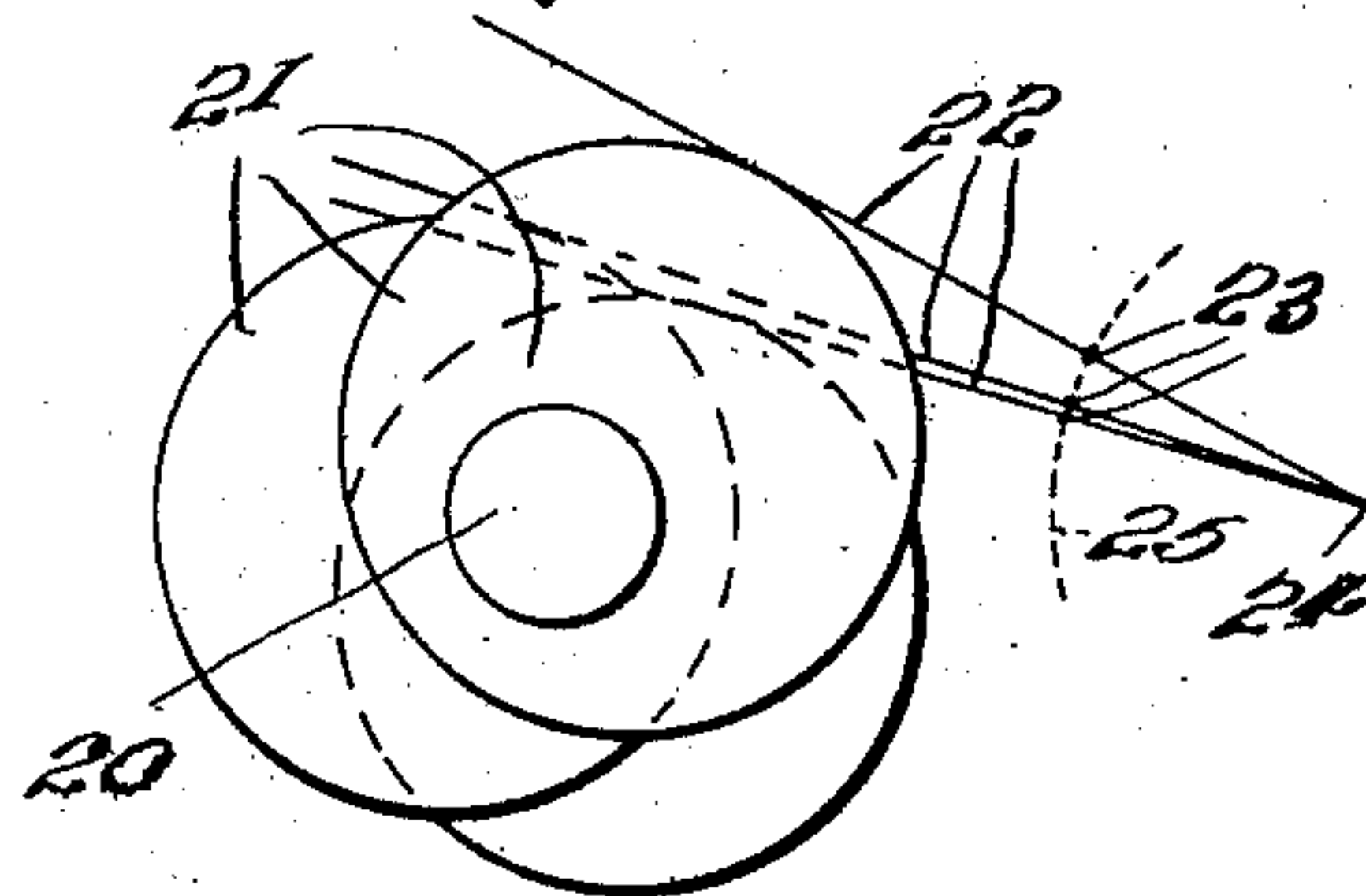


Fig. 6.



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UNITED STATES PATENT OFFICE.

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PERMUTATION-LOCK.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, PAUL ZIRON, a citizen of the United States of America, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Permutation-Locks, of which the following is a specification.

This invention relates to multiple key or permutation locks particularly to that class of locks in which the tumblers or detent elements are identical in size and shape and are given different relative positions for each operative permutation of the lock.

The principal object of the invention is to provide a novel and improved construction for the adjustable elements and a novel means for effecting their adjustment to any one of the possible operative permutations.

A particular object is to provide a simple lock mechanism either with or without keys and capable of ready adjustment to any one of a large number of permutations.

A further particular object is to provide for the use of a master key or master permutation which may serve for a series of locks.

The objects of the invention are obtained through the peculiarly novel principle applied in the construction and arrangement of the tumblers or detent members.

In the drawing Figure 1 represents the invention applied to a key operated lock, Fig. 2 a detail of the key, Figs. 3, 4 and 5 detail modifications, while Fig. 6, a diagram of tumbler positions with an arrangement of rotatable disks for a keyless lock.

The distinctive feature of this invention is the employment of tumbler or detent elements the fulcrums of which are capable of adjustment in a number of relatively varied positions; each possible adjustment of the fulcrums corresponding to a new permutation or operative positioning of the detent members. An elementary form of this construction is illustrated in Fig. 1. 1 is the front plate of the lock, 1' the keyhole and 2 the rear plate, shown partly broken away. 3 is the bolt controlled by a suitable spring 4, and 5 and 5' are two lever tumblers fulcrumed at 6 and 6' respectively on pins attached to slotted plates 7 and 7' guided on studs 8, 8' fixed to the front plate of the lock. The head of stud 8 may be engaged by a screw-driver through a hole 9 in the rear plate 2 or may terminate in a milled head or be otherwise adjustable to clamp the ful-

crum plates in any of their possible positions. Each tumbler 5, 5' is controlled by a spring as 10, 10' tending both to rotate it and to displace its fulcrum plate. At 11 is a key of the form shown in Fig. 2, engaging the tumblers. The key may throw the bolt a short distance sufficient to cause the member 12 of the bolt to engage the tumblers (and be forced back against its spring 12^a) until their gatings are in position to receive it; the position of parts then being as shown. A further movement of the key withdraws the bolt. Only a key having bitings corresponding to the positions of the tumblers 5, 5' will operate the lock. To change the key the bolt is held withdrawn by hand or otherwise. The stud 8 is then loosened releasing the fulcrum slides and a different key inserted and turned to the position shown in Fig. 1, and stud 8 tightened, thus locking the slides in a new arrangement. When stud 8 is loose the tumblers are free to move under the action of the tumbler springs to the positions corresponding to the respective bitings of a key, while still engaging the member 12 in their gatings.

While for the sake of clearness I have shown only two tumblers it is obvious that as many tumbler elements as may be desired can be employed; the number of permutations being the number of possible operative positions which may be given to the fulcrums.

While not shown in the drawing, it will be at once obvious that the tumblers are limited in their movement by a stop suitably positioned to prevent them when the key is withdrawn from taking such positions as would prevent the introduction of the key through the keyhole.

In order to operate the lock by a master key I provide two sets of tumblers, the master key engaging only the second set. In order to allow the bolt to be moved by the master key it is necessary to modify the member 12 as shown in Figs. 3 and 4. 12' and 12'' are two spring controlled slides working in guides on the bolt and each having a stud as 13, 13' adapted to engage a triangular block 14 pivoted on a pin. The slide guides on the bolt and the support for the triangular member 14 are provided by a plate 16 fast to the bolt by means of screws 17 and having a flange 18 forming one of the guide walls for the slides and a rib 19 form-

ing the other slide wall. The rib 19 is offset and in the arm thereof formed by the offset is a bearing for the pin carrying block 14. The block 14 prevents both slides moving back at once but allows either one to do so alone. By so arranging the parts as to allow the slide 12' to normally bear against the arc of the ordinary tumblers and 12'' to bear against the master key tumblers the bolt may be thrown when the gatings of either set will receive its appropriate slide, the other slide being forced back against its spring.

The master key tumblers may or may not have adjustable fulcrums. If it is desired to have them adjustable, as well as the ordinary tumblers, I provide two sets of fulcrum slides as 15, 15', Fig. 5, both guided upon the studs 8^a, 8^b. It will be seen that the lower slides work freely on stud 8^a but can be bound by screwing in the stud 8^b while the upper slides work freely on stud 8^b but can be bound by screwing in the head of the fixed stud 8^a. In this way I can adjust the fulcrum positions of either set of tumblers without disturbing the adjustment of the other set. With such a lock I may have either the sum of the permutations of the two groups or by using a key which will engage both sets of tumblers at once have the permutations of the whole series. In using both sets of tumblers with one key the triangular member 14 should be reversed in position on its pin so as to prevent independent motion of the slides 12' and 12'' or the slides otherwise held. It should be noted that the bolt is moved by the first ward of the key, the other wards extending beyond the bolt and not engaging it.

Fig. 6 diagrammatically illustrates the application of the invention to a keyless lock such for example as a safe lock. In Fig. 6 is shown the pin 20 which carries at its end outside the safe the thumb-wheel (not shown) for operating the lock. On the shaft 20 are indicated a number of eccentrically mounted disks or cams 21. In Fig. 6 these cams are indicated as being fast to the pin 20. In actual practice, however, it is understood that these cams are independently actuated from the pin 20 by suitable gearing. For the purpose of showing the application of the invention to this class of locks, however, the cams 21 may be treated as if fixed to the shaft 20. The tumblers are indicated diagrammatically by the lines 22, each being shown as fulcrumed at a point 23. The ends of the tumblers adapted to cooperate with the detent are indicated at the point 24; when the ends 24 of the tumblers are alined the detent mechanism may be operated. The fulcrum points 23 are adjustable to effect different permutations. We may assume that the pin 20 and cams attached thereto have been brought to the position shown in Fig. 6 by a 30° rotator sufficing to aline the

ends 24 of the tumblers. If now it be desired to change the combination so that instead of a 30° movement of the pin 20 a 90° movement thereof is required the tumbler fulcrums 23 are loosened, the ends 24 of the tumblers held alined in the detent member, and the pin 20 moved in amount according to the combination for which it is desired to set the lock. This movement of the pin 20 moves the tumblers with fulcrums 23 around the point 24 as a pivot, the fulcrums moving in the arc indicated by the dotted line 25. When moved a distance according to the combination desired, the fulcrums 23 are secured and the detent member removed from the ends 24 of the tumblers. The pin 20 may now be moved back to its zero position and the lock is set and ready for operation.

While I have shown the lock in an elementary form the invention is capable of wide application without departure from the distinctive feature which so far as I am aware is entirely new in the art.

It should be noted that by selecting a proper curve along which the fulcrums should be adjusted rather than a straight line a remarkable degree of accuracy of registration of the tumbler gatings may be effected; the lock is thus capable of extreme nicety of adjustment which as those skilled in the art will understand renders possible the employment of a great number of permutations.

Having described my invention, what I now claim is:

1. In a lock, a plurality of tumblers, pivotal bearings for the tumblers, and means for fixing the pivotal bearings in a plurality of bolt-operating relative arrangements.
2. In a lock, a plurality of tumblers, pivotal bearings for the tumblers, the bearings being changeable in position to provide for permutations in the lock, means for moving the tumbler bearings to one bolt-operating combination, the same means changing the tumbler bearings to other bolt-operating combinations.
3. In a lock, a plurality of detent members, pivotal bearings for the detent members, means for bringing the detent members into one bolt-operating positioning, and means for differentially adjusting the positions of the pivotal bearings of the detents to permit the detent members to be brought into other bolt-operating positionings.
4. In a lock, a plurality of tumblers, an independent pivotal bearing for each tumbler, means for adjusting said pivotal bearings in a plurality of arrangements of relative position, and a second set of tumblers independent of the first set.
5. In a lock, a plurality of tumblers, supporting means on which the tumblers are independently pivoted, means for changing the bearings of the tumblers on the supporting

means, whereby the throw of the tumblers may be varied to permit of permutations in the lock.

6. In a lock, a bolt, a lever tumbler one arm of which coöperates with the bolt to control the movement of the same, a support on which the tumbler is pivotally mounted, means for shifting the bearing of the tumbler to another position on the support to vary the throw of the tumbler lever and effect permutations of the lock while maintaining the coöperative relation of lever arm and bolt.

7. In a lock, a tumbler, a bearing on which the tumbler is fulcrumed to have a rocking movement, and means for shifting the tumbler fulcrum to vary the throw of the tumbler and thereby to effect permutations in the lock.

8. In a tumbler lock two sets of tumblers each set normally capable of releasing the fence mechanism independent of the other set, and means for preventing release of the fence mechanism except by the operation of both sets.

9. In a lever tumbler lock two sets of tumblers, each set capable of independent relative adjustment of the fulcrums of its tumblers and each set capable of releasing the fence mechanism independently of the other set and means for preventing release of the fence mechanism except by the operation of both sets of tumblers substantially as set forth.

10. In a lock, two independently movable integral fence members, a set of tumblers coöperating with one of said fence members, and a second set of tumblers coöperating with the other of said fence members, and means controlling the operation of said fence members independently of each other whereby one or the other of said sets of tumblers may control the operation of the lock.

11. In a lock, a bolt, two slides on the bolt, each movable independently of the other, a plurality of tumblers coöperating with each slide, and means whereby one or the other of said slides may be operated to permit the bolt to be thrown.

12. In a lock, a bolt, two slides on the bolt, each movable independently of the other, a set of tumblers coöperating with one of the slides, a second set of tumblers coöperating with the other slide, means controlling the operation of each slide independently of the other to permit the bolt to be thrown through one or the other of said sets of tumblers, and means for locking the slides together to operate the bolt through both sets of tumblers.

13. In a lock a tumbler, a pivot therefor

and means for altering the angular motion of said tumbler necessary to bring it into operative position, consisting of means for fixing the pivot of said tumbler in a plurality of different positions.

14. In a lock, a bolt, two sets of tumblers for permitting the operation of the bolt, the one set independently of the other set, and two fence mechanisms, one coöperating with each set of tumblers, and means allowing one or the other of said fence mechanisms to be operated independently of the other.

15. In a permutation lock, a tumbler, a pivot therefor, and means for arbitrarily fixing said pivot in one of a plurality of different bolt-operating positions.

16. In a lock, a bolt, two sets of tumblers for controlling the operation of the bolt, one set independently of the other set, all of said tumblers being positioned to be operated from a single key and means allowing either of said sets of tumblers to be operated alone.

17. In a lock a tumbler on a pivot, a gating in said tumbler and means for fixing the pivot of said tumbler in a plurality of different bolt-operating positions.

18. In a lock, pivoted tumblers, and means for adjusting the fulcrum of each tumbler independently of the others.

19. In a lock, tumblers, pivotal bearings for the tumblers, the pivotal bearings being differentially disposed in one bolt-operating position, and means for relatively shifting the bearings to other bolt-operating positions.

20. In a lock independently pivoted tumblers having differentially disposed pivots and means for altering the disposition of said pivots.

21. In a lever tumbler lock two sets of tumblers, each set normally capable of releasing the fence mechanism independent of the other set.

22. In a lock two sets of tumblers, each set capable of independent relative adjustment of the fulcrums of its tumblers and each set capable of releasing the fence mechanism independently of the other set.

23. In a lock a fence, a plurality of tumblers in the path of said fence, and slides composing said fence incapable of joint motion with respect to said tumblers but capable of independent motion with respect to a portion of said tumblers.

Signed by me at New York city this 22nd day of June 1908.

PAUL ZIRON.

Witnesses:

F. J. ERWIN,

CHARLES D. EDWARDS.