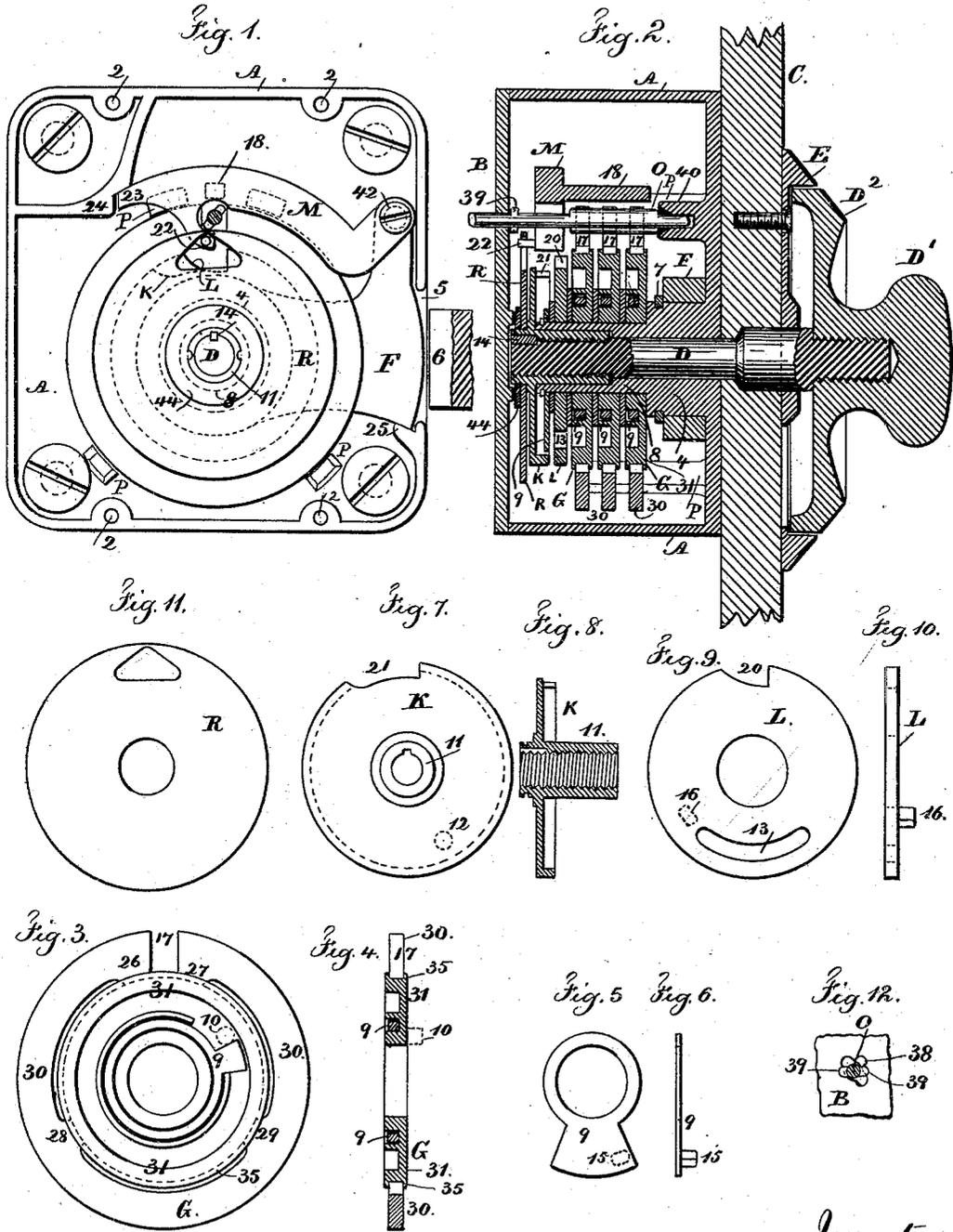


A. STONER.
PERMUTATION LOCK.

No. 370,568.

Patented Sept. 27, 1887.



Witnesses

Chas. H. Smith
J. Staib

Inventor

Augustus Stoner
per Lemuel W. Ferrell

(No Model.)

2 Sheets—Sheet 2:

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Fig. 13.

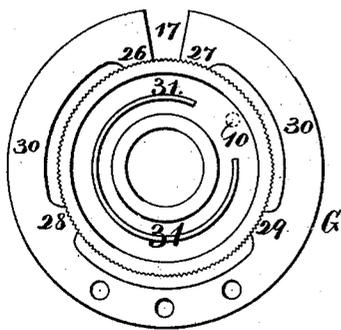


Fig. 14.

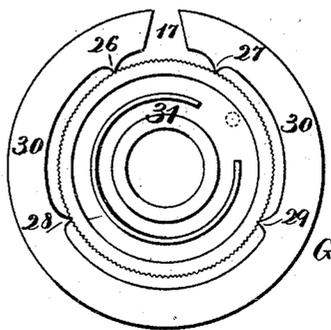


Fig. 15.

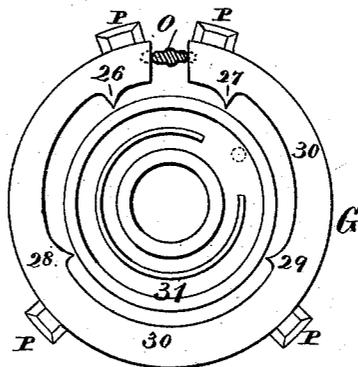


Fig. 16. Fig. 17. Fig. 18. Fig. 19.

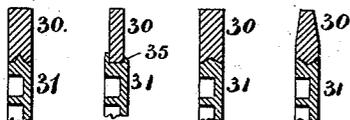
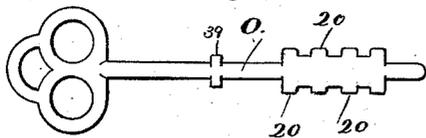


Fig. 20.



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UNITED STATES PATENT OFFICE.

AUGUSTUS STONER, OF NEW YORK, N. Y.

PERMUTATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 370,568, dated September 27, 1887.

Application filed October 27, 1886. Serial No. 217,309. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTUS STONER, of the city and State of New York, have invented an Improvement in Permutation-Locks, of which the following is a specification.

This invention relates to that class of locks in which there are circular notched wheels rotated by a spindle and set in succession by a dial that is revolved with the spindle.

In locks of this character a bolt has been made use of that is turned aside by a partial revolution of the stud through which the spindle passes, and in so doing said bolt has been brought in line with or turned away from an opening in the case that is opposite to a projection upon the bolts of a safe or other door to which the lock is attached, to prevent or allow the movement of the safe-bolts by hand, and in locks of this kind the permutation-wheels have been upon a stud supported by the lock-plate and in line with, but independent of, the spindle; but in this construction the tumblers and lock-plate can be driven into the safe if the spindle is broken off or removed.

My improvements relate to the permutation-wheels and to the stud upon which such wheels revolve, and to the construction and combination of parts hereinafter set forth.

In the drawings, Figure 1 is a rear view of the lock with the cap-plate removed. Fig. 2 is a section of the lock with the spindle partially in elevation. Fig. 3 is an elevation, and Fig. 4 a section, of one of the permutation-wheels. Fig. 5 is an elevation, and Fig. 6 an edge view, of one of the flies. Fig. 7 is a rear view, and Fig. 8 a section, of the tumbler, that is screwed upon the spindle. Fig. 9 is a rear view, and Fig. 10 an edge view, of the secondary tumbler intervening between the tumbler and the permutation-wheels. Fig. 11 is a rear view of the dog-moving tumbler. Fig. 12 shows part of the inner side of the lock-plate and the key sectionally. Figs. 13, 14, and 15 are detached views of permutation-wheels, and Figs. 16, 17, 18, and 19 are sections through the rim of such wheels. Fig. 20 is an elevation of the key for expanding the rims of the permutation-wheels.

The case A of the lock is of any desired size or shape; and B is the removable lock-plate,

attached by screws at 2; and C represents a portion of the safe-door or other plate to which the lock is attached. The spindle D is provided with a handle or knob, D', and a dial, D"; and E is the rim, fastened upon the door C and surrounding the edge of the dial, as usual.

Within the lock-case is a stud, 4, upon which is received the eye of the bolt F. When this bolt occupies the position shown in Fig. 1, it comes behind and closes the opening 5 in the lock-case A, so that the projection 6, that is upon the door-bolts of the safe, as usual, cannot enter the lock-case, and hence the door cannot be opened; but when this bolt F is swung aside upon the stud 4 the door can be opened, and there is a ring or washer, 7, around the stud 4 to hold the eye of the bolt F in its proper position. The stud 4 is continued inwardly as a tube, 8, around which are received the circular permutation-wheels G, and these wheels are constructed, as hereinafter described, with spring-rims that grasp the bodies; and it is preferable to introduce between the permutation-wheels the flies 9, Figs. 3, 5, and 6, that are formed with eyes passing around the tubular stud or around the hubs upon the tumbler-bodies, and have a limited movement, so that the studs 10 upon the tumblers may stop in line with each other when setting the tumblers. These flies are well known in this character of lock, and may or may not be used with my lock.

Upon the end of the spindle D is screwed the hub 11 of the tumbler K, and a pin or key, 14, prevents the tumbler K unscrewing upon the spindle. The fly 9, Figs. 5 and 6, intervenes between the tumbler K and the secondary tumbler L, and the stud 12 upon the tumbler K acts against this fly, upon which there is a stud, 15, passing into the slot 13 in the secondary tumbler L, which latter tumbler has a stud, 16, that acts upon the fly 9 of the first permutation-wheel G, Fig. 3, said permutation-wheel being provided with studs, as aforesaid, so that in setting the lock the spindle is rotated until all the tumblers and wheels are in motion and the dial is turned to the point which will bring the notch 17 in the first tumbler into line with the fence 18 on the dog M, and then the direction of rotation is reversed and the permutation-wheels set in suc-

cession with the notches beneath the fence, as usual. The tumblers K and L are then set so that the notches 20 21 therein are beneath the lower edge of the arm, carrying the stud 22, upon the dog M, so that the said dog M will fall and the end 23 thereof will clear the stop 24, and the bolt F will be partially revolved, so that the lock may be opened. Upon the reverse movement the bolt F will stop against the projection 25, and the dog and fence will be raised by the cam portions of the tumblers K L at the slots 20 and 21, and the permutation-wheels will be moved so that their notches 17 do not coincide with the fence 18.

Permutation-wheels in locks of this character have been made in two parts, the rim surrounding the body being held in the proper position in relation to the body by a clamping action. My present improvement upon this portion of the lock relates to the combination, with the body of the wheel, of a spring-rim the inner edge of which is cut away opposite to the notch or opening in the said rim, and four or more grasping-points are provided upon the inner edge of the rim, so that after the key or wrench has been inserted and turned to expand the ring the grasping-points will be entirely free from the edge of the body of the wheel, and the body can be turned in changing the numbers or permutations of the lock. The grasping-points 26 27 are upon the inner edge of the ring 30, adjacent to the slot 17, and the grasping-points 28 29 are equidistant, or nearly so, from such points 26 27. This allows for a free space between the rim 30 and the body 31 opposite to the slot 17, so that when the rim is expanded by the key or wrench O, inserted into the notch 17 and turned, as seen in Fig. 15, the said rim 30 will spring most easily at the side opposite to the slot 17 and expand with uniformity, so that the periphery of such rim 30 is circular and the grasping-points 26 27 28 29 are free from contact with the body 31 of the permutating-wheel.

I prefer to make the periphery of the body 31 corrugated or milled, as seen in Figs. 13, 14; but the same may be smooth, as in Fig. 15, and the grasping-points 26 27 28 29 may be chisel-shaped, as in Figs. 14, 15, or they may be made broader, as shown in Figs. 3 and 13. All the permutation-wheels may be alike, or some may be similar to that in Fig. 3 and others similar to the wheel shown in Figs. 13, 14, 15.

The edge of the body 31 may be V-shaped, as shown sectionally in Figs. 16, 18, and 19; but usually it is preferable to make the same cylindrical, as shown in Figs. 2, 4, and 17, the flange 35 being spun or pressed up to hold the rim after such rim has been placed around the body of the wheel.

To insure the proper centering of the rim when expanded, I prefer to make use of fixed studs P, projecting from the inside of the lock-case around the permutation-wheels, and these studs are sufficiently far from the axis of ro-

tation to allow said wheels to turn freely when not expanded.

I prefer to make the interior surface of the spring-rims between the clamping projections eccentric, as seen in Fig. 15, so that the spring may be stiffest opposite to the slot where the wrench or key is applied and where there is the greatest leverage, and weakest where there is the least leverage, so that the ring may be expanded with uniformity by the wrench or key.

In instances where permutation-wheels have been made with contractile rims that are expanded by a wrench or key, such wrench or key had to be inserted at a distance from the fence of the dog, because the pendent arm was in the way and prevented the key or wrench being inserted adjacent to the fence, and it was necessary in these locks to have a second zero-mark upon the dial for setting the wheels when the permutations were changed. I avoid this difficulty by cutting away the dog and its pendent arm, in the manner shown in Fig. 1, to form an opening for the key or wrench O, the stud 22 being sufficiently distant below the fence 18 to allow for the insertion of such key or wrench.

Upon reference to Figs. 12 and 15 it will be seen that the key or wrench is formed of a circular stem, with projecting wings that are wide enough for spreading the rims 30 by the partial rotation thereof, and there is a stop, 38, on the inside of the lock-plate B, against which one of the projections 39 upon said key O stops when the same has been properly turned to spread the spring-rims. The inner end of the key is received into a socket, 40. It is to be understood that the setting of the tumbler-bodies while the notched rims are sprung open and held stationary by the key O is to be proceeded with in the ordinary manner in permutation-locks.

The dog M is usually attached to the bolt F by a pivot-screw, 42. Sometimes this pivot-screw clamps the dog M too tightly, either by the hardening of oil or the oxidation of the metal, or by carelessness in putting the parts of the lock together, and the consequence is that the fence and dog fail to drop when the notches 17 are in line beneath the fence, and there is no device for giving motion to this dog, and sometimes the safe has to be opened by force.

I provide a dog-moving tumbler, R, having an opening with inclined edges, and into this opening the stud 22 passes. Said tumbler R surrounds the spindle D between the tumbler K and the lock-plate B, and there is usually a washer at 44. This dog-moving tumbler R does not interfere with the rotation of the spindle D and tumbler K; but in case the dog M does not fall when the permutation-wheels are properly set it is only necessary to press the spindle inwardly and produce a friction between the surface of the tumbler K and the surface of the dog-moving tumbler R, so that

the latter can be partially rotated to cause the inclined surfaces at the opening in the said tumbler R to act against the stud 22 and draw down the same and the dog M for opening the lock; and to allow of this partial rotary motion of the spindle and the tumbler K the notch 21 is made sufficiently long, as seen in Fig. 7, not to act upon the dog when partially rotating the tumbler R first one way and then the other to draw down the dog.

Upon reference to Fig. 13 it will be seen that I sometimes provide holes in the spring-rim of the tumbler opposite to the notch 17, so that the weight of the parts may be balanced.

The ends of the split rim at the notch 17 may be beveled or inclined, as indicated in Figs. 13 and 14, so as to act to better advantage with the key or wrench O when the spring-rims of the permutation-wheels are being sprung open.

The key or wrench may be made in any desired manner; but I prefer to provide projections or bits, as seen at 20 in Fig. 20, which bits pass in between the sides of spring-rims at their ends to hold the parts in their proper relation to each other.

I do not claim a permutating-tumbler having a split spring-rim with two internal projections adjacent to the split and an internal projection opposite to said split, as this has been used. By my improvement the ring is rendered more elastic and the tumbler and ring are more accurately centered, as the bearings 28 and 29 divide the internal periphery of the ring into three nearly equal spaces between the bearings 26 and 27.

I claim as my invention—

1. The combination, with the permutation-wheels having notched spring-rims and a key

or wrench passing into such notches, of a dog and the fence thereon, said dog being cut away below the fence to allow for the insertion of the key or wrench, substantially as set forth.

2. The combination, with the permutation-wheels, the spindle, and the tumbler K, of the bolt F, pivoted dog M and stud 22, and the dog-moving tumbler R, having inclines to act upon the stud 22 and move the dog, substantially as set forth.

3. The combination, with the permutation-wheels having spring-rims, of the key or wrench O for springing the rims open, and the studs P for holding the ring centrally, substantially as set forth.

4. The combination, with the spindle and dog in a permutation-wheel lock, of a dog-moving tumbler actuated by friction and acting to draw the fence of the dog into the notches in the permutation-wheels, substantially as set forth.

5. The combination, with the permutation-wheels having notched spring-rims, of a key or wrench having lateral projections that pass in between the spring-rings and hold them in position while distended, substantially as set forth.

6. The combination, in a permutation-wheel, of a circular body and a spring-rim the exterior of which is concentric and the interior provided with grasping projections, and the inner surface between the projections is eccentric, substantially as set forth.

Signed by me this 22d day of October, 1886.

AUG. STONER.

Witnesses:

GEO. T. PINCKNEY,
WILLIAM G. MOTT.