(Model.)

2 Sheets—Sheet 1.

W. A. LAWRENCE.

PERMUTATION LOCK.

No. 387,307. Patented Aug. 7, 1888.

Fig. 1.

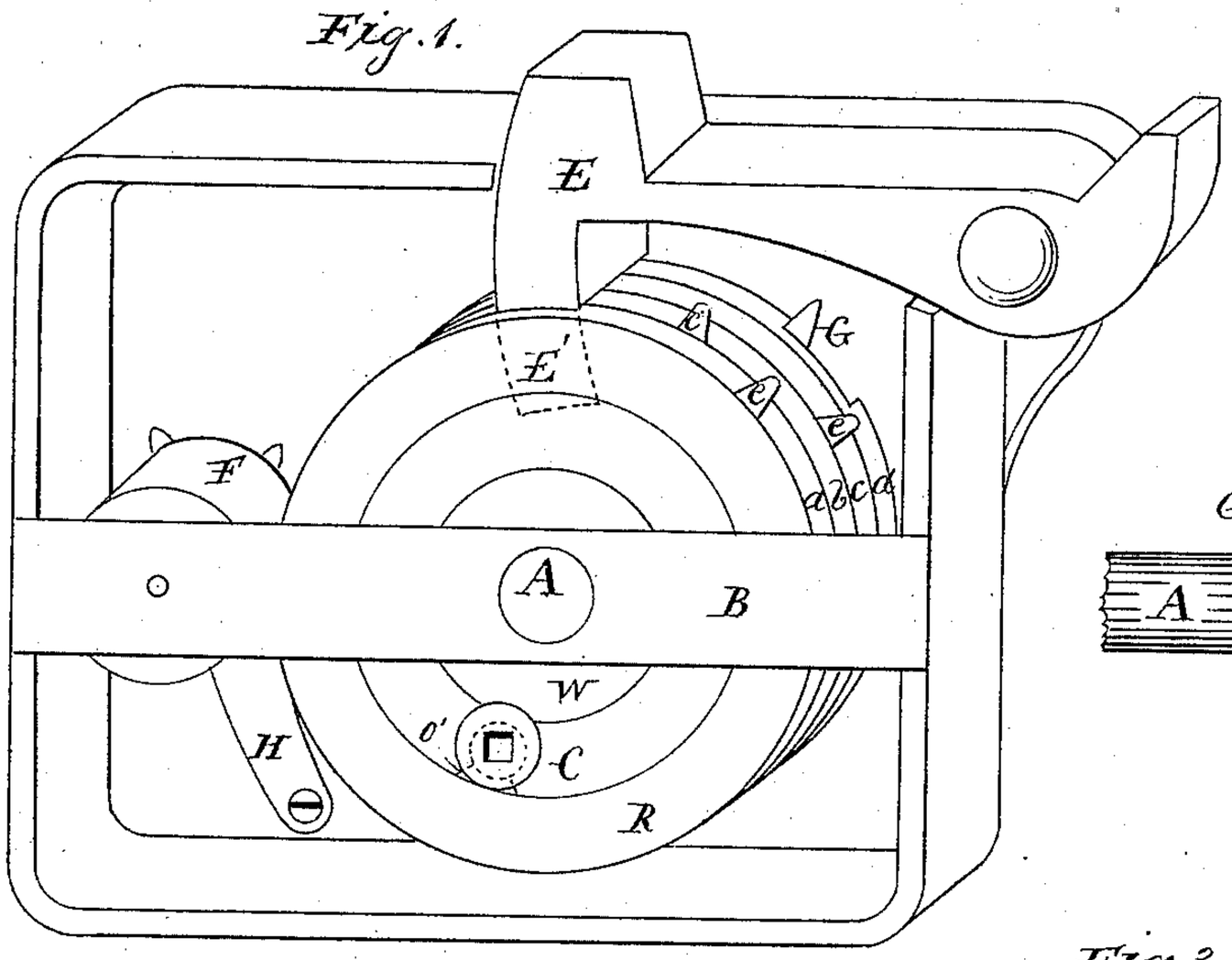


Fig. 2.

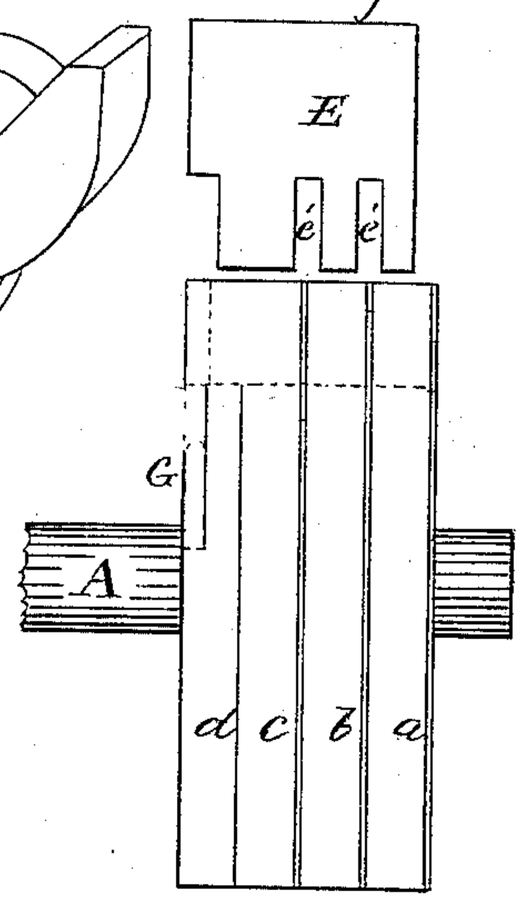


Fig. 3.

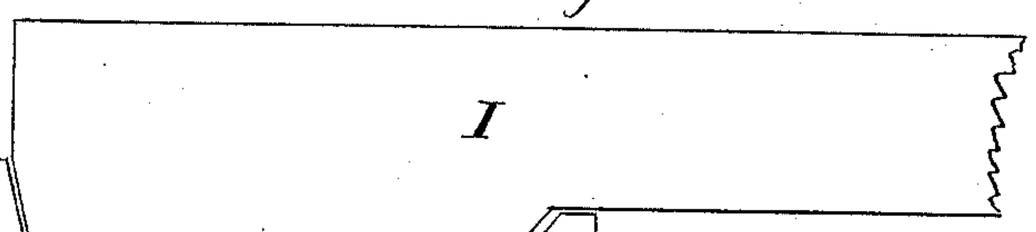


Fig. 4.

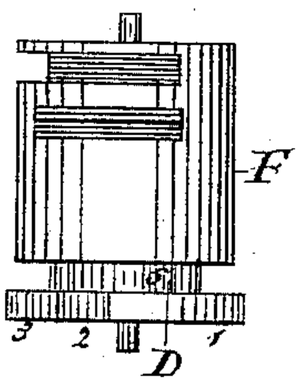


Fig. 5.

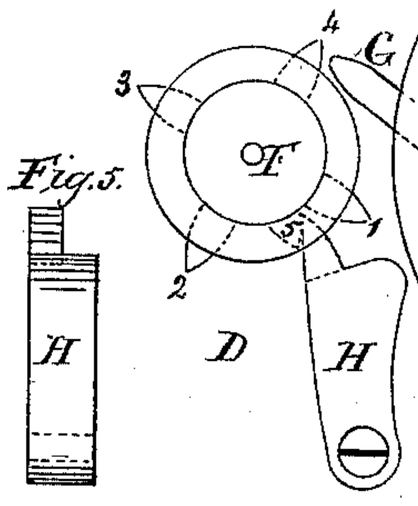


Fig. 7.

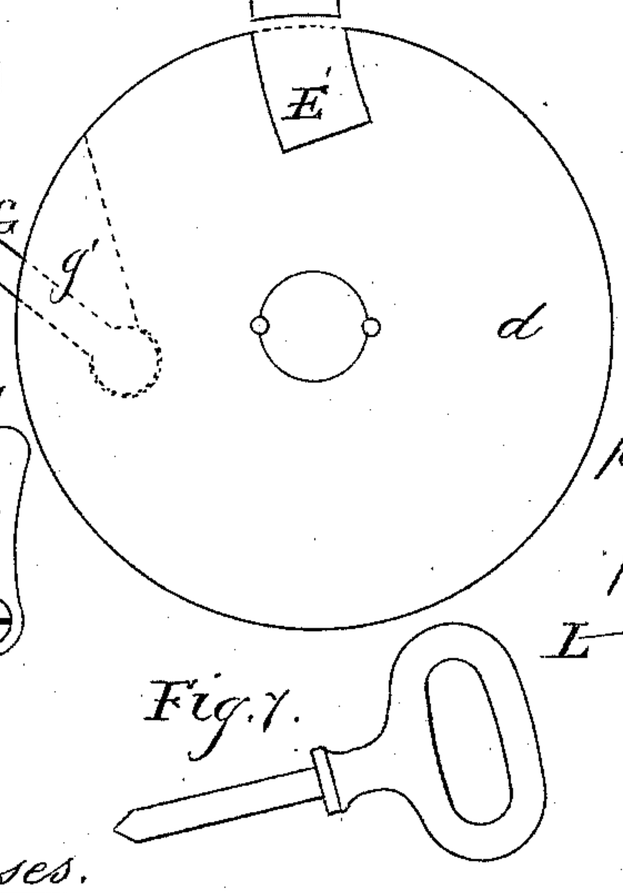
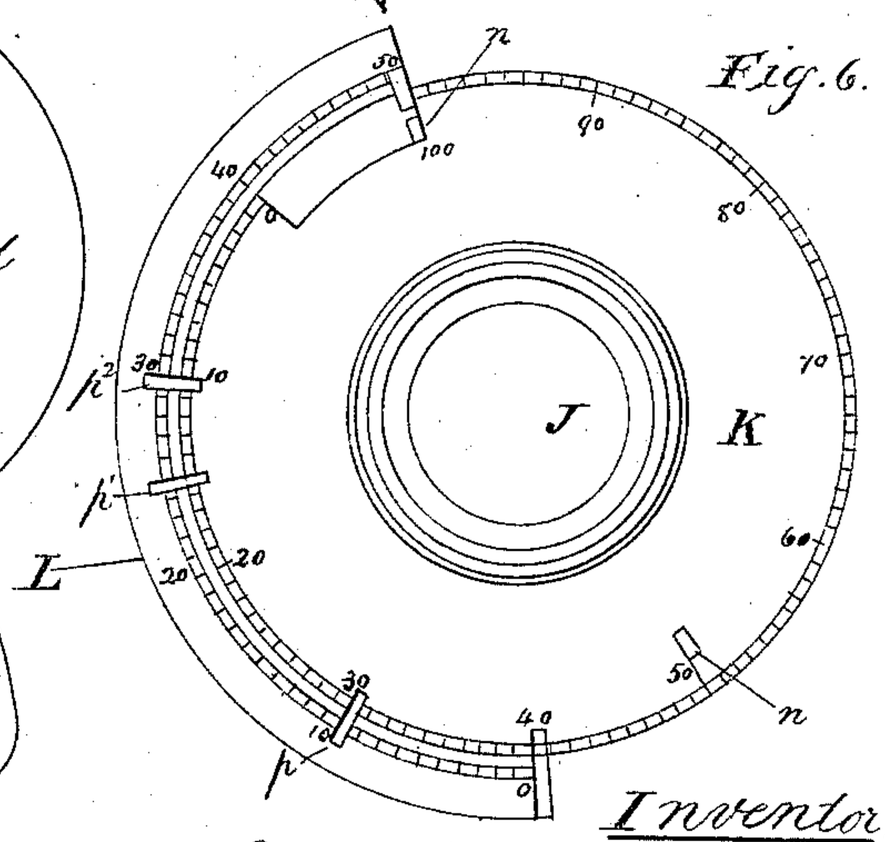


Fig. 6.



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(Model.)

2 Sheets—Sheet 2.

W. A. LAWRENCE.

PERMUTATION LOCK.

No. 387,307. Patented Aug. 7, 1888.

Fig. 8.

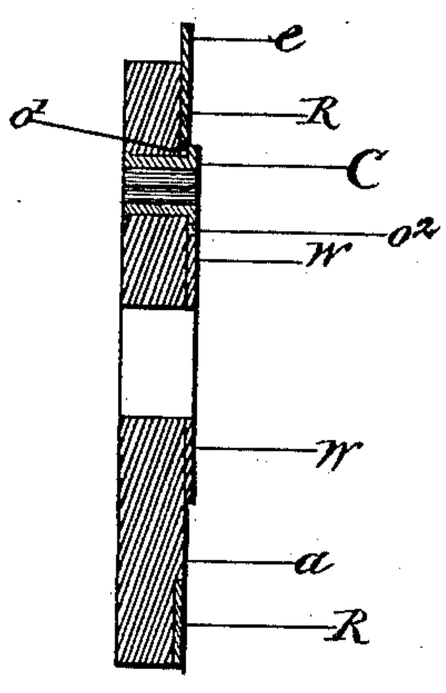
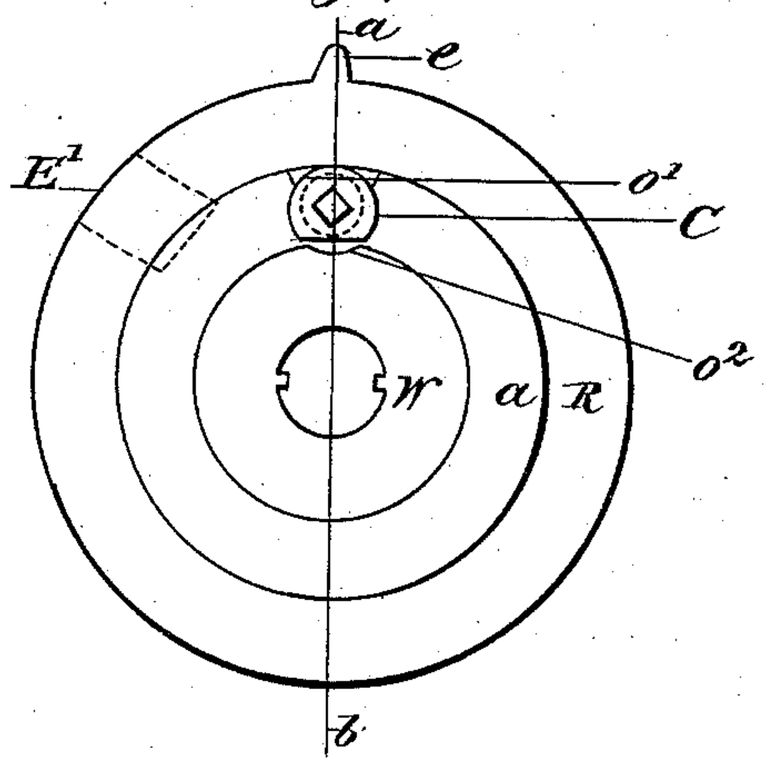


Fig. 9.



Witnesses

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G. Elliott.

Inventor.

William Allan Lawrence

per William Gill.
Atty

UNITED STATES PATENT OFFICE.

WILLIAM ALLAN LAWRENCE, OF SHERIDAN, ONTARIO, CANADA.

PERMUTATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 387,307, dated August 7, 1888.

Application filed June 8, 1887. Serial No. 240,820. (Model.) Patented in Canada January 24, 1887, No. 25,838.

To all whom it may concern:

Be it known that I, WILLIAM ALLAN LAWRENCE, of the village of Sheridan, in the county of Halton, in the Province of Ontario, Canada, have invented new and useful Improvements in Permutation-Locks; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention is shown in this application as a lock suitable for safes for banks and other offices, and may be adapted for other purposes, and for which invention I obtained a patent in the Dominion of Canada, No. 25,838, and dated January 24, 1887.

In the accompanying drawings, Figure 1 is a perspective view of the lock, the front of the case being removed to show the mechanism of the same. Fig. 2 is an edge view showing the position of the wheels and a front view of the locking-latch. Fig. 3 is a face view of the operating mechanism. Fig. 4 is an elevation of a journaled cylinder, by means of which and other mechanism in combination, the operation of opening and locking the lock is performed. Fig. 5 is an edge view of a pivoted arm which acts in combination with the aforesaid cylinder in operating the lock. Fig. 6 is the usual dial common to combination-locks, by means of which the combination-numbers are arranged and operated. Fig. 7 is a wrench for turning the eccentric-rivets for the adjustment of the rings and nibs when arranging the combination-numbers. Sheet 2: Fig. 8 is a sectional elevation of one of the series of wheels composing one of the chief features of the lock, the section being taken through line *a b* in Fig. 9, which is a plan view of same wheel, and shown more fully here than in Fig. 1 of the drawings.

Similar letters of reference indicate the same or corresponding parts.

A represents the main axle, on which a series of loose wheels, *a b c*, with rings R and nibs *e* thereon, and secured to the wheels by eccentric-rivets *c*, a fastened wheel, *d*, and fastened washers *w*, with notches o^2, are placed and operated, as hereinafter described; B, a temporary cross-bar, in which axle A aforesaid is journaled; C, an eccentric-rivet, of which there is one in each wheel, for securing a ring, R, on each of the wheels *a b c*.

D represents a cog on a cylinder, F, hereinafter described; E, the locking-latch, the front end thereof terminating in a downward projection, which falls into the notch E′ in the wheels *a b c d* and liberates the sliding locking-bar I, which is moved, when so liberated, by means of a handle or knob outside the door on which the lock is placed.

F is a cylinder, hereinbefore referred to, and journaled in the bar B, hereinafter more fully described; G, an arm placed in a recess in the under side of the fastened wheel *d* of the series of wheels hereinbefore referred to; H, a pivoted arm, which is acted upon by the aforesaid arm G; I, the locking-bar, which is moved backward and forward in opening and locking the lock; J, the knob or handle on dial K for turning the same; L, an auxiliary dial, with projections $p\ p'\ p^2$, representing the combination-numbers of the lock. In applying this auxiliary dial to the side of the main dial the position of the combination-numbers may be felt by the fingers and operated in the dark, the main dial K being provided with two projections, *n n*, to correspond to the projections $p\ p'\ p^2$ in the auxiliary dial L for this purpose.

Referring to Fig. 1, which shows the loose wheels *a b c* and the innermost wheel, *d*, which is fastened on the axle A, the rings R, with nibs *e*, are fastened to the said loose wheels by a loose eccentric-rivet, C, acting on a wedge-piece, *o′*. The fastened washers W, with notch o^2, are also herein shown and more clearly in Figs. 8 and 9 of Sheet 2. The locking-latch E is shown to be bent down in the inner end, so as to drop into the notches E′ in the series of wheels aforesaid and liberate the locking-bar I. Figs. 8 and 9 in Sheet 2 are referred to as showing more clearly the construction of the wheels *a b c*, also the fastening of the rings R and washers W, one of which is in front of the wheel *d*. The others are between the wheels *a b* and *b c*.

Referring to Figs. 3, 4, and 5, in which are shown the fastened wheel *d* and cylinder F, with the arms G and H and locking-latch E, already referred to, when the axle A is turned to the left, which will appear in the drawings to be to the right, the switch-arm G will act on the arm H and press the end of the same outwardly, so as to react on the short cog D of

the cylinder and turn it back slightly, so as to place the cylinder in the proper position for the switch-arm G to act on the cogs of the cylinder 1 2 3 4 alternately in arranging the notches E′ in line for the locking-latch E to drop into and liberate the locking-arm I. The cylinder F, in addition to its being constructed with four cogs, 1 2 3 4, and the short cog D, is also constructed with three grooves in its periphery and in such parts thereof that in turning the axle A in arranging the notches E′ of the wheels in line, the nibs *e* of the wheels so arranged will pass freely through the said grooves, each nib in its own groove, so as to be unmoved from their position while the other wheels are being so arranged.

Referring to Fig. 6, K represents a dial common to combination-locks, with a handle or knob, J, for turning the same. Said dial is in this case divided into eleven equal parts. One of these is left blank, and the others are divided into ten parts each, making in all one hundred equal parts, equal to one million different combination-numbers to choose from in setting the lock. L represents an auxiliary dial having projections p p' p^2, representing the combination-numbers of the lock. In applying this auxiliary dial to the side of the main dial, the position of the combination-numbers may be felt by the fingers and the lock be opened in the dark, the main dial being provided with two projections, *n n*, to correspond to the projections on auxiliary dial.

Having thus described the construction and location of the parts of my lock generally and in detail, I will now proceed to describe the several operations to be performed in the opening and locking of the same.

Directions for operating the lock.—To lock the device, turn the axle A one revolution to the right, stopping when the zero-point 0 on dial comes opposite the point S on dial-plate the second time. To unlock the device, turn to the left until the zero-point 0 on dial comes away from the point S on dial-plate and the number 100 on dial comes opposite the point S on said plate, then turn to the right until the first combination-number comes opposite the point S on dial-plate. Turn to the left, as before, then turn to the right until second combination-number comes opposite the point S on dial-plate. Turn to the left, as before, then turn to the right until the third combination-number comes opposite the point S on dial-plate, then turn to the left until the number 100 on dial comes opposite the point S on dial-plate. The locking-bar I will then be at liberty and may be thrown back and open the door.

Note.—When the lock happens to have been locked in any other way than as hereinabove described, lock according to the above direction before trying to unlock.

Explanations of the above directions.—First operation: To lock the device, turn one revolution or more to the right. This disarranges all the loose wheels *a b c* as their nibs *e* come in contact with the body of the cylinder F, and thus all the wheels will be turned out of unlocking position, the notches being out of line with each other.

Second operation: To unlock the device, turn to the left until the number 100 on dial comes opposite the point S on dial-plate. The switch-arm G during this operation turns the cylinder F to first position. Then turn to the right until first combination-number comes opposite the point S on dial-plate. The notch in the first wheel is thus turned by cylinder F to be in line with notch in wheel *d*.

Third operation: Turn to the left, as before, until the number 100 on dial comes opposite the point S on dial-plate. The switch-arm G during this operation turns the cylinder F to its second position. Then turn to the right until the second combination-number comes to the point S on dial-plate. The notch in second wheel is thus turned to be in line with the notch in wheel *d*.

Fourth operation: Turn to the left, as before, until the number 100 on dial comes opposite the point S on dial-plate. The switch-arm G has during this operation turned the cylinder F to its third position. Then turn to the right until the third combination-number comes opposite the point S on dial plate. The notch in third wheel is thus turned to be in line with notch in wheel *d* by its nib *e* coming in contact with cylinder F. Turn to the left until the number 100 on dial comes opposite the point S on dial-plate. The locking-latch may now fall into the notches in the wheels and the locking-bar will be at liberty to be thrown back and the door opened.

To change the combination-numbers, introduce the wrench (shown in Fig. 7 of the drawings) into the opening in rivets C, which are all in line with each other, when the lock is open. Then turn the rivets half-round and withdraw the wrench. Then open the lock at the new combination-numbers, reintroduce the wrench in the rivets C, and turn back a half-turn, withdraw the wrench, and lock is ready for use with the new combination-numbers.

Explanation in changing the combination-numbers.—(Refer specially to Sheet 2, Figs. 8 and 9.) Place wrench in rivets C and turn half-round. Then withdraw the wrench. The rivets are all alike, and each rivet has an eccentric body. The rings R are now loosened on the body of the wheel, while the body of each wheel is fastened to the stationary washer by the side of the rivet-head being turned into the notch o^2 of the washer, so that the notch E′ cannot get out of unlocking position while the rivet head is in this position—that is, in the notch o^2 of the fastened washer. Now open the lock at new combination-numbers. The body of each wheel being now fastened in the unlocking position—that is, having its notch in line with notch in wheel *d*—when the

operation of unlocking is being gone through the nibs of the wheels will in turn come in contact with the solid part of the cylinder in the same manner as they do when unlocking ordinarily; but the nibs only with rings R will be arranged into the same positions they will be in when opening the lock by these same combination-numbers afterward. Now put wrench in rivets C and turn them back half-round. This tightens the rings R of each wheel on the body of the wheel, and as the side of the rivet-head is drawn out of notch o^2 in the washer the whole wheel may be operated again as before, altering the combination, but with new numbers.

Having thus described my invention, I claim—

1. In a permutation-lock constructed as described, the combination of the axle A, wheels *a b c* loose thereon, rings R, having nibs *e*, eccentric-rivets C, adapted to secure said rings to the wheels, with the fastened wheel *d*, washers W upon said wheels, the arm G, journaled in the wheel *d*, the pivoted arm H, and cylinder F, substantially as and for the purpose set forth.

2. In a permutation-lock, the cylinder F, having cogs 1 2 3 4, and a short cog, D, upon its lower end, and having grooves in and partially round its periphery, in combination with the wheels *a b c*, having nibs adapted to engage the solid portion of the periphery of the cylinder at the proper times, the fastened wheel *d*, having an arm, G, journaled therein and adapted to engage the cogs 1 2 3 4, and also to engage cog D indirectly by means of the pivoted arm H, whereby the notches in the wheels may be brought into line in the opening of the lock or moved out of line in the closing of the lock, substantially as and for the purpose set forth.

WILLIAM ALLAN LAWRENCE.

Witnesses:
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G. ELLIOTT.