G. B. Atwood,

Permutation Lock,

No. 63,824, Patented Apr. 16, 1867.

Witnesses:
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Letters Patent No. 63,824, *dated April* 16, 1867.

IMPROVEMENT IN PERMUTATION LOCKS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, GEORGE B. ATWOOD, of the city of Philadelphia, in the State of Pennsylvania, have invented a new and useful Improvement in Combination Locks for safes, vaults, &c.; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a vertical transverse section of one of the said improved locks, cut along the central line of its spindle and knob.

Figures 2, 3, 4, 5, plane views of its disk-tumblers detached.

Figure 6, an inside view of the lock, showing its bolt and cam, with the operating disk of the latter, the back plate of the case and the disk-tumblers having been removed therefrom for the purpose; and

Figure 7, a representation of the upper side of the knob and indicating ring, as closed up against a projection on the face side of the lock, together with a horizontal section of the bolt and cam, with the operating disk of the latter on the spindle—

Like letters of reference indicating the same parts when in the different figures.

The object of my improvement is to produce a combination lock that will not only be powder proof, (as being without a key-hole or other opening,) but that will be more simple in its construction and mode of operation, less liable to get out of order, and more certainly effective against any successful manipulations of lock-pickers or burglars.

The nature of my invention consists substantially, as hereinafter described, in locking the spindle in a position disconnected from the bolt, and in ascertaining the extent of different rotary motions required in the knob and spindle in unlocking the lock by means of a loose measuring ring on the knob.

In the drawings, A B is the case of the lock, C the knob, D the spindle, E E^1 E^2 the disk-tumblers, F the bolt, G the cam, H the actuating disk of the cam, and I the loose, measuring, or indicating ring on the knob. The front or knob sides of the case A B and the spindle D are made of undrillable steel. In figs. 1 and 6 two external bolt-eyes are represented, whereby the lock may be bolted fast to the inner side of the door of a safe or vault. The knob C is adjustably fixed on the spindle D by means of a screw-nut, c^1, and the spindle D is cylindrical and made so as to fit and rotate accurately in the case A B, and is also enlarged so as to have the shoulders d^1 d^1 and d^2 d^2; the first, d^1 d^1, to serve as a stop to prevent undue longitudinal motion inward, and the latter, d^2 d^2, as a bearing for the knob C, in fixing the latter upon the spindle D. The measuring ring I is sufficiently loose around the enlarged part of the spindle D to be easily turned around thereon by one's finger while grasping the knob in the hand, and fills the space which is allowed for it between the knob C and the projecting portion a^1 of the face-plate of the case A B, when the spindle is pushed in. (See figs. 1 and 7.) The outer side of the said ring I is divided by transverse lines into numerous equal parts, and on one side of the knob C a small dot, c^2, is made, which can be brought, by rotating the knob, to be directly opposite to or any distance from a like dot, a^2, on the projecting part a^1 of the case A B. (See fig. 7.) On the inner end of the spindle D the disk E, which is about two inches in diameter, and a quarter of an inch thick, more or less, is fixed, by a set-screw in its base. (See fig. 1.) This disk has one-half the thickness of its edge cut away from its inner or front side, at e^3, to the depth of a quarter of an inch, more or less, and has also a slot, e^4, about three-eighths of an inch wide, more or less, cut across in the remaining half of its edge to the same depth as the recess e^3, and has also a small pin, e^6, projecting about an eighth of an inch on its inner side. (See figs. 1 and 2.) The second disk E^1 is of the same diameter and thickness as disk E, is recessed and slotted in the same manner; but in the side which is in contact with the front side of E there is an annular groove, e^5, which receives the projecting pin e^6, and allows the latter to traverse the groove when either of the disks are turned around on the spindle. The groove e^5 has six, more or less, holes made through its bottom, at equal distances apart, and in one of these holes a pin, e^7, is fixed, one end of which is even with the surface of the grooved side of the disk, (see fig. 3,) and projects at its other end about one-eighth of an inch from the opposite side of the disk. (See fig. 4.) The disk E^2 is precisely like the disk E^1, excepting the holes in the groove of the former, and that its pin e^5, in its groove, does not project on the opposite side of the disk. (See fig. 5.) The cam-actuating disk H is about an inch in diameter, and is fixed on the spindle D by a set-screw, and has a pin, h^1,

projecting from its front side about an eighth of an inch. The bolt F is slotted along in its middle so as to receive the disk H, and at the same time allow the bolt to be moved right and left, by the cam G, in locking and unlocking it. (See figs. 1 and 6.) About one-half of the thickness of the bolt F is entirely cut away from the front side, the length of the slot, which receives the disk H, so as to form a recess for the reception and rotary motion of the cam G, and through a hole in the latter the spindle D rotates. In the rear side of the cam G a hole, g^1, is made for the reception of the pin h^1 of the disk H, when the latter is pulled into the slot of the bolt F, as provided for in the arrangement of the several disks on the spindle, as follows: The cam G and bolt F are placed in position in the case A B, and then the spindle D, provided with its ring I and knob C, as described and shown, is inserted through a hole in the face-plate of the case A B, and through the cam G and bolt F, and pushed back until the ring I comes in contact with the projection a^1; the disk H is then slipped over the spindle D until it reaches the rear side of the bolt F, where it is then fixed by its set-screw, so that its pin h^1 will be directly opposite to the corresponding hole g^1 in the cam G, the bolt F being in the locked position, as represented in the drawings. The disks E^2 E^1 E are now slipped over the spindle D in the order named, closed up together against the fixed disk H, and then the disk E fixed on the spindle by its set-screw. (See fig. 1.) K is a solid piece of metal, fixed to the inner side of the case, which has its free end slotted to correspond and interlap with the recessed peripheries of the disks E E^1 E^2, as shown in fig. 1. It will therefore be seen that when the slots e^4 e^4 e^4 of the disks E E^1 E^2 are turned or moved so as to be directly opposite to the projections on the fixed block K, the spindle D can be drawn outward, by pulling the knob C until the fast disk H comes into contact with the cam G, its pin h^1 entering the hole g^1; and that, as the depth of the slot for the disk H in the bolt F equals the thickness of either of the disks E E^1 E^2, the recesses e^3 e^3 e^3 of the said disks will have been moved forward and opposite to the next projections of the said block K; and, therefore, that the spindle D can now be moved round, or rotated, so as to turn over the cam G, and thus unlock and re-lock the bolt F alternately at pleasure, and that, when locked, the said spindle D can be again pushed in and freely rotated in either direction without moving either the said cam G or bolt F. In order to prevent the loose disks E^1 E^2 from being carried around, simply by the friction of the moving spindle and disk E, a superior amount of friction is constantly produced upon them by means of a friction-block, L, supported and pressed against them by a spring, l^1; and, to prevent the possibility of forcing the bolt F back without rotating the cam G, as described, a stop-block, M, is fixed to the case A B, directly beneath the cam G, so as to prevent any further motion of the said cam after the bolt has been either locked or unlocked.

Operation

In the drawings, the bolt F is represented as thrown out to the right, or locked, and the positions of the slots e^4 e^4 e^4 of the disks E E^1 E^2, in respect to the projections on the block K, such that the spindle D can be either rotated freely without moving the bolt F, or drawn forward through a space exactly equal to the thickness of either of the disks E as indicated by the faint lines in fig. 1, and thus simultaneously bringing the flat disk H into the slot of the bolt F and its pin h^1 into the hole g^1 of the cam G. It will therefore be seen that, by then rotating the knob C to the left, the bolt F will be easily withdrawn or unlocked, and that, by then rotating it in the opposite direction, the bolt will be as easily thrown out or re-locked, the block M stopping the cam in either case so as to hold the bolt; and that, if the knob be then pushed in again to its first position, as shown in figs. 1 and 7, and then rotated, the spindle D will be locked in position by the projecting edges of the disks E E^1 E^2 entering and remaining between the projections of the block K; and yet that the said spindle can be freely rotated in either direction by means of the knob C. In this latter position of the spindle it will be almost impossible for any one to move the bolt F without a knowledge of the particular, selected, rotary motions required to be given to the knob C for the purpose; and, besides, these can be chosen or varied at the pleasure of the proper person, by his simply loosening the knob by unscrewing the nut c^1, and then turning the knob around on the spindle to a new position, and again screwing up the nut c^1, the bolt being unlocked and the spindle drawn half way out, so as to prevent the latter from turning round while operating the nut. In the present instance the knob is fixed on the spindle so that its dot c^2 is exactly four spaces of the measuring ring I to the right-hand side of the dot a^2 on the projection a^1, (see fig. 7,) when the slot e^4 of the fixed disk E has one of the projections of the block K directly over or opposite to it. (See fig. 1.) In rotating the knob C in either direction, the pin e^6 of the disk E comes into contact with the pin e^7 in the groove e^5 of the disk E^1, and thus carries the latter around on the spindle D; and the projecting end of the said pin, on the front side of E^1, then comes in contact with the pin e^8 in the groove e^5 of disk E^2, and thus carries the latter around also. This operation is called "winding up the lock." The pin in the groove e^5 of the disk E^1 can be fixed in any one of the holes in its groove, in order to change the movements required to unlock the bolt; but the mode of changing, by turning the knob C around on the spindle D, by means of the screw-nut c^1, as described, affords more convenience and facility. To unlock the lock, (the arrangement of the disks and knob being as described,) the lock must first be "wound up" by rotating the knob C three or four times to the left, bringing the dot c^2 exactly four spaces of the measuring ring I to the left of the dot a^2, then rotating the knob once around to the right, and bringing its dot c^2 exactly eight spaces of the ring I to the right of the dot a^2, and then, finally, turning the knob around back again to the left, exactly four spaces of the ring I, as shown in fig. 7; the spindle can now be drawn forward, as indicated by the faint lines in fig. 1, and rotated so as to withdraw the bolt F as required.

The object in making the measuring ring loose on the knob, or thick part of the spindle, is to deceive or embarrass a thief, as well as to enable the proper person in charge with instant facility to change the place of the indicating mark on the knob, and thus prevent the opening of the lock by any improper person who may have obtained a knowledge of the selected spaces to be used for the purpose. The small dot c^2 is intended to

be very small and shallow; a slight scratch made with a penknife point, so as to be almost unobservable, is sufficient to indicate to the person in charge how far in either direction the ring and knob are to be moved around together from the dot a^2 to open the lock. In the present instance, after "winding up the lock," the dot c^2 must be moved four spaces to the left of dot a^2, then eight spaces to the right of a^2, and finally four spaces to the left, before the spindle can be drawn outward. Now, to instantly change the whole combination of the spaces, all that is necessary is that the dot c^2 be erased and a new indicating dot or scratch be made at, say, one or more spaces either to the right or left of the old one, and then allowing for the said added or subtracted spaces in moving the knob. The improper person would now be baffled in his efforts to open the lock by counting the spaces as before, because the new indicating point on the knob will not correspond with the old numbers of the selected spaces, and, the ring being loose and without any specific mark thereon, a person unacquainted with its use would probably not be able to make any use of it at all, although its loose condition would seem to him to involve the secret in some manner.

Having thus fully described my improved combination lock, what I claim as new therein of my invention, and desire to secure by Letters Patent, is confined to the following, viz:

1. I claim locking the spindle D in a position disconnected from the bolt F, by preventing longitudinal motion without preventing rotary motion in the said spindle, by means of the disks E E^1 E^2 and block K, constructed and arranged to operate together substantially in the manner described and set forth.

2. I claim the loose measuring ring I, in combination with the knob C, arranged and operating together substantially as and for the purpose described.

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Witnesses:

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