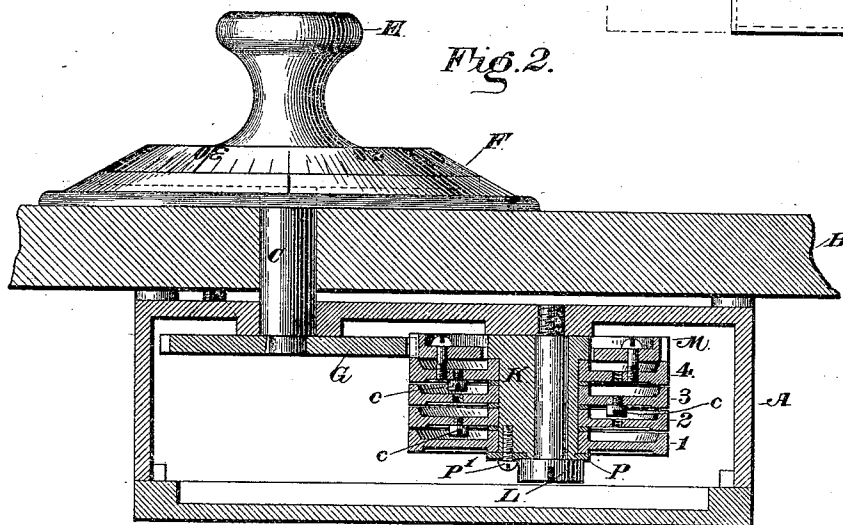


L. J. COOPER.
PERMUTATION LOCK.

No. 513,764.

Patented Jan. 30, 1894.



businesses
M. E. Fowler
and Johnson.

L. J. Cooper

By W. A. Bantell
Atty.

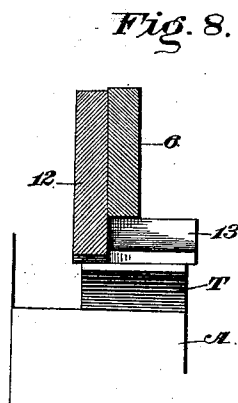
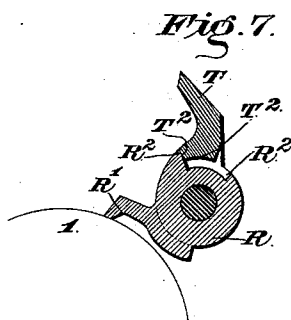
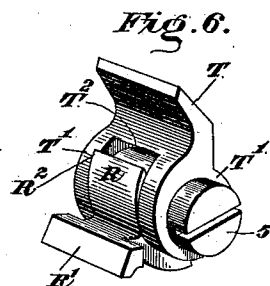
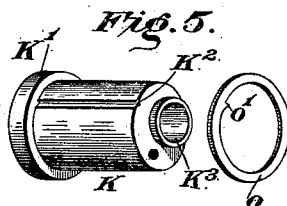
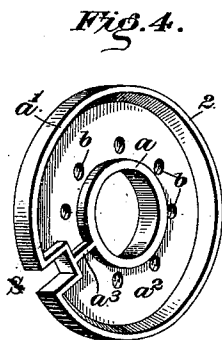
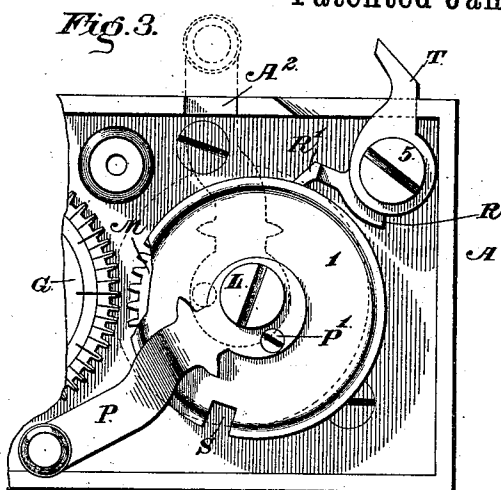
(No Model.)

2 Sheets—Sheet 2.

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Witnesses

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Inventor

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UNITED STATES PATENT OFFICE.

LONZO J. COOPER, OF COVINGTON, KENTUCKY, ASSIGNOR OF TWO-THIRDS
TO LYTLE J. HUNTER AND HARRY C. HUNTER, OF CINCINNATI, OHIO.

PERMUTATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 513,764, dated January 30, 1894.

Application filed March 29, 1893. Serial No. 468,122. (No model.)

To all whom it may concern:

Be it known that I, LONZO J. COOPER, residing at Covington, in the county of Kenton and State of Kentucky, have invented certain new and useful Improvements in Permutation-Locks, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to permutation locks for safes, vaults and the like.

The object of the invention is to produce a permutation lock in which the tumblers may be readily thrown out of gear, to change the combination; also to improve the construction of the tumblers and locking dog; also to connect the locking dog and tumblers in such manner that a back pressure on the bolt may not act on the tumblers; also to improve locks of this general character in various details.

Figure 1 is a plan or face view of the lock with the inner cover removed, and showing enough of the bolt work to indicate the operation of the device. Fig. 2 is a horizontal section, on line *x x*, Fig. 1. Fig. 3 is a broken plan, similar to Fig. 1, showing in full lines the tumblers swung out of gear. Fig. 4 is a perspective of one of the tumblers. Fig. 5 is a perspective of eccentric hub, and one of the washers which separate the tumblers. Fig. 6 is a perspective of the lever between the tumblers and locking dog; and Fig. 7 is a section thereof. Fig. 8 is a detail section on line *yy*, Fig. 1.

The driver and tumblers are inclosed in the casing A, which casing is preferably rectangular, and is attached to the inside of the door B in any suitable or convenient manner. The spindle C extends through the door and casing, and has the usual operating knob or handle E and dial F, outside the door. The driving pinion G is rigidly attached to the spindle inside the lock casing. This driving pinion has teeth corresponding to the index on the dial, and bears an index or dial which also corresponds with the outer dial, and the indicator I corresponds to the usual indicator outside the door.

The tumblers 1, 2, 3, and 4 are annular plates, notched each at one side. These tumblers are mounted on a cylindrical hub K,

which hub is bored in the direction of its length, and at one side of its center. The hub is mounted on the stud or axle L, which may be a screw passing through the hub into the casing. The end of the hub next the base of the stud preferably has an enlargement, K', on which the driven pinion M is mounted. The tumblers are separated from each other on the hub by washers O, O, which washers have a tooth O' to enter a groove K² in the hub. The washers fit snugly to the hub and thus retain the tumblers on the hub by the force of their frictional engagement therewith.

A lever P is attached to the outer end of the hub K, by a screw P', and by engagement with the burr K³ on the hub, or it may be otherwise attached. The lever P is preferably of elastic material, so that it will spring into a notch A² in the casing, and hold the hub in position to bring the driven pinion M into geared engagement with the driver G. The lever P may be swung out of notch A² when the inner plate A³ of casing A is removed, and by moving the lever P into the position shown in Fig. 3 the hub, by reason of its eccentricity, will move the pinion M out of engagement with driver G, when the combination may be changed. When the parts are thus out of engagement, the driver G may be turned on its center, to a greater or lesser distance, by means of its handle E. Then when the driven pinion M is swung back into engagement with the driver G, the engagement will be at a different place, and the combination will be changed. The number of changes which can be made in this way corresponds to the number of teeth in the driver.

The tumblers 1, 2, 3, 4 (more or less in number) are made with an inner flange *a* and an outer flange *a'*, a flat annular plate *a*², and a raised spoke or radial projection *a*³ connecting these flanges. The outer flange preferably bounds the notch *s* in the tumbler. Thus, as shown in Fig. 4, one face of the tumbler has a recess, which is annular except for the radial partition or abutment *a*³. A number of holes *b* are bored into the plate of the tumbler, and a short screw or pin *c* may be inserted into any one of these holes. The projecting head of the screw or pin *c* will lie in the recess of the adjacent tumbler, and in the

path of movement of the spoke or abutment A³ of the said adjacent tumbler. The tumbler 4 is rigidly attached to the driven pinion M, by screws or otherwise. The tumbler 1 need not have holes for the change screws or pins. With these exceptions the tumblers are alike. When the tumblers are removed from the hub, one screw *c* is inserted in a hole in each of the tumblers 2, 3, 4, in position to conform to the desired combination. Then when the tumblers are applied to the eccentric hub, and the hub swung into position to engage the pinions M and G, the turning of driver G will turn pinion M and tumbler 4 on the hub. As the pin or screw C in tumbler 4 moves round to encounter spoke *a*³ of tumbler 3, it moves the tumbler 3 with it, and so with each of the tumblers back to 1. The combination is "set" and locked or unlocked, as is usual in this class of locks, and may be changed by changing the position of one or more of the pins or screws *c*, as well as by changing the position of the driver.

The lever R is pivoted on the stud 5, with its arm R' in position to drop into notches *s*, in the tumblers, whenever the tumbler notches are brought to range with each other under the arm R'. This action of lever R may be effected by gravity or by a spring. The lever R lies between ears T' T' of a lever T, which lever is mounted on the stud 5. Shoulders R² R² on lever R are in position to engage shoulders T², T², on lever T, so that, with an interval of lost motion, the lever T is made to partake of the movement of the lever R. This lost motion permits the disconnection of gears G and M by turning the hub K, without affecting the position of lever T, and insures that the lever may have a sufficient movement to unlock the dog. An excess of movement of lever R beyond what is needed to bring shoulders R² and T² in contact, causes lever T to move with lever R, and the two levers T and R together act as a bell crank lever.

The bar 6 is connected to and moves with the locking bolts 7, 7. The bolts are shot by means of a handle or key 8 extending through the door, and independent of the knob E, as is common. The bar 6 is guided by studs 10, 11, extending through mortises in the bar, or by other suitable supports. The locking shoulder 9 on the bar is held forward by the dog 12, when the bolts are locked (full lines, Fig. 1) but may ride over said dog when the bolts are unlocked (dotted lines, Fig. 1).

The locking dog 12 is pivoted to or near the stud 11, and extends alongside the bar 6, having a locking flange 13 extending under said bar, and in the line of movement of locking shoulder 9. The lever T lies under flange 13, with its upper end bearing against said flange.

When the lock is unlocked, the flange 13 of dog 12 lies down against the casing A, the lever T being turned down and the end of lever R lying in the notches of the tumblers, (dotted lines, Fig. 1.) In this position the

handle E cannot be turned; but when the bolts are shot, the handle E may be turned to work the tumblers, and by their engagement with lever R, lift said lever and the lever T, which lever T lifts the flange 13 of dog 12 behind the locking shoulder 9. Then by turning any one of the tumblers so that the end of lever R passes out of the notch, the lever T is held up, and the bar 6 cannot move back, until all the notches in the tumbler are again brought in line under lever R. As will appear, any backward pressure of shoulder 9 against flange 13 merely tends to hold said dog more firmly in locking position, as the shoulder 9 is inclined to lift, and not bear down on the dog. Thus a back pressure on the bolts has no effect whatever toward displacing or breaking the lever T, or the mechanism between that lever and the operating spindle.

It will be understood that the bolts may be of any suitable construction; that the form of casing may be changed, and that changes involving equivalent construction may be made without departing from the spirit of this invention.

I claim—

1. In a permutation lock, the combination of the driving pinion and means for operating the same, the driven pinion and tumblers, and a hub on which the driven pinion and tumblers are mounted, said hub supported on an axle or stud placed eccentrically thereto, substantially as described.

2. In a permutation lock, the combination of the driving pinion, the driven pinion and tumblers mounted on a movable hub, and means for moving said hub away from the driving pinion to disconnect the gears, for changing their relation, substantially as described.

3. The driven pinion and tumblers inclosed within the casing, and the driving pinion, also within the casing and having a spindle extending through the casing through an orifice only sufficient for the passage of the spindle, said pinions being normally in engagement, but one of said pinions mounted on a support by which it may be readily moved out of engagement with the other pinion, all combined substantially as described.

4. In a permutation lock, the operating handle, a spindle extending therefrom through an orifice in the casing only sufficient to pass the spindle, the driving pinion within the casing and actuated by said spindle, the driven pinion and tumblers within the casing, and an eccentric on which one of the pinions is mounted and by which it may be moved out of gear with the other tumbler, all combined substantially as described.

5. The combination with the notched tumblers, of a lever pivoted to the casing and having one arm in position to drop into the notches, the locking bolt, and a bar pivoted to and moving with said bolt and having its free end in position to bear on the other arm

of said lever, all combined substantially as described.

5 6. The combination with the notched tumblers, the bolt, and the locking dog connected to said bolt, of the lever pivoted to the casing and having one arm in position to drop into the notches in the tumblers, and having the other arm engaging the side of the locking dog, so that endwise pressure on the dog does
10 not tend to bind the lever, all combined substantially as described.

15 7. The sliding bar having an inclined locking shoulder, the dog pivoted in rear of said shoulder in position to swing behind the same and to be drawn firmly against the bar by a pressure tending to slide the same to open position, and means for supporting said dog in locking position, all substantially as described.

20 8. The sliding bar having inclined shoulder, the locking dog having an abutment in position to engage said shoulder when the bolts are locked, a double lever interposed between said dog and the tumblers, and the
25 notched tumblers engaging one end of the

double lever, all combined and arranged substantially as described.

9. In a permutation lock, the operating spindle, the dial on the outer end of said spindle outside the casing and the indexed driver on
30 the inner end of said spindle inside the casing, and indicators bearing the same relation to both dials, substantially as described.

10. The combination of the driving pinion, the driven pinion and tumblers mounted on
35 an eccentric hub, the axle of said hub, and a lever connected to said hub by which the same may be swung to disengage the pinions, all substantially as described.

11. The combination of the driving pinion, 40 the driven pinion and its eccentric hub, a lever connected to the hub, and retaining shoulders in the casing by which said lever may be held, all substantially as described.

In testimony whereof I affix my signature in 45 presence of two witnesses.

LONZO J. COOPER.

Witnesses:

CHAS. J. KAUFFMAN,
ED. W. VAN VINKLE.