Sheet 1, 2 Sheets.

H. Gross.

Permutation Lock.

No. 103,450. Patented May 24, 1870.

Fig. 3.

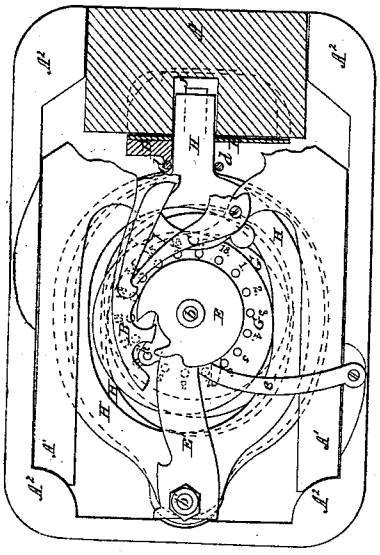


Fig. 4.

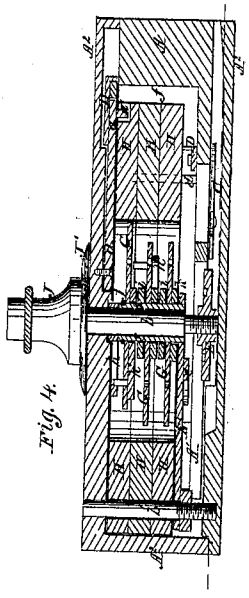


Fig. 5.

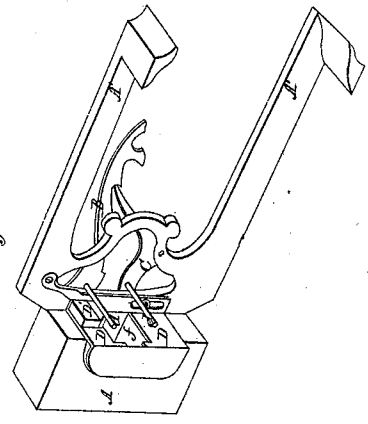


Fig. 1.

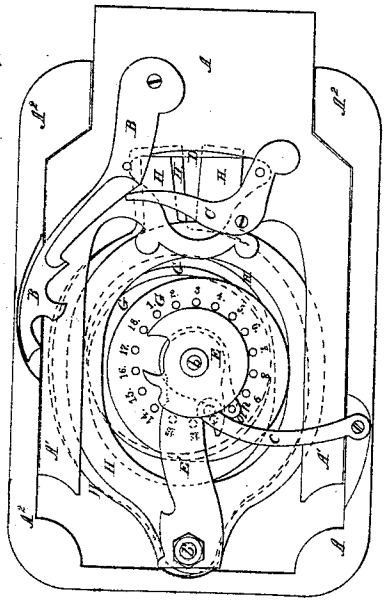
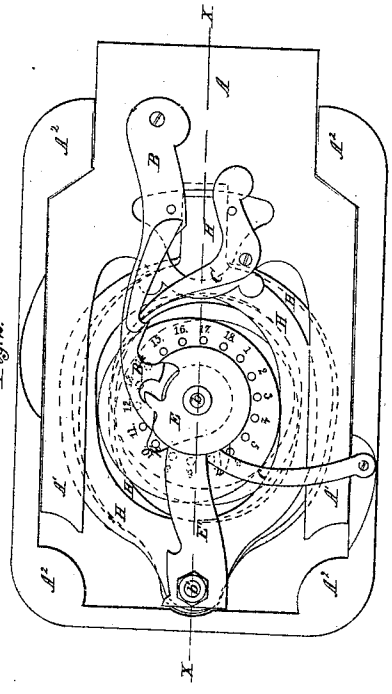


Fig. 2.



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Sheet 2, 2 Sheets.

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Permutation Lock.

No. 103,450. Patented May 24, 1870.

Fig. 6.

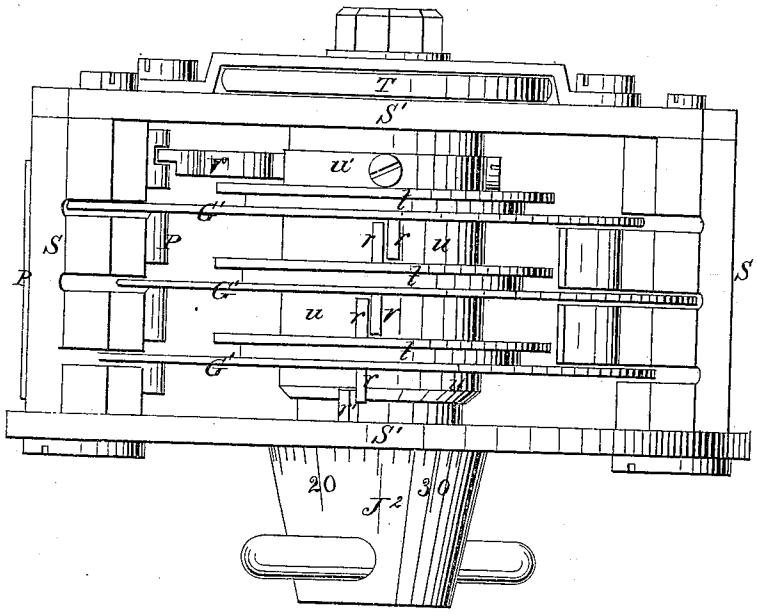
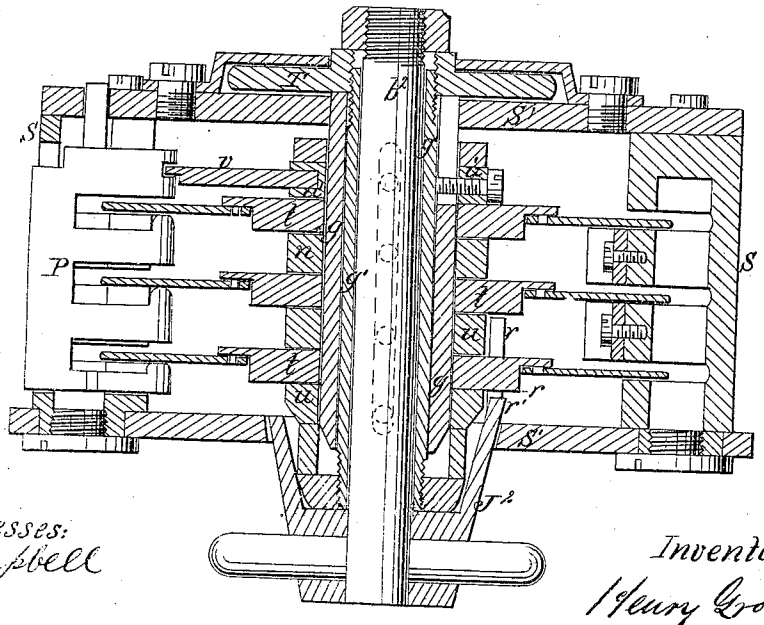


Fig. 7.



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Letters Patent No. 103,450, *dated May* 24, 1870.

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, HENRY GROSS, of Tiffin, in the county of Seneca and State of Ohio, have invented a new and improved Permutating Lock; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings making part of this specification, in which—

Figure 1, sheet 1, is a view of the inside of the lock as seen by removing the back plate, showing the bolt shot out.

Figure 2, sheet 1, is a similar view of the same parts in the act of being unlocked.

Figure 3, sheet 1, is a view of the same parts unlocked.

Figure 4, sheet 1, is a section through the lock in the plane indicated by line *x x* in fig. 2.

Figure 5, sheet 1, is a perspective view of the bolt, its sliding guard, and pivoted dogs.

Figure 6, sheet 2, is a side view, enlarged, of cam or eccentric plates, with devices applied for adjusting them.

Figure 7, sheet 2, is a central section of fig. 6.

Similar letters of reference indicate corresponding parts in the several figures.

This invention relates to certain novel improvements on that class of permutating locks wherein the working parts of the lock are all inclosed within a tight case, and operated without a key, and wherein said working parts are so constructed that they can be readily adjusted and set according to the different combinations which it may be desired to make.

The principle of my invention consists in the arrangement of circular cam or eccentric plates, which operate within oblong slots or openings made through tumblers, so that, by the eccentric plates and the tumblers, the bolt of the lock may be shot backward or forward, as more fully hereinafter described.

It also consists in the employment of dogs upon the bolt, in conjunction with a notched plate upon the stem of the knob or handle, in such manner that the lock-bolt can be moved when the tumblers are all brought in proper position, and only when the tumblers are brought in such position, as will be hereinafter described.

It also consists in the application of a guard to the bolt, in such manner that the space in the bolt which receives the tumblers will be closed, and kept closed until the tumblers are all brought to coincide with said space, as will be hereinafter described.

It also consists in an auxiliary or secondary tumbler, which is made slightly longer than the primary tumblers, and so applied that the position of the latter cannot be ascertained by pressing the bolt against their ends, as will be hereinafter described.

To enable others skilled in the art to understand my invention, I will describe its construction and operation.

In the accompanying drawings—

A^2 represents the lock-case, which is constructed with a removable back or inside plate, for the purpose of allowing easy access to the movable parts of the lock, for changing the arrangement and combinations.

A represents the bolt, which is constructed with a recess, *f*, in its rear end, for receiving the reduced front ends of the tumblers H H H, and which is also constructed with two rear extensions, A^1 A^1, that work within the lock-case, and serve as guides and stays for the front portion A of the bolt, as shown in figs. 1, 2, 3, and 5.

The tumblers H are made with elliptical openings through them, for receiving the circular plates G G G, which are upon a tube, through which the stem *b* of knob or handle J passes; and these tumblers are all pivoted upon a fixed stud, b^1, and held in place thereon by means of a nut, as shown.

The forward ends of the tumblers H are reduced, so that, when these ends are all brought to the positions shown in figs. 2 and 3, they will enter or receive the opening *f* in the rear end of bolt A, and allow the bolt to be moved forward or backward.

The circular plates G G G are applied eccentrically and loosely upon a tube, *s*, and properly spaced thereon by the interposed collars *i* and arms *h'*, which latter are also applied loosely upon said tube *s*, and provided with pins or studs on their ends, which enter holes that are made through the plates G, as shown in fig. 4.

The plates G, the arms *h'*, and the spacing-collars *i* are held in place on the tube *s* by means of a split ring, *j*, so that, by removing this ring, said parts can be detached from their tube, for a purpose which will be hereinafter explained.

The tube *s*, with its attachments, is applied upon a stem, *b*, and held in place thereon by means of a plate, E', one end of which is secured rigidly to the said tube, and the other end to the stud *b'*, shown in fig. 4.

From the stem *b* of knob J, an arm, *h*, projects, shown in fig. 4, which, when the knob J is turned, will be brought around in contact with a stud of one of the arms *h'*, and cause this arm and its plate G nearest the front plate of the lock-case to turn about the axis of stem *b*.

By continuing to turn the knob J in one direction, the arm *h'* will be brought around, and caused to act upon the pin which is on the arm *h'* of the next plate G, and, by a further movement of the knob, the next plate G may, in like manner, be caused to rotate about the axis of stud or stem *b*.

By turning the knob J toward the right, and then toward the left, the three plates G may be arranged

in different relations to each other; and, as each plate G operates independently upon its respective tumbler H, to raise or depress its front end, it will be seen that these tumblers will assume different positions with relation to each other, according to the positions of the plates G with relation to each other.

A number of holes is made through the plates G, and arranged concentrically with respect to the axis of motion of these plates, as shown in figs. 1, 2, and 3.

These holes are for the purpose of receiving the pins or arms *h'*, and allowing the plates G to be adjusted in different relations to each other, according to the combination which it is desired to employ for moving the bolt.

These holes are all numbered, so that, by adjusting the pins on arms *h'* in certain holes, a certain combination of movements is required to bring the tumblers in such position as will allow of moving the bolt.

That portion of the stem *b* which projects through the face-plate of the lock-case A^2 has a knob, J, and also a circular disk secured fast upon it.

The disk J^1 has graduated marks engraved upon it, which are properly numbered; and, above this disk, upon the face of the lock-case, is a mark, which is used, in conjunction with the marks upon the disk, in manipulating the lock, as will be hereinafter described.

On the inner end of the stem *b*, a plate, E, is screwed fast, which plate is notched, as shown in the drawings, for receiving a hooked dog, B, which is pivoted to the back part of the bolt A.

Below this hooked dog B, and pivoted to the back part of bolt is, a lever-dog, C, one end of which acts upward against the lower edge of the dog B. Both dogs have studs *d d* projecting from them, one of which extends beneath the front parts of the three tumblers, and the other extends over the tumblers. The weight of the upper dog B keeps both pins or studs *d d* in contact with the tumblers.

A guard-plate, D, is applied to the rear end of the bolt A, so as to slide freely up and down, and to receive through it the front ends of the tumblers. This guard has a shoulder, D', formed on it, which rests upon one or two of the tumblers, and rises and descends as these tumblers vibrate.

In fig. 4, I have represented a rod, *a*, pivoted to the inner side of the front plate of the lock-case, and fitted into a longitudinal groove made in the tumbler H nearest this lock-plate. The front end of this rod projects slightly beyond the tumblers, and serves to prevent the bolt from being pressed back against the ends of the tumblers, which might assist a person to pick the lock by enabling him to find out the position of the tumblers.

The arm *c*, which is pivoted to the lock-case, is designed for holding the plate E' in a rigid position, and allowing of the ready removal of the several parts of the lock.

The drawing represents the lock set on the combination 9–38–7. To operate the lock, thus set, the knob J, with its graduated plate J^1, is first turned toward the bolt A three times or more, and the figure 9 on the dial-plate J brought to register with a mark which is engraved on the face of the lock-case directly above the axis of the stem *b*.

The knob is then turned backward twice around, and the figure 38 on dial J brought opposite the said mark on the lock-case; the knob J is again turned toward the bolt, as first mentioned, one revolution, and figure 7, the last number of the aforesaid combination, brought opposite the mark on the lock-case.

The knob is now turned slowly backward, when the hook on dog B will fall into the notch in the edge of plate E, and thus the bolt will be drawn back.

The pins *d d* on the dogs B C acting upon the tumblers, and acted upon thereby, will not allow the dog B to fall into the notch in plate E until the tumblers are all in proper position for allowing of the retraction of the bolt.

In figs. 6 and 7, sheet 2, I have represented an arrangement of eccentric plates, G' G' G', which are adapted for being adjusted and set for different combinations, without removing any of the working-parts of the lock.

This is effected in the following manner:

J^2 represents the knob, which is on a stem, b^2, that passes through two tubular stems *g g'*, one within the other, and turns freely therein.

The plates G' are placed eccentrically and loosely upon the tube *g*, and held in place by their edges entering grooves made in the two studs S S, which latter are secured between the ends of parallel plates S' S'.

The parallel eccentric plates G' have large circular holes made centrally through them, which are adapted for receiving circular flanged plates *t t t* that turn loosely around the tube *g*, and which are properly spaced on this tube by means of washers *u u'*, as shown in fig. 7.

The upper washer *u'* is secured to the inner tube *g'* by means of screw-pins passing through slots made through the outer tube, so that, by means of the thumb-nut T on the end of the inner tube, the washers and the three circular plates *t* can be adjusted toward or from the eccentric plates G' the latter being held by the studs S S, as above described.

The plates *t* have pins projecting from their flanges which enter holes made through the plates *d'*, and thus connect the plates *t* and G' together, so that they will turn together around the tube *g*.

A great many holes are made through the plates G' for receiving the pins projecting from plates *t*, and allowing the eccentric plates to be adjusted and set in different relations to each other according to the combination desired. This can be done when the pins on plates *t* are detached from the plates G', as shown in fig. 6.

The three circular plates *t* have studs *r* projecting from them, and the knob J^2 has a pin, *r'*, projecting from it, which, when the knob is turned, will be brought in contact with the pin on the plate *t* next to it, and turn this plate and its eccentric plate G'. In like manner the three plates *t* and the eccentric plates may be turned either toward the right or left hand, as may be desired.

An arm, *v*, projects from the collar or washer *u'*, the outer end of which enters a recess in a notched and hooked plate, P, applied in one of the studs S, so as to move in a direction with its length.

The hooks of plate P are designed to enter holes made through the three plates G', and hold these plates fast when the three plates *t* are detached from them by turning thumb-nut T, thus allowing the plates *t* to be rotated, and their pins set in different holes in plates G' by turning the knob J^2.

By simply turning the thumb-nut T, and rotating the knob J^2, the eccentric plates can be set for different combinations.

It will be seen from the above description of figs. 6 and 7 that the plates G' operate upon the same principle as the plates G, shown on sheet 1, and can be more readily adjusted for different combinations.

The invention is not confined to any definite number of eccentric or cam-plates, as a greater or lesser number may be used, according to the simplicity or complication of the combinations required. The knob by which the tumblers are moved and the bolt shot back and forth is not connected to the bolt, and cannot move the bolt in either direction until all the tumblers are brought in such position that their forward ends coincide with the recess in the lock which

receives said tumblers; then the hooked dog B automatically connects the stem of the knob with the bolt.

Having described my invention,

What I claim as new, and desire to secure by Letters Patent, is—

1. The arrangement of circular cam or eccentric plates which operate substantially as described, within oblong slots or openings made through tumblers H, so that by a certain arrangement of the said eccentric plates, and the tumblers, the bolt of the lock may be shot back or forward, substantially as specified.

2. The secondary tumbler or pivoted rod *a*, in combination with the tumblers H, substantially as described.

3. The sliding guard D, provided with a nose, D′, and an opening through it corresponding to the recess *f* in the bolt A, in combination with vibrating tumblers H, substantially as described.

4. The two pivoted dogs B C applied to bolt A, in combination with the notched plate E upon the stem *b*, said dogs being controlled in their vibrating movements by the action of the tumblers H upon them, substantially as described.

HENRY GROSS.

Witnesses:

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