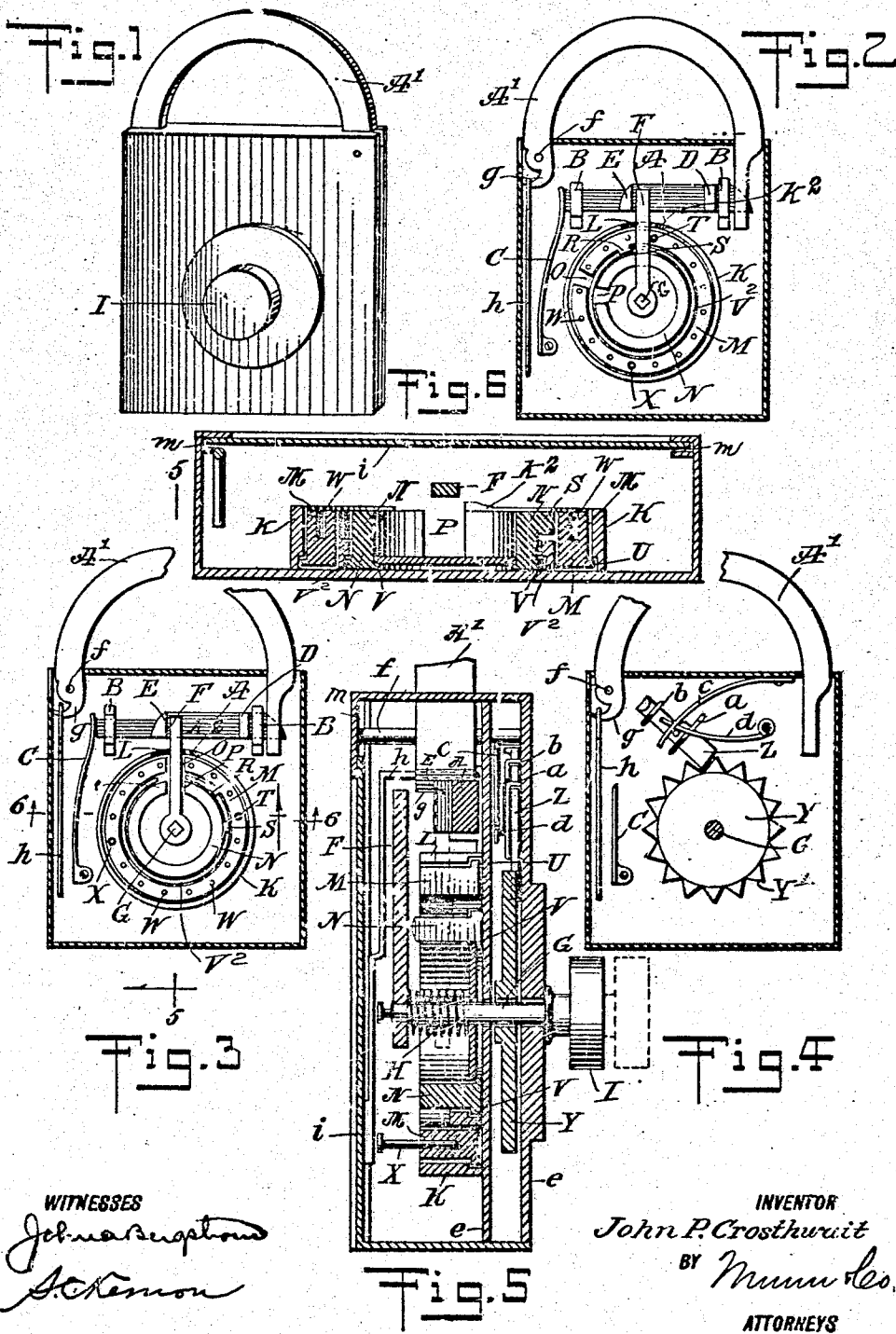


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 PERMUTATION LOCK.
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PERMUTATION-LOCK.

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To all whom it may concern:

Be it known that I, JOHN PERRY CROSTHWAIT, a citizen of the United States, and resident of Sadieville, in the county of Scott and State of Kentucky, have invented a certain new and useful Permutation-Lock, of which the following is a full, clear, and exact description.

The objects which my invention has in view are: to provide a lock of the character described, wherein the combination may be worked by sound; to simplify and cheapen the construction; to provide a lock wherein the combination may be easily and quickly altered; to provide a lock having a combination so simple as to be easily memorized for family use, and thus obviate the need for pass keys.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is an isometric perspective of a lock constructed in accordance with my invention; Fig. 2 is a vertical section of the lock case, showing the permutation wheels and push bar in full lines, and the parts being in the locked position; Fig. 3 is a view similar to Fig. 2, showing the parts in the position in which the locking bolt may be withdrawn; Fig. 4 is a vertical section of the lock showing the star sounding wheel; Fig. 5 is an enlarged view in vertical cross section of the lock, taken on the line 5-5 in Fig. 3, the shackle being partly omitted; and Fig. 6 is an enlarged view in horizontal cross section taken on the line 6-6 in Fig. 3.

While I have shown in the accompanying drawings and shall herein describe the lock as in the form of a pad-lock, I do not wish to be understood as limiting my invention to such application.

The operation of the lock depends primarily on three elements, which are, the bolt, the push bar and the permutation rings. Until these elements are brought into certain positions, they will not cooperate. Thus, the bolt A is mounted in guide loops B, B and is normally forced forward into a locking position by a spring C. It is limited in its forward movement by a lug D, and is retracted from the locking or forward position by the push bar pushing against a lug E and the spring C.

The push bar F is mounted on a knob

shaft G, which is normally drawn within the lock case by a spiral spring H. The normal position of the knob I, the shaft G and push bar F, is shown in Fig. 5 of the drawings. In this position, the push bar F passes above the lug E when the knob and shaft are rotated. Except in the one position of the push bar, it is prevented from being drawn to the level of the lug E by a standing flange K, which is higher than the said lug. At the point nearest the bolt A an opening L is made in the flange K, which opening is large enough to admit the push bar and to permit it to swing against the lug E and to retract the bolt A. The push bar F can assume the position in the opening L only when the permutation rings M and N are in the position shown in Fig. 3 of the drawings, wherein openings O and P in the rings M and N register each with the other and both with the opening L in the flange K. Otherwise the one or the other of the rings interpose and prevent the push bar F being depressed into the path of the lug E. The rings M and N are equal in height, and are independent except when so moved that the extensions R and S are engaged. The push bar F is moved to impinge upon the pin T or the pin X, according as the said push bar is moved to the right or left, referring to the illustration shown in Fig. 3 of the drawings. The rings M and N are provided with annular flanges U and V (see Figs. 5 and 6), which prevent the dislodgment of the rings by extending into grooves formed in the frame structure of the lock. These grooves are formed in the side of the flange K, and in the partition V². This arrangement prevents dislodgment of the rings M and N. The ring M is also provided with holes W into which the pins T and X are fitted. It is by setting these pins T and X that the combination is varied. Corresponding with the holes W are the click points Y' on a sounding wheel Y, mounted on the shaft G. Hence every point of the sounding wheel Y coincides with the spaces between the said holes. The action of the wheel Y is steadied and the movement is announced by the clicking of a detent Z. Thus the number of clicks of the detent audibly indicates the distance of rotation of the shaft G. The detent Z is mounted in guide loops a and b. The loop a is elongated to permit a lateral action on the part of the detent. The de-

tent is controlled by the springs *c* and *d*, the former of which forces the detent against the wheel longitudinally, while the latter forces it against the wheel laterally. When the wheel is moved in either direction the detent over-rides the points of the sounding wheel and falls between the points with a loud click. The sounding wheel Y and detent Z are mounted between the walls *e* and *e'* of the lock casing.

The shackle A' is pivotally mounted at *f*, and is provided at the free end with a recess to receive the end of the bolt A. The pivoted end of the shackle is provided with a hook-like extension *g*, to engage and hold the free end of a spring *h*. The free end of the spring *h* is bent over and behind the extension *g*, as seen in Figs. 2, 3, 4 and 5. When the bolt A is withdrawn from engagement with the shackle, the spring *h* lifts the free end of the shackle by pressing upon the hook *g* of the shackle to rotate the same on its pivot. The opposite end of the spring *h* is fixedly attached to the removable cover *i* (see Fig. 5). The spring *h* serves the double purpose of throwing the shackle from the locked position, and that of a lock for the removable cover *i*. The spring is constructed and arranged in such manner that when the shackle A' is placed in the locking position, the spring *h* is moved from its normal position and under tension. When the shackle A' is free, the spring *h* is released from engagement with the hook *g*, and the cover *i* may be drawn downward to uncover the permutation rings and parts connected therewith. The cover *i* is guided in the grooves, *m, m'* formed in the edges of the sides of the casing for the lock. (See Figs. 5 and 6 of the drawings.) The cover *i* being removed, the rings M and N and the pins T and X are exposed. The combination may then be changed as desired. Whenever the cover *i* is placed in position, and the shackle A' is snapped into locking relation with the bolt A, the bent end of the spring *h* is engaged by the hook *g* passing under the same, and thereby preventing the withdrawal of the cover *i*.

The operation of the lock when constructed as above described is: The knob I is rigidly attached to the shaft G, upon the end of which is mounted the push bar F. In describing the arrangement of the permutation rings M and N I will describe the movement of the push bar F as seen in Figs. 2 and 3 of the drawings. The knob I is turned one complete rotation, carrying the push bar F to the right. The push bar F impinges upon the pin T and thereby moves the permutation ring M to the right. The extension R of the permutation ring M engages the extension S upon the permutation ring N, causing the said rings to there- after move together, while continuing to

the right. The knob I is drawn outward until the push bar F rides on the upper edge of the flange K. The continuation of the rotation of the push bar F to the right causes the same to strike upon and to be arrested by the projection K² extended from flange K. When the push bar F thus contacts with the projection K² it will be found that the permutation rings are arranged as shown in Fig. 2 of the drawings. This is the starting point for the working of the combination of the lock. The knob I is released so that the spring H returns to its initial position, in which it will pass over the projection K² when moved to the right. The rotation is continued in the said direction, carrying the push bar F to the right, as seen in Figs. 2 and 3 of the drawings. The bar F, still engaging the pin T, and the projection R still engaging the projection S, the permutation rings are moved to the right until the opening P in the ring N is alined with the opening L in the flange K. This alinement of the opening P with the opening L has been effected by means of the wheel Y and the detent Z. It will be noticed that it is necessary to move the pin T four spaces to the right of the opening L to aline the opening P therewith. These four spaces on the permutation rings correspond to four of the click points Y' of the wheel Y. The detent Z, striking upon the said click points of the wheel Y, produces resonant clicks, which are counted by the operator. When he has counted four, after having been arrested by the projection K², he knows that so much of the combination has been perfected. The knob I is now turned in the opposite direction, carrying the push bar F to the left until the same impinges upon the pin X. The operator, counting the number of clicks and having his formula, continues to move the knob I to carry the push rod F to the left until the correct number of clicks has been sounded. At this point, he arrests the rotation of the knob I.

According to the combination, as illustrated in the drawings, after leaving the pin T four spaces to the right of the opening L, and the opening O being at that time one space to the right of the opening L, it is necessary to move the knob I in the reverse direction eight spaces. It requires a movement of seven spaces in the reverse direction before the bar F impinges upon the pin X. The only further movement after this impingement moves the ring M one space to the left, and places the opening O in line with the opening L. The ring M, moving to the left, does not move the ring N, and hence the three openings L, O and P will be found to have been alined. It is now necessary to move the bar F over the alined openings L, O and P, and to

do this requires a movement of four spaces to the right. At the end of the movement of the four spaces referred to the bar F is brought to the position as illustrated in Fig. 3 of the drawings, and in line with the openings L, O and P. The bar F may now be drawn down into the openings by pulling outward the knob I. In the depressed position of the bar F the end thereof is extended in front of the lug E. By now moving the bar F to the left, the bolt A is moved out of engagement with the shackle A', and the said shackle is sprung by the spring h.

The "combination" in the above operation after the preliminary rotation to the right, and being arrested, is: to the right four spaces; to the left eight spaces; and to the right four spaces. When the combination is being operated by count of the audible sounds, then it will be understood that the sounds will guide instead of the spaces, as stated above. The combination may be changed at any time by moving the pins T and X, or either of them.

In referring to the direction for moving the knob I and push bar F, in the above description, it is intended that the description shall be read upon the Figs. 2 and 3, that is, a movement to the right would indicate the right as moved on Fig. 2.

As above stated, the spaces between the holes W coincide with the click points of the sounding wheel Y, and the detent Z, on passing each click point, is heard by the operator. Therefore the spaces are, in this lock, indicated by the sounds thus produced. By this arrangement the combination may be worked in the dark as readily as in the light. Should the combination become known, or the owner of the lock be suspicious of this fact, the combination may be quickly changed by removing the cover of the lock casing and then changing the location of one or both of the pins T and X.

While I have herein described the employment in this construction of the two pins X and T, it is obvious that the lock may be operated by omitting one of the said pins. This omission would merely necessitate the further movement of the handle and push bar connected therewith.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A permutation lock, comprising a bolt; a knob shaft having a laterally projecting push bar adapted to engage said bolt when moved into the path of the same; a plurality of rotatable permutation rings having recesses adapted to be alined to receive said push bar when same is moved into the path of said bolt; lateral projections extended from said rings to engage one another to cause the rings to move together; and a mov-

able projecting member mounted upon one of said rings, and extended into the path of said push bar.

2. A permutation lock, comprising a bolt; a knob shaft having a laterally extended push bar adapted to engage said bolt when moved into the path of the same; a plurality of rotatable permutation rings having recesses adapted to be alined to receive said push bar, when the same is moved into the path of said bolts; lateral projections extended from said rings to engage one another to cause the rings to move together; and a movable adjustable projecting member mounted upon one of said rings to extend into the path of said push bar.

3. A permutation lock, comprising a bolt; a knob shaft having a laterally extended push bar to engage said bolt when moved into the path of the same; a plurality of rotatable permutation rings having recesses adapted to be alined to receive said push when the same is moved into the path of said bolt; lateral projections extended from said rings to engage one another to cause the rings to move together; and a plurality of movable adjustable projecting members mounted upon one of said rings, and extending into the path of said push bar.

4. A permutation lock, comprising a bolt; a knob shaft having a laterally extended push bar to engage said bolt when moved into the path of the same; a plurality of rotatable permutation rings having recesses adapted to be alined to receive said push bar when the same is moved into the path of the said bolt, one of said rings having therein perforations to receive a projecting member; lateral projections extended from said rings to engage one another to cause the rings to move together; and a movable projecting member adapted to be mounted in either of said perforations to extend into the path of the said push bar.

5. A permutation lock, comprising a bolt; a knob shaft having a laterally extended push bar to engage said bolt when moved into the path of the same; a plurality of rotatable permutation rings having projections to cause the said rings to become rotatably engaged each with the other, and each having a recess adapted to receive said push bar, said recesses being out of alinement when said rings are mutually engaged, and said recesses adapted to be alined when said rings are disengaged each with the other; and a plurality of removable projecting members adapted to be mounted on one of said rings in various locations hereon, and to extend into the path of said push bar.

6. A permutation lock, comprising a bolt; a knob shaft having a laterally extended push bar to engage said bolt when moved into the path thereof; a plurality of rotatable permutation rings constructed to be-

come engaged each with the other, and having recesses when alined adapted to receive said push bar when the same is moved into the path of the said bolt; a movable projecting member mounted on one of said rings to extend into the path of the said push bar; and a fixed member mounted on the frame of the lock and extended into the path of the said push bar to arrest the same, said member having an opening to receive said push bar.

7. A permutation lock, comprising a bolt; a knob shaft; a push bar mounted on said shaft and adapted to engage said bolt when moved into the path thereof; a plurality of rotatable permutation rings having openings adapted to be alined to receive said push bar to permit said push bar to be moved into the path of said bolt; lateral projections extended from said rings to engage one another to cause the rings to move together; and a sounder mechanism attached to said shaft to audibly indicate the proportionate rotation of the said shaft.

8. A permutation lock, comprising a bolt; a knob shaft; a push bar mounted on said shaft and adapted to engage said bolt when moved into the path of the same; a plurality of rotatable permutation rings having recesses adapted to be alined to receive the said push bar to permit said push bar to engage said bolt when moved into the path thereof; movable, adjustable, projecting members connected with one of said rings and extended into the path of said push bar lateral projections extended from said

rings to engage one another to cause the rings to move together; a deeply serrated wheel mounted on said shaft; and a spring actuated sound producing device adapted to fall in the serrations of the said wheel to audibly announce the proportionate rotation of the said shaft.

9. A permutation lock comprising a shackle; a bolt to engage said shackle; a knob shaft having a laterally extended push bar adapted to engage said bolt; a plurality of rotatable permutation rings having recesses adapted to be alined to permit said push bar to engage said bolt, one of said rings being provided with a series of perforations in the surface thereof; lateral projections extended from said rings to engage one another to cause the rings to move together a plurality of pins adapted to be inserted in said perforations to extend in the path of said push bar; a box like casing to hold said shackle and locking members having an open side to expose said permutation rings and pins; and a removable cover extending over the said rings and pins to cover the same and adapted to be locked in position by the said shackle when the same is moved in position to receive the said bolt.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN PERRY CROSTHWAIT.

Witnesses:

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JNO. A. McCABE.