



# UNITED STATES PATENT OFFICE.

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## PERMUTATION WHEEL FOR KEYLESS LOCKS.

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This invention relates to permutation wheels or disks for keyless locks and has for one of its objects to provide a wheel of this character which will be simple in construction comparatively inexpensive to manufacture and more efficient in use than those heretofore proposed.

A further object of the invention is to provide a permutation wheel which is especially adapted for use with a keyless lock of the type described and claimed in the prior patent of Alexander G. Hatch No. 1,555,969, granted Oct. 6, 1925, entitled "Keyless locks", although it will be obvious from the following description that the said wheel may be employed in other forms of locks, if desired.

With the above and other objects in view which will appear as the description proceeds, the invention consists in the novel details of construction and combinations and arrangements of parts more fully hereinafter disclosed and pointed out in the appended claims.

Referring to the accompanying drawings forming part of this specification, in which like reference characters designate like parts in all the views:

Figure 1 is a rear sectional elevational view of one form of lock shown in the said co-pending application of Alexander G. Hatch with permutation wheels constructed in accordance with the present invention employed therein;

Fig. 2 is a central vertical sectional view at right angles to Fig. 1 through the said lock;

Fig. 3 is an enlarged side elevational view of one of the permutation wheels or disks, partly broken away to more clearly illustrate the construction thereof; and

Fig. 4 is a central sectional view through the disk shown in Fig. 3.

As is disclosed in the said Hatch application, the lock may comprise a casing 6, in which is mounted a shaft 7, which carries the permutation wheels or disks 8. A slide or bolt 9 is mounted for reciprocation within the said casing or housing 6 and adapted to be reciprocated by means of the thumb piece 10 carried by the transverse shaft or stud 11 which also carries the disk 12 provided with a slot 13 for receiving the

pin 14 carried by the bolt 9, as will be clear from Figs. 1 and 2. The said bolt 9 is slotted, as indicated at 15, to accommodate the shaft or stud 11 and to permit of reciprocating movements of the bolt. In locks of this character it is highly desirable that provision be made whereby the combination which will open the lock may be changed at will and it is an important feature of the present invention to provide permutation wheels which will permit of the ready changing of the combination for this purpose. To this end the disks or wheels comprising the body portion 17 have an axial bore 18 through which the shaft 7 passes. The outer circumference of the said body portion, indicated at 19, is constructed to receive the outer ring member 20 which member is provided with the laterally projecting hub 21 having a plurality of spaced notches or indentations 22 adapted to co-act with a detent spring 23 to retain the wheel in a set position, as will be readily understood. The said hub 21 is also provided with a bore 24, see Fig. 3, to receive a set screw or pin 25, the inner end of which is adapted to be received in any one of a plurality of arcuately spaced threaded holes 26, as will be readily understood. It will thus be apparent that by removing the screw or pin 25 and changing the relative positions of the members 17 and 20 that the relative position of the index numerals or characters 27 which are provided upon the outer circumference 28 of the member 20 may be changed.

The bolt or slide 9 of the lock is substantially the same as that shown in the said prior application of A. G. Hatch and is provided with the depending lugs 30, each of which has an angularly disposed toe 31 which is adapted to extend into the angular grooves or slots 32 and 33 provided upon one of the flat faces of the disk. Communication between the slots or grooves 32 and 33 is afforded by means of the radially extending slot or groove 34, see Fig. 2, so that the toe 31 of the lug 30 may pass from one annular groove to the other when the bolt is moved after the proper combination has been set.

In order to guard against picking of the lock, the inner circumference of the outer

groove 32 is provided with a plurality of substantially rectangular notches or recesses 35 while the outer periphery of the inner groove 33 is provided with a series of like notches or recesses 36 which extend in radial direction into the rib 37 which separates the two grooves 32 and 33. It thus results that if one or more of the permutation wheels are not in the proper position to permit of the toe 31 of the bolt 9 to pass through the connecting groove 34, should an attempt be made to open the lock by moving the bolt the said toes 31 of such lugs 30 will enter into one of the recesses 35 or 36, but will be unable to pass into the other groove, as will be readily understood. Furthermore, it will be impossible to manipulate the bolt to bring the toes into engagement with the outer circumference of the rib 37 and to then successively rotate the permutation disks until it can be felt that the toe has reached the passage 34 whereby it might be possible for unauthorized persons to discover the combination and open the lock. It will be obvious that if such procedure is attempted in the present instance that the toes will enter into the recesses 35 and owing to their rectangular shape will prevent the rotation of the wheel for this purpose.

While one form of the invention has been illustrated and described, it will be obvious that those skilled in the art may vary the details of the construction, as well as the precise arrangements of the parts, without departing from the spirit of the invention and therefore it is not wished to be limited to the above disclosure, except as may be required by the claims.

What is claimed is:

1. A permutation wheel for a keyless lock, said wheel having a slotted annular rib extending from one of its surfaces to serve as an abutment adapted to prevent movement of an element of a lock mechanism, the slot in said rib being adapted to form a passageway for such element when in registration therewith, said rib having, in the surface into which one end of said slot opens, a series of relatively shallow consecutively spaced recesses the entrance portions of which conform in shape and size with the entrance portion of said slot so that each of said recesses forms a replica of a slot end, said slot and said recesses being equally spaced in circular series relation.

2. A permutation wheel for a keyless lock, said wheel having a slotted annular rib extending from one of its surfaces to serve as an abutment adapted to prevent movement of an element of a lock mechanism, the slot in said rib being adapted to form a passageway for such element when in registration therewith, said rib having,

each of its opposite surfaces into which the ends of said slot open, a series of relatively shallow spaced recesses the entrance portions of which conform in shape and size with the entrance portions of said slot so that each of said recesses forms a replica of a slot end.

3. A lock comprising a casing, a lock-controlling member so mounted therein as to be movable from an effective to an ineffective position, and vice versa, and a set of permutation wheels mounted in said casing, said wheels having parts obstructing movement of said member from either of said positions to the other except when set in a predetermined relation, and also having indicia-bearing peripheral portions accessible through slots in said casing by which they may be independently set, the parts of said set of wheels and of said lock-controlling element, which cooperate to obstruct effective movement of the latter, comprising a series of lugs projecting from one into engaging relations with a series of circular abutments carried by the other, each of said abutments having a slot therein into which one of said lugs may be moved whenever the slots and lugs have been brought into registration by the setting of said wheels, and each of said abutments having, in the surface by which it cooperates with one of said lugs in obstructing movement of said lock-controlling member, a series of relatively shallow spaced recesses having entrance portions conforming in shape with the entrance portion of its respective lug-receiving slot.

4. A lock comprising a casing, a lock-controlling member so mounted therein as to be movable from an effective to an ineffective position, and vice versa, and a set of permutation wheels mounted in said casing, said wheels having parts obstructing movement of said member from either of its positions to the other except when set in a predetermined relation, and also having indicia-bearing portions accessible through slots in said casing by which they may be independently set, the parts of said set of wheels and of said lock-controlling element, which cooperate to obstruct effective movement of the latter, comprising a series of lugs projecting from one into engaging relations with a series of circular abutments carried by the other, each of said abutments having a pair of opposed surfaces of which one set of surfaces may cooperate with said lugs to obstruct movement of said lock-controlling element from its effective to its ineffective position and the opposed set may cooperate with said lugs to obstruct its movement from its ineffective to its effective position, each of said abutments having a slot therein through which one of said lugs may pass from a position adapted

for cooperation with one of its effective surfaces to a position adapted for cooperation with its opposed effective surface whenever the slots and lugs have been brought into registration by the setting of said wheels, and each of said abutments having, in each of the opposed surfaces by which it cooperates with said lugs in obstructing movement of said lock-controlling member, a series of relatively shallow spaced recesses having entrance portions conforming in shape with the entrance portions of its respective lug-receiving slot.

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