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IMPROVEMENT IN PERMUTATION-LOCKS.

Specification forming part of Letters Patent No. **215,591**, dated May 20, 1879; application filed January 25, 1879.

To all whom it may concern:

Be it known that we, JOHN E. DUNCAN and ALANSON B. ALDEN, of Boscobel, in the county of Grant and State of Wisconsin, have invented a new and useful Improvement in Permutation-Locks, of which the following is a specification.

Our invention relates to a permutation-lock in which the combination is set by the act of locking, and in unlocking the parts are readjusted, so that there is no combination set while the lock is unlocked.

In the accompanying drawings the invention is shown in the form of a padlock.

Figure 1 is a front elevation of the padlock with a portion of the front case removed, the parts being in a locked position. Fig. 2 is a similar elevation with the parts unlocked. Fig. 3 is a vertical cross-section on line *x x* of Fig. 1. Fig. 4 is an elevation of one tumbler-wheel, detached and broken open to show the interior construction.

Similar letters of reference indicate corresponding parts.

The padlock A contains the locking devices, hereinafter described, for securing the hasp *b*. The end of hasp *b* is held when closed by the forked end of the spring-tongue *c*, which tongue is forced back by the inclined end of the hasp as it enters, and returned to place by spring *d*. The tongue or catch *c* is to be moved back to release the hasp by a slide or bolt, *e*, fitted to be moved endwise by a hand-wheel, *f*, at the front of the lock-case. The slide *e* moves between stationary guides *g* upon pins that pass through slots *h* in the slide, and the hand-wheel *f* is provided with an arm, *i*, a pin on the end of which enters a slot, *k*, in slide *e*, so that as the wheel is turned the slide is moved back and the pin *l* on *e* catches tongue *c* and draws it free from the hasp. The reverse action restores the parts to the normal position.

m, *n*, and *o* are tumbler-wheels, of similar construction, secured in the lock on the hubs of their respective dials *m' n' o'*, which latter are at the outside of the lock-case, and may be all at one side, or two in front and one at the back, as shown. These tumblers are similar in construction, and are each made solid and formed with a peripheral groove; or, as shown, each tumbler consists of three circular disks, at-

tached together, the central disk being smaller, so as to leave a space around the tumbler of suitable depth. In this groove are fitted, upon pins, the rocking tumblers *p*, each of which is formed with two projecting portions or teeth, *q*, one or the other of which teeth on each tumbler *p* projects beyond the rim of the tumbler-wheel, according to the position of the tumblers.

The tumblers *q* can be moved about a quarter of a revolution. The motion is limited in either direction by a pin, and the tumblers are held in either position by a flat spring, *s*, in the bottom of the peripheral groove. The dials *m' n' o'* are numbered from 1 upward, corresponding to the number of tumblers *p*—that is, the smaller dial, commencing with 1, is numbered correspondingly with the tumblers of its tumbler-wheel, and the numbering continued upon the second and third dials, so that the last number corresponds with the total number of tumblers *p*.

Upon the lower side of slide *e* is attached a cross or blocking piece, *t*, and the parts are in such relative position that this blocking-piece *t* comes in contact with the projecting teeth *q* of tumblers *p*, the tooth of each wheel *m*, *n*, and *o* that is contiguous to slide *e* thereby serving to prevent backward motion of slide *e*, except as hereinafter described.

To raise the block *t* free from the tumblers at the end of its sliding movement, so that the combination can be changed, the slots *h* in slide *e* are extended at an inclination downward at both ends, thereby raising the slide upward on its guide-pins. The slide *e* also carries a locking-piece, *u*, that is held in place between one guide, *g*, and a pin, *u'*, so as to move vertically by the movement of slide *e*. The lower end of this piece *u* is formed with fingers, that, when the tumblers are set to any combination and the slide *e* moved down, enter notches *v*, that are cut in the edges of the tumbler-wheels, thereby locking the tumbler-wheels against the action of the blocking-piece *t*.

To explain the operation of the above-described parts we will first refer to Fig. 2, where the parts are in the unlocked position and the slide *e* forced back to the extreme point to free piece *u* from the notches *v*. The spring *d* would tend to retain the fingers of *u* in notches *v*; but when the combination is to be changed the

hand-wheel will be moved to raise slide *e*, as shown, and held while wheels *m*, *n*, and *o* are set. That being done, hand-wheel *f* is to be released, and spring *d* will move slide *e* forward until piece *t* takes against the three upper teeth, *g*, of tumblers *p*, one in each tumbler-wheel, that lie in its path, and piece *u* will lock the tumbler-wheels.

As may be seen in Fig. 2, the tumblers *p* are all turned in one direction, and the tumblers, against the teeth of which the piece *t* abuts, may be turned over to permit piece *t* to pass by applying a little force to hand-wheel *f*, and the parts will assume the position shown in Fig. 1, the tumbler that is turned over being marked *q'*. The tumbler-wheels are now free. If the slide be moved back again the tumbler *q'* will be turned back, the blocking-piece *t* in that case acting upon the teeth *g*, that were thrown out by the previous turning of *q'*; but if any of the other tumblers *p* are in the path of *t*, the slide *e* cannot be moved back, as these other tumblers cannot move in that direction.

Thus it will be seen, when the combination is properly set, the motion of unlocking readjusts the tumblers, and the combination is set by the locking movement. The slide *e* or bolt has a positive connection with the hand-wheel, so that it can be moved independently of any springs. The number of tumbler-wheels and tumblers contained in each wheel is not material to our invention, and the tumblers *p* may be made in other forms than that shown. The slide *e* is shown as operating in connection with catch to adapt the parts for a padlock;

but it may be seen that the slide *e* may form the bolt of a lock for different purposes other than a padlock. The bolt *e* in that case will be moved by the hand-wheel by the positive connections described.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. In a permutation-lock, the combination and arrangement of dials *m' n' o'*, tumbler-wheels *m n o*, fitted with tumblers *p*, the slide or bolt *e*, blocking-piece *t*, locking-piece *u*, and hand-wheel *f*, substantially as described and shown.

2. In a permutation-lock; the combination, with tumbler-wheels *m, n, or o*, of the pivoted tumblers *p* and spring *s*, substantially as described and shown, and for the purposes set forth.

3. In a permutation-lock, the combination and arrangement of dials *m' n' o'*, tumbler-wheels *m n o*, fitted with tumblers *p*, the slide or bolt *e*, blocking-piece *t*, locking-piece *u*, hand-wheel *f*, and spring-catch *c*, substantially as described and shown, and for the purposes set forth.

4. In a permutation-lock containing tumbler-wheels fitted with tumblers, substantially as described, dials *m', n', or o'*, marked with cardinal number corresponding with the number of tumblers, as set forth.

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Witnesses:

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