O. E. PILLARD & E. M. McPHERSON.

COMBINATION LOCK.

No. 189,902. Patented April 24, 1877.

Fig. 1.

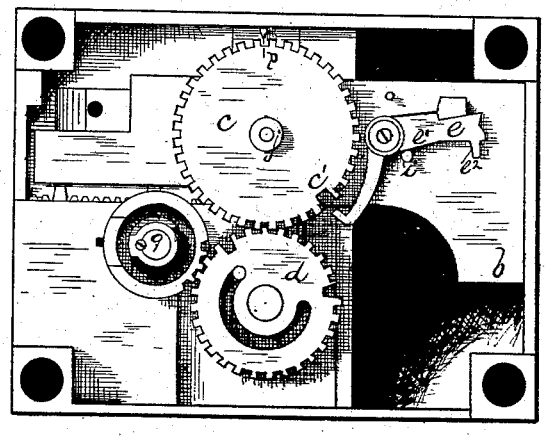


Fig. 5.

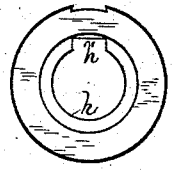


Fig. 6.

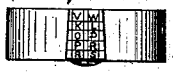


Fig. 2.

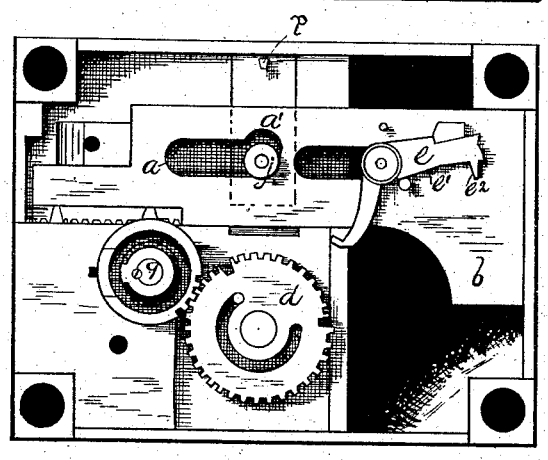


Fig. 3.

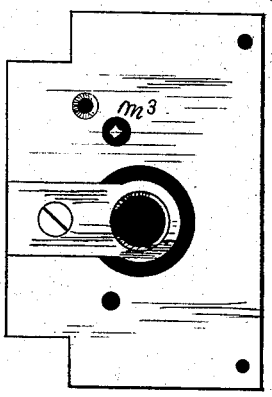
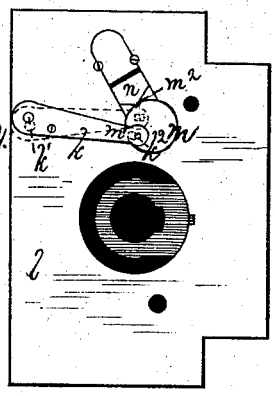


Fig. 4.



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UNITED STATES PATENT OFFICE.

OLIVER E. PILLARD, OF NEW BRITAIN, CONNECTICUT, AND EBENEZER M. McPHERSON, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN COMBINATION-LOCKS.

Specification forming part of Letters Patent No. **189,902**, dated April 24, 1877; application filed March 9, 1877.

To all whom it may concern:

Be it known that we, OLIVER E. PILLARD, of New Britain, in the county of Hartford and State of Connecticut, and EBENEZER M. McPHERSON, of Boston, Suffolk county, Massachusetts, have invented certain new and useful Improvements Pertaining to a Combination-Lock, of which the following is a specification, reference being had to the accompanying drawings, where—

Figure 1 is a view of the interior of the lock from the back side, with the covering plate and cap-block (shown in Figs. 3 and 4) removed. Fig. 2 is a view same as Fig. 1, except that the upper set of gears (gears *c*) are removed. Fig. 3 is a view of the outer face of the cap-block. Fig. 4 is a view of the inner face of cap-block. Fig. 5 is a front view of the key-shell, with key-disks inside, with the slots in line at "zero-point." (Small slide covering zero-point on perimeters of key-disks removed.) Fig. 6 is an edge view of the parts shown in Fig. 5 in same adjustment, showing the different letters on the key-disk perimeters at zero-point.

The present invention consists in improvements on the locks shown and described in patents No. 90,682 and No. 90,683, dated June 1, 1869.

As to those mechanisms we have discovered in practice that if, while the lock is unlocked, a different combination is made on the key—and this may happen through ignorant intermeddling—it is possible to lock the lock on a different combination from the proper one, and that an unknown combination, so that when the proper party comes to set his key on the proper combination to open the lock he finds he cannot do it, and the lock has to be opened by force. This objection our present invention overcomes by providing that, while the combination in the lock remains unchanged, the lock cannot be locked except on the same combination that unlocked it.

The slot or mortise *a* in the bolt *b*, in place of being slanting or oblique, so that when the bolt is in (unlocked) the sets of gears *c d* are out of mesh, is straight, so that these gears remain constantly in mesh, and the pivoted dog *e*, instead of being in mesh with gears *c* when the bolt is in, and out of mesh with these gears when the bolt is out, is out of mesh with these gears when the bolt is both in and out, and midway between these points this dog is in mesh with these gears, so that the bolt cannot be shot out or in except all the gears *c* are in position to let the inner end of the dog fall into the notch *c'* of each of these gears, which, since gears *c* and *d* are constantly in mesh, cannot happen unless the spur on the outer end of the key-spindle *g* retraces the exact path it followed in unlocking the lock, and the key will not and cannot retrace such path if the path has been altered by meddling with and rotating the disks *h*, or any of them. To effect said action of the dog with reference to the gears *c*, in place of making the under side of the lateral arm of the dog straight, as shown in Patent No. 90,683, we make such under side inclined, as shown in these present drawings, so that at the inner end of the play of the bolt the pin *i*, acting on this incline, will raise this lateral arm, and so release the inner end of the dog from the notch *c'*. The bevel or incline e^1 (old construction) moves the inner end of the dog out of notch *c'* when the bolt is out. We will designate the other incline by the letter e^2.

We will now describe means for unmeshing gears *c d*, so that the combination can be changed. At the outer end of the mortise *a* is a short vertical mortise, *a'*, so that, when the bolt is in—and only when it is in—the shaft *j*, bearing gears *c*, can be raised so as to unmesh the gears *c d*. To effectuate this up-and-down movement of the gears *c* from the outside of the lock, we pivot the lever *k* on the inside of the cap-block *l* with a mortise, *k'*, to take hold of the end of shaft *j*. The other end of this lever has a crank-like connection to the disk *m*—that is, a pin, k^2, runs into a slot, m^2, made in the face of this disk. By partially rotating this disk back and forth the lever is reciprocated, and the gears *c d* thrown in or out of mesh. A bevel-pointed pawl, *n*, acting in conjunction with the notches m^2 m^2, and pressed thereto by a spring, defines the limits of the rotary play of this disk. On the back of this disk is a winding-post, m^3, on which a key may be fitted, and the disk—meshing

and unmeshing gear *c d*—operated from the outside. A fixed pin, *r*, shuts into the teeth of gears *c*, when these gears are raised, and keeps them from accidental rotation.

Directions for changing the combination: At the commencement of doing this the bolt is in, gears *c d* are in mesh, gears *d* are at zero, and gears *e* are variously scattered from zero. Draw the spindle out through the key on the old combination. This brings gears *c* to zero, and scatters gears *d*. Now, unmesh gears *c* from gears *d*, push the spindle back through the key, and this brings gears *d* to zero. Remove the key and make the new combination thereon. Replace the key, and draw the spindle out through it; this scatters gears *d* into the new combination. Now, throw gears *c* and *d* into mesh, and push the spindle back through the key.

As to the key: Heretofore when the slots *h'* in key-disks *h* have been all in line, the same letters appeared in line on the perimeters of the disks—that is, the As were all in line, the Bs were all in line, and so on. This has enabled burglars to force one of the bank-officers to divulge the combination, and to deliver up one of the disks; and the burglar could readily open the lock without getting the remainder of the disks, because he could tell the zero-point at a glance, and then by moving his single disk to the different positions of the different disks, varying it rotarily for the proper letters, he could make the key-spindle traverse the proper path for opening the lock. Or a person familiar with the lock, and possessed of the combination, could make a key-disk which would answer the purpose; for, though its zero-point might not be the same as on the disks belonging to the key, he could discover that point by a few trials.

We claim as our invention—

1. The gears *d*, gears *c* on shaft *j*, and bolt *b*, provided with straight mortise *a*, combined and so arranged that, in operation, the said gears are constantly in mesh, substantially as described.

2. The gears *c*, provided with notches *c'*, bolt *b*, bearing pin *i*, and pivoted dog *e*, having inclines e^1 e^2, combined and so arranged that, in operation, the dog must lock into the notch when the bolt is shot out or in, substantially as described.

3. The gears *c* on shaft *j*, and the bolt *b*, provided with straight or horizontal mortise *a* and vertical mortise *a'*, combined and so arranged that the gears *c* can be lifted to unmesh from gears *d* when the bolt is in, substantially as described.

4. Gears *c* on shaft *j*, lever *k*, disk *m*, bearing turn-post m^3, and the spring-pawl *n*, all combined substantially as described.

5. The key-disks *h* bearing different letters at the same relative points on the perimeters, substantially as described, and for the purpose set forth.

In witness whereof we hereto set our hands this 26th day of February, A. D. 1877.

OLIVER E. PILLARD.
EBENEZER M. McPHERSON.

Witnesses:
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ROBT. F. GAYLORD.