No. 669,045. Patented Feb. 26, 1901.

C. B. HOPKINS.

COMBINATION LOCK.

(Application filed Apr. 26, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

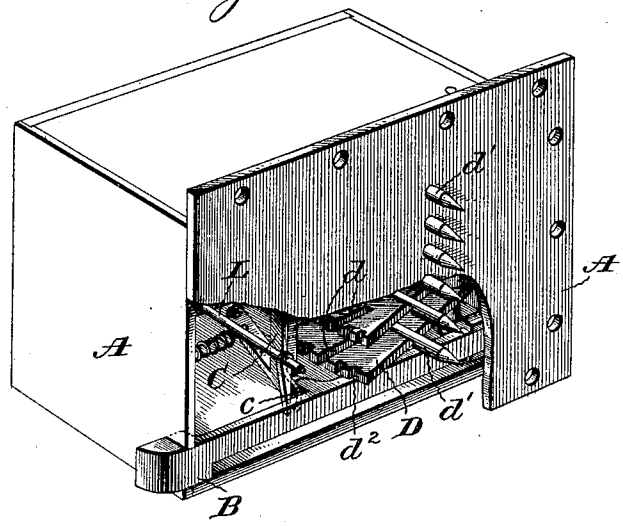
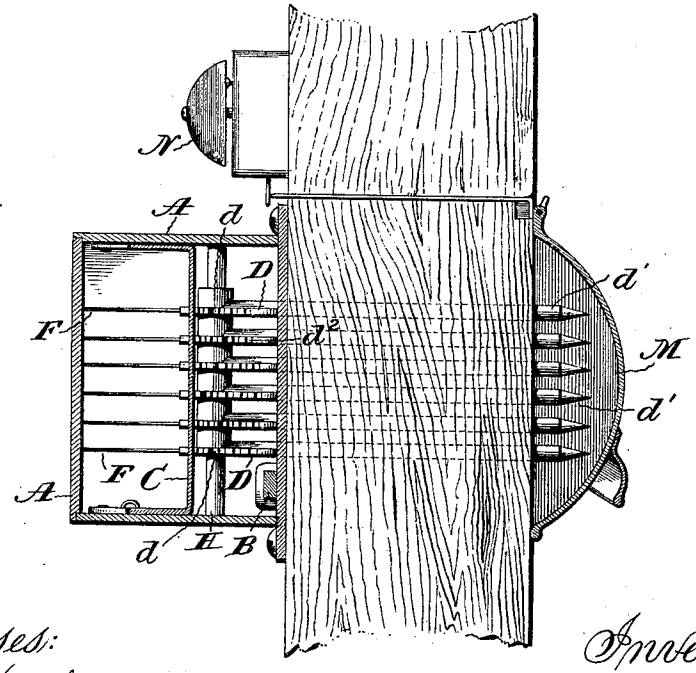


Fig. 2.



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Fig. 3.

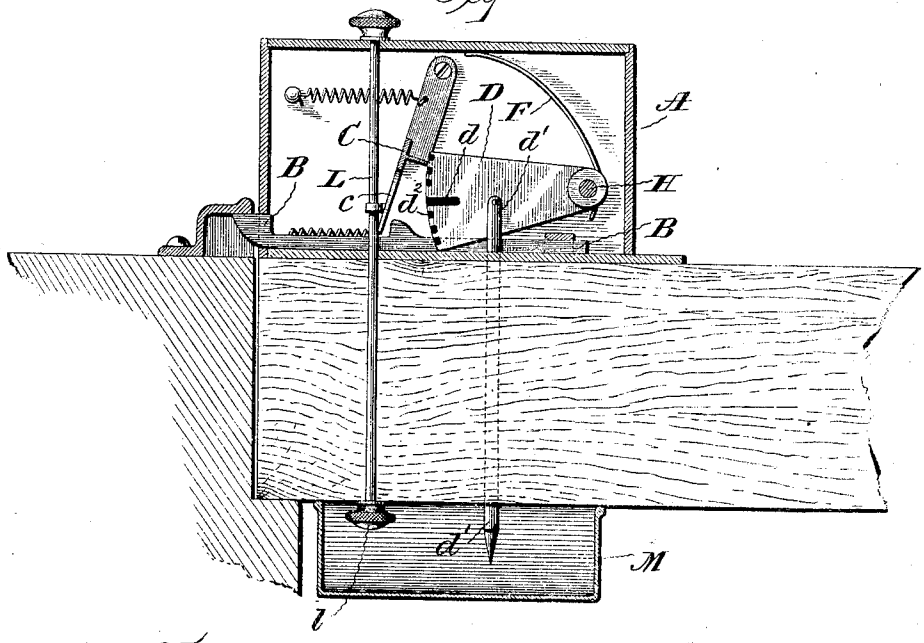
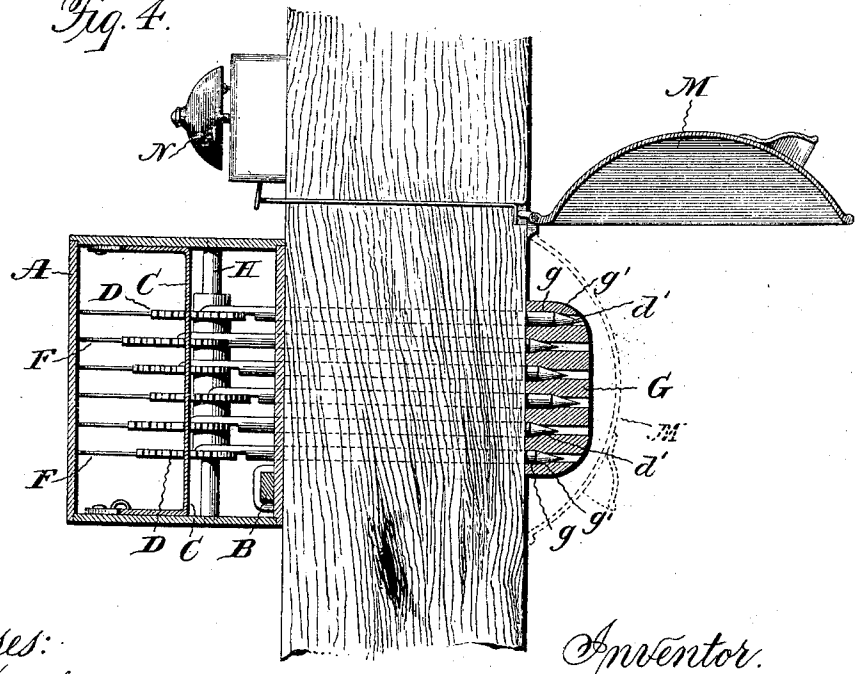


Fig. 4.



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(No Model.) 3 Sheets—Sheet 3.

Fig. 5.

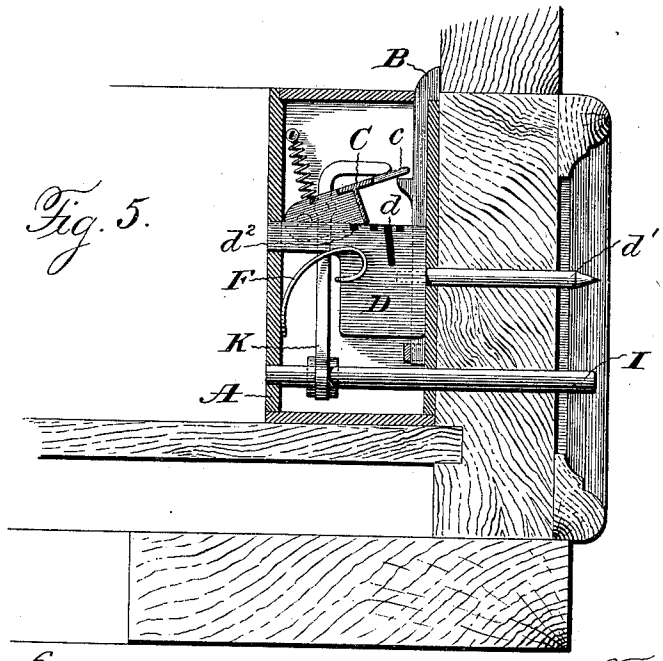


Fig. 6.

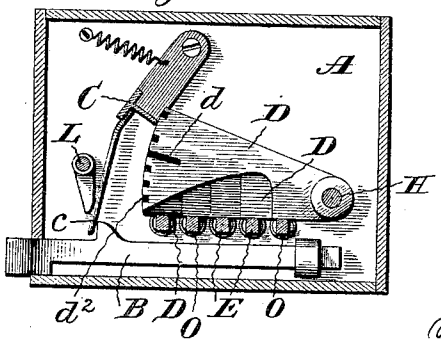


Fig. 7.

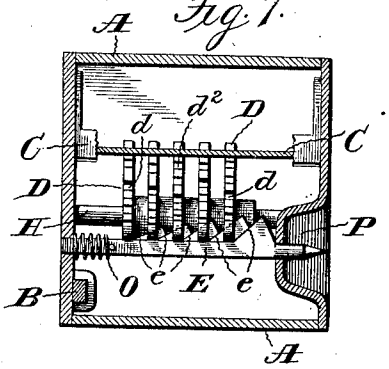
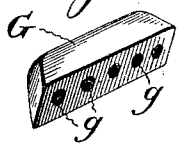


Fig. 8.



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UNITED STATES PATENT OFFICE.

CABEL B. HOPKINS, OF BARBERTON, OHIO.

COMBINATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 669,045, dated February 26, 1901.

Application filed April 26, 1899. Serial No. 714,560. (No model.)

To all whom it may concern:

Be it known that I, CABEL B. HOPKINS, a citizen of the United States, residing at Barberton, in the county of Summit, and in the State of Ohio, have invented certain new and useful Improvements in Combination-Locks; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of a lock constructed in accordance with my invention, a portion of the casing being removed; Fig. 2, a vertical section of a lock embodying my invention applied to a door; Fig. 3, a horizontal section through the lock; Fig. 4, a vertical section with the key applied and the tumblers moved to unlocked position; Fig. 5, a vertical section of a lock adapted for a drawer; Fig. 6, a vertical section of a lock differently constructed; Fig. 7, a horizontal section thereof, and Fig. 8 a detail perspective view of the key for my lock.

Letters of like name and kind refer to like parts in each of the figures.

The object of my invention is to provide a combination-lock whose construction will be very simple and cheap and yet insure perfect security; and to this end said invention consists in the lock and in the key therefor and in the construction, combination, and arrangement of the parts of the lock, substantially as hereinafter specified.

My lock is adapted to any of the varied uses to which locks are applied, and the invention is possible of much variation in the details of construction called for or imposed by the conditions in or under which the lock is to be used. The structures which I illustrate and shall describe are to be considered as merely some of many in which the invention can be embodied.

In the carrying of my invention into practice a suitable casing A is employed, that is given a form suitable for the particular use to which the lock is to be put. Slidingly mounted in said casing is a bolt B, whose keeper-engaging end is adapted to project through a wall of the casing, as usual. Said bolt may be a dead bolt or a spring latch-bolt pressed outward by a spring. A swinging frame C, pivoted at its ends to opposite sides of the casing A and having an arm *c*, that engages the bolt, is provided to move the bolt in the direction to disengage it from the keeper. A series of plates D and D, having each a notch *d* and mounted so as to be movable to place the notches in alinement with each other and with the path of movement of the cross-bar of the frame C, constitute the tumblers for preventing or permitting movement of said frame, and to each of the same is attached a shank or stem E, that projects for a portion of its length through the front wall of the casing, where its free end is accessible to enable the shank or stem to be pushed inward to move its attached tumbler. By giving to the tumbler notches *d* and *d* such locations in the respective tumblers that the tumblers will have to move different distances to place the notches in alinement with each other it is apparent that the lock can only be opened when each tumbler of the series is moved the requisite distance. A spring F is applied to each tumbler, that yieldingly holds it pressed outward.

For moving the tumblers the exact distances necessary to produce alinement of their notches an actuating device or key is employed consisting of a block or bar G, having a series of cavities or openings *g* and *g*, one for each tumbler shank or stem, and having a shoulder or bottom *g'* to engage the end of the shank or stem and move the tumbler the required distance. The distance to the shoulders or bottoms of the openings is not the same for all of the openings, but in each case is fixed by the amount of movement the particular tumbler is to have, and therefore some bottoms or shoulders are farther from the side of the key toward the casing than others, and hence when the key is applied to the shanks and moved until said side strikes the casing the various shanks and tumblers will move varying distances.

The tumblers are made numerous enough and so close together that it is extremely difficult to manipulate the shanks or stems by the fingers, and to discourage and deter such manipulation by the fingers the ends of the shanks or stems are sharpened to points to prick when they are pressed by the fingers.

The key cavity or opening for each shank or stem is elongated beyond the bottom or shoulder thereof, so as to have no surface against which the sharp point will touch, with consequent liability to being dulled, and preferably such elongation is in the form of an opening running wholly through the key, so that there will be no lodgment or accumulation of dirt.

The tumblers can be in the form of plates D and D, pivoted to a rod or shaft H and having the stems or shanks d' and d' pivotally connected to the respective plates, or plates and stems may be integral, as shown in Fig. 5, being supported slidingly in the casing by the stems at one side and a tang or tail on each plate on the opposite side. Shallow or false notches d^2 and d^2 are cut in each tumbler.

Any desired means for swinging the frame C to actuate the bolt B, such as a sliding or push bar I, that engages one member of a bell-crank lever K, pivoted to the inside of the casing A, with its other arm engaging said frame and shown in Fig. 5, or, as shown in Fig. 3, a rotary shaft L, with a turning-knob l and suitably connected with the frame C, may be employed.

In using my lock on street-doors, where the projecting pointed ends of the tumbler shanks or stems would be exposed to the weather, it is desirable to house them, and this can readily be done by a curved plate or cover M, that is hinged at its upper edge, so that it may be easily moved to give access to the shanks or stems or to return it to place to cover them. This hinged cover may be utilized to operate an alarm, so that it may be known that a person is at the door and the lock is being operated. Thus an attempt to tamper with the lock, indicated by long-continued ringing of the bell, could be frustrated. The alarm may be, as shown, a bell N, either electric or a spring-motor bell, suitably connected with the plate M, so as to be actuated or set in motion only when the latter is lifted.

It is apparent, of course, that any number of tumblers may be used and that the shanks or stems can be arranged in one or more rows or banks.

Instead of having the stems or shanks attached to and moving in the same direction with the tumblers a construction such as that shown in Figs. 6 and 7 may be used, in which the stems or shanks E and E are unconnected with the tumblers and move in paths at right angles to the direction of movement of the tumblers, there being a stem or operating device for each tumbler and each stem or device having an inclined surface e on the side next the tumbler to engage the latter and cause its movement when the stem or device is moved inward. A coil-spring O, applied to each stem or device, serves to press and hold the latter yieldingly outward, while to prevent the stem or operating device rocking or turning and getting out of proper relation to its tumbler its bearing part or parts are flattened to engage flat-sided guide-openings in which the stem slides. Each stem or operating device is prevented from acting on any but its own tumbler by cutting away the portions of the other tumblers that would aline with and be engaged by any other than the appropriate stems. An advantage of such a construction as this is that in using the lock on a door it can be arranged so that the tumblers swing in planes parallel with the side of the door, an arrangement that is conducive to the compactness of the lock, whereby the amount of its projection from the door is reduced to a minimum. I also show in Figs. 6 and 7 a simple expedient by which the protrusion of the pointed ends of the tumbler-actuating stems beyond the main surface of the lock, door, or other part may be avoided. Such expedient is simply the depressing of the lock or other surface to form a cavity P of such size as to contain the necessary projecting portions of the stems and to receive the key. By thus housing the pointed ends of the stems possible injury to clothes or other objects can be avoided.

Having thus described my invention, what I claim is—

1. In a lock, having a key-engaging operating device with an exposed portion situated to be readily reached by the fingers, and means connected with such portion for deterring manipulation of the device by direct application of the fingers to such exposed portion, substantially as and for the purpose described.

2. A lock having a key-engaging operating device that projects outside the lock-casing where it may be readily reached by the fingers, and has its projecting portion sharp, substantially as and for the purpose described.

3. In a lock, the combination of a suitable casing, a plurality of tumblers, and an actuating device for each tumbler, having a sharp end that projects on the outside of the casing, substantially as and for the purpose described.

4. A lock, having a key-engaging device that projects through the lock-casing and has its projecting portion sharp, and a movable guard for the latter, substantially as and for the purpose described.

5. In a lock, the combination of a plurality of tumblers and actuating devices therefor having inclined tumbler-actuating surfaces, substantially as and for the purpose described.

6. In a lock, the combination of a plurality of pivoted tumblers and sliding, actuating devices therefor that are movable in lines parallel with the axes of the tumblers, and have inclined tumbler-actuating surfaces, substantially as and for the purpose described.

7. In a lock, the combination of a plurality of tumblers, an actuating device for each tumbler, a bolt-moving part that coacts directly with the tumblers, and an operating de-

vice that acts on said parts to move the same, and through it to move the bolt, substantially as and for the purpose described.

8. In a lock, the combination of a suitable casing, a plurality of tumblers, an actuating device for each tumbler extending to the outside of the casing, a cover for the parts of said actuating devices on the outside of the casing, and an alarm-actuating mechanism operated by said cover, substantially as and for the purpose described.

9. The combination of a plurality of tumblers, an actuating device for each tumbler extending to the outside of the casing, and a key consisting of a block or piece having perforations that receive the portions of said actuating devices that are outside of the casing, substantially as and for the purpose described.

10. A key consisting of a block or piece, having perforations with shoulders or contracted portions that are different distances from the side of the block or piece on which the perforations open, substantially as and for the purpose described.

In testimony that I claim the foregoing I have hereunto set my hand this 13th day of March, A. D. 1899.

CABEL B. HOPKINS.

Witnesses:
RICHARD D. FRAUNFELDER,
A. Y. GERHARD.