# C. C. DICKERMAN.

## Lock and Key.

**No. 234,002.** **Patented Nov. 2, 1880.**

*Fig. 1.*

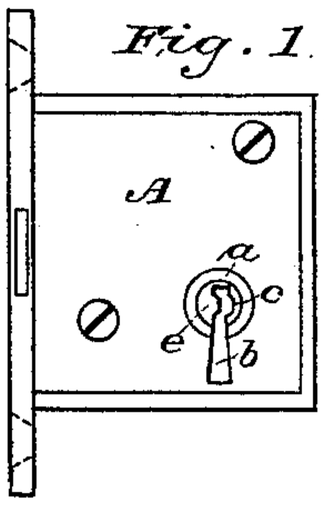



*Fig. 4,*

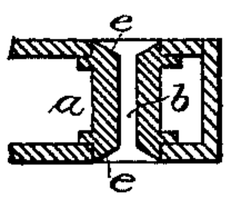



*Fig. 6*


*Fig. 9.*

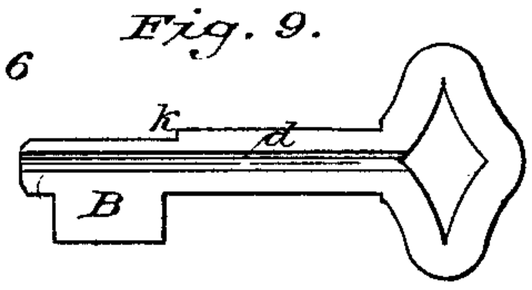



*Fig. 20,*

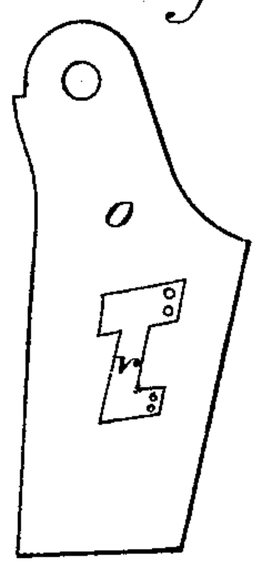



*Fig. 2.*

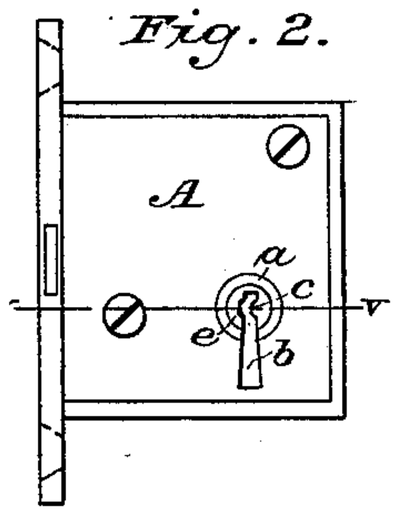



*Fig. 5,*

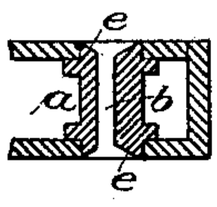



*Fig. 7.*


*Fig. 10,*

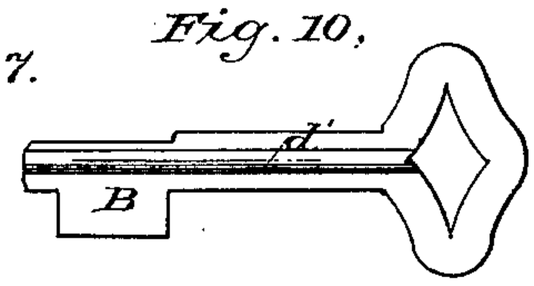



*Fig. 21.*

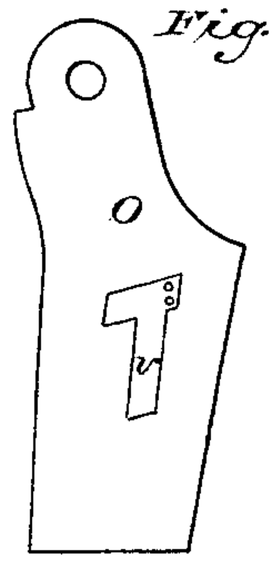



*Fig. 3,*

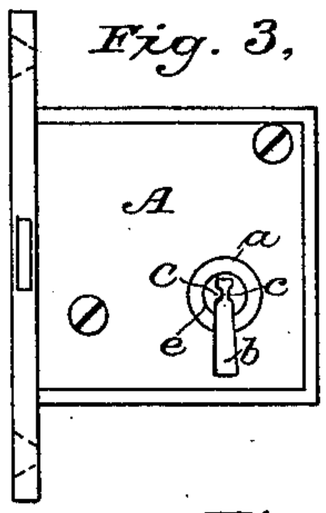



*Fig. 8,*


*Fig. 11,*

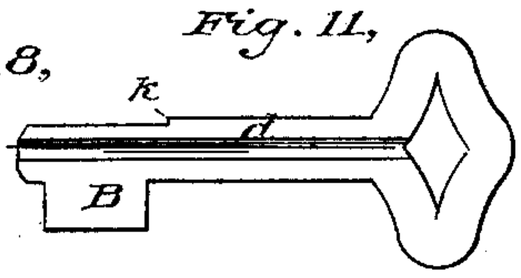



*Fig. 22,*


*Fig. 12,*

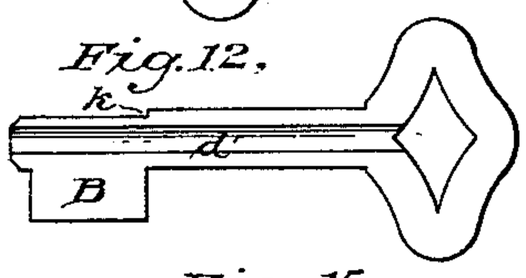



*Fig. 16,*

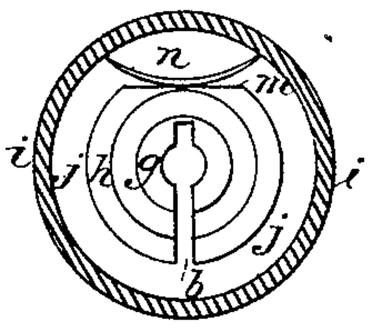



*Fig. 13.*

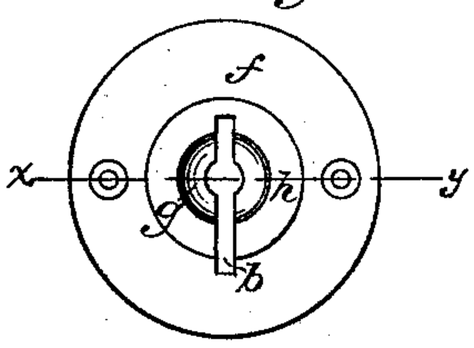



*Fig. 14,*


*Fig. 15.*

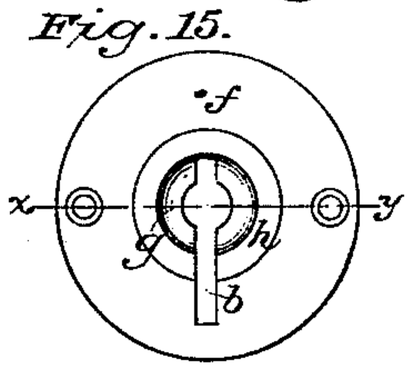



*Fig. 17.*

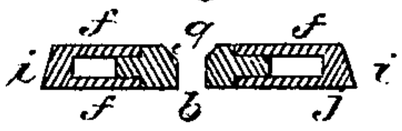



*Fig. 18,*

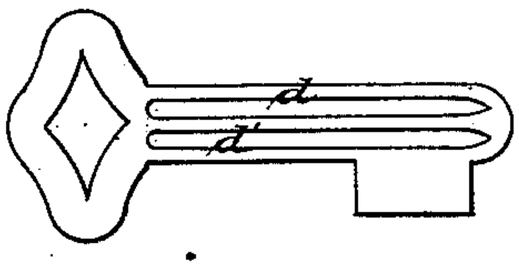
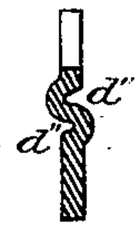



*Fig. 19,*

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# UNITED STATES PATENT OFFICE.

CHARLES C. DICKERMAN, OF BOSTON, MASSACHUSETTS.

## LOCK AND KEY.

SPECIFICATION forming part of Letters Patent No. 234,002, dated November 2, 1880.

Application filed May 25, 1871.

*To all whom it may concern:*

Be it known that I, CHARLES C. DICKERMAN, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Locks and Keys, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to that class of locks in which, for economy of construction and convenience in use, the keys are made of thin sheet metal; and it consists, particularly, of an improved construction of the key and its hub or trunnion, so as to increase the safety of the lock against picking, and so, also, as to admit of the key being wholly formed of a single piece of thin sheet metal, and yet insuring its thorough guiding and support during its insertion and rotation.

My invention applies particularly to locks operated by sheet-metal keys and provided with rotating plugs or roll-backs for guiding the key and supporting it during its revolution to operate the lock.

The locks to which my invention relates may be also provided with key-hole escutcheons, as hereinafter described.

The objects of my invention are to obviate a great difficulty which has been found with flat keys—viz., the tilting of the key—and also to increase the difficulty of picking the lock.

In the old forms of locks the keys rotate on round stems in suitable round bearings in the front and back plates of the lock. If a flat key is used, it is necessary to provide some device to guide it during its insertion and to support it during its rotation.

The device usually employed has been a hub or trunnion, which has been fitted in the bearing formerly used for the round-stemmed keys. In this plug has been cut a straight slot or keyway, into which the key could be inserted, and, the key being in place, the key and hub would revolve together, so that the bits of the key could operate the tumblers.

The difficulty of this construction is, that it offers inadequate resistance to the tilting of the key—that is, to its vibrating on an axis at right angles to the length of the key. The result of this tendency to tilt is twofold: first, it prevents the easy insertion of the key into the lock, and, second, it allows the key to get out of place during its rotation, and thus either stick or perhaps fail entirely to operate the lock.

In my Patent No. 111,732 I have shown a key provided with a laterally-projecting rib, which, in connection with the hub therein shown, will obviate the difficulty of tilting above pointed out. This construction, however, while effectively remedying the difficulty of tilting, adds nothing to the security of the lock against picking, and practically precludes the use of sheet metal in the construction of keys, because a rectangular key-bit having a rib projecting out from one side of it, with no corresponding depression on the opposite side of the bit, cannot economically be made of thin sheet metal, if it can be made of it at all.

My present invention enables me to construct a key entirely of sheet metal, and yet provided with longitudinal grooves and ribs or sinuosities, whereby the sheet-metal key is effectively guided in the lock during insertion and rotation, the security of the lock is increased by the obstacles presented to the introduction of picking-tools, and these advantages are obtained without materially increasing the cost of this sheet-metal key beyond that of others of the ordinary flat form.

The ordinary method of picking locks is by the insertion of a picking-tool, which is placed against the tumblers. The tool is then tilted up and down, retractive pressure at the same time being kept on the bolt, the tumblers being finally adjusted by this tentative process until the bolt can be retracted. It is evident that if any obstruction is made to this tilting of a picking-tool the difficulty of picking will be increased, and my invention increases this difficulty by making the keyway in the plug of a sinuous or contracted form. Such a secure and novel form of keyway in a slotted rotary key-hub of course calls for a corresponding sinuously-shaped key of like wavy outline on its opposite sides, and such a key is much stronger and better in every respect than the ordinary flat plate-key.

I show in my drawings keyways of various shapes, but all of them are intended to accomplish the objects above set forth to a greater or less extent.

In Figs. 1 and 4 is shown a hub or trunnion provided with a longitudinal keyway, which has on one of its inner walls a longitudinal

rib or swelling and on the other a corresponding groove or depression, the two lateral walls of the keyway being thus of sinuous shape, but parallel with each other, so as to leave the space between them of uniform width throughout, and thereby adapted to fit and receive a sheet-metal key of uniform thickness.

Figs. 6 and 9 show a sheet-metal key having upon one of its sides a rib or projection and upon the other a groove or depression, the lines forming its sides being parallel to each other and inclosing at all points a uniform thickness of metal, so that the key is adapted to fit into and entirely occupy the space inclosed within the walls of the longitudinal keyway in the hub.

Figs. 2, 5, 7, and 10 show a similar construction of key-hub and key, but with the sinuosity formed by the ribs and grooves of the keyway and key reversed or inclined in the opposite direction, so that the key shown by Fig. 9 would not enter the keyway of the lock shown by Fig. 2, nor the key shown by Fig. 10 enter the keyway of lock shown by Fig. 1. By this reversion of the sinuosity of the keyway I greatly increase the variety of patterns of keys which can be made without danger that a lock may be opened by any but its own key.

Figs. 3, 8, 11, and 12 show a modified application of my invention, which consists of forming the key of thin sheet metal, in the ordinary way, and in subsequently milling or otherwise cutting a longitudinal groove or depression in both of its sides. In this case the hub or trunnion has a corresponding rib or projection on both of its inner walls, thus forming a keyway of a cross-section coincident with that of the key. This construction and that shown by Fig. 22, although accomplishing the desired results in some measure, does so at greater cost of manufacture and at the expense of weakening the key, and is therefore less desirable than those forms which are more properly termed "sinuous," and which preserve the parallelism of the sides of the key and keyway.

Fig. 18 shows a sheet-metal key having both a longitudinal rib or swelling and a longitudinal groove or depression on each of its two sides, the groove on one side corresponding with the depression on the other, so that the cross-section of the key is sinuous or S-shaped, but of uniform thickness throughout. A keyway fitted to receive this key will, of course, have both a rib and a groove on each of its inner walls. The result is a double engagement of the sides of the key with the walls of the keyway, which insures still further the thorough support of the key and increases its strength. Moreover, the corresponding shape of the keyway greatly increases the difficulty of picking.

By reference to Fig. 19 it will be seen how the grooves or depressions of the key admit of corresponding ribs or projections on opposite sides of the keyway, each of which latter may project inward as far as or even beyond the central line of the keyway. No tool, therefore, can be made so thin that it can be tilted from the lower to the upper half of the keyway in the hub, and the picking of the lock is greatly hindered, if not absolutely prevented. The key is also firmly supported in place both by the projections of the key into the depressions of the plug and by the projections of the plug into the depressions of the key.

A great advantage in making the key with corresponding depressions and projections is, that it can be struck up from sheet metal, which would not be possible were the sides of the key not parallel, as they are shown not to be, for example, in my said Patent No. 111,732 and in part of the figures of my present drawings. It will be observed, also, that the keyway in said patent does not in any way interfere with the tilting of a picking-tool.

In some cases where my invention is applied to mortise-locks the locks are so thin and the hub necessarily so short that I find it advantageous to have a support for the key at another point. This I accomplish by means of a key plate or escutcheon. (Shown in Figs. 13, 14, 15, 16, and 17.) This consists of a surrounding plate, in which is fastened, in any convenient manner, a revolving disk, through which is cut a slot corresponding to the shape of the key used. This escutcheon being fastened on the outside of the door, it will be seen that the key will be supported both by the plug and by the revolving disk. The sinuosity of the key-hole in the escutcheon will also add to the security against picking.

I am aware that a key-blade of angular zig-zag outline has heretofore been made, as in the patent of Holmes and Butler; but that key is what is known as a "push-key"—*i. e.*, the moment the key is pushed into place the lock may be unlocked without rotating the key. The result is, that in this class of locks picking-tools do not have to be tilted to effect the desired object, and therefore corrugations are not safeguards. Moreover, the Holmes and Butler key is bitted upon its end, and is not made complete of a single piece of sheet metal.

Referring to my invention as compared with the prior state of the art, it will be apparent that the problem I have solved is to retain the advantages of a lock operated by a rotary key and the advantages of a parallel-sided plate-key for operating such a lock made complete of a single piece of metal, and at the same time to add to those advantages, first, security against picking; second, support of the key against displacement by vibration while inserting it or operating the lock; and, third, increased strength and durability of the key without appreciably increasing its cost. In other words, I have materially improved a particular style of key and materially added to the value of a popular class of locks.

Proceeding now to a more detailed description of my invention, by reference to the letters on the drawings, Figs. 1, 2, and 3 repre-

sent the exterior lock shell or case, (with bolt thrown back,) with a key-hub and key-hole therein.

A represents the shell or case; *a*, the hub; *b*, the key-hole when extending below the hub and into the shell A; *c*, the key-hole in the hub, which is irregular in form; *e*, the countersink in the hub, which is formed therein for the purpose of directing the key in its proper passage into the lock or key-hole.

Figs. 4 and 5 are sectional views of the lock case or shell A with key-hub therein.

Figs. 6, 7, and 8 are sectional views of the key-holes as shown at *c* in Figs. 1, 2, and 3, which key-holes are so constructed for the purpose of preventing the passage in of an ordinary flat plate-key, and also so as to conform in shape to the several keys shown in Figs. 9, 10, 11, and 12, thus rendering the locks when so made more secure against false or skeleton keys and other implements, and likewise to admit of a greater variety of change in the locks and keys therefor, which effect may be produced by simply changing the position or size of the key corrugation, depression, or depressions and forming the key-hole to correspond.

Figs. 9, 10, 11, and 12 represent my improved keys, which are what are commonly termed "plate-keys," and are intended to be struck up from steel, iron, brass, or other sheet or plate metal.

Fig. 9 is a view of a key-blank, B, showing the web or bit thereto. *k* is a shoulder in the main body or stem of the key at its extreme upper edge, which shoulder may be omitted in many cases. *d* represents a depression or groove extending the entire length of the stem of the key, but which may be omitted in the part that does not enter the lock, with similar or like results.

Fig. 10 gives an opposite view of the above-described key, showing the web or bit B, the shoulder *k*, and the rib or enlargement *d'*, corresponding with the depression or groove, as shown in Fig. 9, which depression and enlargement are intended to be formed at one and the same time by dies that are so constructed as to force the metal from its regular form to the desired shape, thus producing the rib and groove with no loss of stock, as would be necessary in order to produce a finely-finished key of this description in any other known manner.

Figs. 11 and 12 give opposite or reversed views of my improved key corresponding with key-hole *c c* in Figs. 3 and 8. This key differs from all others, inasmuch as instead of a rib on either side it has a depression in one or both sides, as is shown in the drawings, which depression or depressions may be placed at different points on either side when two are used, as may also be the case when there is but one depression. Besides the great variety of keys and key-holes I am enabled to make when constructed in this manner, this device is important for the purpose of sustaining and guiding the key in its proper position and course when placed in the key-hole.

Fig. 13 shows a front or face view of an independent escutcheon formed of two parts, *f* being the main body thereof, and *h* a rotating or revolving center, which is passed through the parts *f* from the back side thereof and held in its position by a shoulder at the rear part or end and an enlargement at the front or face part or end of said rotating center, made after its passage through the part *f*. *g* shows a countersink in the face of the part *h*, which is formed therein to assist in guiding the key into the key-passage *b*, which key-passage is provided with an enlargement for the entrance of the above-described keys.

Fig. 14 is a sectional view of the escutcheon, as shown at Fig. 13, *f* being the main body, *h* the rotating center, and *g* the countersink therein.

Fig. 15 is a face view of an independent escutcheon with rotating center or key-hole, the same as is shown in Fig. 13, with the exception that it is composed of three parts instead of two, and is provided with a spring, *n*, to confine the rotating center or key-hole in position when the key is removed from the key-hole.

Fig. 16 gives a rear view of the escutcheon, *b* showing the key-hole; *g*, the countersink; *h*, the revolving center with a flange which is confined between the face or main body *f* and the rear or back part or section, *j*, which flange has a plane surface, *m*, at its upper edge when in its proper position with key removed. This surface is for the purpose of giving a positive bearing to the spring *n*, the action of which upon said bearing *m* serves to confine the rotary center or part *h* in its proper position when the key is removed, *i* being the extreme outside edge of the main part or body to said escutcheon.

Fig. 17 is a sectional view of my escutcheon before described, *b* showing the key-passage; *g*, the countersink; *h*, the rotating center with flange thereto; *i*, the front or face part, and *j* the rear or back part of said escutcheon. These escutcheons serve to illustrate the application of my invention.

Fig. 18 shows a key having two ribs or grooves, *d d*, on either side, or one rib and one groove, which I sometimes use when extra security is required.

Fig. 19 shows a key-hole when constructed to conform to the key, as shown and described in Fig. 18; yet I do not confine myself strictly to this precise form, as I sometimes make two grooves in one and the same side, instead of one upon each side, as is shown in drawings at *d'' d''*.

Fig. 20 shows an ordinary swing lever or tumbler, such as is in common use in locks, and Fig. 21 shows the same style of lever or tumbler, except it has not the double notch *o o* at each end of its stud-passage *v*, as is shown in Fig. 20. It is such as is commonly used in

night-latches, and both tumblers only serve as illustrations.

Fig. 22 is a view of a key-hole with the projection in one side only, which I sometimes use, which projection may be placed on either side with equal effect, the opposite side being regular in form, as shown.

The forms of key and key-hole illustrated in Figs. 6 and 9 and 18 and 19 are substantially such as I prefer to use, being sinuous in outline and best adapted to practically carry out in the most efficient manner the idea of my invention. The other forms I have suggested merely because they have occurred to my mind, and for the purpose of presenting such modifications as might otherwise be resorted to, perhaps, to evade my patent.

It will be perceived that my invention does not contemplate the use of a flat rectangular key-blade having a mere lateral rib or projection from one or both of its sides, because that would not accomplish two very useful objects desirable to be attained in connection with my present invention, as above stated—viz., to prevent picking and to cheaply and easily manufacture a parallel-sided plate-key of equal thickness throughout and of greater strength than other parallel-sided plate-keys for rotary locks. I only use ribs upon my key where the forming of grooves by depression necessarily causes them, the essential thing being to obtain a key and a key-hole of sinuous contour, as best illustrated in Figs. 6 and 9 and 18 and 19, and to combine the advantages of these with a rotating key, and thus improve the generally-preferred class of locks operated by rotary keys.

In my said Patent No. 111,732, Fig. 8 shows a rectangular plate-key with a rib projecting from one side of its blade, and Fig. 9 shows a corresponding rectangular key-hole with a recess in one of its sides to accommodate the rib. The only purpose of this rib and recess is to aid in guiding and securing the key in position in the lock. It does not at all tend to prevent picking.

I do not claim in this application or intend that it shall reach a merely ribbed plate-key such as my said patent discloses.

I do not broadly claim a key with projections or depressions upon its side or sides, or broadly claim a slotted rotary key-hub; but

What I do claim is—

1. A flat or sheet-metal rotating key, complete of a single piece of metal of uniform thickness, with one or more longitudinal grooves on one side and corresponding ribs on the other, substantially as described, and adapted to be bitted transversely to said grooves and ribs.

2. In a lock, a rotary hub or trunnion provided with a sinuous key-slot adapted to the use of a sinuous sheet-metal key bitted on one side, the sides of the slot being parallel to each other, as described.

3. A key-hole escutcheon with a revolving disk in which is cut a key-hole of sinuous shape and parallel sides, substantially as described.

4. In a lock, the combination of a flat or sheet-metal key, complete of one piece of metal, whose sides are parallel, and of which a cross-section is sinuous, with a hub or trunnion provided with a keyway of the same form as the key.

5. The combination of a plate-key, complete of a single piece of metal, of sinuous cross-section and of uniform thickness, a hub provided with a keyway of a shape corresponding to the key, and tumblers which are operated by the rotation of the key, substantially as described.

C. C. DICKERMAN.

Witnesses:
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L. F. ROCHE.