W. I. LUDLOW.

Lock.

No. 212,957. Patented Mar. 4, 1879.

Fig. 1.

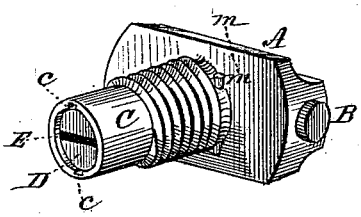

Fig. 2.

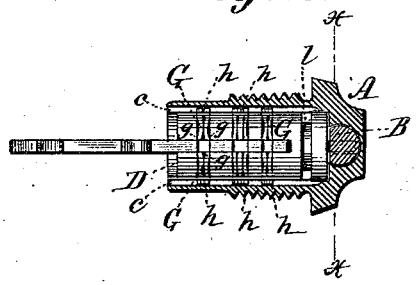

Fig. 6.

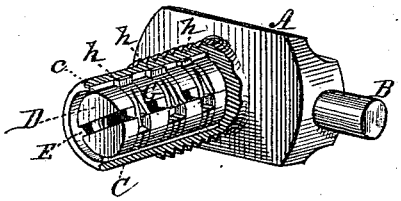

Fig. 3.

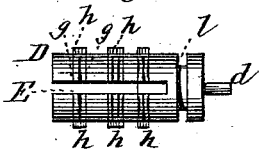

Fig. 7.

Fig. 4.

Fig. 8.

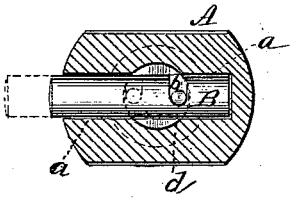

Fig. 5.

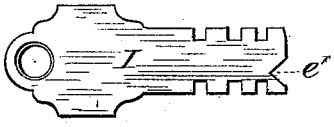

Fig. 10.

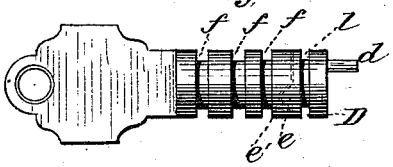

Fig. 9.

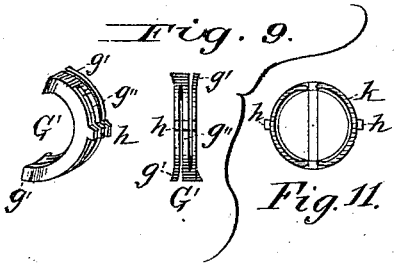

Fig. 11.

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UNITED STATES PATENT OFFICE.

WASHINGTON I. LUDLOW, OF ASHTABULA, OHIO.

IMPROVEMENT IN LOCKS.

Specification forming part of Letters Patent No. **212,957**, dated March 4, 1879; application filed December 21, 1878.

To all whom it may concern:

Be it known that I, WASHINGTON I. LUDLOW, of Ashtabula, in the county of Ashtabula and State of Ohio, have invented certain new and useful Improvements in Locks, of which the following is a specification:

My invention relates to improvements in that class of locks provided with rotary key-barrels, adapted for operation by flat keys having suitable wards.

Its object is to simplify the construction while increasing the security of this class of locks; to provide a lock compact in form, and of small cost in manufacture.

It consists—

First, in a rotary key-barrel having a diametric key-chamber, open at its edges, and a series of circumferential recesses intersecting said chamber, in combination with a series of tumblers arranged in said recesses, and having outward projections, and a case or chamber adapted to receive said barrel, and provided in its inner surface with longitudinal recesses or grooves to receive the projections of the tumblers, whereby the barrel carrying the tumblers can be either turned or moved longitudinally in its case or chamber, but said tumblers are prevented from turning with the barrel, as and for the purpose hereinafter particularly described and explained.

Second, in a bolt-case provided with a hollow horn, a series of stationary tumblers, removably attached within said horn, a rotary key-barrel fitting within said horn, and having circumferential recesses coinciding with the tumblers, and a diametric key-chamber intersected by said recesses, said barrel engaging with and operating a suitable bolt, arranged in the bolt-chamber.

Third, in a rotary key-barrel having a diametric key-chamber, open at its edges, and a series of circumferential recesses intersecting said chamber, in combination with a series of tumblers arranged in said recesses, and adapted to project across said diametric chamber when the barrel is turned.

Fourth, in a lock having a rotary key-barrel, provided with a diametric key slot or chamber, intersected by circumferential recesses for the reception of tumblers.

Fifth, in the combination, with a lock-horn having longitudinal grooves or recesses on its inner surface, and a key-barrel rotating within said horn, and provided with circumferential recesses, of suitable tumblers fitting within said circumferential recesses, and having projections fitting within the longitudinal grooves or recesses of the horn, whereby the tumblers are prevented from turning with the barrel, and held in proper position to enter the wards of a suitable key.

Sixth, in the combination, with a rotary key-barrel having a diametric key-chamber, open at its edges, and provided with a series of circumferential recesses intersecting said key-chamber, of a series of elastic tumblers arranged within said recesses, and adapted to expand in said chamber when their ends are caused to project freely into the same, said ends thereby becoming too extended to enter the coincident portion of the circumferential grooves opening into the opposite side of the key-chamber, and thus preventing the rotation of the barrel except by its proper key.

Seventh, the combination, with a rotary key-barrel, having a crank-pin projecting from its inner end, of a suitably-supported bolt, having a transverse slot embracing said pin and equal in length to the diameter of the circle described thereby, whereby the turning of the said barrel in either direction will cause the bolt to move correspondingly, and the crank-pin will never leave the slot in the bolt, but serve therein both as a mover and stop for said bolt.

In the accompanying drawings, Figure 1 is a perspective view of my improved lock. Fig. 2 is a vertical central section through the casing, as shown in Fig. 1, the barrel and key being shown in full lines. Fig. 3 is a view, in elevation, of the key-barrel, detached, in the direction of the key chamber or slot. Fig. 4 is a similar view at right angles to the key-chamber. Fig. 5 illustrates the general form of the key adapted to my improved lock. Fig. 6 is a perspective view of the lock, with a portion of the horn broken away to show the barrel turned to bring the ends of the expansible tumblers into the key-chamber. Fig. 7 is a perspective view of a form of tumbler adapted for use in my lock. Fig. 8 is a section on line *x x* of Fig. 2. Figs. 9 and 11 illustrate modified forms of tumblers. Fig. 10 is a flat side view of the key inserted in a detached barrel,

having its tumblers removed to show the wards of the key in coincidence with the tumbler-recesses of the barrel.

The letter A indicates the bolt-case, in which are cut suitable guides *a* for the bolt B, having a transverse open slot, *b*. A horn, C, projects from the inner face of the bolt-case, and has a portion of its outer surface provided with a screw-thread, by means of which it may be secured in a hole of proper size in the front of a drawer or door. In the interior surface of this horn are formed longitudinal grooves *c*. Within the horn C fits a key-barrel, D, having a crank-pin, *d*, projecting from its inner end and extending into the slot *b* of bolt B. Through the barrel D is cut a diametric open key slot or chamber, E, which is intersected on opposite sides of the barrel by circumferential recesses or grooves *f*. (Shown clearly in Fig. 10.) In these recesses are arranged tumblers G, having the general form of a segment, approximately equal in length to the portions of the circumferential recesses on opposite sides of the key-chamber. These tumblers are split or furcated at each end to form legs *g*, which are elastic, and normally stand at a distance apart at their ends greater than the width of the circumferential recesses. Midway between their exterior surfaces these tumblers G are provided with projections *h*, which, when the barrel and tumblers are in operative position, rest in the longitudinal grooves *c* of the horn C. These tumblers I prefer to make of tempered steel, in order that the legs *g* may have a high degree of elasticity.

The end wall of the key-chamber E is provided with a projection, *e*, which is adapted to fit into a corresponding recess, *e'*, in the key designated by the letter I, Fig. 5. This projection *e* and the recess *e'* are relatively so arranged that when the key is inserted into its chamber, and the recess fits over the projection, the key will be accurately centered with respect to the barrel and prevented from edgewise movement.

In Fig. 9 is shown a modified form of tumbler, G'. It is somewhat wider than that illustrated by Fig. 7, and is split from each end nearly through its length, forming a center portion, *g''*, and outer legs, *g'*, the free ends of which extend in opposite directions, and are bent slightly outward, the central portion and legs having projections *h*, similar to those of Fig. 7.

In Fig. 11 the tumblers *k* may each be an unsplit elastic piece, the ends of each of which normally stand at a distance apart less than the diameter of the key-barrel, and are bent inward slightly at their tips, so that when said ends are brought into the key-chamber these tips will project toward the center of the barrel and strike the opposite wall of the key-chamber below the portion of the circumferential recess opposite that in which the tumbler lies, and thus prevent the farther turning of the barrel.

The movement of the bolt in either direction, it will be seen, depends on the turning of the barrel, as this movement is accomplished by the revolution of pin *d*, causing said pin to act upon the walls of the slot *b*.

In order that the barrel may turn, it is necessary that the circumferential recesses shall be continued across the key-chamber and form guides for the tumblers; and it is one office of the key to fill up the key-chamber, except such portions as exactly coincide with these circumferential recesses, and give them each a complete annular form of uniform dimensions, so that as the barrel turns the tumblers will not be permitted to expand at any point. The key, therefore, must have a width equal to the diameter of the key-barrel, but must have in its opposite edges notches which precisely coincide with and form continuations of the circumferential recesses when it is inserted in said barrel and centered on the projection *e*, as shown in Fig. 10.

In order to secure this requisite precise coincidence of the key-notches and the tumbler-recesses of the barrel, I place a key-blank, without the notches, in a blank barrel, without circumferential grooves, and then, after securing them firmly together, I cut the grooves in the barrel and notches in the key simultaneously and with the same tool. I thus secure the most accurate coincidence of the grooves and notches, and obviate the necessity of measuring and fitting the wards of the key separately to the tumblers and notches, as is the ordinary practice in lock-making.

In placing the parts of my lock together, I first place the bolt B in the case A so that the slot *b* is at the opening of the horn. I then place the tumblers, of whatever form used, in the circumferential recesses of the key-barrel, with the projections *h* in line on opposite sides of the barrel, and the ends of the tumblers approximately flush with the walls of the key-chamber. I then insert the key-barrel into the horn C, the projections *h* passing into the longitudinal grooves or chambers *c*, and the crank-pin *d* extending into the slot *b* of the bolt.

When the barrel is snugly in place an annular groove, *l*, around and near the inner end of the barrel and beyond the key-chamber, coincides with holes through the walls of the horn for the reception of a pin, *m*, the intermediate portions of which lie in said groove *l*, and prevent the barrel from being withdrawn.

Now, the parts being in position, as explained, the lock may be secured to a drawer or door as usual with screw-threaded horn-locks. When the key is then inserted and its notches coincide with the recesses of the barrel, it is evident that the barrel may be turned, and the travel of pin *d* will move the bolt. When the bolt is retracted the pin is in position, as shown in Fig. 8 in full lines, and forms an absolute stop to the bolt's movement except by turning the barrel. Now, when the barrel is turned half-way round from this position, the pin is brought to the position shown

in dotted lines, the bolt is projected, and the pin here forms a stop also, which prevents the bolt's retraction. Should the barrel be turned by inserting an instrument in its outer end, the ends of the tumblers will expand as soon as they are in the key-chamber and strike its opposite wall instead of entering the opposite portion of the recess, as before explained, and, of course, the barrel is prevented from turning further, and the bolt will not be materially moved. If a key is inserted in the key-chamber which is not notched to accurately coincide with the circumferential recesses, the barrel cannot be turned, as the portions of said key which stand within the line of said recesses will strike the stationary tumblers; and if the notches of the key should be wider than the recesses, it would permit the tumblers to expand and strike the wall of the key-chamber, and prevent further turning thereof, as before explained.

Though, for the sake of clear illustration, I have shown and described my invention in connection with a drawer-lock having a horn, I do not confine myself to horn-locks, as it is obvious that a chamber or casing for my barrel may be arranged in various kinds of locks, and the pin may be adapted to operate a swinging as well as a sliding bolt.

I would here observe that the lock-bolt case and its projecting horn may, if desired, be cast of metal, in a single piece.

What I claim is—

1. A rotary key-barrel having a diametric key-chamber, open at its edges, and a series of circumferential recesses intersecting said chamber, in combination with a series of tumblers arranged in said recesses and having outward projections, and a case or chamber adapted to receive said barrel, and provided in its inner surface with longitudinal recesses or grooves to receive the projections of the tumblers, whereby the barrel carrying the tumblers can be either turned or moved longitudinally in its case or chamber, but said tumblers are prevented from turning with the barrel, as and for the purpose set forth.

2. A bolt-case provided with a hollow horn, a series of stationary tumblers removably attached within said horn, a rotary key-barrel fitting within said horn and having circumferential recesses coinciding with the tumblers, and a diametric key-chamber intersected by said recesses, said barrel engaging with and operating a suitable bolt arranged in the bolt-chamber, substantially as described.

3. A rotary key-barrel having a diametric key-chamber, open at its edges, and a series of circumferential recesses intersecting said chamber, in combination with a series of tumblers arranged in said recesses, and adapted to project across said diametric chamber when the barrel is turned, substantially as described.

4. A lock having a rotary key-barrel provided with a diametric key slot or chamber, intersected by circumferential recesses for the reception of tumblers, substantially as described.

5. The combination, with the horn having longitudinal grooves or recesses on its inner surface, and the key-barrel rotating within said horn and provided with circumferential recesses, of the tumblers fitting within said circumferential recesses, and having the projections fitting within the longitudinal grooves or recesses of the horn, substantially as described, for the purpose set forth.

6. The combination, with a rotary key-barrel having a diametric key-chamber, open at its edges and provided with a series of circumferential recesses intersecting said key-chamber, of a series of elastic tumblers arranged within said recesses, and adapted to expand in said chamber when their ends are caused to project freely into the same, said ends thereby becoming too extended to enter the coincident portion of the circumferential grooves opening into the opposite side of the key-chamber, and thus preventing the rotation of the barrel except by its proper key, substantially as set forth.

7. The combination, with a rotary key-barrel having a crank-pin projecting from its inner end, of a suitably-supported bolt having a transverse slot embracing said pin and equal in length to the diameter of the circle described thereby, whereby the turning of the said barrel in either direction will cause the bolt to move correspondingly, and the crank-pin will never leave the slot, but serve therein both as a stop and mover for the bolt, substantially as described.

8. The key-barrel having the open-eyed diametric key-chamber, the end wall of which is provided with the point *e*, adapted to fit into a corresponding indentation in the end of a key, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of the subscribing witnesses.

WASHINGTON I. LUDLOW.

Witnesses:

ALBERT H. NORRIS,

JAS. A. RUTHERFORD.