2 Sheets--Sheet 1.

H. WINN.
Locks.

No. 153,415. Patented July 21, 1874.

Fig. 1

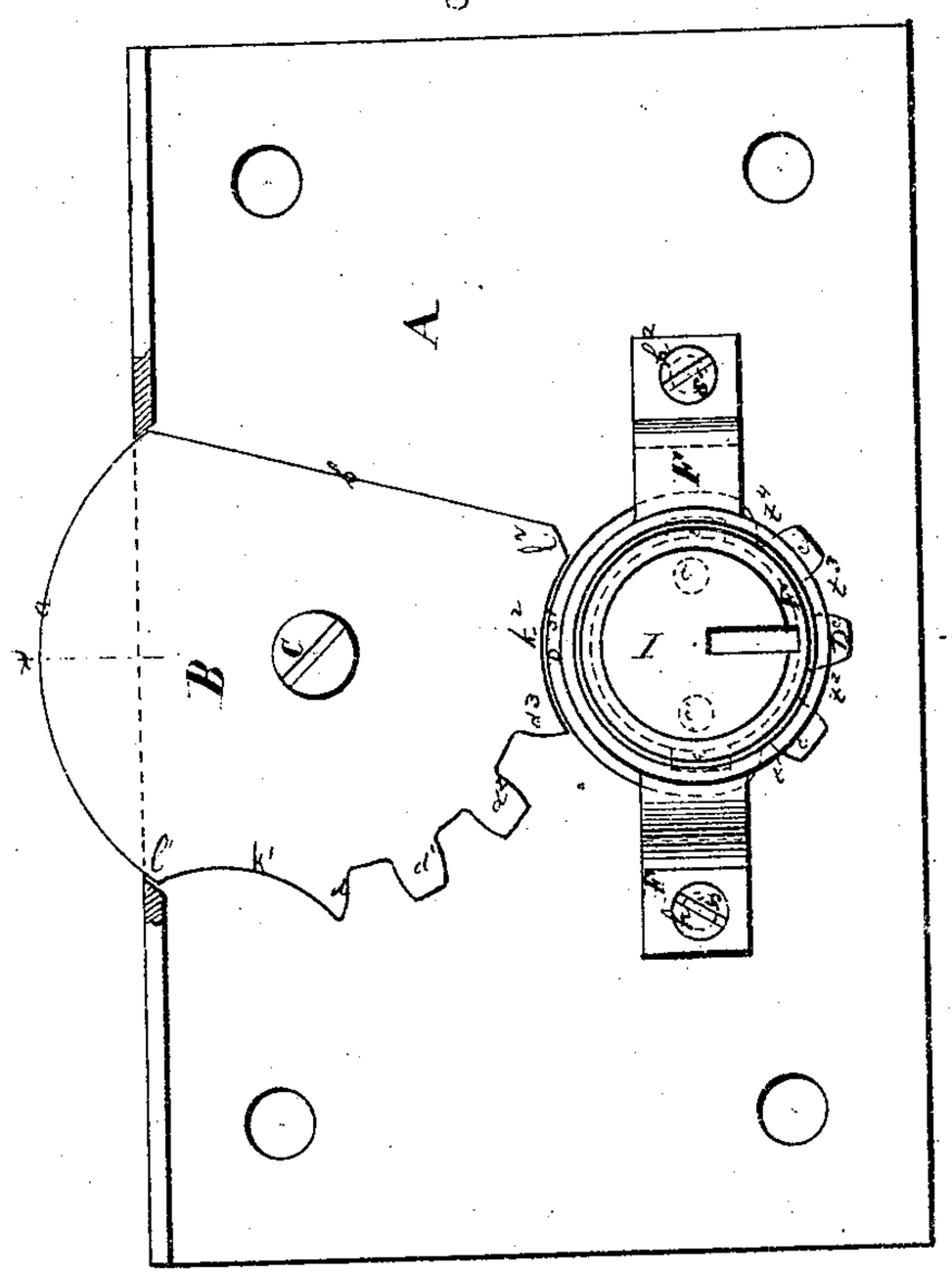


Fig. 2

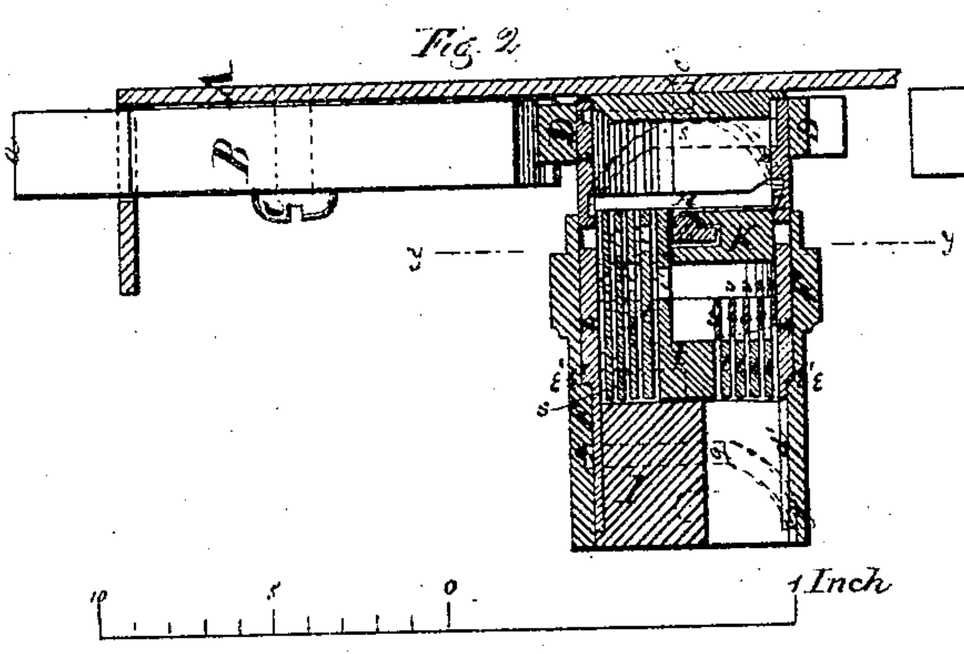


Fig. 3

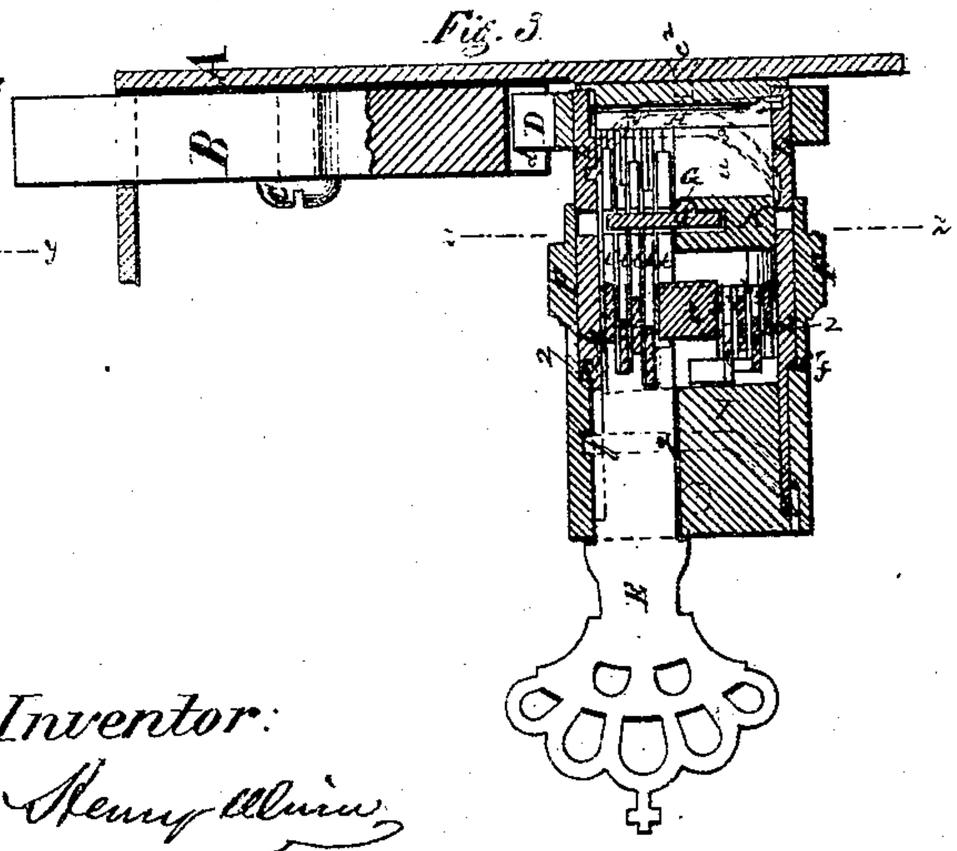


Fig. 4.

Fig. 8.

Fig. 6

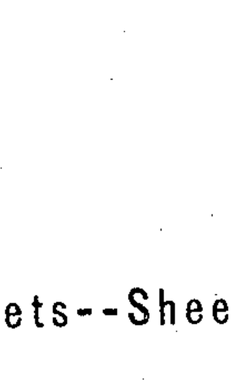


Fig. 7.

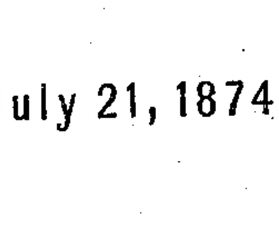


Fig. 9.

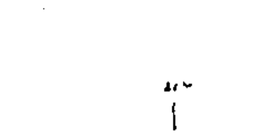
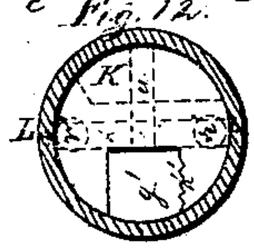


Fig. 10.

Fig. 5.

Fig. 11.

Fig. 12.



Witnesses:

Edwin S. Brake.

S. Butler

Inventor:

Henry Winn

2 Sheets--Sheet 2.

H. WINN.

Locks.

No. 153,415. Patented July 21, 1874.

Fig. 14.

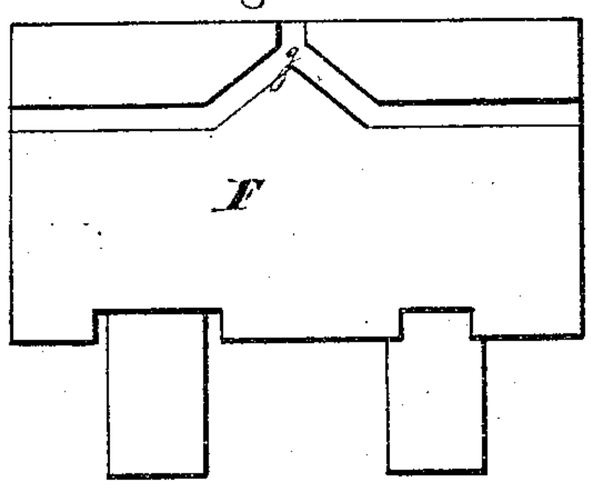
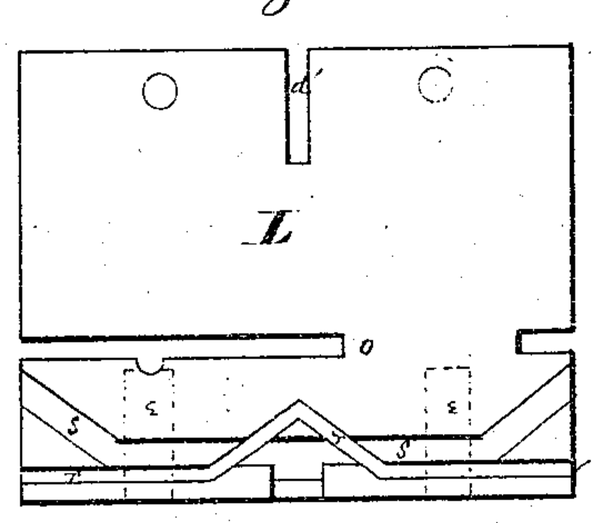


Fig. 13.



Witnesses:

Edwin S. Brake.

D. Butler

Inventor:

Henry Winn

UNITED STATES PATENT OFFICE.

HENRY WINN, OF PIERMONT, NEW YORK.

IMPROVEMENT IN LOCKS.

Specification forming part of Letters Patent No. **153,415**, dated July 21, 1874; application filed March 9, 1872.

CASE B.

To all whom it may concern:

Be it known that I, HENRY WINN, of Piermont, in the county of Rockland and State of New York, have made certain new and useful Improvements in Locks, whereof the following is a full, clear, and exact description, reference being had to the accompanying drawings, in which—

Figure 1 is a front view of the lock in its locked position. Fig. 2 is a section of the lock in its locked position, taken through the line *x x* of Fig. 1. Fig. 3 is a section taken through the same line as Fig. 2, after the insertion of the key and a half-revolution thereof, showing the position of the parts after said half-revolution. Fig. 4 is a section taken through the line *y y* of Fig. 2, the tumblers being removed, showing the fence, the cross-bar, the feathers on the rotating shell, and the ring behind the section. Fig. 5 is a section taken through the line *z z* of Fig. 3, showing the fence, the feathers on the rotating shell, and the ring behind said section. Fig. 6 is a side view of the rotating plug detached from the rotating shell, containing the tumblers, in the position assumed by them after having been set by the key. Fig. 7 is an inner end view of said rotating plug, showing the frictional parts or furrings thereof, which hold the tumblers and tend to restrain their motion; also, a section of the rotating shell within which said plug is secured. Fig. 8 is a section through the line *w w* of Fig. 4, showing an edge view of the fence and the ribbed part thereof; also, a small section of the non-rotating plug and the slots therein, which contain the fence and its rib; also, a small section of the cross-bar and rotating shell. Fig. 9 is a perspective view of the cross-bar, which restores the tumblers and holds them forward until the rotating shell is turned from its locked position. Fig. 10 is a perspective of one of the tumblers. Fig. 11 is a side view of the non-rotating plug and the screws whereby it is secured to the lock-plate; also, a section of the cross-bar in its slot. Fig. 12 is an end view of said non-rotating plug surrounded by a section of the rotating shell, showing its place therein. Fig. 13 shows the rotating shell projected into a plane, showing the two grooves therein, which actuate the cross-bar backward and forward. Fig. 14 is a similar projection into a plane of the non-rotating shell, showing the key-groove therein.

In the several figures the same letters indicate the same parts.

A is the lock-plate. B is the bolt, pivoted to the plate A by the screw C, so that the arc *a* is projected by rotation for the locked position, and the edge *b* for the unlocked position. D is the ring, bearing the teeth *c c c*, which impinge upon the projections *d* d^1 d^2 d^3 of the bolt B to rotate the same. The ring D is fastened to the rotating shell L by the feathers *e e* on said shell fitting in corresponding depressions in the ring. The circular portion *o'* of said ring lies in the depression k^2 when the bolt is in the locked position, and in the depression k^1 when the bolt is in the unlocked position. E is the key, with a bit or projection, *f*, which guides and gives longitudinal motion to the key by its rotation in the groove *g* cut in the stationary inclosing-shell F, which shell is secured to the lock-plate by the screws *h* h^2. Said shell F has a supporting-notch, *m'*, in which the fence lies in an attempt to throw the bolt without setting the tumblers, and which supports the fence, preventing it from damaging the interior of the lock until it is sheared off, or the shell L is twisted off, if sufficient force is applied. G is the fence, which is limited in its action to vertical motion by its rib *i* reacting on the sides of the slot *k* in the stationary plug K, and by the reaction of its sides against the slot *l* in the same. The bottom of the fence is cut in the form of two inclined planes, *m m*, the fence being lifted out of the tumbler-notches by the reaction thereupon of the uncut portion *o* of the rotating shell L. The upper portion of the fence G is provided with the inclinations *n n*, whereby, in case the tumblers are not set when an effort is made to rotate the shell L to throw the bolt, the said uncut portion *o* lifts the fence away from contact with the faces of the parts of the tumblers which bear the fence-notches. H is the cross-bar, which is moved backward and forward by means of the grooves *r* and *s* in the rotating shell L, into which are projected the

ends *p* and *q* of the cross-bar. The forward motion restores the tumblers *t t t t t* to the position shown in Fig. 2, and its backward motion retracts it, to allow said tumblers to be projected, as shown in Fig. 3. It is held from rotation and confined in its motion by its bearing in the slot *u* in the stationary plug K. The ends of the cross-bar are cut diamond shape, with inclinations, as at *p' p'*, for purposes hereafter described. I is the rotating plug, which is screwed to and turns with the rotating shell L, and is provided with the key-hole *n'*. When said plug I is screwed to the rotating shell L it forms a part of the same, acting in all respects as if it were made in one piece with said shell L. In the end of said plug I, and forming part of the same, are cut the furrings or frictional parts *v v v v v*, the recesses between the same holding the circular ends of the tumblers, while said furrings apply friction thereto to prevent unnecessary motion by jarring or propulsion, and to add to the force required to move the tumblers, and prevent picking by the feeling process. These furrings all have the opening *a'* at the bottom of the key-hole, and they extend up to the dotted line *b'* in said plug I. Beyond this line the plug I is solid, excepting the key-hole *n'*, and the screw-holes to fasten it to the shell L. The said furrings are cut away in various parts to insure elasticity, and sprung in and out upon the tumblers to give the requisite friction. K is the stationary plug, which is secured firmly to the lock-plate by the screws c^2 c^2 through the screw-holes c^1 c^1, and has a mortise, *g'*, into which the rectangular ends of the tumblers enter, and by which the tumblers are held from rotation, which mortise is grooved at *h'* to furnish guides for the tumblers, and to prevent their interference. It has the slots *l*, *k*, and *u*, for purposes before described. The shell L is cut away to the residuum part *o*, forming a slot for the admission of the fence G. It bears the feathers *e e*, which enter into and rotate the ring D. Said shell is also slotted in the end at *d'* to admit the passage of the projection *f* on the key, which works in the groove *g* of the stationary shell F. The shell L is prevented from being pulled out by a shoulder, *e'*, fitting in the stationary shell F. The tumblers *t t t t t* are made from concentric cylinders, whereof all except the central one are hollow, by cutting away the ends intended for the fence-notches, until the curved rectangular portions, as at *f'*, are left. The central tumbler is made from a solid cylinder, the end bearing the fence-notch having a flat surface milled upon it, which, reacting against the side of the mortise *g'*, aids to keep it from revolving, and keeps the fence-notch in an upright position. The tumblers have the fence-notches *i' i' i' i' i'*. The ends of the tumblers presented to the key are the ends of concentric cylinders, whereof all are hollow except the central one, which is solid.

By this construction, the ends presenting a constant bearing to the key-bits, the tumblers can never collide with the key-sides, though for this purpose it is only necessary that the portions of the ends against which the key acts, each way, before the uncut part *o* brings up against the fence, should have this form, the tumblers being held thereafter by the fence.

The grooves *g*, *r*, and *s* in the shells F and L are annular through two-thirds of the circumference of their containing-shells; then they form an ascending helix through one-sixth thereof, and a descending helix through the remaining one-sixth thereof. They are arranged harmoniously, so that the bit *f* of the key and the ends *p* and *q* of the cross-bar are each always in a corresponding portion of their respective grooves.

The mode of operating the lock is as follows: The parts are supposed to be in the locked position shown in Figs. 1 and 2. On the key's insertion the projection *f* enters by an opening the groove *g*. While being rotated, the key is advanced by the propulsion of the operator, or, on failure thereof, by the reaction of the bit *f* in the helical portion of the groove *g*. The cross-bar H at the beginning lies against the tumblers and holds them out. While the key rotates the shell L, said shell projects the helical portion of the groove *r* against the end *q* of the cross-bar H, and the same portion of the groove *s* against the end *p* of the cross-bar, and said cross-bar advances in harmony with the key, and allows the tumblers to be projected thereby until the fence-notches *i' i'*, &c., are in line under the fence G. At the beginning of the rotation the fence is held up free from the tumblers, as seen in Fig. 4, by the uncut portion *o* of the rotating shell L; but this support is rotated from under the fence while the key is advancing the tumblers, as aforesaid, and the fence G is allowed thereby to drop, by its own weight, upon the tumblers; or if the notches *i' i'*, &c., are correctly set into the same, as seen in Figs. 3 and 5, the said notches allow the fence G to fall far enough to admit the passage of the uncut portion *o* over the top of the fence G. The portion of the grooves *g*, *r*, and *s* containing the bit *f* on the key, and the ends *p* and *q* of the cross-bar, are now annular for a portion (two-thirds) of the revolution of the shell L, during which portion neither the key E nor the cross-bar H advances or recedes. While the cross-bar and key are in said portions of the grooves, the fence G drops into the fence-notches *i' i'*, &c., the uncut part *o* passes over the top thereof, the bolt is operated, and the fence G is lifted out of the fence-notches, as hereafter described, while the tumblers are unaffected. As the key continues to rotate the shell L the uncut part *o* thereof advances until it strikes one of the inclined planes *m m* on the fence and lifts it out of the tumbler-notches. The return helical portions of the grooves *r* and *s* now reach their proper ends of the cross-bar H, and drive said cross-bar against the tumblers,

and drive the tumblers forward until they are fully restored, during which operation the return helical portion of the groove *g* withdraws the key by action against the bit, if moving therein, so that it cannot interfere with the restoration of the tumblers.

During the first portion of the revolution of the shell L, (which may be made by a false key,) the circular portion of the ring D remains in the depression k^1 or k^2, holding the bolt firmly in its position until the time when the uncut portion *o* would impinge against the fence if it had not fallen into the fence-notches, and then, while said uncut part *o* is passing over the fence, the teeth *c c c* on the ring act on the projections *d* d^1 d^2 d^3 on the bolt until the curved part *o'* of the ring comes into the other depression, k^1 or k^2, and locks the bolt firmly in its new position. In case an attempt is made to rotate the bolt a second succeeding time in one direction, one of the teeth *c c* strikes against the curved portion l^1 or l^2 on the bolt and prevents the same.

The above description, with reverse revolutions, explains the process of unlocking, except that, in the locked position, the arc *a* of the bolt is projected beyond the lock-case, and the curved portion of the ring rests in the depression k^2, while, in the unlocked position, the edge *b* coincides with the edge of the lock-plate, and said curved part rests in k^1.

In case the tumblers are not set correctly, when the uncut part *o* is rotated from under the fence G, said fence will drop on the tumblers, and when said uncut part *o* reaches it, said part will impinge against the inclined plane *n* or *n*, and lift the fence away from the tumblers, and the fence, being in the supporting-notch *m'*, must be sheared off before the bolt can be actuated.

It is intended to construct the uncut part *o* weak enough to twist off before this can occur, so that violence shall merely sever the operator's connection with the bolt without actuating it.

It will be seen that the parts of the tumblers which contain the fence-notches are arranged on one side of that portion of the fence that carries its vertical bearing, to wit, on the side of the fence which receives the impact of the uncut part *o* at *n*, in the effort to unlock the bolt when the tumblers are not correctly set. If the fence G had a bearing to confine it sidewise to vertical motion on the other side of the tumblers, (even if it had bearings on both sides of them,) and the fence had its necessary play, the reaction of the uncut part *o* on the inclination *n*, in such case, would tilt over the fence, and for an instant before the fence was lifted would give some pressure on one or more of the notch-bearing faces of the tumblers and aid in picking by the feeling process. The present construction guards against the slightest pressure from this cause when the lock is locked, by tilting the fence away from all said notch-bearing faces in the unlocking motion, and when the lock is locked the uncut part *o* cannot be brought against the inclination *n*, that it strikes in the locking direction, because the tooth *c* on the wing brings up on the bolt at l^2 before such impact. This position of the tumblers on one side of the fence further gives room to admit the stationary plug K to inclose the fence. In this lock the tumblers do not rotate, being held by the mortise *g'*. The furrings *v v*, &c., on the contrary, being part of the rotating plug I, rotate over the cylindrical outside ends of the tumblers, and, at every rotation, wipe said tumblers wherever they touch them. These furrings are cut away at *a'*, making an opening larger than is required to admit the key, said opening being at the bottom of the key-hole, which opening may be of any desired size, leaving only sufficient of the furring for strength. It is obvious that if wax be inserted into the key-hole, trusting to find a key impression, after operation of the lock by the true key, it can only be put in the open spaces between the tumblers projecting into the cut-away portion *a'* at the bottom of the key-hole *n'*, or the first introduction of the key will force it thereinto. Now, the first attempt to rotate the shell L and plug I will wipe away the wax from the tumbler ends before receiving the key's impression, and will carry away the wax into the opening *a'*, and obliterate the impression, if made; and in case of any trace being left, it will finally be destroyed by the firm restoration of the tumblers by the cross-bar.

A further advantage of rotating furrings is, that rotating with the key they do not interfere with its rotation. If they were stationary, the tumblers would require to be lengthened to furnish, outside the furrings, thrust-motion to the key, or the furrings would collide with the key-side. Thus the variable parts of the tumblers must be shortened, and consequently the combinations reduced, or the lock-escutcheon must be lengthened, so as to be adjustable only to thick doors. The tumblers are concentric cylinders with projections on one end. If the fence-notches were made in the sides of concentric cylinders, the fence would drop into them *seriatim*, and the lock could be picked by feeling down the tumblers, one by one. Hence they must be cut so that fence-notches may be made in such manner that the fence will drop into all of them simultaneously, or nearly so. A further effect of this construction is this: the tumblers serve as bent levers, with their leverage against their forward projection, to create friction by causing a cramping motion. When the furrings are rotated, the spiral motion aids in overcoming the friction, as two adhering concentric ferrules are separated easier by a torsional than by a direct pull. The pick-lock must feel down the tumblers by direct motion. Thus a greater force is required to overcome the friction in detection of the notches by feeling than is required to operate against the normal projection of the tumblers by the key with rotation. These advantages are com-

bined with tumblers having motion, while being set, substantially rectilinear with the axis of the key, which have been used because they afford a greater length of variable part, by utilizing the length of the shell containing them and the thickness of the lock, than any others, except when the wing of the key or the shell itself is made of inconvenient size.

Another advantage of tumblers made of concentric cylinders, with the ends cut away suitably to receive the notches, while the curved form of the notched part is preserved, is that they may be severally projected to any limit without touching or interfering with each other. Were it not so, additional length equal to the key-thrust would be required in the tumblers, and the number of combinations in proportion to their length greatly reduced.

The uncut part *o* and the helical portions of the grooves *g*, *r*, and *s* should occupy substantially the same proportion of the circumference of their respective shells. In the drawings they occupy one-third; but any proportion less than one-half is possible therein. If the ends of the cross-bar that fit in the grooves were in the line of its length, and the proportions of its length operating in the two grooves *r* and *s* below the inner surface of the shell L were equal—in other words, if the grooves occupied the same longitudinal section of the shell, and were of equal depth—there would be a tendency in each end to enter the wrong groove. This might be obviated, first, by arranging the ends *p* and *q* farther apart in the direction of the shell's axis than the movement of the cross-bar therein, in which case the grooves would not cross; second, by making one groove deeper and narrower than the other, with the part of the corresponding end of the cross-bar that moves in it longer and smaller than the part moving in the other groove; third, by making the ends of the cross-bar with unlike inclinations to the axial line of the cross-bar, with grooves to correspond, so that the sides of one groove should not be parallel to the sides of the other. In this case the second method has been adopted, so far following the first, however, that the annular part of the groove *r* lies mainly outside of the same part of the groove *s* to avoid catching the diamond point of the end *p* in said groove *r*. Furthermore, it is evident, if one end, *p* or *q*, be rotated in its groove *s* or *r*, and the front face of it did not present an inclination to the sides of the groove—as, for instance, if the ends were square—that when said end changed the angle of its line of motion it would catch upon the side of the groove into which the line of its former motion projected would cut, and with the least sidewise play of the cross-bar end in the groove it would catch upon the point formed by the junction of the two grooves. (Hereinbefore the motion of the cross-bar in the grooves has been expressed instead of the rotation of the grooves over the cross-bar, the effects being the same when so referred to.) To obviate these difficulties the ends *p* and *q* are made diamond shape to present the most favorable inclinations, as *p′ p′*, to both sides of the grooves, though the circular, polygonal, or other forms having inclinations might suffice. Again, not more than one groove is essential in place of *r* and *s*. A block of metal moving in the mortise *g′*, with a bit similar to *f* on the key, would accomplish the purpose, though with more friction; and a ring surrounding the plug K, with projections corresponding to the ends *p* and *q*, and a projection against the tumbler ends, would suffice. An inclined surface passed over the tumbler ends directly, the tumbler-bearings doing the work of the cross-bar bearing *u*, might be used; but it could not be introduced into the rotating shell without reducing the strength of the plug K.

It is obvious that, so far as regards the restoration of the tumblers, either the plug or the shell L might be made to rotate, the device simply requiring that one of them shall rotate while the other does not; and it is further obvious that, so far as regards said restoration, the front surface of the groove or grooves is unnecessary, not being used therein.

The essential part of the invention for said restoration consists in the use of an intervening piece or cross-bar, and an exterior shell or part, when the one has one or more projections and the other has one or more inclined surfaces, arranged relatively to said projection or projections, to react against the same when the one partakes of the rotary motion of the key at a time when the other does not, whereby the intervening piece or cross-bar is projected forward against the tumblers, to drive them forward at the time when they are required to be restored, said intervening piece or cross-bar having a guide bearing in an interior plug, allowing it to move forward, but otherwise limiting it to the motion or rest of said interior plug.

The drawing represents a right-hand cupboard-lock. The screw-hole S′ in the part F, through which the screw *h* passes, is made like to, and interchangeable with, the screw-hole S′ therein, through which the screw h^2 passes relatively to the screw-holes in the lock-plate, through which said screws pass, which are alike. The screw-holes *r′ r′* in the plug K, into which the screws c^2 c^2 pass, are interchangeable relatively to the screw-holes c^1 c^1 in the lock-plate, through which said screws pass, which are also alike.

The feathers *e e* on the shell L are interchangeable relatively to the depressions in the ring D, receiving the same. Thus, if the parts L and F, with the whole portion of the lock contained therein, be turned half round, and screwed to the lock-plate in their new position, with the feathers *e e* interchanged in their position in the ring D, the lock becomes a left-hand cupboard-lock.

What I claim, and for which I desire Letters Patent to be granted, is—

1. The tumblers of a lock bearing fence-

notches, when constructed with ends which are impinged to set, said notches having the forms of the ends of concentric cylinders.

2. The arrangement of the portions of the tumblers which bear the fence-notches on one side of the bearing-rib *i* of the fence, and its slot *k*, for the purposes set forth.

3. The combination, for the purposes set forth, with the tumblers of a lock which have a motion when being set substantially rectilinear with the axis of the key, of a set of furrings which partake of the rotary motion of the key, while the tumblers do not.

4. The chamber or opening *a'* in the furrings adjacent to the key-hole *n'*, for the purpose set forth.

5. An intervening piece or cross-bar combined with an exterior shell or part, when the one partakes of the rotary motion of the key at a time when the other does not, and when the one has one or more projections and the other has one or more inclined surfaces, the projection or projections on the one being arranged relatively to the inclined surface or surfaces on the other, as described, to drive forward the intervening piece or cross-bar by the rotation of the one when the other is stationary, both combined with an interior plug having a bearing for the intervening piece or cross-bar, and with a set of tumblers located in position to be driven forward by said intervening piece or cross-bar when they are required to be restored.

6. The stationary shell F, secured to the lock-plate by screws *h* h^2, in combination with the stationary plug K, secured to the lock-plate by screws c^2 c^2, and the ring D, having depressions in which fit the feathers *e e* on opposite sides of the revolving shell L, all arranged so that the shells F and L, and plug K, can be reversed, to adapt the lock to a right or left hand door.

7. A key-groove in the stationary shell F, having an inclined portion similar to the inclined part of a groove in the revolving shell L, used in restoring the tumblers, and arranged, relatively to the inclined part of said groove, in the manner described.

8. The combination of a key and a rotating shell having a key-hole with a system of tumblers which have a motion substantially rectilinear with the key's axis while being set by said key, and which are restored by a force transmitted through said rotary shell from the key acting in said key-hole.

HENRY WINN.

Executed in presence of—
EDWIN S. DRAKE,
E. J. BUTLER.