

(No Model.)

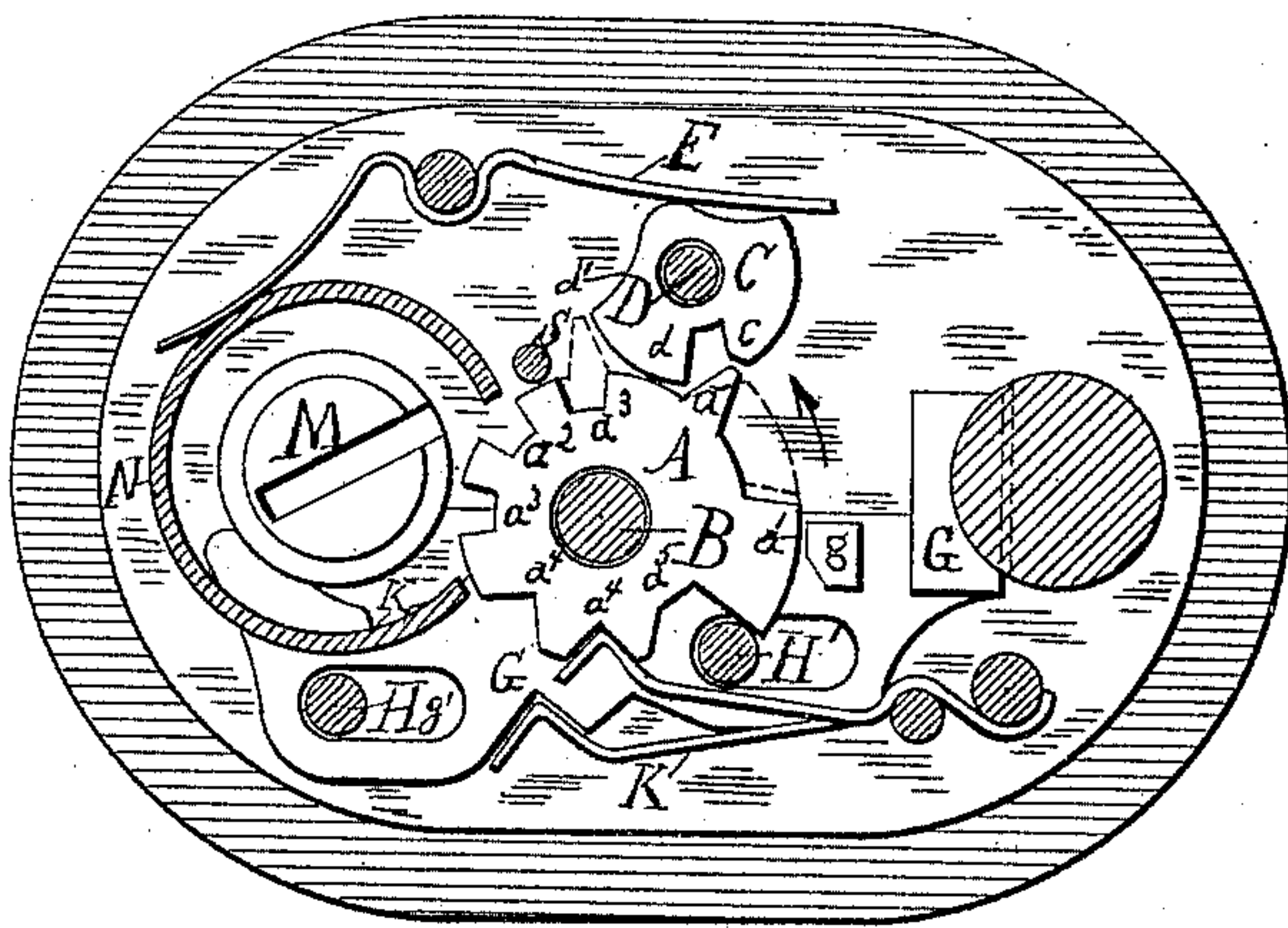
2 Sheets—Sheet 1.

E. C. SMITH.  
LOCK.

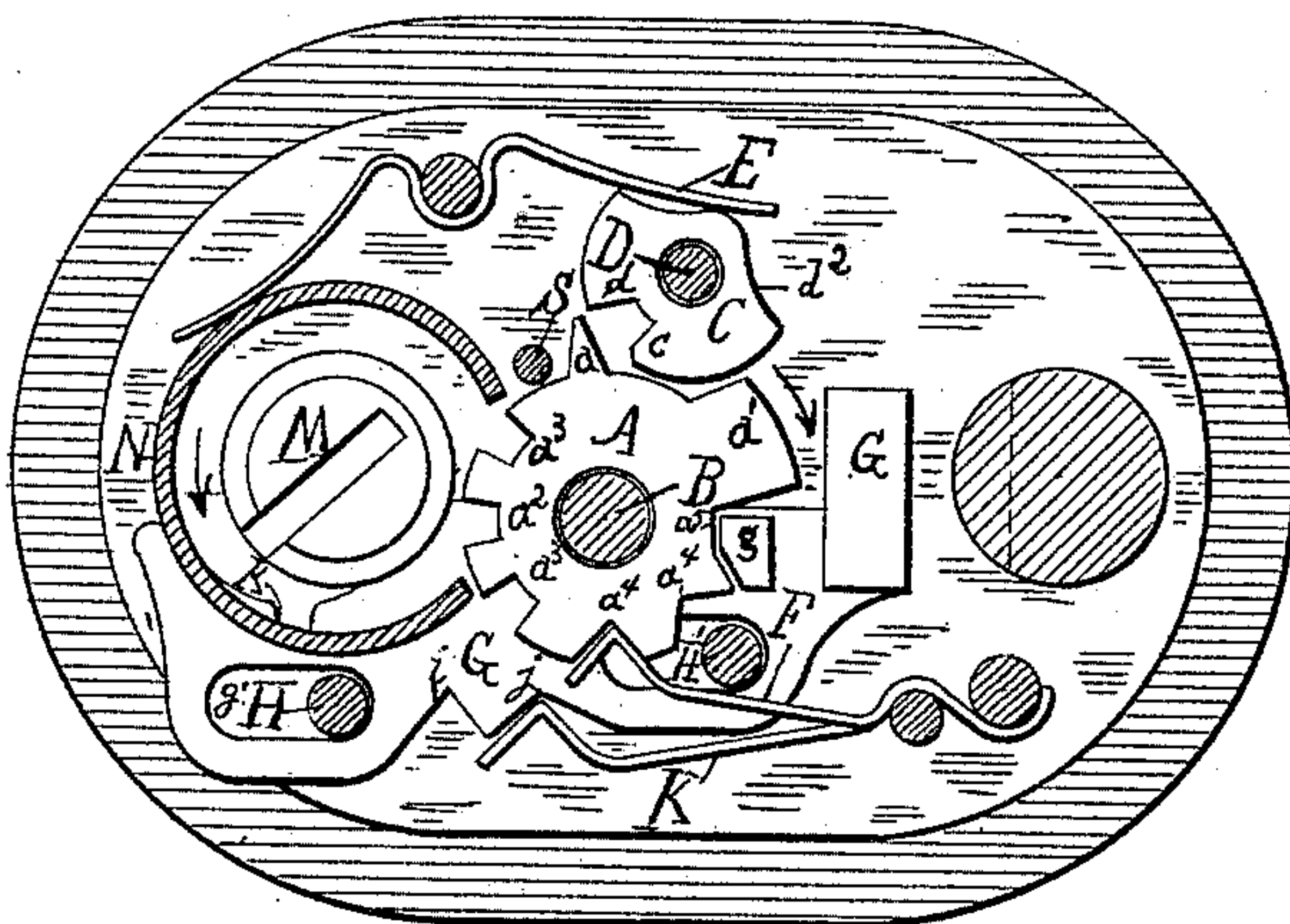
No. 473,857.

Patented Apr. 26, 1892.

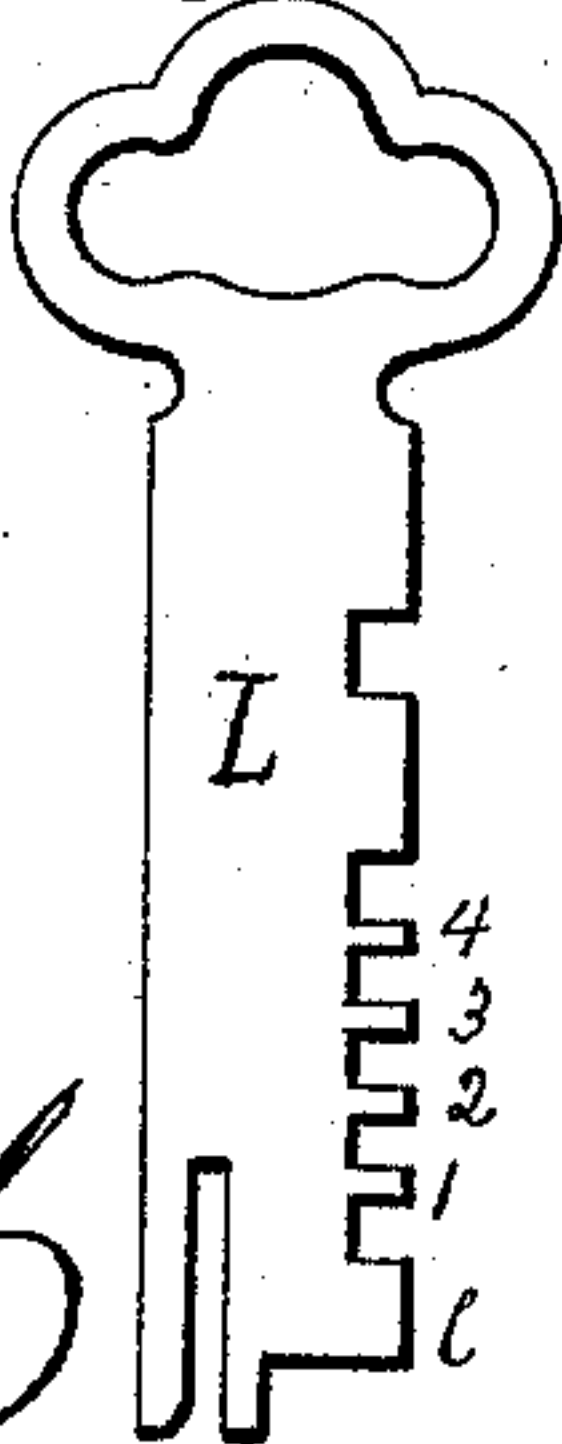
*Fig. 2.*



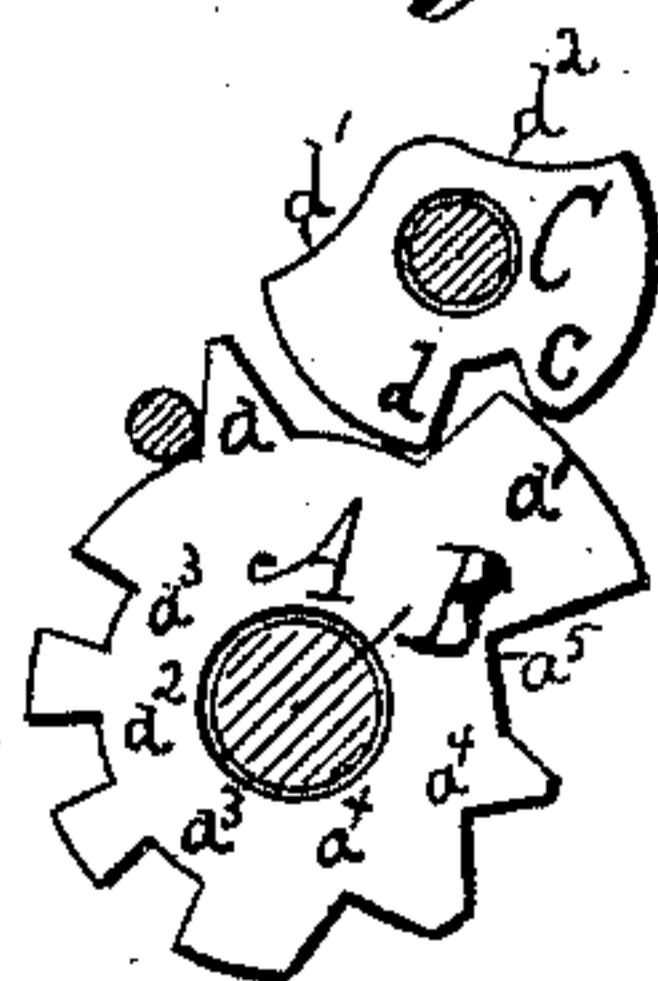
*Fig. 1.*



*Fig. 4.*



*Fig. 3.*



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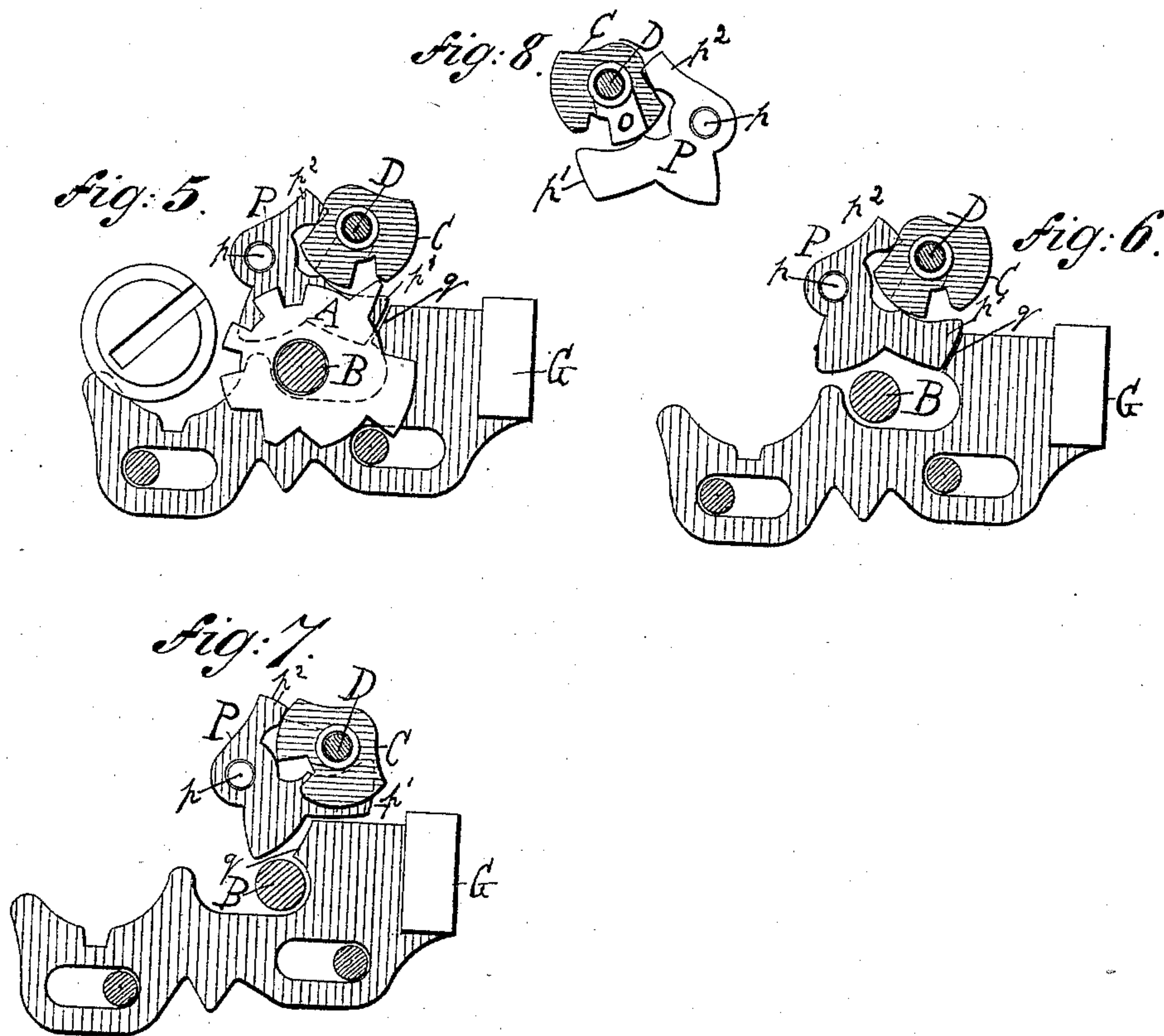
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2 Sheets—Sheet 2.

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WITNESSES:

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# UNITED STATES PATENT OFFICE.

EUGENE C. SMITH, OF NEW YORK, N. Y., ASSIGNOR TO THE UNIVERSAL LOCK COMPANY, OF SAME PLACE.

## LOCK.

SPECIFICATION forming part of Letters Patent No. 473,857, dated April 26, 1892.

Application filed March 5, 1890. Serial No. 342,693. (No model.)

*To all whom it may concern:*

Be it known that I, EUGENE C. SMITH, a citizen of the United States, and a resident of the city, county, and State of New York, have invented a new and useful Improvement in Locks, of which the following is a specification.

My invention relates to combination-locks, and particularly to certain improvements in the locks patented to me, numbered 414,261 and 418,476, and dated November 5, 1889, and December 31, 1889, respectively; and the purpose of my improvement is to give additional security to the lock.

The lock is of the class which employ an angular shiftable locking-bar, which locks the tumblers both in their locked and their unlocked positions; and my improvement consists in forming each tumbler with an auxiliary surface, so placed with reference to the locking-arm of the locking-bar that any motion communicated to the unlocked tumblers in an attempt to surreptitiously open the lock will cause the aforesaid auxiliary surface to hold the locking-bar, so that the locked tumblers cannot be freed to open the lock. I also provide means actuated by the locking-bar for preventing the withdrawal of the bolt.

Referring to the drawings which accompany this specification to aid in the description, Figure 1 is a plan view looking down on the tumblers. The lock-casing is removed in order to show the mechanism, and all the tumblers are shown in the unlocked position. Fig. 2 is a view similar to Fig. 1, except that certain of the tumblers and the locking-bar are shown in the locked position. Fig. 3 is a view of the locking-bar and an unlocked tumbler. Fig. 4 is a view of one certain key. Fig. 5 is a view of a tumbler, bolt, locking-bar, and locking-lever in the locked position. Fig. 6 shows the same parts as Fig. 5, except the tumbler, and in the locked position. Fig. 7 shows same parts as Fig. 6, but in the unlocked position. Fig. 8 is an end view of the locking-bar, showing the arm on the locking-bar and the locking-lever.

As hereinbefore stated, the present invention pertains to an improvement in the locks shown in the patents to me. The mechanism as a whole is therein fully described, and refer-

ence to the said patents is herein expressly made. The present description will therefore be confined principally to the improvement now in question, reference being made to the other parts of the lock only in so far as is necessary to explain the nature and application of the improvement.

In the lock are a series of shiftable tumblers A all of the same size and the same shape, which is preferably approximately circular. These tumblers A turn on a pin B, which is fixed in the lock-case, and each tumbler has a projection *a*, which engages with the arms *c d* of a shiftable locking-bar C. This locking-bar extends across the edge of all the tumblers A, so as to engage with the projection *a* of each tumbler, and the said locking-bar C turns upon an axis D. The said locking-bar is formed with arms *c d*, which engage with the aforesaid projections *a* after the manner of toothed wheels. The back of the locking-bar C is formed with surfaces *d' d''*, which are pressed by springs E in the several positions of the locking-bar, as seen in the drawings. Washers may be placed between the tumblers A in the usual manner.

In addition to the projections *a* aforesaid each tumbler A has an auxiliary surface *a'*, which is adapted to just pass freely under the arm *c* of the locking-bar C, as seen in Fig. 3. This surface *a'* may be shaped as a tooth or as a cam and may be used to prevent the return of the bolt, as hereinafter described, or an independent lever may be used for this latter purpose, as will be explained hereinafter.

Each tumbler A has a true key-slot *a<sup>2</sup>*, false key-slots *a<sup>3</sup> a<sup>3</sup>*, recesses *a<sup>4</sup> a<sup>4</sup>* for the ends of tumbler-springs F, and when required a depression *a<sup>5</sup>* to receive the bolt-stump *g* when the bolt G is drawn back. The said bolt G is guided by slots *g'* and pins H H', and the pin H' may also be used to limit the motion of the tumblers A by engaging against the surface *a'* on the said tumblers, as is clearly shown in Fig. 2. In the bolt-slide are recesses *i j*, which receive the end of a bolt-spring K and also a talon *k* to be engaged by the end bit *l* of a key L. This key is a flat-sheet-metal key, which turns in a slotted key-cylinder M



in the ordinary manner and has bits 1 2 3 4 corresponding to the certain combination of tumblers which are to be locked. Around the said key-cylinder M is a shield N, which is cut out on the side adjacent to the tumblers, in order to permit the bits of the key to engage with the tumbler-recesses  $a^2$ . The purpose of the shield N is to prevent an instrument inserted through the key-hole from ascertaining the positions of the locked and unlocked tumblers.

S is a stop for the purpose of limiting the motion of the tumblers in the direction of the arrow on Fig. 2.

The aforesaid auxiliary surface  $a'$  of the tumbler A is placed on the tumbler so that it is just clear of the arm  $c$  of the locking-bar C when that certain tumbler A is in the unlocked position. This relation of the surface  $a'$  to the arm  $c$  is clearly shown in Fig. 1. The aforesaid arm  $c$  of the locking-bar C is termed the "locking-arm" on account of its function of locking the said locking-bar and the tumblers, as is to be immediately described.

The operation of my improvement is as follows: Suppose all the tumblers A to be in the unlocked position shown in Fig. 1 and the lock to be open. If now a key be inserted and turned to lock in the direction of the arrow, Fig. 1, its end bit will first shoot the bolt and its other bits will then shift the certain combination of tumblers to the locked position of Fig. 2, the other tumblers remaining in the unlocked position, as indicated by the dotted lines of Fig. 2. The surface  $a'$  of the locked tumblers will now have passed behind the bolt-stump  $g$ , thereby preventing the withdrawal of the bolt G, and the projections  $a$  of the said locked tumblers will have turned the locking-bar C to the position shown in Fig. 2, wherein the said projections  $a$  are under the locking-arm  $c$ . The lock is now locked, and the key may be turned to the slot in the case and withdrawn. Suppose now an attempt be made to open the lock by a blank or a pick. The locked tumblers cannot be moved in the direction of the arrow, Fig. 1, because of the pin H' engaging against the side of the surface  $a'$ , and the unlocked tumblers cannot be moved in that direction because the projections  $a$  of such tumblers engage against the arm  $d$  of the locking-bar C. Again, if the pick or blank move the tumblers in the direction of the arrow, Fig. 2, certain locked and unlocked tumblers will be simultaneously moved against the side of the arm  $d$  of the said locking-bar C; but in this position the surface  $a'$  of such unlocked tumblers as were moved will come under the locking-arm  $c$ , as shown in Fig. 3, and the surface  $a'$  will resist the effort of the teeth  $a$  to rotate the locking-bar C and suffer the locked tumblers to return to the unlocked position. Thus the auxiliary surface  $a'$  acts in combination with the locking-arm  $c$  to prevent the opening of the lock by any means, except the very key

which locked the lock or its exact duplicate. The same amount of play may be given between the arm  $d$  and the projections  $a$  of the locked tumblers as between the said arm  $d$  and the surface  $a'$  of the unlocked tumblers, (see Fig. 2,) and also the same play may be given between the projections  $a$  of the unlocked tumblers and the arm  $d$ , Fig. 2, as between the pin H' and the surface  $a'$  of the locked tumblers. (See Fig. 2.) Thus in feeling with a pick every tumbler has the same freedom of motion in each direction as every other tumbler has in the same direction, and no indication is given as to which are the locked or the unlocked tumblers.

Figs. 5, 6, 7, and 8 show a modification of the means for preventing the return of the bolt. At one end of the locking-bar C is formed a projection or cam  $o$ . In the drawings this cam  $o$  is shown as a projection or lug extending radially from the locking-bar axis D to the circumference of the said locking-bar; but it is evident it may also be variously situated—as, for example, a projection from the side of the locking-bar. Adjacent to the said locking-bar C is a bent lever P, pivoted to the case at  $p$  and having arms  $p'$   $p^2$ , which are placed to be actuated by the cam  $o$  during the movement of the locking-bar C, as hereinbefore described. The cam  $o$  acts on the arm  $p'$  in such a manner that when the lock is locked, as hereinbefore described, the said arm  $p'$  will have been pushed by the cam  $o$  behind the shoulder  $q$  of the bolt G, thus preventing the withdrawal of the bolt. The extreme end surface of the lever  $p'$  and the corresponding surface of the shoulder  $q$  may be formed as arcs of circles struck from the pivot  $p$  as a center, so that if the bolt G is thrust back upon the lever  $p'$  the pressure will be communicated directly to the pivot  $p$ . In unlocking, the locking-bar C is shifted before the key begins to draw the bolt, and the cam  $o$ , acting on the lever-arm  $p^2$ , moves the lever P, so that the arm  $p'$  is lifted clear of the shoulder  $q$ , and the key can then draw the bolt, as shown in Fig. 7.

The lock may be made either as a padlock, in which case the bolt G will engage with a socket in a shackle in the usual manner, or it may be made as a flat lock for doors or drawers, &c., and the improvement is applicable either to a lock having a single set of tumblers, as in Patent No. 414,261, before referred to, or to a lock having two sets of tumblers, as in No. 418,476, also before referred to.

I claim—

1. The combination, in a lock, of a shiftable locking-bar having an integral locking-arm and tumblers, each having a projection adapted to shift said locking-bar, and also an auxiliary projection adapted to engage with said locking-arm and prevent moving the locking-bar, as described.

2. In a lock, a shiftable locking-bar having a projection adapted to actuate a bolt-restraining lever, as described.



3. The combination, in a lock, of a shiftable bolt, a shiftable locking-bar, and a bolt-restraining lever adapted to be actuated by the locking-bar, as described.

5 4. The combination, in a lock, of a shiftable locking-bar having a projection and a lever having an arm adapted to be actuated by the projection on the locking-bar, and an arm

adapted to prevent the withdrawal of the bolt, as described.

In witness whereof I have hereunto set my hand this 28th day of February, 1890.

EUGENE C. SMITH.

Witnesses:

CHAS. S. LONGHURST,  
HUDSON CAMPBELL.