

H. L. ARNOLD.
LATCHES AND LOCKS.

No. 177,611.

Patented May 23, 1876.

Fig. 1.

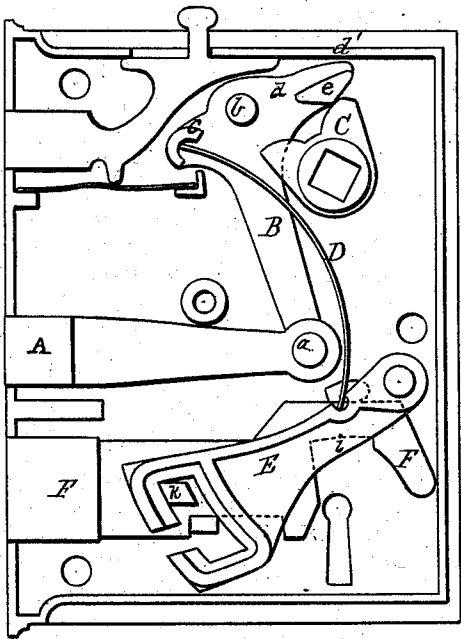


Fig. 2.

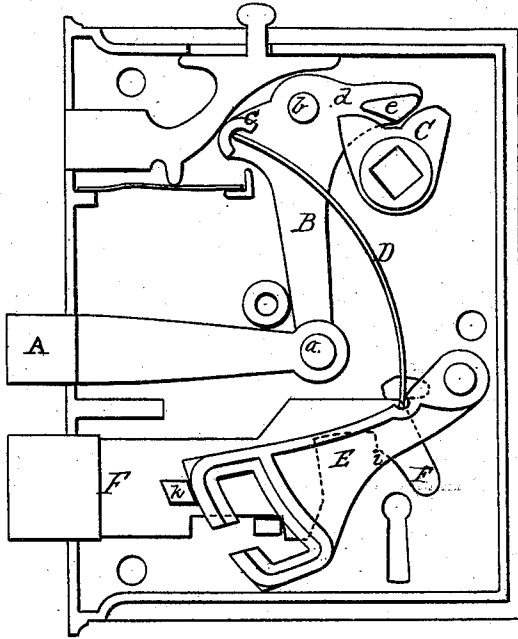


Fig. 3.

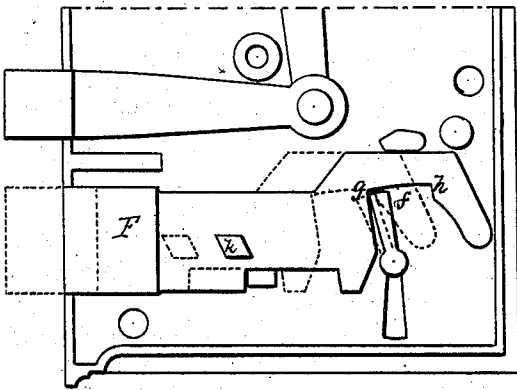
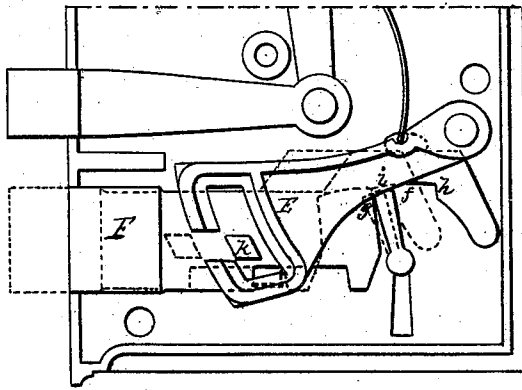


Fig. 4.



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IMPROVEMENT IN LATCHES AND LOCKS.

Specification forming part of Letters Patent No. **177,611**, dated May 23, 1876; application filed July 10, 1875.

To all whom it may concern:

Be it known that I, HORACE L. ARNOLD, of Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Locks and Latches, of which the following is a specification:

My said improvements relate to a combined door-lock and knob-latch, to latch-operating mechanism, and to a peculiar construction of bolts employed in combination with gated lever-tumblers.

That portion of my invention which relates to a combined lock and knob-latch consists in the combination of a lever-tumbler, a spindle-hub, having a V-shaped notch, a latch-lever, provided with a stop for limiting its movement, and also with a V-shaped lug, spring-seats on both latch-lever and tumbler, and a normally-straight flat spring, which is deflected by abutting endwise against its seats on latch-lever and tumbler, these latter being so arranged with relation to each other as to enable them to properly receive and to be actuated by said spring, and to admit of the spring being readily reversed side for side, when set or weakened from long use in one position.

By my novel combination the spring affords a soft resistance to the key at the tumbler, a latch action which is heavy on the hand and light on the strike, and which admits of the withdrawal of the latch by rocking the knob-spindle in either direction, and with the expenditure of practically the same degree of force at the knob, and at the same time the spindle-hub and latch-lever are always maintained in working relations to each other.

That portion of my invention which relates to the latch-operating mechanism consists in the combination of a latch-lever having arms of unequal length, a stop which limits its movement, and a V-shaped lug on one of its arms, with a latch and its spring, and a spindle-hub provided with a V-shaped notch for engaging with the V-shaped lug on the latch-lever, and which is always maintained in working position with relation to said lug by the stop which limits the movement of it and the latch-lever.

That portion of my invention which relates

to the lock-bolt and tumbler consists in the combination, with a gated lever-tumbler, of a lock-bolt, provided with a key-notch, in which the initial point of contact of the key with said bolt, when the bolt is to be moved forward, is separated from the initial point of contact with the key when the bolt is to be moved inward by a space equal, or substantially equal, to the distance which the bolt travels in being thrown forward or drawn inward, whereby the bit of the key occupies nearly the same position at the initial movement of the bolt in either direction, and also whereby at the moment of said initial movements of the bolt the bit of the key will hold the lever-tumbler in practically the same position, whether the bolt is to be thrown outward or withdrawn, in order that the width of the gating in the tumbler may be reduced to a minimum, and be but a trifle wider than the thickness of the bolt-stump which passes through said gating, thereby adding practically to the security of the lock.

To more particularly describe my improvements I will refer to the accompanying drawings, representing locks embodying the several features of my invention.

Figures 1 and 2 represent one of my locks with one side of the case detached, showing the latch and lock bolts in the positions incident to their use. Fig. 3 represents the lower portion of the lock with the tumbler detached. Fig. 4 represents the same as in Fig. 3, with the tumbler in working position.

The latch mechanism consists of the latch-bolt A pivoted reversibly or otherwise (in a manner well-known) to the lower end of the three-armed lever B at *a*. The lever B is pivoted on a stud at *b* projecting from the side of the lock-case, and has a spring-arm at *c*. Said lever has also a cam-arm at *d*, with which the spindle-hub engages. Three-armed latch-operating levers have heretofore been used. The novel feature of my invention in this connection is the two-faced cam-lug at *e* on a bell-crank lever, which is provided with a stop for limiting its movement to the precise degree requisite for retiring the latch into the case, in combination with a spindle-hub, as at C, which is provided with a V-shaped cam-face, so located with reference to the two-faced

cam-lug *e* on lever *B* that when the spindle-hub is rocked one or the other of the sides of the V-shaped cam-face will engage with a corresponding face of the cam-lug, and thereby cause the lever *B* to vibrate and withdraw the latch-bolt. It will be seen that the initial points of contact of the cam-faces on the spindle-hub with the faces of the lug are closely adjacent to each other, and that as the hub is rocked in either direction the points of contact approach the lower point of the cam-lug, and, therefore, although the two initial points of contact vary slightly in their positions with relation to the fulcrum of the lever, this variation gradually lessens in degree up to the time the latch-bolt is fully drawn inward. The stop for the latch-lever, in this instance, is afforded by the interior surface of the upper portion of the rim of the lock-case, as at *d'*. This arrangement of the parts secures a prompt, easy movement of the latch, with a slight movement of the spindle, and by the expenditure of very nearly the same force, regardless of the direction in which the knob-spindle is turned; and at the same time, by reason of the stop which limits the movement of the latch-lever, the V-shaped notch and the V-shaped lug are always maintained in proper relations to each other, all of which contribute largely to the practical value of the lock.

In all locks heretofore known to me, in which bell-crank levers are employed, the spindle-hub has been provided with two cam-faces, located on arms projecting in the same line or plane from opposite sides of the hub, thus, of necessity, requiring the studs on the lever-arm, with which said faces operatively engage, to be widely separated. In such latches an unequal leverage is therefore exerted by the hub, and a much greater rocking movement of the spindle is required when operating against the stud or lug farthest from the lever-fulcrum than when operating against the lug nearest thereto. With my improved latch I am unable to observe either that more force is requisite for withdrawing the bolt by rocking the hub to the right than to the left hand, or that there is any difference in the extent of rocking movement in opposite directions requisite for withdrawing the latch. A knob-latch so constructed may be made at low cost, and, by reason of the slight movements requisite on part of hub and spindle, it has great durability. Moreover, by this construction of the cam lug and hub, I am enabled to use a lever with a shorter arm than it is practicable to use when two widely-separated cam lugs or studs are employed, and to that extent the latch-case may be reduced in dimensions.

It will be obvious that the valve of the two-faced lug, and the spindle-hub with the V-shaped cam-face, will be substantially the same whether they are employed with a three-armed lever, constructed as shown, or with a simple bell-crank lever. All knob-latches of this general class require a spring for holding

the latch-bolt in its projected position, and any form of spring may be employed in connection with this portion of my improvement.

The public demand a latch which shall, in trade-language, be "heavy on the hand and light on the strike," or, in other words, one in which the leverage shall be so distributed that the spring shall influence the knob strongly, and the catch only enough to insure its projection after retraction. Therefore, it becomes practically an important point to make the distance from the center of the three-armed lever to the point of attachment to the latch-bolt exceed the distance from said center to the point at which the spindle-hub engages with the lever, as much as is possible, in a medium-sized case. This requirement is fully met by my arrangement, since I can reduce the length of the hub-arm as much as is desirable. Commercially, this feature is of great importance, as a spring which is satisfactory to the hand must act with a greatly-diminished force on the latch bolt or catch; otherwise, when the door is swung shut the violence of the blow required to force the catch into the lock-case speedily destroys the strike, or loosens it on the door-post, or breaks the lock-case.

I am aware that in a certain so-called latch-lock heretofore constructed the retiring of the latch-bolt into the case is effected by employing a spindle-hub of peculiar construction, and a lever pivoted at one end to the case and arranged to engage by a hook-connection with the bolt, so that when used as a lock-bolt a disconnection of bolt and lever may be effected by means of a key. In this latch-lock the spindle-hub is provided with three cams for engaging with cam-surfaces on one edge of the lever, and is capable of complete rotation at all times, requiring, therefore, close attention at the knob to effect clearance of the bolt from its catch; and for this reason a latch so constructed, with or without the additional locking features heretofore employed therewith, is not suited for general use. In this instance I show the plain flat spring at *D* which is arranged to control not only the latch-bolt, but also the lever-tumbler *E*, common to locks of this class.

Broadly considered, it is not new to combine with a tumbler and a latch-bolt lever a single spring arranged to control both; but so far as I am aware, in all such cases, the tumblers and latch-levers have been so arranged, with reference to each other and to the remaining essential parts of the lock, that said springs are required to be bent or specially formed in order that they might perform this double service.

It is well known that the springs of a lock or latch are usually the parts of the mechanism which first become inoperative, and that when such springs break it is usually at the points where they have been bent so as to cause them to assume arbitrarily a certain form. It is also well known that such springs necessarily

involve considerable bulk of metal, and are hardened or adjusted by hammering.

In my improved combined knob latch and lock I have so arranged the several parts of the lock that a flat spring may be combined with the latch-lever and tumbler, and control both by exercising its abutting force at each of its ends.

I attain economy in construction, as it involves only the cutting from a strip of spring metal a piece slightly longer than the straight-line distance between suitable spring-seats on latch-lever and tumbler. I attain durability in having a spring with no fixed bends, in having it freely held in its seats, and in causing it to act from its ends, in the same manner, whether the latch-lever or the tumbler-lever be vibrated. I attain a soft easy resistance to the movement of latch and tumbler, because the spring, exercising its force endwise, may be made very light, and yet be sufficiently powerful for the service required. I also attain in my lock, and with this spring, a capacity not attainable in any lock employing a specially-formed spring heretofore known to me.

It is obvious if a spring be specially formed or bent so as to occupy a certain position and to perform a certain service, that if such spring at any time naturally assumes the form it has when in service, it cannot be reversed in position. On the contrary with the flat spring as employed by me, if, through long use, it naturally assumes the curved form incident to its position in service, and thereby becomes inoperative, it is only necessary, in order to renew its efficiency, to take it out, reverse it end for end, side for side, and cause what was before its convex side to become its concave side.

It will be seen that the arrangement of the latch-lever and tumbler with relation to the latch-hub and other portions of the lock is such that the flat spring may readily perform the double service. In practice, I prefer to slightly clip the corners of the spring at each end in order to secure a good general bearing of the ends of the springs with their seats.

That portion of my improvement which relates solely to locks is applicable to those in which the bolt is provided with a stump and combined with a gated lever-tumbler. In all prior locks of this class with which I am familiar, the tumbler occupies at the time of the initial forward movement of the bolt a different position with relation to the key-bit than that occupied at the time of its initial backward movement. It is well known that at both of these initial movements of the bolt the gating in the tumbler should be in line with the stump on the bolt in order to permit the entrance of the stump; and it will be seen that if the tumbler be not held by the key in the same position at the time of both initial movements of the bolt, the gating must be as much wider than is necessary for the passage of the stump as the variation in the two positions occupied

by the tumbler at the time of said two initial movements of the bolt. It is also well known that in proportion as the gating is wider than the thickness of the stump, the easier the lock may be violated. One object of this portion of my invention is to attain the reduction of the width of the gating in the lever-tumbler to a minimum—that is to say, to have the gating no wider than is necessary to permit the clear passage of the stump. This I accomplish by a novel construction of the bolt at the key-notch, which is clearly shown in Figs. 3 and 4. The well known "symmetrical" key-notch or "talon," which may be generally described as a square-sided notch approached on each side by concave or curved surfaces, has been departed from in many ways.

My key-notch, as I believe, differs from any heretofore employed in having the bearing or contact sides of the square notch separated from each other by a space which equals in length the distance traversed by the bolt.

In Figs. 3 and 4, bolt F is shown with its key-notch or talon at *f*. The point of contact with which the key engages to throw the bolt forward is shown at *g*, and the backward point of contact at *h*, and it will be seen that they are as far from each other in the longitudinal line of the bolt as the distance traversed by the bolt in being locked or unlocked. In order to secure to the bolt a full forward movement, the front side of the notch is extended downward and toward the rear of the lock-case, so that the bit of the key maintains its control over the bolt while moving over this inclined surface. The notch is widened below on each side, as is usual, to afford full clearance of the key after the bolt has been fully moved in either direction.

In Fig. 4 the tumbler E is shown in its proper position, and it will be seen from the dotted and solid lines in this figure that whether the bolt is to be moved out or in that side of the notch which is to be engaged by the key will always be one-half the thickness of the key-bit from the point *i* on the belly of the tumbler. Therefore, the key being in contact with the tumbler at the same point at the time of both initial movements of the bolt, the gating is in position to allow the entrance of the stump *k*.

Another point gained by me with the talon or key-notch described is the saving of one-half the labor heretofore required for fitting the key.

It is obvious that since the tumbler is longitudinally-stationary, and the key-hole is also stationary, that unless the key-bit stands in one certain position when the stump enters the gating, two points on the belly of the tumbler must be fitted so that when the key-bit is in contact with either point the gating shall be in the line of the travel of the stump.

In practice, with wing-keys the tumblers have, as I believe, always hitherto been necessarily fitted at the two points referred to.

With my talon, however, I am enabled to bring the bit of the key to the same point, as at *i*, on the tumbler, at the commencement of either the inward or outward throw of the bolt, and by making this common point *i* fall in a radius subtending the belly of the tumbler and tangential to the circle traversed by the key-bit, I secure the lift and dwell requisite for the entrance of the stump into the narrow gating, and thus save one-half the labor heretofore essential in fitting keys and tumblers.

Having thus described my invention, I claim as new, to be secured by these Letters Patent—

1. In a combined knob latch and lock, a lever-tumbler, a spindle-hub having a V-shaped notch, and a latch-lever, provided with a stop for limiting its movement, and with a V-shaped lug, in combination with spring-seats on latch-lever and tumbler, and a normally straight flat spring, which is deflected by abutting endwise against its seats on latch-lever and tumbler, and is capable of being reversed side for side, substantially as described, whereby the tumbler offers a soft resistance to the key, the hub and latch lever are maintained in proper relations with each other, the latch is made heavy on the hand and light on the

strike, and is withdrawn by the movement of the knob in either direction with nearly an equal degree of force on the knob, and also whereby the spring may be reversed in position after it is set or weakened, as set forth.

2. The combination of a latch-lever having unequal arms, provided with a V-shaped lug on one of its arms, and with a stop which limits its movement, with a latch, a spring acting on the lever for throwing the latch, and a spindle-hub provided with a V-shaped notch for engaging with the V-shaped lug on the latch-lever, and maintained in proper working position, with relation to said lug, by means of the stop which limits its rocking movement, substantially as described.

3. The combination, with a gated-lever tumbler, of a bolt provided with a stump, and a key-notch which has a width equal to the distance traversed by the bolt, substantially as described, whereby at the initial outward or inward movement of the bolt, the tumbler will occupy the same position with relation to the line traveled by the bolt-stump, as set forth.

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Witnesses:

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