

L. Lillie,
Permutation Lock.

No 40,282.

Patented Aug. 8, 1865.

Fig. 4

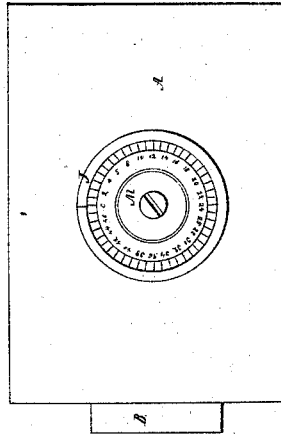


Fig. 3

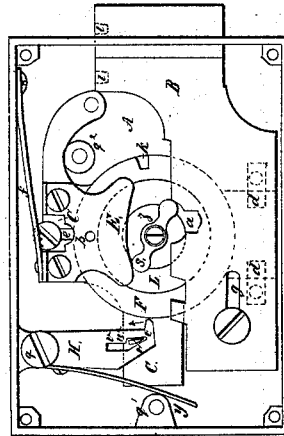


Fig. 2

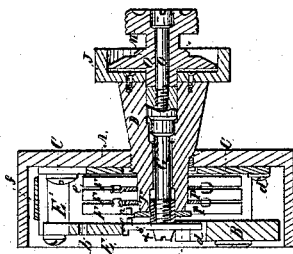


Fig. 8

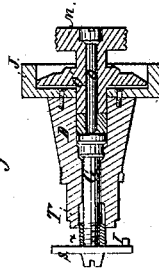


Fig. 1

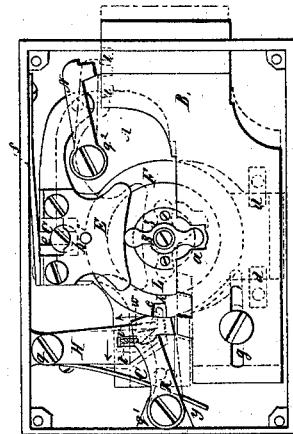


Fig. 5

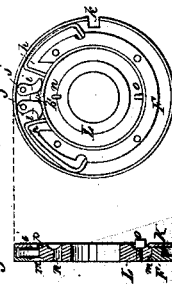


Fig. 10

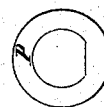


Fig. 7

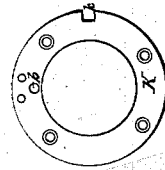


Fig. 9



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LEWIS LILLIE, OF TROY, NEW YORK.

IMPROVEMENT IN LOCKS.

Specification forming part of Letters Patent No. 49,282, dated August 8, 1865.

To all whom it may concern:

Be it known that I, LEWIS LILLIE, of Troy, in the county of Rensselaer and State of New York, have invented certain new and useful Improvements on Combination Dial-Locks for Bank, Vault, Safe, or other Doors, which I denominate an "Anti-Micrometer Combination-Lock;" and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawings, and to the letters of reference marked thereon, forming a part of this specification.

Like letters represent and refer to like or corresponding parts.

Figure 1 is a side elevation of the lock, showing the bolt on a center, or about half shut, or thrown out toward a locked or fixed position. The red lines show the position of the operating parts when the bolt is fully thrown forward and out in a locked or fixed position. Fig. 2 is a vertical cross-section taken through the center of the operating-bolt G and arm S of Fig. 1. Fig. 3 is a side elevation of the lock, showing the bolt-stops removed. Fig. 4 is a view of the front of the lock, showing the dial and its case or cup. Fig. 5 is a section and inside view of one of the combination-wheels, with the cover of the rim removed in order to show the internal construction of the outer rim of the wheels and its connection, by means of the grippers, with the inner combination or set wheels. Fig. 6 is a cross-section through the center of Fig. 5. Fig. 7 is a view of the cap or cover of the wheel or cylinder shown at Fig. 5. Fig. 8 is a vertical-sectional view taken through the center of the lock-barrel, dial-shaft, and bolt-driver, hereinafter described. Fig. 9 is the cap-plate which holds the wheels or cylinders in their required places. Fig. 10 is the friction-washer separating the wheels one from the other.

The nature of my invention consists in the employment and combination of set-wheels with the inner rim or surface of outer wheel, with grippers so constructed and operated that by means of springs will have a firm and continued hold on the peripheries of the set-wheels, securely holding them in any adjusted position in which they may be set, arranged, or combined, substantially in the manner and for the purposes as hereinafter fully described and set forth.

It also consists in combining with a lifter-slide and combination-wheels a self-acting latch, in the lower end of which is a sexangular slot, while projecting within said slot is a pin fixed to the lifter-slide, and the stop-pin operating within said slot effectually prevents the discovery of any means or manner to ascertain the number or divisions of the dial-plate and fractional parts thereof on which the lock is set, or to discover and bring within receiving range of the lip-projection of said latch the slots or notches in the exterior edge of the combination wheels or cylinders, thereby permitting the lifter-slide to raise any or a sufficient height to lift the bolt-stops and allow the driver to revolve so that the bolt may be withdrawn, each part of which is constructed, arranged, and combined substantially as and for the purpose hereinafter more fully described and set forth.

It also consists in the employment and combination of bolt stops or catches with the lifter-slide, lock-bolt, and self-acting latch, and combination-wheels, in the manner and for the purposes substantially as hereinafter set forth.

It also consists in the construction and employment of the lock-barrel, dial-shaft, and bolt-driver, in the manner substantially as herein described and set forth, so that the same can neither be driven in, nor the center shaft pulled out, thereby preventing the forcing of the lock in and from the door when used from the outside thereof, or destroying the lock by the insertion of powder.

To enable others skilled in the art to which my said invention and improvements relate, I will here proceed to describe the construction and operation of the same, which is as follows, to wit:

A is the lock-case.

B is the bolt, and is kept in operative position by means of a slot and guide-post, as shown at *g*, Figs. 1 and 3.

C, Figs. 1 and 3, is a vertical moving bar or slide, by which the latch bolts or levers N and A, also the vertical lever H, having at or near its lower end a sexangular mortise, are operated in the manner and for the purposes substantially as hereinafter more fully described. This lifting slide or bar C has an opening in its center, at the upper part thereof, as shown at *e* in Figs. 1 and 3, so as to move freely by

the connecting-piece E', Fig. 2, to which the lifter E and lifting-slide C are attached and firmly secured by any convenient means, and seen at Fig. 2. This lifting-slide C is held in its proper place by means of the check-pieces *d d* at the lower part thereof, and by the guide-screw operating in the slot *e*, and shown by dotted lines at Fig. 1, at the same time permitting free movement during the operation of said lifting-slide C, while securely holding it in operative position.

E is the lifting device, securely fastened to the connecting bar or piece E', Fig. 2, by means of screw-bolts, or by any substantial means.

F F F are combination-wheels, arranged in a series of from three to six, and rotating on the inner end of the conical barrel D, as seen at T, Fig. 2. At Figs. 5 and 6 will be seen the internal construction and arrangement of the combination-wheels, the internal construction of each of the wheels of the series being substantially the same. The rims of the combination-wheels are constructed with suitable recesses to contain the grippers *i i* screwed in position by pins *j j*.

h h are springs for acting upon the grippers, constructed and arranged substantially as shown at Fig. 5.

k is a notch or slot made in the rim of the combination-wheels F, for the purposes hereinafter described and set forth.

b is a set-hole for passing the set-wire through and between the grippers *i i*.

L is a set-wheel, and rotates in a groove formed in the rim *m* of the wheel F, in the manner as shown in section at Fig. 6. This set-wheel has a smooth periphery. In the face of said set wheel is a catch-hole, *n*, and catch-pin *o*. The central set-wheels of the series have catch-pins on both faces. Upon the peripheries of these set-wheels the grippers *i i* are caused by the springs *h h* to gripe and hold the set-wheels securely in any duly set position, as seen at Fig. 5. The series of set-wheels are separated by a fixed friction-washer, P, Figs. 2 and 10, between each two wheels, and which wheels are held in operative position on the inner end of the conical barrel D by the cap *z*, Figs. 1, 2, 3, and 9.

H, Figs. 1 and 3, is a self-acting bar or lever, (or it may be denominated an "anti-micrometer latch") operating on a post in the lock-case, and is provided with a slot, *v*, at or near its lower end, having a part of one of its sides formed to act as an inclined plane or wedge, and that portion of its opposite side formed with a shoulder, *w*, in the manner as shown in Figs. 1 and 3. Fixed to the said lifter-slide C, and operating within this slot *v*, is a triangular pin or point, *t*, Figs. 1 and 3, which is for the purpose of controlling the operation of the latch or lever H, as hereinafter described. *y* is a spring for actuating or operating the said latch or lever H and retaining the same in its required place or position. R and N are bolt-stops for holding the bolt B, and immediately operating on pins or

projections which are fixed to the lock-case, as seen at *q'* and *q''*, Figs. 1 and 3. The said stops are operated by means of the said lifter-slide C, the latter having a post or pin extending therefrom to the said lock-bolt stops. One end of such posts or pins is firmly fixed to the said lifter-slide C, while the other end operates in a suitable slot upon the inside of the lock-bolt stops in such manner that the said triangular pin or point *t* may rise against the said shoulder *w*, Figs. 1 and 3, without the said lock-bolt stops R and N being lifted from said lock-bolt B.

The operation of the anti-micrometer latch H is as follows, to wit: When the lock-bolt B is fully thrown the working parts of the lock take the position as shown by the dotted lines in red, as seen at Fig. 1. The slots or notches *k* in the edge of the said combination-wheels F F F are now turned away from each other, and any effort to ascertain, by means of a micrometer, or by friction, or by sound, the number or divisions or fractional parts of said divisions on which the lock may be set, and thus discover and bring within receiving range of the lip *c* of the latch H the slots *k* in the said combination-wheels, Figs. 1 and 3, so as to permit the bolt to be withdrawn, is effectually prevented by means of the stop-pin *t*, Figs. 1 and 3, always striking against the shoulder *w*, and the said pin not varying in the distance which it rises and falls, the index-hands of the micrometer can show no change of position of the wheels that can lead to a discovery of their correct position, and the combination necessary to be made before the anti-micrometer latch H can be thrown forward by the spring *y*, Figs. 1 and 3, so as to allow the stop-pin *t* to rise in the upper part of said sexangular slot *v*, Figs. 1 and 3, and past the shoulder *w* in the said slot, and at the same time allowing the bolt-driver *s* to revolve, thereby raising the said lifter-slide C, which, of course, would lift or raise the said bolt-stops R and N, as aforesaid, at the same time withdrawing the said lock-bolt B.

The operations of said latch H and triangular post-pin *t*, Figs. 1 and 3, are such as to give a movement at right angles to said lever, as shown by arrows in red, and pointing upward, as in Figs. 1 and 3, from the said combination-wheels F F F, which operation and movement being obtained always at the same point, the said wheels appear to be a perfect unbroken circle at that time when the combination is disarranged, notwithstanding the slot *k*, or any irregularities of the outer peripheries of the said combination-wheels, in any attempt to measure the variations of said wheels with the micrometer, also preventing any movement of the lock-bolt B by the bolt-driver *s* when the said bolt-stops R and N are entirely removed, as shown in Fig. 3.

G is the center or dial shaft, to the outside end of which is fastened by any substantial means, as seen at *o*, Figs. 2 and 8, the dial *o'*, Figs. 2 and 8, and on the inner end of said

shaft the bolt-driver *s*, Figs. 1, 2, 3, and 8, is firmly fastened. In one end of the said bolt-driver is a short post, *r*, projecting inwardly toward the said combination-wheels, and fitted so as to enter into the catch-hole *n*, Figs. 2 and 5, which catch-hole is in the set-wheel *L*, Figs. 1, 2, and 5. The center or shaft *G* has a double shoulder on the outer end, and a long nut, *x*, screwed on the inner end, as seen at Figs. 2 and 8. The bearing of said center and the manner of fastening the dial *o'* and bolt-driver *s* are fully shown in section at Figs. 2 and 8. The said center or dial shaft, *G*, has a certain amount of end-play necessary to the working of the lock. The dial-face *o'* is graduated into numbers and divisions, as seen at Fig. 4. The operator can use any of said numbers or fractional parts thereof in making up the combination on which he proposes to operate the lock, without limit as to the divisions marked or indicated on the said dial. The face edge of the said dial-cup *J* has an index marked on it, to which the known numbers or divisions on the dial-face are always turned or brought in the manner hereinafter fully described and set forth. The said lock is set to any whole numbers, or to the fractional parts of the numbers, on the said dial in the following manner, to wit: First turn to the known combination on which the lock is set, then insert the set-wire into the set-hole *b*, Figs. 1, 2, and 3, in the back of the lock-case, pressing it through the said set-holes in the rim *m*, Fig. 6, of the combination-wheels and between the said grippers *i i*, thus and thereby releasing their hold on the peripheries of the set-wheels *L* and allowing them to be turned around in the aforesaid groove in the rim *m*, as shown at Fig. 6, they being turned or moved by means of the said shaft *G* and bolt-driver *s*, and by the said post *r* in the bolt-driver *s*, as aforesaid, catching in the said hole *n*, Fig. 2, in the set-wheels *L* rotates the set-wheel, which, acting upon the other set-wheels of the series by means of the catch-pins *o*, so constructed and arranged that all of the set-wheels may be turned forward together. The said outer or combination wheels, *F F F*, are held steadily in position by the set-wire passing through them, and at the same time so that the notches *k* in the rim of the said combination-wheels are in range with the lip *c* of the said latch *H*. The said dial being pulled out flush with the edge of the said cup *J*, Figs. 2 and 8, and then turn the dial to the right, bring the figure 10 twice to the index-marks on the cup; then turn to the left, bring 17 twice to the mark; again turn to the right and bring $35\frac{1}{2}$ to the mark once; then withdraw the set wire from the said combination-wheels, and the combination made is 10, 17, $35\frac{1}{2}$. The bolt is then thrown by disengaging the said bolt-driver *s* from the said set-wheels and pushing it back into the lock and turning the dial to the right, causing the bolt-driver to act on the lifter-plate *E*, as seen at Figs. 1 and 3, and into the notch *a* in

the lock-bolt *B*, as seen at Figs. 1 and 3, which action causes the said lifter-slide *C* to release the said latch *H*, and allowing the said latch to be thrown forward by means of the spring *y*, the said lip *c*, Figs. 1 and 3, to pass into the said notch *k* in the said combination-wheels. The said slide *C* will raise the stop-pin *t* in the slot *v* past the corner *w*, as shown in Fig. 1. The aforesaid connecting post or pins will raise the said bolt-stops *R* and *N*, and the said lock-bolt may then be thrown back or forward by turning the dial to the right to lock and to the left to unlock, after which the spring *f*, Figs. 1, 2, and 3, acts on the said lifter-slide *C* so as to bring it and the said latch *H* and bolt-stops *R* and *N* into their former position. The said dial being now brought out or forward again, the said combination is mixed by moving or revolving the said dial to the right. When the lock is to be operated, turn to the known numbers that the said combination-wheels are set, as aforesaid described in the operation of setting the lock, thus bringing the notches *k* in the said combination-wheels within receiving range of the said lip *c* of the said latch *H*, when the lock-bolt *B* may be operated by means of the aforesaid bolt-driver *s*. The spring *f*, Figs. 1, 2, and 3, is so arranged as to operate upon the said connecting-piece *E'*, and is for the purpose of bringing the said lifting-slide *C* and all other devices connected or combined therewith to their proper places after the operation of the said lock-bolt *B* has been performed. The said spring *y*, Figs. 1 and 3, also facilitates the successful operation of the said devices of which said lock is composed by its effect upon the said anti-micrometer latch *H*, always keeping it in its proper place so as to be worked by the said triangular pin *t*, Figs. 1 and 3. The said lever-latches *H* and *N* are disconnected from the said lock-bolt *B* just before the movement of said lock-bolt commences.

D is a barrel through which the said central or dial shaft, *G*, passes from the said dial *o'* to the said device *s*, by which the said lock-bolt *B* and said lifting-slide *C*, with the plate *E* thereto firmly attached, as aforesaid, is operated. The said barrel *D* passes into and through the entire thickness of the door to which the said lock is applied, and is fastened into the said lock-case *A* by means of a screw, as seen at Fig. 2. This barrel is made in a conical or tapering form, as seen at Figs. 2 and 8. That end of said barrel which is fastened to the said lock-case *A* is made less in diameter than the opposite end, to which the dial-cup *J* is fastened by means of screws. This is thus made tapering for the purpose of preventing the drawing or forcing the same inward, so as to remove said lock from the door, and thereby effect an opening into the interior of the safe or vault, where said lock may be used. The said cup *J* is for the purpose of preventing the inserting of any tool or instrument used by burglars back of the said dial *o'*, and thereby force

the same off from the safe or door where used. The said barrel B may be of any desirable size and tapering form.

Having thus described my said invention and improvements, what I claim and desire to secure by Letters Patent of the United States of America is—

1. The employment of the grippers *i i*, operated by means of the springs *h h*, in combination with the combination-wheel F, and with the set-wheel L, the whole being constructed and arranged in the manner and for the purposes substantially as herein described and set forth.

2. The anti-micrometer or vertical latch H, actuated by means of the spring *y* and by the triangular post or pin *t*, in combination with the lifting-slide C, each being constructed and arranged in the manner substantially as and for the purposes herein described and set forth.

3. The employment of the triangular post or pin *t*, in combination with the sexangular slot *v* in the anti-micrometer latch H, in the manner and for the purposes substantially as herein described and set forth.

4. The employment of the lock-bolt stops R and N, in combination with the lifter-slide C, and with the lock-bolt B, each being constructed and arranged in the manner and for the purposes substantially as herein described and set forth.

5. The employment of the bolt-driver *s*, firmly fastened to the inner end of the central shaft, G, in combination with the lock-bolt B, and with the lifting-piece E, securely fastened to the cross-piece E' of the lifting-slide C, in the manner and for the purposes substantially as herein described and set forth.

6. The combination of the conical barrel D with the central shaft, G, and with the combination-wheels F, in the manner and for the purposes substantially as herein described and set forth.

In testimony whereof I have, on this 20th day of May, A. D. 1865, hereunto set my hand.

LEWIS LILLIE.

Witnesses:

CHARLES D. KELLUM,
MARCUS P. NORTON.