H. Isham,
Ferrule Lock.

No. 4270. Patented Nov. 12. 1845

Fig: 6.

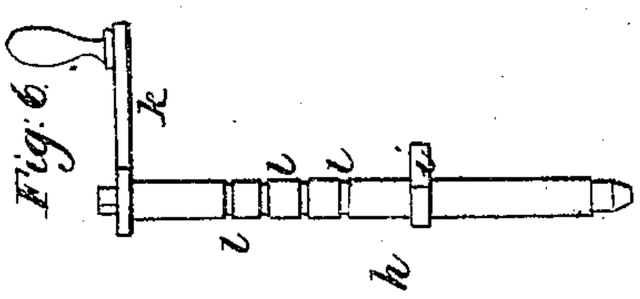


Fig: 3.

Fig: 2.

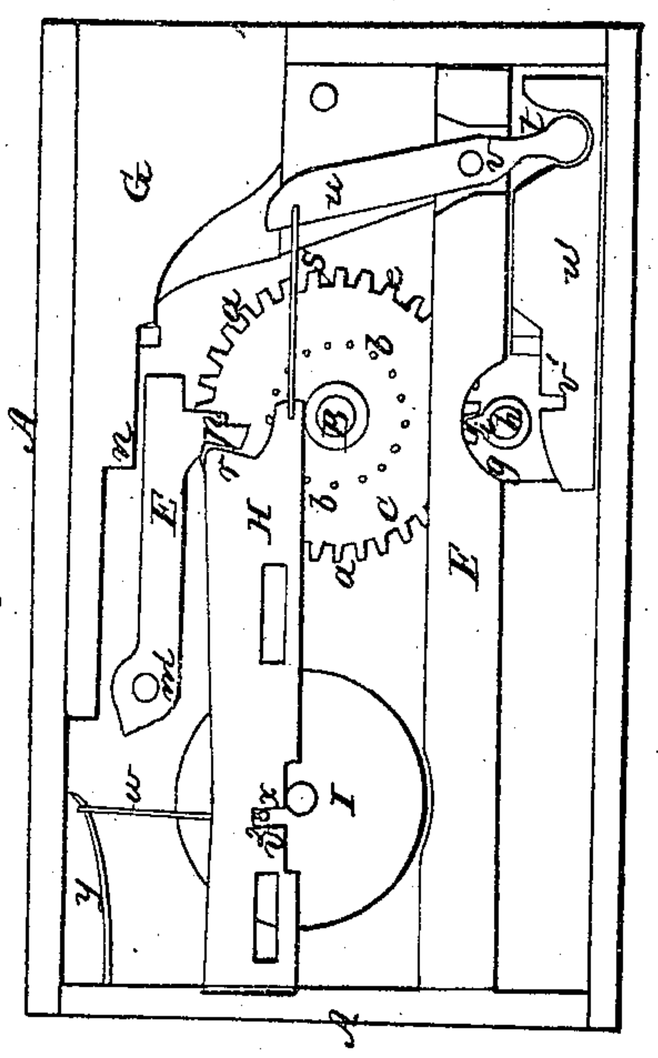


Fig: 8.

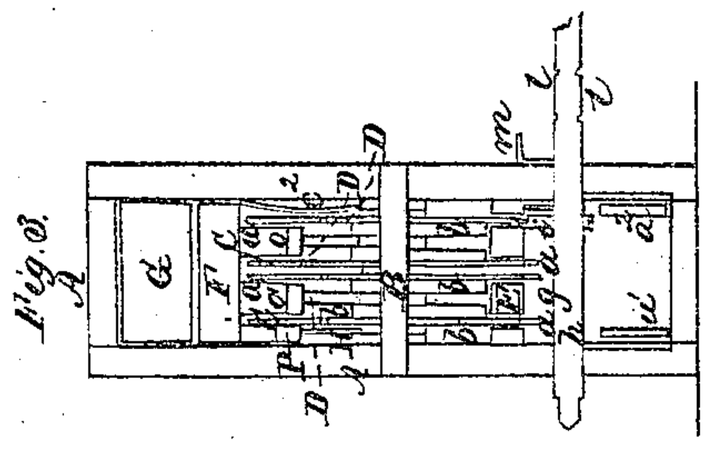


Fig: 4.

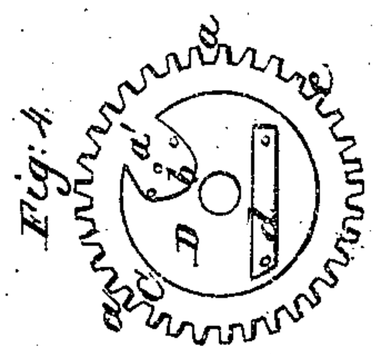


Fig: 7.

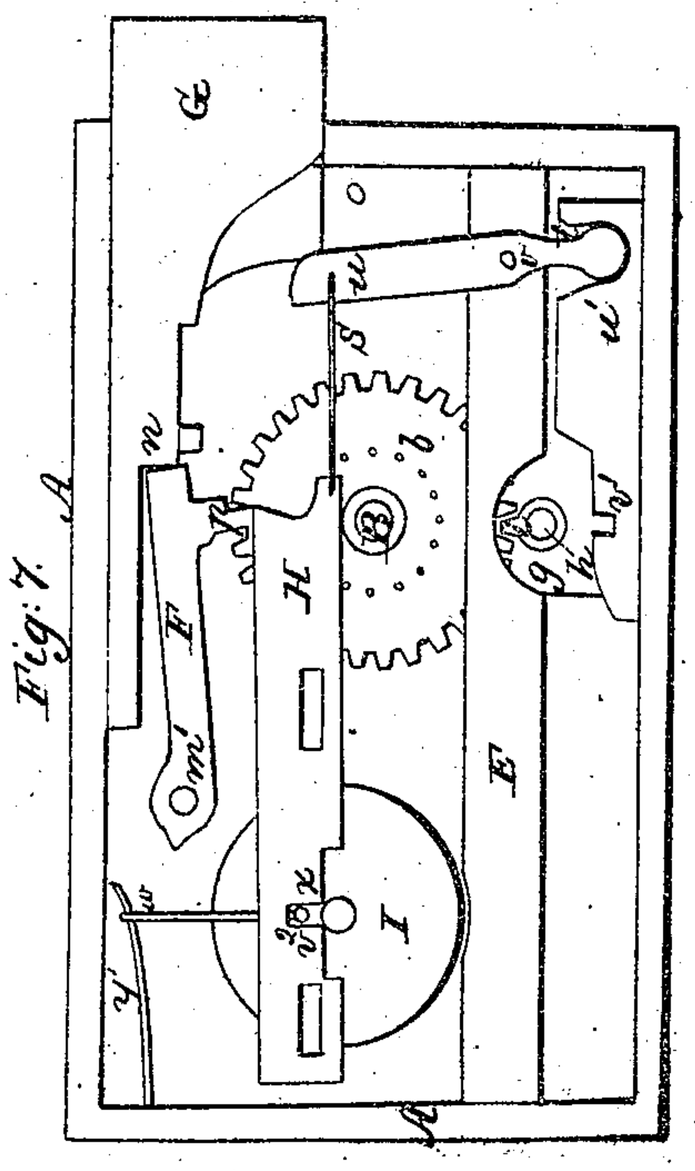
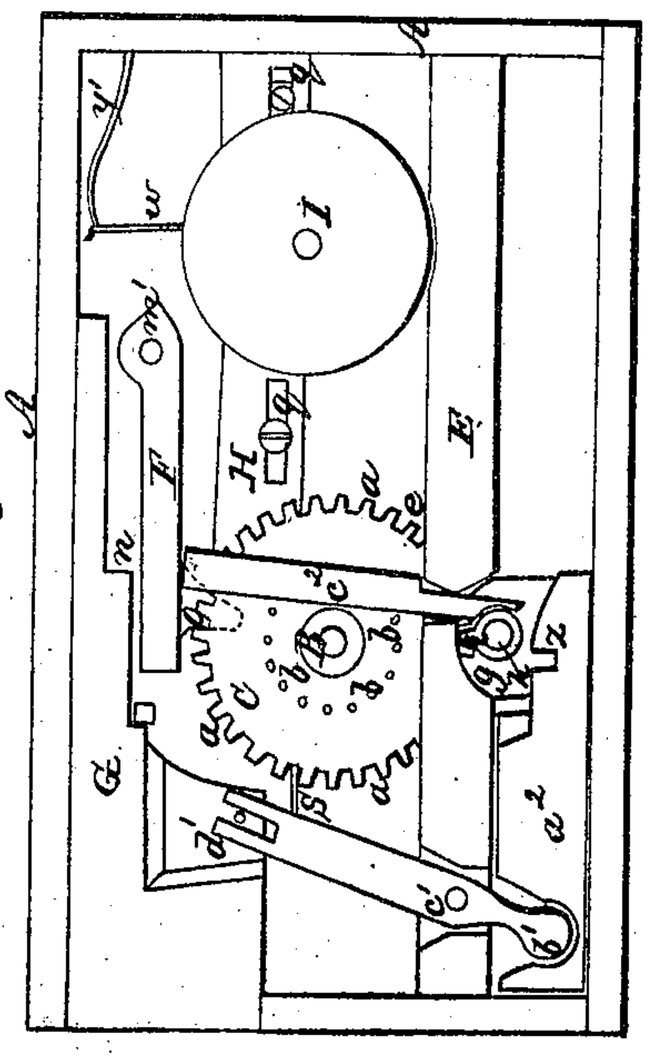


Fig: 1.



UNITED STATES PATENT OFFICE.

HENRY ISHAM, OF MONTPELIER, VERMONT.

IMPROVEMENT IN LOCKS FOR SAFES, &c.

Specification forming part of Letters Patent No. **4,270**, dated November 12, 1845.

To all whom it may concern:

Be it known that I, HENRY ISHAM, of Montpelier, in the county of Washington and State of Vermont, have invented a certain new and useful Improvement in Locks for the Doors of Safes, Bank-Vaults, &c.; and I do hereby declare that the nature of my invention and the manner in which it operates are fully set forth in the following description, accompanying drawings, letters, figures, and references thereof.

Of the aforesaid drawings, Figure 1 denotes a view of the lock-case and internal parts of the lock when the front plate of its case is removed, the said parts being shown in their respective relations to each other, and the bolt when the lock is said to be unlocked. Fig. 2 is a similar representation of the aforesaid parts as they appear when viewed from the other side of the lock-case and when the back plate of the case is removed from the case. Fig. 3 is a transverse vertical section of the whole lock, taken through the common axis of its series of rotating toothed and notched wheels, to be hereinafter described. Fig. 7 is a view of the lock-case, similar to Fig. 2, but representing the bolt as thrown forward or locked and the latch F as raised to its highest position and resting upon the slide H, all of which will be hereinafter more particularly described. Such other figures as may be necessary to exhibit the several parts composing my invention will be hereinafter referred to and explained.

A, Figs. 1, 2, and 3, is the lock-case, which is a rectangular metallic box made, generally speaking, like the cases of other kinds of locks. Upon an arbor B, suitably sustained between the walls or sides of the case, I arrange a series of wheels C C C, &c., and circular plates D D D, &c., as seen in the drawings. The wheels C C C, &c., have each a like number of teeth *a a*, &c., formed around their respective peripheries. They are somewhat larger in diameter than the circular plates D D D, &c., and with the said plates revolve freely upon the fixed arbor. Fig. 4 represents a view of one of the wheels and one of the plates as removed from the series in which (view) it will be observed that the plate D has a deep notch *a'* cut in it and from its circumference toward its center. This is the case with each of the plates of the series. Each of the wheels has a like number of holes *b b*, &c., bored through it at equal distances apart from each other and in the circumference of a circle, as seen in Fig. 1.

Each circular plate is to have a small stud or pin *c* (see Fig. 5, which denotes a cross-section of one of the wheels and one of the plates) projecting from it (or from a spring *d*, secured to the plate) and entering one of the holes *b* of the series of holes *b b*, &c., of the wheel. By such means the wheel and plate are coupled to each other, so that they move together around upon the arbor. When each one of the wheels is placed in juxtaposition with its circular plate, as seen in Figs. 3 and 4, the pin *c* should be made to enter some one of the holes *b b*, &c., in the gear-wheel. In the side of one of the cogs or teeth of each gear-wheel I insert a pin or make thereon a projection *e*, the same being to prevent the said cog or tooth from passing through a thick partition E, which is situated with respect to the series of wheels and extends across the lock, as represented in the drawings. Each of the gear-wheels passes and moves (limited by the projection *e*) through the partition and enters a curved space *g*, cut out of the partition, as seen in Fig. 1. Directly beneath the series of wheels and as seen in the drawings I arrange an arbor *h*, a side view of which is given in Fig. 6. Upon the said arbor a tooth or cam *i* is disposed, the same being of suitable form and size to enter into and engage with the teeth of the gear-wheels.

When the arbor is revolved, it should operate in such manner upon the wheel with whose teeth the cam or tooth *i* may be engaged as to act in regular succession upon each tooth of the wheel and cause the wheel and circular plate coupled to it to be gradually revolved. Upon the front end of the arbor I place a crank *k* or any other suitable contrivance by which it may be revolved and around the arbor I cut a series of grooves *l l l l*. I place a latch or catch *m* upon the front side of the lock-case. The said latch is intended to shut downward into either one of the grooves *l*, and when it is therein the groove in which it rests determines the place of the cam or tooth *i* with regard to one or the other of the gear-wheels, the grooves be-

ing arranged upon the arbor at such distances apart as will allow of the cam acting successively upon each wheel as the latch is successively placed in each groove. Over the several gear-wheels and circular plates I arrange a latch or lever F, which is shaped as seen in the drawings, and turns at one end on a pin m', inserted and fixed in the plates of the lock. The opposite end of the latch rises and falls vertically, and when it is down to its lowest position, as seen in Fig. 2, and the main bolt G is retracted the said end of the latch extends entirely beyond or below a shoulder n of the main bolt G. When the latch F is up, (for which the main bolt must be thrown forward,) as seen in Fig. 7, it rests against the shoulder n or in rear of it, and thus prevents the recession of the bolt, so that no withdrawal of the bolt can be effected until the latch F is depressed or brought into the position as seen in Fig. 2.

At right angles to the front end of the latch a number of tongues or projections o o extend downward, there being the same number of them as there are circular notched plates (or one to every two notched plates, as seen in Fig. 3) and each tongue being directly over each of the said plates.

Between the rear wheel and the rear plate of the lock there is another tongue or projection p, extending downward from the latch F and operating in connection with a slide-plate H, shaped as seen in the drawings, and attached to the inner side of the lock-plate in such manner as to readily move to and fro (upon pins or screws q q) in the direction of its length. The front end of this slide-plate has a shoulder r formed upon it, which, when the latch is down, comes directly in rear of the tongue p.

The slide H has a chain s attached to its front end and connecting it with the upper end of a lever u, whose fulcrum is at v in the partition E. The lower end of the lever is formed circular and enters a notch t, cut in a slide u', arranged against the back plate of the lock and shaped as seen in the drawings. The rear end of the said slide has another notch v' cut down in it and shaped so as to receive the tooth or cam i upon the arbor, and so that when said arbor is turned either in one direction or the other the said tooth shall cause the said slide to move back and forth in a longitudinal direction.

There is a balance or fly wheel I disposed within the lock and in rear of the system of gear-wheels and circular plates, before described, and with respect to the slide-plate, as seen in the drawings. The journals or pivots upon which the fly or balance wheel revolves or turns should be arranged somewhat below the slide-plate H, and the said balance-wheel should have a pin x projecting from its side above its central part or axis and resting and playing in a vertical notch v^2, cut in the slide, as seen in the drawings. A chain w extends upward from the pin x to a spring y, arranged over the balance-wheel.

The several operative parts being in the positions as represented in Fig. 7, the latch F is caused to fall down or below the shoulder n of the main bolt in the following manner: The slide-plate u' is to be drawn back by the tooth i of the arbor acting in the notch v'. While this takes place the slide-plate H will be moved forward, and in consequence thereof draw the pin x forward with it to some distance beyond its position, as seen in Fig. 7, and thus partly turn the balance-wheel on its axis and depress the spring y. As soon as the tooth i of the arbor escapes out of the slide-plate u', the power generated in the spring y will draw the slide-plate H back and far enough to carry its shoulder r some distance behind the projection p, and thus permit the said projection p to drop down in front of the said shoulder r, as seen in Fig. 2. At the same time the tongues o o will fall into the notches of the circular plates D D, &c., which notches are supposed to have been previously arranged so as to allow of the same. When the latch F is up, its projection p rests upon the top of the slide H, and thus keeps the several projections or tongues o o off or from contact with the peripheries of the circular plates.

The manner in which the slide H passes underneath the projection p of the latch F, I shall now describe. By reference to Fig. 2 it will be seen that when the shoulder r and the projection p are in the positions with regard to each other as therein represented the pin x of the fly or balance wheel is in a position somewhat back of a vertical plane passing through the axis of the balance-wheel, and that the said pin has been carried beyond and below its highest point of ascent. It (the pin) is kept from rising upward (the power which acts upon it to rise being the spring y acting through the chain w) by the shoulder r being in contact with the projection p. Consequently, as soon as the projection p, by means to be hereinafter described, is raised above the shoulder r the obstruction by which the slide H is held back is removed and the slide H is advanced by the spring y acting through the chain w upon the pin x. As the pin x rises into its highest position, it presses the slide H forward and carries it into the position with respect to the shoulder p, as seen in Fig. 7, the spring y at the same time having spent its power.

When the slide-plate H is thrown forward by the tooth i of the arbor in order to allow of the fall of the latch F, a reacting power is generated in the spring y and the fly-wheel I sufficient to carry the shoulder r in rear of the projection p and the pin x beyond and below its point of rest, thereby regaining the power of the spring as it is again depressed by the fly-wheel during the rebound thereof. During this rebound the latch F falls, its pro-

jection p retaining the shoulder r of the slide-plate H behind it (see Fig. 2) as the slide-plate H is swayed forward and also so much of the power of the spring as is not then spent. Therefore when the projection p is raised above the shoulder r it is this remnant of the power yet left in the spring y which raises the pin x to its highest position and in so doing throws the slide H forward, as in Fig. 7. Moreover, the object of the slide-plate H, balance-wheel I, lever u, and slide-plate u' is not only to keep the latch F under these circumstances up and in rear of the shoulder n of the bolt G, (thereby to prevent the bolt from being pushed back when locked,) but also to retain the tongues o o of the latch F elevated above the peripheries of the circular plates D D, &c., in order that a pick-lock, when the bolt is thrown forward, may not be able to adjust the circular plates to the tongues by pressure created upon the latch.

The main bolt is moved back and forth by the tooth of the arbor acting in a notch z of a slide-plate a^2, arranged in the front part of the lock and beneath the partition E, and shaped as seen in the drawings. A lever b' c' d', turning on a fulcrum at c', has one end jointed to the slide-plate and the other with or to the main bolt in such manner that when the slide-plate is moved in one direction it (the lever) will cause the bolt to move in the opposite.

The latch F is lifted out of the notches of the circular plates by means of the cam or tooth i of the arbor, and a slide-bar c^2, which is arranged with respect to the latch and cam or tooth, as seen in the drawings, and sustained in the lock so as to slide freely up and down when acted on by the cam, which, when it comes in contact with the lower end of the said slide-bar, throws it upward against and raises the latch F. The instant the latch F is raised above the slide H the latter is shot forward by the spring y. The restraint, as before described, of the projection p on the shoulder r being thus taken away the pin x rises to its highest position, and the slide-plate H passes under the latch F to keep its tongues o o from contact with the circular notched plates and other purposes before explained.

The partition E prevents any one from getting access to the internal operative parts of the lock. From the above description it will be perceived that I have combined with each circular notch-plate a change gear-wheel having a series of holes bored through it at equal distances apart and in a circle, and that I have provided the said circular plate with a projection c or contrivance to extend, as seen in Fig. 5, into either of the holes and thus lock or connect the geared change-wheel to it.

Before proceeding further I would here remark that it matters not what hole b of any one of the gear-wheels C C, &c., the pin c of its notched plate D is placed in before the said wheels and plates are arranged together on their common arbor B.

The positions of the notches a' a', &c., of the respective plates D D, &c., in regard to their respective projections e e, &c., are to be selected according to the option of the party who puts the parts of the lock together and who uses the same.

As it is only when all the several notches of the circular plates are brought into one line with each other that the projections of the latch F will drop into them, it will be seen when each of the change-plates is adjusted to its circular plate—that is, when the pin c of it is inserted in any particular hole b, and is made to require a particular number of turns of the arbor h to bring the notch a' of its circular plate to the position for the tongue of the latch to drop therein (the said particular number of turns of the arbor for each plate differing from that of any other of said plates)—that it would be extremely difficult for a person attempting to pick the lock to bring all the notched wheels around into the necessary position to open the lock.

In order when putting the lock together to ascertain the adjustment of the change-wheels and circular plates, (as they are successively placed upon the arbor B,) the first or rear gear-wheel of the series—that is, the gear-wheel next to the back plate of the lock—should be turned around so that its projection e shall rest upon the partition E. The pin c of the notched plate of said gear-wheel is next to be inserted by the finger in some one of the holes of the series b b, &c., made in the gear or toothed wheel, and the gear-wheel moved by the arbor until the notch of the plate D comes into the position to permit the tongue of the latch F to descend into it, the number of revolutions of the arbor having been carefully counted. The second gear-wheel and circular plate are similarly treated and the turns of the arbor similarly noted. So on with the third and all the rest of the series.

Now from the above it will be evident that whenever the lock is to be opened each gear-wheel in succession must first be turned around, so as to bring its pin or projection c to rest upon the partition, as before, and the arbor afterward turned in the opposite direction the number of times necessary to bring the notch of the circular plate to the correct position to receive the tongue of the latch.

When the change-gears are all operated on in succession and the latch F has dropped down, the main bolt may be retracted by the arbor acting on the slide and lever of the said bolt, as before explained.

In order to throw the bolt forward bring the tooth i of the arbor h to act in the notch z of the slide a^2, so as to draw the slide back. This pushes the bolt forward. Next pull the

arbor to the front, or toward you, as far as possible. Bring the tooth *i* into the right position to elevate the slide c^2. Turn the arbor, and raise the slide c^2 and latch Γ. Next by means of the arbor and its tooth *i* move each gear-wheel into any position chosen, noting the revolutions of the cam *i* required for each. The elevation of the latch F permits the slide-plate to advance and remain, as seen in Fig. 7, and the latch being thus kept up in rear of the shoulder *n* or the bolt, as above explained.

To unlock the bolt or throw it back, bring the notched plates into their correct positions, so as to permit the tongues *o o* of the latch F to fall into the notches of the plate, as before explained, which, being accomplished, move the tooth *i* of the arbor into the notch *z* of the slide-plate a^2 and throw the said slide-plate forward. This will cause the bolt to retreat, as before specified.

I do not claim the series of notched circular plates D D, &c., simply; but

That which I do claim is—

1. The combination of the geared change wheels or plates C C, &c., with the said notched plates D D applied to them and acting in connection with them and operated by an arbor and tooth or cam or other mechanical equivalents, substantially in the manner as above described.

2. The combination of mechanism by which the tongues or projections of the latch F are kept from contact with their respective circular notched plates when the main bolt is locked or thrown forward, the said combination consisting of the balance or fly wheel I, chain *w*, and spring *y* or other mechanical equivalents, the slide-plate H, lever *u*, connected to the slide H, and the slide *u'*, the whole being arranged and operated by the arbor and its tooth, substantially as above set forth.

In testimony whereof I have hereto set my signature this 1st day of November, A. D. 1845.

HENRY ISHAM.

Witnesses:

G. H. BEAMAN,

F. F. MERRILL.