Sheet 1. 2 Sheets

J. H. Butterworth,

Combination Lock,

No. 4,452 Patented Apr. 11, 1846.

Fig. 1.

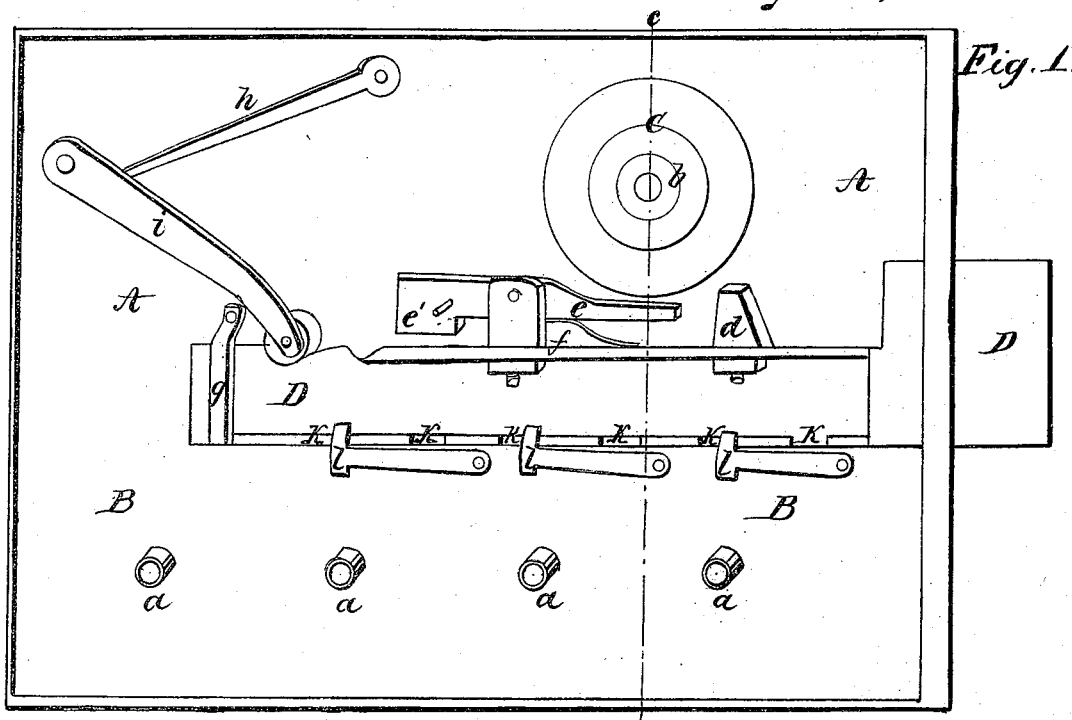

Fig. 2.

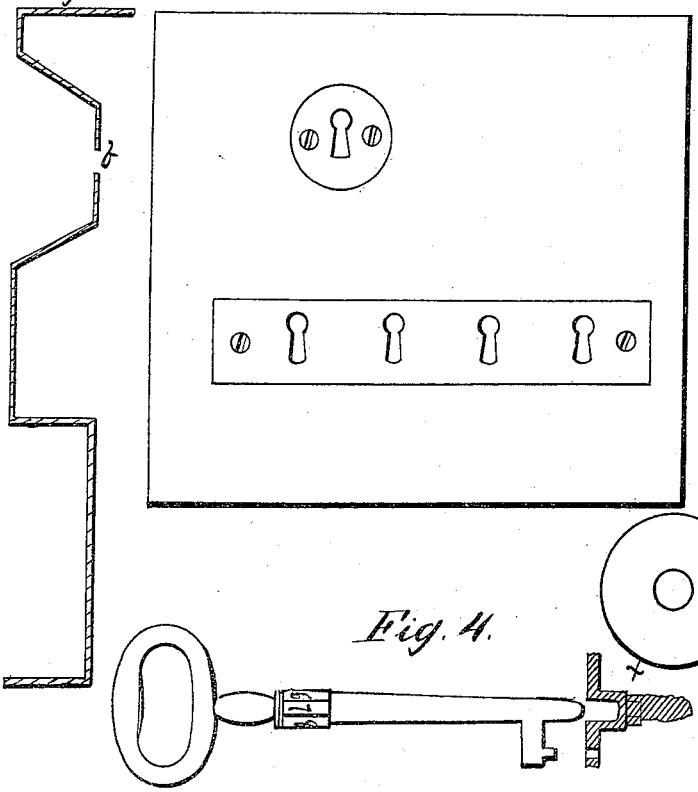

Fig. 6

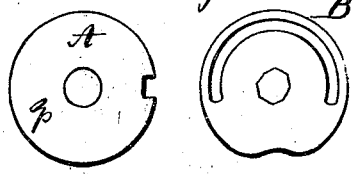

Fig. 8.

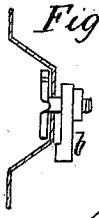

Fig. 9.

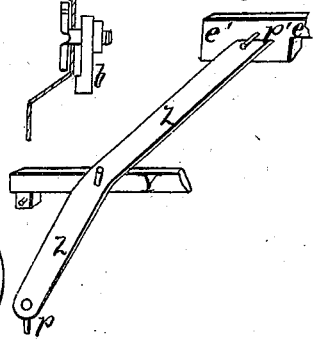

Fig. 4.

Sheet 2 - 2 Sheets.

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Fig. 5.

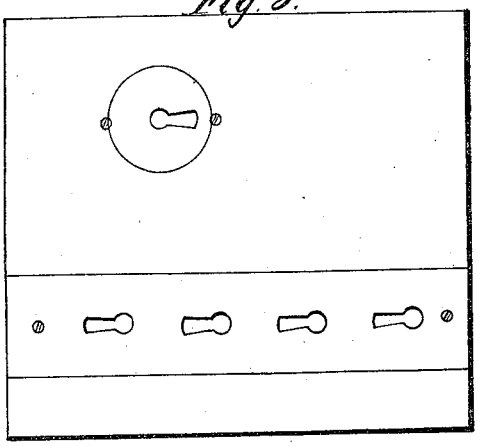


Fig. 3.

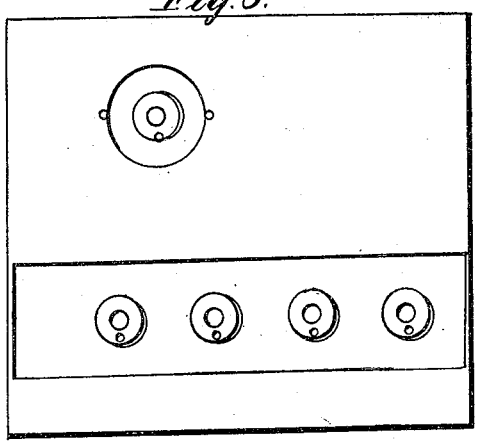
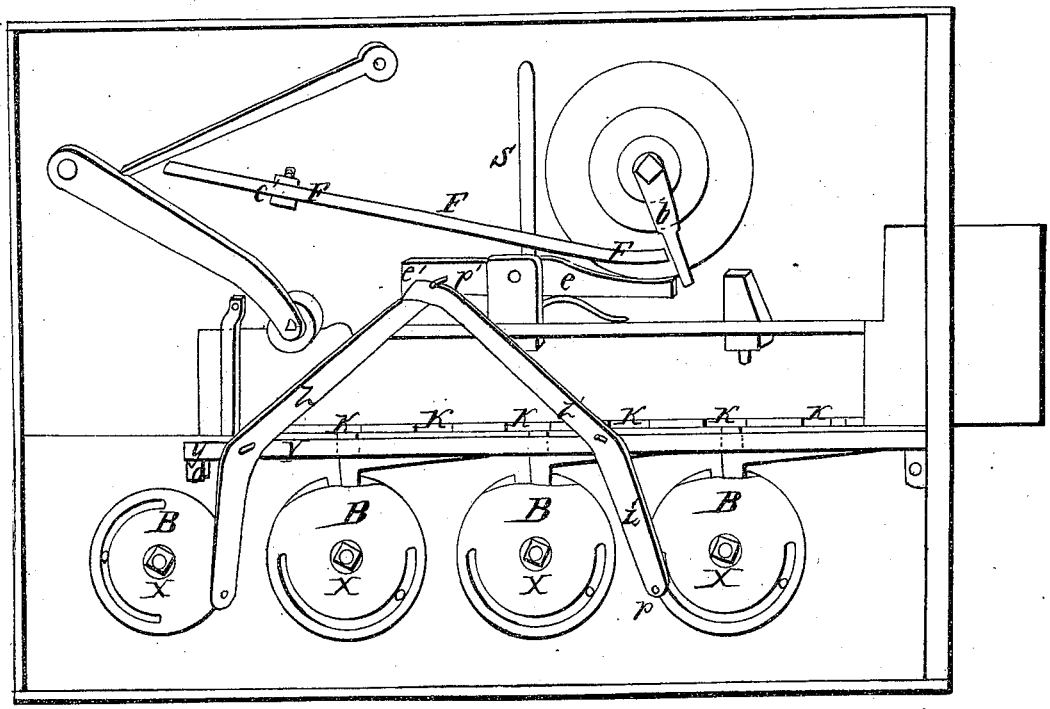


Fig. 7.



UNITED STATES PATENT OFFICE.

J. H. BUTTERWORTH, OF DOVER, NEW JERSEY.

DOOR-LOCK.

Specification forming part of Letters Patent No. 4,452, dated April 11, 1846; Reissued June 4, 1861. No. 1,193.

To all whom it may concern:

Be it known that I, JOSHUA H. BUTTERWORTH, of Dover, in the county of Morris and State of New Jersey, have invented an Improved Combination or Permutation Lock; and I do hereby declare the following is a full and exact description of the same, reference being had to the annexed drawings, which make a part of this specification.

The prominent features of my lock are: First. Unlike other combination locks, the key remains unaltered, no change being made in it by adding to, or diminishing the number of its bits in order to vary the combination. Mine is therefore a changeable lock without a changeable key. Second. In ordinary combination locks, the key hole opens into the interior mechanism, but in my lock there is no opening left whatever into the works through which a burglar's implements or any implements for picking it could be introduced. Its mechanism therefore cannot be tampered with by any one attempting to force it, since there is no way to get at the works except by drilling openings for that purpose through an interposing plate of metal. Third. In the introduction of three distinct species of securities against the bolt being improperly withdrawn. These are first, a preventative stop or kind of flying tumbler, the secret of whose action unless known will of itself prevent most attempts to open this lock from succeeding. Second: While two fixed studs or talons are commonly employed to throw the bolt in and out, I use a fixed one to lock the bolt and a movable one to unlock it. But unless the means be known of bringing the end of this movable talon or stud into a position to be acted on, the lock cannot be opened. Third: In a series of minor bolts or tumblers which are raised into notches cut in the underside of the main bolt. Each of these minor bolts being acted on by a distinct apparatus and through a separate key hole by the key. One only of these securities or safeguards may be employed or any two of them, or all of them as in the door lock I now proceed to describe.

Figure 1, represents the interior of a seven inch lock, full size, the back plate or cover being removed. A, A, is the case. A rectangular recess is formed on the other side and extends the whole length, the bottom B, B, of the recess being elevated in the side represented. A conical cavity of the same depth as the recess is also formed on the other side and likewise protrudes as shown at C. There are four holes *a*, *a*, *a*, *a* drilled through the metal into the recess and one marked *b*, of a similar size into the cavity at C. A projecting rim of about $\frac{1}{8}$ inch depth surrounds the openings *a*, *a*, *a*, *a* which rims are cast on the plate.

Fig. 2, is a section of the case through the dotted line *c*, *c*, of Fig. 1. D, D is the bolt represented in the position it is when thrown out or locked.

To save metal the part within the case is hollowed out. (It may be made thin and solid with the requisite notches cut in its lower side.) *d* is the fixed stud; it is secured to the upper side of the bolt by a screw and nut as represented. *e'*, *e*, the movable talon or stud which consists of a lever suspended on a frame and center secured likewise by a nut to the upper side of the bolt. The half of the lever next to the fixed stud *d*, is made lighter than the other half so that the latter when left free to act will always preponderate. To secure this effect still more I sometimes add a small spring marked *f* in the figure. *g*, the ordinary guide to keep the bolt from rising out of its place. *h* and *i* the common lock spring and lever with friction roller. *k*, *k*, *k*, *k*, *k*, *k*, indicate as many notches in the lower side or edge of the main bolt for the reception of the minor bolts or tumblers, the bottom of the notches is on a plane with the face of B, B. *l*, *l*, *l* three tumblers or minor bolts turning on pins fixed on the face of B, B. These bolts when raised into corresponding notches in the main bolt prevent the latter from being unlocked, as long as they remain in the position indicated.

Fig. 3, is a view on a smaller scale than Fig. 1, of the opposite side of the case, showing the rectangular and the conical cavities. Each of the holes marked *a*, *a*, *a*, *a*, and *b*, (see Figs. 1 and 2) it will be seen is here occupied with a small bolt whose circular flat head only is seen. The face of each bolt head has two holes drilled in it, one in the center about $\frac{1}{4}$ inch in depth to admit the end of the key and the other a small one near the periphery to allow the entrance of a short pin fixed in the bit or pod of the key. X, Fig. 3, is a section of one of these bolts, the part next to the head is cylin-

drical and about $\frac{3}{8}$th in. in length. At the termination of this part the metal is filed into an octagonal form for about $\frac{1}{8}$ in. length, the residue is made smaller, of a cylindrical form and a screw cut on it, to receive the nut *a'* figured near it. A similar bolt is passed through the hole *b*, in the conical cavity, the whole five being precisely alike, and all capable of being acted on by the same key.

Fig. 4 is a view of the key with a section of one of the bolts showing how the key by means of the pin on its bit can turn the bolt in either direction.

For the purpose of explaining how the tumblers *l*, *l*, *l* Fig. 1, are elevated and depressed, I now proceed to describe in detail one of the apparatus, and as all are alike, the description of one will suffice for the whole.

Fig. 6 is a circular plate A the opening in the center of which is just sufficiently large to drop over the projecting rims *a*, *a*, *a*, *a* Fig. 1. A short pin is inserted at *p*, and a square notch is made at the periphery of a width sufficient to admit the projecting foot of the tumblers *l*, *l*, *l*, Fig. 1. B is a similar plate of equal thickness and diameter the opening in whose center is octangular and accurately fitted to receive the 8 sided portion of the bolt, see X X Figs. 3 and 4. A circular slit is made about half way around at the same distance from the center as the pin in the plate A. B is placed over A so that the pin may be within the slit. The bolt X is passed through the plate of the lock and through the two plates A, B, the whole being secured by the nut screwed on the end of the bolt as shown at X, X, X Fig. 7. Thus when the head of the bolt is turned to the right or left by the key Fig. 4, the plate B turns A in either direction by bringing the end of the slit up against the pin on A. A thin washer is placed between the two plates A, B, in order that the friction of one surface against the other may not cause A to turn when the ends of the slit have not reached the pin.

The tumbler *l*, turns on a fixed center and the projecting foot always rests upon the edges of the plates A, B. The security which my plan of moving the tumblers presents consists in requiring a certain portion of the edge of each plate to coincide, in order to admit the descent of that part of the tumbler which enters the notches in the main bolt. Those parts are, the notch in the plate A, and the flat part of B where a portion is removed. To open the lock the notch in A and the flat part in B are required to be brought directly under the foot of the tumbler and allow it to drop by its weight on those parts, and thus relieve the main bolt of their interference. To raise the tumbler and fasten the main bolt, the key is inserted in the head of the bolt X and the latter turned either way, half around or wholly around, or twice around. By this motion the flat of B is turned past the foot of the tumbler and consequently raises it out of the notch in A. The plate A is also turned away from its place and both must again be brought under the tumbler before the main bolt can be relieved. As with one pair of plates and one tumbler so it is with all. Each tumbler being moved separately by the key.

It is evident that when the lock is placed on a door there is no aid to be derived from an examination of its interior, there being nothing but the opening through which the key enters the door and the key to act as a guide. It is the key itself which is the guide in opening my lock. For this purpose a small portion of the stem near the handle is made octagonal and each of the 8 sides is numbered from 1 to 8.

Now as the two plates A, B, admit of distinct motions it is necessary to know the number on the upper one of the 8 sides when the notch in the plate A is directly under the foot of the tumbler,—then by reversing the motion of the key, the flat part of the plate B is brought under the tumbler and the figure on the key required to be uppermost is then brought into that position. Thus for example Figs. 3 and 5 on the key may indicate the true position of the two plates to admit the descent of the tumbler; or any other two figures according to the length of the circular slit, and the position in which the plate B is secured on the bolt that turns it, both of which figures must be first ascertained.

Each bolt and pair of plates may be so arranged as to require different numbers on the key to open them as 1, 3 or 3, 4 or 5, 6, &c.; but in all cases the numbers should be known or preserved on a card lest the person using the lock should forget them.

The operation of one pair of plates explains that of all, and though a lock may have 3 or 4 pair (as represented in Fig. 7) the owner of the lock may use one only, unless when he wishes for further security than it affords.

It will be seen that the plate A does not act on the tumbler at all. It is the plate B which raises the tumbler and allows it to fall in the manner of a cam. By varying the position of one of the plates B on its bolt as shown at Fig. 7, it is evident that a different range must be given to it in order to bring the notch in A under the tumbler; and consequently a different pair of numbers on the key would have to be uppermost in order to lock or withdraw the main bolt. Each of the plates B admits of eight different positions on its eight sided bolt, and therefore afford an equal variety of num-

bers that may be selected for the key. To vary the changes still more I sometimes make the circular slits in B (Figs. 6 and 7) of variable lengths by covering a portion of each with a movable slip of metal turning on a pin; so that the owner of the lock may at pleasure diversify by this means the adjustments, and also the required positions and numbers of the key.

Having now described the third species of security mentioned in the beginning of this specification I proceed to explain the second viz: the means by which the movable stud or talon *e'*, *e*, (Figs. 1 and 7) is acted on by the key.

Fig. 8, exhibits the conical cavity explained in Fig. 1, with the movable bit *b*, secured to the bolt by a nut and screw. The bolt is precisely the same in form and dimensions as those which have been described and shown at Fig. 3. The bit *b* is turned by the application of the key (Fig. 4) upon the bolt. When the main bolt is withdrawn it is evident that by applying the key to the bolt and turning the former, the bit *b* would drive the main bolt forward and thus lock it. To deliver the main bolt from this position or to unlock it, the bit is reversed in its action by turning the key in a contrary direction,—this motion causes the bit *b*, to act upon the movable talon *e'*, *e*, and thereby drive the main bolt backward and unlock it. The movable talon *e'*, *e*, being suspended on a center and having its end next the fixed stud lighter than the other is acted upon by the bit *b*,—but, as a further security I introduce a lever marked Z (Figs. 7 and 9) which works upon a center in the bar Y Y shown also in Fig. 7.

A pin *p* (Fig. 9) is riveted to the lower end of the lever Z, and the upper end of the lever Z acts against another pin *p'* which projects from the movable talon *e'*, *e*. The pin *p* is fixed so as to ride against the periphery of the plates A and B, and by the motion (which has been described in Fig. 7) of the circular plates, it will be evident that the lever Z is raised or depressed as the circular plates are turned, and hence raise or lower the movable talon *e'*, *e*. If the short arm of the movable talon *e'*, *e*, be raised, the opposite end would descend and could not be acted upon by the bit *b*, Fig. 7. Therefore without the adjustment is given so as to allow the movable talon *e'*, *e*, to be in a position for the bit *b* to act upon it, there are no means by which the main bolt can be withdrawn or unlocked. In Fig. 7, there are two of these securities shown (Z Z and Z', Z',) and if desired, one to each pair of circular plates may be used.

It remains now to explain the operation of the preventative stop which is figured F, F, F, Fig. 7. This lever or preventative stop is hung upon a center *c'* Fig. 7, and its longer arm (which is notched at its extremity) rests upon a spring S. When the bit *b*, Fig. 7 is turned by the action of the key, it is made to press upon the end of the preventative stop and if the bit *b*, be not brought around so as to just coincide with the end of the movable talon *e'*, *e*, the spring S, raises the notched end of the lever F, F, F, and prevents the bit *b*, from acting upon the movable talon *e'*, *e*.

What I claim as my invention and desire to secure by Letters Patent, is—

The arrangement of the circular plates (for elevating the tumblers into notches in the main bolt) and raising and lowering the levers Z, Z, (which act upon the movable talon) in combination with the movable talon and the preventative stop or flying tumbler, all as herein set forth.

JOSHUA H. BUTTERWORTH.

Witnesses:

AARON DOTY,

JACOB HURD.

[FIRST PRINTED 1913.]