H. S. Leland.

Sheet 1, 4 Sheets

Permutation Lock.

No. 88,490. Patented Mar. 30, 1869.

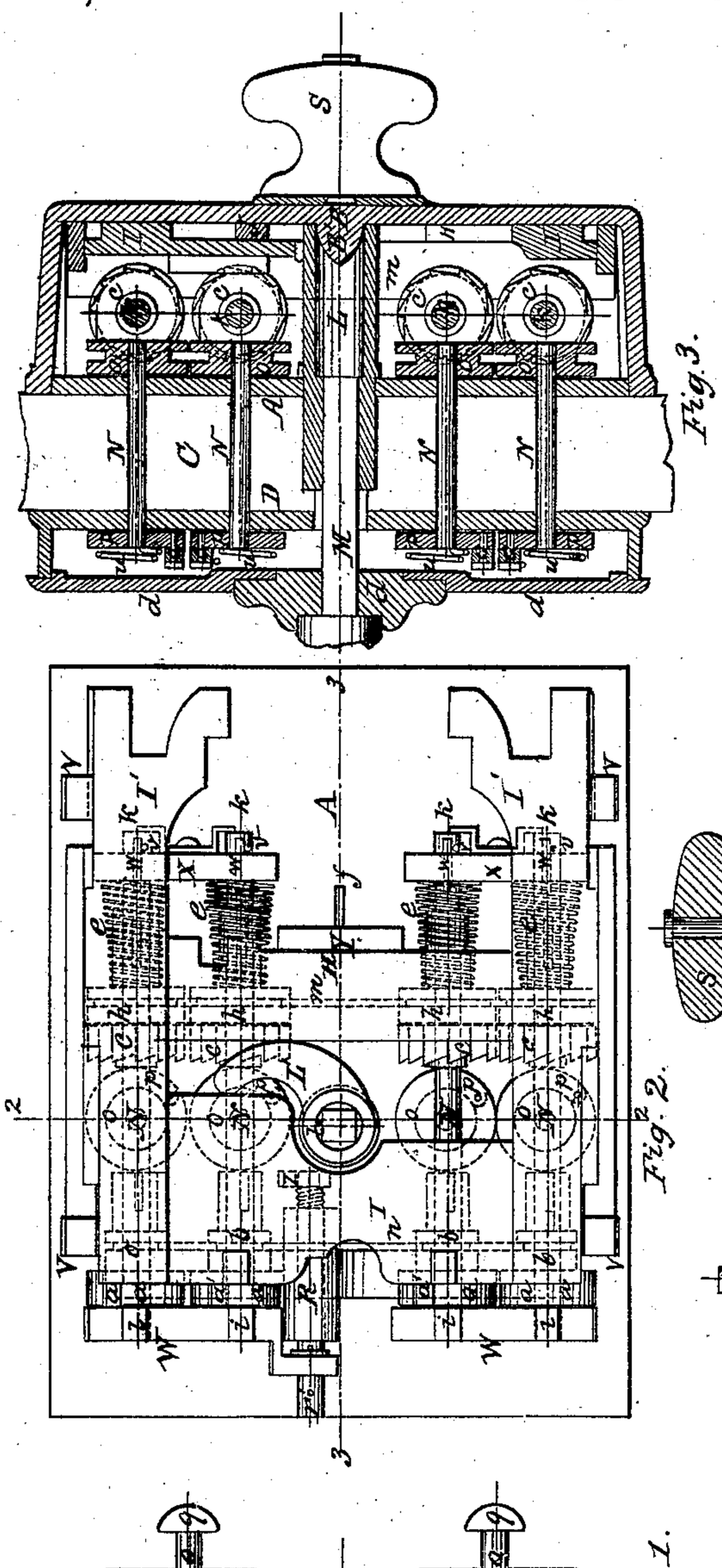
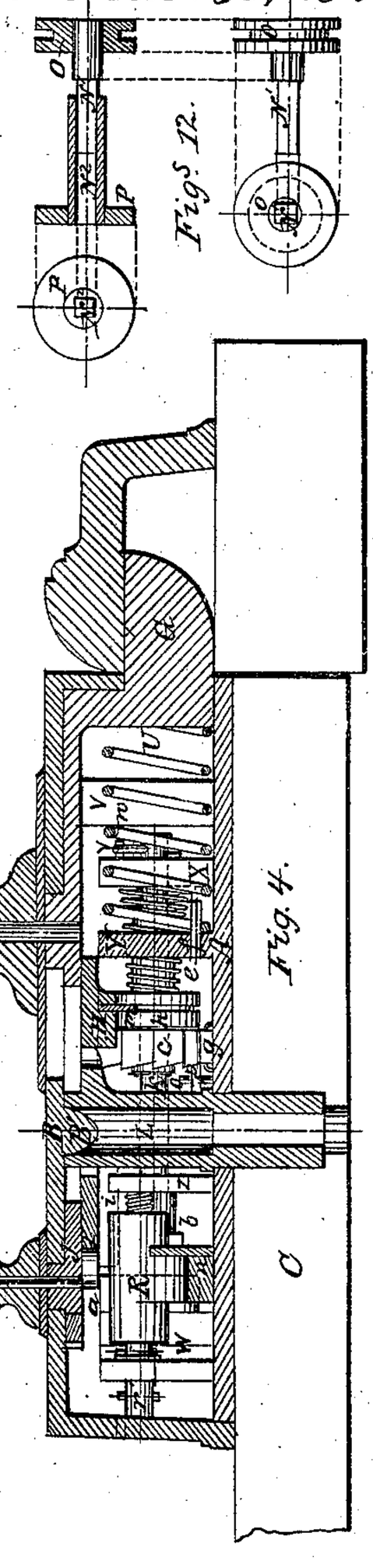


Fig. 3.

Fig. 2.



Figs. 12.

Fig. 4.

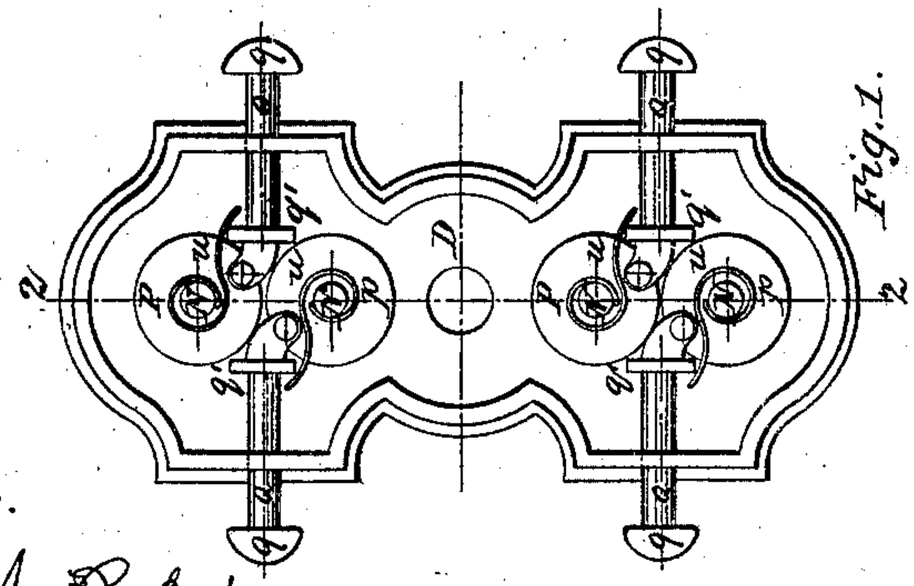


Fig. 1.

WITNESSES.

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INVENTOR

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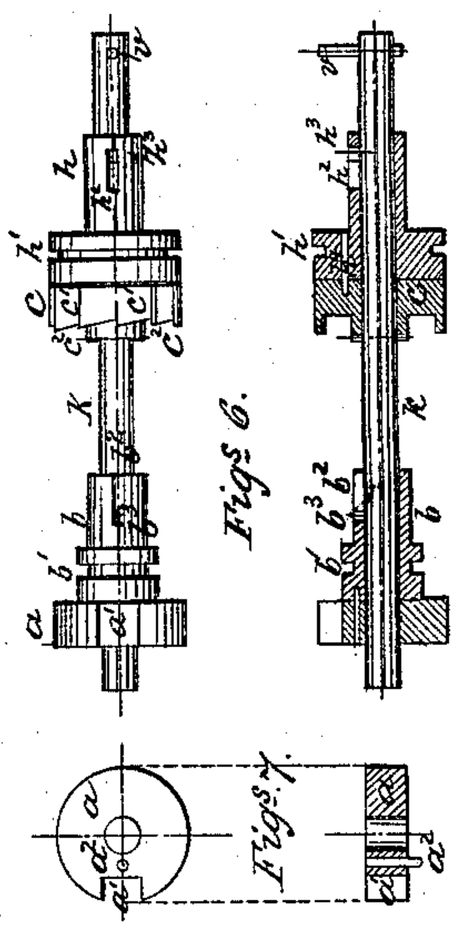
H. S. Leland.

Sheet 2.
2 Sheets.

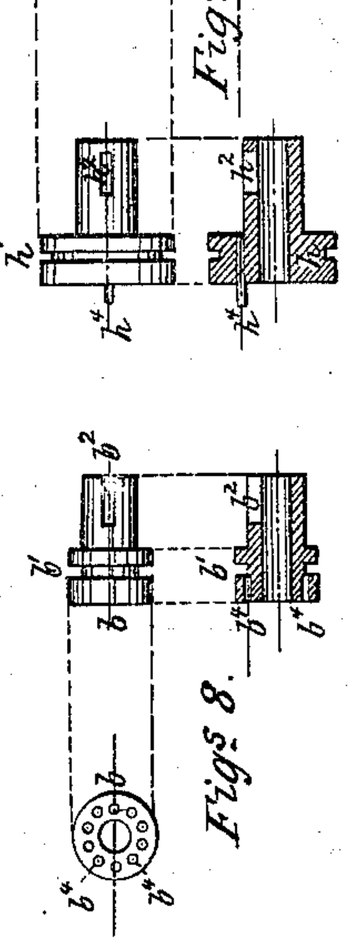
Permutation Lock.

No. 88,490. Patented Mar. 30, 1869.

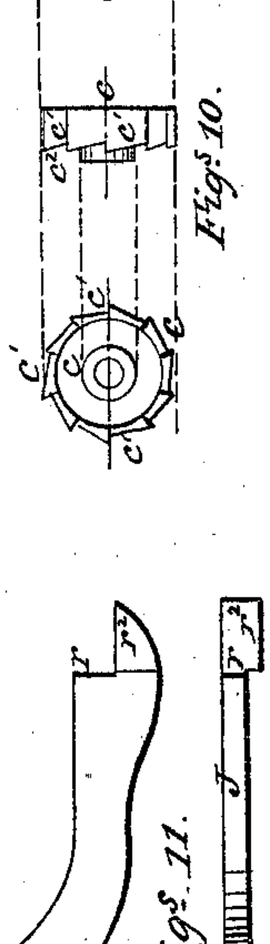


Figs. 6.

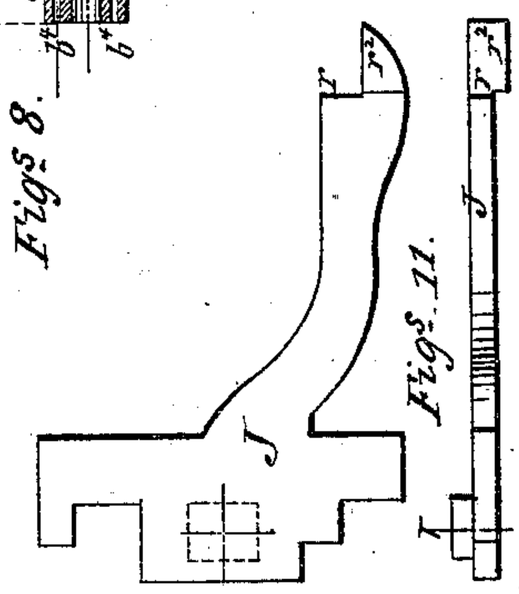
Figs. 7.



Figs. 8.



Figs. 10.



Figs. 11.

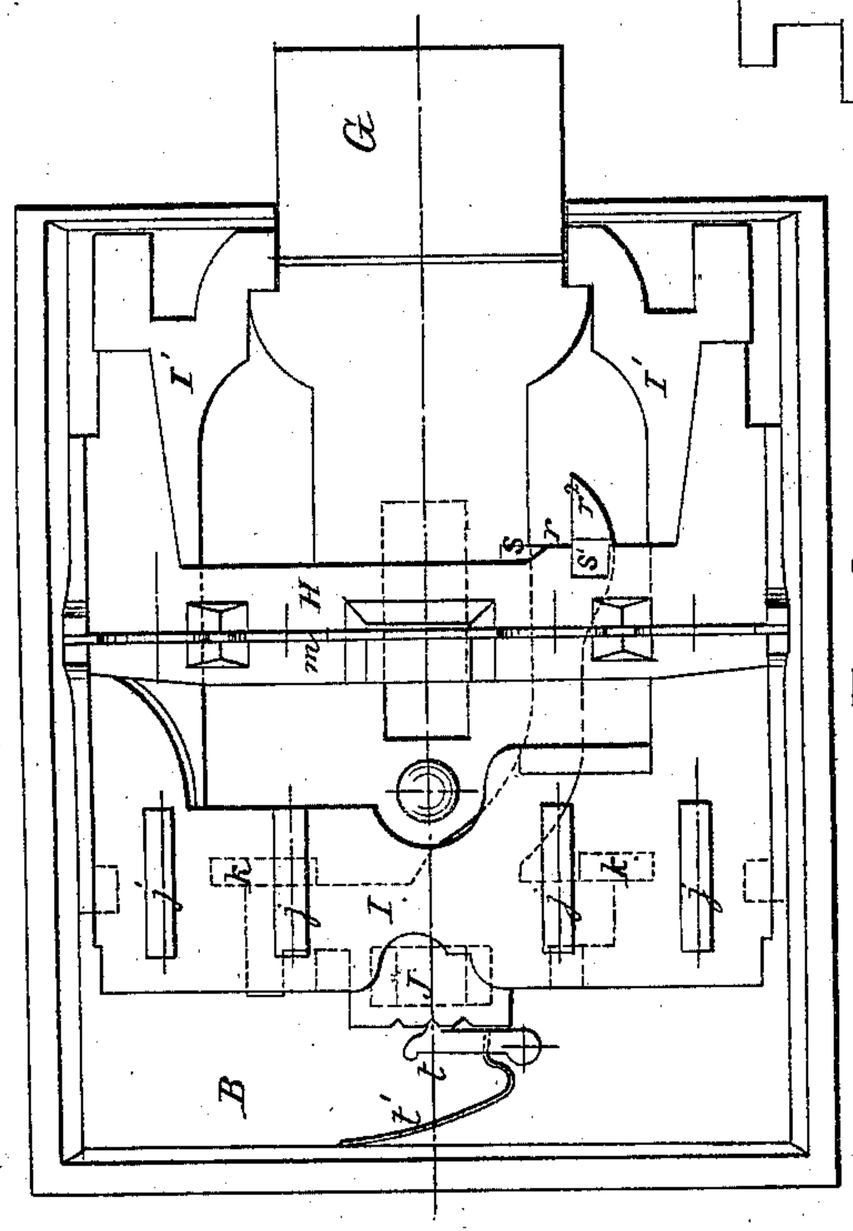


Fig. 5.

WITNESSES

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United States Patent Office.

H. S. LELAND, OF MOUNT UNION, OHIO.

Letters Patent No. 88,490, *dated March* 30, 1869.

IMPROVEMENT IN COMBINATION-LOCKS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, H. S. LELAND, of Mount Union, in the county of Stark, and State of Ohio, have invented a new and useful Combination-Lock; and I do hereby declare that the following is a full, clear, and exact description of my invention, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon, of which drawings—

Figure 1 is an elevation of the front, or outer portion of my lock, with the cover removed.

Figure 2 is an elevation of rear, or inside portion of my lock, with the cover, bolt, and knobs, removed.

Figure 3 is a sectional view of the lock, made by planes 2 2, in figs. 1 and 2, the outer and inner portions of the lock being shown in their proper position on the door, and the covers being shown on the inner and outer portions of the lock.

Figure 4 is a sectional view of the inner portion of the lock, made by plane 3 3, in fig. 2, the cover, bolt, and knobs, being shown in position.

Figure 5 is an inside view of the cover of the inner portion of the lock; the bolt, shifter-plate, lock-plate, and retaining-plate, being shown in said cover, in their proper position, with respect to themselves and the cover.

Figures 6 are detail side view and sectional view of the tumbler, arbor, and its connections.

Figures 7 are details of tumbler.

Figures 8 are detail of tumbler-collar.

Figures 9 are detail of ratchet-wheel collar.

Figures 10 are detail of ratchet-wheel.

Figures 11 are side view and plan of retaining-plate.

Figures 12 are details, showing mode of constructing the arbors, which connect the outer and inner portions of the lock, so as to render it adjustable to doors of different thicknesses.

The nature of my invention consists in the peculiar construction of a combination-lock, which is made in two parts, the inner part, which is attached to the inside of the door to be secured, containing the tumblers and bolt, with peculiar mechanism for operating and setting the same, while the outer part, which is attached to the outside of the door, and is connected with the inner part by suitable arbors, contains a simple set of wheels and levers, by means of which the tumblers are brought into a proper position for allowing the bolt to be thrown back, and which has also a knob, by which the bolt is thrown back from the outside, or the door locked when on the outside of the same.

The whole lock is so arranged, that when the door is locked it can be opened by any person from the inside, but cannot be unlocked, or opened by any person on the outside, unless such person knows on what combination the lock is set. It may be so set that it can be locked on the inside or outside, or so that it cannot be locked from the outside, or may be so left that the door may be opened or locked on either side, the peculiar utility of this lock, aside from its great number of combinations, and the great difficulty of picking it, or blowing it off, consisting in the fact, that while it has no key, it may be opened by any person knowing the combination, in the dark as well as in the light, which is a very desirable feature, especially when used for a common house-door, where persons are coming in at night, when there is little if any light.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A represents the frame-plate for the inner part of the lock, on which are arranged the posts V V V V and the uprights X X, Y, W W, and Z.

The tumbler-arbors K K K K are hung in the uprights X X and W W, as shown, and have arranged on them the tumblers *a*, tumbler-collars *b*, ratchet-wheels *c*, and ratchet-wheel collars *h*, together with the conical spiral springs *e* and stop-pin *v*, as shown.

The shifter-plate H and lock-plate I are made in the form shown, and slide in grooves in the posts V V V V, the long arms I′ I′ of the lock-plate I, sliding over the shifter-plate H, as shown.

The cover B of this inner part is of the form shown in figs. 3, 4, and 5, and has arranged in it the bolt G and the retaining-plate J, which are operated from the outside of the cover, by the knobs S and T, (see fig. 4,) which are attached to spindles on said bolt and retaining-plates, said spindles passing through suitable slots in the cover B, as fully shown in fig. 4.

The bolt G is kept pushed forward by the spiral spring U, which is placed between the back of the bolt and the upright, Y, as shown in fig. 4, being held in position by the pin *f*.

Slots *i i i i* are cut in the uprights W W, and slots a^1 a^1 a^1 a^1, of the same size as the slots *i*, are cut in the tumblers *a a a a*.

The stop-bars *j j j j* (see fig. 5) are of the same cross-section as the slots a^1 and *i*, and are cast on the lock-plate I, so as to come opposite the said slot a^1.

It is easily seen that when the slots a^1 and *i* are in line, the lock-plate I could be slid back, as the stop-bars *j j* could then slide through these slots, and also that the sliding back of the lock-plate I would draw back the bolt G, by the action of the arms I′ I′ on said bolt, as seen in fig. 5.

The outer part of the lock is composed of the case D, which has a cover composed of three pieces, d^1 *d* d^1, (see fig. 3,) which are secured in position by screws.

The spindle M, which is provided with a suitable knob, not shown in the drawings, passes through the cover-piece *d*, down through the bottom of the case D, into the door C, where it enters into a square hole in the throw-shaft L, the end of the spindle M being made square, as shown.

The throw-shaft L is, properly, a portion of the inner

part of the lock, and is arranged as shown, the pin B′, on the cover B, serving to keep one end of it in a proper position, while the other end extends through the frame-plate A into the door C, as shown.

An arm, L′, is cast on the throw-shaft L, so that by turning the spindle M, by means of the knob on its end, at the outside of the door, the shifter-plate H can be forced back, or the lock-plate I moved back, as desired.

In the case D are arranged the lever-wheels P P P P, which are fixed on the arbors N, which extend to the inner part of the lock, through the door C, as seen in fig. 3.

The slide-bars Q Q Q Q are attached to the lever-wheels P P by screws, as shown, and are arranged so as to slide in holes in the rim of the case D, and holes in the posts q^1 q^1 q^1 q^1, which are cast on the bottom of the case D.

The springs *u u u u* are arranged on the wheels P P, as shown, and cause said wheels to assume their original position, after having been turned, by pressing on the knobs *q q* on the slide-bars Q Q.

The arbors N may be made of a simple piece of round metal, if desired, as shown in fig. 2; but where the lock is to be adapted to doors of various thicknesses, they are made as shown in figs. 12, being made in two parts, N^1 and N^2, the first having a square cross-section, and the second a square hole, the two fitting together, as shown.

On the ends of the arbors N N, which project through the frame-plate A of the inner part of the lock, are fixed the pawl-wheels O O O O, in which are arranged the pawls *p p p p*, as shown in figs. 2 and 4, which work in the ratchet on the ends of the ratchet-wheels *c c*.

A thin tongue, *m*, is attached to the shifter-plate H, as shown, and fits in the grooves h^1 h^1 h^1 h^1 of the ratchet-collars *h*.

It is readily seen, that by forcing back the shifter-plate H, all the ratchet-collars *h h* will be slid back on the arbors K K.

The change-bar R has arranged in it a thin plate, *n*, which fits in the grooves b^1 b^1 b^1 b^1 in the tumbler-collars *b b b b*, and is provided with a collar, in which is cut a female thread, which works in connection with the screw r^1, which is arranged in the uprights W and Z.

It is readily seen, that by turning the screw r^1, the tumbler-collars *b b* may be slid back and forth on the arbors K K.

The tumbler-collars *b b* are provided with a slot, b^2, and a pin, b^3, is inserted in the arbor K, as shown in figs. 6 and 8, thus allowing the collars *b* to slide on the arbors K, but not to rotate around said arbor.

In the face of the collar *b* is drilled a series of holes b^4, at a uniform distance from the axis of the collar, and depending, in number, on the number of combinations to be made; and in the tumblers *a*, a pin, a^2, is inserted, so as to be at the same distance from the axis of the arbor K as the holes b^4 in the tumbler-collars *b*, from which it is readily seen, that when the tumblers and tumbler-collars are brought together, the pins a^2 can enter one of the holes b^4, and the tumblers and collars be thus caused to revolve together.

A similar arrangement is made with the ratchet-wheel *c* and ratchet-wheel collars *h*, where h^2 represents the slots in the collars; h^3, the pins in the arbors K; h^4, the pins in the ratchet-wheel collars *h*; and c^3, the holes in the ratchet-wheel *c*, which holes are the same in number as those in the tumbler-collars *b*.

It is evident that it is immaterial whether the pins and holes are arranged on the wheels, as shown, or whether they are placed in an opposite position, the holes being made in the wheels, where the pins are shown, and the pins being placed in the wheels where the holes are now shown.

The stop-pins *w w w w* are inserted in the uprights X X, as shown, one end acting in connection with the stop-pin *v* on the arbor K, and the other end serving as a point of attachment to one end of the spiral spring *e*.

The other end of this spring *e* is attached to a pin in the ratchet-wheel collar *h*, from which it is readily seen that the spring *e* performs a double service, the first being that of pressing the collar *h* against the ratchet-wheel *c*, and the second being that of causing the arbor K to rotate back to its original position, after having been rotated therefrom by any action of the ratchets *c*.

The pins b^3, h^3, and *v*, are so arranged on the arbor K, that before the tumbler *a* is set at any number, the slot a^1 shall be opposite the slot *i*, the stop-pin *v* against the stop *w*, as shown, and the spring *e* at its minimum tension against rotation, the wheels *a* and *b*, and *c* and *h*, being, at the same time, united by the pins a^2 and h^4, as before shown.

The teeth c^1 and c^2, on the face and end of the ratchet-wheels *c*, are the same in number as the holes b^4 and c^3, in the tumbler-collar *b* and ratchet-wheel *c*.

Small spring-pawls, *g g g g*, (see fig. 4,) are attached to the frame-plate A, and work in the teeth c^1 on the ratchet-wheels *c*, thus serving to prevent any backward rotation of these wheels.

The retaining-plate J is kept in position by the catch *t*, which is provided with a spring, *t′*, which forces the catch *t* into notches in the side of the plate J, as shown.

A notch, *s*, is cut in the side of the bolt G, and notch *s′* is cut in the shifter-plate H.

It is readily seen, that with the retaining-plate J in the position shown in fig. 5, the shifter-plate H could be moved back, the block r^2 on the plate J sliding into the notch *s′* in the plate H, while the bolt G would also be free to slide back; but if the plate J be slid toward the centre of the lock, the corner, *r*, would enter the notch *s*, thus preventing the bolt G from sliding back, while the block r^2 would prevent the plate H from sliding back.

If the plate J be moved from its present position, from the centre of the lock, the block r^2 would prevent the plate H from sliding back, but the bolt G would be free to slide.

Having thus fully described the construction of my lock, its operation is readily seen.

Suppose the lock not to be set on any combination, and let it be desired to set it.

The slots a^1 and *i* being in line, the lock-plate I is slid back, and held, by means of the knob on the spindle M, the bars *j j* sliding into said slots, and thus holding the tumblers *a a* in that position.

Then, by means of a key applied to the screw r^1 through a hole in the side of the cover B, the change-bar R is forced back, carrying back with it the tumbler-collars *b*.

Then, to set the lock to any particular combination of numbers, of which each number must be less than the number of holes b^4—as, for example, the numbers 3, 5, 7, 2—press on one of the knobs *q* on the slide-bars Q, in the outer part of the lock, three times. These three pressures will cause an advance of the ratchet-wheel *c* three teeth, by reason of the action of the pawl *p*, in the pawl-wheel O, on the arbor N, which carries the lever-wheel P, to which the slide-bar Q is attached.

In the same manner, the other ratchet-wheels C are caused to advance five, seven, and two teeth, respectively.

By means of the key on the screw r^1, the change-bar R is then slid back, bringing with it the tumbler-collars *b b*, and forcing the pins a^2 into one of the holes b^4, as before shown.

The knob on the spindle M being now loosened, the

spring U forces forward the bolt G, which draws the stop-bars *j j* from the slots *i* a^1, by reason of the action of the bolt G on the arms I′ I′ of the lock-plate I.

Now, it is evident that the advancing of the ratchet-wheels *c c* caused a rotary tension of the springs *e e*, and turned the stop-pins *v v* away from the stop-pins *w w*. Consequently, if the shifter-plate H be forced back, by means of the arm L′ of the throw-shaft L, which is acted on by the knob on the spindle M, until the pins h^4 h^4 are free from the holes c^3 c^3 in the ratchet-wheels *c c*, the arbors K K will be turned back by the action of the springs *e e*, until the pins *v v* strike the pins *w w*, and this turning back will cause a turning back of the tumblers *a a*, thereby throwing the slots *i i* and a^1 a^1 out of line, thus preventing the lock-plate I, and consequently the bolt G, from being forced back by means of the knob on the spindle M, at the outside of the door.

If, now, the same number of pressures be applied to the same knobs *q q*, on the outside of the door, as were applied in setting the lock to its combination, it is evident that the slots a^1 a^1 and *i i* will be brought in line, and the plate I, with bolt G, can then be slid back.

If, with the tumblers in this position, the retaining-plate J be slid, so as to prevent the shifter-plate H from sliding back, the door cannot be locked from the outside, as stated in the first part of this specification.

Having thus fully described the construction and operation of my improved lock,

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

1. The slide-bar Q, when used to produce a rotary motion of the arbor N, which connects the outer with the inner portion of the lock, substantially in the manner and for the purpose herein specified.

2. The tumbler *a*, with slot a^1, and tumbler-collar *b*, with slot b^2, and groove b^1, when arranged and combined on the arbor K, by pin a^2 and holes b^4, or their equivalents, substantially in the manner and for the purpose specified.

3. The ratchet-wheel *c*, with face-teeth c^1 and end-teeth c^2, when used in combination with the pawl *p* on the arbor N, and the spring-pawl *g*, substantially in the manner and for the purpose specified.

4. The upright, X, with stop *w*, tumbler-arbor K, with stop *v*, and pins h^3 and b^3, ratchet-wheel collar *h*, ratchet-wheel *c*, tumbler-collar *b*, and tumbler *a*, the several parts being arranged and combined, substantially as and for the purpose herein specified.

5. The combination of the spring *e*, ratchet-wheel collar *h*, arbor K, and upright, X, when said spring *e* is subjected to both a compressive and torsional strain, the several parts being arranged in the manner herein specified.

6. The shifter-plate H, with the tongue *m* attached thereto, when used in combination with the ratchet-wheel collars *h h*, substantially as and for the purpose herein specified.

7. The lock-plate I I′ I′, with stop-bars *j j*, when used in combination with the bolt G and tumblers *a a*, substantially as and for the purpose specified.

8. The retaining-plate J, with knob T and block r^2, when used in combination with the shifter-plate H and bolt G, substantially as and for the purpose specified.

9. The change-bar R, with thin plate *n* and screw r^1, or its equivalent, when used in combination with the tumbler-collars *b b*, substantially as and for the purpose specified.

10. The spindle M and throw-shaft L, with arm L′, when used in combination with the shifter-plate H and lock-plate I, substantially as and for the purpose herein specified.

11. The slide-bar Q, lever-wheel P, arbor N, pawl-wheel O, pawl *p*, ratchet-wheel *c*, arbor K, ratchet-wheel collar *h*, tumbler-collar *b*, tumbler *a*, lock-plate I I′ I′, and bolt G, the several parts being constructed, connected, and arranged, substantially as and for the purpose herein specified.

As evidence that I claim the foregoing, I have hereunto set my hand, in the presence of two witnesses, this 27th day of April, A. D. 1868.

H. S. LELAND.

Witnesses:

CLARKSON BARNABY,
JOHN N. PAXROW.