(Model.) 3 Sheets—Sheet 1.

D. STEINER & J. SCHIELE.

PERMUTATION LOCK.

No. 476,904. Patented June 14, 1892.

FIG. 3.

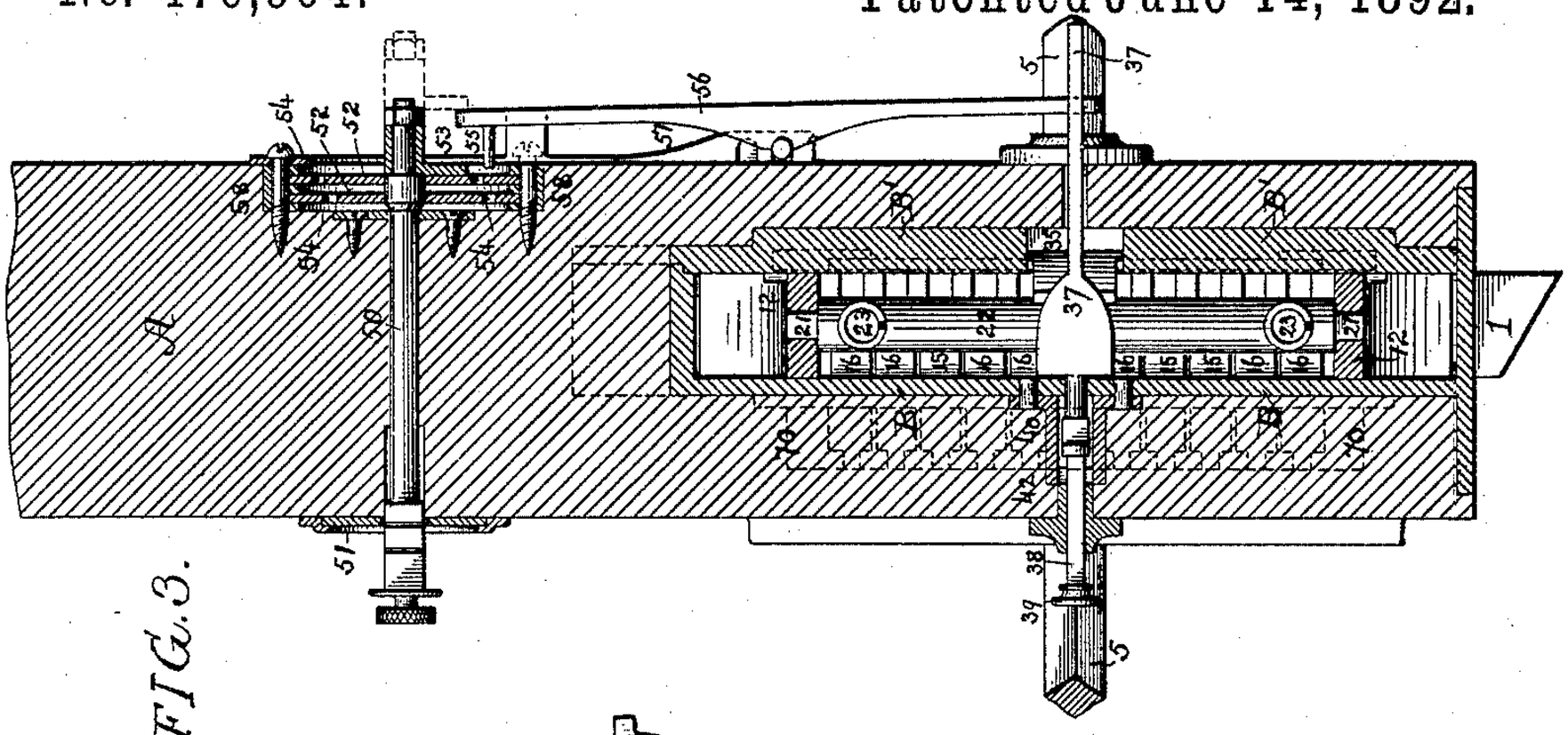


FIG. 4.

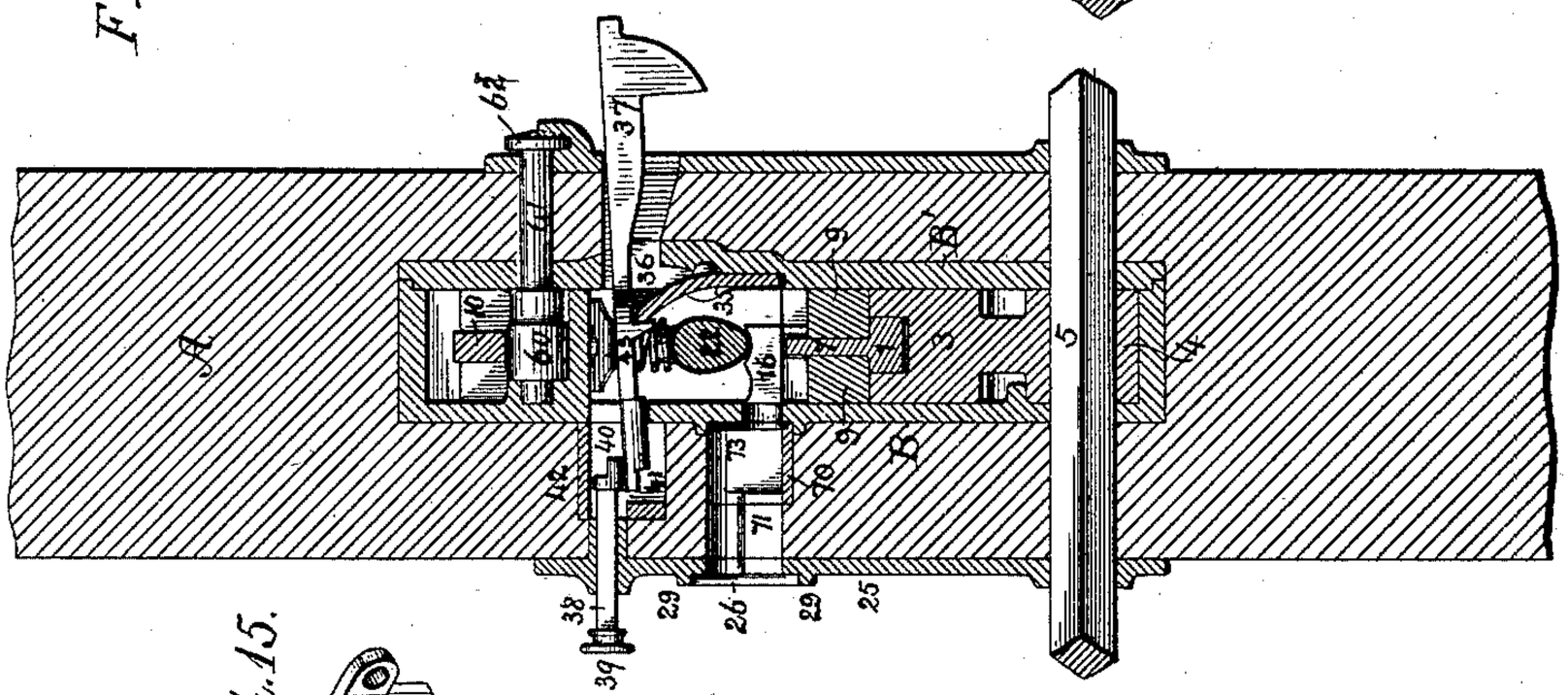


FIG. 15.

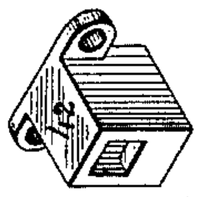


FIG. 6.

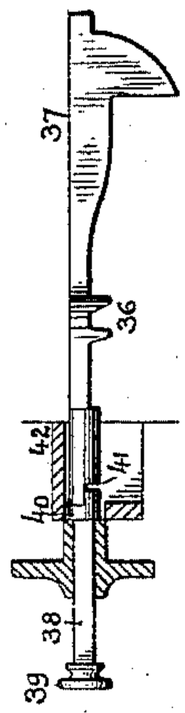


FIG. 2.

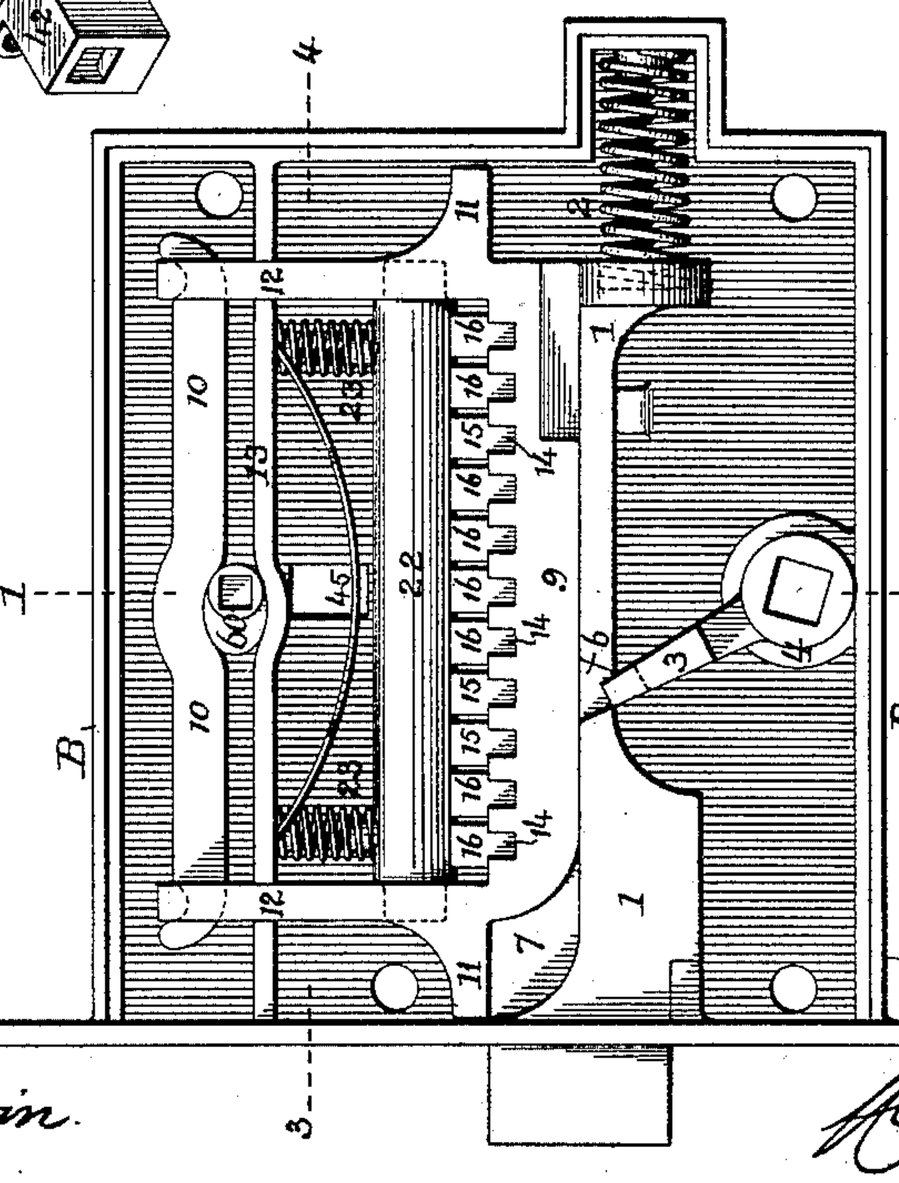
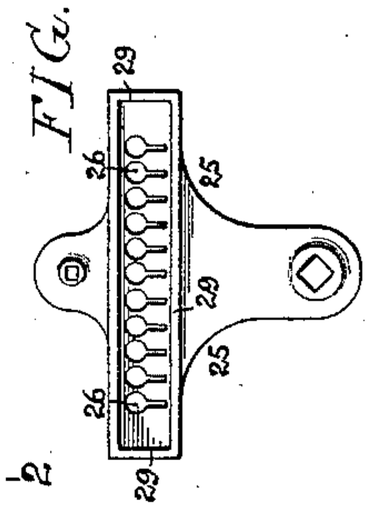


FIG. 14.



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Fred D. Goodwin.

Inventors:

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John Schiele

by their Attorneys

Howson & Howson

(Model.) 3 Sheets—Sheet 2.

D. STEINER & J. SCHIELE.

PERMUTATION LOCK.

No. 476,904. Patented June 14, 1892.

FIG. 4.

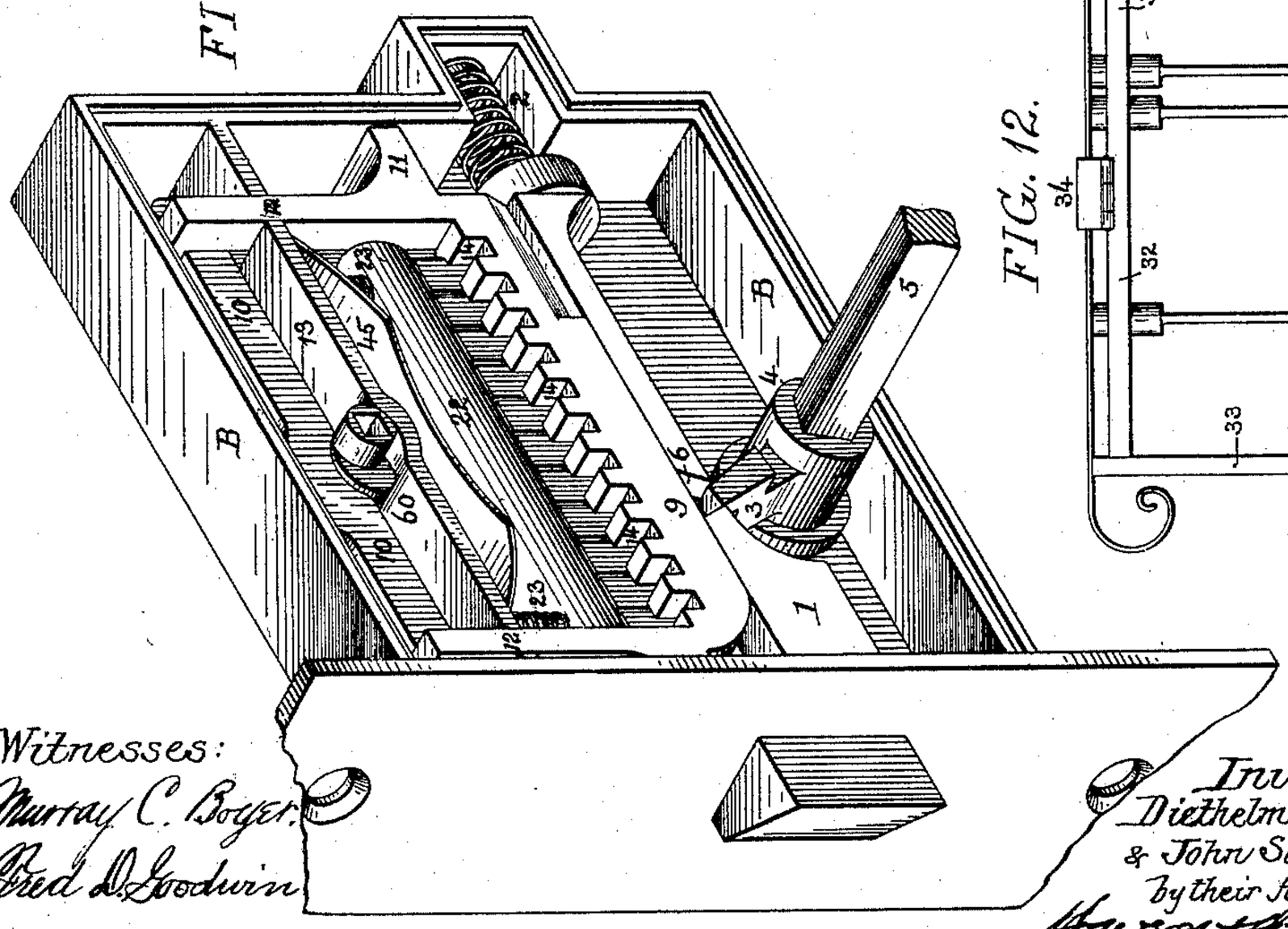

FIG. 7.

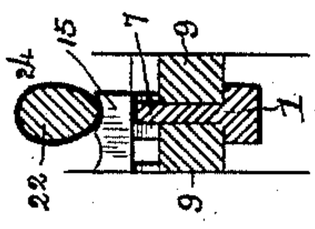

FIG. 8.

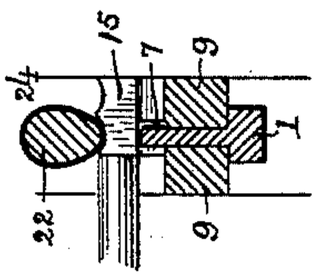

FIG. 9.

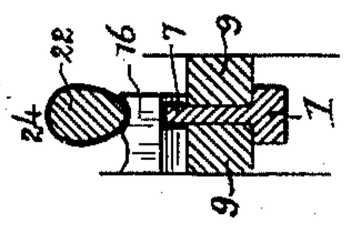

FIG. 10.

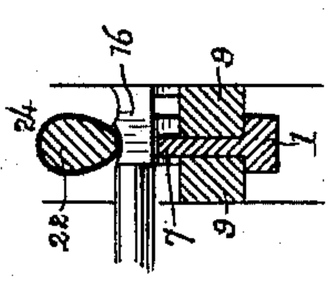

FIG. 16.

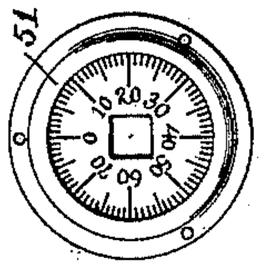

FIG. 11.

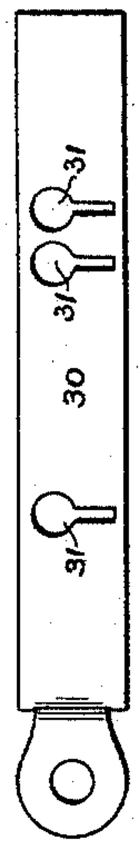

FIG. 17.

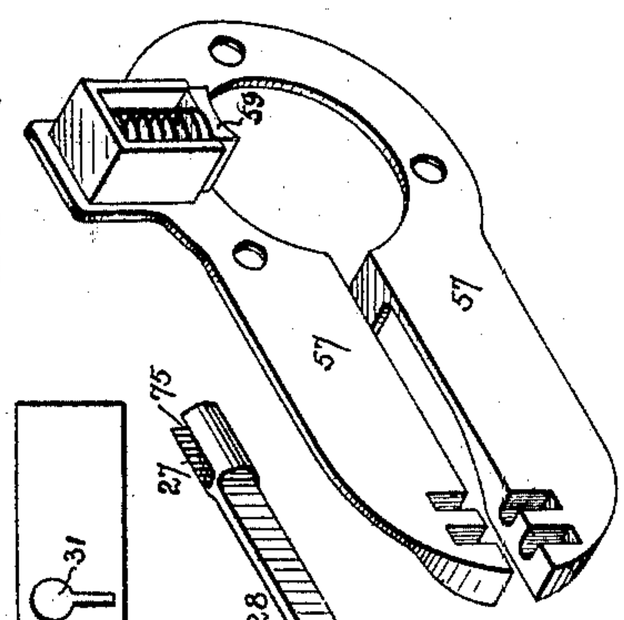

FIG. 13.

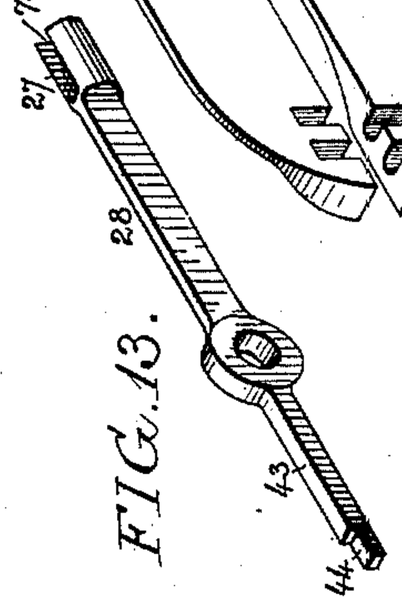

FIG. 18.

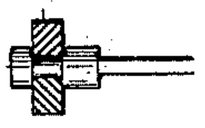

FIG. 12.

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Inventors
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by their Attorneys
Howson & Howson

(Model.)

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PERMUTATION LOCK.

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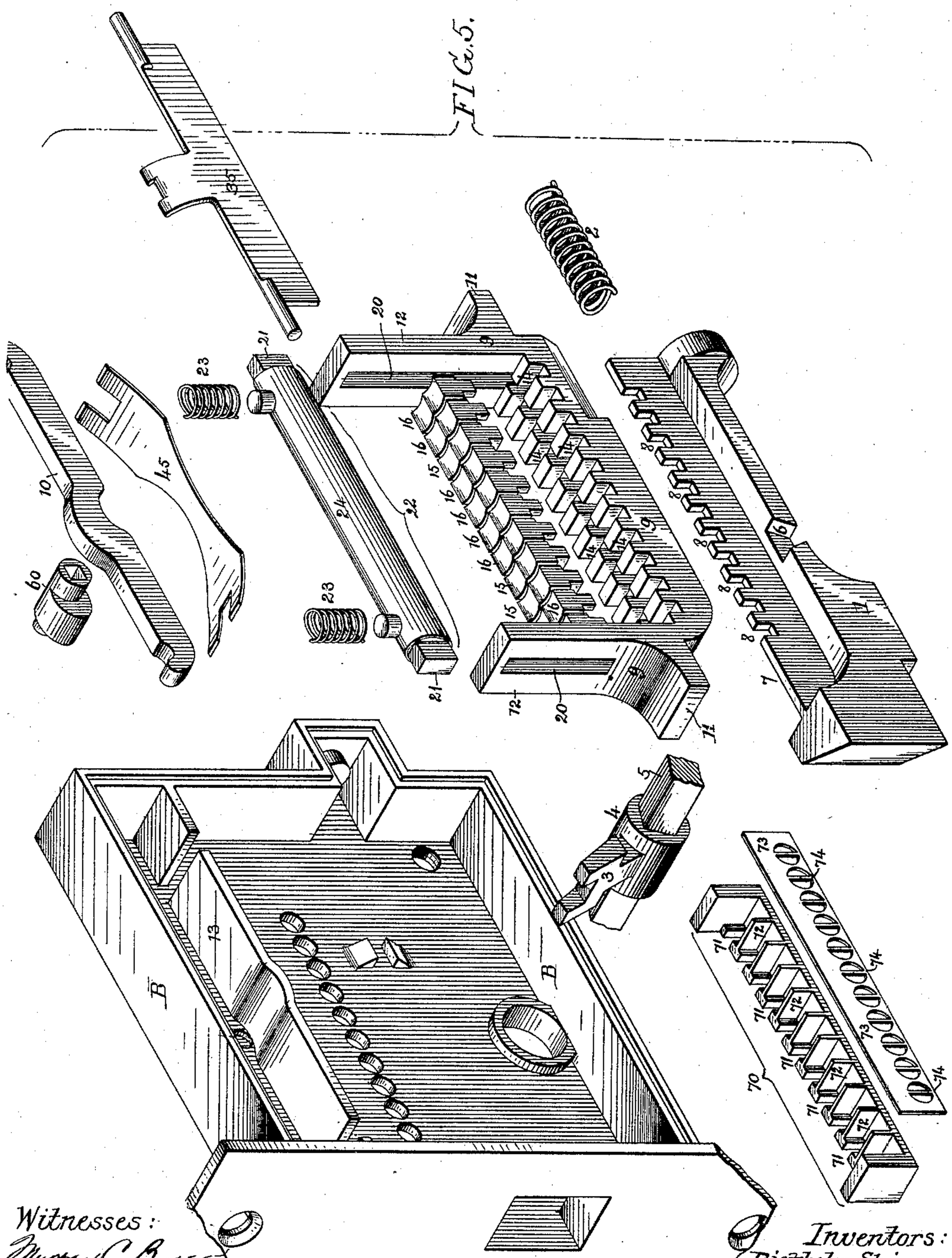
FIG. 5.



Witnesses:
Murray C. Boyer
Fred D. Goodwin

Inventors:
Diethelm Steiner
& John Schiele
by their Attorneys
Howson & Howson

UNITED STATES PATENT OFFICE.

DIETHELM STEINER AND JOHN SCHIELE, OF PHILADELPHIA, PENNSYLVANIA.

PERMUTATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 476,904, dated June 14, 1892.

Application filed June 4, 1891. Serial No. 395,123. (Model.)

To all whom it may concern:

Be it known that we, DIETHELM STEINER, a citizen of the Republic of Switzerland, and JOHN SCHIELE, a citizen of the United States, and both residents of Philadelphia, Pennsylvania, have invented certain Improvements in Locks, of which the following is a specification.

Our invention consists of a novel form of combination tumbler-lock in which the proper tumblers are operated by a suitable key so as to release the bolt and in which the operation of any tumblers other than those forming the proper combination will serve to lock the bolt and prevent its movement until the combination is reset. The lock is also provided with means for relocking the bolt either from one side of the lock or the other after the bolt has been unlocked by means of the key, and it is also provided with a secondary combination-dial and permutation-disks, whereby the combination of the main lock can be reset from the outside by any one having a knowledge of said secondary combination in case the main combination has been disarranged by any one attempting to pick the lock or otherwise tampering with the same or operating the wrong tumblers. The lock also possesses certain minor features of construction, all of which are so fully set forth and claimed hereinafter that any preliminary reference thereto will be unnecessary.

In the accompanying drawings, Figure 1 is a vertical sectional view of a door provided with a lock constructed in accordance with our invention, the section being on the line 1 2, Fig. 2. Fig. 2 is a rear view of the lock with the cover-plate removed and some of the minor parts also detached. Fig. 3 is a sectional plan view of part of the door and the lock, the section being on the line 3 4, Fig. 2, and the secondary mechanism for resetting the main combination being also illustrated. Fig. 4 is a perspective view of so much of the lock as is illustrated in Fig. 2. Fig. 5 is a series of perspective views showing the various parts of the lock detached from each other, and Figs. 6 to 18 are detached views illustrating the operation of the lock or special devices employed in connection therewith.

In Figs. 1 and 3, A represents part of a door, which is suitably mortised for the reception of the case B of the lock, this case having a detachable cover-plate B′, as in ordinary locks. Within the case is suitably guided the locking-bolt 1, which is acted upon by a spring 2, tending to project it, and is also acted upon by an arm 3, projecting from a hub 4, which receives the knob-spindle 5, the outer end of the arm 3 being forked, so as to engage with openings 6, formed in the bolt 1 on opposite sides of the same, as shown in Fig. 1, or, if desired, there may for convenience be but one of these openings and but one projection on the arm 3. The bolt 1 is recessed at the top, so as to form a contracted web 7, which has in its upper edge a series of notches 8, and above the bolt is a tumbler-carrying frame 9, which is recessed for the reception of the contracted web 7 of the bolt, and thus spans the same, as shown in Fig. 1, this tumbler-carrying frame being suspended from a bar 10 in the upper portion of the lock-casing and being guided so as to move vertically by reason of the fact that it has projecting ends 11, bearing against the ends of the lock-casing, and also has suspending-arms 12, adapted to slots in a longitudinal partition 13, formed in the lock-case near the top of the same.

The frame 9 has notches 14 in line with the notches 8, formed in the narrow web of the bolt, and in these notches are guided the shanks of a series of tumblers 15 and 16, which we denominate, respectively, "live" tumblers and "dummy" tumblers, the distinction between the two sets of tumblers being in the character of the notches formed in the shanks of the same. This difference will be understood on reference to Figs. 7, 8, 9, and 10, where it will be seen that the live tumblers are so formed that when said tumblers occupy their foremost position, as shown in Fig. 7, a portion of the shank of the tumbler engages with the notch in the upper edge of the narrow web 7 of the bolt, the notch being in front of said web, so that when the tumbler is pushed inward by the key to the proper extent the notch in the same is brought into line with the bolt-web, and the latter is thereby released from the control of the tumbler, as shown in Fig. 8. In the dummy tumblers

16, however, a reverse construction is adopted—that is to say, when the tumblers are in their foremost positions their notches are in line with the web of the bolt, as shown in Fig. 9; but when either of said tumblers is pushed inward a portion of its shank is caused to enter the notch in the web of the bolt, and thus lock the same, as shown in Fig. 10.

When the lock is in its normal position, all of the tumblers occupy their foremost position, as shown in Figs. 7 and 9. Hence in order to unlock the bolt, so as to permit it to be retracted by turning the knob, it is necessary to push inward all of the live tumblers 15 until their notches coincide with the narrow web of the bolt, as shown in Fig. 8; but if any of the dummy tumblers are pushed inward the shank of the same engages with the notched web of the bolt, and thus effectually locks the same until the combination is reset by restoring all of the tumblers to their foremost position, as hereinafter described.

Each of the tumblers has an enlarged head, in which are formed two transverse recesses, and in suitable slots 20 in the suspending arms 12 of the frame 9 are guided the opposite ends 21 of a bar 22, which is acted upon by springs 23, tending to depress it, and is preferably provided with a covering 24 of rubber or other elastic or semi-elastic material. The bottom of the bar 22 is rounded and the recesses in the heads of the tumblers are likewise rounded, the bar engaging with the rear recess of the tumblers when said tumblers are projected, as shown in Figs. 7 and 9. The recesses are comparatively shallow, however, so that when a tumbler is pushed inward the bar 22 will yield sufficiently to permit of such movement and will then engage with the front recess. Hence while the tumblers can be readily moved by means of a suitable key they cannot be accidentally displaced so as to derange the combination.

The front plate or escutcheon 25, which is applied to the face of the door, is shown in Fig. 14, on reference to which it will be seen that said plate has formed in it as many keyholes 26 as there are tumblers, and each of these keyholes has an enlarged upper portion corresponding with the enlarged head 27 of the key, as shown in Fig. 13, the lower portion of each keyhole being contracted, as shown in Fig. 14, so that it will receive the contracted stem or shank 28 of the key. In using the latter it is therefore necessary to first insert the head of the same through the enlarged upper portion of the keyhole for a proper distance, and the key must then be depressed in order to bring it into line with the tumbler.

Secured to and projecting forwardly from the front face of the lock-casing is a key-box 70, open at the top, but having a front plate with notches 71 wide enough for the narrow shank of the key and a series of partitions 72, by which it is divided into a series of chambers or pockets side by side, each of these pockets being just large enough both as regards length and width to receive the enlarged head of the key, and to the front face of the lock-casing is secured a key-gate 73, each of the key-openings in which is in line with one of the tumblers and has a vertical partition 74 for entering the slot 75 in the head of the key as the latter is projected.

The key-box and key-gate are shown most clearly in Fig. 5. The partitions 74 of the key-gate openings are in line with the notches 71 in the front of the key-box and also with the coutracted lower portions of the keyholes 26 in the plate 25, so that if a wire or other implement is passed through the lower portion of the keyhole it cannot reach the tumblers because of these partitions, while any implement introduced through the upper portion of the keyhole is under the additional disadvantage of being out of line with the tumbler, so that the picking of the lock or any opening of the same except with the special key is prevented.

For the purpose of facilitating the opening of the lock by means of the proper key a guide-plate 30—such as shown in Fig. 11—may be employed. This guide-plate is adapted to fit into a fillet 29, which surrounds the series of keyhole-openings 26, and in the plate are openings 31 corresponding to those keyholes into which the key must be inserted in order to open the lock, or, if desired, a compound key and carrier—such as shown in Fig. 12—may be employed, there being in this case a series of keys properly disposed with reference to the given combination and carried by a duplex bar 32, Fig. 18, which is guided in a frame 33, and can be moved in said frame so as to project all of the keys simultaneously, the bar being normally held in a retracted position by means of a suitable catch 34.

In order to relock the bolt after the door has been opened, a lever 35 is hung to the inner side of the cover-plate B′ of the lock, the lower arm of this lever extending along the entire series of tumblers from one of the arms 12 of the frame 9 to the other, and the upper arm of the lever engaging with a notched projection 36 on a bar 37, which projects on the inside of the door. By pulling this bar inward, therefore, the lever 35 is caused to move forward any of the tumblers which have been pushed inward by the key in opening the lock, thereby again locking the bolt. The bar 37 is acted upon by an arched spring 45, which tends to depress the front end of the bar and cause the lever 35 to occupy, normally, the retracted position shown in Fig. 1, so that it is out of the way of the tumblers when the latter are pushed inward by the key.

In order to provide for relocking the bolt from the outside of the door, a square rod 38 is guided in the upper portion of the front plate 25, this rod having a knob 39 at the outer end and a notched head 40 at the inner

end. Before closing the door the rod 38 is pulled outward and the notched front end 41 of the bar 37 is raised, and the bar is then pushed inward so as to cause the head 40 to engage with said notched end of the bar 37, as shown in Fig. 6. When the door is closed, therefore, the simple pushing inward of the knob 39 will effect a like movement of the bar 37 and will cause the lever 35 to swing so as to lock the bolt. The front end of the bar 37 swings in a box 42, Fig. 15, the front end of which is closed as to the lower portion, so that in case the plate 25 and rod 38 are removed direct access to the front end of the bar 37 is still prevented, and readjustment of the tumblers cannot be effected by any one tampering with the lock. If one or more of the dummy tumblers 16 has been moved to engage with the bolt, the latter cannot be released by the operation of the live tumblers, and it therefore becomes necessary to provide some means for resetting the combination from the outside of the door when the latter is locked, and cannot be unlocked by the proper key in the possession of any one having a knowledge of the main combination. For this purpose we use a secondary device in the nature of a combination-lock and comprising a spindle 50, guided in the door adjacent to the main lock, this spindle having at the front end a suitably-graduated dial 51, Fig. 16, through which a square portion of the spindle can slide longitudinally, while at the rear end of the spindle are a series of permutation-disks 52, any number of which may be used, two being shown in the present instance. These disks have central openings adapted to be engaged by an enlarged portion or projection upon the spindle 50, which also has at its inner end a projecting finger 53, as shown in Fig. 3. In the disks 52 are openings 54, and when the disks are properly adjusted these openings are in line with a pin 55 on one arm of a lever 56, which is hung to a suitable plate 57, the other arm of the lever engaging with the hooked inner end of the bar 37. In order to reset the combination by means of this device, the spindle 50 is first pulled outward to its full extent, so that the enlargement or projection at its inner end engages with the first of the disks 52, and the spindle is then turned until said disk has been moved so as to bring its opening 54 into line with the pin 55 of the lever 56, this movement being determined by a proper number or other character upon the dial. The spindle is then pushed inward to a suitable mark on the square outer end, so as to release the first disk and engage with the second disk, and the latter is then turned in like manner, so as to bring its opening into line with the pin 55, and the spindle is then pushed inward to its full extent, so as to release the second disk, and is then turned so as to cause its finger 53 to overlap the end of the lever 56, as shown by dotted lines in Fig. 3, whereupon an outward pull upon the spindle will cause an inward pull upon the bar 37, and thus effect the resetting of the combination.

The disks 52 are suitably guided and retained laterally by outer rings 58 and a box on the plate 57 carries a spring-actuated block 59, Fig. 17, which exerts such friction upon the disks as to prevent any accidental movement of the same.

In order to provide for readily opening the door from the inside when the combination is set and the bolt is locked by the live tumblers, we provide means for lifting the entire frame 9 and all of the tumblers carried thereby, so as to release the bolt and permit it to be operated by means of the knob-spindle, the lowering of the frame again causing the locking of the bolt without derangement of the combination. For this purpose we use a cam 60, mounted on the partition-plate 13 and acting on the transverse bar 10, from which the tumbler-frame is suspended, as shown in Fig. 2, the hub of this cam receiving a spindle 61, which has on the inside of the door a knob or head 62 of any desired character, so that the spindle can be readily turned in order to raise or lower the tumbler-frame.

If desired, the key may have a portion of its shank squared, as shown at 43, Fig. 13, so that it can be used as a spindle for operating the bolt-moving arm 3 in place of the knob-spindle, and this squared portion of the key may be notched at the end, as shown at 44 in Fig. 13, so that it can be used in place of the rod 38 for operating the bar 37.

Having thus described our invention, we claim and desire to secure by Letters Patent—

1. A lock in which a notched bolt is combined with a series of live and dummy tumblers which have no tendency to move in either direction, but are adapted to engage directly with and to be disengaged from said notched bolt, each tumbler having a single notch in one edge, and the notches of the respective tumblers being so arranged that the live tumblers will normally lock the bolt, but when moved by a single movement will release the same, while the dummy tumblers normally release the bolt, but when moved by a single movement lock the same, substantially as specified.

2. A lock in which the notched bolt is combined with live and dummy tumblers notched as described, a notched frame in which said tumblers are guided transversely to the bolt, and means for lifting said frame so as to carry all of the tumblers out of engagement with the bolt, substantially as specified.

3. A lock in which a notched bolt is combined with a series of notched tumblers, a frame in which said tumblers are guided transversely, and a spring presser-bar extending along the series of tumblers and acting upon all of said tumblers, substantially as specified.

4. The combination of the notched bolt, the transversely-moving tumblers having heads

each with two recesses side by side, and the spring presser-bar bearing upon said tumblers and adapted to enter either recess of the same, substantially as specified.

5. The combination of the notched bolt and the transversely-moving tumblers with the keyhole-plate having openings enlarged at the end and with a key having an enlarged head and contracted shank, whereby it must first be introduced in one direction and then moved in a direction at right angles thereto before it can act on the tumbler, substantially as specified.

6. The combination of the notched bolt and the transverse tumblers, the key having an enlarged head and contracted shank and the key-box having contracted notches for the shank of the key and pockets for the enlarged head of the same, substantially as specified.

7. The combination of the notched bolt and the transverse tumblers, the key having an enlarged head and contracted shank, the keyhole-plate having openings enlarged at one end, and the key-box having pockets for the reception of the enlarged head of the key, but in a different plane from said enlarged ends of the keyhole, substantially as specified.

8. The combination of the notched bolt and the transverse tumblers with the key having a slotted head, the key-gate having partitioned openings, and means for preventing the preliminary insertion of the key in line with the openings in said key-gate, substantially as specified.

9. The combination of the notched bolt, the transversely-moving tumblers, and means, substantially as described, including a graduated dial and permutation-tumblers, for restoring said tumblers and locking the bolt after they have been moved from their normal position to unlock the bolt, substantially as set forth.

10. The combination of the notched bolt, the transversely-moving tumblers, the relocking-bar, and the relocking-lever having one arm for engaging with the tumblers and the other arm engaging with the bar, substantially as specified.

11. The combination of the notched bolt, the transversely-moving tumblers, the relocking-lever, the bar engaging therewith, and means for operating said bar from the outside of the door, substantially as specified.

12. The combination of the notched bolt, the transversely-moving tumblers, the resetting mechanism, and means for operating said resetting mechanism, comprising a spindle, a graduated dial, and a series of permutation-disks which must be adjusted to predetermined position before the resetting device can be operated, substantially as specified.

13. The combination of the notched bolt, the transversely-moving tumblers, the locking-lever and its bar, the resetting-lever, the permutation disks and dial, and the spindle having a squared and graduated portion engaging with the dial, an enlarged portion for engaging with the permutation-disks, and a finger for engaging with the resetting-lever, substantially as specified.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

DIETHELM STEINER.
JOHN SCHIELE.

Witnesses:
EUGENE ELTERICH,
HARRY SMITH.