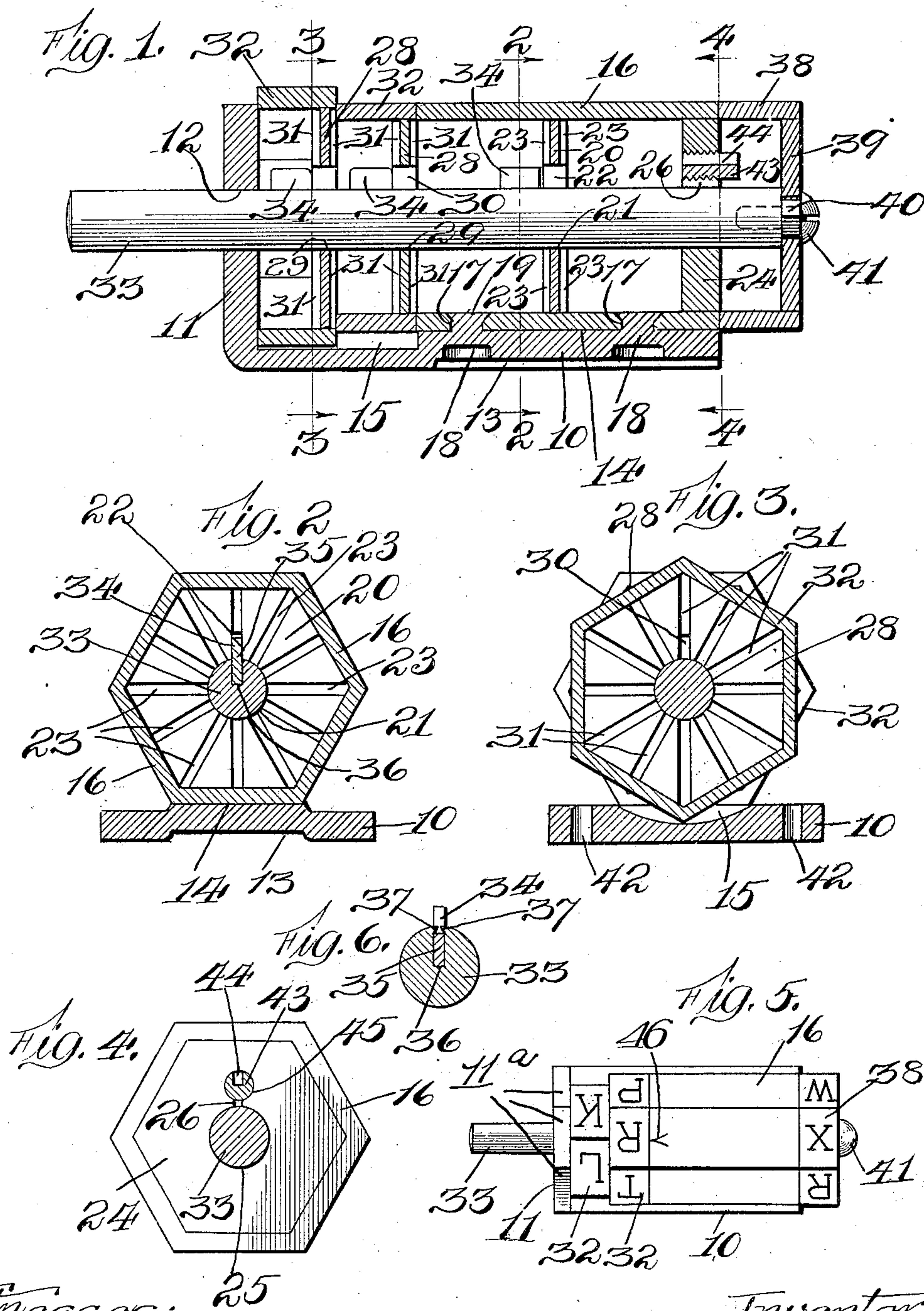


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PATENTED MAY 19, 1908.

D. CHURCHILL.  
PERMUTATION LOCK.  
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Acting



# UNITED STATES PATENT OFFICE.

DURAND CHURCHILL, OF CHICAGO, ILLINOIS.

## PERMUTATION-LOCK.

No. 887,771.

Specification of Letters Patent.

Patented May 19, 1908.

Application filed August 6, 1906. Serial No. 329,327.

*To all whom it may concern:*

Be it known that I, DURAND CHURCHILL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Permutation - Locks, of which the following is a full, clear, and exact specification.

This invention relates to improvements in permutation locks containing a rotatable bolt and tumblers, each of which may be rotated independently of the other; the bolt being provided with retaining lugs adapted to pass through slots in the tumblers to wholly or partially withdraw the same through the tumblers when the latter are properly arranged, and the primary object of the same is to provide an improved device of this character so constructed and arranged as to prevent the lock from being opened by feeling for the slot or opening in the tumbler with the lugs or the bolt.

A further object is to provide improved means for preventing the entire withdrawal of the bolt.

A further object is to provide an improved manner of constructing the tumblers.

A further object is to provide an improved device of this character in which the tumblers may be readily changed to alter the combination, and in which the operator may be able to tell by feeling whether the tumblers are properly set.

A further object is to construct an improved, durable and efficient lock of this character, which shall be of simple and efficient construction.

To the attainment of these ends, and the accomplishment of other new and useful objects, as will appear, the invention consists in the features of novelty in the construction, combination, and arrangement of the several parts hereinafter more fully described and claimed, and shown in the accompanying drawing illustrating an exemplification of the invention, and in which:—

Figure 1 is a longitudinal sectional view, partly in elevation, of a lock constructed in accordance with the principles of this invention; Fig. 2 is a sectional view on line 2—2, of Fig. 1. Fig. 3 is a sectional view on line 3—3 of Fig. 1; Fig. 4 is a sectional view on line 4—4 of Fig. 1; Fig. 5 is a top plan view of Fig. 1; Fig. 6 is a detail sectional view of the bolt showing the manner in which the

key carrying the locking lugs or projections is secured to the bolt.

Referring more particularly to the drawings, and in which the same reference numerals designate similar parts throughout the several views, the numeral 10 designates a base-plate of any suitable size and material, one end of which is bent upward at a right angle to the body portion, as at 11, to form a support for the bolt, as will be set forth, and said bent or upturned portion is provided with a centrally disposed aperture 12. A portion of the base-plate adjacent the end opposite the portion 11 is stamped or pressed upwardly, as at 13, to form a bearing or supporting surface 14, which terminates short of the upturned end 11, and the portion of the base 10 between the end of the upstruck portion 14 and the bent portion 11 is cut away or countersunk, as at 15, for a purpose to be set forth.

A shell or casing 16, preferably hexagonal in shape, rests upon the base 10 in such a position that one of its faces engages the face 14 of the raised portion, and this end of the shell or casing is preferably flush with the end of the base 10, and the other end terminates adjacent one end of the countersunk portion 15, and substantially flush with the end of the upstruck portion. This shell or casing may be secured to the base in any desired manner, but a simple and efficient means consists in providing the face which contacts with the base, with apertures 17, and then forcing a portion of the base, as at 18, into the apertures and riveting or upsetting the extremity of said portion, as at 19, in any suitable or convenient manner. Within the shell or casing, preferably midway of its length, is a partition comprising a body-portion 20, having a centrally disposed aperture or opening 21 of a diameter substantially equal to the diameter of the opening 12 in the portion 11, and communicating with this opening is a slot or opening 22. Extending radially from the opening 21, to the periphery of the partition, and formed in both faces thereof, are a plurality of grooves or channels 23. After being thus formed, the partition is inserted within the shell or casing and secured in position in any desired manner, preferably by means of solder disposed between the walls of the shell or casing, and the edges of the partition. The outer end of the shell or casing being closed by a suitable



head or closure 24, which preferably fits within so as to engage the walls thereof and with its outer face flush with the end of the casing. This head may be secured in a position in a manner similar to the partition 20, and is provided with an aperture 25, of the same diameter as, and in line with the apertures 12 and 21 of the end 11 and partition 20. Communicating with this aperture 25 is a slot or opening 26 which is preferably of a size equal to the slot or opening 22, and these slots or openings 22, 26, are arranged to register with each other.

Any suitable number of tumblers may be provided, and disposed between the end 11 of the base 10 and the extremity of the shell or casing 16, according to the length of space left therebetween, and as the construction of each tumbler is identical, a description of one will apply to each.

The tumbler preferably comprises a body portion 28, having a central aperture 29, and a slot or opening 30 passing through the body and communicating with the aperture 29. Each face of the body portion 28 is provided with a plurality of radiating grooves or channels 31 which extend from the apertures 29 to the periphery of the body. The body portion is inserted within a shell or casing 32 of some width, and is secured therein adjacent one end in any suitable manner, such as by means of solder or the like.

The shell or casing 32 of the tumblers is preferably hexagonal and of a contour similar to the contour of the shell or casing 16, and is supported over the cut-away or countersunk portion 15 in the base 10. The upper end of the portion 11 is also provided with faces 11<sup>a</sup> which are co-incident with the faces of the casing or shell 16, and also the faces on the tumblers.

A suitable locking bolt 33 of any desired length is provided with lateral projections 34 located intermediate its ends, preferably one projection for each tumbler and one for the partition 20. These projections are preferably arranged in line with each other and may be formed on the bolt in any desired manner. A simple and efficient method consists in forming the projections 34 on a key or body portion 35 and inserting the key or body portion into a suitable groove 36 in the bolt 33, so that the top thereof stands just below the top of the groove 36, and then swaging or calking a portion of the bolt adjacent the groove, as at 37 (Fig. 6) over the top of the key or body portion 35, which will securely hold the latter in position, but will permit its removal when desired, for any reason.

When the slots 30, 22 and 26, respectively, in the tumblers, the partition 20, and the head 24, are in alinement, the bolt 33 may be placed in position by inserting the same into the aperture 25 in the head 24, so that the

foremost projection 34 will pass through the slot 26, and may then be pushed through the partition 20, and tumblers, with its extremity passing through the aperture 12 in the portion 11 and extending for some distance beyond the said portion. A head, preferably in the shape of a shell 38, having a closed end 39, is provided with an angular aperture adapted to receive a shouldered angular portion 40 on the end of the bolt, adjacent the head 24 of the shell 16, and is removably secured to the bolt by means of a screw 41 passing into the extremity of the bolt and with its head resting against the outer face of the head 39. This head 39 is preferably of the same configuration as that of the shell or casing 16.

The shell 38 and each of the tumblers is provided with any suitable character on each of the peripheral faces, which are adapted to indicate when the tumblers and bolt have been brought into proper position to cause the slots to aline so that the projections 34 on the bolt will pass therethrough to permit the bolt to be withdrawn. The lock may be secured to a closure in any suitable manner, such as by means of screws or bolts passing through suitable apertures 42, in the base 10, and a suitable keeper (not shown) is adapted to receive the extremity of the bolt. After the bolt has been shot or withdrawn to unlock the closure, the tumblers and the bolt may be given a twirl to displace them with relation to each other. The cut-away or countersunk portion 15 in the base receives the corners of the tumblers to permit them to be rotated with or about the bolt.

In order to prevent the bolt from being entirely withdrawn so as to prevent disassembling of the parts, there is provided a screw or rotatable member 43 having a longitudinal slot 44 extending the entire length thereof. This screw or member is mounted in the head 24 of the shell or casing 16 in a bearing 45, which communicates with the slot 26. When this screw or member 43 is rotated so as to bring the slot 44 therein to register with the slot 26, and the slots 30 in the tumblers are also in register therewith, then the projections 34 on the bolt will pass through all of the slots and the bolt may be removed from the shell or casing, and the tumblers changed to change the combination, after which the bolt may be replaced. When the bolt has reached the position normally assumed when unlocked the screw or member 43 may be rotated (preferably to the position shown in Figs. 1 and 4) to cause the slot 44 to move out of alinement with the slot 26, in which position the bolt cannot be entirely withdrawn, as one of the projections 34 will strike the end of the screw or member 43 which latter serves as a stop or lock. The projecting end of the screw or member 43 will enter and be housed and concealed by the



shell 38 when the bolt is in its operative position. By constructing the shell or casing hexagonal, or angular in shape, and the tumblers and head of the bolt of a similar configuration, it will be seen that the operator can easily feel when the proper faces coincide and can more easily hold them in position, while the remaining tumbler is being adjusted.

10 If desired, and as shown in this exemplification, one of the tumblers may be arranged so that a corner formed by two of the angular faces must be arranged midway between the sides of the top face of the shell or casing 16, and for this purpose and to insure accuracy of adjustment, a suitable indicator 46 may be provided on said face, preferably at the adjacent end of the casing. With such a construction, it will be noted that all 20 of the grooves or channels 31 and 23 serve as false slots or notches for the reception of the projections or lugs 34 to prevent the slots 30 and 22 being found by partially withdrawing the bolt, and feeling for the proper notch by 25 pressing the projections against the face of the tumblers and partition, while turning the bolt to unlock the same.

The grooves or channels on the opposite sides of the tumblers and partition serve in 30 the same capacity to prevent the proper notches from being found in a similar manner, when the lock is open.

In order that the invention might be fully understood, the details of an embodiment 35 thereof have been thus specifically described, but

What I claim is:—

1. In a permutation lock, the combination of a base having one end bent at an angle 40 thereto and provided with an aperture, a shell or casing secured to the base adjacent one end and being spaced from the bent end, said shell or casing being provided with angular faces, a partition in the casing and a 45 closure for the free end, said partition and closure being provided with registering apertures alined with the aperture in the bent end, a tumbler disposed within the space between said end and the adjacent end of the 50 shell or casing, and being also provided with an aperture registering with the other apertures, a bolt passing through the alined apertures, and lugs projecting from the bolt, said tumbler and partition being each provided 55 with a slot through which the lugs pass, and said tumbler being provided with angular faces adapted to coincide with the faces of the shell or casing.

2. In a permutation lock, the combination 60 of a base having one end bent at an angle thereto and provided with an aperture, a shell or casing secured to the base adjacent one end and being spaced from the bent end, said shell or casing being provided with an- 65 gular faces, a partition in the casing and a

closure for the free end, said partition and closure being provided with registering apertures alined with the aperture in the bent end, a tumbler disposed within the space between said end and the adjacent end of the 70 shell or casing, and being also provided with an aperture registering with the other apertures, a bolt passing through the alined apertures, lugs projecting from the bolt, said tumbler and partition being each provided 75 with a slot through which the lugs pass, and a head on the bolt adjacent the closed end of the shell or casing for operating the bolt, said head and tumbler being each provided with angular peripheral faces adapted to coincide 80 with the faces of the shell or casing to direct the parts into operative position.

3. In a permutation lock, the combination of a base having one end disposed at an angle thereto and provided with an aperture, a 85 shell or casing secured to the base and spaced from said end, said shell or casing and end being provided with angularly disposed coinciding faces, a partition in the shell or casing having an aperture registering with the 90 aperture in the angularly disposed end and being provided with a slot communicating with the aperture, a tumbler disposed within the space between the shell or casing and said end, said tumbler being provided with a slot 95 and aperture adapted to respectively register with the slot and aperture in the partition, a bolt passing through the alined aperture and lugs on the bolt adapted to pass through the slots, said tumbler being provided with an- 100 gularly disposed peripheral faces adapted to co-incide with the faces on the shell or casing, and the angularly disposed end of the base for directing the tumbler into operative position. 105

4. In a permutation lock, the combination of a base having one end disposed at an angle thereto and provided with an aperture, a shell or casing secured to the base and spaced from said end, said shell or casing and 110 end being provided with angularly disposed coinciding faces, a partition in the shell or casing having an aperture registering with the aperture in the angularly disposed end and being provided with a slot communicating with the aperture, a tumbler disposed 115 within the space between the shell or casing and said end, said tumbler being provided with a slot and aperture adapted to respectively register with the slot and aperture in 120 the partition, a bolt passing through the alined apertures and lugs on the bolt adapted to pass through the slots, said tumbler being provided with angularly disposed peripheral faces adapted to coincide with the faces on 125 the shell or casing, and the angularly disposed end of the base for directing the tumbler into operative position, and said base being provided with a countersunk or recessed portion adapted to receive the corners 130



formed by the faces on the tumbler to permit rotation of the latter.

5. In a permutation lock, the combination of a base, a support adjacent one end thereof, a shell or casing spaced from the support and resting upon and secured to the base by forcing a portion of the base through the wall of the casing and upsetting said portion, a partition in the shell or casing, a tumbler disposed between the support and shell or casing, said support, tumbler and partition being provided with alined apertures, and said tumbler and partition being each provided with a slot communicating with the respective aperture, a bolt passing through the apertures, and lugs on the bolt adapted to engage the partition and tumbler and pass through the slots therein when the latter are placed in alinement.

6. In a permutation lock, the combination of a base, a support, a casing provided with a closed end secured to the base with its open end spaced from the support, said closed end and support being provided with alined apertures and said end being also provided with a slot communicating with the aperture therein, a partition in the casing, a tumbler disposed within the space between the end of the casing and the support, said partition and tumbler being provided with registering apertures alined with the apertures in the end of the casing and support, and each being also provided with a slot communicating with the respective aperture and adapted to aline with the slot in the casing end, a bolt passing through the apertures, lugs on the bolt adapted to engage the tumbler and partition and pass through the slots therein, and the slot in the casing end where said slots are placed in alinement, and means for preventing the passage of the lugs through the slot in the casing end.

7. In a permutation lock, the combination of a base, a support, a casing provided with a closed end secured to the base with its open end spaced from the support, said closed end and support being provided with alined apertures and said end being also provided with a slot communicating with the aperture therein, a partition in the casing, a tumbler disposed within the space between the end of the casing and the support, said partition and tumbler being provided with registering apertures alined with the apertures in the end of the casing and support, and each being also provided with a slot communicating with the respective aperture and adapted to aline with the slot in the casing end, a bolt passing through the apertures, lugs on the bolt, adapted to engage the tumbler and partition and pass through the slots therein and the slot in the casing end when said slots are placed in alinement, a member supported by the casing end and provided with a slot adapted to register with the slot in said end

to permit the lugs to pass therethrough, and means for partially closing the slot in the casing end to prevent the passage of the lugs therethrough.

8. In a permutation lock, the combination of a base, a support, a casing provided with a closed end secured to the base with its open end spaced from the support, said closed end and support being provided with alined apertures and said end being also provided with a slot communicating with the aperture therein, a partition in the casing, a tumbler disposed within the space between the end of the casing and the support, said partition and tumbler being provided with registering apertures alined with the apertures in the end of the casing and support, and each being also provided with a slot communicating with the respective aperture and adapted to aline with the slot in the casing end, a bolt passing through the aperture, lugs on the bolt adapted to engage the tumbler and partition and pass through the slots therein, and the slot in the casing end when said slots are placed in alinement, and a rotatable member supported by the casing end adjacent the slot therein, said member being provided with a slot or passage adapted to be brought into or out of register with the slot in said end to respectively permit or prevent the passage of the lugs therethrough.

9. In a permutation lock, the combination of a base, a support having an aperture therein, a casing secured to the base with one end spaced from the support, a transverse wall extending across the casing, said wall being provided with an aperture alined with the aperture in the support, tumblers disposed between the end of the casing and the support, said tumblers being provided with an aperture alined with the apertures in the wall and support, and also having a slot communicating with the aperture, a bolt passing through the registering apertures, lugs on the bolt adapted to engage the tumblers and pass through the slots when the latter are alined, a rotatable member journaled in the wall adjacent the apertures therein, said member being provided with a slot passing therethrough, said wall being also provided with a slot communicating with the aperture therein, and with the bearing of the rotatable member, said member being rotatable about its axis to cause the slot therein to register or to be moved out of register with the slot in the wall to respectively prevent or permit the lugs on the bolt to pass therethrough.

10. In a permutation lock, the combination of a base, a support provided with an aperture, a casing secured to the base and spaced from the support, a closure for the free end of the casing, a partition in the casing, said partition and head being provided with apertures registering with the aperture in the support, and each being provided with a slot



communicating with the aperture and alined with each other, a tumbler disposed between the casing and support and having an aperture alined with the other apertures and provided with a slot communicating with the aperture, a bolt passing through the aperture, lugs on the bolt adapted to engage the partition and tumbler and pass through the slots when the latter are brought into alinement, means for permitting or preventing the passage of the lugs through the slot in the casing closure, and means for concealing the last said means.

11. In a permutation lock, the combination of a base, a support provided with an aperture, a casing secured to the base and spaced from the support, a closure for the free end of the casing, a partition in the casing, said partition and head being provided with apertures registering with the aperture in the support, and each being provided with a slot communicating with the aperture and alined with each other, a tumbler disposed between the casing and support and having an aperture alined with the other apertures and provided with a slot communicating with the aperture, a bolt passing through the aperture, lugs on the bolt adapted to engage the partition and tumbler and pass through the slots when the latter are brought into alinement, means for permitting or preventing the passage of the lugs through the slot in the casing closure, and a hollow head on the bolt adjacent the closure, said head being adapted to cover and conceal the last said means.

12. A permutation lock containing a rotatable bolt provided with a projecting lug, a tumbler provided with an aperture through which the bolt passes and having a slot for the passage of the lug, means for supporting the ends of the bolt and concealing the slot

from view, said bolt being provided with a reduced angular extremity, a head for the bolt provided with an angular aperture adapted to receive the angular end, means for securing the head and bolt together, and means on said head for indicating the position of the lug, said head being adapted to be removed and rotatably displaced with relation to the bolt.

13. A permutation lock, containing a shell or casing having a polygonal exterior, a tumbler, said tumbler being also provided with a polygonal exterior adapted to cooperate with the exterior of the shell or casing, a bolt, a lug on the bolt, said tumbler being provided with an aperture for the bolt and having a slot communicating with the aperture for the passage of the bolt, means for supporting the ends of the bolt and concealing the aperture, and slot from view, and an indicator on one of the faces of the shell or casing with which one edge of the tumbler cooperates.

14. A bolt for permutation locks and the like, comprising a body portion having a slot, a key comprising a body portion provided with a projecting lug, said body portion being adapted to be seated in the slot with the top thereof below and the lug projecting beyond the top of the slot, a portion of the bolt adjacent the slot being swaged or calked over the top of the body portion of the key for securing the latter in position.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 2nd day of August, A. D. 1906.

DURAND CHURCHILL

Witnesses:

FRANCIS A. HOPKINS,  
CHAS. H. SEEM.