Sept. 21, 1926. 1,600,661

R. K. WINNING

LOCK

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Fig. 2.

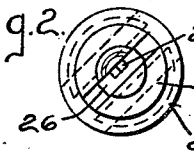


Fig. 3.

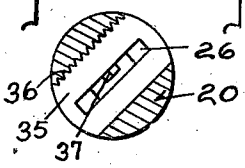


Fig. 8

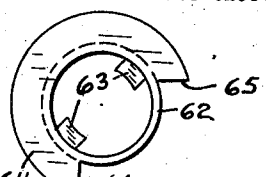


Fig. 9.

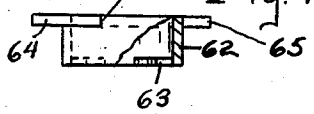


Fig. 1.

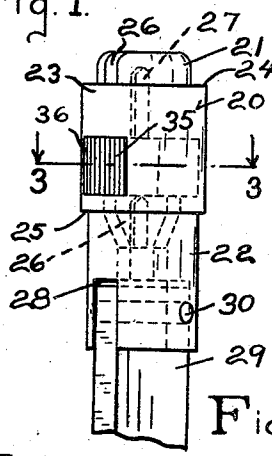


Fig. 7.

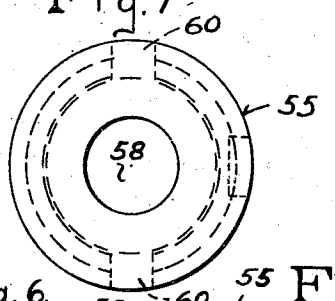


Fig. 6.

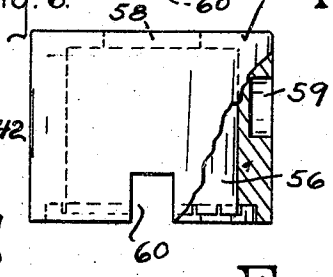


Fig. 10.

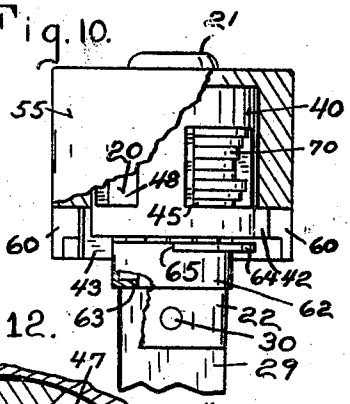


Fig. 5.

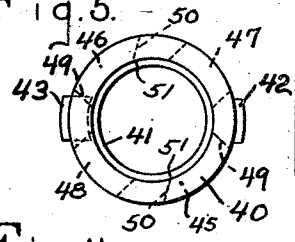


Fig. 4

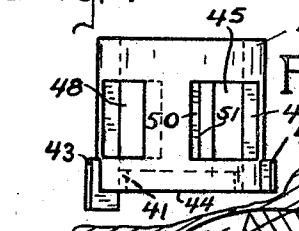


Fig. 11.

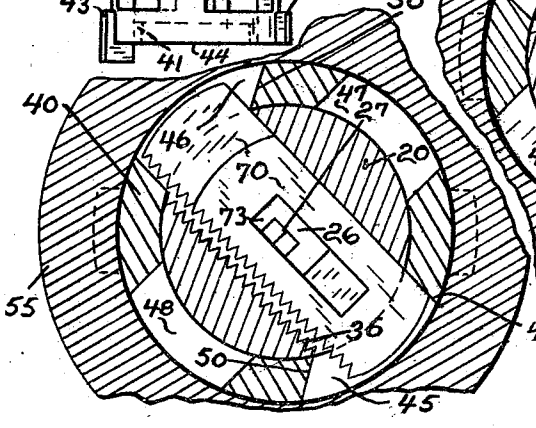
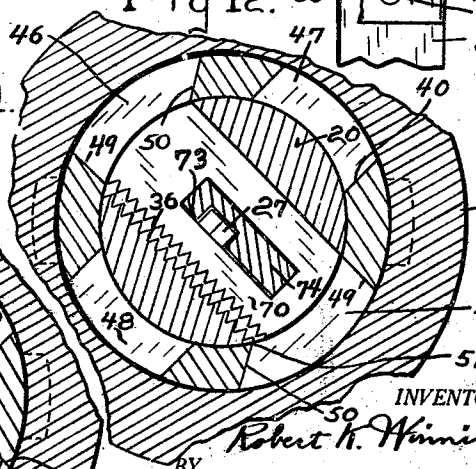


Fig 12.



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Fig. 13.

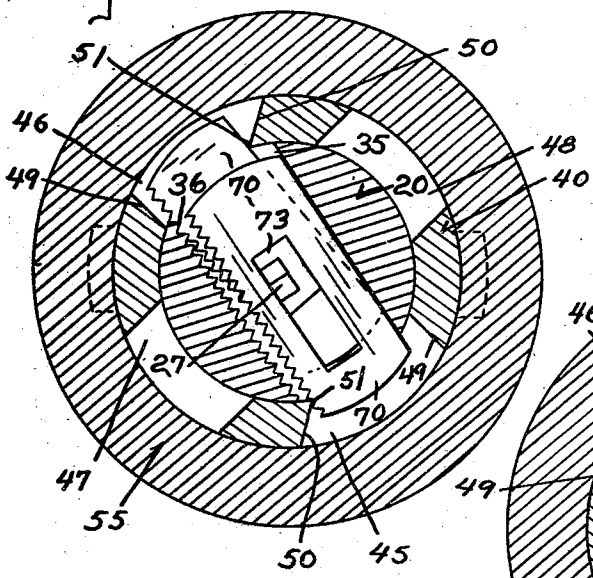
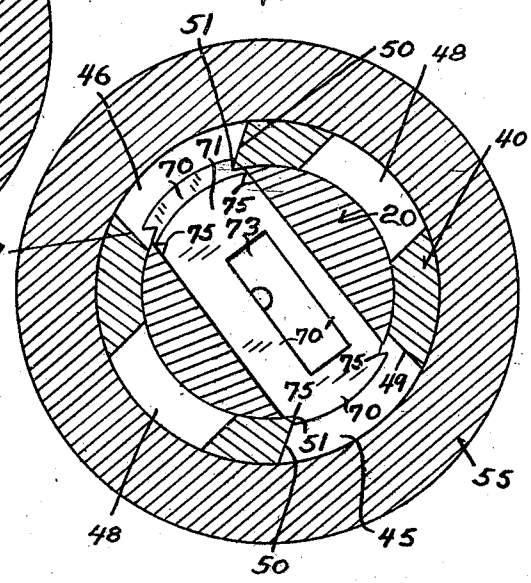


Fig. 14.



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Patented Sept. 21, 1926. 1,600,661

UNITED STATES PATENT OFFICE.

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LOCK.

Application filed September 1, 1924. Serial No. 735,224.

This invention relates to improvements in locks.

It is the primary object of this invention to provide a non-pickable lock.

More specifically stated, it is one of the objects of this invention to provide a lock of the plate tumbler type which will be so organized and constructed that it cannot be picked. The ordinary method of picking a lock of this type involves the application of a screw driver or like implement to one side of the key slot in the lock cylinder. Thereby the cylinder may be rotated slightly to bring the several tumblers into frictional contact with portions of the barrel.

A tool is then inserted centrally in the key slot to manipulate the tumblers individually. As each tumbler is manipulated to its proper position it is held against displacement by the pressure applied through the screw driver to the barrel. The present invention contemplates a cylinder and tumbler construction such that when the barrel is rotated in the slightest degree each of the tumblers becomes interlockingly engaged with the cylinder to be non-slidable therein. The tumblers can only be moved to cylinder-releasing position by releasing the rotative pressure on the cylinder, in which case all tumblers previously aligned with the cylinder will be allowed to fall back out of registry. Tests of this lock indicate that it is not even necessary to provide a spring for projecting the tumblers normally outwardly, since the key, when withdrawn, leaves the tumblers displaced out of registry with the cylinder.

In furtherance of the primary object of this invention as stated above, it is my purpose to provide a lock of this character with a steel shell or casing within which the remaining parts of the lock may be enclosed to render them inaccessible. It is one of the objects of this invention to make a lock of this character as simply and as economically as possible, and I have found that practically all of the parts of the lock proper may be made either by stamping or die casting from relatively soft materials, such parts being then assembled conveniently within the steel shell or casing which renders them inaccessible.

In the drawings Figures 1 to 9, inclusive, show details of the individual parts of the lock, Figure 10 shows an assembled view of the lock, and Figures 11 to 14, inclusive, show enlarged details of parts of the lock in certain positions of adjustment.

Figure 1 is a side elevation of a lock cylinder embodying this invention.

Figure 2 is a plan view thereof.

Figure 3 is a detail taken on the section indicated at 3—3 in Figure 1.

Figure 4 is a side elevation of a lock barrel constructed in the form of a cage.

Figure 5 is a plan view of the lock barrel shown in Figure 4.

Figure 6 is a side elevation of the enclosing shell or casing for the lock, the wall being partially broken away to expose its interior construction.

Figure 7 is a plan view of the shell shown in Figure 6.

Figure 8 is a plan view of a limiting member formed to interact with the lock barrel and cylinder to restrict their relative rotative movement.

Figure 9 is a side elevation of the device shown in Figure 8, a portion of its wall being broken away to expose its construction.

Figure 10 is a view similar to Figure 6 but showing the lock barrel, cylinder, and tumblers assembled in the casing, the wall of the casing being broken away for the purpose of showing these parts.

Figure 11 is a detail section shown on an enlarged scale and illustrating the normal positions of the tumblers when the key has been withdrawn from the lock.

Figure 12 is a view similar to Figure 11, showing the tumblers retracted, as upon the insertion of the key.

Figure 13 is a further enlarged view similar to Figure 11, showing the parts in the positions which they assume if an attempt is made to pick a lock embodying this invention.

Figure 14 is a view similar to Figure 13, illustrating, however, a modified embodiment of this invention.

Like parts are identified by the same reference characters throughout the several views.

The lock cylinder 20 is, in general, similar in construction to other cylinders used in locks of the disk or plate tumbler type. It is provided with upper and lower portions 21 and 22 of substantially like diameters, and with an intermediate portion 23 of slightly increased diameter to provide shoul-

ders at 24 and 25, respectively. A key slot 26, which may be formed to provide the usual ward or wards 27, extends axially through the cylinder and terminates in a somewhat wider slot at 28, which is provided in this particular embodiment of the lock to receive the lockable member 29. A pin 30 holds member 29 within slot 28 so that such member is effectively connected with the key cylinder for rotation therewith. It will be understood that the member 29 may be utilized to operate a latch bolt, a switch, or any other device with which the lock proper may be associated.

The cylinder 20 is provided in the usual manner with a transverse opening 35 of rectangular cross section, this opening being adapted to receive the disk or plate tumblers. The opening herein disclosed differs from that ordinarily provided, in the fact that one of its lateral walls is provided with vertically extending teeth or serrations as at 36.

Adapted to fit exteriorly of the cylinder 20 is the lock barrel 40 which, as previously indicated, is preferably constructed in the form of a cage or lantern ring. The barrel is generally tubular in form but is provided interiorly adjacent its bottom extremity with an integral annular flange or collar 41 which is adapted to abut shoulder 25 on the cylinder, whereby to limit the relative axial movement between these parts. Exteriorly the barrel is provided with a pair of diametrically opposite lugs 42 and 43 which project radially from the otherwise cylindrical surface of the barrel. Lug 42 terminates in the plane of the end 44 of the barrel, but lug 43 projects in an axial direction beyond said end and is adapted for interaction with a stop device hereinafter to be described. In such interaction the projecting portion of lug 43 serves the function of limiting the relative rotative movement between the barrel and cylinder of the lock.

The side wall of the tubular barrel 40 is provided with two sets of openings, the openings of each set being diametrically opposite, and the axes of said sets being related to each other at substantially a 90° angle. These openings are adapted to receive the plate or disk tumblers which are mounted within the opening 35 of the cylinder and are projected from such opening during the withdrawal of the key. Openings 45 and 46 receive the tumblers in the normal locked position of the cylinder, and openings 47 and 48 are adapted to receive the tumblers if it is desired to remove the key when the cylinder is rotated to its so-called unlocked position. In either event, however, the cylinder will be locked against rotation if the key is withdrawn. The word "unlocked" therefore has reference not to the condition of the lock itself but to some latch device or switch controlled by the lock. A lock of this character is always locked when the key is withdrawn.

The laterally opening apertures 45 and 46 differ from apertures 47 and 48 in that the walls of apertures 45 and 46 are preferably not parallel, whereas it is immaterial to the present device whether or not the walls of apertures 47 and 48 are parallel to each other. It will be noted with respect to each of apertures 45 and 46 that whereas one of the walls 49 of such apertures is parallel to a central diameter drawn through the two apertures, the other wall 50 in each case is disposed at substantially 45° to such a diameter. This wall will hereinafter be termed a beveled wall and it will be noted to provide a sharpened margin 51 at one side of each of the two apertures under discussion.

The protector shell 55 is very simple in construction and may conveniently be made of very hard metal. It is provided with an interior chamber 56 of a diameter to receive the lock barrel. Concentric with the chamber is an opening 58 of a diameter to receive the portion 21 of the lock cylinder which exposes in said opening the key slot 26. In practice the shell or casing 55 will be imbedded in a panel or the like and may be secured by any suitable means, such as a set screw, receivable in the countersunk bore 59. Casing 55 is provided on diametrically opposite sides of chamber 56 with radial slots or notches 60 in its lower margin These slots are adapted to receive the lugs 42 and 43 of the lock barrel cage 40, whereby said cage is secured against rotation with respect to the hard metal case 55 and becomes in effect a part of such case except for convenience in manufacture. This construction makes it possible to render the barrel secure against attack while making it easily manufacturable, as above explained.

In Figure 10 the parts are shown assembled for use, the barrel 40 being fitted within shell 55 and locked against rotation with respect to said shell by means of the lugs 42 and 43. Rotatable within the barrel 40 is cylinder 20, portion 21 thereof being projected through the opening 58 in the shell, as indicated. The cylinder may conveniently be restrained to a proper degree of rotation within the casing through the medium of a stop member shown in detail in Figures 8 and 9 and embodying a collar 62 receivable on portion 22 of the cylinder and provided with inwardly directed lugs 63 adapted to engage in the slot 28 upon either side of the lock operated member 29. An arcuate flange 64 projects radially from the upper end of the collar and terminates in shoulders 65 and 66 which are adapted to engage upon one side or the other the downwardly depending lug 43 of the barrel. Thus, the stop member, being keyed by means of lugs

63 to the cylinder for rotation therewith, has a possible movement of substantially 90° with respect to the barrel. The stop member serves conveniently to define ultimate positions of cylinder rotation, in each of which positions the sliding plate or disk tumblers carried by the cylinder may be received within the sets of apertures which are provided in the barrel.

Slidably movable within the cylinder, transversely of the axis thereof, are the tumblers, of which any desired number may be provided. The type of tumbler shown in Figures 11 to 13, inclusive, is designated in its entirety by reference character 70, and the tumbler illustrated in Figure 14 is designated as 71. In general, each tumbler is constructed in the usual manner, comprising a flat plate having its ends curved to conform to the periphery of the cylinder 20, and having a key slot 73 in some predetermined position with reference to the center of the tumbler, the slots in various tumblers being in varied positions so that a properly formed key may throw the slots out of alignment and bring the ends of the several tumblers simultaneously into registry with the cylinder. In Figure 11 I have shown the tumblers in their normal projected position, and in Figure 12 I have shown the tumblers retracted by the insertion of a key 74. It will be noted from Figure 11 that the tumblers, when projected, extend into the openings 45 and 46 of the barrel, whereby to secure the cylinder against rotation.

In the ordinary form of disk tumbler lock a spring is used to keep the several tumblers in their extended positions. If no spring is employed the ordinary type of disk tumbler lock is very easily picked, since one tumbler at a time may be moved to registry with the cylinder and, when released by the picking tool, will remain in its position of registry under a slight rotative pressure of the cylinder. In the present form of lock no spring is necessary, since if the tumblers are subjected to rotative pressure from the cylinder they interact with the wall of the cylinder or of the barrel and are thereby confined against transverse movement to a position for registry with the cylinder.

The tumblers of the present lock have serrated margins. Tumbler 70 has a series of teeth extending along one of its margins throughout its length. Tumbler 71 has but one tooth adjacent the end of each of its margins. It will be understood, therefore, that in using the term "serrated" I do not intend to restrict myself to any particular number or form of teeth. While I have illustrated in tumbler 70 teeth of comparative regularity, it will be understood that the showing is intended to be representative of all types of teeth, whether regular or irregular, and whether formed by a stamping operation, as in the present case, or by cutting, casting, or abrading in some other manner.

Preferably, however, the serrations are regular and the teeth formed on each of the tumblers 70 or 71 is complementary to the teeth of those members with which the tumbler teeth are adapted to interact. The preferred arrangement is clearly demonstrated in Figure 12 in which, with the tumbler in registry with the cylinder, the points of the tumbler teeth register with the points of the teeth or serrations 36 in the cylinder wall. This particular construction is preferred because in any position in which the teeth of the tumbler intermesh with those of the cylinder, the tumbler will always be projected to one side or the other of the cylinder and will not be in registry therewith. Consequently, any attempt to pick a lock embodying the present invention must result in intermeshing the teeth of the tumbler with those of the cylinders, the tumbler being in its locked or off center position at the time.

The result of an attempt to pick a lock of this character is shown in Figures 13 and 14, the showing being somewhat exaggerated to bring out the interaction between the parts. It will be noted that the cylinder 20 has been rotated slightly with respect to the barrel 40. At the time such rotation was attempted the tumblers 70, two of which appear in the drawings, were projected slightly in opposite directions from the cylinder into the openings 45 and 46 of the barrel. The tumblers 70, being restrained against rotation by their entry into the said openings of the barrel, have been forced laterally in the aperture 35 of cylinder 20, and one of the tumblers has, due to its lateral displacement, had its serrated margin forced into interlocking engagement with the serrations 36 of the cylinder. The other tumbler has been forced away from the serrated portion of the cylinder but its serrated margin has been engaged by the sharp edge 51 of opening 45 in the barrel. It will be obvious that any attempt to move the plungers transversely of the cylinder while they are subjected to rotative pressure from the cylinder 20 must fail, since each plunger is interlocked either with the barrel or with the cylinder and is thereby restrained against its normal reciprocative movement. If, however, the key is inserted in the usual way into the key slot 26 of the cylinder, its point will enter the slots 73 in the several tumblers and will thereby retract the tumblers if no attempt is made simultaneously to rotate the cylinder.

The modified construction in Figure 14 shows that both margins of the tumblers may conveniently be serrated, if desired. In this

construction a single notch 75 is formed adjacent each end of each tumbler margin. Into this notch the sharp edges 51 of openings 45 and 46 are receivable, and such edges will obviously enter the said notches if any attempt is made to pick the lock by drawing the several tumblers individually toward a position for registry with the cylinder at a time when the cylinder is subjected to rotative pressure. The openings 47 and 48 in the barrel are not illustrated as provided with sharp margins 51 for the reason that in the particular lock herein disclosed it is only necessary to render the lock proof against picking in one of the two possible locking positions of the cylinder.

I claim:

1. In a device of the character described, the combination with a lock cylinder providing a guideway for the axial movement of a key therein, of a tumbler mounted in said cylinder and movable transversely thereof on a broad path of transverse movement, said tumbler being freely reciprocable transversely in one position of lateral adjustment and said tumbler and a laterally adjacent portion of said cylinder being formed for interaction in another lateral position of adjustment of said tumbler, said tumbler being provided with a slot comprising a continuation of the guideway of said cylinder and adapted in the first mentioned lateral position of said tumbler to be aligned with said guideway whereby a key entering said guideway and said slot will maintain said tumbler in a position for free transverse reciprocation.

2. In a device of the character described, the combination with a barrel member provided with a tumbler receiving opening, of a transversely apertured cylinder member rotatable therein and provided with an axially extending guideway for a key, a tumbler in the transverse aperture of the cylinder member and adapted for free transverse reciprocation on a given path in said aperture, said tumbler being of a size permitting it to be laterally displaced with reference to said path and being provided with a slot so positioned that when said tumbler is in said path said slot will be aligned with said guideway, said tumbler and adjacent lateral portions of said barrel member being provided with teeth adapted for interaction when said tumbler is displaced from said path as aforesaid.

3. In a lock having tumblers arranged for retraction upon key insertion, the combination with a barrel provided with a tumbler receiving opening, of a cylinder rotatably mounted in said barrel and provided with a transverse aperture bounded on one side by a serrated wall and having an axially extending guideway intersecting said aperture, and a plurality of slotted tumblers reciprocable transversely in the aperture of said cylinder in a predetermined path, said tumblers having serrated margins adapted for interaction with said wall when displaced from said path and being of such a size that in said path their respective margins will not interact with said wall, together with a key receivable in the guideway of said cylinder and in the slots of said tumblers and adapted to align said tumblers on said path, said key having its sides formed for interaction with the end of the slots in said tumblers to reciprocate said tumblers in said path to retracted position in said cylinder.

4. In a lock having tumblers adapted for retraction upon key insertion, the combination with a barrel member having tumbler receiving openings, of a cylinder rotatably mounted therein and provided with an axially extending guideway and with a transverse aperture having a serrated side wall. A plurality of tumblers transversely reciprocable in said aperture along a given path and of a size such as to be adapted for displacement from said path, said tumblers being provided with slots having side margins aligned with said guideway when the reciprocable tumblers are in said path and having end margins variously positioned with reference to the centers of said tumblers, teeth upon said tumblers adapted for interacting with the serrated wall of the aperture in said cylinder whereby said tumblers may interact with said cylinders to restrict their freedom of transverse reciprocation when displaced from said path, and a key reciprocable in said guideway and having sides adapted to fit closely within the side margins of the slots of said tumblers whereby to position said tumblers on said path upon insertion, said key having end margins adapted for interaction with the end margins of the slots of said tumblers in a manner to reciprocate said tumblers transversely into retracted position within said cylinder.

5. In a lock having tumblers adapted for retraction upon key insertion, the combination with a barrel member having tumbler receiving openings, of a cylinder rotatably mounted therein and provided with an axially extending guideway and with a transverse aperture having a serrated side wall, a plurality of tumblers transversely reciprocable in said aperture along a given path and of a size such as to be adapted for displacement from said path, said tumblers being provided with slots having side margins aligned with said guideway when the respective tumblers are in said path and having end margins variously positioned with reference to the centers of said tumblers, teeth upon said tumblers adapted for interaction with the serrated wall of the aperture in said cylinder whereby said tumblers may in-

teract with said cylinder to restrict their freedom of transverse reciprocation when displaced from said path and a key reciprocable in said guideway and having sides adapted to fit closely within the side margins of the slots of said tumblers whereby to position said tumblers on said path upon insertion, said key having end margins adapted for interaction with the end margins of the slots of said tumblers in a manner to reciprocate said tumblers transversely into retracted position within said cylinder, the tumbler receiving openings of said barrel member having beveled margins formed to interact with the teeth in the margins of said tumblers whereby said tumblers may be interlocked either with said barrel member or with said cylinder.

6. In a lock, the combination with a cylinder having a transverse aperture and being provided with a longitudinal keyway, of serrations on one side wall of said aperture, slotted tumblers adapted for longitudinal and lateral movement in said aperture and provided with serrations adapted to mate with said serrations in said aperture wall, and a key slidable in said keyway and fitting closely the said keyway and said slots whereby to align said tumblers for free longitudinal movement in said transverse aperture and away from the serrations of the side wall.

7. In a device of the character described, the combination with a relatively impenetrable shell having an annular side wall and an annular face provided with an opening, of a cage fitted within said shell and provided with an inwardly extending shoulder on its end remote from the opening of said shell and a differentially diametered cylinder rotatable within said cage and including a portion journaled in the opening in the annular face of said shell, a shoulder abutting the interior of said shell adjacent said opening, a second portion journaled within said cage and a second shoulder abutting the shoulder of said cage, said cylinder being provided with a key slot opening through the portion thereof which is journaled in the opening of said shell.

8. In a device of the character described, the combination of a lock cylinder member provided with an enlarged cylindrical central portion terminating in peripheral shoulders and having an axially extending key slot and a transversely extending tumbler aperture, a plurality of tumblers in said apertures each provided in an intermediate portion with an opening adapted to be entered by a key in said slot, a cage comprising a lock barrel element and adapted to fit about the enlarged intermediate portion of said cylinder, a flange connected with said cage and adapted to abut one of said shoulders, and a hardened metal case comprising a shell adapted to receive said cage and provided with a central aperture of a size adapted to receive that portion of said cylinder beyond the other of said shoulders.

9. In a device of the character described, the combination with a lock cylinder having a transverse slot, of tumblers reciprocable transversely of said cylinder, a barrel cage provided with an opening in which said tumblers are receivable in one position of said cylinder, a shell enclosing said cage and provided with notches in its margins, lugs connected with said cage and engaged in the notches of said shell, whereby to key said cage to said shell, and a stop plate comprising a collar having interiorly projecting lugs engageable in the said slot of said cylinder and a flange projecting radially from said collar and extending arcuately thereabout and terminating in a shoulder adapted to abut one of said lugs.

10. In a device of the character described, the combination with a lock cylinder having a transverse aperture provided in a side wall with a series of pointed teeth, of a tumbler reciprocable in said aperture and having an end adapted in one position of said tumbler to register with the periphery of said cylinder, said tumbler being provided along one of its sides with pointed teeth so disposed that in said tumbler position the points of said teeth will register with the points of the teeth of said cylinder, whereby said teeth can mesh only when said tumbler is not in said position of registry.

11. In a device of the character described, the combination with a barrel having a lateral opening and a cylinder rotatable in said barrel and provided with a transverse aperture registerable with said opening, of pointed teeth projecting laterally into said aperture from a portion of said cylinder in a regular series, and a plurality of tumblers reciprocable in said aperture and receivable in the opening of said barrel, said tumblers being of a length corresponding substantially to the diameter of said cylinder and being adapted in predetermined positions to register at their extremities with the outside of said cylinder, and pointed teeth projecting laterally from a plurality of said tumblers complementary to the first mentioned teeth, said last mentioned teeth being so disposed with reference to the tumblers from which they project that in said position of registry with their respective tumblers they will present their points to the points of said first mentioned teeth, whereby to prevent meshing of said teeth when a given tumbler is in said position.

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