

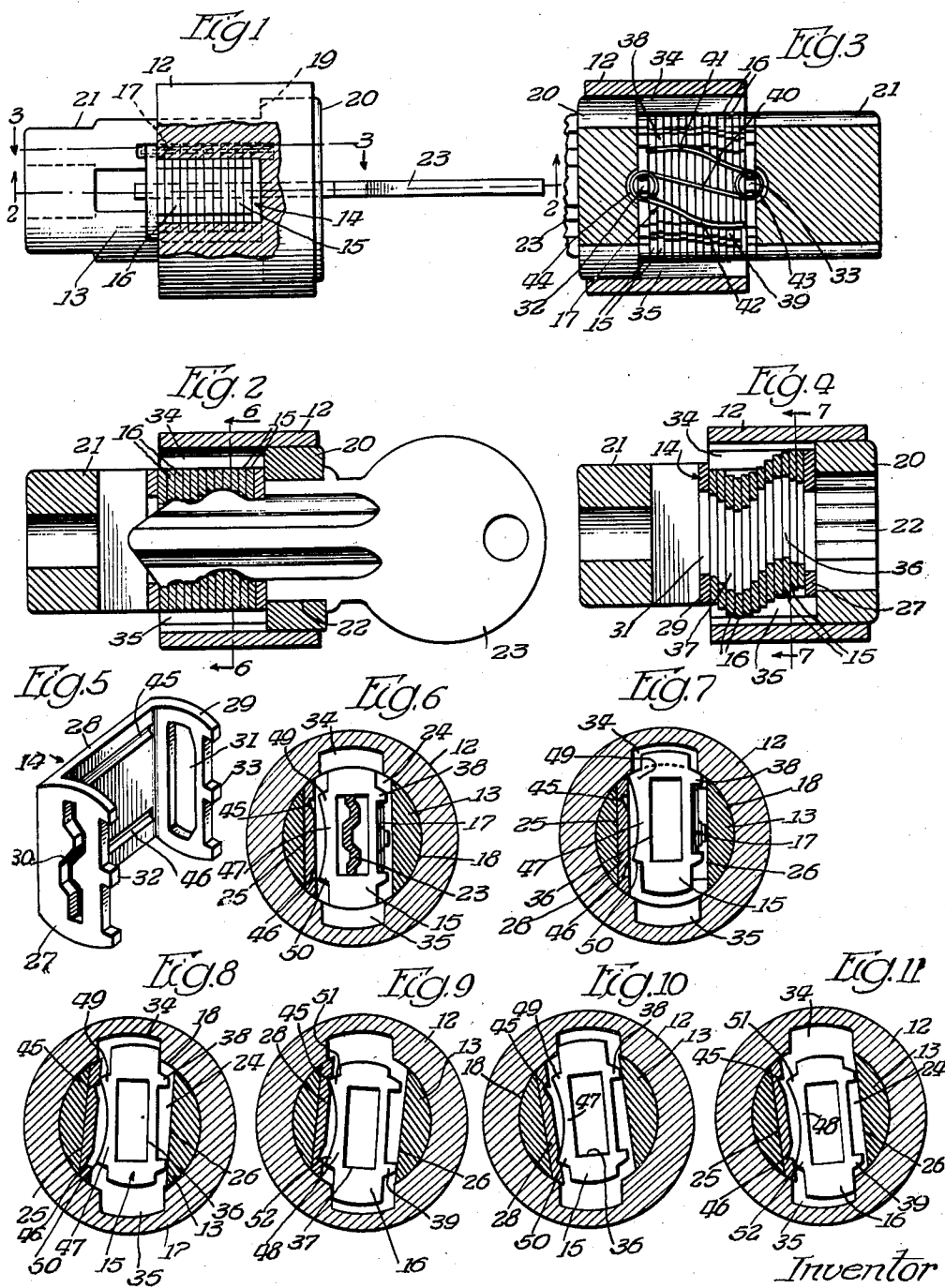
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PLATE TUMBLER LOCK

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PLATE TUMBLER LOCK

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2 Claims. (Cl. 70-419)

The present invention relates generally to locks. More particularly the invention relates to that type of lock which is designed to be "pick-proof" and as its main or principal parts comprises: (1) a casing which has a bore extending longitudinally therethrough and is adapted to be fixed to the part or device to be locked; (2) a plug which is rotatably mounted in the bore and has a longitudinal slot for a key; and (3) a group of key operable plate tumblers which are mounted in the plug to slide transversely of the latter and also to rock laterally to a slight extent and serve, upon removal of the key from the lock, to lock the plug against rotation relatively to the casing.

The main or principal object of the invention is to provide a lock of this type having simple and improved means for locking certain of the plate tumblers against transverse movement relatively to the plug when an attempt is made to pick the lock by first turning the plug as far as permitted by the tumblers in order to hold the tumblers frictionally in place and then inserting a pin or wire into the key slot with a view of manipulating the tumblers individually into their unlocked or plug-releasing position.

Another object of the invention is to provide a plate tumbler lock of the type and character last mentioned in which the means for rendering the lock "pick-proof" comprises a pair of parallel laterally spaced grooves in the part of the plug that is at one side of the tumblers and in addition comprises teeth which are formed on the tumblers in opposed relation with the grooves and are adapted in connection with lateral rocking of the tumblers when an attempt is made to pick the lock by turning the plug as far as permitted relatively to the barrel to enter and become interlocked with the grooves and thus lock or hold the tumblers in their operative or plug locking position.

A further object of the invention is to provide a plate tumbler lock which is generally of new and improved design or construction and has certain advantages over previously designed plate tumbler locks including that which is shown in, and forms the subject matter of, United States Patent No. 1,964,963 granted to me on July 3, 1934.

Other objects of the invention and the various advantages and characteristics of the present lock will be apparent from a consideration of the following detailed description. The invention consists in the several novel features which are

hereinafter set forth and are more particularly defined by claims at the conclusion hereof:

In the drawing which accompanies and forms a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a plan view of a lock embodying the invention, parts being broken away for purposes of illustration;

Figure 2 is a vertical longitudinal section taken on the line 2-2 of Figure 1 and showing the plate tumblers in their released position due to insertion of the lock controlling key in the key slot in the plug;

Figure 3 is a vertical longitudinal section taken on the line 3-3 of Figure 1 and illustrating in detail the construction and arrangement of the wire spring for urging the plate tumblers outwards into their operative or plug locking position upon removal of the key from the plug;

Figure 4 is a vertical longitudinal section showing the arrangement of the tumblers after removal of the key from the key slot in the plug;

Figure 5 is a perspective view of the frame which forms a part of the plug and serves as a housing for the plate tumblers and also to support the wire spring;

Figure 6 is a transverse section on the line 6-6 of Figure 2;

Figure 7 is a transverse section on the line 7-7 of Figure 4;

Figure 8 is a transverse section through the front portion of the lock, illustrating the action of the front tumblers when the plug is turned in a clockwise direction relatively to the casing in connection with an attempt to pick the lock;

Figure 9 is a transverse section through the rear portion of the lock, illustrating the action of the rear tumblers when the plug is rotated in a clockwise direction relatively to the casing in connection with an attempt to pick the lock;

Figure 10 is a transverse section through the front portion of the lock, illustrating the action of the front tumblers when the plug is turned in a counterclockwise direction relatively to the casing in connection with an attempt to pick the lock; and

Figure 11 is a transverse section through the rear portion of the lock, illustrating the action or position of the rear tumblers when the plug is turned or urged in a counterclockwise direction relatively to the casing in connection with a lock picking operation.

The lock which is shown in the drawing constitutes the preferred form or embodiment of the

invention. It is adapted for universal application or use and comprises a casing 12, a plug 13, a frame 14, a front set of tumblers 15, a rear set of tumblers 16 and a tumbler shifting spring 17.

The casing 12 of the lock is cylindrical and embodies a longitudinal bore 18. This bore extends completely through the casing and is of uniform diameter throughout with the exception of the front end which is of slightly larger diameter and results in the formation of an annular shoulder 19 at the front end of the casing. The casing is preferably formed of any suitable hardened metal and is adapted to be fixedly secured in a socket in the part or device which is to be locked by the lock.

The plug 13 is cylindrical and extends through, and is rotatably mounted in, the bore 18. It is formed of any suitable metal and embodies at the front end thereof an enlarged head 20. The latter, as shown in Figures 1 to 4, inclusive, fits within the enlarged front end portion of the bore 18 and abuts against the annular shoulder 19 so as to hold the plug against rearward displacement with respect to the casing. Any suitable device (not shown) is employed to hold the plug against forward movement or displacement relatively to the casing. A stud 21 is formed as an integral part of the rear end of the plug and is adapted to be connected to operate the bolt or other locking instrumentality with which the lock as a whole is associated. In addition to the stud 21 the plug embodies a longitudinal key slot 22 for a key 23. The latter is designed to control the operation of the lock and is of the double bitted variety. The key slot 22 extends through the central portion of the enlarged head 20 at the front end of the plug and conforms in cross sectional shape or design to the double bitted or operating end of the key 23. A diametric pocket 24 is formed in the central portion of the plug. This pocket is in communication with the rear end of the key slot in the enlarged head 20 and serves as a housing medium for the frame 14. It is rectangular in plan section and is defined at one side thereof by a flat wall 25 and at its other side by a flat wall 26. The two walls 25 and 26 are parallel to one another and constitute internal surfaces of the plug.

The frame 14 serves as a retainer for the tumblers and constitutes a part of the plug 13. It fits snugly within the pocket 24 and comprises a front wall 27, a side wall 28 and a rear wall 29. Preferably the frame is in the form of a metallic stamping. The front wall 27 of the frame embodies a key slot 30 and fits against the surface of the plug that defines the front end of the pocket 24. The slot 30 is longitudinally aligned with, and is shaped similarly or conformably to, the key slot 22 in the head 20 of the plug and is adapted to receive and guide the operating end of the key 23 when the key is inserted into place in order to unlock the lock. The side wall 28 extends between, and serves to cross connect, the front and rear walls 27 and 29 of the frame and fits against the wall 25 of the plug. The rear wall 29 of the frame has a central slot 31 and fits against the surface of the plug which defines the rear end of the pocket 24. The slot 31 is longitudinally aligned with the slot 30 in the front wall 27 and is adapted to receive the inner end or extremity of the key when the key is inserted through the slot 22 into the plug. The free side margins of the

front and rear walls of the frame are cut away so as to form laterally extending ears 32 and 33. These ears are centrally positioned with respect to the frame and serve, as hereinafter described, to support the tumbler controlling spring 17.

Rotation of the plug 13 relatively to the cylindrical casing 12 is controlled by the tumblers 15 and 16. The latter are of the plate variety and preferably are in the form of metallic stampings. They are arranged in series form, as shown in Figures 1 to 4, inclusive, and are mounted in the frame 14 so that they are free to slide transversely of the plug and also to rock laterally to a limited extent. The front tumblers 15 are located in the front portion of the frame 14 and have extended upper ends which are adapted when the front tumblers are slid or shifted upwards relatively to the plug to fit within a longitudinal groove 34 in the upper portion of the casing 12 and thus lock the plug against rotation relatively to the casing. The groove 34 extends rearwards from the shoulder 19 and intersects or communicates with the upper portion of the bore 18. The rear tumblers 16 are located in the rear portion of the frame 14 and have extended or enlarged lower ends which are adapted upon downward shift or sliding movement of the rear tumblers relatively to the plug to fit within a longitudinal groove 35 in the bottom portion of the casing 12 and thus lock the plug against rotation relatively to the casing. The groove 35 extends rearwardly from the shoulder 19 and is disposed diametrically opposite the groove 34. Slots 36 are formed in the central portions of the front tumblers 15 and slots 37 are formed in the central portions of the rear tumblers 16. These slots permit the double bitted or operating end of the key to pass through the tumblers and are so shaped that they cooperate with said operating end of the key to shift the tumblers into a position wherein the ends thereof are flush with the periphery of the plug when the key is fully inserted into place. In this position of the tumblers the plug is free so that it may be rotated relatively to the casing for bolt throwing or other purposes, as well understood in the art. When the key is removed the spring 17 operates, as hereinafter described, to slide the front tumblers 15 upwards into interlocked relation with the groove 34 and the rear tumblers 16 downwards into interlocked relation with the groove 35 for plug locking purposes. The front tumblers 15 are provided on the margins thereof that are adjacent the plug wall 26 with laterally extending lugs 38. These lugs are integral parts of the front tumblers and are located directly beneath the extended upper ends of the front tumblers and adjacent the upper ends of the central key receiving slots 36. The rear tumblers 16 are provided with integral laterally extending lugs 39 on the side margins thereof that are adjacent the wall 26 of the plug. These lugs 39 are disposed directly above the extended lower ends of the rear tumblers and are positioned adjacent the lower ends of the key receiving central slots 37.

The spring 17 serves as a medium for urging the tumblers transversely of the plug into locked relation with the casing upon removal of the key 23 from the key slot 22. It is formed of a single piece of wire and comprises a central, substantially horizontal part 40, an upper arm 41, and a lower arm 42. The upper arm 41 is connected to the rear end of the central part 40 of the spring

by way of a loop 43 which surrounds the ear 33 on the rear wall 29 of the frame 14. The front end of the arm 41 underlies and engages the laterally extending lugs 38 on the front tumblers 15. The loop 43 is so arranged that it operates to urge outwards the upper arm 41 of the spring. When the key 23 for the lock is removed the upper arm 41, due to its particular loading, operates through the medium of the lugs 38 to urge the front tumblers 15 outwards into locked relation with the casing 12. The lower arm 42 of the spring 17 underlies the central part 40 and is connected to the front end of the latter by way of a loop 44 which, as shown in Figure 3, surrounds the ear 32 on the front wall 27 of the frame 14. The rear end of the arm 42 engages the laterally extending lugs 39 on the rear tumblers 16 and is urged outwards by the loop 44 so that upon withdrawal of the key 23 it operates through the medium of the lugs 39 to shift the rear tumblers 16 downwards into locked relation with the lock casing 12.

In order to render the lock "pick-proof" the side wall 28 of the frame 14 is provided in the inner face thereof with an upper longitudinally extending groove 45 and a lower longitudinally extending groove 46, the front tumblers are provided with side wings 47 and the rear tumblers 16 are provided with side wings 48. The grooves 45 and 46 are parallel, as shown in Figure 5, and are V-shaped in cross section. The side wings 47 are formed as integral parts of the front tumblers 15 and are located or positioned opposite the side wall 28 of the frame 14. The outer side margins of the side wings 47 are longitudinally dished or concavely curved, as shown in Figures 6, 7, 8 and 10. The upper end portions of the outer margins of the side wings 47 define with the top margins of the side wings laterally extending V-shaped teeth 49 and the lower portions of the outer margins of the side wings 47 define with the lower or bottom margins of said side wings V-shaped teeth 50. The teeth 49 and 50 are spaced from one another a slightly greater distance than the upper groove 45 is spaced from the lower groove 46. As hereinafter described, the lower teeth 50 of the side wings 47 are adapted in connection with certain lateral rocking of the front tumblers 15 during an attempt to pick the lock to interlock with the groove 46 and thus lock the front tumblers in their locked position. The outer side margins of the side wings 47 are dished or convexly curved in a longitudinal direction to permit the front tumblers 15 to rock laterally readily and also to facilitate entry of the lower teeth 50 into the bottom groove 46 in the side wall 28 of the frame 14. The lower teeth 50 are so arranged that when the front tumblers 15 are in their plug holding or locking position they are adjacent or opposite the lower groove 46. The side wings 48 are formed as integral parts of the rear tumblers 16. They are located adjacent the side wall of the frame 14 and are the same in shape as the side wings 47 of the front tumblers 15. The outer side margins of the side wings 48 are dished or concavely curved in a longitudinal direction in order that they do not interfere with limited lateral rocking movement of the tumblers. The upper portions of the outer side margins of the side wings 48 define with the top margins of said side wings V-shaped teeth 51 and the lower portions of the side margins of the side wings 48 define or form with the lower or bottom margins V-shaped teeth

52. The upper teeth 51 are adapted when the rear tumblers 16 are in their plug locking position and are rocked laterally in one direction in connection with an attempt to pick the lock, to fit within the upper groove 45 and thus lock the rear tumblers against transverse displacement relatively to the plug. When the proper key is inserted into the plug 13 of the lock the front and rear tumblers 15 and 16 are automatically centered with respect to the frame and hence the teeth clear the grooves 45 and 46, as shown in Figure 6, and do not interfere with retraction of the tumblers into their plug releasing position. When the tumblers are in their plug releasing position due to insertion of the correct key into the key slot 22 in the plug the upper teeth of the tumblers are disposed above the groove 45 and the lower teeth are disposed beneath the groove 46. Because of this the spring 17 encounters no difficulty in shifting the tumblers into their plug locking position upon removal of the key.

In attempting to pick a lock of the type under consideration the plug is turned as far as possible in one direction or the other relatively to the casing and then a wire or pin is inserted into the key slot with a view of individually sliding the tumblers into their unlocked position. The plug is turned so as to place the tumblers under pressure to the end that they will stay or remain in the various positions to which they are shifted by the wire, pin or other picking tool. If an attempt is made to pick the present lock by first turning the plug to the farthest extent in a clockwise direction, as viewed in Figures 8 and 9, the extended lower ends of the rear tumblers 16 are brought into engagement with the left hand side of the groove 35 in the casing 12. This results in the rear tumblers fulcruming about the lugs 39 and rocking laterally in a counterclockwise direction in such manner that the upper teeth 51 enter and become interlocked with the upper groove 45 in the side wall 28 of the frame 14. When the teeth 51 are in interlocked relation with the groove 45 the rear tumblers 16 are effectively held in their operative or plug locking position and hence cannot be shifted into their released or inoperative position by a wire, pin or other picking tool. When the plug is urged or turned to its fullest extent in a clockwise direction in connection with an attempted picking of the lock there is no locking of the front tumblers 15 because, as shown in Figure 8, the pressure which is exerted upon the extended upper ends of the front tumblers causes the tumblers to rock counterclockwise with the teeth 49 as fulcrum points and such rocking serves to move the teeth 50 away from the groove 46. However locking of the rear tumblers is effected and the locking of such tumblers, due to interfitting of the teeth 51 and groove 45, prevents the rear tumblers from being picked or shifted into their inoperative or plug releasing position. If an attempt is made to pick the lock by first turning the plug to its fullest extent in a counterclockwise direction, as viewed in Figures 10 and 11, the upper extended ends of the front tumblers 15 are brought into engagement with the left hand side of the groove 34 in the upper portion of the casing 12. When the upper ends of the front tumblers 15 are brought into engagement with the left hand side of the groove 34 the front tumblers fulcrum about the lugs 38 and rock laterally in a clockwise direction. Clockwise lateral rocking of the

front tumblers results in the bottom teeth 50 entering and becoming interlocked with the bottom groove 46. As soon as the teeth 50 are in interlocked relation with the groove 46 the front tumblers are held or locked in their plug locking position and hence cannot be picked or manipulated into their inoperative or plug releasing position. Counterclockwise turning of the plug 13 relatively to the casing in connection with an attempt to pick the lock does not affect the rear tumblers because, as illustrated in Figure 11, such turning of the plug causes clockwise rocking of the rear tumblers 16 and such rocking swings the teeth 51 away from the groove 45. However, even though the rear tumblers are not locked in their operative or locked position the front tumblers are effectively held by the teeth 50 and the groove 46 against release from their locked position and hence prevent picking of the lock.

From the foregoing it is manifest that when the plug is turned in one direction in connection with a lock picking operation certain of the tumblers are locked against inward sliding movement with respect to the plug and when the plug is reversely rotated the other tumblers are locked against inward shift away from their locked position.

The herein described lock is essentially "pick-proof" and due to its special construction or design may be manufactured at a low and reasonable cost. The grooves 45 and 46, because they are formed in the side wall 28 of the frame 14, may be readily formed in connection with fabrication of the lock. Because the teeth 50 of the front tumblers 15 and the teeth 51 of the rear tumblers 16 are effectively strutted or reenforced and because they are integral parts of the side wings 47 and the side wings 48, respectively, they cannot readily be bent or ruptured when an attempt is made to pick the lock and hence they effectively and efficiently serve their intended purpose.

The invention is not to be understood as restricted to the details set forth since these may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A lock comprising a casing with a cylindrical horizontal bore therein, a cylindrical plug rotatably mounted in the bore and having a key slot at the front end thereof, a transverse normally vertical pocket in its central portion in communication with the key slot, and a single pair of longitudinally extending vertically spaced grooves in one of its pocket defining side walls, a pair of key operable plate tumblers mounted in the pocket so that they are free to rock laterally to a limited extent and also slide vertically into and out of locked relation with the casing, and spring means for urging the tumblers to slide one upwards and the other downwards into locked relation with the casing, said one tumbler being provided on the side thereof that is adjacent the grooves with a single pair of upper and lower laterally extending teeth

spaced apart a greater distance than the two grooves and arranged so that when said one tumbler is in its unlocked position they are disposed outwards of the grooves, respectively, said one tumbler being adapted when in its locked position and rocked laterally due to the application of rotative force in one direction on the plug in an attempt to pick the lock, to have its lower tooth enter the lower groove and thus hold it in its locked position, said other tumbler being provided on the side thereof that is adjacent the grooves with a single pair of upper and lower teeth spaced apart the same distance as the teeth on said one tumbler and arranged so that they are positioned outwards of the two grooves, respectively, when said other tumbler is in its unlocked position, said other tumbler being adapted when in its locked position and rocked laterally due to the application of rotative force in the other direction on the plug in an attempt to pick the lock, to have its upper tooth enter the upper groove and thus hold it in its said locked position.

2. A lock comprising a casing with a cylindrical horizontal bore therein, a cylindrical plug rotatively mounted in the bore and having a key slot at the front end thereof, a transverse normally vertical pocket in its central portion in communication with the key slot, and a single pair of longitudinally extending vertically spaced V-shaped grooves in one of its pocket defining side walls, a pair of key operable plate tumblers mounted in the pocket so that they are free to rock laterally to a limited extent and also slide vertically into and out of locked relation with the casing, and springs means for urging the tumblers to slide one upwards and the other downwards into locked relation with the casing, said one tumbler being provided on the side thereof that is adjacent the grooves with a vertically elongated longitudinally dished side wing having the ends thereof shaped to define upper and lower laterally extending V-shaped teeth that are spaced apart a greater distance than the two grooves and are arranged so that when said one tumbler is in its unlocked position they are disposed outwards of the grooves, respectively, said one tumbler being adapted when in its locked position and rocked laterally due to the application of rotative force in one direction on the plug in an attempt to pick the lock, to have its lower tooth enter the lower groove and thus hold it in its locked position, said other tumbler being provided on the side thereof that is adjacent the grooves with a vertically elongated longitudinally dished side wing having the ends thereof shaped to define upper and lower V-shaped teeth that are spaced apart the same distance as the teeth on the said one tumbler and arranged so that they are disposed outwards of the two grooves, respectively, when said other tumbler is in its unlocked position, said other tumbler being adapted when in its locked position and rocked laterally due to the application of rotative force in the other direction on the plug in an attempt to pick the lock, to have its upper tooth enter the upper groove and thus hold it in its said locked position.

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