March 25, 1947. C. LEDIN ET AL 2,418,080

REMOVABLE CYLINDER

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Fig. 1.

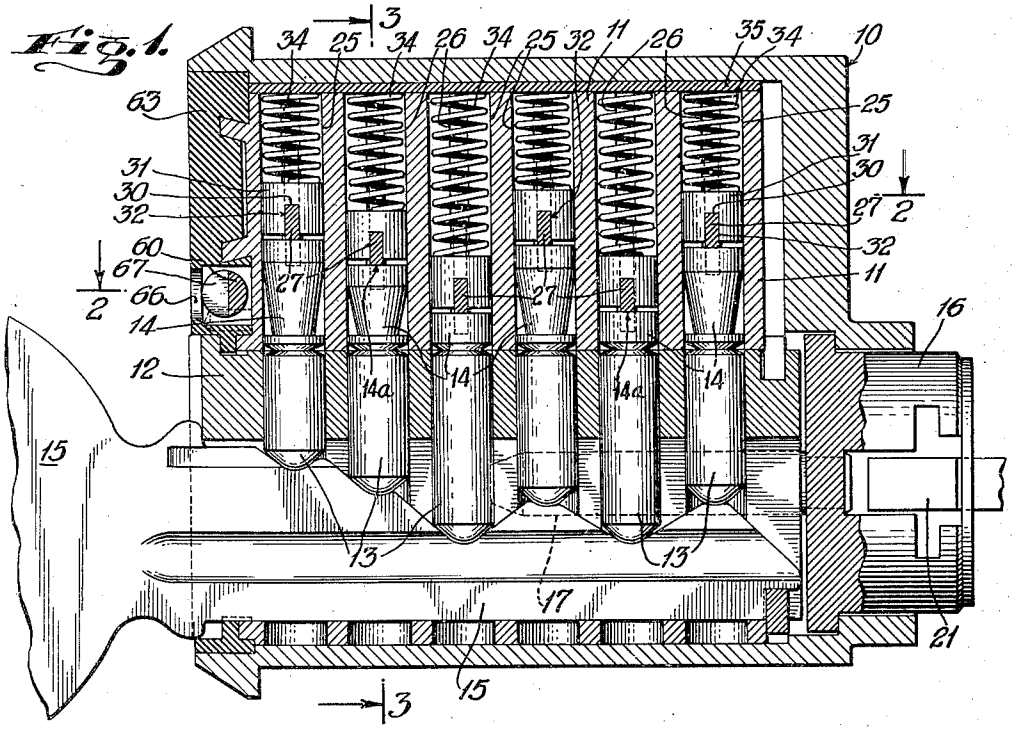
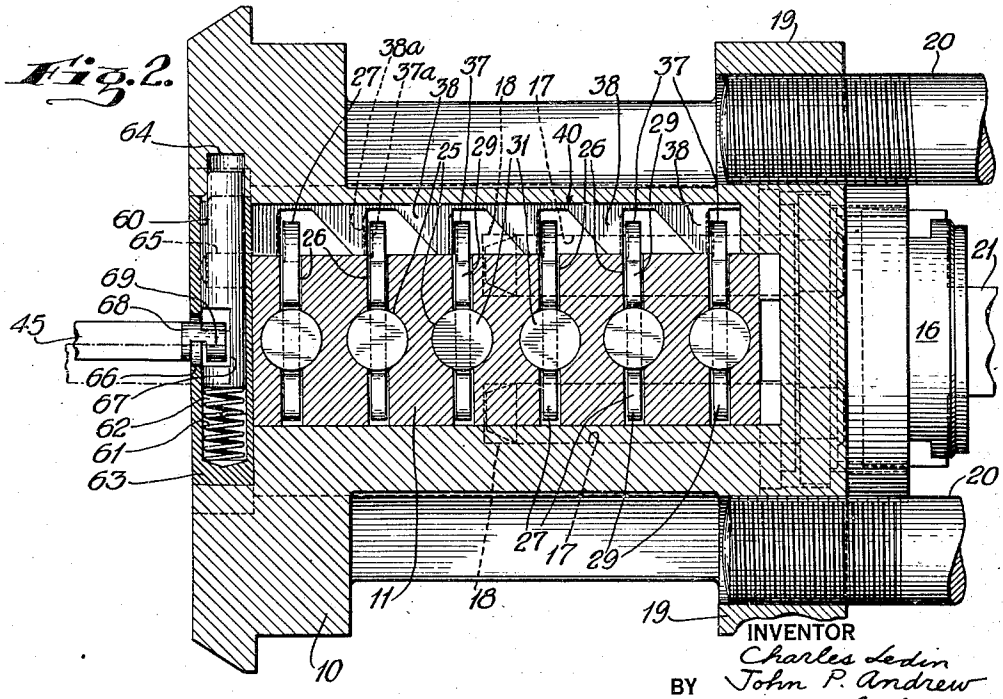


Fig. 2.



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REMOVABLE CYLINDER

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Fig. 3.

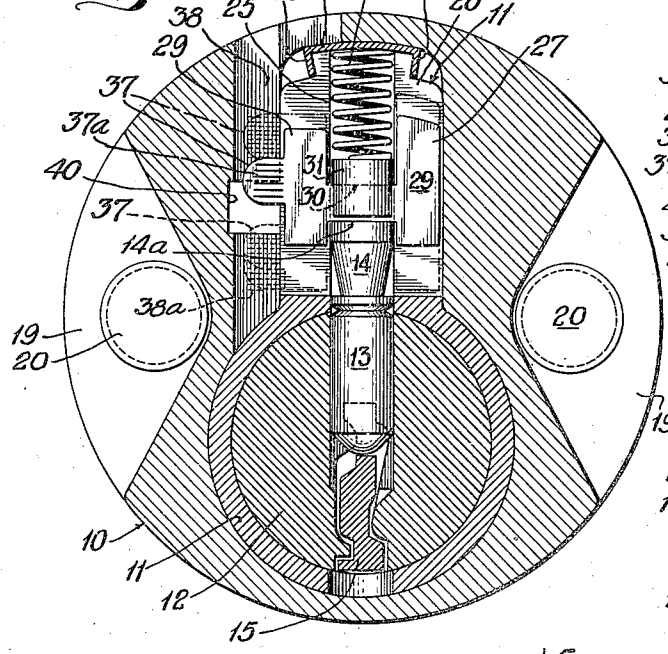


Fig. 5.

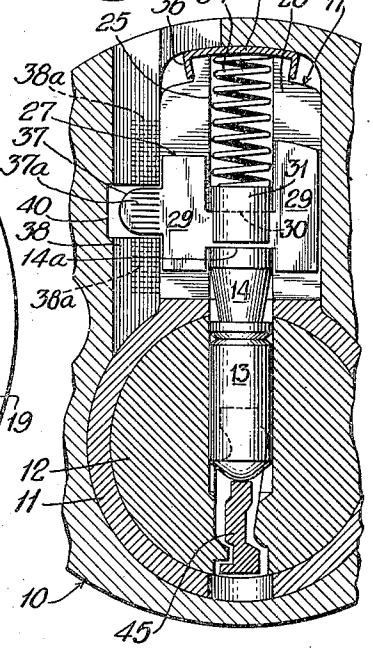
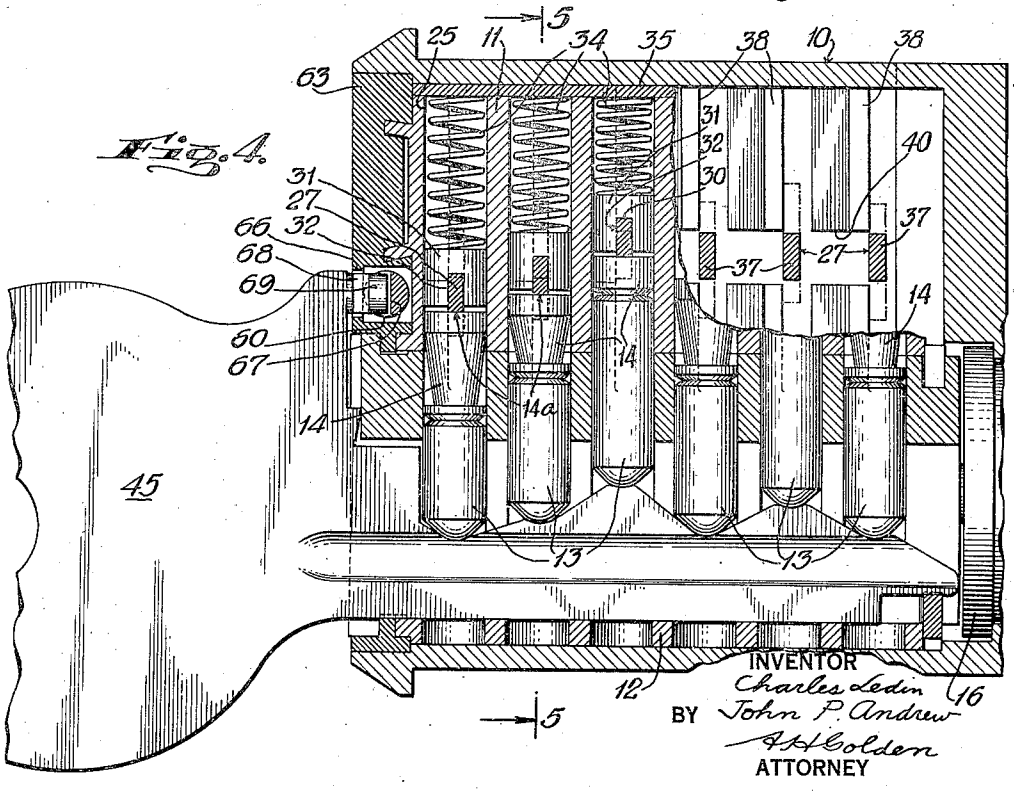


Fig. 4.



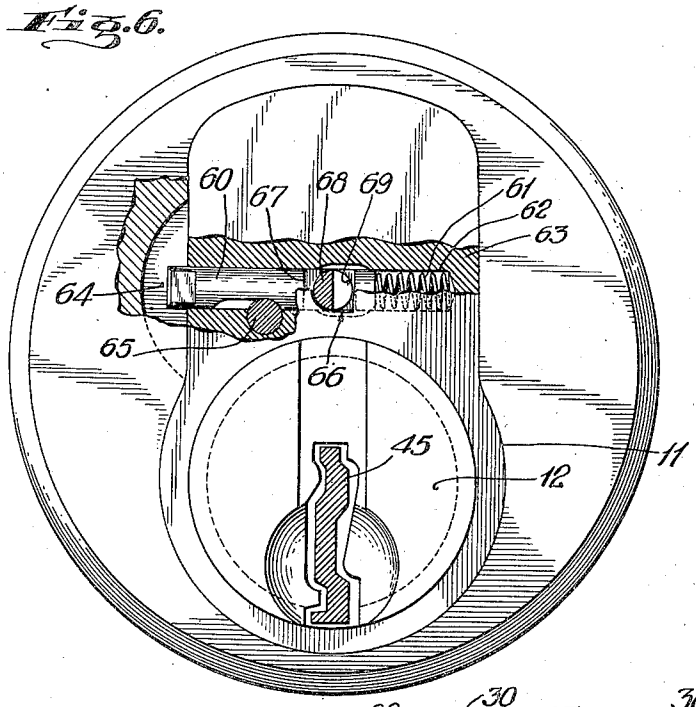
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REMOVABLE CYLINDER

Filed April 21, 1943 3 Sheets-Sheet 3

Fig. 6.



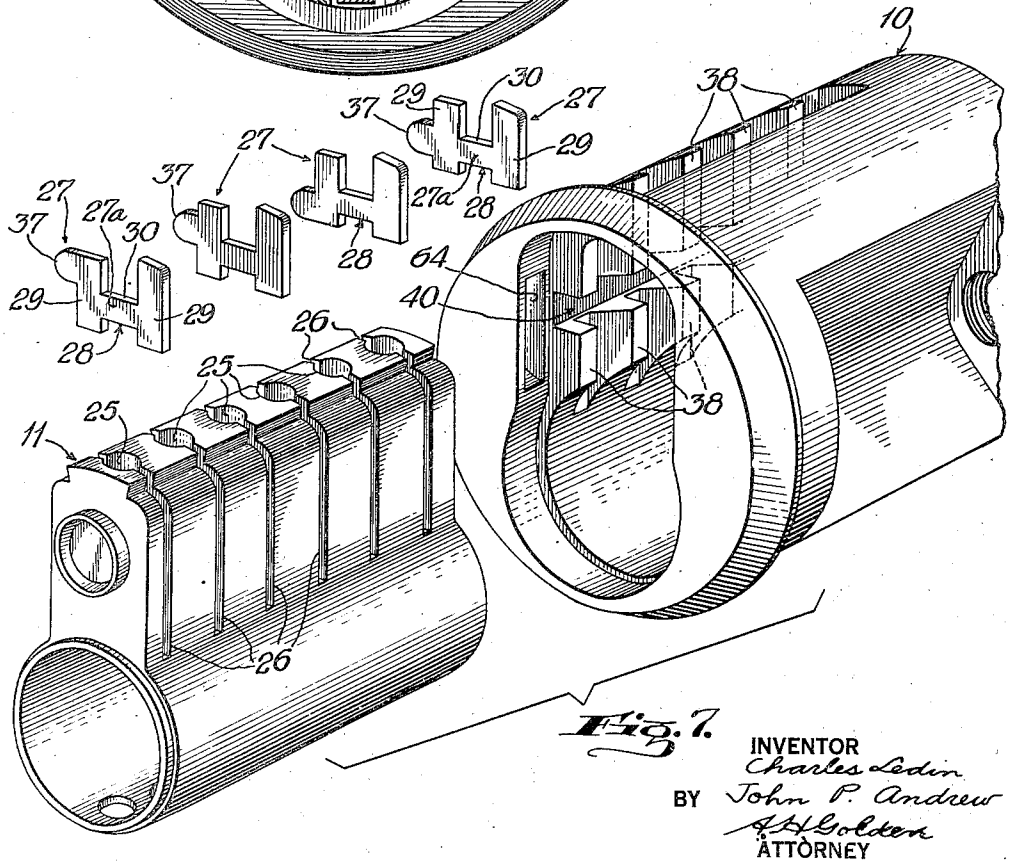


Fig. 7.

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2,418,080

REMOVABLE CYLINDER

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Application April 21, 1943, Serial No. 483,830

21 Claims. (Cl. 70—369)

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This invention relates to a lock of the type in which a lock core is mounted within a core housing, the lock core being readily removable from the housing upon operation of certain key controlled mechanism. More particularly, this invention relates to a lock core and housing of the type discussed in the applications of Johnstone, Serial No. 474,805, filed February 5, 1943, and Serial 474,806, filed February 5, 1943, which have become Patent Numbers 2,391,832 and 2,391,833, respectively, dated December 25, 1945.

As one feature of our invention, we utilize tumblers mounted within the core for controlling directly the removal of the lock core from the core housing. In this manner we distinguish from the Johnstone applications in which the tumblers control retaining mechanism and through the said retaining mechanism control the removal of the lock core from the core housing.

It is a further feature of our invention that both locking and retaining tumblers are mounted in the lock core of our new lock, and both are set simultaneously by a key in the key way of the key plug of the lock core. As a further feature of the invention the retaining tumblers are preferably set through the locking tumblers.

A further feature of our invention resides in the arrangement of the tumblers so that when the retaining tumblers are moved into release position, the locking tumblers remain in locking position, while when the locking tumblers are moved into release position the retaining tumblers are maintained in locking position.

Still a further feature of our invention resides in means for resisting the picking of the retaining tumblers into release position.

A still further feature of our invention resides in additional means for maintaining the lock core within the lock housing, and with said means being preferably adapted to so hold the lock core within the housing as to relieve the main retaining means or tumblers, where retaining tumblers are used, from any stress that might be applied thereto in ordinary operation. A still further feature of our invention resides in the arrangement of the said additional means so that it is operable by a special form of key that is used also to set the retaining tumblers into release position.

Still a further feature of our invention resides in the particular type of key utilized for releasing the tumblers and for actuating the additional retainer means.

We have thus described generally the more important features of our invention in order that our contribution to the art may be better appreciated and in order that the relation of our invention to the prior art may be better understood.

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Naturally, those skilled in the art will readily appreciate upon reading the specification that follows, just how our contribution to the art may be embodied in structures different from that herein shown. Therefore, it is important that the claims to be granted us shall not be limited to the specific structure we shall show and hereinafter describe.

Referring now to the drawings,

Fig. 1 is a vertical section of a lock housing and lock core embodying our invention.

Fig. 2 is a horizontal section taken along lines 2—2 of Fig. 1.

Fig. 3 is a section taken along lines 3—3 of Fig. 1.

Fig. 4 is a view similar to Fig. 1 but illustrates the retaining tumblers set in position to allow removal of the lock core from the core housing.

Fig. 5 is a section taken along lines 5—5 of Fig. 4.

Fig. 6 is a partially cut away view of the front end of the lock core and core housing.

Fig. 7 is an exploded view of certain parts of our invention.

Referring now more particularly to the drawings and especially Figs. 1 and 7, the core housing of our invention is designated by reference numeral 10 while the lock core is designated by reference numeral 11. A key plug 12 is mounted for rotation within the lock core 11 in the usual way known in the art. A series of tumblers 13 and tumbler drivers 14 are mounted within the lock core 11 and the key plug 12 in the usual standard manner, it being understood that when a key such as key 15 of Fig. 1 positions the tumblers 13 and drivers 14 with their parting lines coincidental with the periphery of the key plug 12, the key plug 12 may be rotated. The tumblers 13 and drivers 14 are herein called locking tumblers so as to simplify the description that follows.

Mounted with the core housing 10 as best illustrated in Figs. 1 and 2, is a cam 16 carrying a pair of pins 17. These pins 17 are adapted to enter longitudinal bores 18 in the key plug 12 when the lock core and key plug are inserted into the core housing 10. This relationship of the cam 16, the pins 17 and the key plug 12 is old in the art and is common to removable core cylinders, so that no further reference thereto is necessary. Incidentally, the particular core housing 10 herein illustrated is adapted for night latch operation and is formed with retaining ears 19 into which may enter retaining screws 20, all as is

understood by those skilled in the art. The cam 16 is shown as adapted for cooperation with a connecting bar 21, also, as is standard in this art.

The drivers 14 and the tumbler pins 13 forming the locking tumblers, are adapted for sliding movement in vertical bores 25 of the lock core 11. A series of vertical slots 26 are formed in the lock core 11, one slot passing preferably vertically and diametrically through each of the bores 25. Mounted in each of the slots 26 is an H shaped retaining tumbler 27, the surface 28 of which is adapted to lie against the upper surface 14a of each of the drivers 14. Naturally, the portions 29 of the H shaped tumblers 27 cooperate with the slots 26 to maintain the tumblers against lateral cocking movement.

Against the surfaces 30 of the several tumblers 27 there are applied a series of pressure tumblers 31 slotted at 32 so as to house substantially all of the bar portions 27a of tumblers 27. A series of springs 34 are mounted within the bores 25 and press against the pressure tumblers 31 in a manner which is quite apparent from the drawings. A spring plate 35 formed of sheet metal and shaped as best seen in Fig. 3 may be applied over the lock core to retain the springs 34 in position. The inwardly bent portions 36 of the plate 35 act to maintain the plate 35 in retaining position.

Each of the H shaped tumblers 27 is formed with a retaining shoulder 37 that extends outwardly of the lock core as best illustrated in Figs. 2 and 3. For coaction with the retaining shoulders 37, the core housing is formed with a series of retaining lugs 38 relatively to which the retaining shoulders 37 may slide. It is of course obvious that in the position of the parts in Figs. 1, 2 and 3, the lock core 11 will be maintained within the core housing 10 by the series of retaining shoulders 37 because of their relation to the retaining lugs 38. A slot or gating 40 is formed in the core housing 10, passing longitudinally of the core housing through each of the retaining lugs 38. It is of course obvious that if the retaining shoulders 37 are aligned with the slot 40, the lock core may readily be moved from its position of Fig. 2 out of the core housing and into its position of Fig. 7, unless prevented by other means. The relationship of the tumbler retaining shoulders 37 to the retaining lugs 38 and slot 40 is one that is known in the art as a fence and gating relationship. It is obvious that it can readily be reversed by the forming of the tumblers with gatings or slots such as slot 40, and by placing the fences or shoulder 37 on the core housing 10. The claims appended to this application must of course be considered as covering either combination, since they are entirely equivalent.

For aligning the several H tumblers 27 so as to position their retaining shoulders 37 in alignment with the slot 40, a special removal key 45 is utilized, this key being shown in Figs. 2, 4 and 5. Those skilled in the art will understand that the key will function through the locking tumblers 13, 14 to position the retaining tumblers 27 against the force of the several springs 34 into the position of Figs. 4 and 5. In those figures the several retaining shoulders 37 are aligned with the slot 40, and so far as the retaining tumblers are concerned, the lock core 11 may be removed from the core housing. This setting of the tumblers may readily be distinguished from the setting of the tumblers by the key 15 by comparing Figs. 4 and 5 with Figs. 1 and 3. In Figs. 1 and 3 the locking tumblers 13, 14 have been set so their parting

lines are in alignment with the key plug 12. It is obvious that in this position of the parts, the key plug 12 is readily rotatable relatively to the lock core 11. It is also obvious that the several retaining tumblers are positioned in Figs. 1 and 3 with their retaining shoulders 37 out of alignment with the slot 40 so that the lock core 11 is retained within the core housing 10. In other words, when the locking tumblers are in release position the retaining tumblers are held in retaining position, as is seen from Fig. 3. In the reverse sense, when the retaining tumblers are moved into a release position as in Figs. 4 and 5, the locking tumblers 13, 14 are in locking position and the key plug is held against any rotation whatsoever relatively to the lock core 11.

It is highly desirable in a lock of the class described, that the retaining tumblers resist picking, and also, that no pressure be applied against those tumblers to hinder their free movement when the locking tumblers are being operated by the usual key 15. Thus, those skilled in the art will appreciate that if the shoulders 37 were to bear normally against the retaining lugs 38, in either of the fence and gating relationship discussed earlier, there would be considerable resistance to the operation of the several tumblers, including the locking tumblers, by the operating key 15. In order to relieve the retaining tumblers of stress, we utilize an additional retainer in the form of a pin whose action is best illustrated in Figs. 1, 2 and 6. This retaining pin is designated by reference numeral 60 and is spring pressed by a spring 61 outwardly of a bore 62 formed in the front end of the lock core 11. For facilitating manufacture, the front end of the lock core 11, designated by reference numeral 63 in Figs. 1, 2 and 6, is made as a part separate from lock core 11, and preferably in the manner of a scalp. It is then assembled to the lock core 11 to form an integral part thereof. If desired, however, part 63 may be made integral with the lock core 11, all as is apparent to those skilled in the art. The upper end of the retaining pin 60 as seen in Fig. 2, is formed for entry into a retaining slot 64 in the core housing 10 best illustrated in Fig. 7. It is the function of the retaining pin 60 to retain the lock core 11 within the core housing 10, and with the several retaining tumblers 27 held with their retaining shoulders 37 spaced from the retaining lugs 38 of the core housing.

A pin 65 best illustrated in Fig. 6, limits the throw of the retaining pin 60 by its spring 61. A small hole 66 is formed in the front portion 63 of the lock core 11 so that access may be had to a slot 67 in the retaining pin 60 to retract the pin 60 from retaining position. Special key 45 is formed as is best illustrated in Figs. 2 and 4 with a slotted lug 68 adapted to enter the hole 66 of the front 63 of the lock core. The head 69 of the lug 68 is adapted to move the retaining pin 60 out of the slot 64 in the core housing 10, and the bitted blade of key 45 sets the several retaining tumblers into the position of Figs. 4 and 5. A slight movement of the key 45 in the keyway in which it fits somewhat freely will cause the slotted lug 68 thereof to move with its head 69 into the dotted line position of Fig. 2, thereby not only effecting the release movement of the pin 60, but causing the head 69 of the lug 68 to engage the inner surface defining the bore 62. An outward pull of the key 45 will then of course act to remove the lock core 11 from the core housing, the retaining tumblers having been moved out of retaining position by the bitted portion of key 45

as described. It is well to note that the feature of an additional retaining means is of importance even in those locks where tumber controlled retainers are used rather than the directly retaining tumblers of this application.

Those skilled in the art will now of course appreciate that so long as retaining pin **60** functions to retain the lock core within the core housing, there will be no stress against the retaining tumblers **27**. Those desiring to pick the lock will first move the retaining pin **60** out of retaining position whereupon considerable stress may be applied against the several retaining tumblers **27** merely by an outward pull on the lock core **11**, the retaining shoulders **37** of the tumblers being then applied against the several retaining lugs **38**. With the parts in this position, it will be possible to manipulate the retaining tumblers **27** in an attempt to align them relatively to the release slot **40**. In order to prevent such manipulation, we serrate the surfaces of the shoulders **37** as best illustrated at **37***a* in Figs. 3 and 5, and we similarly serrate the retaining surfaces of the several retaining lugs **38** as shown at **38***a*. It is obvious that if endwise pressure is applied now between the surfaces **37***a* and **38***a*, those serrated surfaces will prevent manipulation of the tumblers. In this way, our lock is maintained pick resisting to a very high degree. This serration of the tumblers and lugs will of course be the same regardless of which fence and gating combination is used.

We believe that the construction and operation of our invention will now be quite apparent to those skilled in the art.

We now claim:

1. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a key plug movably mounted in said lock core and having a key way, a series of tumblers movably mounted in said lock core and adapted to be set by a key in said key way, and means in said housing cooperable with parts of said tumblers for preventing removal of said lock core from said housing.

2. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a key plug movably mounted in said lock core and having a key way, a series of tumblers movably mounted in said lock core and adapted to be set by a key in said key way, surfaces formed as a part of said housing cooperable with surfaces of said tumblers for preventing removal of said lock core from said housing, said tumblers being adapted for alignment by a key into predetermined relation to said lock core and the surfaces of said housing whereby to permit removal of said lock core.

3. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a series of spaced tumblers movably mounted in said lock core and adapted to be set by a key, surfaces of said tumblers lying in juxtaposed relation to a series of spaced surfaces on said housing whereby to obstruct removal of said lock core from said housing, said surfaces being shaped so that a predetermined setting of said tumblers will align the said surfaces in unobstructing relation to allow removal of said lock core from said housing.

4. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a series of spring pressed tumblers movably mounted in said lock core and adapted for setting by a key against the pressure of said springs, and an independent obstructing surface on said housing cooperable with each of said tumblers for preventing removal of said lock core from said housing.

5. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a key plug movable in said lock core and having a key way, key set tumblers for locking said key plug against unlocking movement relatively to said lock core adapted to be positioned by a key in the key way of said key plug to release said key plug, retaining tumblers movably mounted in said lock core and adapted to be moved by said key set tumblers when said key set tumblers are being key set, and surfaces formed as a part of said housing cooperable with surfaces of said retaining tumblers for preventing removal of said lock core from said housing, said retaining tumblers being adapted for alignment by a key into predetermined relation to said lock core and housing so that said surfaces no longer are positioned relatively to one another to prevent removal of said lock core.

6. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a key plug movable in said lock core, locking tumblers for locking said key plug against unlocking movement relatively to said lock core, retaining tumblers movably mounted in said lock core, said retaining and locking tumblers being movable simultaneously by a key in said keyway, and surfaces formed as a part of said housing cooperable with surfaces of said retaining tumblers for preventing removal of said lock core from said housing, said tumblers being adapted for alignment by a key into predetermined relation to said lock core and housing so that said surfaces no longer are positioned relatively to one another to prevent removal of said lock core.

7. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a key plug movable in said lock core, tumblers mounted for movement relatively to said lock core and key plug and adapted to be positioned by a key in the key way of said key plug for releasing said key plug for rotation, and surfaces formed as a part of said housing cooperable with surfaces of certain of said tumblers for preventing removal of said lock core from said housing, said tumblers being adapted for alignment by a key into predetermined relation to said lock core and housing so that said surfaces no longer are positioned relatively to one another to prevent removal of said lock core.

8. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a key plug movable in said lock core, locking tumblers for locking said key plug against unlocking movement relatively to said lock core adapted to be positioned by a key in the key way of said key plug to release said key plug for movement in said lock core, retaining tumblers movably mounted in said lock core and adapted to be moved by said locking tumblers when said locking tumblers are being key set, surfaces formed as a part of said housing cooperable with surfaces of said retaining tumblers for preventing removal of said lock core from said housing, said tumblers being adapted for alignment by a key into predetermined relation to said lock core and housing so that said surfaces no longer are positioned relatively to one another to prevent removal of said lock core, said retain-

ing and locking tumblers being so formed that when said locking tumblers release the key plug for rotation in said lock core said retaining tumblers are in retaining position, and when said retaining tumblers are out of retaining position said locking tumblers are in locking position.

9. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a key plug in said lock core having a key way, a series of tumblers movably mounted in said lock core, means positioned between said tumblers and said key way and adapted to be set by a key in the key way whereby to set said tumblers, and means in said housing cooperable with parts of said tumblers for preventing removal of said lock core from said housing.

10. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a key controlled element movably mounted in said lock core, means in said housing cooperable with a part of said key controlled element for preventing removal of said lock core from said housing, and additional means for maintaining said lock core in said housing with said key controlled element spaced from the means in said housing.

11. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a series of tumblers movably mounted in said lock core, means whereby said tumblers control the removal of said lock core from said housing, and additional retaining means for maintaining said lock core in said housing independently of said means controlled by said tumblers.

12. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a series of tumblers movably mounted in said lock core and adapted to be set by a key, surfaces formed as a part of said housing cooperable with surfaces of said tumblers for preventing removal of said lock core from said housing, said tumblers being adapted for alignment by a key into predetermined relation to said lock core and housing so that said surfaces no longer are positioned relatively to one another to prevent removal of said lock core, and means for maintaining said lock core in said housing with the surfaces of said tumblers spaced from the surfaces of said housing.

13. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a key plug in said lock core having a key way, a series of tumblers movably mounted in said lock core and adapted to be set by a key in said key way, surfaces of said tumblers lying in juxtaposed relation to surfaces of said housing whereby to obstruct removal of said lock core from said housing, and means for maintaining said lock core in said housing with the surfaces of said tumblers spaced from the surfaces of said housing.

14. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a series of tumblers movably mounted in said lock core and adapted to be set by a key, surfaces of said tumblers adapted for cooperation with surfaces in said housing to obstruct removal of said lock core from said housing, and means for maintaining said lock core in said housing in a position wherein said tumblers are free of said surfaces and are adapted for free movement by the key.

15. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a series of tumblers movably mounted in said lock core and adapted to be set by a key, surfaces of said tumblers adapted to obstruct removal of said lock core from said housing, and means for maintaining said lock core in said housing in a position wherein said tumblers are free of said housing and are adapted for free movement by the key, said tumblers being serrated so that if they contact the housing they are prevented from free movement.

16. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a series of tumblers movably mounted in said lock core and adapted to be set by a key, surfaces of said tumblers lying in juxtaposed relation to surfaces within said housing whereby to obstruct removal of said lock core from said housing, said surfaces being shaped so that a predetermined setting of said tumblers will align the said surfaces in unobstructing relation to allow removal of said lock core from said housing, the said surfaces being formed so that when they are in contact movement of said tumblers will be inhibited, and means for maintaining said lock core in said housing with the surfaces of said tumblers spaced from the surfaces within said housing.

17. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a series of tumblers movably mounted in said lock core and adapted to be set by a key, surfaces of said tumblers lying in juxtaposed relation to surfaces of said housing whereby to obstruct removal of said lock core from said housing, said surfaces being shaped so that a predetermined setting of said tumblers will align the said surfaces in unobstructing relation to allow removal of said lock core from said housing, and the said surfaces being formed so that when they are in contact movement of said tumblers will be inhibited.

18. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a series of tumblers movably mounted in said lock core, means in said housing cooperable with parts of said tumblers for preventing removal of said lock core from said housing, and additional means for maintaining said lock core in said housing with said tumblers spaced from the means in said housing, said lock core having an opening through which said additional means are readily moved out of retaining position.

19. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a key plug movable in said lock core, aligned bores in said key plug and lock core in communication with a key way in said key plug, pin tumblers in said aligned bores, and plate tumblers mounted in vertical slots in said lock core parallel to said aligned bores, means whereby said plate tumblers are movable with said pin tumblers, and surfaces of said plate tumblers cooperable with surfaces of said housing for obstructing removal of said lock core from said housing.

20. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a key plug in said lock core having a key way, a series of tumblers movably mounted on said lock core and adapted to be set by a key in the key way of said key plug, means in said housing cooperable with parts of said tumblers for preventing removal of said lock core

from said housing, additional means for retaining said lock core in said housing with said tumblers spaced from the means in said housing, said lock core having a forward opening through which said additional means are readily moved out of retaining position, and a key for said lock core having a surface for setting said tumblers and a portion adapted to enter said opening to move said additional means.

21. In a lock of the class described, a housing, a lock core mounted in said housing and adapted for removal therefrom, a key plug movable in said lock core, aligned bores in said key plug and lock core in communication with a key way in said key plug, pin tumblers in said aligned bores, plate tumblers mounted in vertical slots in said lock core parallel and diametrically traversing said aligned bores, means whereby said plate tumblers are movable with said pin tumblers, a series of surfaces formed on said housing and adapted to lie in obstructing relation to portions of the said

plate tumblers to prevent movement of said lock core outwardly of said housing, springs pressing said plate tumblers into a predetermined obstructing relation to said series of surfaces, and said tumblers being movable by a key in said key way out of said obstructing relation to release the lock core for removal.

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