Oct. 28, 1958 L. J. BIRO 2,857,753

CYLINDER LOCK

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Fig. 1

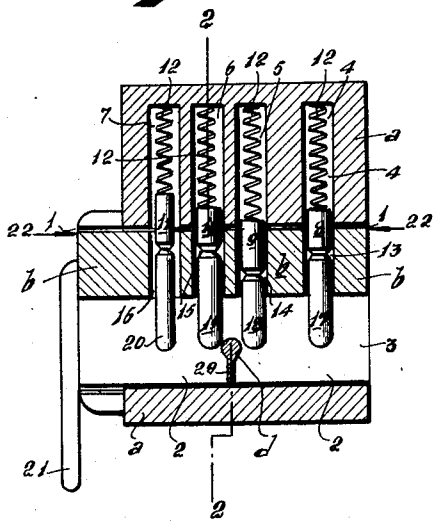


Fig. 2

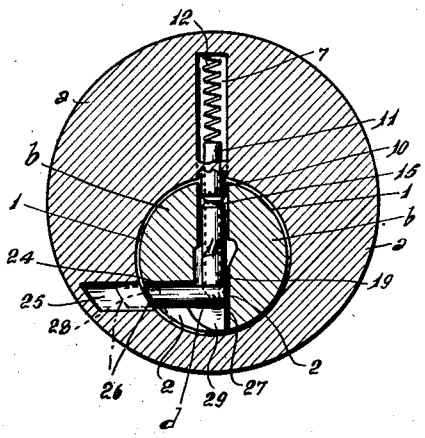


Fig. 3

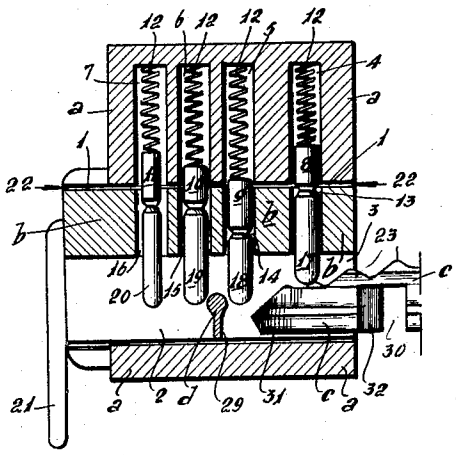
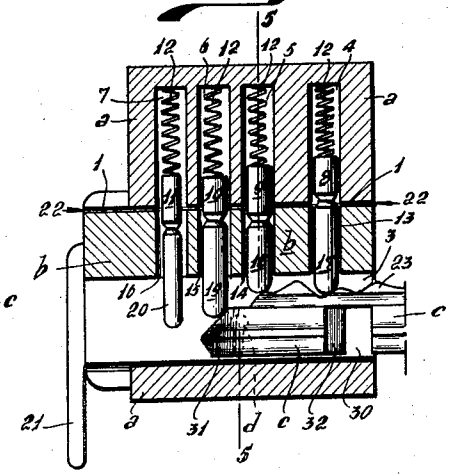


Fig. 4



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CYLINDER LOCK

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Fig. 11

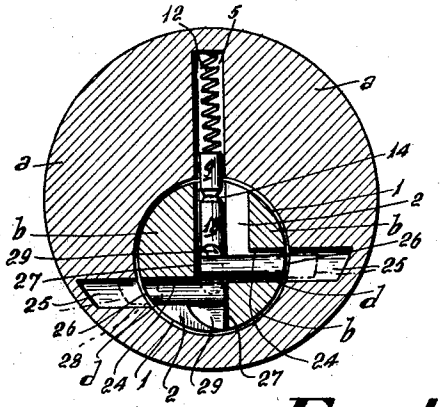


Fig. 12

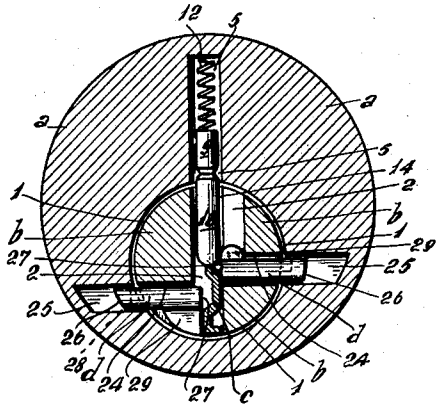


Fig. 10

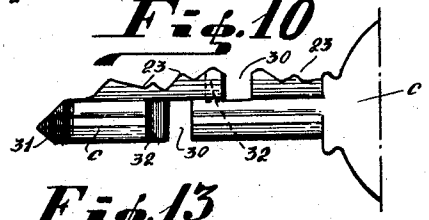


Fig. 13

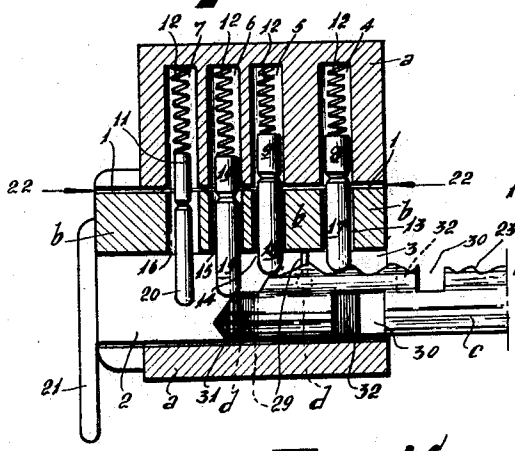


Fig. 14

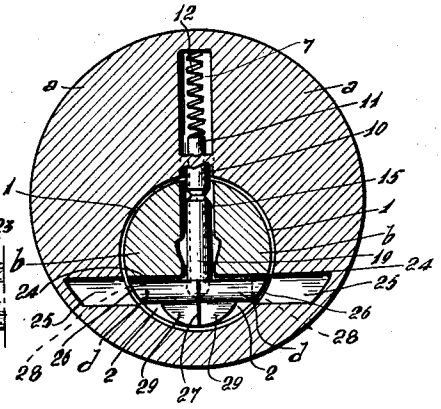
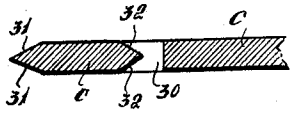


Fig. 15



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CYLINDER LOCK

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Fig. 5

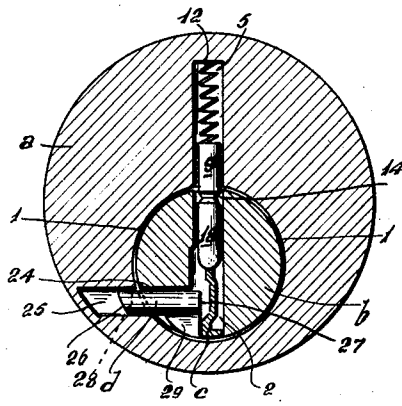


Fig. 6

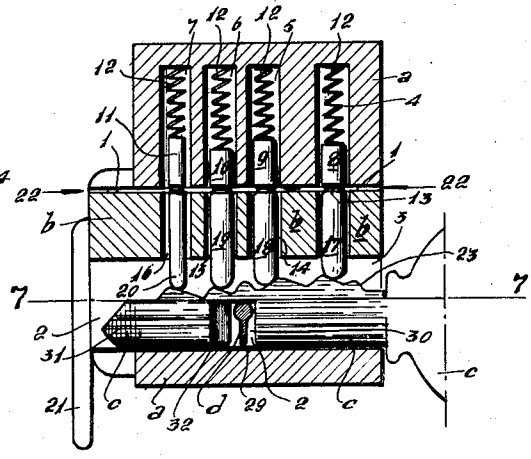


Fig. 9

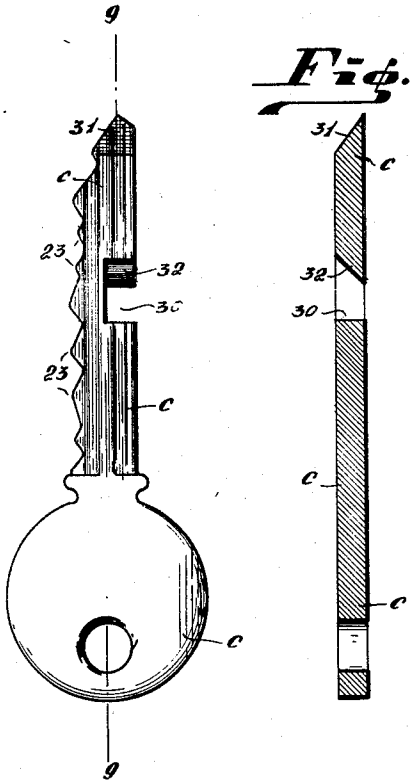


Fig. 7

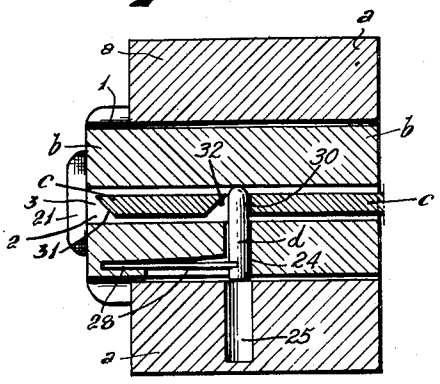


Fig. 8

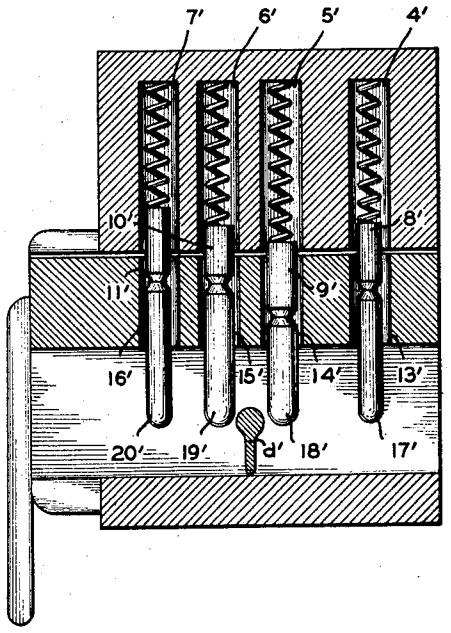
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CYLINDER LOCK

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FIG. 16



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United States Patent Office 2,857,753 Patented Oct. 28, 1958

2,857,753

CYLINDER LOCK

Ladislao J. Biro, Buenos Aires, Argentina

Application May 24, 1954, Serial No. 432,002

13 Claims. (Cl. 70—421)

The present invention refers to a drum lock and more particularly to an automatic prevention ratchet, which, by the manner in which it acts as an opposing obstacle in the key drum, acts as a guarantee for preventing any violation or illicit maneuvering of the lock.

As is known, combination locks, consisting of one operating cylinder fastened by tumblers, are apparently inviolable as the pin tumblers of the combination being several, and the secret thereof not being known, it is very difficult to effect the displacement degree required (for each of them) for the loosening of all the parts which form the set; but since it is not by means of the key that delinquents attempt to suppress the obstacle represented by the seal, the security is therefore relative, as same may be vanquished by anyone knowing the easy process which evil genius has created in order to open the lock without a key.

In effect, since the cylinder has an indispensable rotating play so that the pin tumblers may coincide in the perforations of each part, any person may liberate said cylinder if, with patience, he employs an instrument in order to obtain a fractional rotation in said drum, whilst with another instrument same is inserted in the key channel in order to lift, one by one, the pin tumblers of the combination. In this operation each pin tumbler must be mounted and retained in the respective edge of the perforation of the drum, which means that, with the second instrument, the alignment thereof may be obtained, as if done by a key, in order to stop the fastening of the lock which will allow the drum to rotate. This can easily be accomplished by means of the use of the first instrument.

It is interesting to note the manner wherein the present invention solves the old and important problem of the cylinder locks, for, since the cause of the vulnerability of the lock is precisely the freedom of play in the cylinder, this is overcome by immobilizing a catch, acting as an obstacle of access into the key channel, so that if any other than the proper key is introduced said catch will be moved out of place and will hinder the movement required for the operation of aligning the combination pin tumblers.

This means that the intruder, although he may know the manner in which to open the lock without a key, will be unable to do so in this case, as the latching element acts precisely as a blocking means in the key channel giving access to the pin tumblers of the combination. Consequently any movement tending to force a passage towards said pin tumblers will be sufficient to produce a blocking thereof, so that it would be futile to try and align the pin tumblers, and they will remain in the line corresponding to the union between the cylinder and the fixed body thereby preventing rotation of the cylinder.

The cylinder, apart from the pin tumblers of the combination possesses one or more latches which, with the tension caused by a spring is or are interposed in the channel, so as to block the entrance of illegal instruments. Said latch coincides with a groove which in turn

coincides with a section able to receive said latch but with axial play movement of said pin tumblers, in their corresponding perforations so that anyone attempting to operate same in an illicit manner will cause the latch, or latches, to enter the perforation of the fixed body, in which case the necessary rotating fraction of the drum cannot be obtained, thus serving as a retainer of the pin tumblers.

Apart from what has been stated, several are the objects pursued by the present invention, amongst which may be stated that of manufacturing a cylinder lock which can offer a real guarantee insofar as illegal uses are concerned.

Another object is that of establishing a blocking means with the latches, which, although they can be displaced to give entrance to the corresponding key, must return to their normal position, in view of the fact that these latches are converted into blocking means, as soon as the least displacement occurs.

Another object is to offer absolute security for this type of lock, universally known, as most manufacturers maintain special research service, with the object of solving any problem created by the failure of aligning the pin tumblers with the help of a fractional rotation of the cylinder in order to ensure their positions.

Another object of the invention is that of offering a simple basis for the application of the security device, as it only comprises latches which, by their disposition, do not alter to any extent, the construction and manufacture of locks.

Another object is that of obtaining in the security device a totally automatic effect which does not offer any complications to the user, as the key is the instrument which displaces the latch and normalizes its position once it has been inserted into the key channel.

Another object is that of increasing the security of the lock, as disposing the latch or latches in different relative positions in the key channel, it is possible to form a secret code in order to prevent illegal usage.

The further objects of this invention will be shown throughout the following description, which for greater clearness and comprehension has been illustrated with several drawings in which are represented the improved lock in one of its preferred forms of realization, thus:

Fig. 1 is a longitudinal section, through the lock of the present invention, and represents the position of the parts before introducing the key.

Fig. 2 is a transversal section of the line **2—2** of Fig. 1.

Fig. 3 is a similar view of Fig. 1 but showing this key partially introduced.

Fig. 4 is a similar view of Figs. 1 and 3 but also showing the key introduced in a further degree within the lock.

Fig. 5 is a transversal section of the line **5—5** of Fig. 4.

Fig. 6 is a longitudinal section of the lock, showing the position of the parts with the key wholly introduced.

Fig. 7 is a tranversal section of line **7—7** of Fig. 6.

Fig. 8 is a view of the body of the key for opening the lock.

Fig. 9 is a section of line **9—9** of Fig. 8.

Fig. 10 is a key of different execution, which, instead of one, has two indentations destined for locks with two latches in different planes.

Fig. 11 is a transversal section of the lock with two latches in different planes. In same may be appreciated the manner in which, with the sum of the two latches (inner parts) the rear access of the key channel is completely closed.

Fig. 12 is the same view as Fig. 11 but showing the manner in which, when introducing the key, the latches are displaced, resting in their respective grooves.

Fig. 13 is a longitudinal section of the lock corresponding to the example of Figs. 11 and 12. In this cut is shown the manner in which the key penetrates, separating the latches, which are to occupy their normal place in their respective indentations when the key is totally introduced.

Fig. 14 is a transversal section of the lock in a different execution in which the latches are set on the same line in antagonistic opposition.

Fig. 15 is a part of the key destined to the type of lock with two antagonistic latches, as in Fig. 14. This key has been cut longitudinally so as to show its extreme end shaped in V and the wedge which forms the double bevel of the indentation, also shaped in V.

Fig. 16 is a longitudinal section through the lock of the present invention and is directed to a modification wherein two tumblers have a greater movement play than the remaining tumblers.

In the different drawings the same reference numbers indicate equal or corresponding parts, the elements being indicated by letters.

As may be seen in the drawings, the lock comprises a fixed body *a* possessing a longitudinal cylindrical hollow **1**. In said hollow is rotatively included a drum *b* having a key channel **2** for access through its mouth **3** for introducing key *c*.

Said fixed body *a* has a plurality of guide chambers **4**, **5**, **6**, and **7** which include several pin tumblers **8**, **9**, **10** and **11**, which form the closing combination.

Pin tumbler **11**, the remotest from the mouth **3**, is of a smaller diameter than the other pin tumblers, so that in its chamber **7**, pin tumbler **11** has a movement play greater than that of pin tumblers **8**, **9**, and **10**; all the pin tumblers are pressed by springs **12**, so that thus tensioned they penetrate perforations **13**, **14**, **15** and **16**; said perforations, made in the drum from the periphery of same up to the key channel **2**, serve as guides to the coacting tumblers **17**, **18**, **19** and **20**. In perforation **16**, said pin tumbler **11** also has a lateral movement play greater than that of the pin tumblers **8**, **9**, and **10** in their perforations **13**, **14** and **15**; with this movement play in perforation **16** and in guide chamber **7**, pin tumbler **11**, in spite of passing between the fixed body and the drum, allows a fractional rotative movement to said drum *b*, but this movement is impeded by the other pin tumblers.

The coacting tumblers **17**, **18**, **19** and **20** are projected into key channel **2** as a consequence of the pressure of springs **12**. With the pressure of springs **12** the pin tumblers and coacting tumblers occupy the position of Fig. 1 which is the closing position, as the pin tumblers **8**, **9**, **10** and **11** lie athwart the fixed body *a* and the drum *b*.

As drum *b* must rotate in order to displace a latch bolt by means of wing **21**, key *c* must set the pin tumblers and the coacting tumblers so that the union of each pin tumbler with its respective coacting tumbler coincides with the line **22—22** shown in Figs. 1, 3, 6 and 13.

To this end, key *c* possesses a plurality of crests **23** with a projection proportioned to the run which must be made by the coacting tumblers and pin tumblers, so that their respective unions may coincide with line **22—22**. Thus, when the key is totally introduced, as shown in Fig. 6, the crests **23** elevate the coacting tumblers in order that the pin tumblers may be free of drum *b* and remain with their extreme ends level with line **22—22**. In this state, that is to say, with the key inserted (Fig. 6) there is no inconvenience for the key to rotate the drum so that, with its wing **21**, it provokes the displacement of the latch proper of the lock.

After said operation, when withdrawing key *c*, the springs **12** force the coacting tumblers to return to their original position in which the pin tumblers lie across the junction of the fixed body *a* and the drum *b*.

Any lock with pin tumbler combination is liable to be violated by employing an instrument for raising the coacting tumblers and pin tumblers, aligning them on the periphery of the drum, so that the pin tumblers may rest on the border of the perforations of said drum; the retaining of the pin tumblers in the border of their perforations is possible owing to the movement or play of the pin tumblers in their guide chambers and perforations, which allows for the drum to be sufficiently rotated so that, when the pin tumblers are raised, they may be retained in the edge offered by the rotation.

That is why, in the new lock, in order to render it inviolable, drum *b* is provided with at least, one latch *d* which forms a blocking to the access of any instrument in the rear part of channel **2**, and if it is withdrawn, said latch produces the immobility of drum *b*.

To this end, latch *d* is disposed in a respective guide **24** which passes from the periphery of drum *b* up to the key channel **2**. In the inoperative position of drum *b*, guide **24** coincides with groove **25**, which is made in the fixed body *a*; the latch *d* being of a greater length than that of guide **24**, has its outer extreme **26** flush with the periphery of drum *b*, whilst its inner extreme **27** is projected in the key channel **2** as an obstacle to a rear access in said channel; said latch is pressed by spring **28** towards an inoperative position in which the extreme **26** remains precisely flush with the periphery of drum *b* in such a manner that if an instrument is inserted in channel **2**, upon displacement of latch *d*, so that the instrument may pass, the extreme **26** fits into grooves **25**.

The movement of play of extreme **26** of the latch in the groove **25** is smaller than the movement play of the pin tumbler **11** in its guide chamber **7** and perforation **16**, so that when latch *d* is displaced towards the operative position (Fig. 5) the fixing of the latch *d* in the groove **25** annuls the movement of drum *b*; that is to say that the possible fraction of movement of drum *b* allowed by the movement play of pin tumbler **11**, is annulled by the blocking imposed by latch *d* entering groove **25**.

In this manner it is not worth while trying to raise the coacting tumblers **17**, **18**, **19** and **20** with unlawful instruments, for, as drum *b* is unable to rotate, and pin tumbler **11** cannot reach the border of perforation **16**; this means that even repeating the operation of raising the coacting tumblers, the pin tumbler **11** falls again without finding any retaining means, so that it maintains a blocking position for drum *b*.

The fact that pin tumbler **11** has a greater movement play with respect to pin tumblers **8**, **9** and **10**, establishes another combined security, for as pin tumbler **11** is the most remote from mouth **3**, the intruder must forcibly displace the coacting tumblers **17**, **18**, and **19** in order to reach coacting tumbler **20** with the instrument. And if he commences by displacing the coacting tumblers **17**, **18** and **19**, the lesser movement play of their respective pin tumblers **8**, **9** and **10** will prevent drum *b* from being rotated in order to reach pin tumbler **11** and raise it to the border of perforation **16**.

Therefore, since latch *d* with its extreme **27** and wing **29** totally covers the part of the channel **2** opposite to that part covered by the coacting tumblers, it is difficult if not impossible to operate with instruments different to that of the key. This is because introduction of an illegal instrument into the part of channel **2** covered by latch *d* displaces latch *d* immobilizing the drum by the entering of the extreme **26** in groove **25**, and if the intruder, so as not to move the latch, acts in a different manner with the instrument through the coacting tumblers **17**, **18** and **19**, as has been mentioned, pin tumbler **11** cannot be jammed, because pin tumblers **8**, **9** and **10** prevent it due to the lesser movement play.

The latch *d* is disposed near the coacting tumblers **18** and **19** in such a manner that it forms a closing curtain opposite to coacting tumbler **19**; in this case the intruder is obliged to raise such coacting tumbler **19** in order to reach coacting tumbler **20**; in which case, pin tumbler

10, due to its lesser tolerance play annuls the movement of the drum, preventing pin tumbler 11 from being raised to the edge of perforation 16.

All this is no obstacle for key *c* for it has means for acting correctly without altering the position of latch *d* when totally inserted, as in Fig. 6. In effect, this key has an opening 30 which coincides precisely with the place in which is found latch *d*, and as may be appreciated, said key *c* is bevelled in its extreme 31 so that when inserted it may act as a wedge with said bevelled extreme 31. The inner extreme 27 of latch *d* is sharpened, so that when key *c* is inserted, with the wedge formed by its bevel 31, it easily separates latch *d* as graphically shown in Fig. 5. Latch *d* is displaced, entering its outer extreme 26 in groove 25. When key *c* reaches the total insertion position (Figs. 6 and 7) latch *d* pressed by spring 28 recovers its normal inoperative position, as said latch is projected through opening 30 presented in coincidence. In this manner, latch *d* emerging from groove 25 does not hinder the movement of drum *b* which, being also free of the closing operation of pin tumblers 8, 9, 10 and 11 can be rotated by means of the key, in order to effect the displacement of the latch bolt in the opening or closing sense. The opening 30 is also bevelled at 32, so that when withdrawing the key from the lock, said bevel 32 displaces latch *d* in order to allow the withdrawal of the part of the key which is behind same.

If desired, for additional security one of the pin tumblers on the side of the lock toward the mouth of the lock may also be provided with greater movement play in its guide chamber in the same manner as pin tumbler 11. This is the modification as shown in Fig. 16 wherein 4', 5', 6', and 7' are guide chambers corresponding to chambers 4, 5, 6, and 7 of Fig. 1. Pin tumblers 8', 9', 10', and 11' correspond to pin tumblers 8, 9, 10, and 11 of Fig. 1, and coacting tumblers 17', 18', 19', and 20' correspond to the respective coacting tumblers of Fig. 1. Perforations 13', 14', 15', and 16' correspond to the respective perforations of Fig. 1. Latch *d'* corresponds to latch *d* of Fig. 1. In this modification pin tumbler 8' as well as pin tumbler 11' are of smaller diameters than the remaining pin tumblers so that each of said pin tumblers 8' and 11' have greater movement play in their respective guide chambers than that of pin tumblers 9' and 10'.

In case of having two latches *d* as shown in Fig. 14, both latches being bi-symmetrical are urged by their respective springs 28 acting antagonistically and abutting in the line in the middle of channel 2; that is, the inner extremes 27 abut against each other whilst the respective outer extremes 26 remain flush with the periphery of drum *b*.

In this case the extremes 27 and wings 29 act together forming a curtain which covers the part which is not reached by the coacting tumblers 17, 18, 19 and 20.

Thus even when an illegal instrument is introduced, it is difficult if not impossible to violate the lock as the channel is obstructed by the presence of extremes 27 and wings 29, for, although this instrument may separate the latches *d* these render impossible the required turning of drum *b* due to the lesser lateral movement play that extremes 26 have in grooves 25 with respect to the movement play of pin tumbler 11 in its guide chamber 7; and if said instrument is directed through the part covered by the coacting tumblers 17, 18, 19 and 20, because pin tumbler 10 has a lesser movement play than pin tumbler 11, the raising of the coacting tumbler 19 with pin tumbler 10 will not allow the movement of drum *b* so that pin tumbler 11 may reach the edge of perforation 16 since the drum is still prevented from rotating sufficiently because of the latches. This means that it is impossible to elevate said pin tumbler 11 as it cannot reach the edge in view of the blocking imposed by pin tumbler 10.

The key proper for acting in the lock, according to model in Fig. 14 must have a double sharp edge 31, that is to say that said key *c''* must be bevelled in V as shown in Fig. 15. In this manner the key forms a wedge with the joint of both latches *d*, in such a manner that it is easily inserted. The opening 30 must also possess two bevellings forming a wedge in V as shown in Fig. 15.

In the example of Figs. 11, 12 and 13 the lock also has two latches *d*; but in this case the latches are placed in different planes and positions. For example, the inferior latch is set in identical conditions as the latch of Figs. 1 to 7, but the superior latch is set nearer to the mouth 3 and in a place in which its extreme 27 with its wing 29 covers the rest of the key channel corresponding to that part of the channel covered by the coacting tumblers 17, 18, 19 and 20.

This means that between the two latches *d* (Fig. 11) the access to the rear part of channel 2 is completely closed, and as both latches, in their normal inoperative position, have their extremes 26 flush with the periphery of drum *b*, any displacement of said latches in order to pretend to introduce an instrument, produces the setting of said extremes 26 in the corresponding groove 25 which prevents the rotating movement of drum *b*. As the movement play of extreme 26 in groove 25 is smaller than the movement play of at least one of the pin tumblers to be found behind the latches, it is impossible for the furthermost pin tumbler to mount the edges of their corresponding perforations 15 and 16.

Key *c'* as shown in Figs. 10 and 13, possesses two openings 30, one for each latch *d*, correspondingly, so that in inserting the key as shown in Figs. 12 and 13, once it has been totally inserted, said openings allow the resetting of both latches *d* to their inoperative position, Fig. 11. Key *c'* with its crests 23 acting against the coacting tumblers, levels the pin tumblers as at line 22—22 so that, out of the drum, said pin tumblers may not impede the rotation of same for the opening or closing operation of the lock. The key *c'*, in the event that the tip of the key is high enough to reach the upper latch, has a double bevel at 31 to displace each latch. Otherwise, an appropriate bevel is provided at the forwardmost edge of the key at the point where the key is high enough to displace the upper latch.

This application is a continuation-in-part of copending application Serial No. 393,883, filed November 23, 1953, now abandoned.

It is obvious that in carrying out this invention, modifications of detail and structure may be introduced without this implying a departure from the scope of said invention, the characteristics of which are clearly defined in the following claims.

I claim:

1. A tumbler lock comprising a fixed body defining a longitudinal cylindrical hollow, a revolvable drum enclosed within said hollow, said fixed body having a plurality of guide chambers communicating with said hollow, said drum having a plurality of perforations in alignment with said guide chambers when said drum is in its inoperative position, pin tumblers mounted within said guide chambers, said pin tumblers being urged toward said perforations, tumblers in said perforations coacting with the pin tumblers in said guide chambers, a key channel in said drum, said coacting tumblers normally projecting from said perforations into said key channel, a guide channel in said drum extending from the periphery of said drum to said key channel, a groove in said fixed body, said groove being in alignment with said guide channel in the inoperative position of the drum, at least one latch having a length greater than said guide channel, said latch being positioned within said guide channel and urged toward an inoperative position within said drum in which the outer extremity of said latch is flush with the periphery of the drum while the inner extremity of said latch projects into said key channel to act as an obstacle to access to the rear of said key channel, at least one of said pin tumblers being mounted to the rear of said latch

and at least one of said pin tumblers mounted to the rear of said latch having a lateral play movement in its guide chamber which is greater than the lateral play movement of said latch and at least one of the pin tumblers positioned forwardly of said rear pin tumbler in their respective guide channel and guide chamber, so that said rearpin tumbler having said greater lateral play movement cannot be lifted without the use of the appropriate key since sufficient rotation of said revolvable drum to enable said rear pin tumbler to be caught on the peripheral edge of said perforations is prevented by said latch or by one of said forward pin tumblers.

2. A tumbler lock as recited in claim 1 in which said pin tumblers are spring-urged toward said perforations and said latch is spring-urged toward said inoperative position within said drum.

3. A tumbler lock as recited in claim 1 in which said tumblers obstruct the upper portion of said key channel and said latch obstructs the remainder of said key channel.

4. A tumbler lock as recited in claim 3 in which the inner extremity of said latch is formed with a key obstructing the portion of said key channel opposed to the portion of said key channel obstructed by said coacting tumblers.

5. A tumbler lock as recited in claim 1 in which said latch is positioned between adjacent tumblers.

6. A tumbler lock as recited in claim 1 in which said latch and a tumbler immediately adjacent thereto each possess a lateral play movement in their respective guide channel and guide chamber which is smaller than the lateral play movement of said pin tumbler mounted to the rear of said latch.

7. A tumbler lock as recited in claim 1 in which the rearmost pin tumbler has a lateral play movement in its guide chamber which is greater than the lateral play movement of said latch and all of the remaining pin tumblers in their respective guides.

8. A tumbler lock as recited in claim 1 in which a plurality of latches are provided each of said latches being positioned within a separate guide channel, each of said guide channels being positioned in a different plane, said latches being urged toward an inoperative position within said drum.

9. A tumbler lock as recited in claim 8 in which said guide channels enter said key channel from opposite sides.

10. A tumbler lock as recited in claim 1 in which a plurality of latches are provided each of said latches being positioned within a separate guide channel, at least two of said guide channels being positioned in the same plane and in which said two guide channels enter said key channel from opposite sides.

11. A pick-resistant tumbler lock comprising a fixed body provided with a longitudinal cylindrical hollow, a revolvable drum rotatably positioned in said hollow, a plurality of spaced parallel chambers including outermost chambers and intermediate chambers in said fixed body, a plurality of spaced parallel recesses including outermost recesses and intermediate recesses in said drum, a key channel in said drum, said recesses extending between said key channel and the periphery of said drum and being positioned for movement into and out of registry with said chambers upon rotation of said drum, spring-pressed pins mounted for sliding movement in said chambers and said recesses and each including a driver and a tumbler, a guide channel in said drum, said guide channel extending between the periphery of said drum and a lower side of said key channel, a groove in said fixed body, said groove communicating with said guide channel when said chambers and said recesses are in registry, a latch slidably mounted in said guide channel for movement into and out of said key channel, said latch entering said groove to prevent rotation of said drum when said latch is moved out of said key channel, resilient means urging said latch out of said groove and into said key channel, the pins in said outermost chambers and recesses having a greater play in their chambers and recesses than the pins in said intermediate chambers and recesses and the latch in its groove, the inner end of said latch having a downwardly projecting portion completely closing the lower portion of said key channel when said latch is out of said groove.

12. A pick-resistant tumbler lock as recited in claim 11 in which said groove and said guide channel are positioned between said outermost pins.

13. A pick-resistant tumbler lock as recited in claim 11 in which said groove and said guide channel are positioned between said intermediate pins.

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