Aug. 22, 1939. J. LOMBARDO 2,170,205

LOCK CONSTRUCTION

Filed June 29, 1938

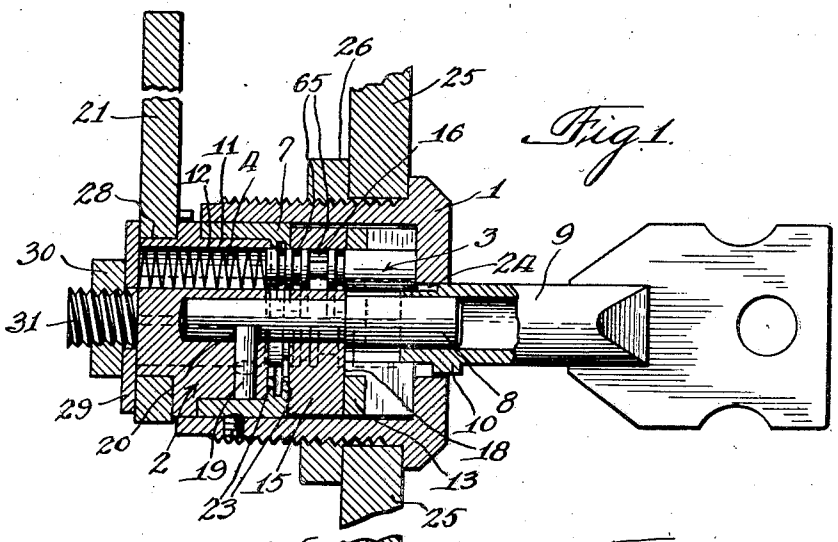


Fig. 1.

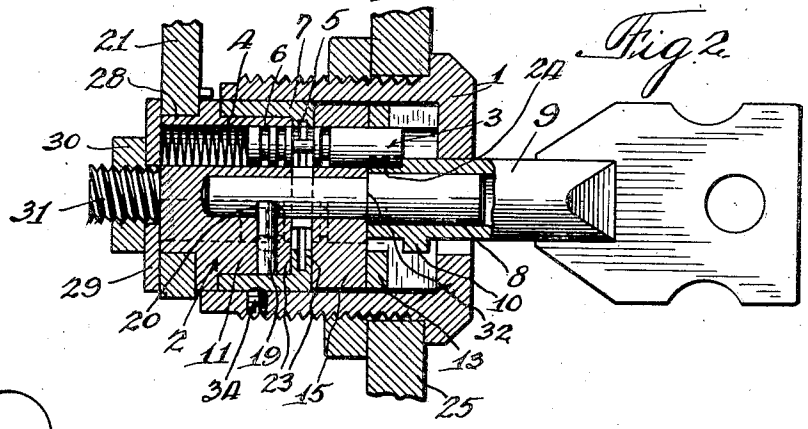


Fig. 2.

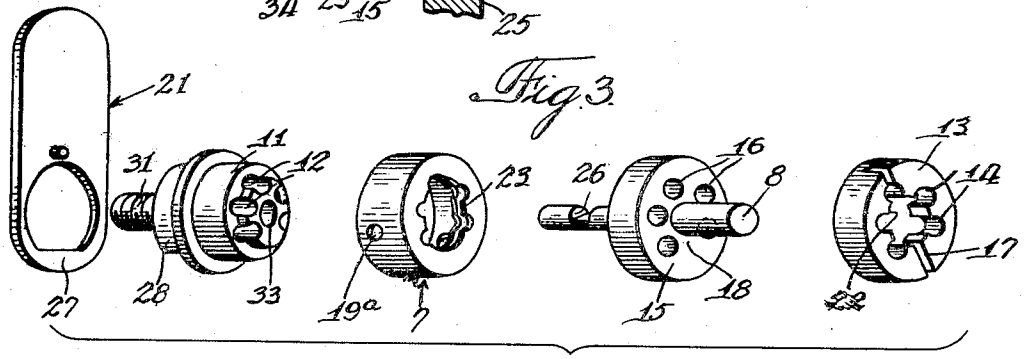


Fig. 3.

Inventor:
Joseph Lombardo.
By Owen, Dixon, Olds & Mecklenburger
Attys.

Patented Aug. 22, 1939 2,170,205

UNITED STATES PATENT OFFICE

2,170,205

LOCK CONSTRUCTION

Joseph Lombardo, Chicago, Ill., assignor of one-half to Sydney Roth, Chicago, Ill.

Application June 29, 1938, Serial No. 216,443

14 Claims. (Cl. 70—363)

My invention relates to a lock construction.

One of the objects of my invention is to provide a lock construction which will be in the nature of an improvement over the construction shown in my United States Letters Patent No. 1,998,900, dated April 23, 1935.

A further object is to provide a lock construction in which the tumbler carrier is made up of a plurality of sections and in which rotation is transmitted from one section to another through the tumblers.

A further object is to provide a plural section tumbler carrier which avoids drilling of countersunk holes in the sections.

A further object is to provide a lock construction which will be inexpensive to manufacture and assemble.

A further object is to provide a lock construction of the parallel tumber type which will be difficult to pick.

Further objects and advantages of the invention will be apparent from the description and claims.

In the drawing, in which an embodiment of my invention is shown,

Figure 1 is an axial section through a tumbler lock with a key about to be inserted;

Fig. 2 is an axial section, similar to Fig. 1, showing the key fully inserted; and

Fig. 3 is an exploded perspective view showing portions of the tumbler carrier and showing the locking ring and bolt.

Referring to the drawing in detail, the construction shown comprises a cylindrical casing 1, a barrel or carrier 2 for tumblers 3 and springs 4 rotatably mounted in said casing, a plurality of unitary parallel tumblers 3 slidably mounted for axial movement in said carrier, each tumbler having a relatively wide deep annular groove 5 and a number of narrower and more shallow grooves 6, a plurality of coil compression springs 4, one for each tumbler, a flanged locking ring 7 for preventing rotation of the carrier except when all of the wide deep grooves 5 of the tumbler are aligned with said preventing means, and a key-centering and supporting pin 8 coaxial with the carrier over which pin fits a tubular key 9 having a ward 10 extending outwardly from the tubular portion. The carrier comprises a rear section 11 having parallel holes 12 drilled therein, in which the rear ends of the cylindrical tumblers 3 slide and in which the springs 4 are mounted, a front section 13 having holes 14 drilled therethrough in which the front ends of the tumblers slide, and an intermediate section 15 having holes 16 drilled therethrough in which the front ends of the tumblers slide. The front section 13 has a transverse slot 17 milled therein to receive the outwardly-extending ward 10 of the key whereby turning the key will cause rotation of this section. The intermediate section 15 has a shoulder or front face 18 engaged by the key to limit the extent of insertion of the key. The key-centering pin 8 is secured to the rear section 11 by means of a pin 19 fitting in a hole 19a drilled transversely through the side of the rear section, the inner end of the pin fitting in a transverse slot 20 in the centering pin. The locking ring 7 has a hole 21 drilled in its side to enable the insertion of the pin 19.

The holes 12, 14 and 16 drilled for the tumblers in all three sections are aligned to receive the tumblers so that when the front tumbler carrier section 13 is rotated by the key, the tumblers 3 will cause the rotation of all three sections of the tumbler carriers.

A locking member, such as a bolt 21, is secured to the rear carrier section 11 so that rotation of the tumbler carrier will cause rotation of the bolt to move it from unlocked to locked position, and vice versa. The front tumbler carrier section 13 has a central hole 22 drilled therethrough intersecting the tumbler holes 14, in which central hole the key may enter to engage the limiting shoulder 18.

The front carrier section 13 is rotatably mounted in the casing but provision is made for a slight lateral movement of this section. This is accomplished by making the front section a somewhat loose fit in the casing and by making the central hole 22 which is drilled through the front section slightly larger in diameter than the tubular portion of the key. This provision for limited lateral movement of the front section makes it very difficult, if not impossible, to pick the lock by one of the methods employed in picking locks.

The locking ring 7 has a pair of inwardly-extending notched flanges 23 which cooperate with the tumblers to control the rotation of the tumbler carrier. If a tumbler is moved to a position in which its wide groove 5 is aligned with the two inwardly-extending flanges 23, this tumbler will not prevent rotation of the tumbler carrier as the small reduced portion will not engage the inwardly-extending flange projections. The cylindrical portion of the key is provided with a plurality of axially-extending grooves 24 of different lengths, one for each tumbler, the length of each groove being such that when the

key is fully inserted to its limiting position, each of the tumblers will be moved to the true breaking position in which the wide deep groove 5 in the tumbler aligns with the two notched flanges 23. In this position the carrier can be turned to unlock the bolt without any interference between the locking flanges and the tumblers.

In picking locks of the parallel tumbler type, it is sometimes attempted to determine the breaking position of the individual tumblers by inserting a picking apparatus having axially adjustable wards, exerting a turning pressure on the key to cause one of the tumblers to bind, determining which one of the tumblers is binding and then axially adjusting the ward corresponding to this tumbler until a click is sensed, indicating that this particular tumbler is in the breaking position. A picking apparatus of this type is shown in my United States Letters Patent No. 2,059,376, dated November 3, 1936. The ward for this particular tumbler is then secured in the position corresponding to the breaking position of the tumbler and the above process is repeated for all of the tumblers, one after the other, until the breaking position of all of the tumblers has been determined. With my improved construction, however, in which the front section of the tumbler carrier has a slight lateral floating motion, turning pressure on the key will cause a binding action on a plurality of the tumblers, since the front carrier section is floatably mounted. Since a number of the tumblers, and perhaps all of them, are thus bound, it is impossible to pick out any one tumbler which can be experimented on to determine its breaking position.

In addition to the wide, deep, breaking groove 5 in the tumbler, a number of additional dummy grooves 6 are provided which are shallower and narrower than the true breaking groove. The effect of this is to make it still more difficult for anyone attempting to pick the lock to determine which is the true breaking position of the tumbler. These dummy grooves 6 cooperate with the narrow flange portion 23 of the locking flanges in such a manner as to give a click when the dummy groove 6 lines up with the narrow flange portion 23. This click is almost indistinguishable from the click given by the true breaking groove when it lines up in breaking position so that anyone attempting to pick the lock is in the dark as to which one of the several clicking positions is the true breaking position of the tumbler. The width of the flanged portions of the tumblers lying between the grooves in the tumblers is slightly less than the distance between the two locking flange portions 23 of the locking ring so that when turning pressure is exerted on the barrel and the tumbler is forced inwardly in attempting to find the breaking position, this narrow flange portion on the tumbler will snap into the space between the two locking flange portions 23 when in alignment therewith to permit a slight rotational movement of the tumbler barrel, causing a click to be made which cannot be distinguished from the click made when the true breaking position of the tumbler is reached. The dummy notches 6 do not permit the barrel to rotate sufficiently to effect any unlocking operation as the neck portion formed by the comparatively shallow groove 6 is too thick to permit it to clear the innermost portion of the locking flanges 23. These dummy grooves, in cooperation with the floating carrier section 13, make it exceedingly difficult, if not impossible, to pick this lock by the clicking method.

In my previous Patent No. 1,998,900, the key was provided with a ward extending inwardly into the tubular portion of the key for engagement with an outwardly-opening notch in the front section of the tumbler carrier. This inwardly-extending ward on the key was difficult and expensive to manufacture. I have overcome this costly construction of the key by providing the front section of the carrier with a transverse slot 17 which can be engaged by the projection extending outwardly from the parallel portion of the key, this same outwardly-extending projection serving to align the key so that the locking member will be turned to the proper position on removing or inserting the key.

By making the carrier in three sections, I am enabled to avoid counterboring the carrier to provide a stop face or shoulder to limit the extent of insertion of the key. In making the front section 13, a cylindrical plug is first formed in a screw machine or the like, the tumbler-receiving holes are then drilled therethrough, the central key-receiving hole is drilled therethrough intersecting the tumbler-receiving holes as shown in Fig. 3 and a cross slot is milled therein to receive the outwardly-extending projection or ward 10 on the key. This avoids the necessity of counterboring to provide a shoulder to limit the insertion of the key as the key will pass clear through the central hole 22 in the front section and engage the front face 18 of the intermediate section.

The casing 1 may be secured to a support 25 in any suitable manner as by inserting it through an opening in the support and securing it by means of a clamping nut 26, threaded on the casing. The bolt 21 may be secured on the rear section 11 of the carrier by providing it with a noncircular opening 27 which receives a noncircular rearward extension 28 of the carrier section so that rotation of the carrier will cause rotation of the bolt. The bolt may be secured in place on the extension by means of a washer 29 bearing against the bolt and a nut 30 threaded on a threaded extension 31 of the carrier section. To remove the springs 4 and tumblers 3, it is only necessary to remove the nut 30 and washer 29 which will leave the carrier openings exposed.

In assembling the lock, the locking ring 7 is slipped over the forward extension of the rear carrier section 11, the centering pin 8 is inserted into the intermediate section 15 until its shoulder 32 engages the front face 18 of the intermediate section 15, the rear end of the centering pin is inserted into the central hole 33 in the rear carrier section, the securing pin 19 is inserted through the hole 19a in the side of the locking ring into the position shown in Fig. 1, the front carrier section 13 is slipped over the centering pin 8 and this assembly is then inserted into the casing 1 and secured therein by means of the set screw 34 threaded into the side of the casing and engaging a notch in the locking ring 7. The casing may then be secured to the support by means of the lock nut 26 and the bolt 21 may then be secured to the rear extension of the carrier. It will be seen that the tumblers 3 may be removed easily and quickly without removing the casing from its support simply by unscrewing the nut 30 and removing the washer 29, thus leaving the springs and tumblers accessible for replacement for changing the combination or the like.

In further explanation of the pick-proof fea-

tures of my lock, it is pointed out that even if all but one of the tumblers are in open or unlocked position, a binding action will be exerted on several of the other tumblers when turning pressure is exerted on the front section 13 of the tumbler carrier. This is because of the fact that the one tumbler which is still in locking position will prevent rotation of the tumbler carrier and as turning pressure is exerted on the front section this front section will tend to swing about the locked tumbler as an axis, bringing the edges of the tumbler holes in the front section into binding engagement with a plurality of the tumblers which may be in unlocked position. Thus, a plurality of the unlocked tumblers will be caused to bind so that it will be impossible by sliding these tumblers back and forth to determine when a breaking position is reached.

Further modifications will be apparent to those skilled in the art and it is desired, therefore, that the invention be limited only by the prior art and the scope of the appended claims.

Having thus described my invention, what I claim and desire to be covered by Letters Patent is:

1. A lock construction comprising a rotatable carrier for tumblers and springs, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced intermediate portion, a plurality of springs, one for each tumbler, means for preventing rotation of said carrier when an unreduced portion of a tumbler is aligned with said preventing means but enabling rotation of the carrier when all of the reduced portions of the tumblers are aligned with said preventing means, and a key centering and supporting pin coaxial with said carrier over which pin fits a tubular key having a ward extending outwardly from said tubular portion, said carrier comprising a rear section having parallel recesses in which the rear ends of said tumblers slide and in which the springs are mounted, and a front section in which the front ends of the tumblers slide, the reduced intermediate portion of said tumblers being exposed between said sections for cooperation with said preventing means, said front section having a recess to receive said outwardly-extending ward whereby turning the key will cause rotation of the carrier.

2. A lock construction comprising a rotatable carrier for tumblers and springs, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced intermediate portion, a plurality of springs, one for each tumbler, means for preventing rotation of said carrier when an unreduced portion of a tumbler is aligned with said preventing means but enabling rotation of the carrier when all of the reduced portions of the tumblers are aligned with said preventing means, a key centering and supporting pin coaxial with said carrier over which pin fits a tubular key having a ward extending outwardly from said tubular portion, said carrier comprising a rear section having parallel recesses in which the rear ends of said tumblers slide and in which the springs are mounted, and a front section in which the front ends of the tumblers slide, the reduced intermediate portions of said tumblers being exposed between said sections for cooperation with said preventing means, said front section having a recess to receive said outwardly-extending ward whereby turning the key will cause rotation of the carrier, and a casing in which said carrier is rotatably mounted having a guide opening for the key having a recess cooperating with the outwardly-extending ward on the key to align the ward with the recess in the carrier.

3. A lock construction comprising a rotatable carrier for tumblers and springs, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced intermediate portion, a plurality of springs, one for each tumbler, means for preventing rotation of said carrier when an unreduced portion of a tumbler is aligned with said preventing means but enabling rotation of the carrier when all of the reduced portions of the tumblers are aligned with said preventing means, and a key centering and supporting pin coaxial with said carrier over which pin fits a tubular key having a ward extending outwardly from said tubular portion, said carrier comprising a rear section having parallel recesses in which the rear ends of said tumblers slide and in which the springs are mounted, and a front section in which the front ends of the tumblers slide, the reduced intermediate portions of said tumblers being exposed between said sections for cooperation with said preventing means, said front section having a recess to receive said outwardly-extending ward whereby turning the key will cause rotation of the carrier, said tumblers serving to transmit rotation from the front carrier section to the rear carrier section.

4. A lock construction comprising a rotatable carrier for tumblers and springs, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced intermediate portion, a plurality of springs, one for each tumbler, means for preventing rotation of said carrier when an unreduced portion of a tumbler is aligned with said preventing means but enabling rotation of the carrier when all of the reduced portions of the tumblers are aligned with said preventing means, and a key centering and supporting pin coaxial with said carrier over which pin fits a tubular key having a ward extending outwardly from said tubular portion, said carrier comprising a rear section having parallel recesses in which the rear ends of said tumblers slide and in which the springs are mounted, and a front section in which the front ends of the tumblers slide, the reduced intermediate portions of said tumblers being exposed between said sections for cooperation with said preventing means, said front section having a recess to receive said outwardly-extending ward whereby turning the key will cause rotation of the carrier, said tumblers serving to transmit rotation from the front carrier section to the rear carrier section, and said front carrier section being mounted for rotational movement and limited lateral movement with respect to said rear section to cause the front carrier section to bear on a plurality of tumblers as it turns.

5. A lock construction comprising a rotatable carrier for tumblers and springs, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced intermediate portion, a plurality of springs, one for each tumbler, means for preventing rotation of said carrier when an unreduced portion of a tumbler is aligned with said preventing means but enabling rotation of the carrier when all of the reduced portions of the tumblers are aligned with said preventing means, and means for supporting and centering a key, which key has a cylindrical portion having a ward

extending outwardly therefrom, said carrier comprising a rear section having parallel recesses in which the rear ends of said tumblers slide and in which the springs are mounted, and a front section in which the front ends of the tumblers slide, said front section having a recess to receive said outwardly-extending ward whereby turning the key will cause rotation of the carrier.

6. A lock construction comprising a rotatable carrier for tumblers and springs, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced intermediate portion, a plurality of springs, one for each tumbler, means for preventing rotation of said carrier when an unreduced portion of a tumbler is aligned with said preventing means but enabling rotation of the carrier when all of the reduced portions of the tumblers are aligned with said preventing means, means for supporting and centering a key, which key has a cylindrical portion having a ward extending outwardly therefrom, said carrier comprising a rear section having parallel recesses in which the rear ends of said tumblers slide and in which the springs are mounted, and a front section in which the front ends of the tumblers slide, said front section having a recess to receive said outwardly-extending ward whereby turning the key will cause rotation of the carrier, and a casing in which said carrier is rotatably mounted having a guide opening for the key having a recess cooperating with the outwardly-extending ward on the key to align the ward with the recess in the carrier.

7. A lock construction comprising a rotatable carrier for tumblers and springs, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced intermediate portion, a plurality of springs, one for each tumbler, means for preventing rotation of said carrier when an unreduced portion of a tumbler is aligned with said preventing means but enabling rotation of the carrier when all of the reduced portions of the tumblers are aligned with said preventing means, and means for supporting and centering a key, which key has a cylindrical portion having a ward extending outwardly therefrom, said carrier comprising a rear section having parallel recesses in which the rear ends of said tumblers slide and in which the springs are mounted, and a front section in which the front ends of the tumblers slide, said front section having a recess to receive said outwardly-extending ward whereby turning the key will cause rotation of the carrier, said tumblers serving to transmit rotation from the front carrier section to the rear carrier section.

8. A lock construction comprising a rotatable carrier for tumblers and springs, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced intermediate portion, a plurality of springs, one for each tumbler, means for preventing rotation of said carrier when an unreduced portion of a tumbler is aligned with said preventing means but enabling rotation of the carrier when all of the reduced portions of the tumblers are aligned with said preventing means, and means for supporting and centering a key, which key has a ward thereon, said carrier comprising a rear section having parallel recesses in which the rear ends of said tumblers slide and in which the springs are mounted, and a front section in which the front ends of the tumblers slide, said front section having a recess to receive said ward whereby turning the key will cause rotation of the carrier, and said front carrier section being mounted for rotational movement with respect to said rear section and limited lateral movement to cause the front carrier section to bear on a plurality of tumblers as it turns.

9. A lock construction comprising a rotatable carrier for tumblers and springs, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced intermediate portion, a plurality of springs, one for each tumbler, means for preventing rotation of said carrier when an unreduced portion of a tumbler is aligned with said preventing means but enabling rotation of the carrier when all of the reduced portions of the tumblers are aligned with said preventing means, and means for supporting and centering a key, which key has a cylindrical portion having a ward extending outwardly therefrom, said carrier comprising a rear section having parallel recesses in which the rear ends of said tumblers slide and in which the springs are mounted, a front section in which the front ends of the tumblers slide, said front section having a recess to receive said outwardly-extending ward whereby turning the key will cause rotation of the carrier, and an intermediate section through which the tumblers extend and in which they slide, said intermediate section having a shoulder engaged by the key to limit the extent of insertion of the key, the reduced intermediate portions of said tumblers being exposed between said rear section and intermediate section for cooperation with said preventing means.

10. A lock construction comprising a rotatable carrier for tumblers and springs, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced intermediate portion, a plurality of springs, one for each tumbler, means for preventing rotation of said carrier when an unreduced portion of a tumbler is aligned with said preventing means but enabling rotation of the carrier when all of the reduced portions of the tumblers are aligned with said preventing means, and means for supporting and centering a key, which key has a cylindrical portion having a ward extending outwardly therefrom, said carrier comprising a rear section having parallel recesses in which the rear ends of said tumblers slide and in which the springs are mounted, a front section in which the front ends of the tumblers slide, said front section having a recess to receive said outwardly-extending ward whereby turning the key will cause rotation of the carrier, and an intermediate section through which the tumblers extend and in which they slide, said intermediate section having a shoulder engaged by the key to limit the extent of insertion of the key, said front section having a central hole drilled therethrough intersecting the tumbler holes in which central hole the key may enter to engage said limiting shoulder, the reduced intermediate portions of said tumblers being exposed between said rear section and intermediate section for cooperation with said preventing means.

11. A lock construction comprising a rotatable carrier for tumblers and springs, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced intermediate portion, a plurality of springs, one for each tumbler, means for preventing rotation of said carrier when an unreduced portion of a tumbler is aligned with said

preventing means but enabling rotation of the carrier when all of the reduced portions of the tumblers are aligned with said preventing means, and means for supporting and centering a key, which key has a cylindrical portion having a ward extendig outwardly therefrom, said carrier comprising a rear section having parallel recesses in which the rear ends of said tumblers slide and in which the springs are mounted, and a front section in which the front ends of the tumblers slide, the reduced intermediate portions of said tumblers being exposed between said sections for cooperation with said preventing means, said front section having a transverse slot in its front face to receive said outwardly-extending ward whereby turning the key will cause rotation of the carrier.

12. A lock construction comprising a rotatable carrier for tumblers and springs, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced intermediate portion, a plurality of springs, one for each tumbler, means for preventing rotation of said carrier when an unreduced portion of a tumbler is aligned with said preventing means but enabling rotation of the carrier when all of the reduced portions of the tumblers are aligned with said preventing means, and a key centering and supporting pin coaxial with said carrier over which pin fits a tubular key having a ward extending outwardly from said tubular portion, said carrier comprising a rear section having parallel recesses in which the rear ends of said tumblers slide and in which the springs are mounted, a front section in which the front ends of the tumblers slide, said front section having a recess to receive said outwardly-extending ward whereby turning the key will cause rotation of the carrier, and an intermediate section through which the tumblers extend and in which they slide, the reduced intermediate portions of said tumblers being exposed between said rear section and intermediate section for cooperation with said preventing means, said intermediate section having a shoulder engaged by the key to limit the extent of insertion of the key, and said pin being secured to said rear section, all three of said sections having aligned holes drilled therethrough in which the tumblers slide, and said intermediate section having a hole drilled therethrough in which said centering pin fits.

13. A lock construction comprising a rotatable carrier for tumblers and springs, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced intermediate portion, a plurality of springs, one for each tumbler, means for preventing rotation of said carrier when an unreduced portion of a tumbler is aligned with said preventing means but enabling rotation of the carrier when all of the reduced portions of the tumblers are aligned with said preventing means, and a key centering and supporting pin coaxial with said carrier over which pin fits a tubular key having a ward extending outwardly from said tubular portion, said carrier comprising a rear section having parallel recesses in which the rear ends of said tumblers slide and in which the springs are mounted, a front section in which the front ends of the tumblers slide, said front section having a recess to receive said outwardly-extending ward whereby turning the key will cause rotation of the carrier, and an intermediate section through which the tumblers extend and in which they slide, the reduced intermediate portions of said tumblers being exposed between said rear section and intermediate section for cooperation with said preventing means, said intermediate section having a shoulder engaged by the key to limit the extent of insertion of the key, and said pin being secured to said rear section, all three of said sections having aligned holes drilled therethrough in which the tumblers slide, said intermediate section having a hole drilled therethrough in which said centering pin fits, and said front section having a central hole drilled therethrough intersecting the tumbler holes into which central hole the key may enter to engage said limiting shoulder.

14. A lock construction comprising a rotatable carrier for tumblers and springs, a plurality of unitary parallel tumblers slidably mounted for axial movement in said carrier, each tumbler having a reduced intermediate portion, a plurality of springs, one for each tumbler, means for preventing rotation of said carrier when an unreduced portion of a tumbler is aligned with said preventing means but enabling rotation of the carrier when all of the reduced portions of the tumblers are aligned with said preventing means, a casing in which said carrier is rotatably mounted, said carrier having a portion extending from the rear end of the casing, a lock member mounted on said carrier and rotatable therewith and having an opening into which the extending portion of the carrier fits, said carrier having parallel holes therethrough in which the tumblers slide and in which said springs are mounted, said holes extending through said carrier extension, and a member secured to said extension for securing said locking member to said carrier and holding the springs and tumblers in the holes.

JOSEPH LOMBARDO.