This invention relates to improvements in padlocks and more particularly relates to such padlocks in which the shackle may be released by operation of a key operated mechanism or by permutation mechanism.

A principal object of the invention is to provide a simple and improved padlock in which the control of the shackle of the padlock is by key operated or permutation mechanisms all arranged with a view toward increasing the simplicity and reliability of the padlock.

A further object of the invention is to provide an improved form of padlock released by operation of permutation mechanism in which the shackle of the padlock upsets the tumblers of the permutation mechanism and also serves to reset the latch bolt in position to lock the shackle upon insertion of the shackle within the padlock.

A still further object of the invention is to provide a simple and improved upsetting mechanism for the tumblers of a permutation padlock in which the tumblers are upset by a yieldable pawl as the shackle is removed from the lock casing accommodating outward movement of the shackle and upsetting the outermost tumbler by the bias of the yieldable pawl as the latch bolt is reset to its latching position.

A still further object of the invention is to provide a simplified form of key operated release for the latch bolt of a combination key operated and permutation operated padlock consisting in a slidable plate engaged by a key operated rotatable disk.

A still further object of the invention is to provide a combination key operated and permutation padlock together with a simplified guide means for the shackle of the padlock which serves to reset the latch housing as the shackle is moved outwardly from the casing of the padlock to its open position.

These and other objects of the invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

Figure 1 is an end view of a padlock constructed in accordance with the invention.

Figure 2 is a fragmentary sectional view taken through a padlock constructed in accordance with the invention looking at the padlock from the end thereof adjacent the key cylinder.

Figure 3 is a fragmentary exploded view of the padlock illustrating the permutation tumblers and key cylinder for releasing the shackle of the padlock; and

Figure 4 is a sectional view somewhat like Figure 1 showing the shackle of the padlock being moved to its release position and the tumblers in the process of being upset.

In the embodiment of the invention illustrated in the drawings, I have shown a lock casing of a generally cylindrical form having a front plate 11 and a rear plate 12 apertured to receive a key cylinder 13 operable to release a shackle 15 of the padlock.

The shackle 15 is of a generally U-shaped form and has a long leg 16 slidably extending within the lock casing through a cylindrical wall 17 thereof. The shackle 15 also has a short leg 19 slidably extending through the cylindrical wall 17 of the lock case 10. The short leg 19 has a notch 20 formed therein near its end engaged by a spring pressed lock bolt 21, slidably carried in a rockable latch housing 23. The long leg 16 of the shackle 15 extends between spaced ears 24, extending from the latch housing 23, and has a reduced diameter end 25 having a guide plate 26 mounted thereon for pivotal movement about the longitudinal axis of the leg 16, to accommodate pivotal movement of said shackle with respect to said guide plate. The guide plate 26 has guiding engagement with a guide 28 formed in an inner casing 32 for the padlock and adjacent the front plate 11 of the padlock. The guide plate 26 is also guided at its opposite end in a similar guide (not shown) in an inner plate 27 abutting the inside of the plate 12. The plate 27 also forms a support for a post 29 carrying the permutation mechanism.

The latch bolt 21 has rectangular lugs 30 extending from opposite sides thereof, slidably guided in slots 31 formed in opposite side plates 33 of the latch bolt housing 23. The latch bolt housing 23 is pivotally mounted in the inner casing 32 on a pivot pin 35, riveted or otherwise secured to the inner casing 32 and having a reduced diameter end portion 36 extending through the plate 27 and supported therein.

A torsion spring 37 extends about the pin 35 and engages a stationary abutment 39 at one end and extends through an apertured portion (not shown) of the latch bolt 21 at its opposite end, to bias the latch bolt 21 in its extended position into engagement with the notch 20 in the short leg 19 of the shackle 15.

The side plates 33 of the housing 23 are spaced apart by a spacer plate 40 and are riveted or otherwise secured thereto. The spacer plate 40 has a downwardly turned portion 41 terminating into a tongue 43 depending from the housing 23 and engageable with aligned slots 44 in the latch plate 45, 46 and 47, rotateably mounted on the latch plate post 29. When the latch plate disks 45, 46 and 47 are upset with the slots 44 out of alignment with each other, the outer periphery of said latch plate disks engaged by the end of the tongue 43, will maintain the housing 23 in position and prevent opening of the padlock, except by retractable movement of the latch bolt 21 by operation of the key mechanism 13.

The key mechanism 13 includes a cylinder 49 rotatably mounted within a tube 50 staked or otherwise secured to the end wall of the inner housing 32. A disk 51 is mounted on the opposite end of the cylinder 49 from the end plate 11 and rotatably carried within the inner plate 27. The disk 51 is accessible through an apertured portion (not shown) in the plate 12 and has a key slot 53 therein, having a central groove 54 on one side thereof.

A projection 55 extending within said slot, to receive a flat key grooved and ribbed to conform to the form of the key slot. The grooves and ribs in the slot 53 and in the key fitting within said slot require a special key blank, making it necessary to procure the blank from the manufacturer of the lock and thus making it difficult for unauthorized persons to open the padlock. The disk 51 has a slot 57 recessed within the periphery thereof. Said slot has an end wall 59 abutting an end 60 of a release plate 61 mounted on a rectangular lug 30 projecting from the latch bolt. Said release plate is also slidable mounted on the pin 35.

Thus, when a key is inserted within the key slot 53 and turned in a direction which in Figure 2 is shown as being a clockwise direction, the release plate 61 will be moved to the right to withdraw the latch bolt 21 from the notch 20 in the short leg 19 of the shackle 15 and accommodate opening of the padlock.
The permutation tumblers 45, 46 and 47, rotatably mounted on the tumbler post 29 are pressed into engagement with each other by a compression spring 63 abutting the inner side of the inner plate 27 at one end and a tumbler spacer 64 at its opposite end, having abutting engagement with the top tumbler 45 and frictionally restraining said tumbler from rotation.

The top tumbler 45 has a spacer collar 65 like the spacer 64 projecting from its face opposite the spacer 64 and engaging an end face of the intermediate tumbler 46. The intermediate tumbler 46 in turn has a spacer collar 66 engageable with an end face of the outer or bottom tumbler 47.

The bottom tumbler 47, as herein shown, has a sleeve 67 extending outwardly therefrom and secured thereto. A dial 69 and knob 70 is mounted on the sleeve 67 for turning the sleeve 67 and tumbler 47 upon turning movement of the knob 70. The bottom or driving tumbler 47 has the usual transfer pin 71 extending inwardly therefrom for engagement with a transfer pin 73 projecting from the intermediate tumbler 46. The intermediate tumbler 46 also has a transfer pin 74 projecting from the opposite face thereof from the transfer pin 73 for engagement with a transfer pin 75 projecting inwardly from the inner or top tumbler 45.

Thus in order to open the padlock, the knob 70 is turned to successive predetermined positions to rotate the tumblers 45, 46 and 47 and bring the slots 44 thereof into registry and in position to admit the tongue 43 of the rockable bolt housing 23 and accommodate release of the shackle 15 by outward pulling movement thereon.

Referring now to the mechanism for upsetting the tumbler 45 upon release of the short leg 19 of the shackle 15 from the casing 10, and for resetting the latch bolt 14 in case the lock is locked using the key, as the short leg thereof is inserted within the casing 10, an angle bracket 76 is riveted or otherwise secured to the lower end of the long leg 16 of the shackle 15 beneath and in abutting engagement with the guide plate 26 and is restrained from turning movement by engagement with the guide slot 28. The angle bracket 76 has a depending leg 77 extending parallel to the axis of the tumbler post 29 and facing the periphery of the tumblers 45, 46 and 47. The depending leg 77 has a tumbler upsetting pawl 80 mounted thereon for angular movement with respect to an axis extending transversely of the longitudinal axis of the leg 16 of the shackle 15 and forms a guide for said tumbler upsetting pawl. The tumbler upsetting pawl 80 is loosely mounted on a pin 81 riveted or otherwise secured to the vertical leg 77 and extending outwardly therefrom in a direction away from the tumbler 45. The pin 81 has a head 83 on its outer end, forming a seat for a compression spring 84 encircling the pin 81 and seated at its end opposite the head 83 on the tumbler pawl 80. The spring 84 thus presses the tumbler pawl 80 outwardly with respect to the vertical leg 77, in position to engage an upsetting pin 85 extending outwardly from the outer face of the top tumbler 45 as the shackle 15 is withdrawn from the casing 10 and the tongue 43 moves out of the aligned slots 44 as the shackle is released.

It may be seen from Figures 2 and 4, that as the shackle is released and the tongue 43 is moved out of the slots 44 of the tumblers, that the inclined face of the upsetting pawl will come into engagement with the upsetting pin 85 and yield as it presses the slot 44 of the tumbler 45 into engagement with the tongue 43. Upon continued outward movement of the shackle, the guide plate 26 will come into engagement with the ears 24 to reset the rockable housing 23 and latch bolt 21 and withdraw the tongue 43 from the slots 44 as shown in Figure 4. During resetting of the lock housing as the tongue 43 is removed from the slots 44 and the tumbler 45, the spring 84 will extend the pawl 80 with respect to the leg 77 and pivot the tumbler 45 and move the slot 44 out of registry with the tongue 43 by the bias of the spring 84. As the shackle 15 is inserted within the casing 10, the padlock will then be locked and can only be opened by operation of the knob 70 to move the permutation disks 45, 46 and 47 into positions to align the slots 44 with the tongue 43, or by operation of the key operated mechanism 13.

It may be seen from the foregoing that a simplified and improved combination key operated and tumbler operated padlock has been provided, in which the guide plate for the shackle repositions the rockable housing for the latch bolt and in which the upsetter pawl 80 yields upon outward movement of the shackle, until the tongue of the rockable housing has moved out of the aligned slots 44 and then upsets the top tumbler with a spring or snap action, assuring misalignment of the slots 44 whenever the padlock is opened.

It may further be seen that a simplified form of key operated release has been provided in which a release plate slidably moved by turning movement of key operated mechanism having direct engagement therewith, and that the key operated release is far simpler than key operated releases heretofore provided for padlocks, with resultant more positive action of the latch bolt and reduction in parts of the padlock.

It will be understood that modifications and variations in the present invention may be effected without departing from the spirit and scope of the novel concepts thereof.

I claim as my invention:
1. In a padlock, a casing, a shackle having spaced legs and guides for movement within said casing on one leg thereof, a latching notch on the other leg of said shackle, a rockable latch bolt housing rockingly mounted within said casing and having a latch bolt slidably mounted therein for engagement with said notch, permutation mechanism comprising a plurality of rotatable tumbler disks, a tongue projecting from said latch bolt housing for engagement with the peripheries of said disks to maintain the latch bolt housing in a latching position, slots in said disks, opening to the peripheries thereof for receiving said tongue and accommodating release movement of said latch bolt housing, a guide plate for said shackle pivotally mounted on the inner end of the long leg of the shackle for rectilinear movement therewith, means within said casing for rectilinearly guiding said guide plate and retaining said guide plate from pivotal movement with respect to said casing, an upsetter bracket depending from said guide plate, having an upsetter pawl mounted thereon for angular movement with respect thereto about an axis extending transversely of the longitudinal axis of the long leg of the shackle, a spring biasing said pawl in extended relation with respect to said upsetper bracket and accommodating angular retractable movement of said pawl with respect to said bracket, an upsetter pin extending outwardly from the innermost tumbler disk for engagement with said upsetper pawl, said upsetper pawl angularly yielding upon engagement thereof with said upsetper pin as said tongue is in engagement with said slots, and said guide plate withdrawing said tongue from said slots upon outward movement of said shackle and accommodating the energy stored up in said spring by angular retractable movement of said pawl to extend said pawl to upset said tumblers with respect to each other.
2. In a padlock, a casing, a shackle having parallel legs of unequal length, a guide plate pivotally mounted on the long leg of said shackle, guide means within said casing guiding said guide plate for movement therealong and accommodating removal of the short leg of said shackle from said casing, a rockable latch housing pivotally mounted within said casing and having a latch bolt slidably mounted therein for engagement with said notch, permutation mechanism comprising a plurality of rotatable tumbler disks, a tongue projecting from said latch bolt housing for engagement with the peripheries of said disks to maintain the latch bolt housing in a latching position, slots in said disks, opening to the peripheries thereof for receiving said tongue and accommodating release movement of said latch bolt housing, a guide plate for said shackle pivotally mounted on the inner end of the long leg of the shackle for rectilinear movement therewith, means within said casing for rectilinearly guiding said guide plate and retaining said guide plate from pivotal movement with respect to said casing, an upsetter bracket depending from said guide plate, having an upsetter pawl mounted thereon for angular movement with respect thereto about an axis extending transversely of the longitudinal axis of the long leg of the shackle, a spring biasing said pawl in extended relation with respect to said upsetper bracket and accommodating angular retractable movement of said pawl with respect to said bracket, an upsetper pin extending outwardly from the innermost tumbler disk for engagement with said upsetper pawl, said upsetper pawl angularly yielding upon engagement thereof with said upsetper pin as said tongue is in engagement with said slots, and said guide plate withdrawing said tongue from said slots upon outward movement of said shackle and accommodating the energy stored up in said spring by angular retractable movement of said pawl to extend said pawl to upset said tumblers with respect to each other.
mechanism including a plurality of tumblers, each having a slot therein and means for moving said tumblers to align said slots, a tongue projecting from said latch housing for engagement with the peripheries of said tumblers to hold said latch housing in a latching position, said tongue being moveable within said slots when aligned to accommodate release of said latch bolt from said shackle, said latch bolt housing having ears projecting therefrom extending along opposite sides of the long leg of said shackle and engaged by said guide plate upon outward movement of said shackle to reposition said latch bolt housing in a latching position and to withdraw said tongue from said slots, the innermost of said tumblers having an upsetter pin projecting from the face thereof, a bracket mounted on the long leg of the shackle and having a guide leg depending therefrom, an upsetter pawl guided by said guide leg and mounted thereon for rocking movement toward and from said upsetter pin, a spring biasing said upsetter pawl in an extended position to engage upsetter pin and yielding to accommodate retractive movement of said upsetter pawl upon engagement with said upsetter pin upon outward movement of said shackle as said tongue is in engagement with said notches, said upsetter pawl being moved by said spring into an extended position and pivoting said innermost tumbler disk to misalign the slot therein upon release of said tongue from the slots in said disk, as said guide plate resets said latch bolt housing.

3. In a padlock, a casing, a shackle having spaced legs of unequal length and guided for movement within said casing on the longer leg thereof, a latching notch on the short leg of said shackle, a rotatable latch bolt housing rockingly mounted within said casing and having a latch bolt slidably mounted therein for engagement with said notch, spring means biasing said latch bolt in a latching direction, permutation mechanism comprising a plurality of rotatable tumbler disks, a tongue projecting from said latch bolt housing for engagement with the peripheries of said tumbler disks, to maintain the latch bolt housing in a latching position, slots in said disks opening to the peripheries thereof for receiving said tongue and accommodating release movement of said latch bolt housing, means yieldably mounted on the longer leg of said shackle for misaligning said slots upon outward movement of said shackle to open the padlock, a guide plate pivotally mounted on the longer leg of said shackle for rectilinear movement with said shackle, guide slots within said casing having guiding engagement with said guide plate for guiding said shackle for axial movement along said casing, said latch bolt housing having at least one ear extending along the longer leg of said shackle and directly engaged by said guide plate upon outward movement of said shackle to open the padlock, to pivot said latch bolt housing to reposition said latch bolt in a latching position as the padlock is unlocked, and said tongue retaining said housing and latch bolt in a latching position by engagement with the peripheries of said disks.

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