

July 3, 1945.

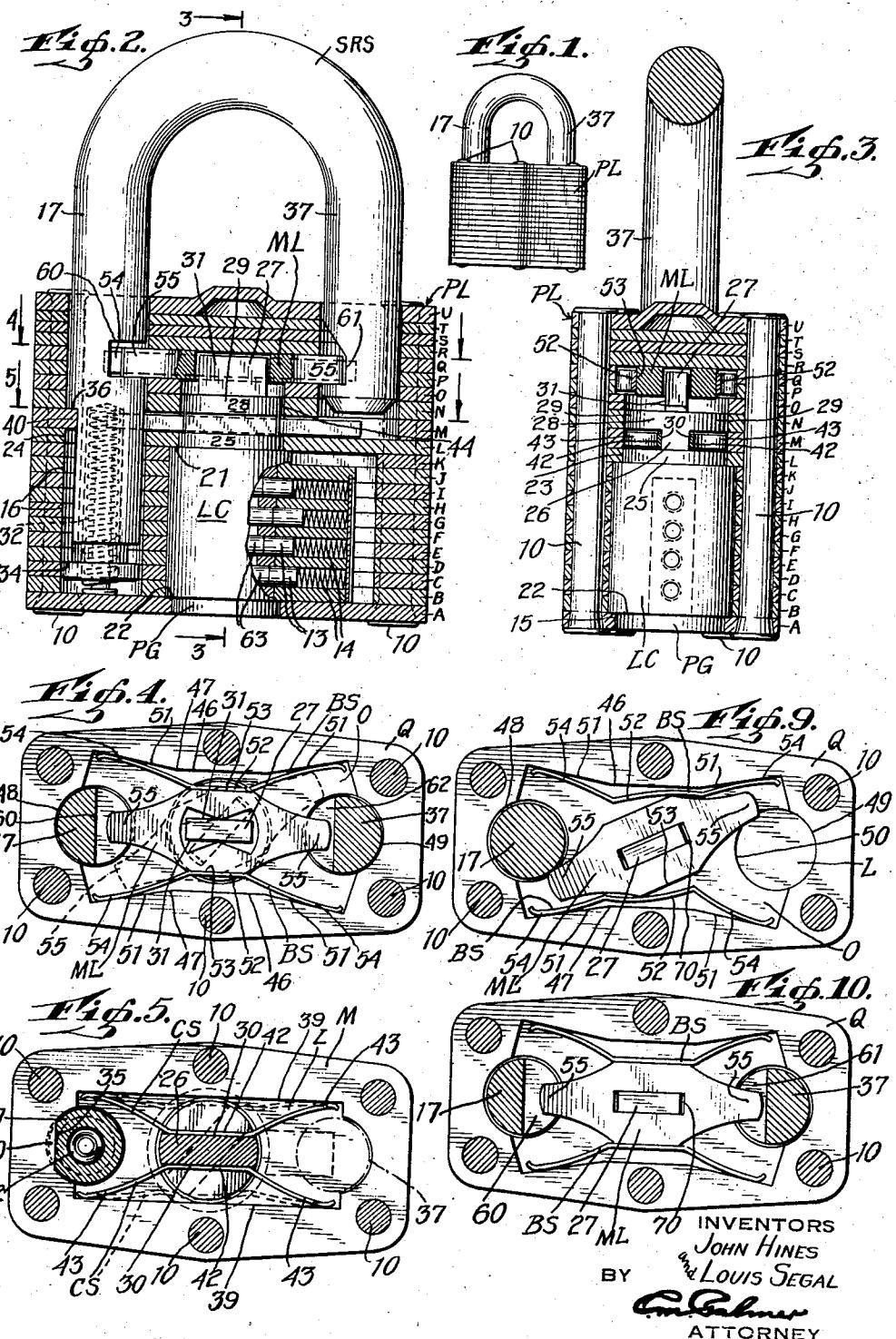
J. HINES ET AL.

2,379,437

LAMINATED PADLOCK

Filed Jan. 7, 1943

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Fig. 6.

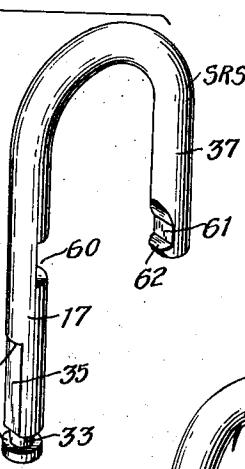
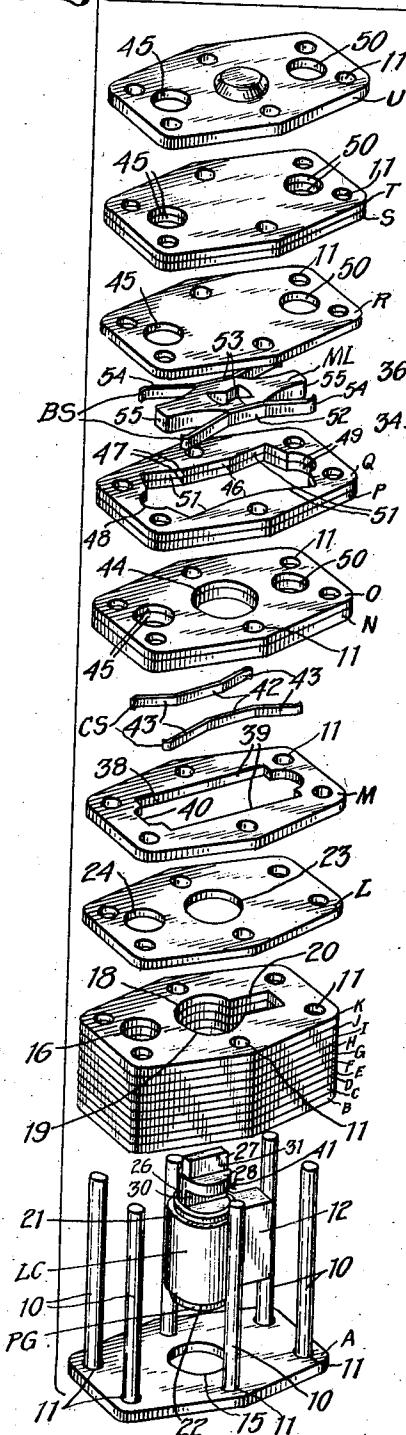


Fig. 7.

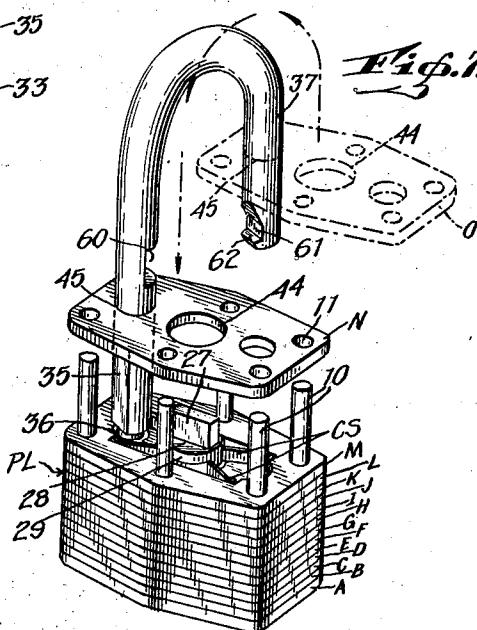
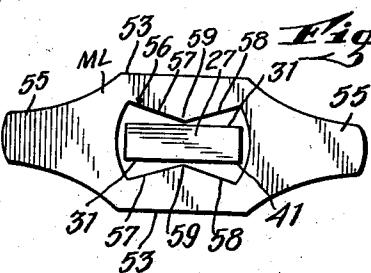


Fig. 8.



INVENTORS

INVENTORS
John Hines

JOHN HINES
John Hines

BY

LOUIS SEGAL
C. S. Salmer
ATTORNEY

UNITED STATES PATENT OFFICE

2,379,437

LAMINATED PADLOCK

John Hines, South Norwalk, Conn., and Louis Segal, New York, N. Y., assignors to Norwalk Lock Company, New York, N. Y., a corporation of Connecticut

Application January 7, 1943, Serial No. 471,588

16 Claims. (Cl. 70—38)

The subject matter of this invention is a padlock and is especially concerned with laminated padlocks. The object of the invention is realized in the provision of a novel and improved padlock having a plurality of superimposed plates to characterize a rugged and durable laminated casing convenient and easy to assemble and having an intervenor rim disposed intermediately of the casing to preclude the removal of the cooperating 10 sliding and rotatable shackle from the casing 10 concordantly permitting the projection thereof in part outside of the casing subsequent to the disengagement of a pivotally controlled oscillatable and spring balanced multiple latch having means adapted to simultaneously unlock both 15 shanks of the shackle pursuant to rotation of a tumbler controlled key receiving plug in one direction preparatory to the automatic but linear projection of the shackle in part out of the casing and adapted and waiting to simultaneously interlock with both shanks of the shackle on rectilinear 20 displacement of the shackle towards the casing.

The invention has as another object the provision of an intervenor plate or rim forming a part of the laminated casing peripherally encompassing spaced compensatory springs held within the casing by an adjacent pair but spaced confining plates likewise constituting a part of the casing, the compensatory springs in one embodiment of the invention acting to restore or retract a tumbler controlled and key receiving plug to its normal locked position even though the companion key for actuating the plug may still be within the plug or removed therefrom. The invention in one embodiment thereof has a further object to utilize a pair of confining plates or laminations of the casing to retain opposed but balancing springs against a pivoted or floating multiple latch in a rim or plate peripherally surrounding the latch to permit the latter to be desirably held in an unlocked but waiting relation pursuant to projection of the shackle in part outside of the casing, the balancing springs being effective to automatically actuate or swing the multiple latch to its interlocked relation with the shackle upon swivelling of the latter initially towards and subsequently rectilinearly and downwardly into the casing.

The invention has as another object to provide a multiple latch for interlocking with the shackle and interlocked positively with the plug in such manner that it is directly responsive to the rotation of the plug without any lost motion and consequently is set to an unlocking position upon the rotation of the plug to deform opposed balancing springs associated with the multiple

latch held by the shackle from retracting until the shackle is swiveled to align its free shank with a companion shank receiving socket of the laminated casing. Other objects, advantages, and structural and functional aspects of the invention will be better understood from the following detailed disclosure taken with the accompanying drawings wherein:

Fig. 1 is a front elevational view of the laminated padlock according to our invention.

Fig. 2 is an enlarged, partly broken away, and longitudinal sectional view of Fig. 1.

Fig. 3 is a transverse sectional view on the line 3—3 of Fig. 2.

Fig. 4 is a sectional view on the line 4—4 of Fig. 2, particularly illustrating the balanced and pivotal latch.

Fig. 5 is a sectional view on the line 5—5 of Fig. 2, depicting the compensating springs for normally urging the rotatable tumbler controlled plug of the lock cylinder towards its neutral position or locked position in advance of the retraction of the multiple latch.

Fig. 6 is an exploded view of the laminated padlock.

Fig. 7 is a perspective view of the padlock showing the manner of assembly of several of the laminations.

Fig. 8 is a plan view of the multiple pivoted latch shown encompassing the upper actuating web of the plug.

Fig. 9 is a view of a modified multiple latch in a laminated casing according to our invention, but illustrated in an unlocked position, and

Fig. 10 is a view similar to Fig. 9, however showing the multiple latch in a locked relation with the shackle.

Illustrative of the embodiments disclosed the laminated padlock is generally designated PL 40 characterized by a casing built up from a plurality of superimposed laminated plates A—U respectively. Within this casing is a tumbler controlled lock cylinder LC having the rotatable key receiving plug PG for ultimately affecting the balancing leaf springs BS associated with the multiple latch ML, the compensatory leaf springs CS, and for unlocking the sliding and rotatable shackle SRS.

For facilitating and enhancing the assembly 50 of the casing, the bottom or base plate A is initially threaded on the shanks of the bolts 10 which extend through the openings 11 therein. Subsequently the lock casing LC, which has the laterally extending housing 12 (Fig. 6) for the 55 slidably guided driving pins 13 (Fig. 2) and the

confined helicoidal springs 14, is positioned on the base plate A so that the lower part of the plug PG is received and projects through the centrally arranged opening 15.

Thereafter the gang of plates B-K are simultaneously mounted on the positioning pins or bolts 10. Plates B-K are identical and are adequately provided with openings 11 for receiving bolts 10, the alined openings 16 for slidably and rotatably receiving and guiding one shank 17 of the shackle, and the irregularly shaped and alined openings 18 comprising centrally arranged and registering circular openings 19 for closely encompassing the lock casing or cylinder LC and the communicating and alined slots 20 receiving the housing 12. In this way the lock cylinder is held interlocked with the gang of plates B-K and against accidental rotational displacement.

The confining plate 5 is now threaded on the pins 10. This plate like all of the laminations or plates A-U has openings as 11 for receiving bolts 10. However plate L is seated against the upper end of the lock casing LC or against annular shoulder 21 formed by this casing since the upper end or stud 41 (Fig. 6) of the plug PG extends beyond the upper end of the lock casing. It has been previously stated that the lower end of the plug PG also extends beyond the lock casing forming the annular shoulder 22 seated on the bottom plate A. It follows that the cylinder lock is thus prevented from lengthwise or axial displacement relative to the laminated casing.

When the confining plate L is assembled, its central opening 23, although smaller, is lined up with openings 19 and its shackle receiving opening 24 is in registration with openings 16 of the gang plates B-K. But it should be observed that the circular upper end or collar 25 (Figs. 2 and 3) of plug PG extends into and is journalled in the opening or bearing 23 of plate L or in other words the irregularly shaped stud 41 is rotatably guided in bearing 23.

However this stud includes the lower and upper attenuated portions or flattened webs 26 and 27 interrupted by the disc shaped member 28 defining retaining lugs 29 overhanging the straight or rectilinear faces 30 of the lower web 26 and extending laterally of the straight faces 31 of the upper web 27.

Having assembled the confining or closure plate L, the long shank 17 of the shackle is inserted into alined openings 16 and 24. Consequently the helicoidal spring 32 which is confined within this shank and in part projects therefrom, is seated on the bottom closure plate A as shown in Fig. 2. This shank is undercut at 33 to provide the annular shoulder 34 and is also flattened longitudinally at 35 to provide the overhanging shoulder 36.

With the long shank 17 of the shackle and its spring 32 disposed within the alined guide openings 16 and 24 the intervening plate M is threaded over the open end or shank 37 of the U shaped shackle in the manner suggested by the dash and dot lines in Fig. 7 and onto the locating pins 10 and against the confining plate L.

It is important to observe that plate M is provided with an irregularly shaped and relatively large opening 38 and in fact characterizes a rim shaped member or a rim having the spaced straight inner sides 39 and the transversely arranged stop or abutment portion 40, the latter cooperating with lower shoulder 34 of shank 17 to limit the upward projection of the shackle

when unlocked. This stop portion 40 projects or overhangs the alined guide openings 24 and 16 and also serves as an abutment to cooperate with upper shoulder 36 to limit inward or downward movement of the shackle.

The opposed compensatory leaf springs CS are now arranged in rim M and interposed between the retaining lugs 29 of disc 28 of the stud 41 of the rotatable plug PG and the confining or closure plate L, stud 41 being that part of the plug PG extending beyond the upper part of the lock casing LC including webs 26 and 27 intervened by the disc 28. Specifically however, the central rectilinear portion 42 (Fig. 5) of the compensatory springs CS bear against the flat faces 30 of the lower web 26 for retracting the plug while the curved or reflexed ends of the diverged arms 43 bear against the ends of the rectilinear inner faces 39 of the rim or plate M.

Supplementary and identical plates N and O are now threaded onto the open end or shank 37 of the shackle in the manner as shown in Fig. 7 and received by the positioning pins 10 and are situated over the compensatory springs. Thus rim or plate M intervenes or is between the confining plates L and N and hence the compensating springs are precluded from disassociating or jumping out of the rim M, the central opening 44 of plate N constituting a guide bearing for the disc 28 of stud 41.

As a further commentary in respect to the threading of plates N and O onto the shackle, it will be noted (Fig. 6) that each of these plates includes the shank receiving opening 45 as is the case of plates R-U. In assembling these plates onto the shackle, the short shank 37 of the latter is first swiveled to overhang one side of the laminated casing and thereafter is threaded through openings 45 and the plates are shifted over the bight of the shackle and threaded onto the positioning pins 10.

Assuming that the confining plates N and O have been assembled, identical plates or rims P and Q are now threaded over the shackle and located on the pins or bolts 10. These plates have the alined irregular shaped openings 47 provided at the ends thereof with the alined notches or bearings 48 for facilitating guiding of shank 17 and the alined notches 49 for slidably guiding the short shank 37 of the shackle, notches 48 being alined with guide openings 45 while notches 49 are alined with the registering openings 50 in plates N, O, and R-U, the ends 51 of the alined openings 47 sloping outwardly as shown.

Mounted and fitting into the irregularly shaped openings 47 of the alined and identical rims P and Q are the opposed and latch balancing leaf springs BS and each of these has a central straight part 52 abutting the opposed straight sides 53 of the pivoted multiple latch ML. Each spring BS also has outwardly extending arms or wings 54 confined against the tapered or flared portions 51 of the sides of the openings 47, or in other words the ends 55 of the multiple latch ML are confined between corresponding arms 54 of the balancing springs BS and the ends of the latter are reflexed or bent as illustrated.

The multiple latch ML is seated on the plate O and of course within plates or rims P and Q and is provided with a centrally arranged polygonal opening or slot broadly denoted 56 (Fig. 8) having sloping and diverged sides 57 and 58 defining opposed cams or teeth 59 closely straddling the straight sides or fulcrum means 31 of the upper web 27 of the stud 41 of the rotatable plug

PG, which web projects into the slot 56 of the latch ML.

Thereafter the confining plate R is threaded on the shank and on the bolts 10 and positioned against plate Q. Hence plates O and R prevent accidental withdrawal of the balancing springs BS from rims P and Q. Subsequently the remaining plates S, T and the top plate U are threaded over the shackle and over the pins 10 which are now upset to hold all the plates close together as a unitary laminated construction in the form of a casing.

By the arrangement disclosed the long shank 17 is spring controlled and in part is slidably and rotatably confined within the casing. This shank also includes the notch or recess 60 for interlocking with one end 55 of the multiple latch. The short shank 37 embodies the cut away portion 61 defining shoulder 62 which cooperates to prevent upward displacement of the shackle when an opposing end 55 of the multiple latch snaps into the cut away portion 61.

As is well understood when a suitable key (not shown) is inserted in the rotatable plug PG in the form according to Figs. 1-8, tumblers 63, 25 actuate the driving pins or tumblers 13 (Fig. 2) permitting these tumblers to line up, thus unlocking the plug PG from the cylinder LC and hence the plug can be rotated relative to the laminated casing.

Rotation of plug PG of course bodily rotates stud 41 since the latter is merely an extension of this plug. It follows that web 26 causes the straight portions of the compensating springs CS to be urged outwardly as shown by the dotted lines in Fig. 5.

The upper web 27 since it is also a part of the plug is also rotated and hence its straight sides ultimately act against a pair of inclined portions 57 and 58 of the opposing sides of the flared and indented winged slot 56 and cause the straight portions 52 of the balancing springs to spread outwardly towards the opposed straight sides 46 of the openings 47 (Fig. 4). This condition takes place regardless of the direction of rotation of the plug but such action is delayed until after tensioning or flexing of the compensating springs CS in view of the angular relation of the flat and reentering sides 57 and 58 of cams or toothed means 59 in respect to the flat sides 31 of the upper web 27.

If the shackle be locked as shown in Fig. 2, the ends 55 of the multiple latch are within the locking notches 60 and 61. Thus each shank of the shackle is locked. If a key be inserted in the plug and the latter is rotated, ultimately both ends of the latch are simultaneously withdrawn from the shackle and the action of spring 32 projects the shackle upwardly until shoulder or flange 34 hits the overhanging abutment or stop 40 of plate or rim M at which time short shank 37 is completely withdrawn from the laminated casing. Even though the key is within the plug, rotation of the latter is resisted by the compensatory and balancing springs CS and consequently after the latch is unlocked these springs automatically and immediately restore the plug to its interlocked relation with the tumblers provided finger pressure on the key be released. With the shackle unlocked it is swiveled or rotated to present its short shank to one side of the laminated casing and by this action, the long shank of the shackle holds the multiple latch in an ineffective oblique relation (note dash lines Fig. 4) but ready to be auto-

5 matically snapped into interlocking relation with the shanks of the shackle when the latter is rotated to align the short shank 37 with the openings 50 which characterize a socket and subsequently depressed against the action of spring 32.

Or in other words where the short shank 37 of the shackle is positioned to overhang the casing, the long shank 17 acts as a stop against the multiple latch to prevent its retraction until of course short shank 37 is again lined up with aligned openings 50 and depressed in which instant both ends 55 of the multiple latch snap into interlocking relation with the shackle. This also holds true for the embodiment illustrated in Figs. 9 and 10 wherein the upper web 27 is keyed in a closely confining rectangular slot 70 and hence the multiple latch promptly responds to the rotation of the plug but the key therein cannot be removed until the shackle is swung back for the reception by the casing of the short shank and depressed. In other aspects the embodiment shown in Figs. 9 and 10 is identical to the form illustrated in Figs. 1-8 inclusive although in all of the forms disclosed bolts 10 of the padlock have their upper ends appreciably upset for holding all the laminations or plates of the casing together and compactly as desired.

30 Various changes may be made in details of construction and arrangement of parts without departing from the spirit of the invention or sacrificing any of the advantages thereof inherent therein.

35 I claim:

1. In a padlock, a shackle having a pair of spaced shanks, a laminated casing embodying a plurality of superimposed plates including aligned means for rotatably and slidably guiding one shank of said shackle, a rim intervening a pair of said plates and having means projecting into said aligned means for limiting linear displacement of said shackle, latch means within said casing and cooperating to interlock with said shackle and having an elongated opening defining opposed tapering portions, and rotatable means having an extension projecting into said opening and coacting with said portions for actuating said latch means to unlock from said shackle.

2. In a padlock, a shackle having a pair of spaced shanks, a laminated casing embodying a plurality of superimposed plates including aligned means for rotatably and slidably guiding one shank of said shackle, a rim intervening a pair of said plates and having means projecting into said aligned means for limiting linear displacement of said shackle, latch means within said casing and cooperating to interlock with said shackle and having an opening defining spaced tapering portions, rotatable means comprising a stud having an extension having flat sides co-operating with said portions for actuating said latch means to unlock said shank, and spring means cooperating with said stud for resisting rotation of said rotatable means.

3. In a padlock, a shackle having a pair of spaced shanks, a laminated casing embodying a plurality of superimposed plates including aligned means for rotatably and slidably guiding one shank of said shackle, a rim intervening a pair of said plates and having means projecting into said aligned means for limiting linear displacement of said shackle, pivoted latch means within said casing and cooperating to interlock with

said shackle and having spaced toothed means, and rotatable means for actuating said toothed means to unlock said latch means from said shackle.

4. In a padlock, a shackle having a pair of spaced shanks, a laminated casing embodying a plurality of superimposed plates including alined means for rotatably and slidably guiding one shank of said shackle, a rim intervening a pair of said plates and having means projecting into said alined means for limiting linear displacement of said shackle, latch means within said casing and cooperating to interlock with said shackle and having an opening including opposed reentrant sides defining opposed toothed means, and rotatable means having a web in said opening and characterizing fulcrum means for said toothed means.

5. In a padlock, a spring controlled shackle having a pair of spaced shanks, a laminated casing embodying a plurality of superimposed plates including alined means for rotatably and slidably guiding one shank of said shackle, means for limiting linear displacement of said shackle, pivoted latch means within said casing and cooperating to interlock with said shackle and having an opening including at least one reentrant side defining toothed means, and rotatable means having a web smaller than said opening and projecting therein and characterizing fulcrum means for said toothed means and constituting means for driving said latch means relative to said shackle for unlocking the latter from said latch means.

6. In a padlock, a spring controlled shackle having a pair of spaced shanks, a laminated casing embodying a plurality of superimposed plates including alined means for rotatably and slidably guiding one shank of said shackle, means for limiting linear displacement of said shackle, pivoted latch means within said casing and cooperating to interlock with said shackle and having an opening including at least one reentrant side defining toothed means, key receiving rotatable means having a web smaller than said opening and projecting therein and characterizing fulcrum means for said toothed means and constituting means for driving said latch means relative to said shackle for unlocking the latter from said latch means, and spring means to resist rotation of said rotatable means and to automatically retract the latter pursuant to said rotation.

7. In a padlock, a spring controlled shackle having a pair of spaced shanks, a laminated casing embodying a plurality of superimposed plates including alined means for rotatably and slidably guiding one shank of said shackle, means for limiting linear displacement of said shackle, pivoted latch means within said casing and cooperating to interlock with said shackle and having an opening including reentrant sides defining opposed toothed means, rotatable means having a web smaller than said opening and projecting therein and characterizing fulcrum means for said toothed means and constituting means for driving of said latch means relative to said shackle for unlocking the latter from said latch means, spring means acting on said latch means to resist displacement thereof relative to said shackle, and spring means acting on said rotatable means to automatically retract the latter if rotated.

8. In a padlock, a spring controlled shackle having a pair of spaced shanks, a laminated casing embodying a plurality of superimposed plates including alined means for rotatably and slid-

ably guiding one shank of said shackle, means for limiting linear displacement of said shackle, pivoted latch means within said casing and cooperating to interlock with said shackle and having an opening including reentrant sides defining opposed toothed means, key receiving rotatable means having a web smaller than said opening and projecting therein and characterizing fulcrum means for said toothed means and for driving of said latch means relative to said shackle for unlocking the latter from said casing, balancing spring means to resist rotation of said latch means, and compensatory spring means to resist rotation of said rotatable means, said web bodily rotating with said rotatable means in advance of the actuation of said toothed means by said web for displacing said latch means relative to said shackle to unlock the latter.

9. In a padlock, a spring controlled shackle having a pair of spaced shanks, a laminated casing embodying a plurality of superimposed plates including alined means for rotatably and slidably guiding one shank of said shackle, a rim intervening a pair of said plates and having means for limiting linear displacement of said shackle, latch means within said casing and cooperating to interlock with said shackle and having an opening, key receiving rotatable means comprising a web smaller than said opening and projecting therein and characterizing means for driving of said latch means relative to said shackle for unlocking the latter from said latch means, spring means to resist rotation of said rotatable means and confined in said rim, and said pair of plates constituting means to prevent withdrawal of said spring means from said rim.

10. In a padlock, a shackle having a pair of spaced shanks, a laminated casing embodying a plurality of superimposed plates including alined means for rotatably and slidably guiding one shank of said shackle, a rim intervening a pair of said plates and having means projecting into said alined means for limiting linear displacement of said shackle, latch means within said casing and cooperating to interlock with said shackle and including an opening, rotatable means comprising a stud having an extension cooperating with sides of said opening for actuating said latch means to unlock said shank, compensatory spring means cooperating with said stud for resisting rotation of said rotatable means, said pair of said plates confining said spring means in said rim, balancing spring means resisting rotation of said latch means, said casing including rim means intervening a pair of spaced plates of said plurality and surrounding said latch means, and said last mentioned pair constituting means to prevent withdrawal of said balancing spring means from said rim means.

11. In a padlock, a shackle having a pair of spaced shanks, a laminated casing embodying a plurality of superimposed plates including alined means for rotatably and slidably guiding one shank of said shackle, a rim intervening a pair of said plates and having means projecting into said alined means for limiting linear displacement of said shackle, latch means within said casing and cooperating to interlock with said shackle and including an opening, rotatable means comprising a stud having an extension cooperating with sides of said opening for actuating said latch means to unlock said shanks, and spaced spring means within said rim and cooperating with spaced sides of said stud for resisting rotation of said rotatable means.

12. In a padlock, a shackle having a pair of spaced shanks, a laminated casing embodying a plurality of superimposed plates including alined means for rotatably and slidably guiding one shank of said shackle, a rim intervening a pair of said plates and having means projecting into said alined means for limiting linear displacement of said shackle, latch means within said casing and cooperating to interlock with said shackle and including an opening, rotatable means comprising a stud having an extension cooperating with sides of said opening for actuating said latch means to unlock said shanks, and spaced spring means within said rim and cooperating with spaced sides of said stud for resisting rotation of said rotatable means.

12. In a padlock, a shackle having a pair of spaced shanks, a laminated casing embodying a plurality of superimposed plates including alined means for rotatably and slidably guiding one shank of said shackle, a rim intervening a pair of said plates and having means projecting into said alined means for limiting linear displacement of said shackle, latch means within said casing and cooperating to interlock with said shackle and including an opening, key receiving rotatable means comprising a stud having an extension cooperating with sides of said opening for actuating said latch means to unlock said shanks, and spaced spring means within said rim cooperating with spaced sides of said opening and spaced sides of said stud for resisting rotation of said rotatable means.

13. In a padlock, a shackle having a pair of spaced shanks, a laminated casing embodying a plurality of superimposed plates including alined means for rotatably and slidably guiding one shank of said shackle, a rim intervening a pair of said plates defining an inner elongated slot and having means projecting into said alined means for limiting linear displacement of said shackle, pivoted latch means within said casing and cooperating to interlock with said shackle and including an opening having reentrant sides defining opposed toothed means, rotatable means comprising a stud having upper and lower webs and flanges intermediate said webs and extending laterally thereof, spaced compensatory springs confined within said rim under said flanges and cooperating with spaced sides of said opening to resist rotation of said rotatable means, and spaced balancing springs cooperating with spaced sides of said latch means to resist pivotal displacement of the latter relative to said upper web.

14. In a padlock, a shackle having a pair of spaced shanks, a laminated casing embodying a plurality of superimposed plates including alined means for rotatably and slidably guiding one shank of said shackle, a rim intervening a pair of said plates and having means projecting into said alined means for limiting linear displacement of said shackle, latch means within said casing and cooperating to interlock with said shackle and including an opening, key receiving rotatable means comprising a stud having an extension interlocking with the sides of said opening for actuating said latch means to unlock said shanks, and spaced spring means cooperating with said stud for resisting rotation of said rotatable means.

15. In a padlock, a base plate, a pack of identical plates mounted on said base plate, a confining plate mounted on said pack, a rim mounted on said confining plate, a lock cylinder interlocked

with said pack and having key receiving rotatable means projecting into said base plate and into said confining plate and including a stud extending into and through said rim, compensatory spring means within said rim and cooperating to resist rotation of said stud, confining plate means mounted on said rim, rim means mounted on said confining plate means, latch means within said rim means and interlocked with said stud, balancing spring means within said rim means and cooperating with said latch means to resist displacement thereof, closure plate means mounted on said rim means, a plurality of superimposed plates mounted on said closure plate means, a spring controlled shackle slidably and rotatably mounted in said pack, confining plate, rim, confining plate means, rim means, closure plate means and superimposed plates and having means for disengageably interlocking with said latch means, and bolt means for holding said base plate, pack, confining plate, rim, confining plate means, rim means, closure plate means, and superimposed plates together.

16. In a padlock, a base plate, a pack of identical plates mounted on said base plate, a confining plate mounted on said pack, a rim mounted on said confining plate, a lock cylinder interlocked with said pack and having key receiving rotatable means projecting into said base plate and into said confining plate and including a stud extending into and through said rim, spaced compensatory spring means within said rim and cooperating to resist rotation of said stud, confining plate means mounted on said rim, rim means mounted on said confining plate means, multiple latch means within said rim means and actuated by said stud, balancing spring means within said rim means and cooperating with said latch means to resist displacement thereof, closure plate means mounted on said rim means, a plurality of superimposed plates mounted on said closure plate means, a spring controlled shackle slidably and rotatably mounted in said pack, confining plate, rim, confining plate means, rim means, closure plate means and superimposed plates and having spaced shanks having means for simultaneously disengageably interlocking with said multiple latch means, and bolt means for holding said base plate, pack, confining plate, rim, confining plate means, rim means, closure plate means, and superimposed plates together; and said base plate, pack, confining plate, rim, confining plate means, rim means, closure plate means, and superimposed plates characterizing a laminated casing.

JOHN HINES.
LOUIS SEGAL.