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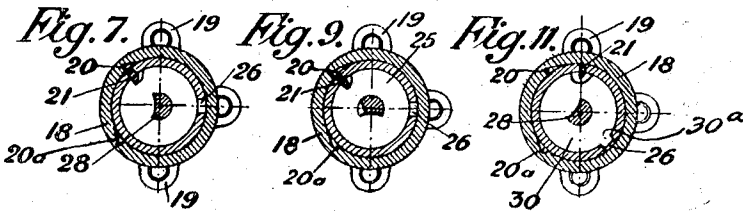
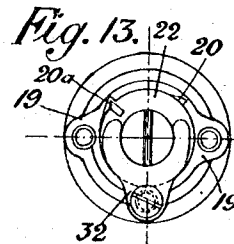
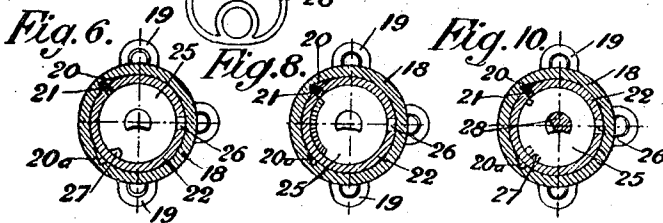
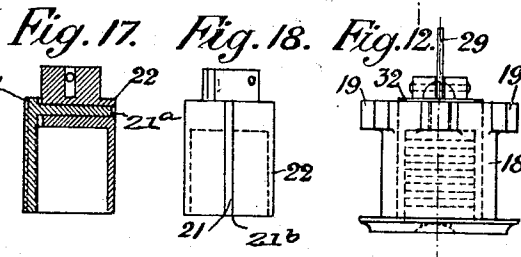
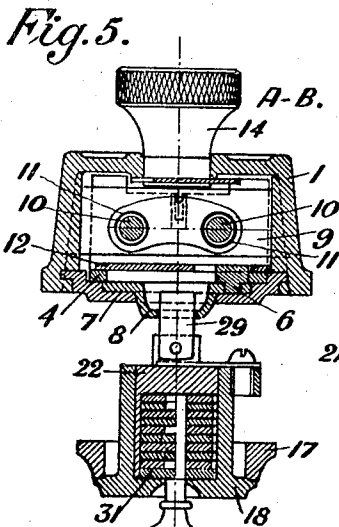
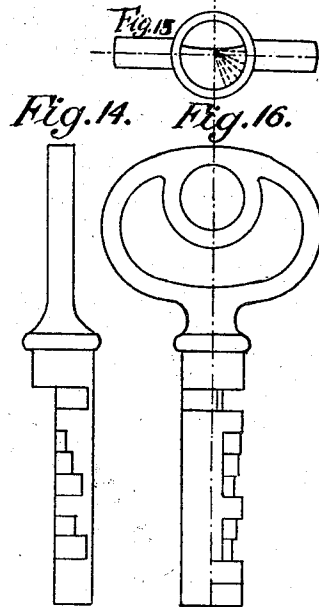
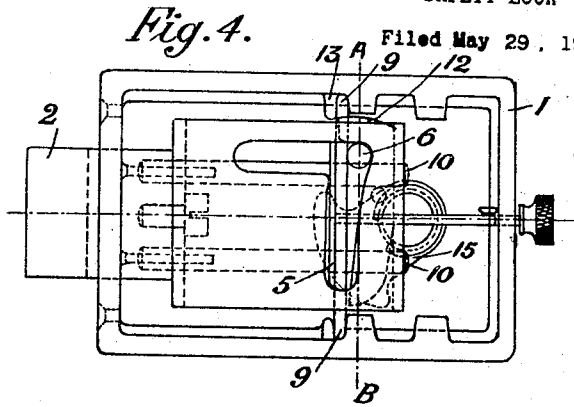
E. W. HENRIKSSON

1,514,318

SAFETY LOCK

Filed May 29, 1919

2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE.

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## SAFETY LOCK.

Application filed May 29, 1919. Serial No. 300,753.

*To all whom it may concern:*

Be it known that I, EMIL WILHELM HENRIKSSON, a subject of Finland, residing at Helsingfors, Finland, have invented a new and useful Safety Lock, of which the following is a specification.

This invention is an improved lock adapted for use on doors, safes, boxes and the like, and also adapted for use as a padlock.

The object of the invention is to provide an improved lock including key actuated mechanism for operating the bolt from the outer side of the door on which the lock is used and also including manually operable means for the bolt arranged on the inner side of the door.

Another object is to provide an improved lock including manually operable means to secure the bolt either in locked position or in retracted or unlocked position.

Another object is to provide improved means for holding the bolt in its single throw position which means are released to permit of the full throw of the bolt by its contact with the strike plate as the door approaches its closed position.

A further object is to provide improved means for locking the bolt against retraction when in its single throw position.

A further object is to provide means operable from the inside of the door for dead locking the bolt when in its single throw position and independent means for dead locking the bolt in its double throw position, said latter means being operable to release the bolt by the bolt retracting means.

With the above and other objects in view the invention consists in the construction, combination and arrangement of devices hereinafter described and claimed.

In the accompanying drawings:

Figure 1 is a plan of my improved lock, with the cover removed and the bolt and its coacting parts in the position assumed thereby when the bolt is double locked.

Figure 2 is a vertical central sectional view of the same.

Figure 3 is a diagrammatic plan of the same with some of the parts removed and showing the knob 14, member 15, and the members 6 and 8 in double locked position.

Figure 4 is a similar view showing the

bolt and tappet 6 in one bolt locked position and the arm 15 in working position.

Figure 5 is a transverse sectional view of the lock.

Figure 6 is a detail sectional view of the key actuated mechanism on a plane disclosing the first disc.

Figure 7 is a similar view of the same as in the position when the lock is being operated.

Figure 8 is a similar view of the same in locking position and on a plane disclosing the last disc.

Figure 9 is a similar view of the same in position when being opened.

Figure 10 is a similar view of the same in locking position and on a plane disclosing the third disc.

Figure 11 is a similar view of the same in opening position and on a plane disclosing the ninth disc.

Figure 12 is a detail elevation of the key actuated mechanism.

Figure 13 is a plan of the same.

Figures 14, 15 and 16 are detail views of the key on an enlarged scale.

Figure 17 is a detail sectional view of the cylinder and the bolt 21.

Figure 18 is a detail elevation of the same.

The lock case 1 may be of any suitable form, is adapted to be secured on the inner side of a door and is provided in its opposite side walls with notches 1<sup>a</sup>, 1<sup>b</sup>. The bolt 2 is movable through an opening in the inner end wall of the lock case and is provided on the inner sides with an angle plate or arm 4 which operates in the lock case and is provided with a curved transversely extending slot 5 which slot has an arm 5<sup>a</sup> which is parallel to one side of the lock case. A bridge 9 extends across the lock case and a pair of parallel rods 10 extend through the bridge and are fastened to the angle plate 4 behind the bridge 9, through openings in the angle plate 4 and also through the openings in the bridge 9, said rods serving to guide the movements of the bolt. The springs 11 are arranged on said rods and bear against the bridge and the angle plate and serve to normally project the bolt. The outer movement of the bolt in its latch position is limited by a hook 12 which is pivot-

ed as at 33 to the plate 4 and is pressed against the projection 13 with which the wall of the lock case is provided as in Fig. 4.

A tappet 6 projects from a circular plate 8 which is mounted for rotation in the outer side of the lock case, said tappet operating in the slot 5 of the angle plate 4. Said plate 8 has a non-circular central opening 34 to receive a correspondingly shaped connecting bar 29 from the cylinder lock.

To enable the bolt to be manually operated from inside the door I provide a knob 14 which has a short hub which is mounted for rotation in an opening in the inner side of the lock case and is provided at its inner end with a bolt operating arm 15. To enable the bolt to be dead locked when either in projected or retracted position, I provide a detent 15<sup>a</sup> which is pivotally mounted as at 16<sup>a</sup> in the lock case and bridge and is provided with a plurality of spaced lugs 16<sup>b</sup> any one of which may be turned into engagement with the inner arm 4<sup>a</sup> of the plate 4. A knob 15<sup>b</sup> is provided at the outer end of said detent to enable the same to be readily turned.

The key actuated mechanism for operating the bolt from outside the door includes a cylinder 18 which has lugs 19 at its inner open end and an annular flange at its closed outer end. Bolts 16 which engage threaded openings in said lugs secure the cylinder to the lock case and pass through the door between them, the cylinder being morticed in the door and an escutcheon ring 17 being provided which is held by said bolt between the flange head or outer end of the cylinder and the outer side of the door. Said cylinder has a key hole in the flanged head thereof and in said cylinder is mounted a sleeve 22 which has a socket at its inner end in which the connecting bar 29 is secured. Hence when the sleeve is turned by means of a key the plate 8 is also turned and caused to operate the bolt 2 as will be understood. The sleeve 22 is provided near its inner end with a diametric opening in which operates the arm 21<sup>a</sup> of a bolt 21 which tumbler is arranged for radial movement in a slot 21<sup>b</sup> in one side of the sleeve. Said tumbler when projected may be engaged in either of a pair of grooves 20, 20<sup>a</sup> in the inner side of the wall of the cylinder and which are arranged at right angles to each other as shown in Figures 6 to 11 inclusive. A cover 31 is provided for the open end of the sleeve. A series of discs are arranged in the sleeve and may be of any suitable number, nine of said discs being here shown and said discs being designated by the reference numeral 25. Each disc has a suitable central opening to receive the stem of the key 28 and also has a peripheral notch 27 to receive the bolt 21 when the disc is in such position that said notch is opposite either the groove 20

or the groove 20<sup>a</sup>. The discs are separated from each other by spacer discs 30 which also have openings to receive the key and are provided with peripheral projections 30<sup>a</sup> which engage in a slot 26 in one side of the sleeve 22. Hence said spacer discs turn with said sleeve and this is also true of cover disc 31 of said sleeve. The position of the notches 27 varies in the several discs with relation to the eccentric part of the key hole of the discs, and said notches must be in a certain position for each disc and with reference to the key and key hole to render it possible to operate the lock. When the notch 27 is out of alignment with either of the grooves 20, 20<sup>a</sup> the tumbler is held by the discs firmly in engagement with one of said grooves and hence the turning of the sleeve is prevented and it is impossible to withdraw the bolt.

The shank of the key is shaped to conform to the openings in the discs and cover 31. When the key is inserted it is then turned to the right and caused to push or partly turn the discs one after another in due order, dependent on the size of the key's center angle, beginning with the smallest one, Figure 10. When the discs have all been turned by the key their notches 27 are arranged in alignment with each other and also with the tumbler 21 and further turning of the discs in the sleeve is prevented by the cover 31 with which the bolt engages. The lock is then in opening position as in Figures 5, 7, 9 and 11. If the key is turned further to the right the cover 31 is also turned together with the sleeve 22. The oblique surface of the grooves 20 or 20<sup>a</sup> then pushes the tumbler into the notches 27 and thus joins the discs 25 with the sleeve 22. The latter can now be easily turned, to operate the bolt, as will be understood.

The key acts upon all tumbler discs in the same way excepting upon the first disc and on that tumbler disc which is right close to the stationary tumbler disc 31. That part of the key which corresponds to the first disc has the shape of the key hole as indicated in Figures 6 and 7. When the key is withdrawn it is turned to the left. The tumbler disc 25 which is directly in the rear of the stationary tumbler disc 31 also is selected so that it is in mutual cooperation with a sector of the key having the full cross-section of the key. This tumbler disc, however, must then be in conformity with the first mentioned lifting tumbler at the bottom of the cylinder. It is just as simple to use instead of a tumbler disc an intermediary disc 30 having the thickness of a tumbler disc. The main thing is that the key as shown in Figs. 14 and 16 has a complete or full cross-section in this part, for the key can then only be removed from the lock after it has been returned to that position in which

it had been inserted. This arrangement also safeguards the accurate axial division of the key in proportion to the respective tumbler discs. It thereby turns only the first disc which in turn turns the sleeve 22 until the tumbler 21 is in line with either the groove 20 or the groove 20<sup>a</sup> whereupon the oblique surface of the notch 27, Figures 6 and 7, on the first disc which corresponds to a similar oblique surface on the tumbler 21, Figures 2, 5, 6 and 7, lifts up the same.

When the lock is to be retracted by the key when in its latch position the procedure is as follows: The key is inserted and turned to the right. The discs are turned successively in an order corresponding to the notches on the key until the bolt 21 is engaged in the notches 27. By a continued turning to the right the plate 8 is turned by the rod 29 and hence the bolt 2 is drawn inwardly by the tappet 6. To withdraw the key it must be first turned to the left. This causes the sleeve 22 and the discs 25 to come into such relation that the tumbler 21 is pushed into the groove 20. While this is being done the springs 11 project the bolt 2.

To double lock the lock or to throw the bolt to its lock position the procedure is the same until the bolt is entirely withdrawn whereupon the key is further turned one-half turn to the right. This causes the tappet 6 to press against the edge of the hook 12, so that the same runs free on the projection 13. At the same time the bolt is pushed out to about its double effective length independently of the springs 11. When it is double bolt locked, the radius of the plate 8 which carries the tappet 6 coincides with the direction of movement of the bolt, Figures 2 and 3, and thus rendering it impossible to push in the bolt until the plate 8 has been first turned. When the bolt is pushed out to its full length the central portion of the arm 15 lies in a slot on the angle curved end of the posterior of the plate 4, Figures 1, 2 and 3, thus preventing the knob 14 from turning and hence preventing the opening of the lock from the inside. To withdraw the key it should be turned to the left, thus causing the sleeve 22 to turn until the tumbler 21 is in engagement with the groove 20<sup>a</sup>.

My improved lock cannot be picked, operates without the employment of springs, may be constructed so as to require the successive use of a number of different keys and hence is entirely suitable for use on safe deposit boxes and for other similar uses. It is impossible to make a duplicate key that will fit the lock from an impression. The key may be small and the entire length of its spindle is employed. The lock can be double locked only by one complete turn of the key and can be released from double locked position with only a three-fourths

turn. The position of the lock as to being single bolt locked or double locked can always be noted by the position of the key handle when the key is withdrawn or inserted.

Having thus described my invention, I claim:

1. A safety lock comprising a cylinder, and a number of discs therein arranged to revolve on their centres, said discs being provided with semicircular axial holes, uniform in size and shape and through which holes the key extends.

2. A safety lock comprising a cylinder, and a number of discs therein arranged to revolve on their centres, said discs being provided with semicircular axial holes, uniform in size and shape and through which holes the key extends, said discs being also fitted with notches in the periphery, and so arranged that one side of the notch facilitates the lifting of a fastening bolt, the notches being arranged in definite, variable position in relation to the key hole.

3. A safety lock comprising a cylinder, and a number of discs therein arranged to revolve on their centres, said discs being provided with semicircular axial holes, uniform in size and shape and through which holes the key extends, said discs being also fitted with notches in the periphery, and so arranged that one side of the notch facilitates the lifting of a fastening bolt, the notches being arranged in definite, variable position in relation to the key hole, said cylinder having recesses, one side of each of which is slanting, to facilitate the movement of the fastening bolt.

4. A key for safety locks of the class described comprising a stem of semicircular cross section with sector shaped recesses of varying depth and with slanting bottom surfaces all radially arranged from the center of the semicircled key.

5. A safety lock comprising a cylinder, and a number of discs therein arranged to revolve on their centres, said discs being provided with semicircular axial holes, uniform in size and shape and through which holes the key extends, said discs being also fitted with notches in the periphery, and so arranged that one side of the notch facilitates the lifting of a fastening bolt, the notches being arranged in definite, variable position in relation to the key hole, said cylinder having recesses, one side of each of which is slanting, to facilitate the movement of the fastening bolt, said discs being operated by a key to cause the notches to form a straight axial groove in which a fastening bolt may enter.

6. A safety lock comprising a cylinder, and a number of discs therein arranged to revolve on their centres, said discs being provided with semicircular axial holes, uni-

form in size and shape and through which  
holes the key extends, said discs being also  
fitted with notches in the periphery, and so  
arranged that one side of the notch facili-  
tates the lifting of a fastening bolt, the  
notches being arranged in definite, variable  
position in relation to the key hole, said cyl-  
inder having recesses, one side of each of  
which is slanting, to facilitate the movement  
of the fastening bolt, said discs being op-  
erated by a key to cause the notches to form

a straight axial groove in which a fastening  
bolt may enter, one of the discs forming a  
guide in order to ascertain, that the key  
be turned back to its entering position be-  
fore it may be removed. 15

In testimony whereof I affix my signature  
in presence of two witnesses.

EMIL WILHELM HENRIKSSON.

Witnesses:

E. ERIKSSON,

ESTER MURTOVAARA.