July 15, 1930. H. O. RIVERS 1,770,864

DOORLOCK

Filed Sept. 9, 1929

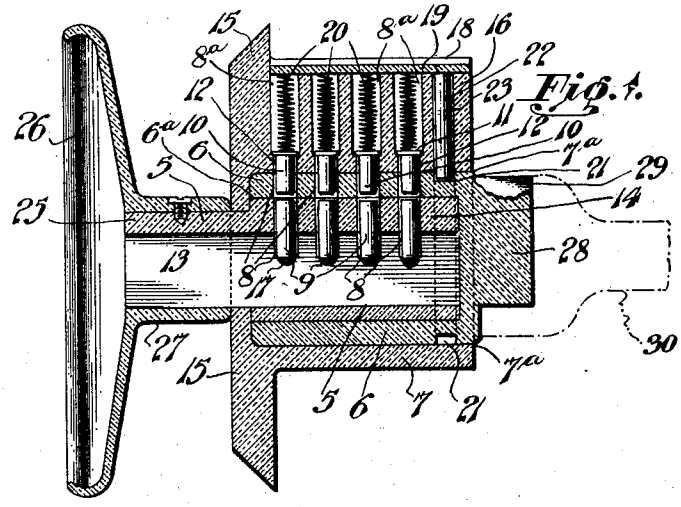


Fig. 1.

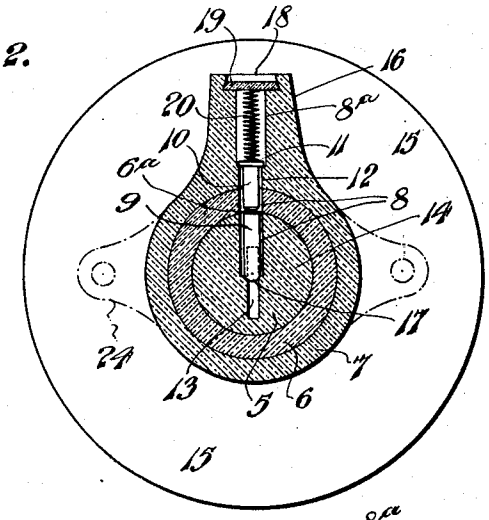


Fig. 2.

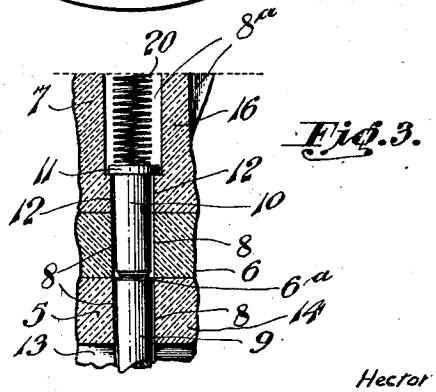


Fig. 3.

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UNITED STATES PATENT OFFICE

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DOOR LOCK

Application filed September 9, 1929, Serial No. 391,341, and in Australia July 27, 1928.

This invention relates to improvements in door locks being particularly directed to a pin lock and has for its object the provision of simple and effective mechanism which results in a lock of great utility.

Locks of this class at present in use are all dependent on the pins only for locking and are disposed in a single barrel arranged in a housing and as such tend to allow of the insertion of an instrument which would allow of the unauthorized picking of the lock.

This invention has been devised to overcome this defect and to provide simple means combined in a lock which will prevent the insertion of any implement or tool other than the key designed for the purpose to bring about the combination necessary to open the lock and to allow it to function properly.

A lock constructed in accordance with this invention comprises a freely rotatable spindle having a keyway therethrough, said spindle being enclosed by a rotatable barrel member, the two members being accommodated within a housing, forming a plurality of orifices in the spindle and in the barrel member and accommodating sets of pins in the said orifices, the lower ends of the lower set of pins projecting into the keyway of the spindle whereby they are in intimate contact with the undulations of the key, the upper set of pins being normally disposed partly in the barrel and partly in the housing, the rows of pins being complementary to each other, so that on the withdrawal of the key from the spindle the lower set of pins drop in order that their upper edges are flush with or slightly below the surface of the spindle which allows of the free rotation of the spindle and the lock remains in locked position by reason of the fact that the upper set of pins register between the barrel and the housing and in that position the barrel, and consequently the bolts or bars which are connected therewith, are maintained in rigid locked position, but on the insertion of the key in the keyway of the spindle the lower set of pins are actuated by the undulations of the key and are forced upwardly so that they also enter the barrel and the top ends of the pins of the lower row force the upper row of pins further into the housing and clear of the barrel so that in that position the spindle can be partially turned and by the position of the lower set of pins which have partially entered the barrel so the barrel turns with the spindle and the locking members carried by the barrel can thus be moved to the right or left to lock or unlock the door to which the lock is fitted. When in locked position, the key is removed from the keyway and the pins acted on by springs above the top row return to normal position, that is, the bottom row of pins drop to their lowest movement in the spindle clear of the barrel leaving the spindle in free rotatable condition and the upper set of pins drop so that they enter partly into the barrel and remain partly in the housing, thus it will be observed that as the upper pins retain the barrel in rigid relationship to the housing, the spindle is free to rotate and the upper pins being the retaining elements between the barrel and the housing it is impossible for any instrument applied from the outside to interfere with them in an unauthorized manner.

The invention is further characterized by firstly forming pins in the barrel, spindle and housing of the same diameter so that when the door is locked any combined movement between the barrel and the spindle is prevented, the lock being always dependent on the position of the rows of pins for opening as well as locking.

The invention is further characterized in that a lower set of pins is provided disposed wholly into the spindle when the door is locked and said pins are adapted to be retained in such lowermost position by forming a collar or rim or the like on the upper set of pins, the upper ends of which normally rest on a shoulder formed in the slots in the housing so that only by the use of the key suitable to the combination can the lock be manipulated.

The invention is further characterized by the use of a series of holes in the housing, barrel and spindle of the lock, said holes being normally in alignment to accommodate spring controlled pins, the upper set of which is disposed in the housing and provided with collars at the upper end thereof to seat on a

shoulder portion formed at the base of each hole in the said housing.

The invention is further characterized by the provision of a pin in the housing separate from the locking pins and extending into an annular groove in the barrel of the lock to ride therein on the rotation of said barrel and at the same time prevent the voluntary detachment of the parts.

But in order that the invention may be more readily understood reference will now be made to the accompanying drawings in which:—

Figure 1 is a view in vertical central section of the improved door lock, and

Figure 2 is an end sectional elevation thereof.

Figure 3 is an enlarged view in section illustrating the pin formation in detail.

According to this invention the lock comprises a spindle member 5, a barrel member 6 and a housing 7, the three members being provided with a series of normally registering holes 8 which form passages or slots for the retention and operation of lock operating pins 9.

The spindle member 5 is provided with a keyway 13 extending the entire length thereof into which merge the holes 8 receiving the lower set of pins 9 which are also set upwardly into the holes 8 formed in the body portion 14 of the said spindle and in line with the holes 8 formed in the surrounding barrel 6.

The barrel 6 and spindle 5 of the lock are rotatably mounted in the housing 7 which is bored out as at 7^a to receive them and the housing is provided with a face plate 15 disposed at the front of and cast integral with a longitudinal rib 16 in which the holes 8 are formed corresponding with the holes 8 in the barrel 6 and spindle 5 respectively, the said holes 8 in all the parts, except the upper portions 8^a of the holes in the housing, being of the same diameter to accommodate the locking pins 9.

The upper portions 8^a of the holes in the housing are larger in diameter to accommodate collars 11 at the top of the upper set of pins 10.

The pins 9 are of the same diameter being arranged in two sets, the upper set 10 being received in the holes 8 in the housing 7 and normally project into the registering holes 8 in the barrel 6 flush with the internal surface 6^a thereof.

The upper pins 10 are provided at the upper ends thereof with collars 11 which normally seat upon a shoulder 12 formed by reducing the said holes 8 at the bottom of the housing 7.

By providing the upper pins 10 with collars 11 as mentioned they are prevented from dropping right through into the holes 8 in the body portion 14 of the spindle 5 which condition would effect the operation of the lower set of pins 9 thereby upsetting the combination necessary to open the lock and also preventing the spindle member 5 from freely rotating within the barrel 6.

The lower pins 9 at the base 17 are rounded to project into the keyway 13 of the spindle member 5 to receive the undulatory surface of the key and extend into the holes 8 in the body portion 14 of the spindle, said pins 9 each being of sufficient length as is required by the undulations of the key to produce the necessary combination between the upper and lower pins 9 and 10 respectively to operate the lock as will be hereinafter described.

The rib 16 of the housing is grooved as at 18 to slidably receive a cover plate 19 against which springs 20 recessed in the larger diameter 8^a of the upper set of holes are adapted to impinge the said springs seating on the collars 11 of the upper pins 10 to provide sufficient compression on the said pins to keep them normally in the lowermost position in relation to the spindle, i. e. upon the shoulders 12 in the holes formed in the housing.

The barrel member 6 is provided with an annular groove 21 preferably at the rear end, the said groove 21 receiving a pin 22 recessed in a hole 23 in line with the holes 8 in the housing 7, said pin 22 being adapted to ride in the groove 21 and while allowing the barrel and the spindle to rotate prevents the voluntary detachment of the parts.

The longitudinal rib 16 of the housing 7 is also provided at each side with lugs 24 which are tapped to receive threaded bolts or the like for affixing the lock to the door.

The stem 25 of the spindle member 5 projects beyond and is separate from the face plate 15 of the housing 7, the projection or stem 25 being adapted to receive the flanged portion 27 of an operating handle knob 26 or the like which is so formed as to permit the stem 25 with the keyway 13 of the spindle being presented for the insertion of the key.

The barrel member 6 at the rear end is closed and formed with a reduced portion 28 provided with a rib 29 to receive a cup head spindle 30 adapted to connect with latch mechanism or locking bars, straps or the like to lock the door.

As the lower set of pins 9 is disposed in the body of the spindle 5 and do not normally project into the holes 8 of the barrel, the spindle being normally free to rotate loosely within the barrel 6 in unison with the handle knob 26 without affecting the mechanism of the lock thus providing a loose handle.

In this condition a key cannot be inserted in the keyway 13 of the spindle 5 since the lower pins 9 cannot rise owing to their upper ends impinging against the internal surface of the surrounding barrel 6.

To lock or unlock the door, the key is in-

serted in the keyway 13 while the operator slowly rotates the spindle 5 by the handle knob 26 to bring the holes 8 in the said spindle 5 into registration with the holes in the barrel 6 and housing 7, the pressure caused by the insertion of the key when such registration of the said holes takes place causes the first pin when impinged on by the initial undulation of the key to move upwardly in its hole 8 to engage with and lift the corresponding upper pin 10 off its shoulder 12 against the pressure of the spring 20.

On the operator striking the first pin 9 he then "feels" with the key which being correctly shaped with the necessary undulations to effect the combination will force each pin 9 consecutively to rise together with the corresponding upper pins 10, thus permitting the lower set of pins 9 to rise partially into the holes in the barrel 6, the movement of said pins being limited to retain a portion thereof in the holes in the spindle, thus effecting a substantially rigid connection between the said spindle and barrel whereby the barrel 6 will rotate in unison with the spindle 5 as the operator rotates the handle knob 26.

The rotation of the barrel 6 effects the rotation of the cup headed spindle 30 connecting said barrel whereby the latch mechanism or locking bars will be operated to either lock or unlock the door.

The owner of the premises upon which the lock is positioned, however, being conversant with the function of the lock inserts the key as far as it will go and rotates the handle or knob 26 at the same time in the direction of rotation required whether unlocking or locking the door.

It will be obvious that both sets of pins 9 and 10 must all function to allow the barrel to rotate with the spindle to operate the locking mechanism, this being only possible by the insertion of the correct key having the necessary undulatory effective surface to produce the combination of the said pins whereby if an incorrect key were used causing one pin to fail to act the combination would fail owing to that pin producing a lock between the housing 7 and barrel 6, thus preventing the rotation of the said barrel which is essential as has been hereinbefore described.

As has been previously mentioned, the pin holes 8 together with the pins 9 and 10 except the upper portion 8^a of the upper set of holes being of the same diameter, slackness is avoided between the spindle, barrel and lock and also the formation of the collars at the top of the upper set of pins 10 prevents the said pins 10 from dropping right through into the unoccupied portions of the holes in the spindle and obstructing the passage of the lower pins 9 on the insertion of the key, or preventing the spindle from rotating freely, resulting in an indifferent functioning of the lock.

The avoidance of slackness between the spindle, barrel and housing in the manner outlined above ensures the positive operation of the pins and the prevention of any insertion of an alien key or tool to effect the unauthorized use of picking of the lock which being separate from the latch mechanism or locking bars may be broken or destroyed without effecting the unlocking of the door.

The invention therefore consists of a pin lock having a cylindrical spindle 5 and barrel 6 within the housing 7 and sets of pins 9, 10 so arranged as to be operable so that a partial turn brings the sets of pins into line and permits the insertion of the key at that position, the complete operation of locking being by a partial turn of both the spindle and barrel and the automatic locking or unlocking is effected.

The lock as hereindescribed has therefore the characteristic that there is an effective fixing between the spindle 5 and the barrel 6 by reason of the fact that the key being disposed in the keyway 13 in the spindle 5 instead of in the housing 7, the lifting pins 9 must all be fully connected to the spindle from the key upwards and into the barrel 6 in order to unlock and therefore is readily capable of carrying the strain of the operating bars or bolts which fasten the door and it also allows a wide combination of change in the pins and keys.

This lifting movement of the lifting pins 9 causing them to move upwardly into the barrel 6 and to the outer circumference thereof, so forcing the upper pins 10 clear of the barrel against the springs 20 so that the spindle and the barrel are interconnected by the lifting pins 9 to allow the barrel 6 to rotate with the spindle 5 during the operation of either locking or unlocking.

Thus I have described and illustrated improvements in door locks which shall be of great utility and I desire it to be understood that the improvements herein described may be adapted to other forms of pin locks as desired.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A door lock comprising the combination of a housing, a barrel within the housing and a spindle within the barrel, a set of holes in each of said members all positively in registration with each other only when the key is inserted in the keyway of the spindle, the holes receiving upper and lower sets of pins of similar diameter, the lifting pins being set in the spindle and are forced upwardly by the undulations of the key, so that the upper ends thereof pass through the holes in the barrel and practically flush with the outer surface of said barrel, the upper set of pins being normally set at locked position relatively between the barrel and the housing, but on the upward movement of the lower pins the said upper set of pins are forced fully into the

housing clear of the barrel and so that in this position the spindle and barrel rotate in unison to affect the locking or unlocking movement of the latch mechanism carried by the barrel substantially as described.

2. An improvement in door locks comprising a spindle, barrel and housing member, upper and lower sets of pins of similar diameter disposed in holes adapted to register with each other and formed in the spindle barrel and housing, a keyway in the spindle, the lifting pins being fully connected to the spindle from the key upwards and through the barrel surrounding the spindle to permit of the locking or unlocking of the lock substantially as described.

3. An improvement in door locks comprising a spindle, a barrel and a housing member, a series of holes in said members adapted to register and de-register with each other, upper and lower sets of locking pins of equal diameter disposed in said holes, providing the upper set of pins with collars to seat on a shoulder formed in the holes in the housing, said upper pins extending into the registering holes in the barrel, the holes in the spindle member accommodating the lower set of pins being merged into a keyway extending the entire length of said spindle, the spindle being provided with a projecting portion for the reception of a handle knob, a reduced portion at the rear end of the barrel adapted to connect latch operating mechanism, a longitudinal rib to said housing slotted to receive a cover plate, an additional pin recessed within said housing and projecting into an annular groove in the barrel and a face plate to said housing member substantially as described and illustrated.

4. An improvement in door locks comprising a spindle, a barrel and housing member, the combination therewith of upper and lower sets of locking pins of similar diameter disposed in a series of holes adapted to relatively register, said holes being formed in the spindle barrel and housing members, collars formed on the upper sets of pins at the top thereof seating upon shoulders formed in the base of the holes in the said housing member substantially as described.

5. An improvement in door locks comprising a spindle, barrel and housing member, the combination therewith of a series of holes normally in registration and formed in the spindle, barrel and housing members, upper and lower sets of pins of similar diameter disposed in said holes, collars at the top of said upper pins to seat on shoulders formed in a reduced portion at the base of the pin holes in the housing, said upper pins extending into the registering holes in the barrel member, the lower pins extending into a keyway cut in the spindle member which is freely rotatable in unison with a handle knob, springs seating on the collars of the upper pins and impinging on a cover plate slotted in the upper ribbed surface of the housing and a reduced portion on the rear end of the barrel member adapted to operate latch mechanism or the like as described.

Signed at Melbourne, Victoria, Australia, this 5th day of August, A. D. 1929.

HECTOR OSMOND RIVERS.