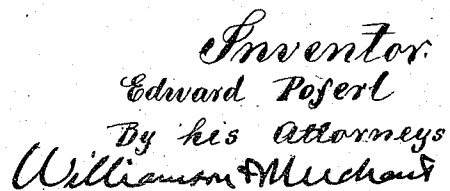


APPLICATION FILED JULY 6, 1909.

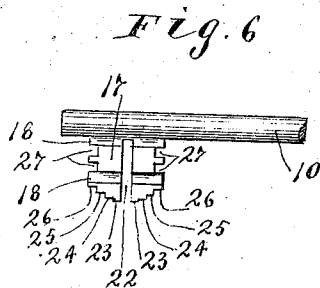
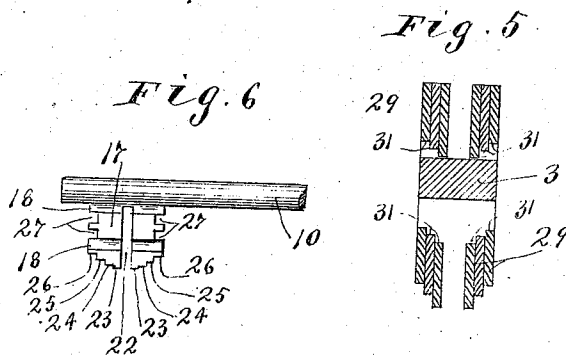
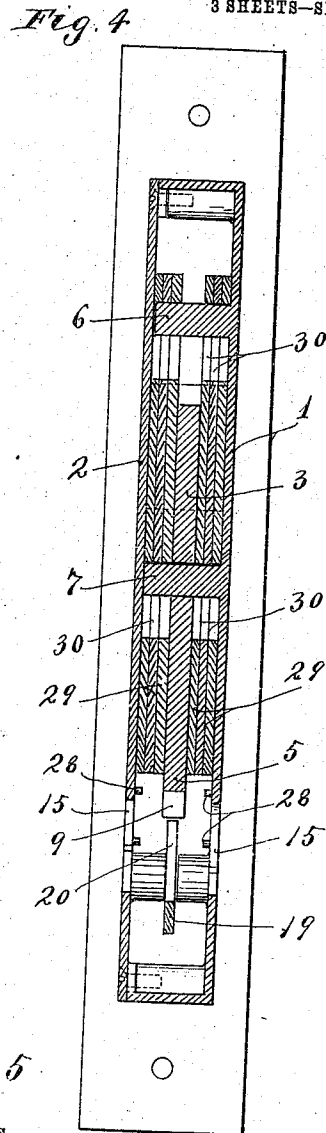
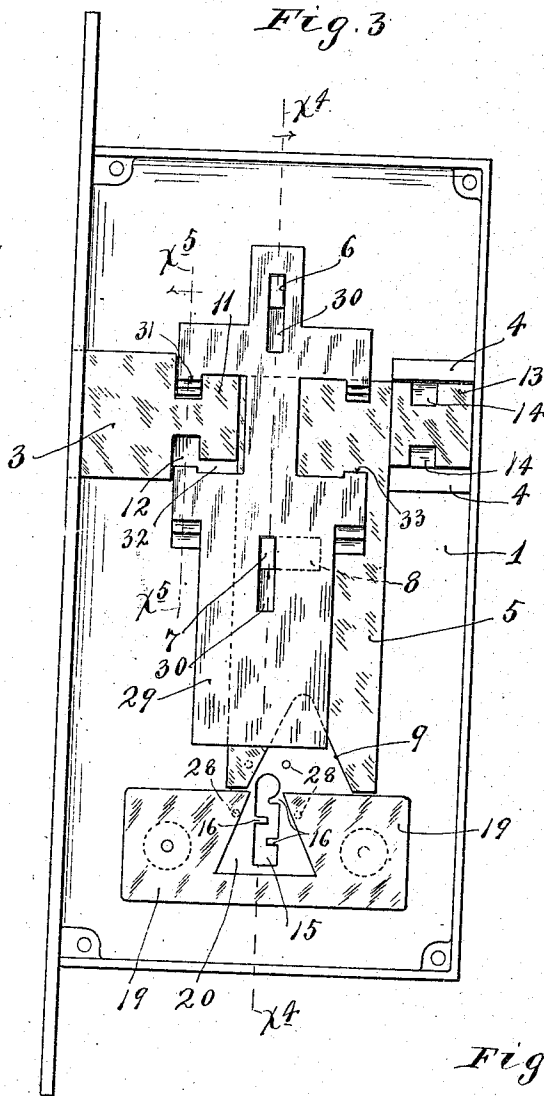
3 SHEETS-SHEET 1.



966,594.

Patented Aug. 9, 1910.

3 SHEETS—SHEET 2.



Witnesses.
A. H. Opsahl.
L. L. Simpson.

Inventor
Edward Pofert
By his Attorneys
Williamson Merchant

966,594.

E. POFERL.
DOOR LOCK,
APPLICATION FILED JULY 6, 1909.

Patented Aug. 9, 1910.
3 SHEETS—SHEET 3.

Fig. 7

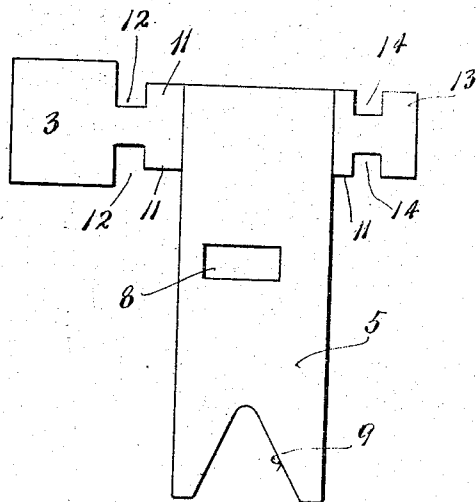


Fig. 8

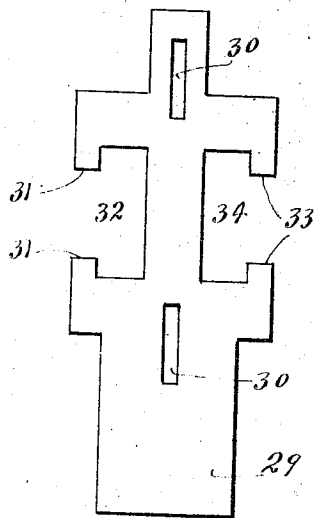


Fig. 9

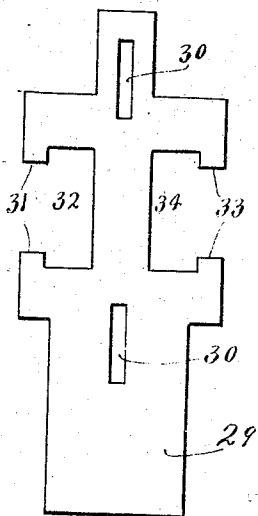
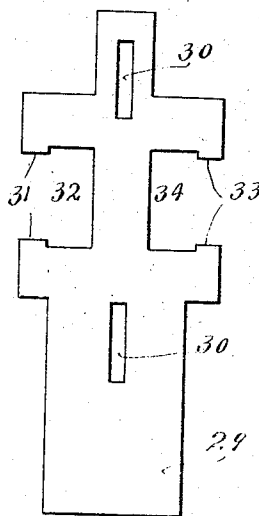


Fig. 10



Witnesses.
A. H. Opsahl.
L. L. Simpson.

Inventor
Edward Pofersl
By his Attorneys
Williamson Merchand

UNITED STATES PATENT OFFICE.

EDWARD POFERL, OF ST. PAUL, MINNESOTA.

DOOR-LOCK.

966,594.

Specification of Letters Patent.

Patented Aug. 9, 1910.

Application filed July 6, 1909. Serial No. 505,970.

To all whom it may concern:

Be it known that I, EDWARD POFERL, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Door-Locks; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its object to provide an improved lock, especially adapted for use as a door lock, and to this end, it consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

In the accompanying drawings which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings: Figure 1 is a view in side elevation with some parts broken away, showing the improved lock with the bolt thereof projecting into a locking position; Fig. 2 is a horizontal section taken on a line $x^2 x^2$ of Fig. 1; Fig. 3 is a side elevation of the lock with one side of the case removed and with the lock bolt in its retracted or inoperative position; Fig. 4 is a vertical section taken on a line $x^4 x^4$ of Fig. 3; Fig. 5 is a vertical section taken on a line $x^5 x^5$ of Fig. 3, some parts being removed; Fig. 6 is a plan view of the key; Fig. 7 is a detail in side elevation showing the lock bolt removed from the lock; and Figs. 8, 9 and 10 are detail views in side elevation showing several of the so-called tumblers of the lock.

The lock case 1 is of rectangular form and is provided with a detachable side plate 2, shown as secured thereto by screws. The lock bolt 3 is mounted to slide horizontally through the front edge plate of the case and between guide flanges 4 located within the lock case near the inner edge thereof. This lock bolt 3 is provided with a depending leg 5, preferably formed integral therewith. This leg 5 is preferably flat and located centrally in respect to the body of the bolt 3, and as shown, is approximately one-third as thick as the said bolt, this feature being best shown in Fig. 2.

On the back plate of the case 1 is a pair of rotary projecting guide lugs 6 and 7, located respectively above and below the body of the bolt 3. The depending leg 5 of the bolt

is formed with a horizontal elongated perforation 8, through which the lower guide lug 7 projects. In its lower edge, the leg 5 is formed with a large approximately V-shaped notch 9, that affords a cam surface to be engaged by the blade of the key 10. The construction of this key will be more fully considered later on. Just forward of the upper portion of the leg 5, the lock bolt 3 is formed with upper and lower lock shoulders 11 and lock notches 12, and just rearward of the upper portion of the said leg 5, said bolt is formed by the upper and lower lock shoulders 13 and upper and lower lock notches 14. The lock shoulders 11 and 13, and notches 12 and 14 are the full width of the body of the bolt 3.

Both side plates of the case 1 are formed with key holes 15 of special form, being as shown, provided with inwardly projecting lugs 16, three in number. To adapt the key for insertion into the lock from either side thereof, as required for an outside door, the key blade 17 is formed with grooves 18 that are adapted to clear the said lugs 16.

Rigidly secured with the lock case, centrally below the leg 5 of the lock bolt 3, is an obstruction plate 19, having a central notch 20 adapting the key blade to be inserted in the lock case through the key holes 15. When this plate 19 is employed, the key blade 17 is necessarily provided with a small slit 22, which adapts said blade to clear said plate 19 when the key is rotated within the lock. Immediately on each side of this slit 22, the lock bolt is provided with projecting cam lugs 23, both of which are adapted to engage with the diverging cam surfaces of the notch 9 of the leg 5. On each side of the cam lugs 23, the key blade 17, in its outer edge, is provided with cam surfaces 24, 25 and 26, and in its upper and lower edges, said blade is provided with clearance notches 27. The clearance notches 27 are adapted to clear obstruction in the pins or studs 28 secured in the two side plates of the lock case projecting slightly inward, as best shown in Figs. 4 and 5. The cam surfaces 24, 25 and 26 are adapted for action upon lock tumblers preferably in the form of vertical movable slides, the construction of which will now be considered.

The so-called lock tumblers 29 are preferably stamped from thin sheet metal and made perfectly flat, although they may of course, be otherwise constructed. They are

guided for vertical movements by the guide lugs 6 and 7 above noted and are provided for that purpose with vertically elongated slots 30, through which the said guide lugs are passed. Any desired number of these tumblers 29 may be employed, but as illustrated in the drawings, there are six thereof, located three on each side of the depending lock portion 5 of the lock bolt. Also with the key provided with the cam surfaces 24, 25 and 26 in step relation, all located at varying distances from the axis of the key stem, the lower ends of these tumblers 29 are preferably arranged to stand coincident or in horizontal line when the said tumblers are in their normal lowermost positions. Each tumbler, on its left hand side, is provided with upper and lower lock lugs 31, and a clearance passage 32, and on its right hand side, each tumbler is provided with upper and lower lock lugs 33, and a clearance passage 34. In all of the tumblers 29, the distance between lock lugs 31—31 and 33—33 is but very slightly greater than the vertical distance between the upper and lower surfaces of the lock shoulders 11—11 and 13—13, being in fact, only sufficiently greater to permit sliding movements of the bolt 3 when all of the said tumblers are positioned with the said cooperating surfaces horizontally aligned.

When the lock bolt is in its projected position, as shown in Fig. 1, it is independently locked in that position by the upper lock lugs 33, of all of the tumblers. The said bolt can be moved inward only when all of the said tumblers are given the required different movements necessary to carry all of their lugs 33 entirely out of the lock notches or detents 14. If any one of the tumblers be given less than the required upward movement, its upper lug 33 will remain in the upper lock notch 14 and if any one of the said tumblers be given slightly too great upward movement, its lower lock lug 33 will be engaged with the lower notch 14, and in either instance, the bolt will remain locked in its projecting position. When, however, the said tumblers are all properly moved so as to remove both their upper and lower lock lugs 33 from the notches 14, and the key is then inserted and its blade rotated against the cam surface 9 of the bolt leg 5, the said bolt will be moved inward into its retracted or inoperative position, shown in Fig. 3. The cam surfaces 24, 25 and 26, of the key blade 17, as already indicated, are so relatively located that they will impart the required differential vertical movements to the tumblers 29 required to release lock bolt 3, as above just stated, and they will effect this release of the lock bolt just before the key blade 17 is engaged with the said rear cam surface 9. When the lock bolt is in its retracted or innermost position,

as shown in Fig. 3, and is locked in such position by the upper lock lugs 31 of all of the tumblers 29 and when the key is inserted and turned against the front cam surface 9 of the bolt leg 5, the cam surfaces 24, 25 and 26, acting on the lower ends of the tumblers 29 will impart to the latter differential movements required to throw all of the upper lock lugs 31 out of the cooperating upper lock notches 12 without engaging the lower lock lug 31 of any tumbler with the lower lock notch 12, this action, as is evident, being similar to that above described, which takes place in moving the lock bolt from its projecting into its retracted position. The above described action, of course, requires the proper relation of the cam surfaces 24, 25 and 26 in respect to the length of the lock lugs 31 and 33 of the several tumblers. To illustrate: if we assumed the lock lugs of the tumbler shown in Figs. 10, 9 and 8, to be respectively one-sixteenth of an inch, two-sixteenths of an inch and three-sixteenths of an inch long in a vertical direction, then the cam surfaces 26 should be arranged to impart one-sixteenth of an inch vertical movement to the outermost tumbler, (one of which is shown in Fig. 10), the cam surfaces 25 should be arranged to impart two-sixteenths of an inch vertical movement to the next outer tumblers (one of which is shown in Fig. 9), and the cam surfaces 24 should be arranged to impart three-sixteenths of an inch vertical movement to the inner tumblers (one of which is shown in Fig. 8). It will thus be seen that the tumblers, when moved to predetermined intermediate positions, release the lock bolt, but when moved in either direction from such intermediate releasing positions, lock the bolt in one or the other of its extreme positions. Inasmuch as different movements are required to set the different tumblers in their releasing position and as either too much or too little movement of any one of the tumblers will hold the bolt locked, it is practically impossible, either by taking wax impressions or otherwise to determine the form of key required to release or operate the lock. As is evident, the number of the so-called lock tumblers may be either increased or decreased, at will, and in some instances, tumblers having lock lugs only above or only below a lock bolt, instead of both above and below, as shown in the drawings, may be employed.

In the drawings, the lock bolts on opposite sides of the bolt leg 5 are in bi-symmetrical arrangement, so that the lock may be operated by a key inserted from either side of the lock. This adapts the lock for use on outside doors. Where the lock is to be used in a place where the key is always inserted in the same side of the lock, the tumblers on opposite sides of the leg 5, where the said

leg is employed, or otherwise stated, all of the tumblers employed in the lock may be arranged for different amounts of movement, and this, as is evident, will double the number of tumblers and, hence, very greatly increase the number of possible combinations.

In the drawings, the tumblers 29 terminate at their lower ends in a horizontal line with each other, and the different movements imparted to the several tumblers is due entirely to the variation in positions of the tumbler lifting surfaces 24, 25 and 26, but, however, the tumbler lifting surfaces of the key might be on the same line and the different movements of the tumblers regulated by the different normal positions of the key engaging portions of the tumblers; or, to complicate the matter, the different movements of the tumblers might be due in part to the different positions of the tumbling engaging surfaces on the key and in part to the different positions or relations of the key engaging surfaces of the said tumblers.

What I claim is:

1. In a lock, the combination with a lock bolt having a depending leg in which a key is engageable to move said bolt, said bolt having upper and lower front and rear lock notches, of a multiplicity of key-actuated differentially movable sliding tumblers hav-

ing upper and lower front and rear lock lugs cooperating with the notches of said bolt to lock the same but serving to release said bolt when the proper predetermined differential movements are imparted to said tumblers by the key, substantially as described.

2. In a lock, the combination with a sliding lock bolt having an intermediately located depending leg narrower than the body of said bolt and with which the lock key is engageable to move said bolt, said bolt having upper and lower front and rear lock notches, of a multiplicity of differentially movable sliding tumblers in bi-symmetrical arrangement on opposite sides of said leg, whereby said tumblers may be operated by a key inserted in either side of the lock, said tumblers having upper and lower front and rear lock lugs cooperating with the lock notches of said bolt to lock said bolt, but serving to release said bolt when and only predetermined differential movements are imparted to said tumblers by the key, substantially as described.

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

EDWARD POFERL.

Witnesses:

ALICE V. SWANSON,
HARRY D. KILGORE.