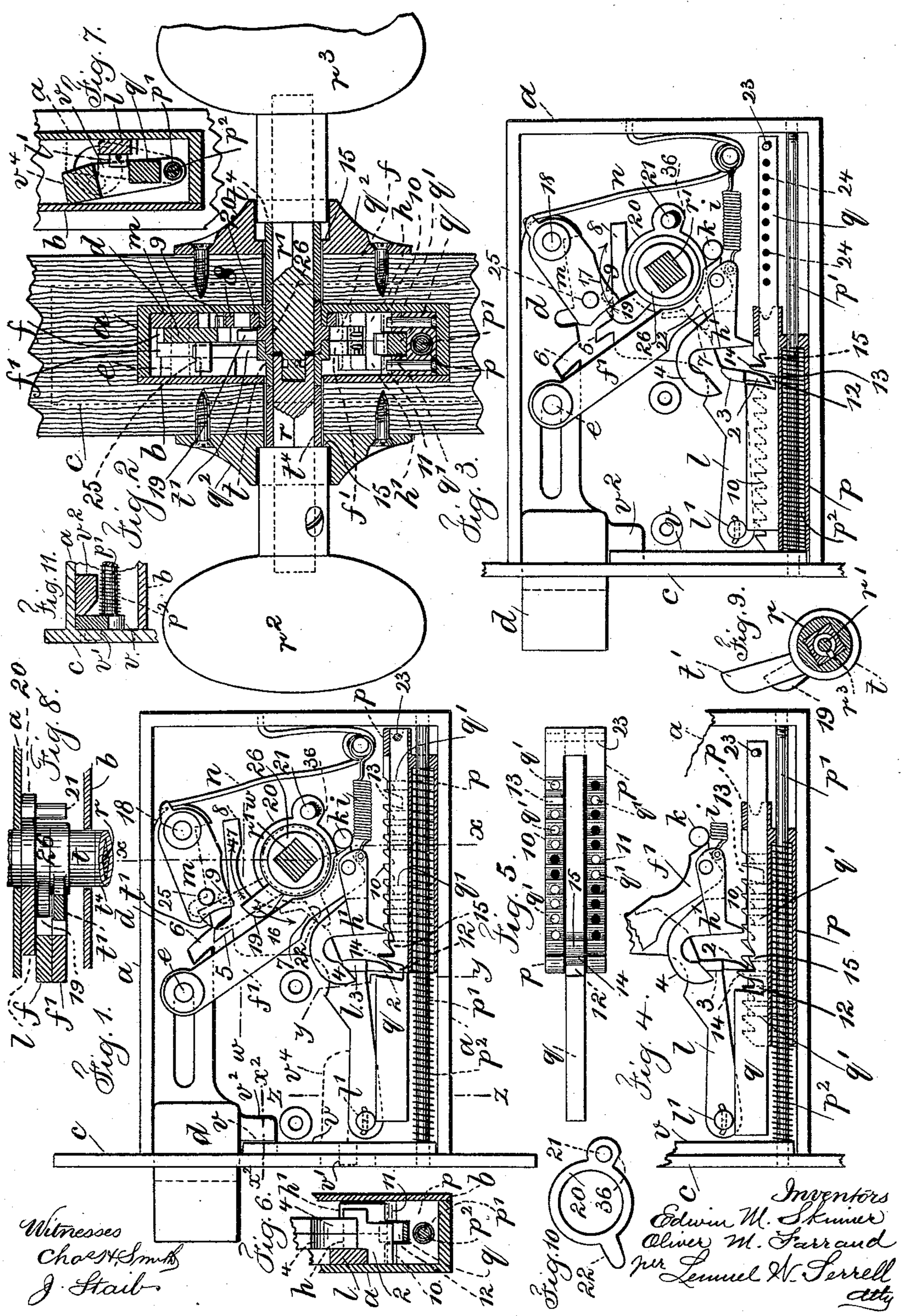
(No Model.)

E. M. SKINNER & O. M. FARRAND.

COMBINATION LOCK.

No. 495,276. Patented Apr. 11, 1893.



Witnesses
Chas. H. Smith
J. Stair.

Inventors
Edwin M. Skinner
Oliver M. Farrand
per Lemuel W. Serrell
Atty

UNITED STATES PATENT OFFICE.

EDWIN M. SKINNER, OF SOUTH BEND, INDIANA, AND OLIVER M. FARRAND, OF NEW YORK, N. Y.

COMBINATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 495,276, dated April 11, 1893.

Application filed August 16, 1892. Serial No. 443,255. (No model.)

To all whom it may concern:

Be it known that we, EDWIN M. SKINNER, of South Bend, in the county of St. Joseph and State of Indiana, and OLIVER M. FARRAND, of the city, county, and State of New York, have invented new and useful Improvements in Combination-Locks, of which the following is a specification.

Our invention relates to a permutation or combination lock, especially adapted to doors of buildings, but it may be used upon safes.

In our lock the knob spindle is fitted to be moved longitudinally of its axis as well as to be turned, and said spindle carries an arm that acts upon the devices of the lock and the lock is unlocked by moving said spindle longitudinally of its axis first in one direction and then in the other, and partially turning said spindle the proper number of times after each longitudinal movement of said spindle, all as hereinafter fully described.

In the drawings Figure 1 is an elevation of the lock with the cap plate removed and with the knob-spindle and permutation toothed bar in section. Fig. 2 is a transverse section of the lock at the line *x x* of Fig. 1, a portion of the door being shown in section. Fig. 3 is a view similar to Fig. 1 but with the parts in the position they assume when the knob-spindle has been operated correctly. Fig. 4 is an elevation of a portion of the lock, showing the position of the safety bar with respect to the permutation bar when the knob-spindle has not been operated correctly. Fig. 5 is a plan of the permutation bar and safety bar detached. Figs. 6, 7 and 8 are sections at the lines *y y*, *z z* and *w w* respectively of Fig. 1. Fig. 9 is a cross section of the knob spindle, and Fig. 10 is an elevation of the ring for actuating the lifter plate, and Fig. 11 is a section at x^2 x^2, Fig. 1 with the bolt in position for operating as a latch.

a is the lock-case, *b* the cap-plate, and *c* the front plate of usual character.

d is the latch-bolt guided by the lock case and by the stud *e* in a slot in said latch-bolt.

f f' are arms forming pawl carriers, having the stud *e* for their pivot, and to the lower ends of said pawl carriers are pivoted the pawls *h h'* respectively. The pawls *h h'* are provided with springs *i* that tend to keep the toothed ends of the pawls in contact with the teeth of the permutation bar and also to draw back said pawls and carriers *f f'*.

k is a stop to limit the backward movement of the pawl carriers and pawls.

l is a lifter plate pivoted at *l'* and said plate has a downwardly projecting tooth 2, a projection 3 for the fingers 4, 4 of the pawls *h h'* to rest upon, a projection at 5, to enter a notch at 6 in the latch bolt *d*, an incline at 7 and an arm at 8 upon which latter bears the stud 9 of a dog *m*, pivoted at 18 to the latch bolt *d*.

n is a spring that acts upon said dog *m* to keep the stud 9 in contact with the arm 8, and said spring also acts to throw the latch bolt forward.

p is the permutation bar guided by the lock case and rod *p'* and retracted by the spring p^2, and said bar has two rows of teeth, one row 10 being for the pawl *h*, and the other row 11 for the pawl *h'*: the teeth in said bar are inclined, and in the row 10 there is a deep notch at 13. The permutation bar *p* is recessed between the two rows of teeth 10 and 11 for the safety bar *q* which has a deep notch at 12, and teeth 14 and 15, and there is a cross pin at 23 in said safety bar. There are holes in the permutation bar in the rows of teeth 10 and 11 as shown most clearly in Fig. 5, and into some of these holes pins *q'* are to be placed and the location of these pins determines the combination of the lock. The holes in the permutation bar for the pins *q'* preferably extend entirely through the said bar and are countersunk at the under side of said bar for the heads upon said pins, hence as the said bar rests upon the rim of the lock said pins cannot become displaced.

The combination in Fig. 5 is 4— 2— 3— 1— 1—, there being four pins in the row 10, then two in the row 11, then three in the row 10, then one in the row 11, and finally one in the row 10. The top surfaces of the pins *q'* are below the top of the teeth 10 and 11, for a purpose hereinafter explained. The knob spindle is made in two parts *r r'*, so that one can be turned independently of the other, and the knob r^2 is upon the inside of the door and the knob r^3 is upon the outside of the door. The spindle *r r'* can be moved longitudinally of its axis, and the amount of movement is

determined by the inner end of the shank of either knob coming against the portion 15 of the socket of the rose q^2, in which the shank moves and turns. Upon the portion r' of the knob spindle, there is a collar 26, having an arm 19, and in one position of the knob spindle said arm 19 is in the same plane as the pawl carrier f, as in Fig. 2, and when the spindle is moved to the left, said arm will be in the same plane as the pawl carrier f'.

The operation of the lock thus far described is as follows: Starting with the parts in the locked position shown in Figs. 1, 2, 5, 6, 7 and 8, when the spindle r' is turned in the direction of the arrow 16, Fig. 1, the arm 19 comes against the pawl carrier f and moves the same and the pawl h, and the latter taking into the row of teeth 10 moves the permutation bar p forward one tooth; the pressure of the hand upon the knob spindle must now be released when the spring i returns the pawl carrier f and pawl h to its first position. In order to open the lock upon the combination 4— 2— 3— 1— 1— before referred to, three successive partial turnings and releasings must be given to the spindle r', by which the pawl h will have moved forward the permutation bar three teeth or four in all. The knob spindle $r\ r'$ is now moved to the left, Fig. 2, so as to bring the arm 19 in the plane of the pawl carrier f', and by two successive turns and releasings of the spindle r' the permutation bar p is moved forward two teeth by the pawl h'. The spindle $r\ r'$ is now moved back to the position of Fig. 2 so as to bring the arm 19 in the path of the pawl carrier f, and then by three successive turns and releasings of the spindle r' the permutation bar p is moved forward three teeth by the pawl h; in like manner the spindle $r\ r'$ is moved to the left and then to the right, but only one turn and releasing is given to the spindle each time, so that the permutation bar will be moved forward one tooth by the pawl h' and one by the pawl h, and the parts will then be in the position shown in Fig. 3, in which the deep notch 13 of the permutation bar p will be in line with the deep notch 12, of the safety bar q, with the tooth 2 of the lifter l in said notches, and with the dog m in the path of the arm 19, so that by turning said arm by the spindle r' in the direction of the arrow 17, Fig. 3, the arm 19 will act against said dog m and move said dog and the latch bolt d back and unlock the door. It is to be understood that in unlocking the lock as aforesaid, the portion r' of the spindle is operated by turning the knob r^3 which latter is outside the door. In order to return the parts from the position of Fig. 3 to that of Fig. 1, the knob spindle must be moved to the left Fig. 2, so that the arm 19 is beyond the dog m; then the knob spindle and arm 19 must be turned in the direction of the arrow 17 until the arm 19 comes in contact with the pin 21 upon a ring 20 that is loose on a circular flange on the lock case, and the further movement must be continued until the stop portion 36 of the ring 20 strikes the stud k. Upon the ring 20 is a finger 22, and as said ring is turned the finger acts upon the incline 7 of the lifter plate l and lifts said plate so that the tooth 2 is out of the notches 13 and 12 of the permutation and safety bar, and by the projection 3 acting upon the fingers 4 of the pawls $h\ h'$ lifts said pawls so that the spring p^2 returns the permutation bar p to the position shown in Fig. 1.

We will now explain the use of the safety bar q. The top surfaces of the pins q' of the permutation bar p are sufficiently below the top of the teeth of said bar so that the pawls $h\ h'$ can act upon said teeth to move said permutation bar, and the surface of the tooth 15 of the safety bar is slightly below the tops of the pins q', and it is to be understood that the toothed ends of the pawls $h\ h'$ are sufficiently wide so that a portion of the toothed end of each pawl is over the safety bar, as shown in Figs. 2 and 6; hence when the pawl h or h' rests upon a pin q', said pawl cannot strike said tooth 15 when the pawl is moved forward, but if the person operating the lock should turn the spindle r' when the pawl h or h' is between two teeth of the permutation bar p, where there is no pin, the pawl would then drop into the recess in the safety bar in front of the tooth 15, and as said pawl is moved forward it will move the safety bar as well as the permutation bar forward one tooth, and in so doing the tooth 2 upon the lifter plate l will be lifted out of the deep notch at 12, and over and behind the tooth 14 of said safety bar to the position shown in Fig. 4, hence the further turning of the spindle will merely move the permutation bar p forward, and if the permutation bar should be stopped with the notch 13 of said bar in line with the tooth 2 of the lifter plate l, said plate cannot drop because it will be held up by the tooth 2 resting upon the safety bar q. We provide a pin at 23 in the safety bar q, which is acted upon by the rear end of the permutation bar when the latter is retracted and insures the safety bar being moved to the correct position when the parts are returned from the position of Fig. 4 to that of Fig. 1, by simply turning the ring 20 by the arm 19, so as to lift the plate l and pawls as before described.

In Fig. 3 we have shown holes at 24 in the safety bar q; by placing the pin 23 in the first hole nearest the tooth 15, the permutation bar p will only have to be moved one tooth to bring the notch 13 of the permutation bar in line with the notch 12 of the safety bar to open the lock; if in the second hole, two teeth, and so on, thereby the number of times that the knob spindle will have to be moved to open the lock can be varied to suit the person using the lock.

As before mentioned, the knob spindle is made in two parts $r\ r'$, so that either part may be turned independently of the other, there being a cylindrical portion on r' entering a correspondingly shaped recess in r, the two

parts being connected together by a pin r^3 in r that passes into a groove in the cylindrical portion of r', see Fig. 9. The object of making the knob spindle in two parts is, that the lock may be unlocked from inside the door by simply turning the knob upon the inside of the door. Upon the spindle r there is a sleeve or collar t that turns with r, and upon said collar t is an arm t' shown by dotted lines in Fig. 1, and full lines in Figs. 2, 8 and 9, and on the dog m is a stud 25, hence when the spindle r is turned in the direction of the arrow 47, Fig. 1, the arm t' comes against the stud 25, and the dog m, and latch bolt are retracted so that the door may be opened. The collars 26 and t are kept from moving upon the spindle r r' by means of the cylindrical sleeves t^4 t^4 that are in turn kept in place by the shanks of the knobs r^2 r^3.

In order to prevent the lock being operated from outside the door, we provide an arm v that has the rod p' for its pivot, and, said arm has a pin v' projecting through a hole in the front plate c of the lock, see dotted lines Figs. 1, 7 and 11. It is preferable to have the lug v^2 beveled as shown in Fig. 11 so that the latch bolt may be moved back by the arm v when said arm is moved. Said arm v is to be moved by the finger applied to the pin v' when the door is open, and when said arm is moved it comes between the front plate c and the lug v^2 of the bolt d as shown in Fig. 11. In this position of the bolt, if the lock is in the locked position of Fig. 1, the lock cannot be operated from the outside because the projection 5 of the plate l will then be against the under side of the bolt d, and the plate l cannot be moved if the arm 19 is brought against f or f' in the effort to turn the knob spindle, it being understood that when the parts are in the locked position as in Fig. 1 if the spindle is turned and the permutation bar p moved forward the lifter plate l is lifted successively by the teeth of the bar p, acting upon the tooth 2 of said lifter plate l, and each time that said plate l is raised the projection 5 passes into the notch 6 in the latch bolt, hence when said latch bolt is held back by the arm v, the notch 6 is no longer in line with the projection 5, and said lifter plate l cannot be moved nor the lock operated from outside the door as before explained. The arm v instead of passing between the lug v^2 and front plate c, might have a finger v^4 projecting from the same as shown by dotted lines in Fig. 1 and full lines in Fig. 7, so that when said arm v is moved into the position shown by dotted lines in Fig. 7, said finger v^4 will be over the lifter plate l and prevent said plate being lifted and the door being unlocked from the outside. The spring p^2 that retracts the permutation bar p also acts against the arm v, and presses said arm tightly against the front plate c and holds said arm in the position to which it may be moved.

When the lock is to be used as a latch, the parts are brought to the unlocked position Fig. 3, as before described, then by moving the arm v so that it comes between the front plate c of the lock case and the lug v^2 of the latch bolt, the latch bolt can be retracted from either side of the door by simply turning either knob r^2 or r^3 which knob by its spindle r or r' will, by the arm 19 or t' act upon the dog m and move the latch bolt.

With the parts in the unlocked position and operating as a latch as just described, the parts cannot be returned to the position of Fig. 1 as long as the arm v is between the lug v^2 and the front plate c, because if the spindle r' is turned and the lifter plate l raised by the arm 19 and ring 20, said plate will not be raised sufficiently high to lift the tooth 2 out of the notches 12 and 13 of the safety and permutation bars, because the projection 5 of said lifter plate will come in contact with the under side of the latch bolt d and stop said lifter plate in its upward movement.

Our lock may be used upon either the right or left hand edge of the door without taking out and changing or reversing the latch bolt, as our lock merely requires to be placed so as to have the incline of the latch bolt face in the proper direction, as said lock works equally well whether the lock is placed so that the bolt is at the top or at the bottom of the lock.

It will be evident that the portion r of the lock spindle might be dispensed with and the lock operated only by the spindle r', the spindle being fitted with a suitable collar or projection so that said spindle cannot be drawn out of the lock. In this form the lock is adapted to safes, and when so used, the projection 5 of the lifter-plate should be made sufficiently long so as to be always in the notch 6 of the bolt when the lock is locked and thereby prevent the bolt being forced back by any instrument inserted between the door of the safe and its frame.

We claim as our invention—

1. The combination in a lock with a knob-spindle fitted to move longitudinally of its axis and having an arm for actuating the lock, of the pawl carriers and pawls, a toothed permutation bar for the pawls to take against, and having holes between the teeth, pins arranged in said holes to form the combination of the lock, a safety bar having a notch and teeth and a lifter plate having a tooth to enter a notch in the permutation bar and safety bar, substantially as specified.

2. The combination in a lock with a knob spindle fitted to move longitudinally of its axis, and having an arm for actuating the lock, of a toothed permutation bar having holes between the teeth, pins arranged in said holes to form the combination of the lock, a spring to retract the toothed bar, a safety bar having a notch and teeth and mechanism substantially as set forth between the knob spindle and toothed bar for operating the latter, substantially as set forth.

3. The combination in a lock with a lock spindle fitted to move longitudinally of its axis, and having an arm for operating the lock, of the permutation bar having two rows of teeth with holes between the teeth, pins arranged in the holes to form the combination of the lock, a safety bar fitted to slide between the two rows of teeth of the permutation bar, and springs for the permutation bar and pawl carriers and pawls, each pawl having a toothed end that is over its row of teeth of the permutation bar and over part of the safety bar, substantially as and for the purposes specified.

4. The combination in a lock with a knob spindle fitted to move longitudinally of its axis, an arm on said lock spindle for operating the lock, of the permutation bar having a deep notch at 13, and holes between the teeth of said bar, pins arranged in said holes to form the combination of the lock, the safety bar having a deep notch at 12, and teeth 14 and 15, and the lifter plate having a tooth 2, and the pawl carrier and pawls for actuating said permutation bar and safety bar, substantially as specified.

5. The combination in a lock with a knob spindle fitted to move longitudinally of its axis and an arm on said spindle for actuating the lock, of the permutation bar having a deep notch and holes between the teeth, pins arranged in said holes to form the combination of the lock, the safety bar having a deep notch and teeth, the pawl carriers and pawls and the lifter plate having a tooth at 2, and a projection 3 for the pawls to rest upon, substantially as specified.

6. The combination in a lock with a knob spindle fitted to slide longitudinally of its axis, and an arm on said lock spindle for operating the lock, of the pawl carrier and pawls, springs for said pawls, the permutation bar and safety bar, a spring to retract the permutation bar, the lifter plate, the latch bolt and its dog, and the loose ring 20 having a finger to take against the lifter plate, substantially as and for the purposes specified.

7. The combination in a lock with a lock spindle fitted to move longitudinally of its axis, an arm secured to said spindle, the permutation bar and safety bar, the pawl carrier and pawls, and the notched latch bolt having a lug v^2, of the lifter plate having a tooth at 5, and a pivoted arm v fitted to pass between the lug v^2, and the case to prevent the lifter plate being raised, substantially as and for the purposes set forth.

8. The combination in a lock with a knob spindle fitted to move longitudinally of its axis, of a toothed permutation bar having holes between the teeth and pins in said holes to form the combination of the lock, and mechanism, substantially as set forth for actuating said permutation bar, substantially as specified.

9. The combination with the latch bolt of a two part spindle and separate knobs capable of being turned independently, the collar and arm on one part of the spindle by which the latch can be withdrawn by one knob at any time, and the collar and arm on the other part of the spindle and two sets of appliances intervening between the spindle and the bolt that are acted upon alternately after an end movement is given to the spindle substantially as specified.

10. The combination in a lock with the knob spindle and its arm for operating the lock of the safety bar and permutation bar, said safety bar having holes therein, and a pin in one of said holes for the permutation bar to take against when said retracted bar is retracted, and mechanism substantially as specified for operating said permutation bar, as set forth.

11. The combination in a lock with a knob spindle fitted to move longitudinally of its axis, an arm upon said spindle for operating the lock, and the bolt having a notch at 6 and the dog m upon said latch bolt, of the pawl carriers and pawls, the permutation and safety bars and the lifter plate having a projection to enter the notch in the bolt, substantially as and for the purposes specified.

Signed by us this 15th day of August, 1892.

EDWIN M. SKINNER.
OLIVER M. FARRAND.

Witnesses:
GEO. T. PINCKNEY,
ALICE M. OLIVER.