

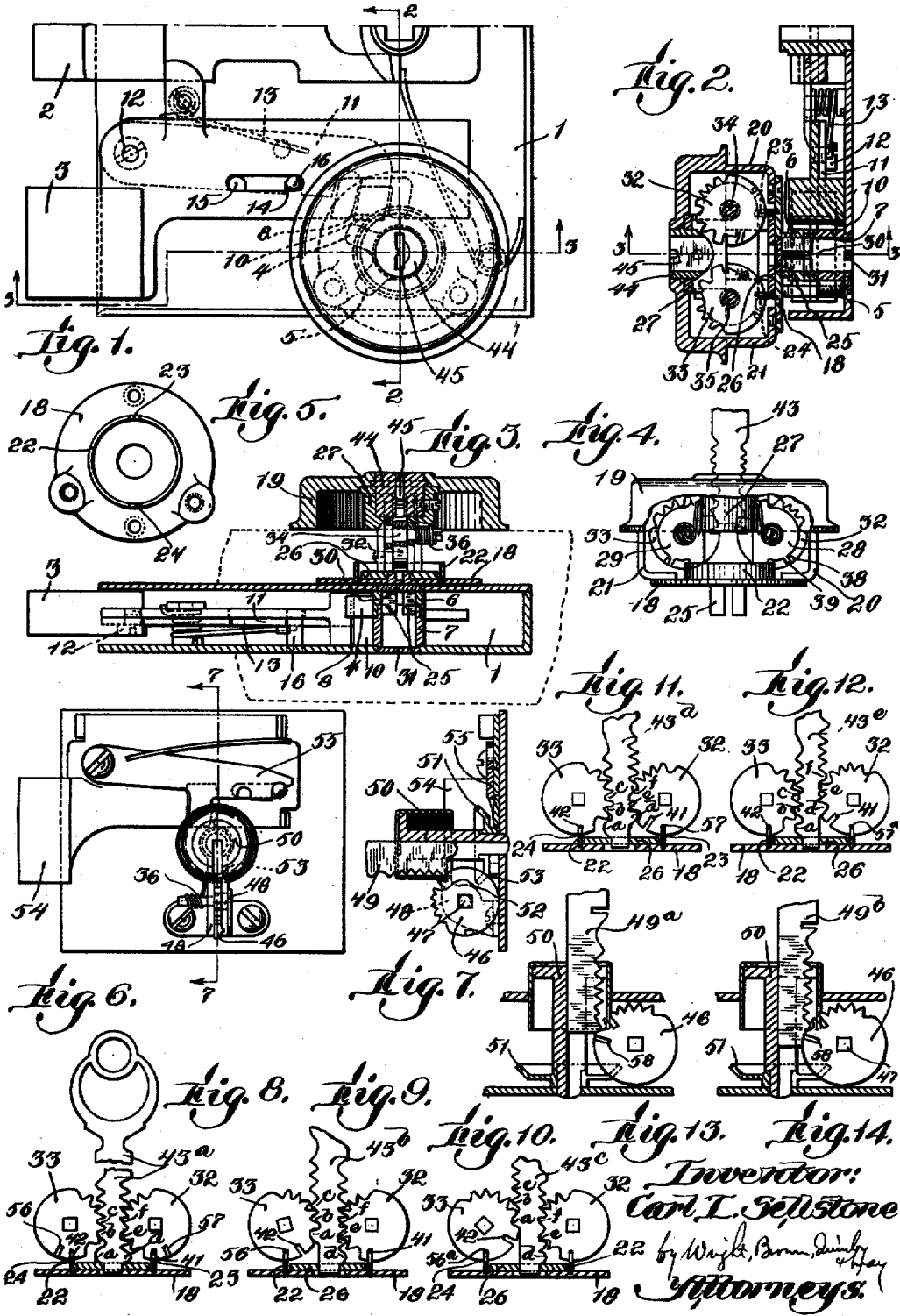
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LOCK AND KEY.

APPLICATION FILED JAN. 29, 1919.

1,317,828.

Patented Oct. 7, 1919.



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UNITED STATES PATENT OFFICE.

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Specification of Letters Patent.

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Application filed January 29, 1919. Serial No. 273,718.

To all whom it may concern:

Be it known that I, CARL I. SELLSTONE, a citizen of the United States, residing at Bridgewater, in the county of Plymouth and State of Massachusetts, have invented new and useful Improvements in Locks and Keys, of which the following is a specification.

This invention relates to locks or safety latches for doors and the like. It has for its object to provide an exceptionally secure and at the same time simple means for guarding against operation of the lock by any means other than the specific key designed for the specific lock, or by the master key designed to open the series of locks of which the particular lock may be a unit. A further object, which is a corollary to that above set forth, is to provide means by which a very great and almost unlimited number of different locks and keys may be made. Still another object is to devise a form of lock and key according to a system by which locks may be made in sets or series, each lock of each series operable by a specific individual key, and yet all locks of any one of said series operable by a master key adapted to operate all locks of that series but no lock of any other series, and it being possible not only to have a very great number of locks operable as above in any one series, but also an almost indefinite number of series, and yet have the several series and the individual locks therein so varied and different that any individual lock cannot be operated except by a key adapted to it and the master key adapted to the particular series of which the lock may form a unit.

The invention is applicable to substantially all forms and varieties of lock, for whatever specific purpose required, which contain a bolt or latch adapted to be projected and retracted by manipulation of the key or to be projected by a spring and retracted by a key. The precise nature of the invention may be best understood by reference to specific examples of locks made according to the invention and described in the following specification with reference to the drawings.

In the drawings, Figure 1 is an elevation of the principal parts of a door lock having my invention applied thereto. Fig. 2 is a cross section on the line 2—2 of Fig. 1. Fig. 3

is a cross section on the line 3—3 of Fig. 1. Fig. 4 is an elevation with parts broken away to show the interior of that part of the lock in which the novel principles of the present invention are particularly embodied. Fig. 5 is a plan view of the base of the lock. Fig. 6 is an elevation showing a modified form of lock embodied in the invention. Fig. 7 is a cross section on line 7—7 of Fig. 6. Figs. 8, 9, 10, 11 and 12 are fragmentary views showing the application of that principle of my invention which involves a master key to the form of lock illustrated in Figs. 1 to 5. Figs. 13 and 14 are views illustrating the master key principle applied to the form of lock shown in Figs. 6 and 7.

Like reference characters designate the same parts wherever they occur in all the views.

Referring first to Figs. 1, 2 and 3, 1 represents a casing similar to those used in common door locks adapted to be set into a chamber in the edge of the door, and containing a latch bolt 2 which is retracted by turning the knob and a locking bolt 3 under the control of the key. The locking bolt is retracted and projected by either one of two cams 4 and 5 which are carried by tubes 6 and 7 respectively, mounted in axial alignment within the casing 1, as shown in Fig. 3. When either of these tubes is rotated the cam carried by it is turned, and in so turning it passes into a notch 8 in the shank of the bolt and, by pressing against one wall or the other of this notch either projects or retracts the bolt according to the direction in which it is turned. 10 represents the locking tumbler or dog which crosses the entrance to the notch 8 and is carried by an arm 11 pivoted on a stud 12, which is carried by the shank of the bolt and pressed upon by a spring 13. The arm 11 has on its underside two notches 14 and 15, one of which engages a pin 16 when the bolt is projected, and the other of which embraces the same pin when the bolt is retracted, thus holding the bolt in either of these positions so that it cannot be moved by any other means than the operating cam 4 or 5. When either of these dogs is operated, however, it raises the locking tumbler 10 when entering notch 8, and so lifts arm 11 far enough to disengage that one of the notches 14 or 15 which previously embraced the fixed pin 16, thereby allowing the bolt to be moved; and when the

propelling cam has moved the bolt to the limit of movement, the holding tumbler drops and secures the bolt.

Two operating cams 4 and 5 are provided each on a separate and independently rotatable tube in order that the bolt may be actuated by either of the two key mechanisms mounted on opposite sides of the door. One of these mechanism is shown in the drawings at one side of the lock casing, and the other is adapted to be correspondingly mounted at the opposite side of this casing.

This key operating mechanism is mounted in a frame which comprises a base plate 18 and a cover plate 19, the base plate being secured upon the side of the lock casing and the cover plate being connected to the base plate by two (or more if desired) posts or arms 20, 21 shown in Figs. 2 and 4. The cover 19 is adapted to bear at its rim on the surface of the door in a manner similar to the common arrangement of door locks. On the plate 18 there is mounted and held fixedly a cylindrical rib or wall 22 which has openings 23, 24 (Fig. 2) in its upper or outer edge at diametrically opposite points. Between the base and cover plates there is mounted a rotatable frame having a rotatable support in these plates, one of the supports being a shank 25 which passes through a hole in the base plate 18, such hole being concentric with the annular rib 22, and is secured in a permanent and rigid manner to a disk 26, which is part of the rotatable frame. The other end of the same frame is comprised by a slotted shell or head 27 which occupies a recess in the inner side of the cover plate 19 and turns therein. Between this disk or plate 26 and the head 27 are two pairs of connecting webs 28, 29 at respectively opposite sides of the axis around which the frame rotates. These webs with the head 27 and plate 26 and shank 25 complete a rigid unit supported by bearings at its opposite ends. The shank 25 passes into the tube 6 and is slotted so as to embrace a cross bar 30, which is secured to the nearer end of the tube. Hence when the shank is rotated the tube 6 is also rotated to operate the lock bolt, as previously described. The tube 7 is likewise equipped with a similar cross bar 31 to engage the corresponding shank of the key mechanism at the other side of the door.

Between the wings 28 is mounted rotatably a toothed disk 32 and between the wings 29 a toothed disk 33, these disks having shafts 34 and 35 respectively which turn in the supporting wings and each of which is engaged by a spring, as 36, which tends to rotate the disks and to hold them each in an extreme position where a pin or projection 38 on the disk bears against a stop shoulder 39 on one of the flanking wings, but the springs permit these disks to be

rotated by insertion of the key. By virtue of the construction described the disks lie in the same plane but at opposite sides of the axis of rotation around which the frame carrying them turns, and their rims pass through the notches 23 and 24 respectively in the stationary rib or wall 22. When the circumference of the disk crosses this wall, the rotatable frame is secured so that it cannot be turned, and therefore the shank 25 cannot be caused to operate the lock. But these disks are adapted to be rotated by an inserted key to bring notches 41 and 42 in their rims into registry with the cylindrical rib 22, whereupon the entire carrying rib then occupying the notches 41, 42 of the disks. In order thus to rotate the disks, their edges adjacent to the notches 41 and 42 are provided with alternate teeth and spaces complementary to spaces and teeth respectively provided in the engaging edges of the key 43. These complementary teeth of the disks and key are irregular so that only a key made to fit a specific lock, excluding for the present the master key for a series of locks, will be effective to operate that lock. The irregular character of these complementary teeth and spaces is clearly indicated in Figs. 2 and 4; and it will be readily apparent that by making slight changes in the number or spacing or form of such teeth or any one of them, a great variety of different locks, each operable only by its special key, may be produced. A change of any one of these factors in only one of the disks and of the edges of the key is sufficient to differentiate one lock from another and to prevent the key adapted to one lock from operating the other lock, wherefore it will be apparent that the possible number of variations is almost unlimited.

In the head 27 there is mounted and fixed a plug 44 having a key slot 45 which may have an irregular contour in cross section complementary to a particular key body so as further to limit the character of the key which may be used, and thus safeguard the lock against being picked.

In the form of key mechanism thus described, the rib 22 may be considered as a stationary obstructor and the disks may be considered as both rotatable and transportable detents or tumblers. Of course, it is to be understood that I do not restrict the invention to the use of a pair of disks as distinguished from only one arranged adjacent to one line of teeth of the key, and that neither am I limited to a stationary obstructor and a transportable detent. Figs. 6 and 7 illustrate an arrangement where only one detent disk is employed and where the obstructor is rotatable with the key.

In the latter form the detent disk is

shown at 46 having a shaft 47 which turns in a fixed supporting web 48 mounted in any convenient way upon the casing of the lock itself. 49 is the key, and it is shown as adapted to enter a slot in a rotatable bar 50. This bar carries with it a rib or flange 51 corresponding to the obstructing device 22 and having a notch in which the rim of the detent disk 47 lies. The disk has a notch 52 complementary to the flange 51 which is adapted to be placed in registry with that flange by the inserted key, the key and detent disk having conjugate irregular teeth for rotating the disk for that purpose. When the detent disk has been thus placed, the key may be freely rotated and the obstructing flange 51 then turns with it. A dog 53 connected to the bar 50 operates the bolt 54 in substantially the same manner that the bolt 3 previously described is operated, at the same time causing release of the holding dog 55.

I will now describe the manner in which my scheme of master keys is applied to locks of the type herein described. Fig. 8 shows a master key adapted to be used with all the locks of a series in which the disks of all the individual locks have the same shape, spacing and number of irregular teeth. Variations between the master key and individual keys of the same series may be made by simply shifting the position along the key of the teeth corresponding to those on either side of the master key, or by making provisions for insertion of keys having like teeth to relatively different distances, and by providing a second notch in one or the other of the detent disks. Thereby in either case provision is made for causing the detent disk to be rotated at different degrees by the respective keys, and when either the individual key or the master key is used, the disk is brought to a stop in a position where one or the other of the notches registers properly with the arresting rib. Thus, referring to Fig. 9, the key 43^a there shown is like the master key 43^b shown in Fig. 1 in all particulars except that its teeth *a*, *b*, *c*, etc., are set a farther distance back from the end than are the corresponding teeth *a*, *b*, *c*, etc., of key 43^a, whereby when 43^a is inserted into its lock, the detent disk 32 is turned through a less angle than when the master key is inserted. But by having a second notch or slot 56 spaced apart from the slot 42 by a distance equal to the relative displacement of the teeth *a*, *b*, *c* back from the end of the individual key, the detent disk may be unlocked from the obstructing rib just as well as when it is turned far enough to bring the notch 42 into registry with that web. The key 43^c shown in Fig. 10 differs from 43^a and 43^b in that the corresponding teeth *a*, *b*, *c*, etc., are set back a still farther distance from the end of the key and the second re-

lease notch 56 is set farther from the notch 42 than in the lock shown in Fig. 9. Thus it will be seen that one master key will fit all the locks in a series having the same form and spacing of teeth and will rotate the corresponding disks in all of those series to the full extent possible, while the individual key will turn one of the disks to a less extent; but that the particular individual key designed for a particular lock will turn that one of the detent disks which has two release notches to the exact point necessary to register the second release notch with the obstructing rib, in only the lock for which it is designed, and no other.

While Figs. 9 and 10 show individual keys which differ from the master key by having the teeth *a*, *b*, *c*, etc., on one edge displaced different distances from the end, Figs. 11 and 12 show the similar effect with respect to the teeth *d*, *e*, *f*, etc., in the opposite edge, which co-act with the other detent disk 32. In this series of locks, disk 32 has in addition to the notch 41 which serves when the master key is used, a second notch 57 or 57^a (Fig. 12) which serves when the individual keys 43^d and 43^e respectively are used. Evidently the same principle may be extended to provide an indefinite number of locks, each having its individual key different from all others, by displacing the teeth on both edges in a similar manner by equal or unequal distances.

The same principle is applicable with the form of invention shown in Figs. 6 and 7, as is shown by Figs. 13 and 14, where 49^a is the master key and 49^b the individual key, and 58 is the secondary notch which serves when the individual key is used.

Evidently the master key principle here described is applicable to keys having teeth on either or both edges, but its range of variation is many times greater with that type of key having teeth on both opposite edges than with the other. I would not have it supposed that the foregoing description of two forms of the invention is intended to be exhaustive of the forms in which the invention may be embodied or the modes in which it may be applied, for such is not the case. Thus the showing of the teeth in the edges instead of the sides of the key is merely for convenience and is not essential; neither is it essential that the key be flat and narrow, rather than polygonal with teeth in each of its angles or edges, or cruciform in cross section, or of other shape providing more than two portions adapted to contain teeth. Where more than two tooth bearing elements are provided in the key, I will provide a like number of detent disks each complementary to one of such elements, and thereby the range of permutations and combinations is further increased.

I have intended by the foregoing specifi-

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 cation and the accompanying drawings merely to disclose the fundamental principles and explain in detail a possible mode of application thereof, but I do not limit my claim to protection in any other manner than as indicated by the express terms of the claims hereinafter set forth.

What I claim and desire to secure by Letters Patents is:—

10 1. In a lock, a key mechanism comprising a follower adapted to be entered and rotated by an inserted key, said key having two sets of irregular projections and indentations, detent members having projections and indentations in their circumferences each mounted in a rotatable manner with the part of it which carries such projections in the path of entrance of one of the said lines of projections of the key, said detent members being on respectively opposite sides of the key, and an obstructing member having two notches each entered by one of said detent members, and the detent members having notches arranged to be placed in registry with the edge of said obstructing member when the key is inserted to a given degree, one of said members being stationary and the other being rotatable with the key.

2. In a lock as set forth in claim 1, the key being provided in its opposite edges with irregular projections and indentations, and that two detent members are provided each having projections and indentations complementary to the projections and indentations on one only of the edges of the key, said obstructing member also having two indentations, each of which is occupied by the rim of one of said detent members.

3. A lock comprising a bolt, a rotatable cam adapted to project and retract the lock, and a key mechanism for rotating said cam, said mechanism comprising a rotatable body having a key opening, an obstructing rib having a notch, and a rotatably mounted detent tumbler arranged with its rim occupying said notch, having in a part of its rim a series of irregular teeth and spaces, and having also a notch adapted to be placed by rotation in registry with the edge of said rib; and in combination with a key having irregular teeth in one edge conjugate to the teeth of said detent.

4. In a key operated mechanism for locks, a stationary frame, a rotatable frame mounted to turn within said stationary frame and having a key opening, a rib fixed to said stationary frame concentric with the axis about which the rotatable frame turns, and detent disks carried by said rotatable frame mounted in the same plane but at opposite sides of the key slot adapted to be engaged by opposite parts of the key and having in their perimeters irregular teeth conjugate to teeth formed in the key, said rib having notches occupied by the rims of

the disks, and the latter having also notches adapted to be brought by rotation of the disks under actuation by an inserted key into registry with the edge of said rib, thereby permitting the key and rotatable frame to be turned.

5. In a lock mechanism, an outer frame, an inner frame rotatably mounted in said outer frame, a key having irregular teeth in its opposite edges adapted to be inserted along the axis of said rotatable frame, detent disks carried by said rotatable frame in the same plane and on opposite sides of said axis, said disks being also rotatable upon their own axis and having teeth in their rims conjugate to the irregular teeth of the key, a rib concentric with such axis fixed to the stationary frame and having notches in which the rims of said disks lie, said disks also having notches adapted to be brought into registry with the rib by rotation when the key is inserted.

6. In a key operated mechanism, the combination with an obstructing member and a rotatable detent member, one of which is fixed in position and the other is displaceable by the turning of the key, and an operating key, the latter and the disk having conjugate irregular teeth and the disk having also two notches, one of which is adapted to be brought by rotation under the impulse of an inserted key into registry with said obstructing rib and the other adapted to be brought into similar registry by a different key having similar teeth but displaced longitudinally from its end.

7. In a lock, the combination with an obstructing member having a circular edge with an intersecting notch, a rotatable detent member occupying said notch, and having also a notch adapted to be placed in registry with the edge of said obstructing member, one of said members being rotatable with respect to the other by a key when such registry occurs, but being at other times obstructed from rotation, said detent member having also irregular teeth conjugate to the teeth of a specific master key, whereby it may be rotated to bring its notch in to the condition of registry above described by insertion to a predetermined extent of such master key; and the disk having also a second notch adapted to be brought into similar registry by insertion to the same extent of a specific individual key having teeth like those of the said master key but of which corresponding teeth are at different distances from its end than the teeth of the master key.

8. In a lock, the combination with an obstructing member having a circular edge and a notch in such edge, of a rotatably mounted detent member having a rim occupying said notch and having a plurality of notches in its rim complementary to the edge of said

obstructing member, each notch adapted to be brought into registry with said edge, whereby rotation of one member relatively to the other about the axis of the circular edge is permitted, said detent member having a series of irregular teeth; and an individual key and a master key both having teeth conjugate to the teeth of said detent, and different from one another in that the teeth of one key are located at greater distances from the end than are the corresponding teeth of the other key by an amount equal to the circumferential distance between the said registry notches of the detent.

9. In a lock, the combination of two detent disks and an obstructing member having a circular edge intersected by notches in which the rims of said detent members lie, said members having notches adapted to be brought by rotation into registry with the edge of the obstructing member, whereupon relative rotation between the obstructing member and the detents is permitted, both detents having irregular teeth in their perimeters, in combination with a key having two sets of irregular teeth each conjugate to the teeth of one of said disks; the disks being in the same plane on opposite sides of the aforesaid axis, and the teeth of the key being provided in its edges.

10. In a lock, the combination with an obstructing device having notches and two rotatable disks arranged with their rims entering said notches and themselves having notches adapted to be brought into registry with said obstructing device whereby relative rotation about the axis of said device

is permitted, said disks both having irregular teeth on their perimeters adapted to be turned simultaneously by a single inserted key having two sets of teeth conjugate to the teeth of the respective disks, and one of the disks having a second notch adapted to be brought into registry with said obstructing device by a key having teeth similar to those of the aforesaid key but of which one of the sets of teeth is displaced longitudinally with respect to the other.

11. Individual and master keys having irregular teeth in their edges similar to one another, but located at respectively different distances from the ends of said keys.

12. A plurality of keys each adapted to operate the same lock, one being an individual key specific to such lock, and the other being a master key adapted to operate also a number of other and specifically different locks; said keys having irregular tooth-engaging portions which are alike in the two keys, but are located in different positions in said keys.

13. A plurality of keys each adapted to operate the same lock, one being an individual key specific to such lock, and the other being a master key adapted to operate also a number of other and specifically different locks; said keys having irregular tooth-engaging portions which are alike in the two keys, but are located relatively farther from the end of one key than of the other.

In testimony whereof I have affixed my signature.

CARL I. SELLSTONE.