No. 649,087. Patented May 8, 1900.

C. G. WADE & W. S. MONROE.

COMBINATION LOCK.

(Application filed Sept. 19, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig 1.

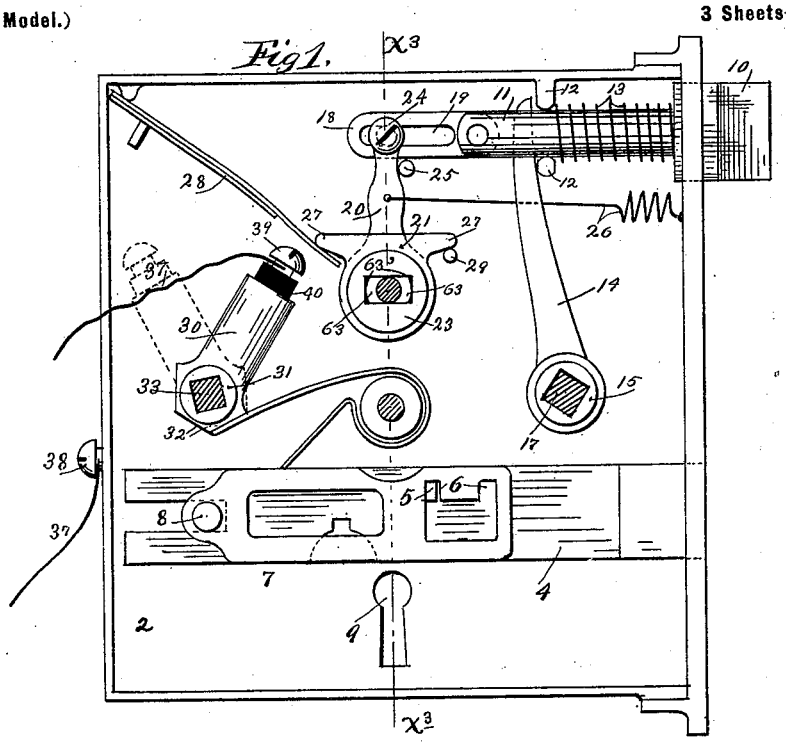

Fig 2.

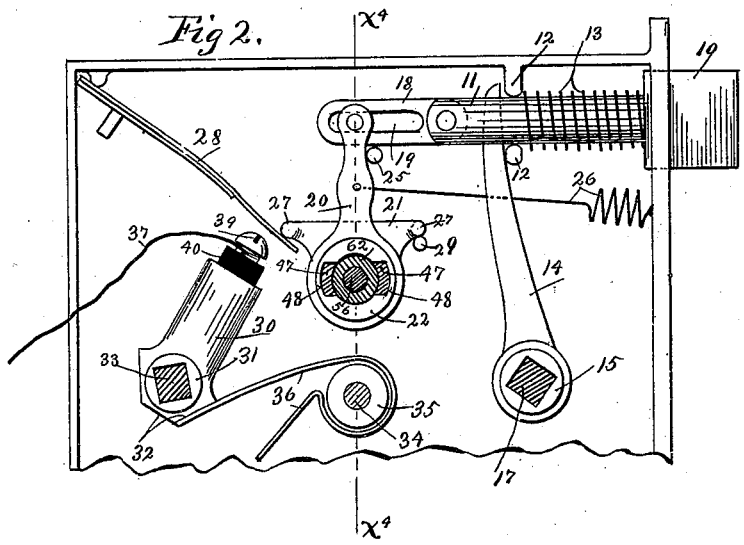

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Fig. 3.

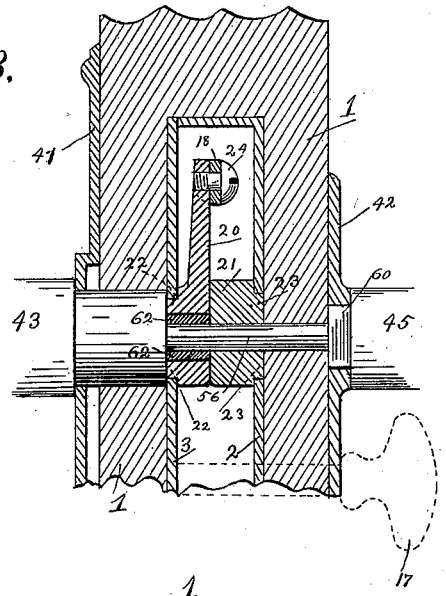

Fig 4.

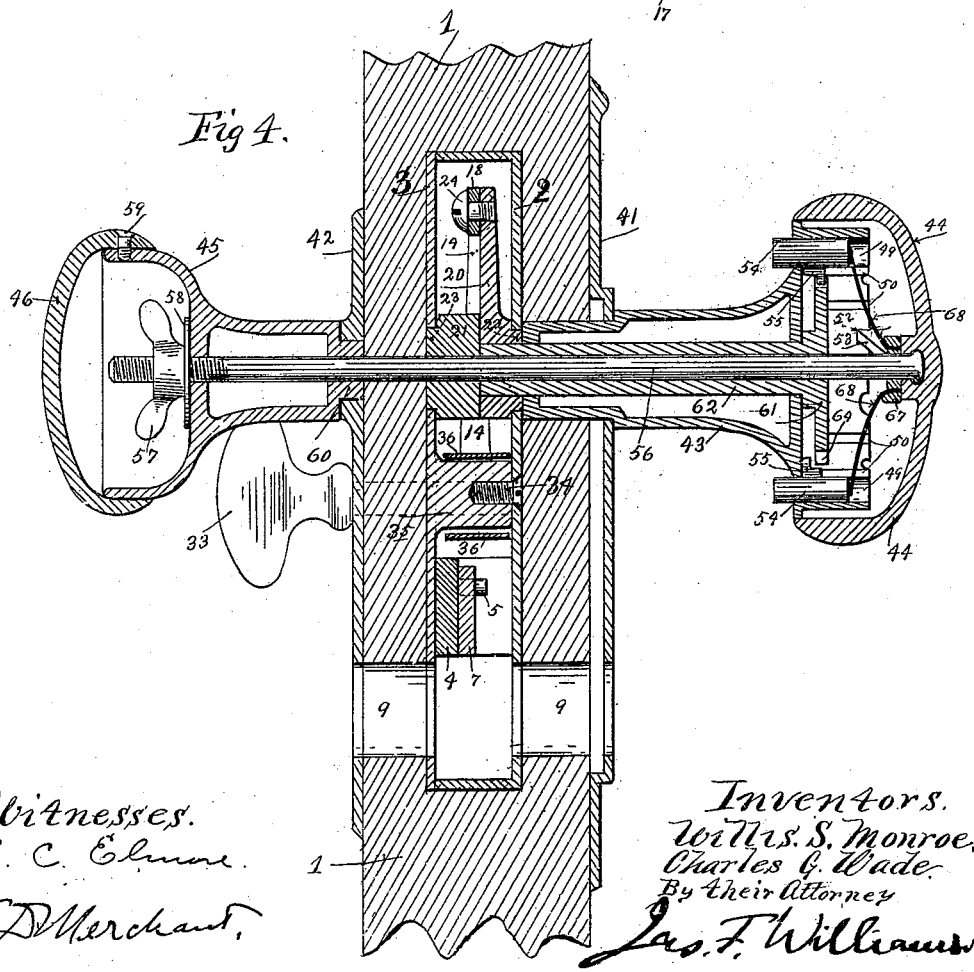

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Fig. 5.

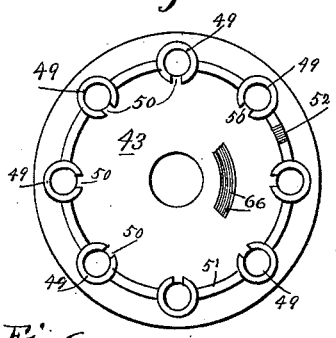


Fig. 7.

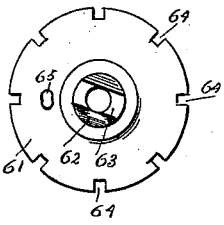


Fig. 8.

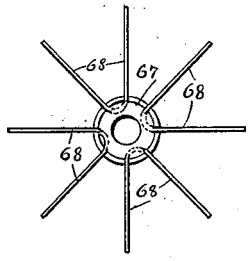


Fig. 6.

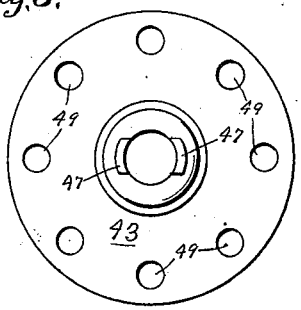


Fig. 9.

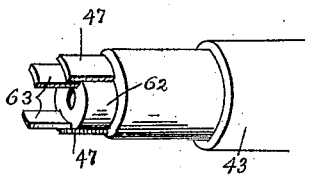
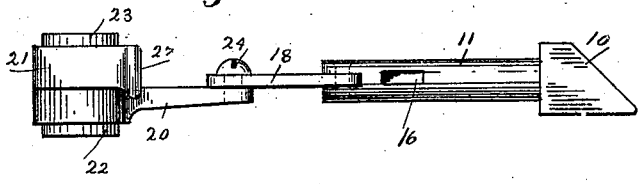


Fig. 10.



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UNITED STATES PATENT OFFICE.

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COMBINATION-LOCK.

SPECIFICATION forming part of Letters Patent No. 649,087, dated May 8, 1900.

Application filed September 19, 1898. Serial No. 691,292. (No model.)

To all whom it may concern:

Be it known that we, CHARLES G. WADE, residing at Chicago, in the county of Cook, State of Illinois, and WILLIS S. MONROE, residing at Minneapolis, in the county of Hennepin, State of Minnesota, citizens of the United States, have invented certain new and useful Improvements in Combination-Locks; and we 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.

Our invention relates to combination or keyless locks of the type disclosed in the United States Letters Patent to Edward C. Penfield, of date February 9, 1892, bearing Serial No. 468,429, and has for its object to improve the construction of such locks in the several particulars hereinafter noted.

The invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The preferred form of the invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Figure 1 is a side elevation of the lock with one side of the case removed. Fig. 2 is a similar view to Fig. 1, but illustrating reversed positions of certain of the parts and certain of the parts being broken away. Fig. 3 is a transverse vertical section taken approximately on the line x^3 x^3 of Fig. 1, some parts being broken away. Fig. 4 is a transverse vertical section taken through the lock and knobs thereof on the line x^3 x^3 of Fig. 2. Fig. 5 is an outside elevation or end view of the innermost section of the outer knob. Fig. 6 is an end elevation of the knob-section shown in Fig. 5, looking from a reverse direction. Fig. 7 is an end elevation of the alarm-sounding disk looking outward. Fig. 8 is a plan view of a so-called "spider-spring" which is used in the operating-knob. Fig. 9 is a perspective view of the interlocking ends of the operating-knob and the stem of the alarm-sounding disk, and Fig. 10 is a plan view of the latch or lock-bolt and its immediately-connected parts.

1 indicates a portion of a door which is provided with a suitable mortise formed in its edge, in which the lock-case is placed and secured in the ordinary manner. This lock-case is of the ordinary or any approved construction and, as shown, consists of the rectangular body-section 2 and removable side 3. In the lower part of this lock-case the ordinary key-operated lock-bolt 4 is mounted in the ordinary manner, the same being provided with a lug 5, which coöperates with notches 6 of a detent-plate 7, one end of which is pivoted on a fixed stud 8. 9 indicates the key-holes, through which a key may be passed to operate the detent and locking-bolt, above described, in the ordinary manner. In the upper portion of the lock-case the locking-bolt or latch, which is operated through the instrumentalities of our improvements, is mounted to move horizontally. As shown, this locking-bolt or latch has a cam-acting or self-closing head 10, which works through a correspondingly-shaped passage in the outer edge of the lock-case. A stem portion 11 projects centrally into the lock-case and works through an open keeper or guide-lug 12, between which and the head 10 a coiled spring 13 is compressed on said stem 11.

After the manner of a so-called "night-latch" the bolt or latch 10 11 may be moved inward or released from the inner side of the door by means of a rocking arm 14, pivoted to the lock-case at 15, working with its free end through a seat 16 in the bolt-stem 11 and subject to the action of an ordinary finger-piece 17. (Indicated in section in Figs. 1 and 2 and by dotted lines in Fig. 3.)

Projecting in a plane midway between the sides of the lock-case and pivoted to the inner end of the bolt-stem 11 is a link 18, provided with an elongated slot 19.

20 indicates a rocker, and 21 a tumbler, which parts are respectively provided with short, but large, trunnions 22 23. The trunnions 22 and 23 are of the same diameter and are adapted to work interchangeably in seats or bearings formed in the sides of the lock-case. This interchangeable feature is very important and will be given further consideration later on. The free end or arm exten-

sion of the tumbler 21 is provided with a headed stud or screw 24, which works in the slot 19 of the link 18. A fixed stop 25 on the lock-case limits the pivotal movement of the rocker 20 toward the right, and a light spring 26 normally holds said rocker in contact with said stop.

The tumbler 21 has a pair of projecting lugs or fingers 27, one of which is acted upon by a leaf-spring 28, which holds the other lug against a fixed stop 29. Both the spring 28 and the stop 29 are of such dimensions transversely of the lock-case that they will engage the lugs 27 in either position of the parts 20, 21, 18, and 10, which two positions are shown in Figs. 1 and 2.

Below the spring 28 a contact-block 30 is pivoted between the sides of the case, the same having trunnions 31, that engage seats therein. The hub of the block 30 is made angular, as shown at 32, and said block is adapted to be moved from the position indicated by full lines in Fig. 1 into the position indicated by dotted lines in said figure by means of an ordinary finger-piece 33, projecting from the inner side of the door and having its angular stem projecting into said hub.

The sections 2 and 3 of the lock-case are held together by means of a screw 34, which projects through said section 3 and is screwed into a hub 35 on said section 2.

36 indicates a peculiarly-formed leaf-spring, the intermediate portion of which nearly surrounds the hub 35 and the free ends of which engage and press one against the top edge of the detent-plate 7 and the other against one or the other of the flat surfaces 32 on the hub of the pivoted contact-block 30. This spring 36 thus serves to hold the detent-plate 7 downward, and the rocker 30 either in its operative position, indicated by full lines, or in its inoperative position, indicated by dotted lines in Fig. 1.

37 indicates the terminals of an electric wire-circuit, in which an alarm device or gong and a battery or other electric energizer (not shown) are connected. One terminal of this wire-circuit is secured directly to the lock-case by means of a binding-screw 38 or otherwise, and the other end or terminal is directly secured to a screw or metallic contact-piece 39, which is secured and embedded in an insulation 40, carried by the free end of the contact or switch block 30. As is evident, the circuit through the conductor 37 will be closed whenever the contact-piece 39 is brought into contact with the leaf-spring 28 or the hubs of the parts 20 and 21.

41 and 42 indicate, respectively, the outside and the inside escutcheon-plates, which may be of any approved construction. The outside or operating knob is made up of a stem or body section 43 and a cap or crown section 44, and likewise the inner knob is made up of corresponding, although not very similar, sections 45 and 46, respectively. The section 43 of the outside knob is reduced at its inner end and is mounted with freedom for rotation in suitable seats formed in the outer escutcheon-plate 41 and in the outer face of the door 1. The extreme inner end of this knob-section 43 is bifurcated or provided with a pair of prongs 47, which enter into and interlock with notches or seats 48 in the hub of the rocker 20. Hence it should be remembered that whenever the outer knob is moved the rocker 20 will also be moved, and if said knob is moved far enough the bolt or latch 10 11 will be retracted or released. The outer end of the knob-section 43 is provided with a series of circumferentially and longitudinally extended cylindrical key-seats 49, that are slotted, as at 50, on their inner portions. An annular flange 51 is shown as connecting the seats 49, and this flange 51 is provided with a notch 52, with which a flange or lug 53 on the knob-section 44 is adapted to engage to prevent said sections 43 and 44 from turning with respect to each other. Working within each seat 49 is a plunger-like finger-key 54, provided with a laterally-projecting detent 55, which projects through and works in the coöperating slot 50.

56 indicates a spindle or center-bolt which is passed through the knob-sections 43 and 45, through the escutcheon-plates, the door, and parts 20 and 21 of the lock. This stem or bolt 56 is secured at one end to the knob-section 44, and, as shown, it is screw-threaded at its other end and provided with a thumb-nut 57, which serves to clamp a washer 58 against the knob-section 45, and thus hold all of the parts of the knob together and in position. The knob-sections 45 and 46 are shown as secured together by a screw 59, and the stem end of the knob-section 45 is shown as provided with a square or annular shank 60, which engages a correspondingly-shaped seat in the inner escutcheon-plate 42, and thus prevents the inner knob from being turned.

The releasing-disk 61 has a sleeve or stem 62, which is loosely mounted on the spindle or rod 56 and is bifurcated or formed with prongs 63 at its extreme inner end, which engage and interlock with a rectangular seat or slot 63′ in the tumbler 21. Hence it should be remembered that the tumbler 21 will be operated whenever, but only when, the releasing-disk 61 is moved. The releasing-disk 61 is provided with peripheral notches 64, which stand in line or registration one with each of the slots 50 and detents 55 of the finger-keys 54. On its inner face the disk 61 has a lug or projection 65, which works in a segmental slot 66 in the outer face of the knob-section 43. This segmental slot 66 is of such length that it will permit sufficient movement of the disk 61 and parts moved thereby to release the latch or lock-bolt 10 11; but it is not sufficient in extent to permit any given detent 55 to be brought into line with more than one of the several notches 64. This cooperation of the lug 65 with the groove 66

prevents the pronged ends 47 and 63, respectively, from being engaged with their coöperating seats 48 and 63' in improper positions.

The finger-keys 54 are yieldingly pressed outward, as shown in Fig. 4, by means of a spider-spring consisting of an annular head 67 and a plurality of radial spring-arms 68. The collar 67 is placed on the stem or rods 56 and presses against the inwardly-projecting hub of the knob-section 44, and the spring-arms 68 work in the slots 50 of the key-seats 49 and engage one with each of the finger-keys 54. The action of these spring-arms 68 is entirely independent one of the other, yet they have a common base of resistance and are removed and placed in working position all at the same time. This spider-spring is best illustrated in Fig. 8, by reference to which it will be seen that the eight spring-arms therein employed are formed by four approximately U-shaped spring-wire sections passed through the flange of the collar 57 and rigidly secured thereto. If desired, these U-shaped springs may be cast into the common supporting-collar.

The details of construction of our improved lock have now been described.

The general operation of the mechanism may be briefly summarized as follows: The finger-piece 54 may be reversed end for end, so as to set more or less of them in either one of the two positions illustrated in Fig. 4, by reference to which it will be noted that the uppermost finger-key is positioned with its detent 55 in engagement with one of the notches of the operating-disk 61, while the lower finger-key is so positioned that it will clear and permit the movement of the operating-disk. Hence it is obvious that the former of these finger-keys when pressed will release said disk 61, while the latter when pressed will carry its detent 55 into engagement with one of the notches of said disk. The person knowing the combination may readily select and press all of those keys and only such keys as normally stand in position to prevent the movement of the outer or operating knob without carrying therewith the operating-disk 61 and parts operated thereby. It is of course obvious that this combination may be varied at will simply by reversing end for end any of the finger-keys 54. When the proper combination of finger-keys 54 have been pressed, the operating or outer knob being released from the alarm-sounding disk 61 may be moved so as to cause the rocker or arm 20 to retract or draw the primary locking-bolt or latch 10 11 into its unlocking position. In this case the doors may be opened without sounding the alarm. However, when the proper combination of finger-keys is not struck any attempt to move the operating-knob will correspondingly move the disk 61, sleeve 62, and rocker 20, and the tumbler 21 will engage and press the spring 28 into contact with the contact-screw 39, thus closing the circuit through the conductor 37 and sounding the alarm. However, this slight movement of the operating-knob necessary to sound the alarm does not retract or release the primary locking-bolt or latch, but simply moves the screw 34 to the limit of its inward movement in the slot 19 of the link 18.

In view of the above-noted actions it will be seen that the operating-knob may be used as a door-bell, for the gong or alarm device may be sounded at any time by a slight movement of said knob when the proper combination of finger-keys is not struck. By means of the finger-piece 33 on the inner side of the door the contact-screw 39 may be brought into contact with the hubs of the rocker 20 and tumbler 21 by rocking the switch-block 30 toward the right. Hence this device may be used by the occupants of the house as a private call or signaling device. When the switch-block 30 is thrown into the position indicated by dotted lines in Fig. 1, the alarm device will not be sounded when the door is opened.

In locks of this character a self-latching primary lock-bolt is usually employed. The projecting end of this primary latch or lock-bolt is of course beveled in one direction only, and hence a lock having this cam-latch and connected parts set for a door which opens toward the right could not be applied to a door which would open toward the left. In view of these facts it has been the previous practice to construct certain of the parts contained within the lock-case in rights and lefts, which parts must be substituted one for the other according to the requirements of a particular case. This is an objection which will be found in the construction disclosed in the patent to Penfield, previously noted.

Our invention removes the above defects and provides parts which may be reversed, so as to adapt the lock to a door which swings either toward the right or toward the left, this being accomplished in both cases by the same parts. For example, for a door which may be assumed to open by movement toward the observer and toward the left the parts are set as shown in Figs. 1 and 4. In this position it will be noted the rocker 20 is located adjacent or next to the back of the case-section 2, while the tumbler 21 is located next to the removable case-section 3.

To reverse the parts, so as to adapt the lock for a door which opens toward the right, the parts are rearranged as shown in Figs. 2 and 3. This may be readily accomplished when the case-section 3 is removed by first removing the parts 20 and 21 from their seats, so as to allow the spring 13 to force the head 10 outward of its seat. Then after having lifted the stem laterally out of the keeper 12 all of the parts shown in Fig. 10 may be given a half-turn on the axis of said stem 11. After this has been done the parts are rearranged as shown in Figs. 2 and 3, by reference to which it will be noted that the parts 20 and

21 have their trunnions 22 and 23 journaled, respectively, in the case-sections 3 and 2.

What we claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In a lock of the character described, the combination with a locking-bolt or latch, arranged to be reversed side for side with respect to the lock-case, of a knob having finger-operated combination key devices, and connections to the interior to the lock-case, intermediate operating connections between the same and the locking-bolt or latch arranged to be reversed side for side with respect to the lock-case, an electric contact, and a reversible tumbler having oppositely-projecting arms.

2. In a lock of the character described, the combination with the lock-case, of the lock-bolt or latch 10, 11 spring-held outward to its limit, the reversible rocker 20 and tumbler 21, 27, provided, respectively, with trunnions 22, 23, the spring 28 acting on one of the lugs 27 of said tumbler, a contact-piece adapted to be engaged by said spring 28, under the initial movement of said tumbler 21, an alarm-sounding electric circuit arranged to be closed by said engagement, and finger-operated combination devices operating on said parts 20 and 21, substantially as described.

3. In a lock of the character described, the combination with the lock-case, of the ordinary key-operated lock-bolt 4 and pivoted detent-plate 7 coöperating therewith to lock the same where set, of the pivoted switch-block 30 having the flattened surfaces 32, and the leaf-spring 36 incompletely coiled at its intermediate portion, to surround the retaining-hub 35, and engageable at one end with said detent-plate 7, and at its other end with said flattened surfaces 32, substantially as described.

4. In a lock of the character described, the combination with the lock-case, of the spring-pressed bolt or latch 10, 11, the rocker 20 and tumbler 21, an alarm device arranged to be sounded by the initial movements of said rocker and tumbler, and a connection between said rocker and said lock-bolt or latch, constructed to permit an initial movement of said rocker, necessary to sound said alarm device, without causing a movement of said bolt or latch, substantially as described.

5. In a lock of the character described, the combination with an actuating-knob provided with a plurality of finger-operated keys, of an alarm-sounding disk or head engaged and released by said keys, in the manner indicated, and a slot-and-pin or stud-and-groove connection between said knob and said disk or head, arranged to permit limited rotation of the said parts, with respect to each other, substantially as and for the purposes set forth.

6. In a lock of the character described, the combination with the bolt-releasing rocker 20, provided with the seats or notches 48, of the alarm-sounding tumbler 21 provided with the perforation $63'$, the knob provided with the stem projections or prongs 47 fitting said seats or notches 48, the alarm-sounding disk or head 61, the stem or sleeve portion 62 of which has the prongs or stem projections 63 fitting said seat or perforation $63'$, and finger-operated combination-keys carried by said knob and operating on said disk or head 61, substantially as described.

7. In a lock of the character described, an operating-knob, involving two knob-sections, a plurality of finger-operated keys mounted in one of said knob-sections and engageable and disengageable with the other knob-section, and the spider-spring, operating independently on the said keys and comprising the central hub or body section, 67, and the plurality of U-shaped radial spring-fingers, 68, cast into the said hub 67, the said parts operating substantially as described.

In testimony whereof we affix our signatures in presence of witnesses.

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