

M. S. CONNER.
SWITCHING APPARATUS.
APPLICATION FILED MAY 19, 1904.

Patented June 29, 1909.

2 SHEETS—SHEET 1.

926,175.

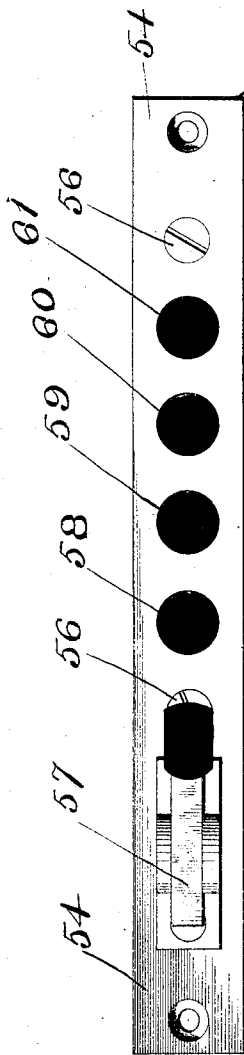


Fig. 2.

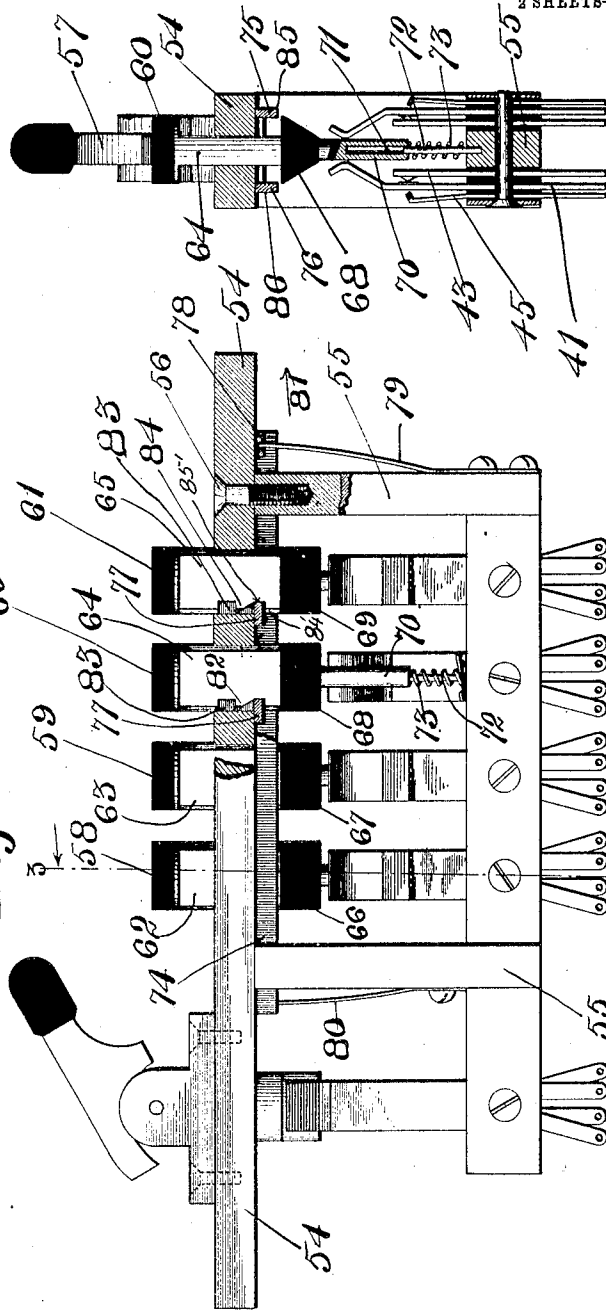


Fig. 1.

Fig. 3.

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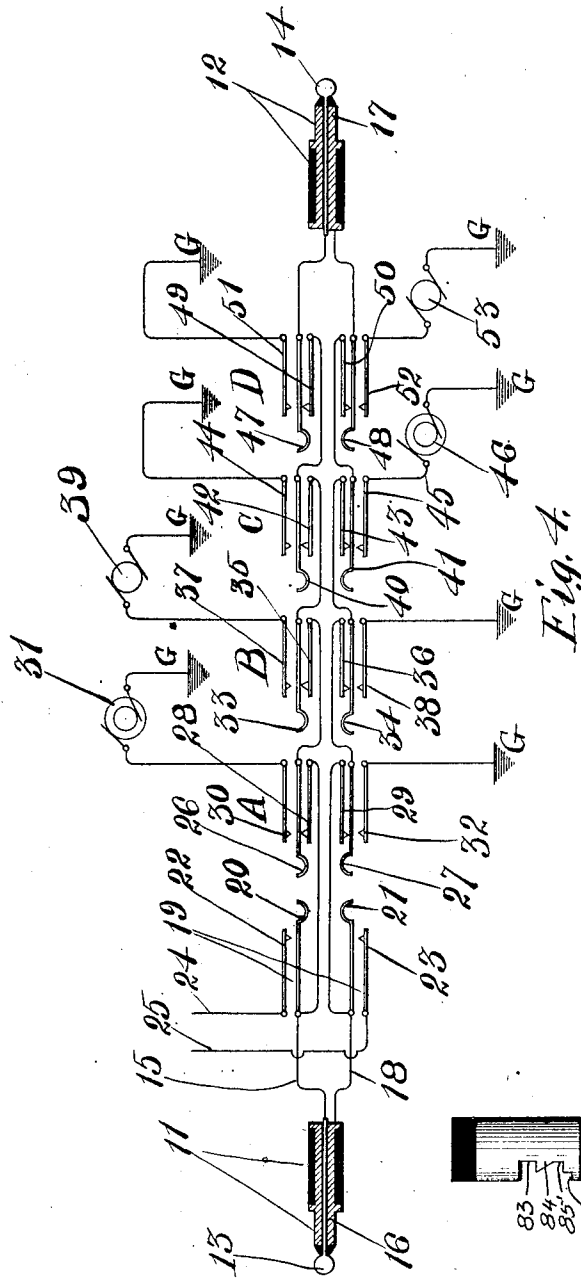


Fig. 4.

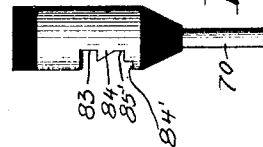


Fig. 5.

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UNITED STATES PATENT OFFICE.

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SWITCHING APPARATUS.

No. 926,175.

Specification of Letters Patent.

Patented June 29, 1909.

Application filed May 19, 1904. Serial No. 208,685.

To all whom it may concern:

Be it known that I, MERRITT S. CONNER, citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented a certain new and useful Improvement in Switching Apparatus, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to electrical switching apparatus and is particularly well adapted for use in conjunction with so-called party line selective ringing or telephone exchange systems and I shall, therefore, explain my invention in connection with an embodiment particularly well adapted for use in this manner.

As is well understood by those skilled in the art, it is now a frequent practice to provide a telephone line leading to a central station with a plurality of subscribers' telephone sets. When four such subscribers' substations are equipped, it is usual to connect the signaling apparatus, such, for instance, as the signal bell, at two of the stations between one of a pair of bimetallic line limbs and the ground, while the signaling apparatus at the other two stations is connected between the other line limb and the ground. The signaling devices at the substations connected with the same line limb are adapted to be operated by signaling currents of different electrical character, for instance, one of the bells is adapted to be operated by an alternating current only, while the other is arranged to be operated by a direct current only. When such multi-party lines are connected with a telephone exchange, it is desirable to provide the telephone operator with a switching device by means of which she can signal any one of the parties connected with a given line without signaling the others connected with the same line, and in so doing it is desirable that after having once operated the signal controlling and switching mechanism she may be able to ascertain later on from an inspection of the signal controlling apparatus which one of the substations has been called.

My invention, as above stated, relates to such a ringing key as may be employed by an operator for this purpose.

My invention will be more readily understood by reference to the accompanying drawings, in which:—

Figure 1 illustrates in side elevation a four-party line ringing key constructed in accordance with my invention, parts being broken away to more clearly illustrate the details of construction, Fig. 2 is a plan view of the same, Fig. 3 a cross sectional view taken on line 3, 3 of Fig. 1, Fig. 4 illustrates the circuit connections of the keys when associated with an operator's cord circuit, and Fig. 5 shows a modified form of button which may be employed.

Referring more particularly to Fig. 4, I shall point out in the usual way the purposes for which this embodiment of my invention is intended. There are illustrated an answering plug 11, and a calling plug 12, the tip contacts 13 and 14 of these plugs being connected by means of a tip strand 15, while the sleeve contacts 16 and 17 are connected by means of the sleeve strand 18. An operator's listening key is provided at 19, this key comprising the springs 20 and 21, normally out of engagement respectively with the contacts 22 and 23 to which the conductors 24 and 25 lead to the operator's telephone set in the well known manner. I have shown four ringing keys in association with this cord circuit. The first key, which in general is designated by the character A, comprises movable contact springs 26 and 27, the actuation of which will be more clearly understood hereinafter. These movable contact springs normally make electrical connection with inner contact springs 28 and 29, respectively, these contacts being connected with the listening key to maintain normally the continuity of the cord strands. The outer contact spring 30 is connected with one pole of the source of alternating current 31, the other pole of which is connected with the ground at G. The other outer contact spring 32 of the pair is connected directly with ground G, as shown. Upon manipulating the movable springs 26

and 27 to change their electrical connections from the inner to the outer contact springs, the source of alternating current 31 is connected with the tip strand leading to the tip contact 14 of the calling plug, while ground is connected with the sleeve strand leading to the sleeve contact 17. This ground contact on the sleeve side may in certain cases be omitted, if desired. It will be seen that a manipulation of the key A will connect the source of alternating current between ground and the limb of the bimetallic telephone line, which is connected with the tip spring of a jack into which the calling plug has been inserted. One of the substations upon the line is provided with a signal bell or other signal device connected between the tip line limb and ground, this signaling device being constructed in such a way that it will be actuated by an alternating current from the source 31. The second key B, comprising movable springs 33 and 34, inner springs 35 and 36 and outer springs 37 and 38, serves when actuated to connect the source of direct current 39 between the ground G and the tip line limb, while the sleeve line limb is grounded through the outer contact 38. While I have described in this connection one source of alternating current and a second source of direct current, it will be understood that the keys may be used for connecting sources of current differing in any desired electrical characteristic with the line. Thus may be employed sources of alternating currents of different frequency or pulsating currents of different frequency or different polarity. Indeed, the ringing key of my invention may be utilized in conjunction with almost all forms of multi-party line selective signaling apparatus.

The key C comprises movable contact springs 40 and 41, inner contact springs 42 and 43 and outer contact springs 44 and 45. A manipulation of this key, as will be understood, serves to connect the source of alternating current 46 between the ground G and the sleeve line limb by way of the sleeve contact 17 of the calling plug 12. At the same time, the other outer contact 44 may, if desired, serve to connect the tip line limb with the ground G.

The ringing key D comprises the movable contact springs 47 and 48, the inner contact springs 49 and 50 and the outer contact springs 51 and 52. A manipulation of this key D serves to connect the source of direct current 53 between the ground and the sleeve limb of the line, the tip line limb being grounded in the manner heretofore described. The sources of current marked 31 and 46 may or may not be the same generator and in the same way the sources marked 39 and 53 may or may not be the same source of direct current. The number of keys employed may be added to if desired or, as in

some cases will be sufficient, but one key for each side of the line may be employed, thus enabling the operator to signal selectively a two-party line in which one substation is connected between each line limb and the ground.

Referring now more particularly to Figs. 1, 2 and 3, the mechanical construction of a preferred embodiment of my invention will be made apparent. In these figures the same reference characters are employed, so far as they apply. In these figures I have illustrated a base plate 54 adapted to be set into a suitable recess in the key shelf of a telephone switch board. To this base plate is attached a suitable metal frame 55, by means of the screws 56, 56. The base plate, together with this frame 55, serves to support the listening key or cam 57, the mechanical construction of which forms no part of the present invention, and which, therefore, need not be described with greater detail.

The contact springs more specifically illustrated in Fig. 3 are supported by the frame 55 and are given the reference characters already applied to them in Fig. 4.

Fig. 3 illustrates in detail the contact springs for the ringing key C, the connections of these contact springs being as indicated in Fig. 4. The buttons 58, 59, 60 and 61 are provided for the various sets of ringing contact springs, each button comprising a hard rubber finger piece, a metallic slide (as, for instance, 62, 63, 64 or 65) and a hard rubber wedge (as, for instance, 66, 67, 68 or 69). Each button is provided also with a downwardly extending guide bar 70, this guide bar being raised at 71 for the reception of an associated guide pin 72, the guide pin being set in the metal portion of the frame 55. Surrounding the guide pin 72 is a small helical spring 73 for the purpose of maintaining the associated button in its normal upper position, as shown, and for returning it to this position when opportunity affords, as will hereinafter be more fully understood. A compound latch 74 is provided, this latch being formed of a piece of bent sheet metal and having side bars 75 and 76 connected together by means of the latching bars 77, 77. The compound latch is provided at either end with an additional cross rod 78 for engagement by the springs 79 and 80, these springs exerting a pressure in the direction indicated by the arrow 81. Upon depressing, for instance, the button 60 of ringing key C, the ratchet tooth 82 of the slide 64 engages the cross bar 77 pushing the same to the left against the tension of the springs 79 and 80. When the upper face of the ratchet tooth has passed below the lower edge of the latching bar 77, the bar, together with the entire compound latch, will move to the right, the bar resting within the notch 83 of the slide.

The button may be depressed thus far without causing an actuation of the contact springs 40 and 41. The movement of this extent serves merely to bring the wedge into engagement with the contact springs so that a further depression of the button 60 wedges these springs apart, thereby causing the movable contact springs to disengage the inner contact springs, thereby interrupting the continuity of the cross strands and connecting the desired source of ringing current with the telephone line to be called. Upon removing the pressure from the tip of the button 60, the small spring 73 raises the button sufficiently to permit the movable contact springs to return to their normal position, as shown in Fig. 3, whereupon the upper edge of the ratchet tooth 83 engages the lower side of the associated latching bar 77, thus preventing further upward movement. This leaves the button which has last been actuated in a partially depressed position so that if the called subscriber does not answer his signal, as will be indicated, for instance, upon the operator's supervisory signal, not shown, the operator may again depress this button to its full extent, thereby connecting the source of signaling current again with the line, the partial depression of the button in this case indicating to the operator without, however, having to remember it which of the substations upon the called line has been signaled. The last operated button will remain in this partially depressed position indicating which of the substations has been called until some other button, as for instance 61, is actuated, whereupon the button 60 last depressed is released as the latch 74 is moved to the left upon engagement of the tooth 84 of the button 61 with the corresponding latching bar 77. The button 61 will in turn, however, be held in its depressed position after the tooth passes beyond the latching bar and said latching bar engages in the groove 83. Openings 85 and 86 through the vertical standards 55 accommodate the latch frame 74 to allow this longitudinal motion thereof.

In Fig. 5 is shown a modified form of button which is cylindrical instead of flattened although its operation is similar to that of the flattened button. In both buttons the apex of the tooth 84 does not reach to the edge of the button and therefore upon release of one button upon depression of another the latching bar at the released button will engage the shoulder 84' below the tooth 84 and will rest in the notch 85' to prevent further upward movement of the button. Upon sufficient motion of the latch frame toward the left, however, so that the corresponding latching bar will clear the shoulder 85' any of the buttons may be withdrawn from the key frame.

While I have herein described a preferred

embodiment of my invention, it will be apparent to those skilled in the art that many modifications may be used without departing from the spirit of my invention. I do not wish, therefore, to be limited to the precise construction herein shown, but

Having described my invention, I claim as new and desire to secure by Letters Patent:—

1. In a switching apparatus, the combination with a supporting frame, of a plurality of actuating buttons mounted thereon, switch springs for each button adapted upon depression thereof to be actuated thereby, a latch frame for said buttons, means upon depression of a button for moving said latch frame to lock said button in its depressed position, means for subsequently allowing actuation of said button to actuate its switching mechanism without movement of said latching frame and means for releasing an actuated button from its depressed position.

2. In an electrical switching apparatus, the combination with a supporting frame, of a plurality of actuating buttons mounted thereon, switch springs for each button, a common latching frame for all of said buttons, means upon release after depression of any button for causing motion of said latching frame to lock the actuated button in a partially depressed position, and means upon depression of another button for moving said latching frame to lock said other button in position and to release the first actuated button.

3. In an electrical switching apparatus, the combination with a supporting frame, of a plurality of actuating buttons mounted thereon, switching mechanism for each button adapted upon actuation thereof to be actuated thereby, a latching frame common to all of said buttons, means upon depression of one button for causing longitudinal motion of said latching frame whereby said frame will lock said button in its depressed position, means whereby said depressed button may subsequently be further depressed to actuate its switching mechanism without causing further motion of said latching frame, and means upon depression of another button for causing similar actuation of said latching frame whereby said other button is locked in its depressed position and the first actuated button released to return to its normal position.

4. In an electrical switching apparatus, the combination with a supporting frame, of a plurality of buttons mounted thereon, switching mechanism below each button, a tooth on each button, a common latching frame through which said buttons pass, a latching bar on said latching frame for each tooth, means upon partial depression of a button for causing the corresponding latching bar to engage over the tooth of the button whereby said button is held in its par-

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tially depressed position, and means upon depression of another button for causing the tooth of said other button to engage below the corresponding latching bar whereby said
5 other button is locked against return to normal position, depression of said other button causing motion of said latching frame to release the latching bar from the first button whereby said first button may return to its
10 normal position only complete actuation of a button causing actuation of the corresponding switching mechanism.

5. In an electrical switching apparatus, the combination with a supporting frame, of
15 a plurality of actuating buttons mounted therein, switching mechanism below each button, springs tending to hold said buttons in a normal upper position, a tooth on each button, and a common latching bar for said
20 buttons, depression of a button causing the corresponding tooth to be engaged by the latching bar whereby said button is held in a partially depressed position, depression of
25 a second button causing engagement of its tooth with the latching bar whereby said second button is locked in a partially depressed position and whereby said latching bar is moved to release the first actuated
30 button further depression of a button from its partially depressed position causing actuation of the corresponding switching mechanism.

6. In an electrical switching apparatus, the combination with a supporting frame, of
35 a plurality of actuating buttons mounted therein, switching mechanism below each tooth adapted to be actuated thereby upon depression thereof, a tooth on each button, a
40 notch above the tooth on each button, a common latching frame for said buttons, and a latch bar extending from said frame for each button and normally disposed below said tooth, depression of a button causing
45 the corresponding tooth to move the latching frame whereby the corresponding latching bar engages in said notch over the tooth whereby said button is locked in its depressed position, said notch allowing further depression of said button independently of said
50 latching frame to move the latching bar of the first button from engagement with the tooth thereof whereby said button may be returned to its normal position, said second actuated button being also locked in its depressed position by said latching frame.

7. In an electrical switching device, the combination with a supporting frame, of a plurality of actuating buttons adapted for vertical reciprocation within openings in
60 said frame, switching mechanism mounted on said supporting frame below each button, a tooth on each button, a notch on each button above the tooth thereof, a second notch on each button below the tooth thereof,
65 of, a common latching frame adapted to re-

ciprocate longitudinally on said supporting frame, a latch bar on said latching frame for each button, springs normally tending to hold said buttons in an upper position, spring means normally causing said latching bars to engage in the lower notches of
70 the buttons, depression of one button causing its tooth to move the latching frame longitudinally whereby the corresponding latching bar will engage in the notch above
75 the tooth of the actuated button whereby said button will be locked in a partially depressed position without actuation of switch mechanism, actuation of another button causing similar actuation of the latching
80 frame whereby said other button is locked in a partially depressed position and whereby the latching bar at the first button is released from the tooth thereof, whereby said first button may be returned to its normal
85 position and means for allowing further actuation of the button to actuate the corresponding switch mechanisms.

8. In an operator's ringing key, the combination with a suitable supporting frame, of
90 a plurality of vertically reciprocating plungers and a plurality of switch springs carried by said frame, each of said plungers having three distinct positions, a normal position, an intermediate position and an operative position, said plungers being adapted
95 to actuate said springs when in the last mentioned position to put ringing current upon the line, and means for releasing any one of said plungers from the intermediate position
100 when any other of said plungers is moved to the operative position.

9. In an operator's ringing key, the combination with a suitable supporting frame, of a plurality of vertically reciprocating
105 plungers and a plurality of switch springs carried by said frame, each of said plungers having three distinct positions, a normal position, an intermediate position and an operative position, said plungers being adapted
110 to actuate said springs when in the last mentioned position to put ringing current upon the line, and means for releasing any one of said plungers from the intermediate position when any other of said plungers is
115 moved to the intermediate position.

10. In a switching apparatus, the combination with a supporting frame, of a plurality of actuating buttons mounted thereon, switch springs below each button, locking means for said buttons, means upon partial depression of a button for moving said
120 locking means to lock said button in its partially depressed position, means for subsequently allowing complete depression of said button to actuate the associated switch springs without causing movement of the locking mechanism and means for releasing an actuated button from its partially depressed position.
130

11. In a switching apparatus, the combination with a supporting frame, of a plurality of actuating buttons mounted thereon, switch springs below each button, a common locking means for all of said buttons, means upon partial depression of any button for causing motion of said locking means to lock the actuated button in its partially depressed position, and means upon partial depression of another button for moving said locking means to lock said other button in its partially depressed position and to release the first actuated button, further depression of any button from its partially depressed position causing actuation of the associated switch springs.

12. In a switching apparatus, the combination with a supporting frame, of a plurality of actuating buttons mounted thereon, switch springs for each button, locking mechanism for the buttons, means upon initial depression of a button for causing simultaneous actuation of the locking mechanism to lock the depressed button in a partially depressed position, means for allowing further actuation of the button independently of the locking mechanism to actuate the associated switch springs, and means for releasing an actuated button from its partially depressed position.

13. In a switching apparatus, the combination with a supporting frame, of a plurality of actuating buttons mounted thereon, switch springs for each button, locking mechanism for the buttons, means upon initial depression of a button for causing simultaneous actuation of the locking mechanism to lock the depressed button in a partially depressed position, means for allowing further actuation of the button independently of the locking mechanism to actuate the associated switch springs, and means upon initial depression of a second button for actuating the locking mechanism to release the first button from its intermediate position.

14. In a switch apparatus, the combination with a supporting frame, of a plurality of actuating buttons mounted thereon, switch mechanism for the buttons, ratchet mechanism associated with the buttons, initial depression of a button causing actuation of the ratchet mechanism to lock the button against return to its normal position, means for allowing further depression of the button independently of the ratchet mechanism to engage the switching mechanism, release of the button from the switch mechanism causing said button to return to its locked position, actuation of a second button causing movement of the ratchet mechanism to release the first button to return it to its normal position and to lock the second button against release to its normal position.

15. In an operator's key, the combination

of a plurality of actuating members, each having a normal position, an indicating position, and an operative position, switch springs associated with each actuating member, and an operating element associated with each actuating member to operate the corresponding switch springs when such actuating member is moved to its operative position.

16. In an operator's key, the combination of a plurality of actuating members, each having a normal position, an indicating position, and an operative position, switch springs associated with each actuating member, an operating element associated with each actuating member to operate the corresponding switch springs when such actuating member is moved to its operative position, and means for retaining an actuated member in its indicating position, the operation of one of such actuating members serving to release a previously actuated member.

17. In an operator's key, the combination of a plurality of actuating members, each having a normal position, an indicating position, and an operative position, switch springs associated with each actuating member, an operating element associated with each actuating member to operate the corresponding switch springs when such actuating member is moved to its operative position, and means for causing one of such members when operated to assume and remain in an indicating position, until the operation of another of such members.

18. In an operator's key, the combination of a plurality of actuating members, each having a normal position, an indicating position, and an operative position, switch springs associated with each actuating member, an operating element associated with each actuating member to operate the corresponding switch springs when such actuating member is moved to its operative position, and means for causing one of such members when operated to assume and remain in an indicating position, until the operation of another of such members, the operation of such other member adapted to restore to its normal position the member first operated.

19. In an operator's ringing key, the combination with a supporting frame, of a plurality of actuating buttons, each having three distinct positions, a normal position, an indicating position, and an operative position, switch springs associated with each button, a cam adapted to be operated by each button when in its operative position, to operate the corresponding switch springs and means for releasing an actuated button from its indicating position.

20. In an operator's ringing key, the combination with a supporting frame, of a plurality of actuating buttons, each having

three distinct positions, a normal position, an indicating position, and an operative position, switch springs associated with each button, a cam adapted to be operated by each
5 button when in its operative position, to operate the corresponding switch springs, and a latch plate for retaining an actuated button in an indicating position, the operation of one of said actuating buttons serving to

release from such plate a previously actuated button. 10

In witness whereof, I hereunto subscribe my name this 18th day of May A. D. 1904.

MERRITT S. CONNER.

Witnesses:

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H. E. BALL.