No. 720,885. PATENTED FEB. 17, 1903.

G. L. BURLINGAME.

SELF INDICATING OPERATOR'S KEY.

APPLICATION FILED APR. 3, 1902.

NO MODEL.

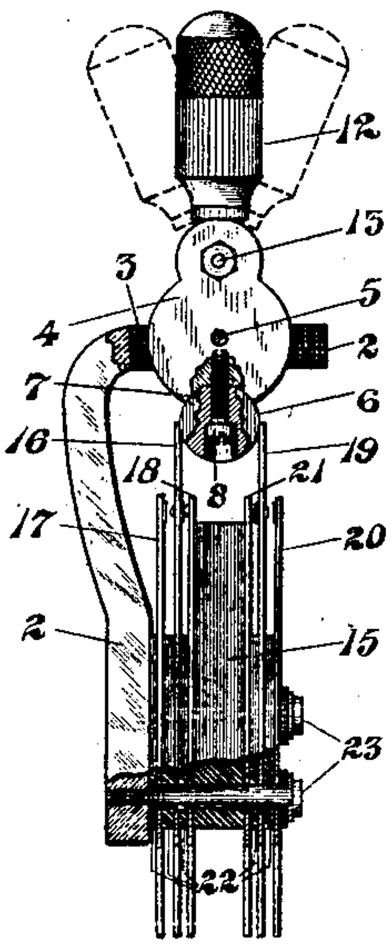

Fig. 1.

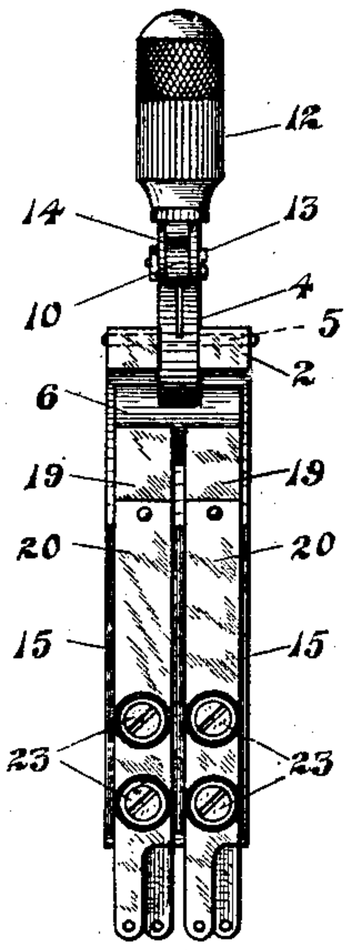

Fig. 2.

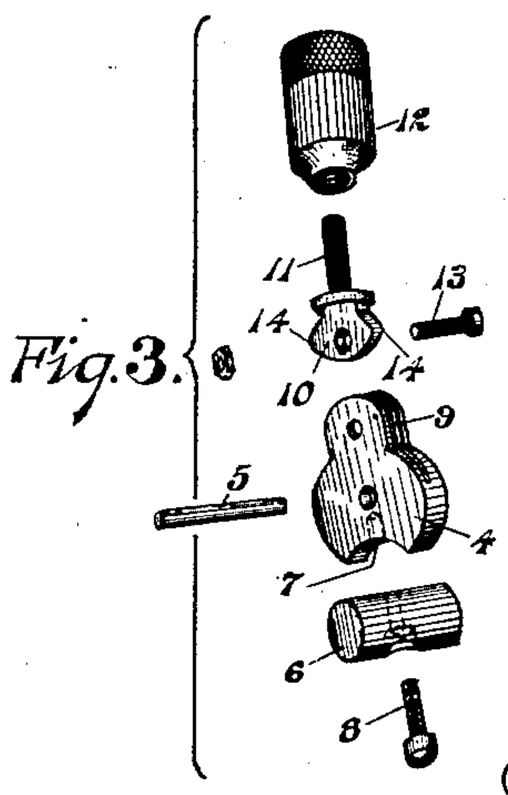

Fig. 3.

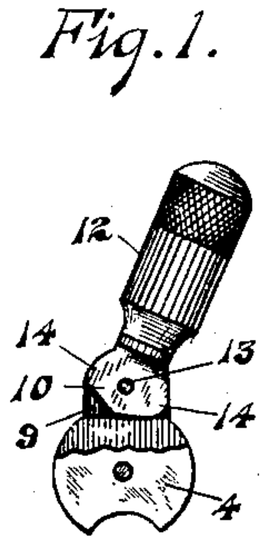

Fig. 4.

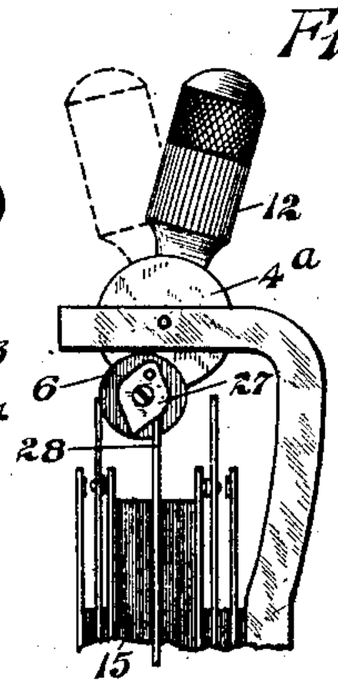

Fig. 6.

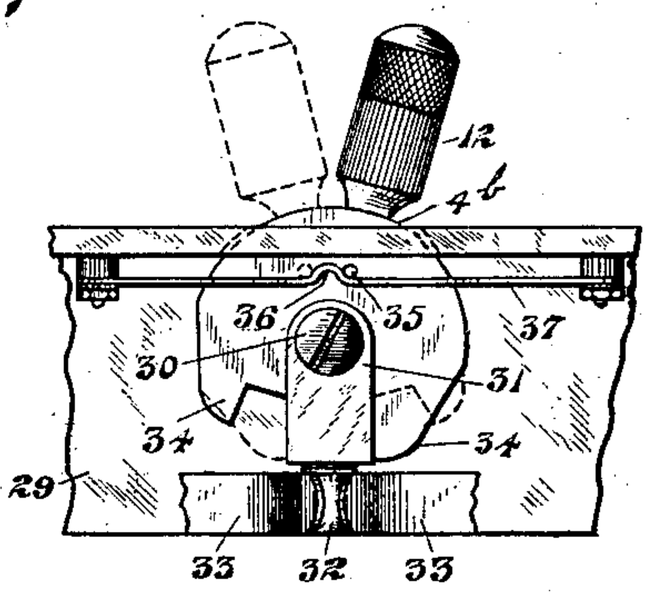

Fig. 7.

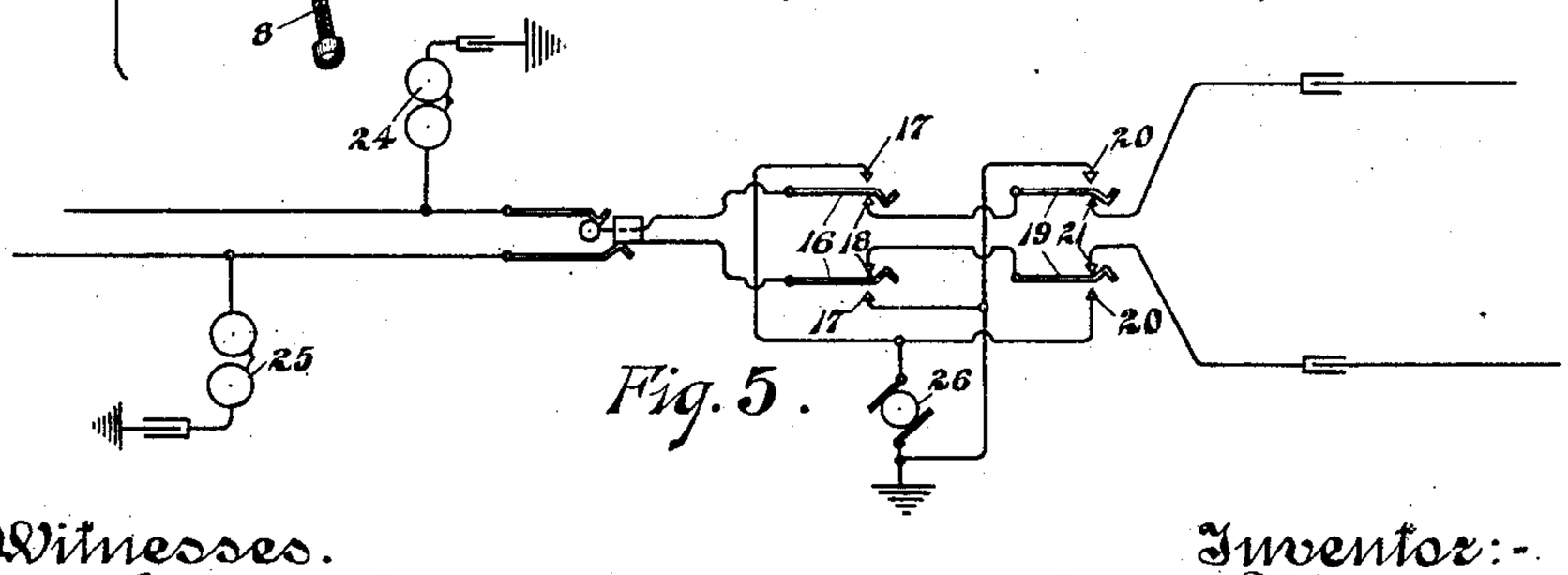

Fig. 5.

Witnesses.

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UNITED STATES PATENT OFFICE.

GEORGE L. BURLINGAME, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

SELF-INDICATING OPERATOR'S KEY.

SPECIFICATION forming part of Letters Patent No. 720,885, dated February 17, 1903.

Application filed April 3, 1902. Serial No. 101,170. (No model.)

To all whom it may concern:

Be it known that I, GEORGE L. BURLINGAME, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented a certain new and useful Improvement in Self-Indicating Operators' Keys, of which the following is a specification.

My invention relates to a self-indicating operator's key or switch for use particularly in telephone-switchboards, and has for its object the provision of a key or switch of the kind described which shall itself indicate the use to which it was last put, whereby the operator is relieved of all mental effort in remembering the same. Such a device is useful in selectively ringing or calling subscribers located on a party line. Heretofore a plurality of keys have been used for this purpose in association with a separate and distinct indicating mechanism which would show the key of the set last used, it being understood, of course, that each key rang a different subscriber upon the line, so that in case it became necessary for any reason, such as his failure to respond, to again ring the same subscriber the operator upon turning to the particular set of keys would immediately see which one to press. Such an arrangement, however, is objectionable on account of the expense involved in the indicating mechanism and the number of separate keys required and also on account of the room taken up thereby on the operator's keyboard.

My invention contemplates the use of a single key in place of the plurality of keys mentioned to call the several subscribers and means whereby the key itself indicates the substation last called. In accordance therewith I provide a single key-lever or apparatus adapted to be moved in different directions to actuate different sets of switch-contacts, so as to throw currents of different characters upon the line to call the different subscribers, together with means to indicate the direction the said lever or apparatus was last moved, whereby the operator may readily see which way to again operate it in case it becomes necessary or desirable to do so.

The invention further comprises the novel details of construction, parts, and combinations of parts hereinafter described, and particularly pointed out in the appended claims, reference being had to the accompanying drawings, forming a part hereof, in which the same reference characters designate like parts throughout the several views, and in which—

Figure 1 is a side elevation of a key embodying my invention. Fig. 2 is a similar view looking from the right-hand side. Fig. 3 represents a view of the parts of the key-lever detached. Fig. 4 is a detail view of the key-lever and handle. Fig. 5 is a diagrammatic view showing the use of the invention. Fig. 6 is a view of a modified form of key, and Fig. 7 is a view of still another modification.

In the figures the numeral 2 indicates the frame or support which is adapted to be secured to the switchboard-apron or other part in any desired manner, said frame or support comprising, preferably, a horizontal portion and a substantially vertical portion, as shown. In the horizontal portion a slot 3 is formed, in which the key-lever, or "cam," as it is sometimes called, is pivoted. Said lever comprises, as shown in Fig. 3, the disk-like portion 4, pivoted upon a pin 5, extending centrally through the same and through the frame, as shown in Figs. 1 and 2. This pivot permits the lever or cam to be suitably rocked in either direction, as hereinafter explained. A block of insulation 6, preferably cylindrical, is secured in a notch 7 in the lower edge of said disk 4 and is held in position therein by a suitable screw 8, passing through the same and threading into the disk 4. The block 6 is thus held transversely of the disk, as clearly shown, the head of screw 8 being countersunk, as shown in Fig. 1.

The upper part of the disk 4 is slotted, as at 9, and is arranged to receive the lower end of the operating-handle, which consists of the flattened head 10 of the screw 11, which is adapted to thread into the lower end of the handle 12, so as to form a strong connection therewith, said handle being preferably of hard rubber. The flattened part 10 of the

lever-operating handle is secured in the slot 9 by the screw or bolt 13, and while the same is permitted to move back and forth upon said screw the engagement between it and the sides of the slot 9 is close enough to cause the same to frictionally bind, and therefore prevent it from moving unless manually operated. The amount of independent vibration of the handle or the lost motion between it and the cam is determined by the shape of the edges of the portion 10. As shown in Fig. 4, the corners or portions 14 of the said edges strike the bottom of the slot 9 when the handle is tipped slightly to one side or the other from the vertical, whereby in the further movement of the handle the cam or lower part of the lever is pushed over.

Four sets of switch-springs are carried by the vertical portion of the frame or support 2, two sets side by side and the other two sets similarly located upon the opposite side of an insulating-block 15. The inner sets—that is, those nearer the frame—comprise a central long spring 16, placed between two other springs 17 and 18, while the outer sets comprise similar springs 19, 20, and 21. At their lower ends strips 22 of insulation separate the springs from each other and from the frame. Screws 23 extend through the opposed sets and the block 15 and thread into the frame to clamp the sets together and to the frame, the screws being suitably insulated throughout, as shown. The free ends of the long or center springs of the opposed sets stand upon opposite sides of the key-lever or cam-block 6 and tend to keep it in its central position. These springs normally contact with the inner springs of the sets; but when pressed outwardly they move out of contact therewith and into contact with the outer springs.

Fig. 5 indicates a circuit in which such a key is found useful. The subscribers' party line has one conductor connected through a bell 24 to ground at one substation and the other conductor through another bell 25 to ground at a different substation. The key is connected in the operator's cord-circuit, and the grounded generator 26 has its terminals connected with the outer springs of each set, the cord-circuit strands being normally completed through the inner springs and the long springs. Now when it is desired to call the subscriber having bell 24 the key is pressed toward the left, which connects the generator 26 and the bell 24 in a grounded circuit over the proper conductor and accomplishes the desired result. The key-handle in such movement takes up the lost motion between it and the lower part of the lever before said springs are operated, whereby when the handle is released and the springs 16 return the lower part of the lever to normal position the handle remains tipped or inclined to that side of the vertical. Now should the operator desire to again call the same subscriber the position of the handle will at once indicate to her the direction it was last pressed, and she knows that it is only necessary to press the key again in the same direction. She is thus relieved of all care and trouble in either remembering the same or in looking at any separate indicator.

Fig. 6 shows another species of my generic invention. In this case the handle 12 is rigidly connected with the cam-disk 4^a, and upon one end of the block 6, which is carried like the previously-described block, a pointed cam 27 is secured, as by means of a suitable screw and steady-pin. A flexible spring-wire 28 is mounted upon the key in any suitable manner, as upon the block 15, and its upper end stands in the path of the lower pointed end of the cam 27. When the lever is moved in one direction to operate one set of springs, the spring 28 will snap to one side of the cam 27 and will cause the handle to remain tipped in that direction when released, which thus indicates how last used. When operated in the reverse direction, the same operation takes place. Otherwise the construction is the same as in Figs. 1 to 4.

Fig. 7 shows another species of self-indicating cam-key which is within the limits of my generic invention. In this form the lever comprises a handle 12, secured rigidly to a flattened portion 4^b, pivoted upon a supporting-frame 29 by means of a screw 30. Said screw also joins the lower part 31 of the lever thereto which part consists of a forked member in which the portion 4^b vibrates and a downwardly-extending stem carrying a block or roller 32 of insulation adapted to separate suitable horizontally-disposed contact-springs 33 to make the desired circuit changes. The disk of flattened portion 4^b is provided with projections 34, adapted to engage the opposite edges of the forked member 31 and to carry the roller 32 between the ends of the switch-springs 33 against the inwardly-exerted tension thereof. These projections permit a certain amount of lost motion between the handle and cam-fork 31, whereby when the handle is pressed to one side or the other of the vertical and is then released it remains inclined to that side until manually changed. To insure the handle remaining tipped to one side, a pin 35 projects from the side of the part 4^b, which engages with a raised portion 36 in the spring 37, supported at its ends upon the frames 29. When the handle is moved from one side to the other, the pin 35 rides over the bend 36 in the spring 37. When released, the handle remains upon the side to which it was last moved by the bend 36 and the pin 35.

It is thus apparent that the invention may be embodied in many mechanical forms, and I therefore do not wish to be limited in all its features and in all the claims to the exact construction shown; but,

Having thus described my invention and several ways of carrying the same into practical effect, what I claim, and desire to secure by Letters Patent, is—

1. In a self-indicating operator's key, the combination with a key-lever, of a plurality of sets of switch-contacts adapted to be operated thereby, and means actuated wholly by said key-lever to indicate the last set operated by said lever and returned to normal position, substantially as described.

2. In a self-indicating operator's key, the combination with a key-lever, of a plurality of sets of switch-contacts adapted to be operated thereby, and means whose operation depends entirely upon said key for indicating the last set operated and returned to normal position by the lever, substantially as described.

3. A self-indicating operator's key, comprising a key-lever and a plurality of sets of switch-contacts adapted to be opened and closed thereby, and means for causing the lever itself to indicate the last set of contacts so opened and closed, substantially as described.

4. A self-indicating operator's key, comprising a key-lever and a plurality of sets of switch-contacts adapted to be operated by said lever to make the desired circuit changes and to be again restored to normal position after such operation, and means to cause the lever itself to indicate the last set of contacts so operated and returned to normal position by the said lever, substantially as described.

5. A self-indicating operator's key, comprising a key-lever and a plurality of sets of switch-contacts adapted to be operated by said lever to make the desired circuit changes and to be again restored to normal position after such operation, and means to cause the lever itself to indicate the last set of contacts so caused to pass through a complete cycle of changes by the said lever, substantially as described.

6. A self-indicating operator's key, comprising a plurality of sets of switch-contacts, a key-lever adapted to be moved into different positions to operate said sets, and means actuated by the operation of the key-lever to cause said lever to indicate the direction in which it was last moved, said indication continuing after the return of the switch-contacts to normal position, substantially as described.

7. A self-indicating operator's key, comprising a plurality of sets of switch-contacts, a key-lever adapted to be moved into different positions to operate said sets, said lever having a certain amount of lost motion between its switch-operating positions, and means to utilize said lost motion to indicate the position into which the lever was last moved, substantially as described.

8. A self-indicating operator's key, comprising a plurality of sets of switch-contacts, a key-lever adapted to be moved in different directions to operate said sets, said key-lever having a certain amount of lost motion between its switch-operating positions, whereby the handle of the lever remains on the side of the central position to which it was last moved to act as a visual indicator of the switch-contacts last operated, substantially as described.

9. A self-indicating operator's key, comprising a plurality of sets of switch-contacts, a pivoted key-lever adapted to be tipped in different directions to open and close said contacts, and means to cause the handle of the lever to remain tipped in the direction in which it was last used to so open and close the switch-contacts to serve as a visual indicator of the switch last operated, substantially as described.

10. A self-indicating operator's key, comprising a plurality of sets of switch-contacts, a pivoted key-lever adapted to be tipped in different directions to operate said contacts, said lever having its handle connected with its contact-operating part by means of a loose joint, whereby when the lever has been used to operate a set of contacts, the handle remains inclined in the direction in which the lever was last used.

11. A self-indicating operator's key, comprising a frame, a jointed key-lever pivoted in said frame and carrying a cam at its lower end, and a handle at its upper end and projecting above the frame, said lever having a small amount of lost motion between its jointed parts, and sets of switch-springs mounted upon the frame and arranged to be operated by said cam when the lever is moved in different directions, the said lost motion permitting the handle to remain tipped to the side in which the lever was last operated, substantially as described.

12. The combination with an operator's ringing-key having an operating-lever and a plurality of sets of switch-contacts adapted to be operated by said lever, of a source of ringing-current connected with each said set of contacts, and means to cause the lever itself to indicate the last set operated after the contacts have returned to normal position, substantially as described.

13. The combination with a circuit, of a plurality of signal-receiving devices thereon, a selective ringing-key adapted to be connected with said circuit to selectively operate said devices, said key having an operating-lever and a plurality of sets of switch-contacts operated thereby, and means to indicate by the position of the lever itself and after the switch-contacts have passed through a complete cycle the last set of contacts so operated thereby, substantially as described.

14. An operator's connective circuit and apparatus comprising connecting-plugs and cord-strands connected with the contacts of said plug and extending therebetween, a ringing-key having a comparatively narrow frame to permit the installation of a ringing-key for each cord-circuit, said key having a plurality of sets of switch-contacts, the normal contacts of said sets being included in the circuit of said strands between the connecting-plugs, and the alternate contacts of said sets being connected with a ringing-generator, and

means to cause the lever of said key to indicate the last set of contacts operated thereby after the contacts have returned to non-operative position, substantially as described.

15. A self-indicating operator's key comprising a plurality of sets of switch-contacts, a key-handle adapted to be moved into different positions to operate said sets, said handle having a certain amount of lost motion between its switch-operating positions, and means to utilize said lost motion to cause the handle itself to indicate the switch-operating position into which it was last moved, substantially as described.

16. A self-indicating operator's key, comprising a key-lever and a plurality of sets of switch-contacts adapted to be operated by said lever to make the desired circuit changes and to be again restored to non-operating position after such operation, and means to cause the lever itself to indicate the last set of contacts so operated and returned to non-operating position by the said lever, substantially as described.

17. An operator's indicating ringing-key switch comprising a frame having a horizontal portion, a key-lever pivoted upon said frame and having an operating-handle projecting above the said horizontal portion, a plurality of sets of switch-springs carried by the frame beneath the said horizontal portion, said springs being flat metallic strips suitably insulated from each other and having their free ends disposed in operative position with respect to said lever so as to be operated thereby when the handle thereof is tipped in one direction or the other, said handle having an initial movement in either operating direction before operating said springs, and means whereby the handle remains in the direction last moved when pressure is removed therefrom and the springs have returned to normal.

18. An operator's indicating ringing-key switch comprising a metallic frame having a horizontal portion and a pendent portion, a key-lever pivoted in said horizontal portion and having an operating-handle projecting above the same and a switch-operating portion projecting below the same, a plurality of sets of vertically-arranged switch-spring strips carried by said pendent portion and having their free ends disposed in operative position with respect to the lower portion of said lever, the handle of said lever having a free movement in either switch-operating direction before operating the switch-springs, and means whereby said handle remains in the direction last moved when pressure is removed therefrom and the springs have returned to non-operating position, substantially as described.

19. An operator's indicating ringing-key switch comprising a frame consisting of a metal bar having a horizontal portion and a vertically-disposed portion, a key-lever pivoted in said horizontal portion and having an operating-handle above the same and a switch-operating portion below, a plurality of sets of switch-spring strips vertically arranged and secured at their lower ends to said vertical portion of the frame, said strips being suitably insulated from each other and from the frame and having their free ends standing in operative relation with respect to said switch-operating part of the lever, the handle of said lever having a limited free initial movement in the switch-operating directions before operating said springs, and means whereby when pressure is removed from the handle after the operation and return to normal, of a set of springs it indicates the last set operated, substantially as described.

20. An operator's indicating-key switch comprising a frame consisting of a metal bar bent to form a horizontal portion and a depending vertical portion, the said vertical portion being bent so that its lower end stands beneath the said horizontal portion, a plurality of sets of vertically-arranged switch-springs, strips carried by said lower end, each set consisting of three flat strips placed face to face with insulating-strips therebetween and two such sets being placed side by side against said lower end with insulating-strips between said sets and the said end, a heavy bar of insulation placed upon the other side of said sets from the said end and a second pair of sets side by side upon the other side of said bar, screws passing through said sets, bar and strips to secure them together and to the said end, said insulating-bar serving to support the inner springs of the sets, the central springs normally engaging said inner springs and extending beyond the other springs at their free ends, a key-lever pivoted in said horizontal portion and having an indicating-handle projecting above the same and a transverse insulating member below the same and between the said extended ends of the said sets, the said handle having a limited movement to either side before operating said member to move the middle springs from contact with the inner springs to contact with the outer springs, the said limited movement permitting the handle to remain in the direction last moved after the pressure is removed therefrom and the springs have returned to normal, substantially as described.

21. An operator's indicating-key switch comprising a frame having a horizontal portion, switch-contacts carried on the frame, a key-lever pivoted on the frame and having an operating-handle projecting above the horizontal portion and a switch-operating member beneath the same, said lever consisting of two parts, one of said parts being forked or yoked and the other fitting into said fork or yoke and pivoted therein, said latter part having stops to permit tipping the handle in one direction or the other a limited distance without movement of the lower part and then to engage with the said other part and move

the said lower part to operate a set of said switch-contacts, said limited movement permitting the handle to remain in the direction last moved when pressure is removed therefrom.

22. An operator's indicating-key switch comprising a frame, a key-lever consisting of a portion pivoted in said frame and carrying upon its lower end a switch-operating member and having an upper forked end, a handle pivoted in the said forked end and having stop portions arranged to permit the same to be moved in either direction a limited distance without operating said other and pivoted portion, and switch-springs beneath the horizontal portion of the frame and in position to be operated by said lever, substantially as described.

23. An operator's indicating-key switch comprising a frame having a horizontal plate, a key-lever having a flattened portion pivoted in a slot in said plate, a transverse insulating member carried at the lower end of said pivoted portion beneath said plate, a pair of sets of switch-springs also beneath said plate upon each side of said pivoted portion and having their free ends extending into proximity with said insulating member, said pivoted portion having a slotted upper end, a handle having its lower end pivoted in said slot, the said lower end being formed upon each side of the pivot to engage the bottom of the said slot to act as a stop, said stops serving to permit a limited relative movement of the handle and pivoted portion and then limit the said movement.

24. An operator's indicating-key switch comprising the combination with a switch-key, of a set of switch-contacts adapted to be operated by said key and to be again restored to normal position after such operation, means whereby the key itself indicates when the said contacts have been so operated and returned to normal position, a second set of switch-contacts adapted to be operated and again restored to normal position, means for so operating and then returning the said second set of contacts to normal position, and further means to destroy said first-mentioned indication when said second set of contacts is operated and to establish a second indication to indicate that said second set of contacts has been operated and returned to normal position, substantially as described.

25. In an operator's indicating ringing-key switch, a manually-operated switch-key having a pressure-button, a set of switch-contacts adapted to be operated by said key and to be again restored to inoperative position, the pressure-button of said key having an initial movement in its operating direction before the said contacts are actuated, and means for preventing said button from returning to its initial position when the pressure is removed therefrom and the said contacts have returned to inoperative position, whereby the said button indicates by its retained position that the said contacts have been so operated and returned, substantially as described.

26. In an operator's indicating ringing-key switch, the combination with a set of switch-contacts adapted to be operated and to be again returned to inoperative position, of a manually-operated key to so actuate said contacts and provided with a handle, means to cause said handle to move a limited distance when pressure is applied thereto to operate said contacts before operating the same, and further means to prevent the return of said handle to initial position after the said contacts have been so operated and again returned to normal inoperative position, whereby the said handle indicates by its retained position that the said contacts have been so operated and returned, substantially as described.

27. In an operator's indicating ringing-key switch, the combination with a frame having a horizontal top, of a set of switch-contacts carried by the frame beneath the top and adapted to be operated and again returned to normal position, a key to so actuate said contacts, said key extending through said top and having a pressure-button above and a contact-operating part below the same, said button having an initial movement when pressure is applied thereto before the said contacts are operated, and means whereby the said button remains out of its initial position after the pressure is removed therefrom and the said contacts have been operated and returned to normal position to indicate that the said contacts have been thus actuated, substantially as described.

28. In an operator's indicating ringing-key switch, the combination with a frame having a horizontal top, a set of switch-springs vertically arranged and carried by the frame beneath the said top and adapted to be operated and to be again returned to normal position, a key to so actuate said springs passing through said top and carrying a pressure-button at its upper end and a switch-operating member below the top and in proximity to the free ends of said springs, said button having a limited free movement when depressed before the said member engages to so operate said springs and then return them to normal position, and means for retaining said button depressed from its initial position when the pressure is removed therefrom and the said springs have been operated and returned to their normal inoperative position, whereby the button indicates by its retained position that the said contacts have been thus actuated, substantially as described.

29. In an operator's indicating ringing-key switch, a switch-key, a set of switch-contacts adapted to be operated thereby and to be again returned to inoperative position, said key being provided with a pressure-button

having a limited initial movement when pressure is applied thereto before the said switch-contacts are so operated and returned to normal position, means to prevent said button from returning to its initial position when pressure is removed therefrom and the said contacts have been operated and returned to inoperative position, whereby the button indicates by its retained position that the said contacts have been thus actuated, other switch-contacts of the key-switch also adapted to be operated and to be again returned to normal position, means to so actuate said other contacts, and further means whereby said first indication is destroyed when the said other contacts are so operated and returned to inoperative position, substantially as described.

30. In an operator's indicating ringing-key switch, a manually-operated switch-key, a set of switch-contacts adapted to be operated thereby and to be returned to inoperative position, said key being provided with a pressure-button having a limited initial movement when pressure is applied thereto before the said switch-contacts are so operated and returned to normal position, means to prevent said button from returning to initial position when the pressure is removed therefrom and the said contacts have been so operated and returned to inoperative position whereby said button indicates by its retained position that the said contacts have been thus actuated, a second set of switch-contacts of the key-switch adapted to be operated and to be again returned to inoperative position, means to thus actuate said second set, and further means whereby said first indication is retired when the said second set is operated and a second indication given that said second set has been completely operated, substantially as described.

31. In an operator's indicating ringing-key switch, the combination with a frame having a horizontal top plate, of a vertically-arranged set of switch-springs carried by said frame beneath the top plate and adapted to be operated and again returned to inoperative position, a key extending through said top plate and having a pressure-button above the same and a spring-engaging part below the said top plate to thus actuate said springs, said button having a limited initial movement before so operating said springs when pressure is applied thereto for the purpose, means to retain the said handle out of its initial position and in the direction in which it was initially moved to actuate said springs when pressure is removed therefrom and the said springs have been so operated and returned to normal position, its handle thus indicating by its retained position that the said contacts have thus been completely actuated, additional springs likewise carried by the frame beneath the top plate and adapted to be also operated and again returned to normal position, means to thus actuate said additional springs, and means whereby said first indication is retired when said additional springs are operated and a second indication established to indicate that said additional springs have been so operated and returned to normal position, substantially as described.

Signed by me at Chicago, county of Cook, State of Illinois, this 29th day of March, 1902.

GEORGE L. BURLINGAME.

Witnesses:
ROBERT LEWIS AMES,
T. W. DUNBAR.