

L. A. WILLIAMS.
SWITCHING KEY.
APPLICATION FILED JULY 23, 1909.

958,453.

Patented May 17, 1910.

2 SHEETS—SHEET 1.

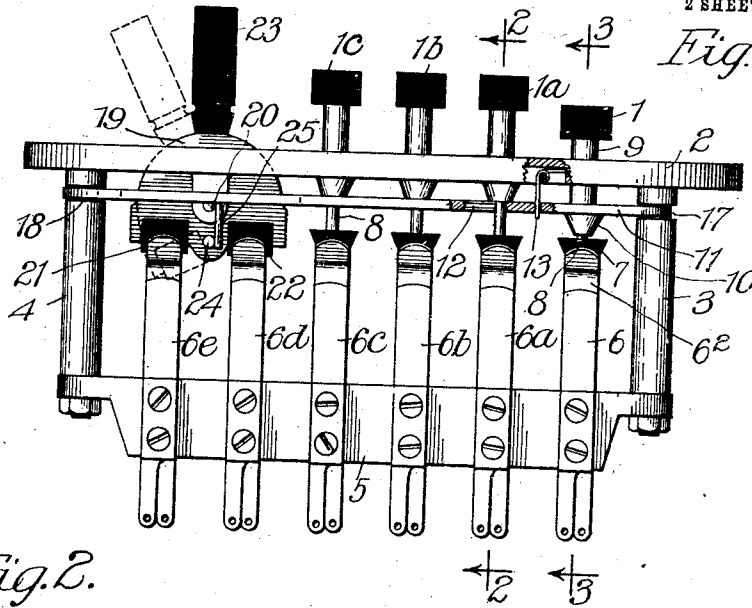


Fig. 2.

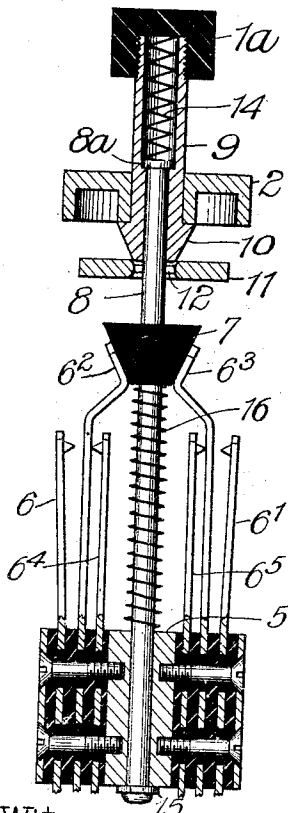


Fig. 3.

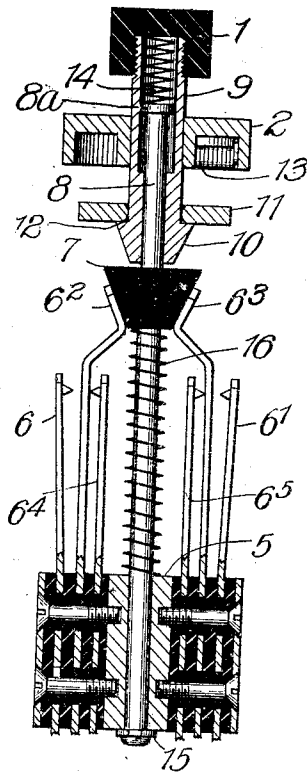
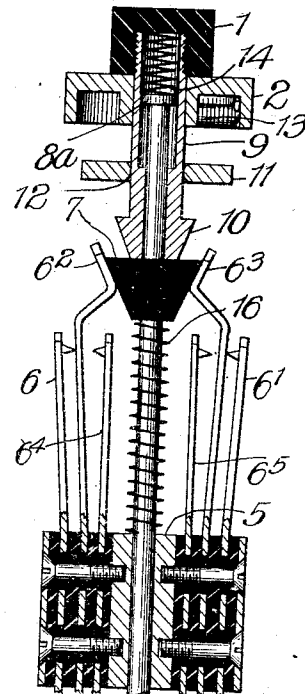


Fig. 4.



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SWITCHING-KEY.

958,453.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, LYNN A. WILLIAMS, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Switching-Keys, 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 operators' switching keys used in connection with telephone systems for the purpose of applying ringing current to party lines.

My invention is adapted for use in connection with that system of ringing in which a ringing key or switch is provided for each party connected to a party line, such switch operating to directly connect a source of ringing current to the cord circuit connected with the line in such a way that only the corresponding subscriber is signaled.

My invention consists essentially in providing a key construction by which a selecting or ringing button may be depressed from a normal to an indicating position, in which it is retained until subsequently released without actuating the ringing cam associated therewith. Continued motion of the depressed button from its indicating position to its ringing position carries with it the ringing cam and operates the corresponding switch springs. When the button is released, the ringing cam is returned to its normal position and the button returned to its indicating position. Upon the operation of a second button, the first button is released from its indicating position and returns to its normal position. In this way, I have provided a mechanism in which the button last operated is positively indicated. Furthermore, this indicating mechanism is so constructed as to be entirely independent of the ringing mechanism associated with the several buttons, as a result of which, if, for any reason, it is desired to change the indicating condition of the ringing keys without ringing a subscriber, this may be accomplished without the danger of accidentally applying ringing current to the calling end of the cord.

The several drawings illustrating my invention are as follows:

Figure 1 is a side view of my improved switching mechanism complete, and shows four ringing or selecting buttons mounted upon a frame carrying an operator's listening key; Fig. 2 is a vertical sectional view, taken along the line 2, 2 in Fig. 1; Fig. 3 is a vertical sectional view, taken along the line 3, 3 in Fig. 1; Fig. 4 is a view similar to Fig. 3, and shows the position of the parts when the actuating button is in its ringing position; Fig. 5 shows in diagrammatic arrangement a cord circuit, with which the switching mechanism shown in Fig. 1 is so connected that the ringing buttons operate to directly connect a desired ringing generator to the calling end of the cord circuit.

As shown in Fig. 1, a plurality of buttons 1, 1^a, 1^b, 1^c, are mounted in a plate 2 forming the top of the key frame. From the ends of this plate 2 posts 3 and 4 extend downward, and have secured between their lower ends a vertically disposed plate 5, to the sides of which, but insulated therefrom, a series of switching springs is secured, as indicated at 6, 6^a, 6^b, 6^c. Each of these sets of switching springs consists of six springs, as indicated in Fig. 2, three of which are disposed on each side of the plate 5. Each set of springs consists of two make contacts 6 and 6^a, two switching springs 6² and 6³ for changing the circuit conditions, and two break contacts 6⁴ and 6⁵. The switching springs 6² and 6³ are extended upward above the make and break contacts, and conformed to engage a cam 7 secured to a rod 8, the lower end of which extends through the plate 5 and the upper end of which extends into the tube 9 carrying at its upper end the button 1.

The tube 9 is guided by the top plate 2 of the frame, and such tube carries at its lower end a cam 10, adapted, when the tube and button are depressed, to move a latch plate 11 longitudinally to the right, as indicated in Fig. 1, in order that the cam 10 may pass through an opening 12 provided in the locking plate for the purpose. When the cam 10 has passed through the opening 12, a spring 13 serves to return the locking plate to its

left hand position above the cam 10 and to lock the tube 9 and the button 1 in a partially depressed position, as indicated at 1 in Fig. 1, which position serves as an indicating position to show either that the switch springs associated with this button have been operated or are to be operated. The upper end of the tube 9 is counterbored somewhat larger than the rod 8, to accommodate the enlarged upper end 8^a of such rod, which prevents the rod 8 from passing downward to the lower end of the tube 9. A spring 14 is provided in the upper end of the tube 9 between the enlarged portion 8^a of the rod 8 and the button 1, which spring tends to maintain the button 1 in its upper or normal position, when the cam 10 is not in engagement with the locking plate 11. The lower end of the rod 8 carries a washer 15, which is secured upon the rod by riveting, and prevents the rod 8 and cam 7 from being moved above their normal position relative to the switch springs 6² and 6³. A spring 16, located around the rod 8 between cam 7 and the plate 5 tends to maintain the cam 7 in its normal position, which tendency is assisted by the normal action of the springs 6² and 6³ upon such cam.

The locking plate 11 is provided with an opening 12 for each of the cams 10 and with a slot at each end, the latter adapted to engage grooves 17 and 18 cut in the posts 3 and 4, to guide the plate as it moves to lock the operated buttons. At the left hand end of the plate 2 and its under side, an operator's listening cam 19 is pivoted at 20, as indicated. This cam carries rollers 22 and 21 adapted to operate switch springs 6⁴ and 6⁵, similar to the switch springs already described, the only difference being that when the handle 23 is moved from its vertical position to the left, to the listening position, as indicated in dotted lines in Fig. 1, the roller 21 so engages the switch springs as to be locked in its operated position. The switch springs 6⁴ are provided in order that they may be used for private line ringing if desired.

The cam 19 carries a pin 24 projecting toward the observer, as shown in Fig. 1, which pin 24 engages a pin 25 extending downwardly from the locking plate 11. The pins 24 and 25 cooperate in such a manner that the locking plate 11 is moved to the right when the handle 23 is moved from its vertical position to the left, as indicated in Fig. 1, and therefore such motion of the handle 23 serves to release any of the buttons 1, 1^a, 1^b, 1^c that may have been in engagement with the locking plate at this time. This is to be desired when the switch is used for connecting any desired ringing condition directly to the line, since

the act of listening in, by the operator in answering a call, should restore all of the buttons to their normal position, in order to be ready to select the ringing condition required by the call. The pins 24 and 25 also cooperate to throw the handle 23 from its left hand position, as shown in Fig. 1, to its vertical position, if one of the buttons 1, 1^a, 1^b, 1^c is depressed when the handle 23 is in its left hand position.

It is apparent that while under certain conditions of operation the pins 24 and 25 are useful in performing functions indicated above, under other conditions these results may not be desired, and therefore these pins may be dispensed with.

From the construction described above, it follows that when the operator has occasion to ring a desired party as a result of a call received, the depression of one of the buttons 1, 1^a, 1^b, 1^c first moves the corresponding cam 10 into engagement with the locking plate 11 against the action of the spring 14. The spring 16 is stiff enough to prevent the cam 7 being moved from its normal position by this step in the operation of the switch. Continued motion of the button 1 from its indicating to its ringing position moves the cam 7 downward, as a result of the engagement with it of the cam 10, and this motion spreads the springs 6² and 6³ apart and breaks connection between them and the contacts 6⁴ and 6⁵ respectively, and makes connection between them and the contacts 6 and 6¹ respectively. When the button 1 is released, the spring 16 and the action of the springs 6² and 6³ upon the cam 7 returns such cam to its normal position, and at the same time the cam 10 is moved upward by the action of the springs 16 and 14 until the cam 10 is in engagement with the under side of the locking plate 11, in which position it is retained until the locking plate is moved to the right by the operation of another button, which serves to disengage it.

Fig. 5 shows in diagrammatic circuit arrangement the connection of the key mechanism shown in Fig. 1 to an operator's cord circuit for the purpose of impressing upon the calling plug ringing current having characteristics necessary to selectively operate any of the subscribers connected to a party line. The cord circuit shown is provided with an answering plug P and a calling plug P¹, connected by cord strands 26 and 27, which are divided into two portions by the condensers 28 and 29. The listening springs 6⁵ of the mechanism shown in Fig. 1 are connected across the answering end of the cord strands 26 and 27. The operating springs of the switches 6, 6^a, 6^b, 6^c and 6^d are serially included with the back contacts of the corresponding springs in the calling

end of the cord strands 26 and 27. The make contacts associated with the upper operating springs of the switches 6, 6^a, 6^b and 6^c are tied together, and connected by wire 30 through non-inductive resistance 31 to ground 32. The make contacts associated with the lower operating springs of the switches just mentioned are connected to the generators 33, 34, 35 and 36, respectively, the other terminals of which are connected together and to ground 37. The make contacts of the switch 6^d are connected to the terminals of the generator 38.

The generators 33, 34, 35 and 36 represent diagrammatically any generator arrangement adapted to supply ringing current of different kinds to the calling plug P¹, in order that a desired subscriber connected to a called party line may be signaled.

From the circuit connections above described, it is apparent that during the operation of any one of the ringing switches or keys 6, 6^a, 6^b or 6^c, the cord strands 26 and 27 are opened and the generator 33, 34, 35 or 36, corresponding to the ringing key operated, is connected to the calling plug P¹ and thus operates to send current having the desired characteristics over the line with which the calling plug is connected. The generator 38 is adapted for private line ringing and is connected to the ringing key 6^d, in order that the single operating lever 23 may be used both for listening and ringing when connection is made with private lines. The ringing key 6^d, by its operation, also opens the cord strands 26 and 27, and connects the generator 38 to the calling plug P¹.

While I have shown my invention in the particular embodiments herein described, I do not, however, limit myself to these constructions, but desire to claim any equivalents that will suggest themselves to those skilled in the art.

What I claim is:

1. In a switching key, the combination of a plurality of actuating buttons each having a normal, an indicating and a ringing position, means for moving each button to its normal position when released, a ringing cam having normal and operating positions associated with each button, switch springs adapted to be operated by such cams, and means for locking an actuated button in its indicating position without moving the corresponding ringing cam from its normal position.

2. In a switching key, the combination of a plurality of actuating buttons each having a normal, an indicating and a ringing position, means for moving each button to its normal position when released, a ringing cam having normal and operating positions associated with each button, switch springs

adapted to be operated by such cams, and means for locking an actuated button in its indicating position without moving the corresponding ringing cam from its normal position, such locking operation serving to release a previously actuated button.

3. In a switching key, the combination of a plurality of actuating buttons each having a normal, an indicating and a ringing position, means for moving each button to its normal position when released, a ringing cam having normal and operating positions associated with each button, switch springs adapted to be operated by such cams, and means for locking an actuated button in its indicating position, motion of one of such buttons from its indicating to its ringing position serving to move the associated ringing cam from its normal to its operating position.

4. In a switching key, the combination of a frame, a plurality of actuating buttons each adapted to assume a normal, an indicating or a ringing position, and a locking plate adapted to retain a button when moved to its indicating position, each button having associated with it the following instrumentalities,—a locking cam connected with such button, a first spring tending to maintain the button in its normal position, a plunger having normal and ringing positions, an operating cam carried by the plunger, switch springs adapted to be actuated by the operating cam, and a second spring tending to maintain the plunger in its normal position.

5. In a switching key, the combination of a frame, a plurality of actuating buttons each adapted to assume a normal, an indicating or a ringing position, and a locking plate adapted to retain a button when moved to its indicating position, each button having associated with it the following instrumentalities,—a locking cam connected with such button, a plunger having normal and ringing positions, a first spring between the button and the plunger tending to maintain the button in its normal position, an operating cam carried by the plunger, switch springs adapted to be actuated by the operating cam, and a second spring of greater stiffness than the first spring tending to maintain the plunger in its normal position.

6. In a switching key, the combination of a frame, a plurality of actuating buttons each adapted to assume a normal, an indicating or a ringing position, and a locking plate adapted to retain a button when moved to its indicating position and to release a previously actuated button, each button having associated with it the following instrumentalities,—a downwardly extending tube terminating at its lower end in a locking

cam, a plunger extending downward from
within the tube and guided at its lower end
by the frame, an operating cam carried by
the plunger having normal and ringing po-
5 sitions, switch springs supported by the
frame adapted to be actuated by the operat-
ing cam, a first spring in the tube tending to
maintain the button in its normal position,
and a second spring around the plunger be-

tween the operating cam and the frame, such 10
second spring being stiffer than the first
spring.

In witness whereof, I hereunto subscribe
my name this 20th day of July, A. D. 1909.

LYNN A. WILLIAMS.

Witnesses:

ALBERT G. McCALEB,
A. A. THOMAS.