No. 836,067. PATENTED NOV. 13, 1906.

W. W. DEAN.

OPERATOR'S RINGING AND LISTENING KEY.

APPLICATION FILED JUNE 20, 1902.

Fig. 1.

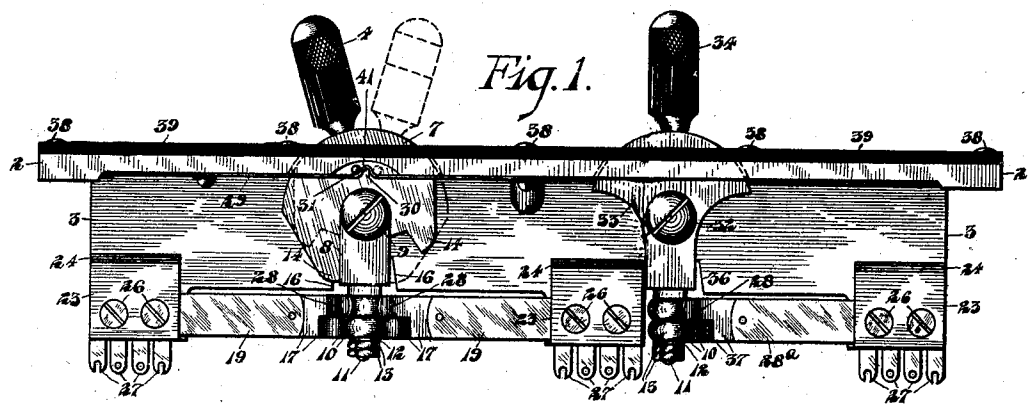


Fig. 2.

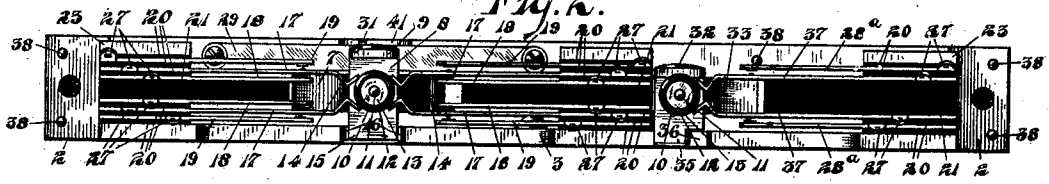


Fig. 3.

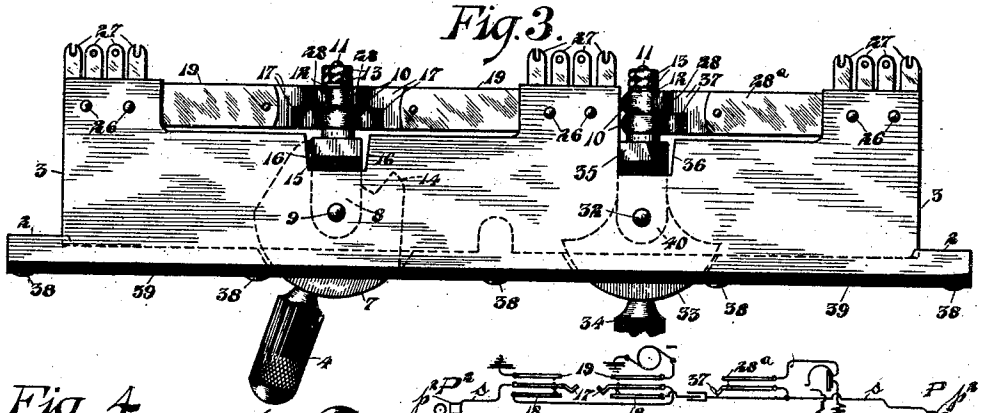


Fig. 4.

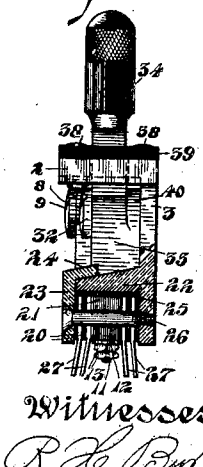


Fig. 5.

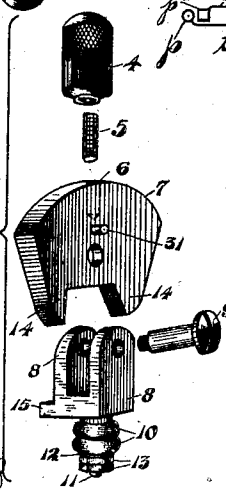


Fig. 6.

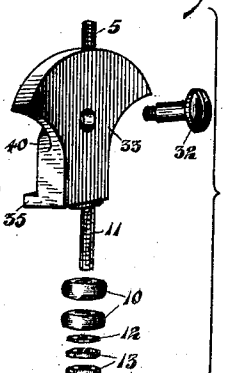


Fig. 8.

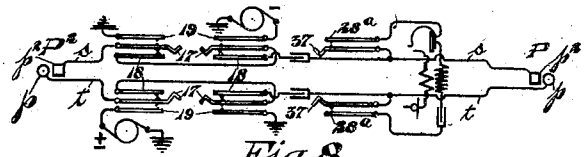
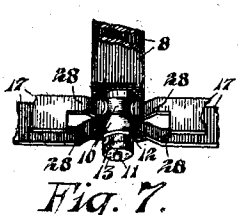


Fig. 7.



Witnesses.

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# UNITED STATES PATENT OFFICE.

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## OPERATOR'S RINGING AND LISTENING KEY.

No. 836,067. Specification of Letters Patent. Patented Nov. 13, 1906.

Application filed June 20, 1902. Serial No. 112,436.

*To all whom it may concern:*

Be it known that I, WILLIAM W. DEAN, 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 Operators' Ringing and Listening Keys, of which the following is a specification.

My invention relates primarily to improvements in operators' ringing and listening keys, although some of its features are of more general application.

My especial object is to provide a key of the kind described that is convenient to install, use, inspect, and repair; that is strong, durable, and efficient in operation, and one that is simple, comprises few parts, and is comparatively inexpensive to manufacture.

Referring to the accompanying drawings, forming a part hereof, in which the same reference characters designate like parts throughout the several views, Figure 1 is a side view of the invention. Fig. 2 is a bottom plan view. Fig. 3 is a view of the opposite side of the invention from that shown in Fig. 1, the same being placed in the position shown for the sake of clearness. Fig. 4 is a view of the right-hand end of the key, parts being in section. Fig. 5 is a view of the detached parts of the indicating-key. Fig. 6 is a like view of the listening-key. Fig. 7 is a detailed view of the switch, springs, and rollers; and Fig. 8 is a diagram of the circuits involved.

The metallic frame of the device consists of a horizontal portion 2 and a vertical portion 3, depending from one side edge of the same, as clearly shown in Fig. 4, these portions being preferably cast or drawn integrally, although other methods may be resorted to in their manufacture.

The ringing-key lever, which is of the self-indicating type, is preferably located near one end of the frame of the key and comprises a hard-rubber handle 4, threaded upon a stud 5, which is in turn threaded into an aperture 6 in the upper edge of the flattened part 7 of the upper member of the jointed key-lever. These parts are all rigidly secured together and constitute the upper member of the jointed key-lever.

The lower member of the key-lever comprises a yoke-shaped or forked part 8, between the vertical arms of which the flattened part 7 is pivoted upon a screw 9, passing therethrough and into the vertical portion 3 of the frame to form a pivotal support for both members of the key-lever. The upper edge of this part 7 is curved concentrically with the pivot-screw 9 and projects slightly above the top of the horizontal part 2 of the frame, the aperture through the latter being formed to closely fit about the sides and edges of the part 7 to prevent the passage of dust through the aperture and to present a neat appearance.

The rollers 10, employed to operate the switch-springs, as hereinafter explained, are mounted upon a pin 11, such as is shown more clearly in Fig. 6, depending from the yoke 8, a suitable washer 12 and nuts 13 at the lower end of the pin 11 serving to secure the rollers 10 thereon.

In order to provide a certain amount of lost motion between the upper and lower members of the key-lever, a notch is formed in the lower edge of the flat portion 7, into which the yoke 8 extends, so that the projecting portions 14 stand upon either side of the transverse portion of the said yoke, whereby when the handle is tipped in one direction or the other the projections 14 strike against the yoke 8 and force the lower member of the lever in the proper direction. These projections 14 are far enough apart, as shown in Figs. 1 and 3, to provide for a small amount of lost motion between the two members of the key-lever, whereby the handle 4 must be moved to one side or the other of the central and vertical position to actuate a set of switch-contacts, as hereinafter explained.

A projection 15 is carried upon the inner side of the yoke 8, which extends into a notch 16, cut in the vertical portion 3 of the frame. This projection operates as a stop to limit the extent of vibration of the lower member of the key-lever by striking against the edges of the notch 16.

The switch-springs are mounted horizontally upon the lower part of the vertical portion 3 of the frame of the device. As the ringing-key is intended for a double key—that is, for operating two sets of ringing switch-contacts—duplicate sets are provided,

one set to be actuated in one direction of movement of the key-lever and the other set to be actuated in the opposite movement.

As shown in Fig. 2, each set comprises two groups of springs, each group having a central spring 17, normally resting in contact with an inner spring 18, but adapted to be disengaged therefrom and pressed into contact with the outer spring 19 by means of the key-lever. These springs are rigidly secured at their rear ends to the frame and are suitably insulated therefrom and from each other by insulating-strips 20, a heavy insulating-strip 21 serving to separate the groups and extending forward to support the inner springs 18. These springs are firmly secured to the frame by the means shown more clearly in Fig. 4, although the particular set of springs shown in this figure are those used for "listening in" and are located at the opposite end of the frame. A projecting ledge 22, with a slanting or beveled upper face, is formed upon the inner side of the vertical part 3 of the frame. A plate or cap 23, having an inwardly-extending flange 24, with a lower slanting face, is provided. The set of springs is placed just beneath the ledge 22, a strip of insulation 25 being placed between, and the screws 26, which are preferably surrounded by insulation, are employed to secure all firmly in place. When the said screws are tightened during the process of securing the springs in position, the cap 23 slides up the inclined face of ledge 22 and serves to crowd the set of springs tightly together and against the lower side of the ledge, thus overcoming defects due to shop inaccuracies in the manufacture of the springs and strips and providing a firm and substantial securing means for the set of springs. The springs have downwardly-extending lugs 27, which are staggered longitudinally to permit the circuit-conductors to be readily connected therewith, holes or notches being provided in the ends of the lugs to facilitate making the said connections.

The free ends of the central springs 17, as explained, are adapted to be actuated by the key-lever, the two springs 17 of each set being simultaneously spread apart by the wedging action of the lower end of the key-lever between them.

In order to avoid the friction and sticking which would result from crowding a single block or roller between the opposed like ends of a pair of springs, I offset the rubbing surfaces of the two springs, preferably by cutting away the ends thereof on opposite edges, so as to leave only the offset narrow portions 28 and provide upon the key-lever the two rollers 10, one opposite each spring end 28, whereby when the key-lever is vibrated the said ends press upon one side only of the rollers, which freely rotate, and thus prevent sticking, jamming, or undue friction between the parts. The ends 28 are preferably first curved inwardly and then outwardly, as shown in Fig. 2, the flaring ends permitting the rollers 10 to be readily and easily pushed between them. The four springs 17 stand, preferably, in the relation shown in said figure, and since the stop 15 prevents the rollers 10 from moving too far between the springs the said springs serve by their elasticity to return the bottom member of the key-lever to its normal position.

In order to more surely retain the key-lever tipped to the side to which it was last operated, a flat spring 29 is secured at its ends to the lower side of the top plate 2 of the frame, and a centrally-located bend 30 is formed therein with which a pin 31, secured to the side of the flat part 7 of the handle member of the key-lever, coöperates, a curved notch 41 in the top plate 2 of the frame permitting such movement. When the handle is moved from one side to the other, the pin 31 rides over the bend 30 and depresses the spring 29; but when the handle is released the pin strikes against the bend and holds the key-lever tipped to that side, as shown in full and in dotted lines in Fig. 1.

The listening-in key is pivoted upon a shouldered screw 32, passing through the block 33, forming the body portion of the key and threading into the vertical part 3 of the frame and is provided with a flattened segmental upper portion projecting throug a correspondingly-shaped slot centrally located between the edges of the top plate 2, a handle 34 being secured to said segmental portion in the same manner as in the ringing-key. A stop 35 projects into the notch 36 to limit the movement of the key-lever in both directions. The rollers 10, carried by the key, are adapted to wedge between the ends of springs 37 to press them into engagement with springs $28^a$ to connect the operator's telephone with the strands of the cord-circuit. These springs are mounted, as described, with reference to the ringing-springs and are of the same construction, the free ends 28 being offset for the purpose before described.

It is desirable to be able to permit the listening-key to remain in operated position without being manually held. This is accomplished in this instance by adjusting the proper edge of stop 35 to permit the key to be pressed over so far that the switch-springs will not in operated position tend to return the key to normal position. The size of the stop 35 may be readily reduced by filing off its edge or edges.

In case an indicating-key is not desired for ringing, a key like the listening-key may be employed. In such case it is desirable to have the stop 35 the full width of the key, so that these keys are preferably manufactured with a wide stop, which may be readily filed

down to the desired size for use, as shown in the drawings. The edges of stop 15 of the ringing-key may be filed off to permit the rollers to pass between the ends of the springs to a greater extent when it is not desired to have the key automatically returned.

The lower edge of the portion 3 of the frame is cut away at the sides of the free ends of the sets of springs to facilitate inspection and repair. The top of the frame is preferably covered with a strip 39 of polished hard rubber, suitable screws 38 passing therethrough into the top plate 2 to hold the same in place, though any suitable means for securing the same may be employed.

The circuit of the device that may be used is shown in Fig. 8, though it will be understood that any may be employed, the answering-plug P and calling-plug $P^2$ having tip and sleeve contacts $p$ and $p^2$, joined by corresponding strands $t$ and $s$. The listening-springs $28^a$ are connected with the operator's set and the ringing-springs 19 with the alternating generators or generator, arranged in this instance for party-line ringing.

One special advantage of the form of frame shown is that the same is adapted to be formed in what is technically known as a "finished" casting, which requires no lathework or other finishing before it can be used, but is ready for assembling as it is received from the foundry. This form of frame, moreover, enables all the working parts to be secured thereto from the side and does not require turning and twisting in several directions, as in many forms of keys.

While I have described my invention with special reference to the details of construction which have been worked out in commercial and practical form, I do not wish to be limited in all respects thereto, as it is apparent to those skilled in the art that various changes and modifications may be made therein and still not depart from the scope or principle; but

What I do claim, and desire to secure by Letters Patent, is—

1. The combination with opposed switching members having their ends transversely offset, of an operating device adapted to operate said members to control the circuit thereof, and separate rollers carried by said device opposite the offset ends of said members, each of said rollers being adapted to engage one only of said members, substantially as described.

2. The combination with opposed switching members, of an operating device to control the circuit thereof, and adapted to move between said members to force said members apart, and separate rollers carried by said device, said rollers being adapted to engage said members when said device is operated, each roller being adapted to engage one only of said members, whereby friction of the parts is avoided, substantially as described.

3. In a telephone-key the combination with opposed contact-strips, said strips being provided at their free ends with tongues lying substantially opposite each other, suitably-mounted rollers for operating said strips, said strips ranging on opposite sides of the path of movement of said rollers, the rollers for operating said strips being arranged to engage their respective tongues only, and a movable carrier for said rollers, substantially as described.

4. The combination with suitable antifriction-rollers, of contact-strips lying on opposite sides of the path of movement of the rollers and provided at their free ends with offset surfaces arranged for engagement by said rollers, whereby each roller will engage only the contact-strip it is designed to operate, and will not be prevented from turning by engagement with the opposite contact-strip substantially as described.

5. In an operator's listening and ringing key, the combination with a frame having a top plate and a vertical plate depending from the top plate at one edge, of a set of switch-springs secured to said vertical plate upon the inner side and arranged longitudinally with reference to said plate, and an operating-lever for said springs also secured to the vertical plate and having its handle projecting above said top plate, a pair of rollers carried by said lever and adapted in their movement to deflect said springs, and means for securing said springs and lever being accessible from said inner side whereby the key is conveniently assembled and disassembled, substantially as described.

6. In an operator's ringing and listening key, the combination with a frame having a top plate and a vertical plate depending therefrom along one side, of a set of opposed springs mounted upon the inner face of said vertical plate and arranged longitudinally with respect thereto, screws passing through said set and into the said plate, and an operating-lever for said set upon the same side of said plate and having a handle projecting above said plate, a pair of rollers carried by said lever and adapted in their movement to deflect said springs and a screw passing through the said lever and into the vertical plate, substantially as described.

7. In an operator's ringing and listening key, the combination with a frame having a top plate and a vertical plate depending therefrom along one side, of a plurality of sets of switch-springs, said springs being disposed longitudinally with reference to said vertical plate, a pair of operating-rollers for each of said sets, all said sets being carried upon the inner face of said vertical frame, and means, accessible from said inner side, for securing

the same thereto, whereby all the operative parts of the switch are mounted beneath the top plate and are conveniently assembled, as described.

8. The combination with a pair of anti-friction-rollers, of a movable carrier therefor, two pairs of contact-strips arranged upon opposite sides of the neutral position of said rollers, said strips being provided with tongues adapted to be engaged by said rollers, the free ends of said tongues of each pair of contacts being slightly offset, each of said tongues being disposed in the line of travel of one of said rollers.

9. In an operator's ringing and listening key, the combination with a frame having a top plate, and a vertical plate, of a ringing-key lever pivoted upon said vertical plate near one end of the frame and having an operating-handle projecting above the top plate, a set of switch-springs secured to said vertical plate upon each side of the vibrating end of the said lever and disposed substantially perpendicular to the movement of said end, a listening-key lever also pivoted to said vertical plate near the other end of the frame, and a set of switch-springs secured to said vertical plate and disposed substantially perpendicular to the movement of the end of said listening-key lever, the whole forming a self-contained double ringing and listening key, substantially as described.

10. In an operator's ringing and listening key, the combination with a frame having a narrow top plate and a vertical plate depending from the top plate at one side and extending longitudinally of the same, a ringing-key lever pivoted upon the vertical plate, two sets of switch-springs secured to said vertical plate substantially parallel to the top plate and upon opposite sides of the said lever, whereby the key is adapted for selectively ringing upon a party-line or for ordinary double ringing, a listening-key lever pivoted upon said vertical plate in advance of the ringing-lever, and a set of switch-springs also secured to said vertical plate and disposed parallel to the top plate in position to be operated by said last-named key-lever, substantially as described.

11. In an operator's key, the combination with a frame having a top plate and a single depending vertical plate, of a plurality of sets of switch-contacts secured to one side of said vertical plate, the portion of said plate at the side of the free ends or contacts of said springs being cut away whereby the said ends or contacts are made accessible, and a key-lever pivoted upon the frame and in position to operate said springs, substantially as described.

12. In an operator's key, the combination with a frame having a long, narrow top plate and a single vertical plate cast integrally therewith and depending therefrom along one side, of a plurality of sets of opposed switch-springs arranged longitudinally with reference to said vertical plate and mounted upon the inner face thereof, and a suitable actuating-lever carried by the frame and a pair of rollers carried by said lever and adapted to engage said switch-springs to operate them, substantially as described.

13. In an operator's key, the combination with an operating-key lever, of a plurality of sets of switch-springs disposed substantially perpendicular to said lever and in position to be operated thereby, and means by which the lever itself indicates the set last completely operated, substantially as described.

14. In an operator's key, the combination with an operating-key lever vertically disposed, of a plurality of sets of switch-springs horizontally disposed and in position to be operated by said lever, and means to cause the lever itself to indicate the set last completely operated, substantially as described.

15. In an operator's key, the combination with a plurality of sets of switch-springs, a lever adapted to be moved longitudinally between the ends of said springs of any of said sets to spread them apart, and means whereby the lever itself indicates the last set used, substantially as described.

16. In an operator's key, the combination with an operating-key lever, of a plurality of sets of switch-springs disposed substantially perpendicular to the direction of movement of said lever and in position to be operated thereby, and means to cause the lever itself to indicate the set last completely operated, substantially as described.

17. In an operator's key, the combination with a plurality of sets of switch-springs, a lever adapted to be moved longitudinally between the ends of said springs of any set to spread them apart, and means to cause the lever itself to indicate the last set used, substantially as described.

18. In an operator's key, the combination with a plurality of sets of switch-springs, of a key-lever adapted to be moved between the ends of the springs of any set to spread them apart to cause them to make different circuit combinations, and means to cause the lever itself to indicate the direction it was last moved to completely open and close a set of springs, substantially as described.

19. The combination with an operating-key lever, of a plurality of sets of switch-springs disposed substantially perpendicular to the direction of movement of said lever and in position to be operated thereby when the lever is tipped in different directions, and means to cause said lever to remain tipped in the direction in which it is last used to completely operate a set of springs, substantially as described.

20. In an operator's key, the combination with a plurality of sets of springs, a pivoted key-lever jointed at the pivot so as to pro-

vide a certain amount of lost motion between the two parts thereof, one of said parts being disposed in position to operate said springs said sets of springs and the other serving as the handle portion, whereby when the lever-handle is operated the first-named part returns to normal position and the handle remains tipped in the direction last used, substantially as described.

21. In an operator's key, the combination with a key-lever having upper and lower parts, projections upon the upper part adapted to engage and operate the lower part when tipped from side to side, a plurality of sets of switch-contacts adapted to be operated by said lower part, whereby when a set of contacts has been completely operated, the upper end of the lever remains tipped in the corresponding direction, substantially as described.

22. In an operator's key, the combination with a jointed key-lever comprising two parts pivoted upon the same pivot, the lower part comprising a yoke between the arms of which the upper part is adapted to fit, projections upon said upper part upon opposite sides of the yoke and adapted to engage the same to cause the lower part of the lever to travel with the upper when the lever is operated, and a plurality of sets of switch-springs mounted adjacent the lower part and in position to be operated thereby in its vibration, substantially as described.

23. In an operator's key, the combination with a plurality of sets of horizontally-disposed switch-contact springs, a lever adapted to operate said sets and to remain in indicating position after a set is completely operated, and an auxiliary device to retain the said lever in its indicating position, substantially as described.

24. In an operator's key, the combination with a frame having a top plate, of a pivoted key-lever extending up through said top plate, a lug or pin upon the side of said lever beneath the top plate, a spring fixed upon the lower side of the top plate and having a projecting portion adapted to be engaged by said lug or pin in its vibration to retain the key-lever in indicating position when released, and a plurality of sets of switch-contacts adapted to be operated by said key-lever, substantially as described.

25. In an operator's ringing and listening key, the combination with a frame, of a listening-key lever and a set of switch-contacts operated thereby mounted on said frame, a ringing-key and a plurality of sets of switch-contacts also mounted on said frame, and means to indicate by the position of the lever itself the last set of contacts completely operated thereby, substantially as described.

26. The combination with a support, of a set of superposed switch-springs and alternately-disposed strips of insulation mounted flatwise upon said support, a ledge upon said support immediately at the edge of said set of springs, and means to crowd said set against said ledge when the set is secured in place, substantially as described.

27. The combination with a support, of a set of superposed switch-springs and alternately-disposed strips of insulation mounted flatwise upon said support, a ledge upon said support immediately at the edge of said set of springs and having a beveled or inclined portion opposite the face from said set, and a cap-piece for said set of springs to hold them in position, said cap-piece having a part overlapping said inclined or beveled portion and adapted to coöperate therewith, whereby when the springs are secured in place the set is crowded against the ledge and held firmly in position, substantially as described.

28. The combination with a support, of a set of superposed switch-springs and strips of insulation mounted flatwise upon said support, a ledge formed upon said support immediately at the edge of said set and having a beveled or inclined opposite face, a cap-piece fitting over said set opposite the support and having a part overlapping the said inclined portion, and screws passing through said cap-piece and the support to clamp the set together and in position upon the support, the said inclined portion serving during said clamping action to crowd the set against the ledge whereby they are rigidly and firmly secured, substantially as described.

29. The combination with opposed switching members having their ends transversely offset, of an operating device adapted to be inserted between said members to spread them apart, and separate rollers carried by said device opposite the offset ends of said members, substantially as described.

30. The combination with opposed switching-springs having their free ends cut away on opposed edges so as to present offset ends, and a lever adapted to be inserted between said springs to spread them apart, said lever carrying two rollers, one above the other in position to engage said offset ends of the springs, substantially as described.

31. In an operator's key, the combination with a frame, having a depending side plate provided with a notch, and a lever pivoted on said frame and vibrating in a plane at the side of said plate and carrying a lug projecting into said notch, the said lug being adapted to engage the edges of the notch and limit the movement of the lever, substantially as described.

32. In an operator's key, the combination with a frame having a depending side plate provided with a notch, a lever pivoted on the frame at the side of the plate and carrying a lug that projects into said notch, said lug being adapted to engage the edges of the notch at both limits of its movement, whereby the

extent of movement of the lever may be adjusted by cutting away the edges of the lug, substantially as described.

33. A telephone-key comprising a key-lever, a base and the contact strips or plates extending longitudinally parallel with the said base, and arranged edgewise in a plane at a right angle to the plane of the said base and provided at their free ends with tongues lying in slightly offset positions relative to each other, and with respect to the direction of length of the key-lever, and ranging on opposite sides of a path for the said key-lever intermediate the strips, substantially as described.

34. The combination of the key, the pair of rollers at different points longitudinally along and upon the same arm of said key and the two pairs of contact-strips arranged on opposite sides of the neutral position of said rollers and provided with tongues for engagement by the said rollers.

35. The combination of the key and the pairs of contact-strips arranged on opposite sides of the neutral position of said key and having tongues for engagement by the said key, the tongues of each pair being arranged diagonally with respect to the direction of length of the key.

36. In an operator's key, the combination with an operating-key lever, of a plurality of sets of switch-springs disposed substantially perpendicular to the said lever and in position to be operated thereby, the said lever being so constructed as to indicate in which direction it was last moved to operate the springs.

37. The combination with a pair of contact-strips, of a member adapted to be moved between the free ends of said strips, a pair of rollers at different points longitudinally along and upon the part of said member moving between said strips, said strips having tongues for engagement by the said rollers.

38. The combination with a pair of opposed and parallel contact-strips provided at their free ends with tongues upon opposite edges, a pivoted operating member substantially at right angles to said strips and carrying a pair of rollers at different longitudinal points along the same, the tongue of one of the strips engaging one roller upon one side of the said member, and the tongue of the other strip engaging the other roller upon the other side of the member.

39. A telephone-key with contact-strips arranged edgewise in parallel planes and provided at their free ends with tongues lying diagonally opposite each other and ranging on opposite sides of the path of movement of the rollers for operating said strips, the rollers for operating said strips arranged to engage their respective tongues, and a movable carrier for said rollers.

40. The combination of the rollers and contact-strips lying on opposite sides of the path of movement of the rollers and provided at their points with diagonally opposite tongues arranged for engagement by the rollers whereby each roller will only engage the contact-strip it is designed to operate and will not be prevented from turning by engagement with the opposite contact-strip.

41. The combination substantially as described of the pair of rollers and the movable carrier therefor and the two pairs of contact-strips arranged on opposite sides of the neutral position of said rollers and provided with tongues for engagement by the said rollers, the tongues of each pair being diagonally opposite each other.

42. A telephone-key commprising a key-lever, a base and the contact strips or plates extending longitudinally parallel with the said base and arranged edgewise in a plane at a right angle to the plane of the said base, and provided at their free ends with the tongues lying diagonally opposite each other with respect to the direction of length of the key-lever and ranging on opposite sides of a path for the said key-lever intermediate the strips.

43. In an operator's key, the combination with a pair of contact-strips, of antifriction-rollers adapted to pass between said strips and actuating the same to control an electric current, said strips being adapted to engage one side only of each of said rollers, whereby the rollers are permitted to freely rotate as said strips are actuated, substantially as described.

Signed by me at Chicago, county of Cook, State of Illinois, this 12th day of June, 1902.

WILLIAM W. DEAN.

Witnesses:

G. BEDER,

ROBERT LEWIS AMES.