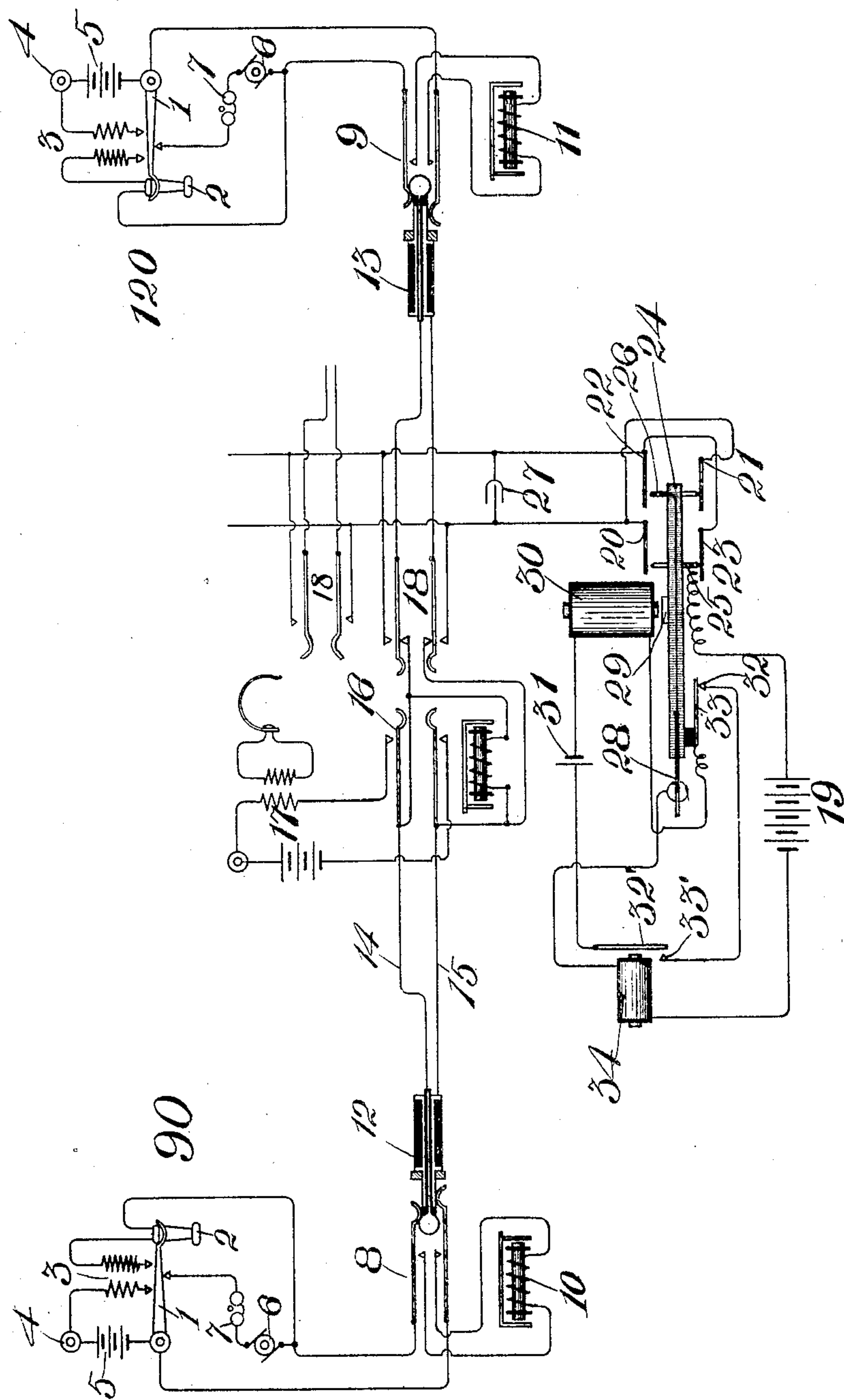


No. 807,870.

PATENTED DEC. 19, 1905.

H. O. RUGH.  
POLE CHANGING DEVICE.  
APPLICATION FILED JUNE 2, 1902.



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# UNITED STATES PATENT OFFICE.

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## POLE-CHANGING DEVICE.

No. 807,870.

Specification of Letters Patent.

Patented Dec. 19, 1905.

Application filed June 2, 1902. Serial No. 109,841.

*To all whom it may concern:*

Be it known that I, HARRY O. RUGH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Pole-Changing Devices, 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 telephone-exchange systems, and has for its object the provision of improved apparatus at the central exchange whereby a battery or other source of direct current may be employed for effecting the operation of alternating-current magneto-bells at substations, such bells as are usually employed to be operated by mechanically-actuated alternating-current generators and having polarized armatures carrying the bell-clappers.

My invention has for its direct object the provision of a pole-changing switch operated by electromagnetic means and associated with an agency that will only cause its actuation during the time the operator's ringing-key is employed for the purpose of calling a subscriber, by which apparatus the instrument may be caused to remain idle at other times. To this end I provide in the preferred embodiment of the invention a combination including a pole-changing switch, an electromagnet for effecting its operation, a circuit including the electromagnet made and broken by the switch, whereby it may be caused to assume alternative positions to change the polarity of the battery with respect to the called subscriber's line, and an additional agency for controlling the circuit through the actuating-electromagnet associated with the ringing-key and brought into service thereby when the ringing-key is employed for effecting the propagation of signaling-current. The instrumentality that is associated with the ringing-key for effecting a partial control of the circuit including the actuating-electromagnet is a second electromagnet whose armature is practically constantly closed upon a contact during the employment of the corresponding ringing-key. There is thus provided a pole-changing switch in combination with an electromagnet for actuating the same and a double control of the circuit including the said electromagnet, one control

being governed by the electromagnet itself and the other control by an agency brought into service independently or substantially independently of the actuating-electromagnet, so that the said electromagnet may only be caused to operate during the connection of the signaling source of current with the called telephone-line.

I will explain my invention more fully by reference to the accompanying drawing, in which I have diagrammatically indicated a telephone-exchange and subscribers' substations connected with the exchange in one of many ways that may be adopted.

At each of the stations 90 and 120 I have indicated one type of well-known apparatus, there being shown at each station a telephone switch-hook 1, a telephone-receiver 2, the windings of an induction-coil 3, a transmitter 4, a local transmitter-battery 5, a hand-operated magneto-generator 6, and a polarized call-bell 7. These stations are connected at the exchange, terminating thereat in spring-jacks 8 and 9, there being associated with the telephone-lines well-known forms of indicating-drops 10 and 11. Line construction and the connection of the lines with the exchange form no essential parts of my present invention, and a detailed description of the same will not be required.

At the exchange I have illustrated one type of cord connecting apparatus that may be suitably employed in practicing my invention, this cord connecting apparatus including an answering-plug 12 and a connecting-plug 13, whose tips are united by means of the tip-strand 14 and whose sleeves are united by means of a sleeve-strand 15.

There is associated with the cord-circuits in the well-known way switching apparatus comprising listening-keys 16 for including the operator's telephone set 17 in the telephone-circuit and ringing-keys or main switches 18, adapted to include a source of signaling-current, as the battery 19, in circuit with the called telephone-line. The circuits associated with the ringing-key are different from those usually employed, as it is desirable to enable the operation of polarized signal-bells by means of commutated direct current, by accomplishing which result the use of constantly-driven power-generators, that are at present so largely employed, may be dispensed with, it only being necessary to



bring the signaling-generator into service for signaling purposes when the ringing-key is operated. To this end the alternate contacts of the ringing-key 18 extend by the conductors in which they terminate to contacts 20 21, corresponding to one pole of the battery 19—for example, the positive pole—and the contacts 22 23, corresponding to the other pole of the battery. Contacts 20 and 22 are arranged upon one side of the pole-changing switch-arm 24, while the contacts 21 and 23 are arranged upon the other side of the pole-changing switch, the relations of the contacts with the contacts 25 26, carried by the pole-changing switch, being such that when such pole-changing switch is in one position the battery will be associated with the telephone-line to send current over the same in one direction, while when the pole-changing switch is in an alternative position the direction of the battery-current will be reversed, thereby effecting the propagation of alternating current over the telephone-line to the signal-bell at the called subscriber's station. It may be desirable to smooth the alternations caused in reversing the battery-current by means of a condenser 27, that may be bridged across the conductors leading to the alternate contacts of the ringing-key. The contacts 25 26, carried by the pole-changing switch, constitute, preferably, the permanent terminals of the battery 19, these contacts, as has been specified, engaging one or the other of said ringing-contacts 20 22 or 21 23, according to the position of the switch-arm 24, which is preferably flexibly pivoted at its anchored end by means of a spring 28. To effect the operation of the switch-arm 24, it is preferably provided with an armature 29, mounted thereon, an electromagnet 30 for operating the armature being located above the same. This electromagnet 30 is preferably included in a local circuit that contains a battery 31 and switch-contacts 32 33, the latter of which is carried by the switch-arm and which is preferably so arranged that when the switch-arm is in its lowermost position the contacts 32 33 are closed to effect an energization of the electromagnet 30, and thereby effect the elevation of the arm 24 through the attraction of the armature 29 by the said electromagnet. When the armature has been elevated to effect a change in the polarity of the battery with respect to the called telephone-line, the circuit through the electromagnet 30 will be opened, permitting a descent of the arm 24, whereupon the battery-current is again reversed. In order that the electromagnet 30 may be caused to operate the arm 24 only during the employment of the ringing-key, there is included in

the main circuit containing the battery 19 supplemental means for closing the local circuit at the contacts 32' 33', which supplemental means is brought into action simultaneously with the operation of the ringing-key. The supplemental means referred to preferably comprises an electromagnet 34, which is preferably constantly included in the main battery-circuit, current being thus practically maintained through this electromagnet during the operation of the pole-changing device, so that the contact 32', which is preferably the armature of the said electromagnet or a contact carried thereby, may be maintained in engagement with the contact 33' to close the local circuit containing the magnet 30 at this point. I do not wish to be limited, however, to the precise agencies that have herein been set forth for maintaining the double control of the electromagnet 30, as it is obvious many changes may be made from the embodiment of my invention herein specifically illustrated without departing from the spirit of the invention; but,

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

In a pole-changing device, the combination with a main electromagnet 30, of an armature therefor, contacts 25 and 26 carried by said armature, pole-changing contacts 20, 22 and 21, 23 adapted to be alternately engaged by said armature-contacts, a switch-arm 33 carried by said armature, a contact 32 normally engaged by said switch-arm, a local circuit including said switch-arm and contact and said main relay, a source of current 31 in said local circuit, an armature 32' and a contact 33' adapted for inclusion in said local circuit, a main source of current 19, an electromagnet 34 controlling the armature 32', said main source of current and said electromagnet 34 being adapted for inclusion in the circuit including the armature-contacts 25 and 26, and normally open switches 18, actuation of said switches causing closure of the circuit containing one set of pole-changing contacts, said main source of current and said electromagnet 34 whereby said electromagnet is energized to close the local circuit containing the main relay 30 and whereby said armature is vibrated to continually change the direction of current-flow through the main circuit.

In witness whereof I hereunto subscribe my name this 29th day of May, A. D. 1902.

HARRY O. RUGH.

Witnesses:

LYNN A. WILLIAMS,  
HARVEY L. HANSON.