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W. W. DEAN.

MEANS FOR PROTECTING OPERATORS' RINGING LEADS.

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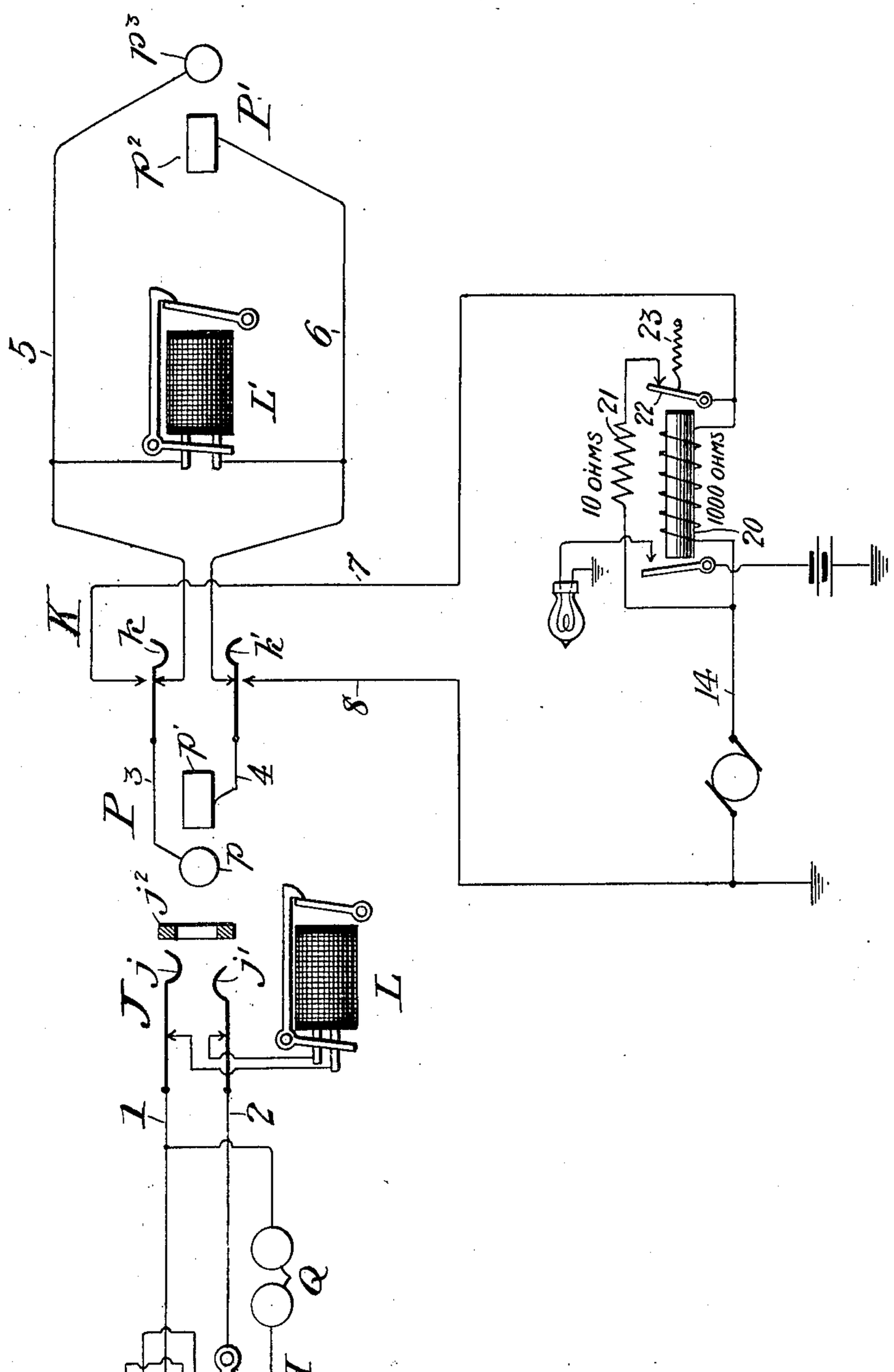

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UNITED STATES PATENT OFFICE.

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MEANS FOR PROTECTING OPERATORS' RINGING LEADS.

No. 872,171. Specification of Letters Patent. Patented Nov. 26, 1907.

Application filed April 7, 1906. Serial No. 310,572.

To all whom it may concern:

Be it known that I, WILLIAM W. DEAN, a citizen of the United States, residing at Elyria, in the county of Lorain and State of Ohio, have invented certain new and useful Improvements in Means for Protecting Operators' Ringing Leads, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to electrical signaling systems, and particularly to the signaling apparatus and circuits employed in telephone exchange systems.

It has for its object the provision of means for the protection of signaling wires or operators' ringing leads from short circuit.

Heretofore it has been customary to connect ordinary incandescent lamps in the ringing leads or branches from the power-board to the operators' keys. Some provision of this kind is necessary, for the reason that the resistance of lines varies widely, and if an operator should ring out over a line which was short-circuited or grounded, the lead would obviously also become short-circuited, but by including a sufficient resistance in the path of the ringing current any injurious rise thereof due to a short circuit would be prevented.

The objections to the use of incandescent lamps in the manner stated are as follows: First, the voltage and effective output of the generators must be made very much higher than they would otherwise have to be, in order to overcome the resistance of the lamps when ringing; second, a lamp resistance acts in a manner directly the reverse of what is most desired, because its resistance falls when hot. Thus, when ringing over a long line of high resistance, the lamp resistance will be at its maximum, thereby cutting down the effective voltage thrown on the line; and when ringing over a short line, of low resistance, the lamp heats up and lowers its resistance, thereby raising the effective voltage on the line, and still further increasing the current.

My invention obviates the disadvantages of the lamp resistances, providing for a normal low resistance, rising to a maximum when the line resistance is below a definite predetermined quantity.

Briefly stated, my invention comprises a high resistance relay with a back contact armature, provided with a low resistance shunt circuit. The relay is so adjusted that it will not pull up under normal ringing conditions, but when the operator rings on a short-circuited line, the consequent large flow of current effectively energizes the relay which pulls up its armature, thereby breaking the low resistance shunt circuit and causing the current from the generator to traverse the high resistance relay windings.

My invention is illustrated in the accompanying drawing, wherein the figure is a diagram showing a subscriber's line and substation apparatus, with a central office connective circuit and ringing key.

In the drawing, A indicates the subscriber's station, provided with the usual transmitter, T, receiver, R, switchhook H, and ringer, Q. The line wires 1 and 2 terminate at the central office at the springs j and j' of the line jack J, which may also have a test thimble j^2. When in a condition of disuse, the jack springs are closed upon the contact anvils forming terminals of the circuit of the line annunciator, L. For simplicity of illustration I have shown an annunciator of the magneto drop shutter type, but it is to be understood that my invention is applicable to any type of system, and that its essential features are unchanged in any case, whether the switchboard be a transfer or a multiple board, and its circuits supplied with current from a central office battery for all purposes or from local batteries and magneto generators for talking and signaling respectively.

For interconnecting the lines at the central office cord circuits are provided, each with terminal plugs P and P', having the tip and sleeve contacts connected together respectively by the conductors 3—5 and 4—6. For a magneto system such as the diagram indicates, a clearing-out annunciator is bridged across the cord at L'. A suitable listening key is connected in each cord, but this is omitted from the illustration.

The operator's ringing key is shown at K. This has the usual or any desired form of button or lever manipulated by the operator to move the contact springs k and k', which

normally rest on contact points forming the terminals of the cord conductors 5 and 6 whereby the tips p and p^3 and the sleeves p' and p^2 are joined. When the springs k and k' are separated they leave the normal or cord terminals and make contact with the terminals of the generator circuit or ringing lead 7—8, thus connecting the generator G through conductors 3 and 4 to the plug P and so to the line 1—2, assuming the plug to have been inserted in the jack J.

The system thus far described is old and well known, and as I have stated, may be varied in many ways without affecting the essential features of my invention.

In a copending application, Serial No. 273,455, filed August 9, 1905, I have shown a low resistance relay interposed in the path between the generator bus and the ringing key, whose windings are connected on the one side to the key contact and on the other to its own armature, or a contact moved thereby. I now discard the relay of the said application and use instead a relay 20 of about 1,000 ohms resistance interposed between the generator bus 14 and the path 7 to the key K. In shunt with respect to the windings of the relay 20 is a non-inductive resistance 21 of 10 ohms or thereabout. The branch circuit in which this resistance is placed has its continuity completed through a back contact of the armature 22 of the relay 20. The spring 23 normally holds the armature 22 in engagement with its back contact and thereby completes the shunt circuit around the high resistance relay 20.

The relay 20 is so designed that a large current is required to operate it, this being accomplished in a manner well known to all engineers by suitably arranging its magnetic circuit and air gap and adjusting its retractile spring 23. Upon a predetermined rise or leakage of current through it, however, it will operate by pulling up its armature and opening and disconnecting it from the back contact so that the shunt circuit in which the non-inductive resistance 21 is placed is broken. This turns the entire force through the relay 20 and that in addition to the drop due to its ohmic resistance, will exercise a choking effect on the current, which in this case, of course, is supposed to be alternating current. When, however, the ringing current is cut off, the armature 22 is pulled back to its normal position by the retractile spring 23, and the shunt circuit is again completed through the back contact of the armature thereby again introducing the non-inductive resistance 10 which normally remains in the circuit.

The operation is symmetrical and properly directed to produce symmetrical ringing effects.

I do not desire to limit myself to the construction or arrangement shown and described, as many changes might be made in the manner of use and application, particularly as regards the circuits, and all such are contemplated by me. It is equally useful for both direct and alternating currents.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States, is:

1. In a telephone system, a line circuit, a source of current supply for the line, an inductive resistance between said source and the line, and means including a non-inductive resistance for rendering said inductive resistance normally inoperative.

2. In a telephone system, a line circuit, a source of signaling current for the line, connection from said source to the line, a high inductive resistance in series in said connection, and a low non-inductive resistance in shunt of said high inductive resistance and controlled thereby.

3. In a telephone exchange system, a subscriber's station and a central station, and a line circuit interconnecting them, a signal receiving device at the subscriber's station and a source of signaling current at the central station adapted to be connected to the line; together with a high magnetic resistance between said source and the line, and means controlled by said magnet normally completing a low resistance path from the source to the line.

4. As a means for protecting operator's ringing leads, a high resistance relay therein normally inoperative, and a low resistance shunt around said relay controlled thereby.

5. As a means for protecting operator's ringing leads, a relay having high self inductance connected therein and a low non-inductive shunt around said relay controlled thereby.

6. As a means for protecting operator's ringing leads, a high resistance relay connected therein and a low resistance shunt around said relay, said shunt being normally closed through a back contact of said relay whereby when the relay operates, the shunt circuit is rendered inoperative.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM W. DEAN.

Witnesses:
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