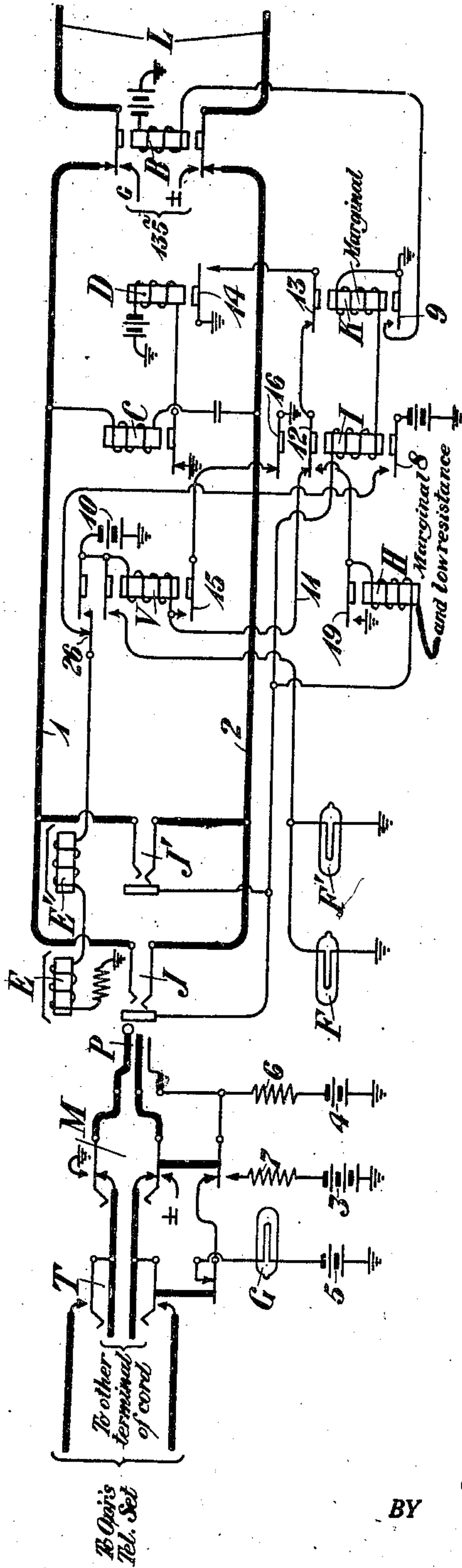


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J. F. TOOMEY.
SIGNALING APPARATUS AND CIRCUITS.
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SIGNALING APPARATUS AND CIRCUITS.

Application filed November 24, 1919. Serial No. 340,134.

To all whom it may concern:

Be it known that I, JOHN F. TOOMEY, residing at New York, in the county of New York and State of New York, have invented certain Improvements in Signaling Apparatus and Circuits, of which the following is a specification.

My invention relates to signaling apparatus and circuits.

It is an object of the invention to associate the apparatus for controlling the supervisory signals with the toll line circuits and trunk circuits rather than with the toll cord circuits, and to attain, thus, a considerable saving in cost of equipment because of the fact that the number of cords in the average switchboard exceeds by far the number of toll lines or trunks. I utilize, moreover, a single relay for receiving line signals as well as the supervisory signals, arranging the apparatus such that on an incoming line signal the relay causes the response of the usual answering lamp, and on an incoming supervisory signal the relay actuates the supervisory signal device which is associated with the sleeve wire of the cord.

For outgoing signals I provide a relay which responds to an actuation of the ringing key and causes the application of ringing current of proper frequency to the line, thus avoiding the necessity of the expensive composite ringing set now in common use.

A full understanding of the invention may now be had from the following description thereof having reference to the specific form of embodiment of the invention illustrated in diagrammatic view in the accompanying drawing.

In this drawing reference character L designates a transmission line which is normally connected to switchboard conductors 1 and 2 by means of the back contacts of a relay B. Associated with the switchboard conductors are the usual multiple jacks J and J', and a cord circuit terminated by a plug P is provided for cooperating with the jacks. Busy signals E and E' and answering lamps F and F' are provided adjacent these jacks, and a supervisory signal G is associated with the cord, these signals and lamps being controlled and operated by certain relays and other apparatus which cooperate in the manner which I shall now describe to accomplish the objects of the present invention.

When an operator desires to ring over line

L, she associates plug P with one of the jacks and operates the ringing key M in the usual manner. When the plug is introduced into the jack, current flows in the sleeve circuit, part of this current being supplied by a battery 4 in series with a resistance 6, and part by the battery 5 which is in series with a supervisory signal lamp G and the normally closed contacts of the talking and ringing keys, T and M. The currents from the two batteries unite and flow through the windings of a sleeve relay I, and a marginal relay K to ground. The various elements of this circuit have such resistance that the current from battery 5 is insufficient to cause a glow of the filament of lamp G, whereas the combined current of batteries 4 and 5 is of sufficient value to operate the relay I but insufficient to cause the response of the marginal relay K. Relay I closes the contact 8 and sets the busy signals E and E', the circuit of which is governed by the contact 8 and by the normally closed contact 26 of a relay V. When the operator actuates the ringing key M, she disconnects battery 5 from the sleeve circuit and connects thereto, instead, a battery 3 which is of higher potential than batteries 4 and 5 and connected in series with a resistance 7, the value of which is smaller than that of resistance 6. The consequent increase in the strength of current in the sleeve circuit causes the operation of the marginal relay K, so that this relay closes at contact 9 the circuit of the relay B. The last-mentioned relay is thus caused to disconnect the line from the switchboard conductors and to associate therewith a source of ringing current, herein shown as having a frequency of 135 cycles, although current of any other suitable frequency may be used. This current enters line L and causes response of the ringing apparatus at the distant station. It will be observed that this arrangement avoids the necessity of the composite ringer now commonly used.

The operation of the apparatus in response to a signal coming in over the line L is as follows: Relay C, bridged across switchboard conductors 1 and 2, is energized by the ringing current and opens the circuit of the normally energized relay D. This relay applies ground to the circuit of a relay V, which circuit extends from a battery 10 through the winding of relay V, wire 11, contact 12 of relay I, contact 13 of relay K, and back con-

tact 14 of relay D to ground. Relay V is thus energized and locks up through its contact 15 and contact 16 of relay I to ground. It simultaneously supplies current from battery 10 to the answering lamps F and F' and to the busy signals E and E', thus notifying the operator of the incoming signal.

When the operator responds to the ring and inserts the plug P of her cord into the corresponding jack, she causes the energization of relay I in the manner explained hereinbefore. Relay I opens back contacts 12 and 16 and breaks thus both the energizing and locking circuits of relay V. The last-mentioned relay is thus restored to its normal position, so that the answering lamps F and F' are extinguished. The busy signals remain set, however, owing to the closure of contact 8 of relay I.

The operation of relay I prepares the apparatus for the reception of supervisory signals, the relay H being now connected over the front contact 12 of relay I with the contact 14 of relay D. When, therefore, relay D closes its back contact in response to ringing current in line L, it connects ground to the winding of relay H, so that current flows from the sleeve batteries 4 and 5 through the winding of relay H, contact 12 of relay I, contact 13 of relay K and contact 14 of relay D to ground. Relay H, it will be observed, is in a branch of the sleeve circuit in parallel with the branch comprising relays I and K. The comparatively large volume of current now drawn from the sleeve batteries is sufficient to cause the incandescence of the filament of the lamp G, which thus gives the supervisory signal to the operator. Relay H locks up through its contact 19 and causes lamp G to remain lit until the operator responds to the supervisory signal by actuating the talking key T.

Although I have herein shown and described only one form and arrangement of apparatus embodying the invention, it is readily understood that various changes and modifications may be made therein within the scope of the following claims without departing from the spirit and scope of the invention.

What I claim is:

1. In combination, a transmission line, a cord therefor having a sleeve wire, a supervisory signal controlled by current in said wire, and means actuated by ringing current in said line for governing the flow of current in said wire.

2. In combination, a transmission line, a sleeve circuit, means for associating said circuit with said line, a low resistance translating device, a relay actuated by ringing current in said line for associating the said device with said sleeve circuit, and a supervisory signal governed by the change caused

in the current in said sleeve circuit when said device is associated therewith.

3. In combination, a transmission line, a sleeve circuit associated therewith, a device responsive to ringing current in said line for increasing the current in said circuit, and a supervisory signal responsive to said increase of current.

4. In combination, a transmission line, a sleeve circuit associated therewith, said circuit comprising a plurality of parallel branches, one of said branches being normally open, a device responsive to ringing current in the line for closing said branch, and a supervisory signal associated with said circuit and responsive to the closure of said branch.

5. In combination, a transmission line, a sleeve circuit associated therewith, said circuit comprising a plurality of parallel branches, one of said branches being normally open, a translating device in another branch for partially closing said normally open branch and a relay responsive to ringing current in the line for completing the closure of the said branch, and a supervisory signal responsive to the closure of said branch.

6. In combination, a transmission line, a sleeve circuit associated therewith, said circuit comprising a plurality of parallel branches, one of said branches being normally open, a self-locking relay for closing said branch, means responsive to ringing current in the line for operating said relay, a supervisory signal responsive to the closure of said branch, and an operator's key for causing the re-opening of said branch.

7. In combination, a transmission line, a relay responsive to ringing current therein, an operator's signal responsive to said relay, a sleeve circuit, a supervisory signal associated therewith, and means in said sleeve circuit for rendering said operator's signal unresponsive and said supervisory signal responsive to said relay.

8. In combination, a transmission line, a signal responsive to incoming signal current on said line, a local sleeve circuit associated with said line, an operator's key for causing change of current in said circuit, a relay associated therewith responsive to said change of current and means responsive to said relay for disconnecting said line from said signal and causing the flow of signaling current over said line.

9. In combination, a transmission line, a signal responsive to incoming signal current on said line, a local sleeve circuit associated with said line, an operator's key for augmenting the value of current in said circuit, a marginal relay responsive thereto, a source of ringing current, and a relay responsive to said marginal relay for disconnecting said line from said signal and asso-

ciating said source of ringing current with said line.

10. In combination, a transmission line consisting of two conductors, a signal responsive to incoming signal current on said line, a local sleeve circuit associated with said line, an operator's key for causing change of current in said sleeve circuit, a relay associated therewith responsive to said

change of current, and means responsive to said relay for disconnecting said line from said signal and causing the flow of signaling current over the line comprising said two conductors.

In testimony whereof, I have signed my name to this specification this 22nd day of November 1919.

JOHN F. TOOMEY.