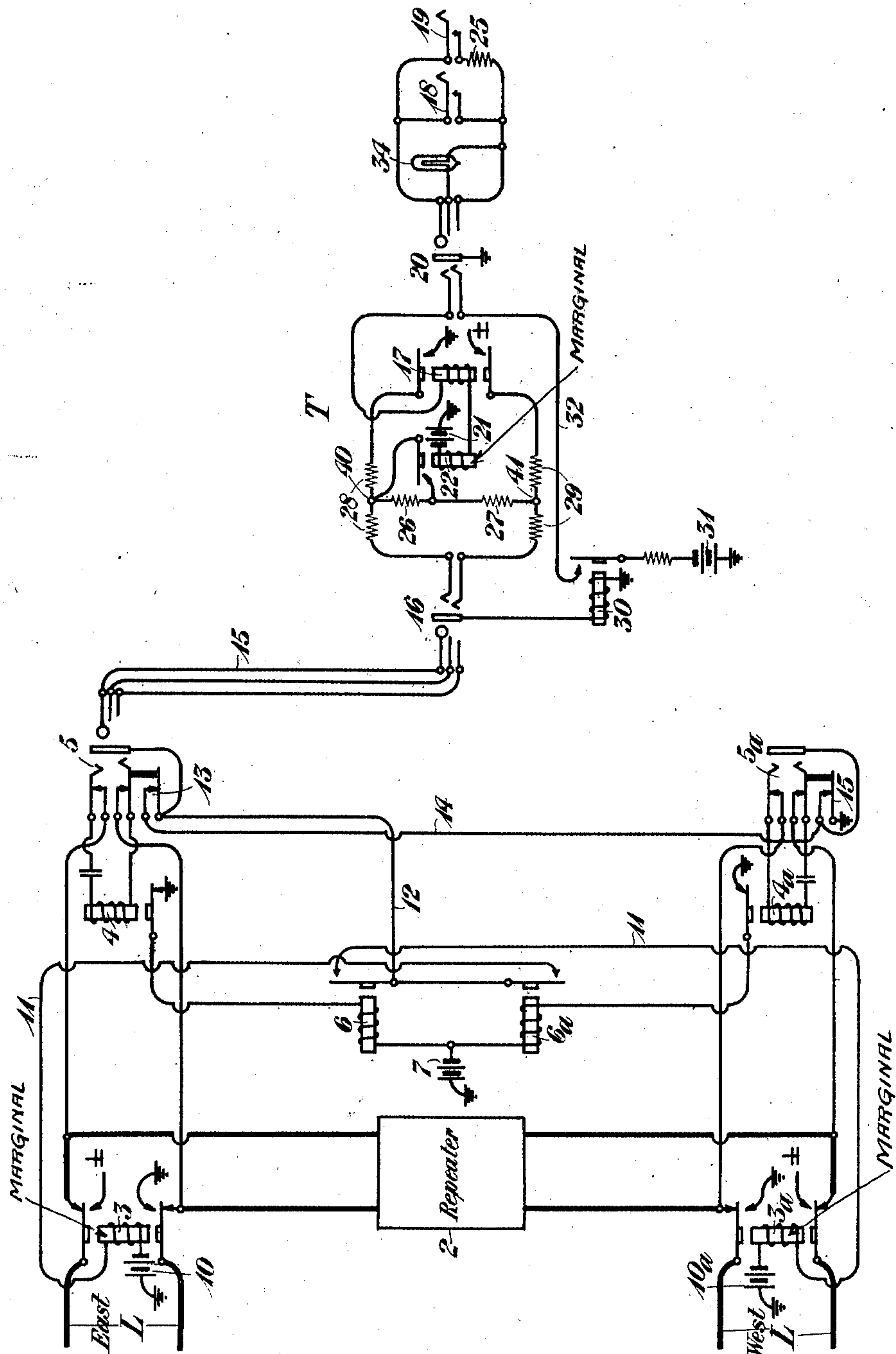


1,360,332.

J. F. TOOMEY.
TESTING CIRCUIT.
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TESTING-CIRCUIT.

1,360,332.

Specification of Letters Patent. Patented Nov. 30, 1920.

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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 Testing-Circuits, of which the following is a specification.

This invention relates to testing circuits, particularly circuits for testing relays at repeater installations.

10 Certain types of telephone repeaters present so high an impedance to currents of the frequencies ordinarily employed for ringing that it is necessary to provide separate apparatus for relaying the ringing current around the repeater installation. This relaying apparatus comprises, generally, a relay associated with the section of the line on one side of the repeater and responsive to ringing current in said section, which relay controls a ringing relay associated with the section of the line on the other side of the repeater and adapted to apply ringing current to said section when the first-mentioned relay is energized by ringing current in its section. A similar arrangement is provided for relaying the ringing current in the opposite direction. This relaying apparatus is subjected to frequent tests, for if its fails to operate properly it is usually impossible to ring over the line.

It is the object of this invention to provide a testing circuit and apparatus by means of which these tests may be made expeditiously and accurately, without causing any interruption in a conversation that may be in progress at the time of the test, or causing a false ring over the line.

40 The manner in which the above objects and advantages are attained by this invention will be readily understood from the following description thereof, considered in connection with the accompanying drawing showing in diagrammatic form one arrangement of apparatus and circuits embodying the invention.

50 In this drawing reference character L designates a transmission line, the conductors of the east and west sections of which are normally associated by means of relays 3 and 3^a with a repeater 2, which may be of any suitable type. Apparatus is provided for relaying signaling current from one section of the line to the other, which apparatus comprises a relay 4 associated with the east section of the line by means of the

tip and ring contacts of a jack 5. Relay 4 controls a relay 6, which is normally energized by current from a battery 7, and relay 6 controls the relay 3^a, the circuit of which extends from battery 10^a through the winding of relay 3^a, conductor 11, contact of relay 6, conductor 12, contact 13 governed by jack 5, conductor 14, contact 15 of jack 5^a to ground. When ringing current flows in the east section of the line, it causes the energization of relay 4, which relay opens its contact and thus causes relay 6 to close the circuit of relay 3^a. This relay is energized and closes its front contacts and thus applies ringing current to the west section of the line. The apparatus above described thus relays ringing current from east to west, and like apparatus is employed for relaying the ringing current in the opposite direction, this apparatus comprising relays 4^a, 6^a and 3.

A testing circuit T is provided for testing the relay apparatus above described, a patching cord 15 and jacks 5 and 16 serving to associate this circuit with the said apparatus. The tip and ring contacts of jack 5 connecting the relay 4 with the east section of the line are broken when the plug of cord 15 is inserted in the jack 5, the circuit of the relay now extending from a source of ringing current in the testing circuit, through the contacts of a relay 17, through the tip and ring of jack 16 and the tip and ring conductors of the patching cord 15 to the winding of the relay. The circuit of relay 17 is governed by keys 18 and 19 in a portable control box not shown, which keys may be associated with the testing circuit by means of a plug and jack 20; the circuit of the relay 17 extending from a battery 21, through the winding of a marginal relay 22 and the winding of relay 17, through the tip contact of jack 20, keys 18 and 19 in parallel and through the sleeve contact of jack 20 to ground. When key 18 is closed the current from battery 21 is sufficient to energize both relays 22 and 17 and when key 19 is depressed the current is so limited by a resistance 25 in series with the key that the marginal relay 22 fails to operate. Relay 17, therefore, responds to either key but relay 22 only to key 18. The relay 22 controls a contact which, when closed, short circuits a resistance 26 connected in series with another resistance 27

between the midpoints 40 and 41 of resistances 28 and 29 in the testing circuit. The strength of the current applied to relay 4 from the source in the testing circuit depends on the resistance of the path between points 40 and 41, this resistance being low when the contact of relay 22 is closed and high when the contact is open. In the latter case relay 4 receives more current than in the former, and the resistances are so proportioned that relay 4, when in proper adjustment, responds in one case but not in the other. In other words, relay 4 should open its contact when the operator depresses key 19, but not when he depresses key 18.

To prevent a false application of signaling current to the west section of the line, when relay 4 is thus operated, relay 3^a is rendered unresponsive to relay 6 by connecting a relay 30 in series with relay 3^a, the circuit thereof now extending from battery 10^a through the winding of relay 3^a, conductor 11, contact of relay 6, conductor 12, sleeve contacts of jacks 5 and 16, relay 30 to ground. The resistance of relay 30 is such that the current from battery 10^a is too weak to cause an operation of relay 3^a, although sufficient to operate relay 30, this relay being arranged to attract its armature when traversed by only a small current. The contact of relay 30 controls a circuit extending from battery 31 through the contact of relay 30, conductor 32, ring contact of jack 20, an indicating lamp 34 in the portable control box, and the sleeve of jack 20 to ground. Lamp 34 is thus caused to indicate the operation of relays 4 and 6. The operation of relays 4^a and 6^a may be observed in like manner by associating the testing circuit with jack 5^a.

The testing operation is readily understood from the foregoing description of the circuits. The operator merely associates the testing circuit with the jack of the relays under test and with the plug of the portable control box. He then depresses keys 18 and 19 consecutively. If the relays 4 and 6 are properly adjusted, lamp 34 remains dark when key 18 is operated, lights when key 19 is depressed and goes out when key 19 is released.

One of the main features of this invention resides in the fact that one man, alone, may make the test, whereas in the arrangements heretofore used two men were required. The relay jacks 5 and 5^a are located at the relay racks and the jacks 16 and 20 of the testing circuit are brought out in multiples near the relay jacks, so that the operator may observe the action of the relay armatures and contact springs when he actuates the keys 18 and 19 of the portable control box, and thus determines where the trouble lies when the indicating lamp in the box fails to respond properly to the control keys.

Although only one form of apparatus and circuit embodying the invention is shown and described herein, 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 is claimed is:

1. In combination, a line, a relay responsive to ringing current in said line, a second relay responsive to said first relay for applying ringing current to said line, means for applying testing current to said first relay, an indicating device and means operative when said first mentioned means is associated with said relay for rendering said second relay unresponsive and said indicating device responsive to said first relay.

2. In combination, a transmission line comprising two sections, means responsive to ringing current in one section of said line for applying ringing current to the other section thereof, a source of testing current, means for associating said source with said first mentioned means, an indicating device, and means for rendering said first mentioned means inoperative to apply current to said other section and for rendering said indicating device responsive to said first mentioned means.

3. In combination, a first relay, a source of testing current therefor, a second relay, a circuit for controlling the second relay by the first relay, a third relay responsive to less current than said second relay, means operative when said source is associated with said first relay for connecting said third relay in series with the circuit of said second relay, whereby the third relay is rendered responsive and the second relay unresponsive to said first relay.

4. In combination, a line, a relay responsive to ringing current in said line, a second relay responsive to said first relay, a source of ringing current, a third relay responsive to said second relay for associating said source with said line, a testing circuit for said first and second relays comprising a source of ringing current, means for associating said circuit with the first mentioned relay and dissociating said relay from said line, an indicating device, means for governing said device by said first and second relays and means associated with said testing circuit for governing the amount of current supplied to said first relay from said source in said testing circuit.

5. In combination, a line, a relay responsive to ringing current in said line, a source of ringing current, a second relay for associating said source with said line, a source of testing current for said relays, means for associating said source with said first relay and dissociating said relay from said line, a translating device, means operative when

said first relay is energized by testing current for rendering said translating device responsive to said first relay and said second relay unresponsive thereto, means for controlling the amount of testing current applied to said first relay, and an indicating device controlled by said translating device.

6. In combination, a transmission line comprising two sections, a first relay responsive to ringing current in one of said sections, a second relay responsive to said first relay, a source of ringing current, a third relay responsive to said second relay for associating said source with said other section of the line, a source of testing current, a plug and jack for rendering said first relay unresponsive to current in said line but responsive to said testing source, a fourth relay responsive to less current than said third relay, a circuit operative when said plug is associated with said jack for connecting said fourth relay in series with said third relay and thus rendering said third relay unresponsive to said second relay and said fourth relay responsive thereto, an indicating device responsive to said fourth relay, a plurality of controlling keys, and a relay selectively controlled by said keys for controlling the amount of testing current associated with said first relay.

7. A device for testing the translating apparatus for relaying ringing current from one section of a transmission line to another, the said translating apparatus comprising a first relay responsive to ringing current in

one section of the line and a second relay responsive to the first for associating ringing current with the other section of the line; said device comprising a source of testing current, a portable controlling apparatus and means associated therewith for causing a normally operative or an inoperative amount of current from said source to traverse said first relay, means for rendering said second relay nonresponsive to said first when the same is actuated by testing current, and an indicating device associated with said portable apparatus for indicating the response of said first relay to said testing current.

8. A device for testing the apparatus for relaying ringing current from one section of a transmission line to another, about a repeater normally associating said sections of the line for current of other than ringing frequency, said relaying apparatus being arranged, when operating, to dissociate the repeater and the line; said device comprising means for associating testing current with said relaying apparatus, means for preventing said relaying apparatus from dissociating the repeater and the line during the test, an indicating device, and means for causing said device to indicate the response of said relaying apparatus to said testing current.

In testimony whereof, I have signed my name to this specification this 20th day of June, 1919.

JOHN F. TOOMEY.