

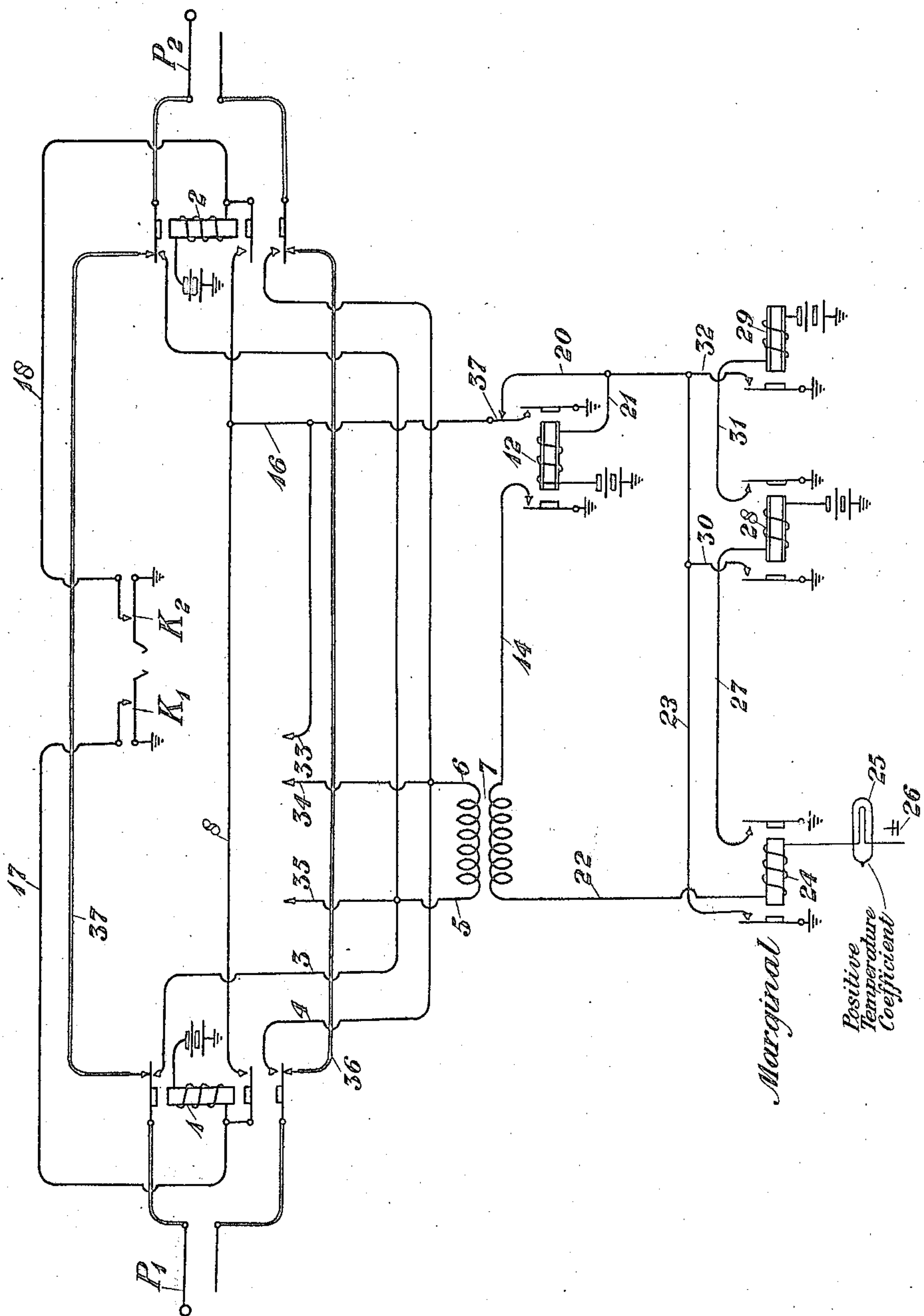
Feb. 27, 1923.

1,446,526

J. F. TOOMEY

RINGING REGULATOR

Original Filed Sept. 17, 1918



INVENTOR
John F. Toomey
BY *J. F. Toomey*
ATTORNEY

Patented Feb. 27, 1923.

1,446,526

UNITED STATES PATENT OFFICE.

JOHN F. TOOMEY, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

RINGING REGULATOR.

Original application filed September 17, 1918, Serial No. 254,493. Patent No. 1,408,784, dated March 7, 1922. Divided and this application filed July 1, 1921. Serial No. 481,904.

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 Ringing Regulators, of which the following is a specification.

This invention relates to ringing arrangements and particularly to arrangements for transmitting ringing current over transmission lines.

The invention is a division of my copending application, Serial No. 254,493, filed September 17, 1918, entitled "Ringing regulators," issued as Patent No. 1,408,784, March 7, 1922.

It has been found desirable when ringing over certain types of lines to have the ringing continue for a certain interval of time. A desirable interval for long distance lines has been found in practice to be approximately two seconds, although the interval may vary under different conditions. In former arrangements for ringing over long distance lines the ringing would only continue during the interval in which the operator held closed the ringing key. With such arrangements it has been found difficult to obtain a ringing interval which would be of satisfactory or uniform duration. Accordingly, it is one of the objects of this invention to provide a means which will operate when the ringing key is thrown to insure the continuation of the ringing for a satisfactory and uniform interval of time. Other and further objects of the invention will be clear from the detailed description to be given later.

The ringing arrangements of this invention may be associated with a cord circuit or a section of a transmission line, which will include a ringing key. Controlled initially by this ringing key is a chain or series of slow-releasing relays and means whereby ringing current is applied to the cord circuit or transmission line. When the ringing key of the cord circuit or transmission line is released the means for applying ringing current to the cord circuit or transmission line will remain held operative by the chain or series of slow-releasing relays during that interval which elapses while the chain or series of slow-releasing relays are releasing. By increasing or de-

creasing the number of slow releasing relays in this chain the ringing interval may be prolonged or shortened as desired.

The invention may now be more fully understood with reference to the accompanying drawing, in the figure of which the arrangements of the invention are illustrated as associated with a cord circuit. The cord circuit includes the talking conductors 36 and 37 and terminates in the plugs P_1 and P_2 . At each end of the cord circuit are the relays 1 and 2 which operate when the ringing keys K_1 or K_2 are thrown and serve to connect the ringing conductors 3 and 4 of the link circuit to the plugs P_1 and P_2 respectively. Included in a bridge across the ringing conductors is the winding of a transformer 7. Under the control of either relay 1 or relay 2 is the slow-releasing relay 12. Under the control of the slow-releasing relay 12 is a ringing circuit including one winding of the transformer 7 and terminating in a source 26 of ringing current. Included in this circuit is a marginal relay 24 and the ballast lamp 25. Under the control of marginal relay 24 is a series of slow-releasing relays such as the relays 28 and 29. These relays in turn control the relay 12. By means of the conductors 33, 34 and 35 the ringing arrangements of this invention may be made common to a plurality of cord circuits.

The invention may now be more fully understood from the following description of its operation. If the plug P_1 is inserted in the jack of a long distance line over which it is desired to transmit ringing current, the operator will throw the key K_1 and thereby close the following circuit: from ground and contact of key K_1 , conductor 17, winding of relay 1 to battery and ground. The closing of this circuit will energize relay 1, which will connect the ringing conductors 3 and 4 to the contacts of plug P_1 . The energization of relay 1 will also close the following circuit; from ground, contacts of key K_1 , conductor 17, armature and contact of relay 1, conductors 8 and 16, contact 37, conductors 20 and 21, winding of relay 12 to battery and ground. The closing of this circuit will energize the relay 12. The energization of relay 12 causes it to pull up its righthand armature and open the circuit including its winding at contact point 37, at

the same time completing a locking circuit for relay 1 over its righthand armature to ground. As the relay 12 is a slow-releasing relay, it will not become de-energized at once but will hold up its armatures and close the following circuit; from ground, lefthand armature and contact of relay 12, conductor 14, winding of transformer 7, conductor 22, winding of marginal relay 24, filament of lamp 25, to source 26 of ringing current. Ringing current will now be transmitted from the source 26 over the last-mentioned circuit and, by means of the transformer 7, will be transmitted over conductors 5 and 6 and thence over the ringing conductors 3 and 4 and out over the long distance line. The closing of this last-mentioned ringing circuit will energize the marginal relay 24, which will pull up its armature and close the following circuit: from ground, lefthand armature and contact of relay 24, over conductors 23 and 21, winding of relay 12 to battery and ground. The closing of this circuit will serve to maintain the relay 12 in an energized condition and prevent the ringing circuit from being broken. The operation of relay 24 also closes the following circuit: from ground, righthand armature and contact of relay 24, conductor 27, winding of slow-releasing relay 28 to battery and ground. The closing of this circuit energizes the relay 28, which will pull up its armatures and close the following circuit: from ground and lefthand armature and contact of relay 28, conductors 30, 23, and 21, winding of relay 12 to battery and ground. The closing of this last-mentioned circuit will also serve to maintain the relay 12 in an energized condition and to prevent the ringing circuit from being broken. The operation of relay 28 also closed the following circuit: from ground, righthand armature and contact of relay 28, conductor 31, winding of slow-releasing relay 29, to battery and ground. The closing of this circuit energizes the slow-releasing relay 29, which pulls up its armature and closes the following circuit: from ground, lefthand armature and contact of relay 29, conductors 32, 23 and 21, winding of relay 12 to battery and ground. The closing of this last-mentioned circuit also serves to maintain the relay 12 in an energized condition and to prevent the ringing circuit from being broken.

After the first rush of ringing current over the ringing circuit, the filament of the lamp 25, which is included in the ringing circuit, will become heated and so increase the resistance of the ringing circuit that the marginal relay 24 will become de-energized. When the marginal relay 24 becomes de-energized and its lefthand armature retracts, one of the circuits formerly closed about the relay 12 will be opened

and the relay 12 will now be maintained in an energized condition only by the circuits formerly closed upon the operation of the slow-releasing relays 28 and 29. When the righthand armature of relay 24 retracts, the before mentioned circuit about the slow-releasing relay 28 will be broken. As the relay 28 is a slow-releasing relay, it will hold up its armatures momentarily and still serve to maintain the relay 12 in an energized condition. However, when the lefthand armature of relay 28 is released, it will be seen that the relay 12 will now be maintained in an energized condition only by the circuit formerly closed upon the operation of relay 29. When the righthand armature of relay 28 retracts, the circuit formerly closed through the relay 29 will be opened. As the relay 29 is a slow-releasing relay, it will momentarily hold up its armature and maintain the relay 12 in an energized condition. When the armature of relay 29 retracts, the circuit formerly closed thereby through the relay 12 will be broken and the relay 12 after momentarily holding up its armatures, will become de-energized and, by allowing its armatures to retract, will open the before-mentioned ringing circuit and allow the ringing operation to cease.

With the above described arrangements it will be seen that ringing current will be transmitted out over the transmission line for a period of time comprising the interval necessary for the heating of the ballast lamp and the deenergization of relay 24, together with the intervals necessary for the releasing in order of the slow acting relays 28, 29 and 12. By increasing or decreasing the number of slow acting relays such as the relays 28 and 29 which control relay 12, the ringing period may be increased or decreased as desired.

While the arrangements of the invention have been disclosed in certain specific arrangements which are deemed desirable it is understood that they are capable of embodiment in many and other widely varied forms without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. In a signaling system, a link circuit including switching means, a transformer associated with said link circuit, a slow-releasing relay primarily controlled by said switching means, a ringing circuit including a source of current and a marginal relay and a winding of said transformer, means controlled by said slow-releasing relay for closing said ringing circuit and dissociating said slow-releasing relay from said switching means; a series of slow-releasing relays controlled by said marginal relay and means controlled by said series of slow-re-

leasing relays for controlling said first mentioned slow-releasing relay.

2. In a signaling system, a link circuit including switching means, a slow-releasing relay primarily controlled by said switching means, a ringing circuit including a source of current and a marginal relay, means controlled by said slow-releasing relay for closing said ringing circuit and dissociating said slow-releasing relay from said switching means, a series of slow-releasing relays controlled by said marginal relay, means controlled by said series of slow-releasing relays for controlling said first mentioned slow-releasing relay and automatically operating means in said ringing circuit for controlling said marginal relay.

3. In a signaling system, a plurality of link circuits, signaling keys in each of said link circuits, a slow-releasing relay under the initial control of each of said signaling keys, a transformer having one of its windings associated in common with all of said link circuits, a ringing circuit including a source of current and the other winding of said transformer, means controlled by said slow-releasing relay for closing said ringing circuit and means associated with said ringing circuit for dissociating said relay from said signaling keys.

In testimony whereof, I have signed my name to this specification this 30th day of June, 1921.

JOHN F. TOOMEY.