March 11, 1930. E. W. NILES 1,749,838

SELECTIVE SYSTEM

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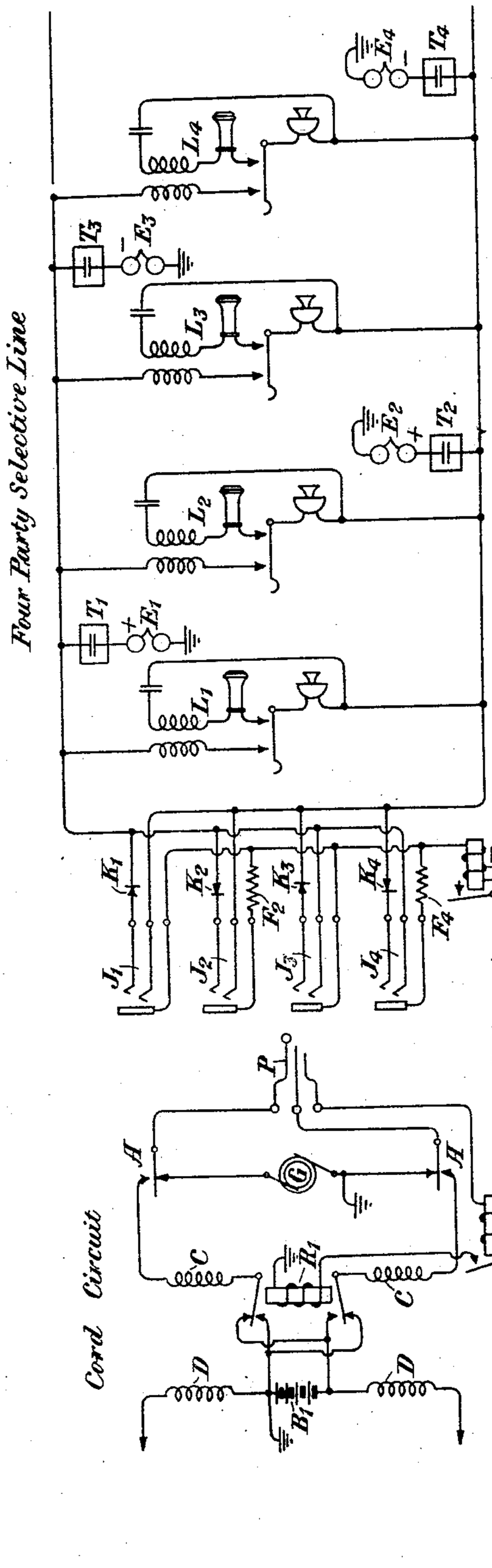

Fig. 1

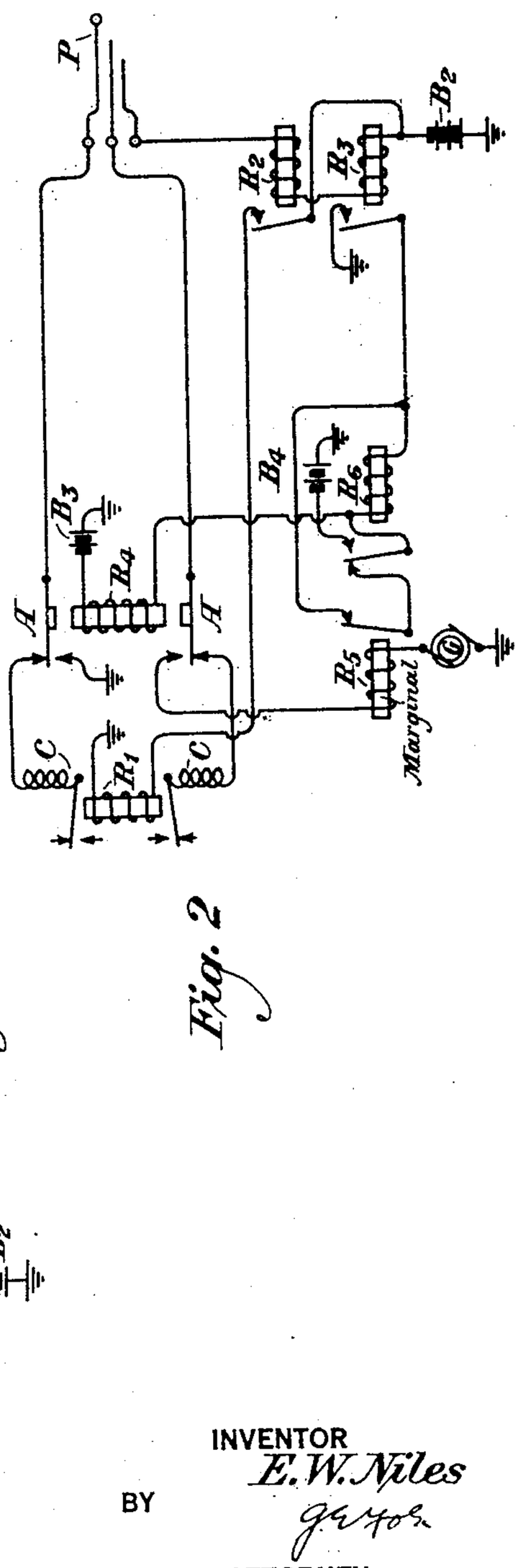

Fig. 2

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SELECTIVE SYSTEM

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This invention relates to selective systems, and more particularly to arrangements for causing the selective operation of electro-responsive devices such as telephone ringers, relays, or the like.

In four-party selective ringing systems employed heretofore, positive and negative polarities of current are supplied to the cord circuit of the telephone system for ringing purposes and these are controlled by keys which are manipulated by the operator in selecting the desired party on the four-party line. The keys supply the positively or negatively polarized current between the tip or ring side of the line and ground, thus operating the particular ringer, relay, or the like, having the corresponding tip and ring connection and polarity.

In the present invention, it is proposed to employ a cord circuit for a telephone system which does not require any keys for ringing purposes. A simple alternating current generator is used and its output is polarized by rectifying devices which are directly connected in the circuit of, for example, four jacks associated with the telephone line and which correspond to each of the four parties. These jacks are, of course, connected to the telephone line and include means for connecting the alternating current generator to the proper side of the telephone line for ringing purposes.

One of the objects of this invention is to associate an alternating current generator with a pair of rectifiers and a pair of oppositely polarized ringers, relays, or the like, so that the generated current may be rectified to operate the proper ringer or relay.

While this invention will be pointed out with particularity in the appended claims, the invention itself, both as to its further objects and features, will be better understood from the detailed description hereinafter following, when read in connection with the accompanying drawing, in which Figure 1 represents an arrangement including a cord circuit and a four-party selective line, this arrangement disclosing the general features of the invention, and Fig. 2 represents the details of means associated with armatures AA by which the source of ringing current and source of talking current are switched into the cord circuit as required.

Referring to Fig. 1 of the drawing, the cord circuit is shown at the left terminating in a plug P. This cord circuit includes the familiar repeating coil windings CC and DD and the main battery B_1. A generator which is capable of supplying simple alternating current is designated G and this generator may be connected to the tip and ring side of the plug P through armatures AA, which are operated by a relay shown and described in connection with Fig. 2 of the drawing.

The sleeve side of plug P is connected in series with a relay R_2, a battery B_2 and ground. Whenever relay R_2 becomes operated, its armature is attracted, closing the circuit of relay R_1, the current required to operate relay R_1 being derived from battery B_2. Relay R_1 is employed for the purpose of reversing the polarity of battery B_1 whenever relay R_2 becomes energized.

The four-party selective line includes four jacks J_1, J_2, J_3, and J_4, any one of which may be engaged by plug P. Four rectifiers K_1, K_2, K_3, and K_4 are connected, respectively, to the tip sides of the jacks J_1, J_2, J_3, and J_4, respectively. These rectifiers may be of the dry disk or copper oxide type, or they may be of any other type well known in the art. It is to be noted that two of these rectifiers, K_1 and K_2, are tied to one side of the telephone line and that the other two, K_3 and K_4, are tied to the other side of the line. Rectifiers K_1 and K_2 are oppositely directed, and therefore one of these rectifiers, for example, K_1 will derive positive pulses of current from impressed alternating current, and the other, K_2, will derive negative current pulses. Rectifiers K_3 and K_4 are also oppositely directed. rectifier K_3, for example, transmitting positive pulses of current and rectifier K_4 transmitting negative pulses.

The sleeve sides of jacks J_2 and J_4 include resistances F_2 and F_4, respectively. All of the sleeve sides of the four jacks are connected in multiple and in series with a relay R_0. When plug P engages either jack J_1 or J_3, a substantial current will flow from battery B_2

through the winding of relay R_2, the sleeve sides of plug P and the particular jack engaged, and through the winding of relay R_0, causing the operation of both relays R_2 and R_0. In that event, relay R_1 becomes energized, its armature is attracted, and battery B_1 is connected in its normal polarity to the tip and ring sides of plug P. Whenever plug P engages either of jacks J_2 or J_4, the corresponding resistance, either F_2 or F_4, is interposed in series with the winding of relays R_2 and R_0, preventing the flow of substantial current therethrough, and relay R_2 does not become operated. In that event, relay R_1 is unoperated and battery B_1 is connected to the tip and ring sides of plug P in opposite polarity. The reason for changing the polarity of battery B_1 in connecting plug P with either of jacks J_1 or J_3 or with either of jacks J_2 or J_4, is to properly pole the current from battery B_1 with respect to the corresponding rectifier so that said current may traverse that rectifier.

The telephone line may be bridged by four telephone subsets of any familiar type. Those designated L_1, L_2, L_3, and L_4 represent the subsets normally employed in four-party selective systems. Two bells E_1 and E_3 are connected to one side of the line through electrical discharge tubes or devices T_1 and T_3, respectively. Bells E_2 and E_4 are connected to the other side of the line through electrical tubes or devices T_2 and T_4, respectively. Devices T_1, T_2, T_3, and T_4 are preferably sealed tubes enclosing a rare gas, such as neon, each preventing the passage of current when its voltage is below a predetermined value, and passing current when its voltage is increased beyond this value. Bells E_1, E_2, E_3, and E_4 are connected to the line in the manner shown and described in a patent to Messrs. Norton and May, No. 1,517,857, dated December 2, 1924. It is to be noted that bells E_1 and E_3 are positively poled and that bells E_2 and E_4 are negatively poled.

An individual line may also be terminated in the tip and ring sides of another jack, if desired. A telephone subset of the type already considered may be connected to the individual line and may include a bell similar to those already considered hereinabove. This line need not include a rectifier, nor a discharge tube or device and it is not necessary for the bell to be poled.

When plug P is inserted in one of the jacks J_1, J_2, J_3 or J_4, the corresponding party will be rung selectively. It is to be noted that one of the rectifiers K_1, K_2, K_3 or K_4 associated with the jack engaged by plug P modifies the current transmitted by generator G so as to produce a polarized pulse to selectively ring the bell associated with the particular jack engaged.

The circuit arrangement shown in Fig. 2 of the drawing discloses how it is possible to operate the armatures AA associated with the generator G of Fig. 1. The sleeve side of plug P is connected to ground through the windings of relays R_2 and R_3 and a battery B_2 in series relationship. A relay R_4 controls the motion of the armatures AA and the winding of this relay is connected in series with a battery B_3. The outer contacts of armatures AA are connected to the repeating coil windings CC, the inner contact of the upper armature A is connected to ground, and the inner contact of the lower armature A is connected in series with a marginal relay R_5, the generator G and ground. The relay R_1 controls the armatures which connect the main battery B_1 of Fig. 1 in one polarity or the other. A relay R_6 is shown, and since all of the relays of Fig. 2 are normally unoperated, the winding of relay R_6 is shunted by a circuit which includes the armature of relay R_5 and its contact, and the armature of relay R_6 and its outer contact.

When plug P engages either of the jacks J_1 or J_3 shown connected to the selective line of Fig. 1, relays R_2 and R_3 become operated, current flowing from battery B_2 through the windings of these relays over the sleeve sides of plug P and the particular jack engaged, through the winding of the relay R_0 and ground. Upon the operation of relay R_2, relay R_1 becomes operated, a circuit being established which includes battery B_2, the armature and contact of relay R_2, the winding of relay R_1 and ground. Upon the operation of relay R_3, relay R_4 becomes operated, a circuit being established which includes the armature and contact of relay R_3, the armature and contact of relay R_5, the armature and outer contact of relay R_6, the winding of relay R_4, battery B_3 and ground. Upon the operation of relay R_4, the armatures AA become attracted, the upper armature A becoming grounded and the lower armature being connected to generator G through the winding of the marginal relay R_5. Thus, the generator G is bridged across the tip and ring sides of plug P. If jack J_1, for example, is the jack of Fig. 1 heretofore engaged by plug P, then the generator G will supply the current which traverses rectifier K_1 and the discharge device T_1 so as to ring the bell E_1. The ringing current of itself, is insufficient to operate the marginal relay R_1. But when the signaled party responds to the sound of the bell and removes the receiver from the hook of his subset, the current from generator G will increase to the extent sufficient to cause the marginal relay R_5 to become operated. Accordingly, the armature of relay R_5 opens its associated contact and current is permitted to flow through the winding of relay R_6, the circuit now established including battery

B_3, the winding of relay R_4, the winding of relay R_6, the armature and contact of relay R_3 and ground. The shunt circuit around the winding of relay R_6 having been removed from the operation of relay R_5, the armature of relay R_6 becomes attracted and relay R_6 becomes locked, the locking circuit including a battery B_4, the armature and inner contact of relay R_6, the winding of relay R_6, armature and contact of relay R_3 and ground. Inasmuch as batteries B_3 and B_4 are common, the closure of the front contact of relay R_6 closes a shunt circuit around the winding of relay R_4, causing it to release, and this in turn disconnects the generator from the cord circuit and reconnects the repeating coil windings CC to the cord circuit. When the plug P is disconnected from the jack of the selective line, the windings of relays R_2 and R_3 become deenergized and upon release of the armature of relay R_3, the relay R_6 also releases. Moreover, upon the release of the armature of relay R_2, the circuit in series with the winding of relay R_1 is opened and relay R_1 releases its armatures.

It is to be noted that relay R_5 is operated by periodic current and is, moreover, operated only when the periodic current flowing through its winding increases beyond a predetermined value. This relay is set so that the current of generator G, which flows merely through one of the ringers and its associated discharge tube, is insufficient to cause its operation. However, relay R_5 does become operated only when the receiver of one of the subsets is removed from its hook after a ringing signal has been impressed upon the selective line.

While this invention has been disclosed in certain particular embodiments merely for the purpose of illustration, it will be understood that the general principles of this invention may be applied to other and widely varied organizations without departing from the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. A line for a multi-party telephone system which includes a pair of oppositely polarized relays, a pair of two-electrode discharge devices connected respectively in series relationship with said relays, a pair of dry-disk rectifiers associated with the line and corresponding in polarity respectively with said relays, a source of alternating current, means whereby said source may become rectified by one of the rectifiers to produce positive pulses of current which flow through the corresponding discharge device and relay, and means whereby said source may become rectified by the other of said rectifiers to produce negative pulses of current which flow through the corresponding discharge device and relay.

2. A telephone signaling system comprising a two-wire line, four two-electrode discharge devices each capable of transmitting current when the impressed voltage exceeds a predetermined value, four ringers, two of which are poled positively and the other two of which are poled negatively, two of said discharge devices and two mutually oppositely poled ringers being respectively connected in series relationship with each other and with one of the wires of the line, the other two of the discharge devices and the other two of the ringers being connected respectively in series relationship with each other and with the other wire of the line, four rectifiers, two of said rectifiers being associated with each wire of the line, means whereby either of the two rectifiers connected with one of the wires of the line may transmit positive pulses of current capable of being transmitted by one of the discharge devices to operate its associated ringer, and means whereby either of the two rectifiers connected with one of the wires of the line may transmit negative pulses of current capable of being transmitted by one of the discharge devices to operate its associated ringer.

3. A four-party signaling system comprising a telephone line, four rectifiers, two of which are connected to one side of the line and are oppositely directed and the other two of which are connected to the other side of the line and are also oppositely directed, four polarized ringing devices, one corresponding with each rectifying device, two of the ringing devices associated with each side of the line being oppositely polarized, a source of alternating current, and means whereby said source of alternating current may be connected to one side of the line through either of its associated rectifying devices to operate the corresponding ringing device.

4. A telephone system including a line to which a source of alternating current may be connected, two oppositely directed rectifiers, two oppositely poled ringers, one corresponding to each rectifier, and means for connecting a source of alternating current with each of the rectifiers to operate the corresponding ringer.

5. A line for a telephone system including a source of alternating current, two oppositely directed rectifiers, two oppositely polarized ringers, one corresponding to each rectifier, means for selectively transmitting current of said source through either of the rectifiers to operate its corresponding ringer, a battery, and means for connecting said battery to the line in one direction when one of the ringers becomes operated and for connecting said battery to the line in the opposite direction when the other ringer becomes operated.

6. A multi-party selective system including a telephone line, two rectifiers connected with the line, one poled in one direction and

the other poled in the opposite direction, a source of alternating current, a source of direct current, means for connecting the source of alternating current to the line through either of the rectifiers, and means for connecting the source of direct current to the line in one direction when one of the rectifiers transmits current derived from the alternating current source and for connecting the direct current source in the opposite direction when the other of the rectifiers transmits current derived from the alternating current source.

In testimony whereof, I have signed my name to this specification this 23rd day of April, 1929.

ELIOT W. NILES.