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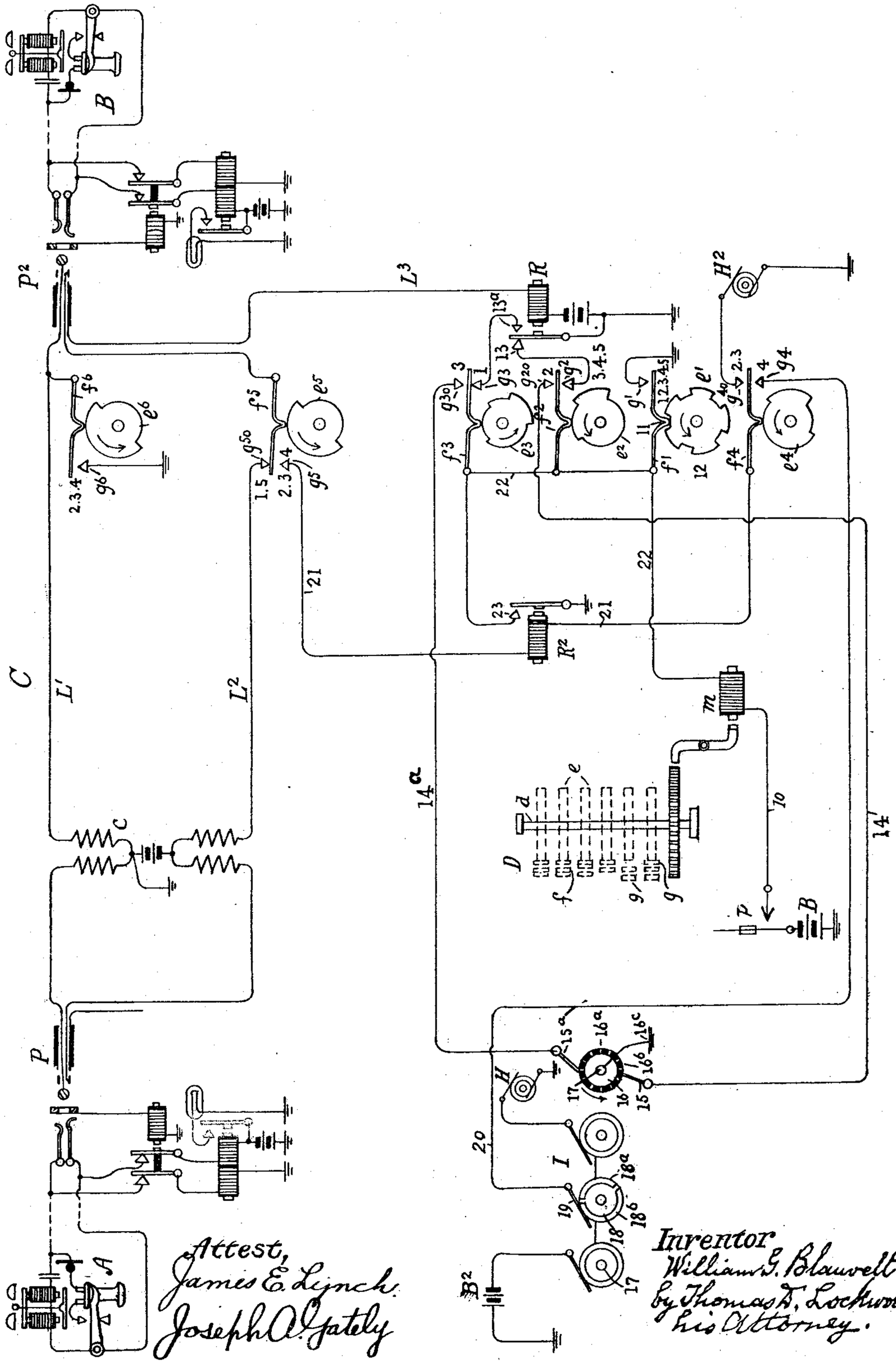
TELEPHONE SIGNALING SYSTEM.

APPLICATION FILED MAY 4, 1911.

1,055,863.

Patented Mar. 11, 1913



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TELEPHONE SIGNALING SYSTEM.

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Application filed May 4, 1911. Serial No. 624,972.

To all whom it may concern:

Be it known that I, WILLIAM G. BLAUVELT, residing at New York, borough of Manhattan, in the county of New York and State of New York, have invented certain Improvements in Telephone Signaling Systems, of which the following is a specification.

In telephone systems, in signaling substations, a well known practice is what is commonly termed "automatic ringing," in which the ringing generator of the central station is connected with the line of the called substation through an interrupter having a rotatable contact device, which gives alternate periods during which ringing current is applied to the line and is cut off therefrom. Obviously, any call, when it reaches the point at which ringing over the called line is to begin, may find the interrupter upon the silent segment of the contact device, and no ringing current will be available until the generator segment comes into the circuit. The periods of connection and disconnection are often of two and four seconds duration, respectively, and it will be seen that in this case during two-thirds of the time there will be a delay in starting the signal averaging two seconds, which is wholly wasted. My invention avoids this loss by rendering immediately available at the commencement of the ringing stage an uninterrupted or continuous supply of current, this acting for a definite time, after which the interrupter is joined to the line, and the signaling operation will proceed as usual.

The invention is equally applicable to manual, automatic and combination manual and automatic systems, but, since the principle is the same in all, and the manual furnishes the simplest embodiment, only that will be herein described. It is illustrated by the diagrammatic drawing in which merely the more essential elements appear.

Telephone substations with their lines and customary associated apparatus appear at A and B, these being considered as the calling and called stations, respectively. Means at the central station C for connecting the lines for conversation may be any which is desirable. I have illustrated a portion of a manual cord circuit *c*, provided with an answering plug P and a calling plug P^2. Associated with the cord circuit is an automatic switching mechanism D, the arrangement and functions of which will depend upon the character of the system of which it is a part, but which, in any event, is adapted to assume successive controlling positions in regular sequence. In the present instance, it is employed solely as a means for governing the signaling of the called subscriber, and for this purpose it consists of a shaft *d* upon which is fixed a series of cams *e*, the peripheries of which coöperate with springs *f* to force them against or permit them to separate from contacts *g*. These cams, springs and contacts all appear in two places in the drawing, in dotted lines in their actual relation to the shaft *d* and in full lines at points most clearly developing the circuit organization. In the latter case, they are distinguished from one another by numerals affixed to their reference letters. The switch shaft with its cams may be moved from position to position by a motor magnet *m* actuating ratchet mechanism. A pulsator *p* supplies intermittent current from battery B through conductor 10 to the motor magnet *m*, and thus rotates the shaft whenever its circuit is completed at one of the contacts of the sequence switch D to ground or other return conductor. This ground connection may be at some external point or local to the switching mechanism itself, the cam e^1 controlling the latter condition and determining the correct stopping points of the switch shaft. When the spring f^1 cooperating with this cam is separated from the contact g^1, this being in the positions indicated by the numerals placed at the opposite side of the spring from the contact, the projection 11 upon said spring lies in a depression 12 in the periphery of the cam, and the shaft with the associated cams is properly positioned. Upon the completion of the circuit of the motor magnet *m* at some point in the system the projection rides out of the depression, and when resting upon elevations of the cam e^1 closes a local circuit for the motor magnet which insures the rotation of the shaft to the next position at which the cams are to stop, regardless of external conditions. The numerals applied to the contacts of the remaining cams show the positions in which said contacts are closed. Of the other cams,

a contact g^2 of cam e^2 is joined to the back contact 13 of a relay R, the winding of which is in the third conductor L^3 of the cord between the free pole of the central battery and the sleeve of the calling plug. The front contact 13^a of relay R is connected to contact g^3 of cam e^3. From the opposite contacts g^{20} and g^{30} of cams e^2 and e^3 conductors 14 and 14^a, respectively, lead to brushes 15, 15^a coöperating with narrow segments 16^a of an extra contact cylinder 16 upon the shaft 17 of an interrupter or signaling mechanism I. These segments are separated by alternate blocks 16^b of insulating material and are all connected to ground at 16^c through the shaft 17. As the cylinder 16 rotates in the direction of the arrow at a predetermined speed, the brush 15 first contacts with one of the segments 16^a, and then, after a definite time interval but never simultaneously, the brush 15^a contacts with another of the segments. Thus a ground connection is alternately applied to the brushes with any suitable time intervening, this depending upon the relative position of the brushes, the spacing of the segments and the rate of rotation of the interrupter. Apart from this extra contact device the interrupter may be as usual, supplying current from the generator H and battery B^2, respectively, to the ringing segment 18^a and silent segment 18^b of a cylinder 18. A brush 19 alternately delivers the current from these elements to a conductor 20 leading to contact g^4 of cam e^4. The contact g^{40} of the same cam is joined directly to a ringing generator. This generator H^2 is illustrated as separate from the generator H, but in practice they will preferably be identical. It will be seen, however, that since there is no intermediate interrupter, this contact g^{40} applies ringing current to the spring f^4 coöperating with it differing in character from the current interruptedly given at g^4. Spring f^4 is included by a conductor 21 in the circuit of a marginal relay R^2 with the contact g^5 of cam e^5. The spring f^5 and its contact g^{50} complete the continuity of the cord conductor L^2 for conversation. The cam e^6 by its contact g^6 and spring f^6 puts ground upon the tip of the calling plug. The switch springs f^1, f^2 and f^3 are united by a common conductor 22 with the motor magnet m of the sequence switch D and with the front contact 23 of relay R^2.

Let it be assumed that upon a call from substation A, the line of substation B was not found in use, and that it has been connected by the cord c with the calling line. A circuit is at the same time completed for the relay R in series with the cut-off relay of the called line, and the closing of the front contact 13^a gives a path for current from the pulsator p through conductor 10, motor magnet m, conductor 22, spring f^3 and normal switch contact g^3 to ground. The switch is thereupon advanced to its second position. Whatever the position of the segments 18^a, 18^b, current will at once flow from generator H^2 through contact g^{40}, spring f^4, conductor 21, winding of relay R^2 (which does not respond) contact g^5, spring f^5, cord conductor L^2, over the line of substation B and to ground through conductor L^1, spring f^6 and contact g^6, and ringing begins without delay. As soon as the rotation of the interrupter brings a grounded segment 16^a of the device 16 into coöperation with the brush 15, a new circuit is provided for the motor magnet including conductor 22, spring f^2, contact g^{20} and conductor 14 causing the switch to assume its third position. Here it remains for a measured interval of time, say half a second, determined by the interrupter I as previously described, until the brush 15^a is grounded through a segment 16^a, the ringing of the substation B continuing during this period. Then a circuit for the motor magnet exists by way of conductor 14^a, contact g^{30}, spring f^3 and conductor 22, and the switch advances to the fourth position. This disconnects the generator at the contact g^{40} and connects the interrupter by means of contact g^4 and conductor 20, resulting in intermittent ringing until the called subscriber removes the receiver from its hook. Then the increased current from either the generator H or battery B^2, depending upon which segment of the cylinder 18 the brush 19 contacts with, causes relay R^2 to close its contact 23. There is now a circuit for the motor magnet by way of conductor 22 and said contact to ground at the armature of relay R^2, and the switch is driven to its fifth position, cutting off the ringing current at spring f^4, disconnecting ground at the spring f^6 and closing the talking circuit at the spring f^5. It will be seen that immediately upon connection with the line of the called subscriber, ringing current will be continuously applied for a time extending between determinable limits, not less than that required for the brushes 15, 15^a to successively coöperate with segments 16^a, nor greater than double such time, followed by the usual interrupted application of current. Upon the completion of conversation the relay R is deënergized, in the present instance by the removal of the plug p^2 from its jack, giving a circuit for the motor magnet m through the back contact 13^a of the relay, switch contact g^2, spring f^2 and conductor 22. The switch is thereby restored to its normal position. If, for any reason, the talking circuit should be similarly opened in the third or fourth position of the switch, the restoring circuit will be closed through the same switch con-

tact. Disconnection in the second position leads to the same result, since the motor magnet circuit through interrupter brush 15, conductor 14 and contact g^{20} immediately causes the assumption of the third position.

I claim:

1. The combination with a telephone line and a source of signaling current, of independent automatic means for applying the signaling current to the line, said signaling current being constantly available at one of said means and intermittently available at another of said means.

2. The combination with a telephone line and a source of signaling current, of automatic means for successively applying the signaling current to the line, said signaling current being constantly available at the first applying means and intermittently available at the means by which it is thereafter applied to the line.

3. The combination with a substation telephone line, of automatic means for continuously applying signaling current to the substation line through one connection and for intermittently applying signaling current to the substation line through another connection.

4. The combination with a telephone line, of a source of ringing current, an interrupter between said source of current and the line, and independent means for automatically applying ringing current to the line before the interrupter comes into operation.

5. The combination with a telephone circuit, of a source of signaling current, movable means for automatically alternately connecting and disconnecting the source of current with respect to the telephone circuit, and means independent of said movable means for automatically connecting the source of current with the circuit for a time varying between definite limits.

6. In a telephone system, line connecting means, automatic switching mechanism associated therewith, a current interrupter, and a source of ringing current connected with the switching mechanism through the interrupter and also having independent connection with the switching mechanism whereby the latter may apply the current either through the interrupter connection or the independent connection.

7. In a telephone system, line connecting means, a switching mechanism associated therewith, a current interrupter, a source of ringing current connected with the switching mechanism through the interrupter and also having independent connection with the switching mechanism, and means forming a portion of the interrupter for controlling the switching mechanism.

8. The combination with telephone lines, of a connecting circuit, a mechanism having switching contacts associated with the connecting circuit, said switching mechanism being capable of assuming a plurality of contact actuating positions, means for continuously applying ringing current to the connecting circuit through one combination of the contacts in one position of the switching mechanism, and means for intermittently applying ringing current to the connecting circuit through another combination of the contacts in another position of the switching mechanism.

9. The combination with telephone lines, of a connecting circuit, a mechanism having switching contacts associated with the connecting circuit, said switching mechanism being capable of assuming a plurality of contact actuating positions, means for continuously applying ringing current to the connecting circuit in one position of the switching mechanism, means for intermittently applying ringing current to the connecting circuit in the succeeding position, means controlled by the putting of the connecting circuit into use for advancing the switching mechanism from its normal position to its first active position, and means controlled by the means for intermittently applying current for advancing the switching mechanism to another position.

10. In a telephone system, substation lines, a connecting circuit therefor, a sequence switch associated with the connecting circuit and being provided with motor mechanism, a source of ringing current, and a ringing interrupter interposed between the source of current and the sequence switch, said interrupter having a contact device controlling the motor mechanism of the sequence switch.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses, this twenty-fourth day of April, 1911.

WILLIAM G. BLAUVELT.

Witnesses:

SAMUEL RASMISON,

ROBERT S. SUTLIFFE.