

**June 9, 1925.**

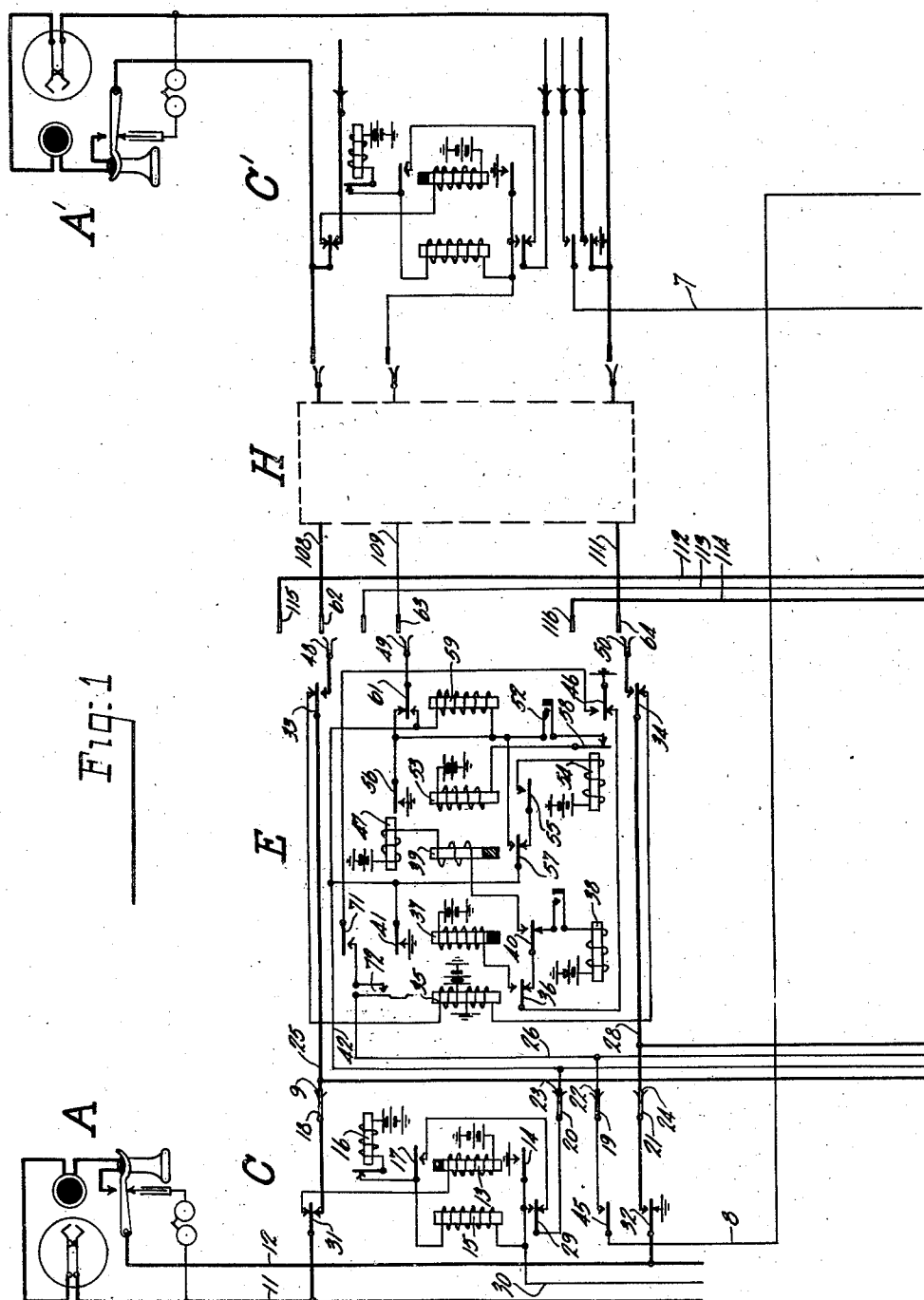
**1,540,786**

C. E. LOMAX

TELEPHONE SYSTEM

Filed Jan. 11, 1923

2 Sheets-Sheet 1



— Inventor —

Clarence E. Lomax

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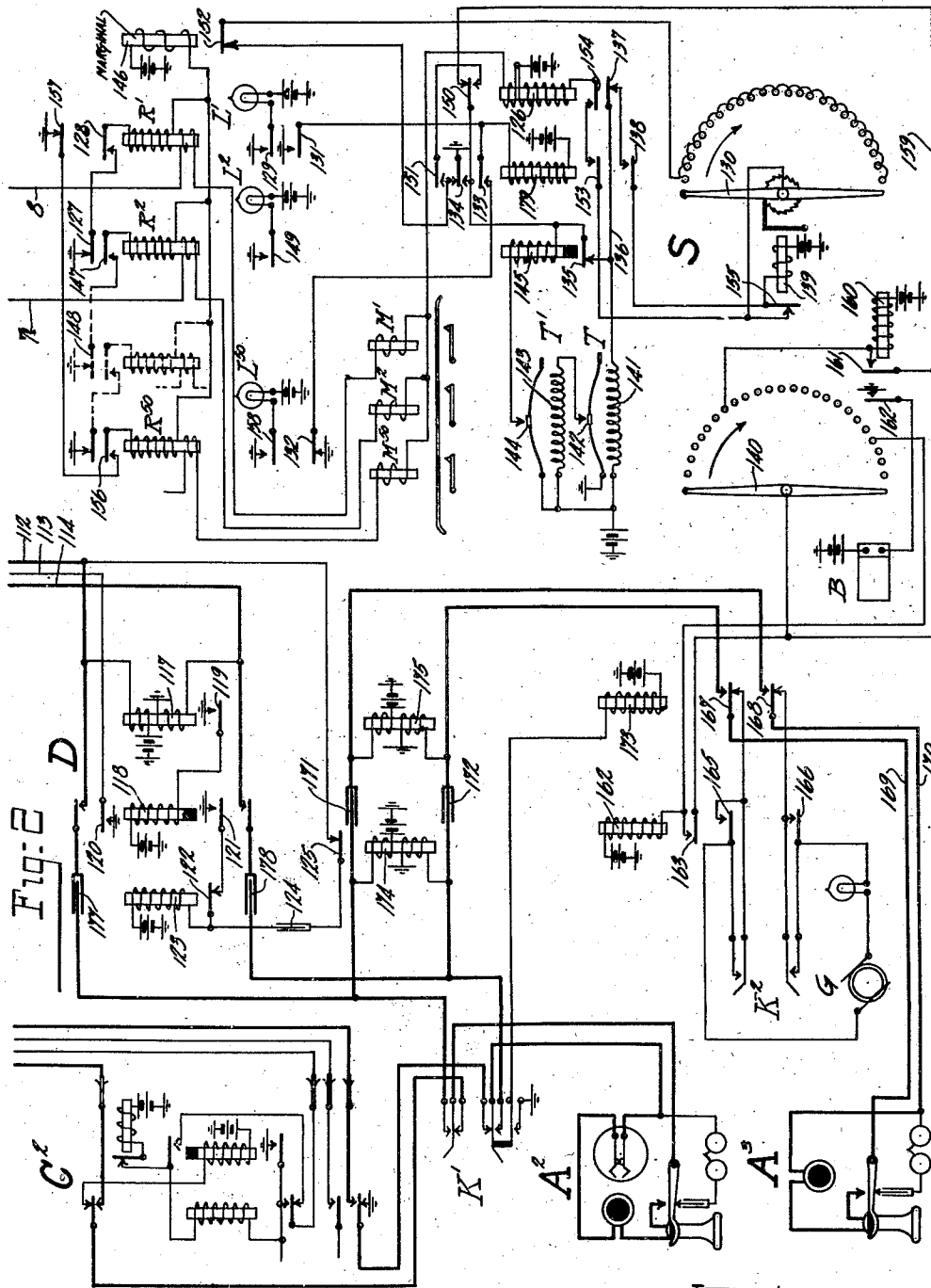
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2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE.

CLARENCE E. LOMAX, OF CHICAGO, ILLINOIS, ASSIGNOR TO AUTOMATIC ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## TELEPHONE SYSTEM.

Application filed January 11, 1923. Serial No. 611,916.

*To all whom it may concern:*

Be it known that I, CLARENCE E. LOMAX, a citizen of the United States of America, and a resident of Chicago, Cook County, and State of Illinois, have invented certain new and useful Improvements in Telephone Systems, of which the following is a specification.

The present invention relates in general to telephone systems in which connections may be established through the medium of subscriber controlled selector and connector switches, but is more particularly concerned with a system of the above character which is combined with or has superimposed on it, so to speak, a watchman's service system; and the object of the invention may be said to be, broadly, the provision of new and improved auxiliary apparatus for use in connection with a telephone system.

In the preferred embodiment of the invention, means are provided whereby certain telephones in the system may be used as watchman's stations in addition to performing the functions usually ascribed to a telephone in an automatic system. When used as a watchman's station the receiver of a given telephone is removed and a certain digit dialed in the usual manner, the receiver then being immediately restored to the switchhook. As a result of the foregoing a visual signal is produced at the supervisory board indicating that a watchman has called in from a certain station, and in addition a permanent record is made of the station number and the time of calling.

A special object of the invention is the provision of means which insure that a watchman must "call-in" from the various stations in prescribed order.

Another special object is the provision of means which will bring in an alarm at the supervisory board should a predetermined interval of time elapse between the calling in from a given station and the calling in from the next station on the route. Further means are provided to bring in an additional alarm at a distant office, police headquarters for instance, should a yet longer predetermined time interval elapse before the call-in is made from the next station in the route.

These objects, together with others which will not be specifically pointed out now, will be more fully pointed out hereinafter, refer-

ence being had to the accompanying drawings, Figs. 1 and 2, which show by means of the usual circuit diagrams sufficient of the apparatus employed in a system embodying the principles of the invention to enable the same to be understood. Fig. 1 discloses the equipment pertaining to an automatic telephone switchboard wherewith to establish a connection between a calling station A and a called station A', while Fig. 2 shows the auxiliary equipment of the watchman's service.

Referring to the drawings, the automatic stations A and A', Fig. 1, are ordinary automatic stations having the usual talking signalling and impulse sending instrumentalities. The telephone A<sup>2</sup>, Fig. 2, is located at the supervisory board and is normally connected through the key K' to the line switch C<sup>2</sup>; this telephone is identical with telephones A and A'. The telephone A<sup>3</sup> is located at a distant office, police headquarters for instance, and may be considered as being similar to telephone A, except, in view of the fact that as it is used only to receive incoming calls, it is not provided with a dial.

The line switches C and C', Fig. 1, and C<sup>2</sup>, Fig. 2, are mechanically of the well known rotary type in which the wipers have no normal position and move in a forward direction only.

The selector E, Fig. 1, is mechanically of the well known vertical and rotary type in which the bank contacts are arranged in horizontal rows or levels.

The connector switch denoted by the dotted rectangle H, Fig. 1, is also a switch of the vertical and rotary type.

The holding bridge D, Fig. 2, is one of a number of such bridges which are seizable by the selector E when the wipers of the said selector are raised to the ninth level of bank contacts. When a connection is extended to the holding bridge D battery is supplied to the calling subscriber by the line relay 117, while a holding ground is provided by release relay 118.

A relay, such as the relays R', R<sup>2</sup>, or R<sup>50</sup>, Fig. 2, is associated with each line switch whose telephone is to be used as a watchman's station, the association being such that the relays R, reading from right to left, will correspond with the watchman's

stations in the order of their operation as determined by the watchman's route.

A magnet, such as the magnet  $M'$ ,  $M^2$  or  $M^{50}$ , is associated with each of the relays  $R$ , and indirectly, with each of the watchman's stations. Each magnet is provided with an armature which may serve to perforate or mark a continuously moving tape in order that a permanent record may be made of the station number and the time of calling.

The thermostats  $T$  and  $T'$ , Fig. 2, are provided in order to obtain a slow step by step operation of the switch  $S$ .

The switch  $S$ , Fig. 2, is a step by step rotary switch of the type in which the wipers move in a forward direction only. In further explanation of this switch it should be stated that it is of the type in which the wipers are advanced when the stepping magnet retracts its armature rather than when the stepping magnet is energized.

The system having been described in general, a detailed description will now be given of its operation, and for this purpose it will be assumed that the subscriber at station  $A$ , Fig. 1, desires to call station  $A'$ , Fig. 1, whose number is assumed to be 236.

When the receiver is removed at the calling station, a circuit is closed over the line conductors 11 and 12 for the line relay 13 of the line switch  $C$ . Line relay 13, upon energizing, closes at armature 14 a circuit for switching relay 15 and stepping magnet 16 in series, and at armature 17 connects the test wiper 20 to a point in the circuit between the switching relay 15 and the stepping magnet 16. From this point the operation depends upon whether the trunk line upon which the wipers of the line switch are standing is busy or idle. If it is busy there is a ground potential on test contact 23, switching relay 15 is short circuited, and the stepping magnet 16 which interrupts its own current is operated in the manner of a buzzer to advance the switch wipers step by step in search of an idle trunk line. In the present case, however, we shall assume that the trunk line upon which the wipers of the line switch are standing is idle. That being the case, switching relay 15 is not short circuited and stepping magnet 16 is not energized on account of the high resistance of switching relay 15. Switching relay 15, however, is energized and at armature 29 disconnects the test wiper 20 from the point between its own winding and that of the stepping magnet 16 and connects it to the grounded private normal conductor 30. As a further result of the energization of switching relay 15 it disconnects the line conductors 11 and 12 from the winding of relay 13 and ground, respectively, and extends them by way of armature 31 and 32

and their working contacts, wipers 18 and 21, bank contacts 9 and 24, trunk conductors 25 and 28, armatures 33 and 34 and their resting contacts to the upper and lower windings of the line relay 35 of the selector  $E$ . Line relay 35 now energizes on the calling subscriber's loop and at its armature 36 closes a circuit for the slow acting release relay 37. Release relay 37, upon energizing, opens a point in the circuit of release magnet 38, prepares a circuit for relay 39 at armature 40, and at armature 41 places ground upon release trunk conductor 42, thereby establishing a holding circuit for the line switch  $C$ . By means of this ground potential on test contacts 23 and its multiples in the banks of the other line switches which have access to the selector  $E$ , the seized trunk line is maintained busy in the usual manner. A branch of this holding circuit extends by way of private normal conductor 30 to multiple test contacts in the banks of the connector switches having access to the calling line, thereby guarding it against intrusion in the usual manner. It may be mentioned that a further result of the energization of the switching relay 15 was the extension of the recording conductor 8 by way of armature 45, wiper 19, bank contact 22 to conductor 26.

The calling subscriber now operates his calling device in accordance with the first digit 2 of the desired number thereby producing two interruptions in the circuit of the line relay 35 of the first selector  $E$ . As soon as line relay 35 deenergizes in response to the first of these interruptions a circuit is closed which is traceable from ground at armature 46, armature 36 and its resting contact, armature 40 and its working contact, winding of the series relay 39, winding of the vertical magnet 47 to battery. Vertical magnet 47, upon energizing, raises the wipers 48, 49 and 50 opposite the first level of bank contacts, whereupon the off normal springs 52 close and complete a circuit traceable from the grounded release trunk conductor 42 by way of armature 57 and its working contact (relay 39 having energized), off normal springs 52, armature 58 and its resting contact, winding of relay 53 to battery. Stepping relay 53, upon energizing, closes a point in the circuit of rotary magnet 54 at armature 55 and at armature 56 closes a locking circuit for itself independent of relay 39. When the line relay 35 deenergizes in response to the second interruption produced in its circuit, the vertical magnet is again operated to raise the wipers one step, thus bringing the wipers opposite the desired level of bank contacts. The relay 39, being slow acting, will remain energized while impulses are passing through it to the vertical magnet. Shortly after the last vertical impulse relay 39 will

deenergize and close a circuit through the rotary magnet 54 at armature 57. Rotary magnet 54, upon energizing, advances the wipers 48, 49 and 50 into engagement with the first set of contacts in the second level, and at armature 58 opens the circuit of stepping relay 53. Stepping relay 53, upon deenergizing, opens another point in its circuit, and at armature 55 opens the circuit of rotary magnet 54. Rotary magnet 54, upon deenergizing again closes the contact at armature 58.

From this point the operation depends upon whether the trunk line terminating in the first set of contacts is busy or idle. If it is busy, the stepping relay 53 energizes again over the following circuit: from ground by way of the test contact with which test wiper 49 is in engagement, test wiper 49, armature 61 and its resting contact, off normal springs 52, armature 58 and its resting contact, winding of relay 53 to battery. Stepping relay 53, upon energizing, closes a locking circuit for itself at armature 56 and at armature 55 again completes the circuit of rotary magnet 54. This alternate operation of the stepping relay and rotary magnet continues so long as test wiper 49 engages grounded contacts. In this case we will assume that the trunk line comprising conductors 108, 109 and 111 is the one first found to be idle. That being the case, when the wipers of selector E arrive upon the bank contacts 62, 63 and 64 there is no ground potential on test contact 63 and consequently stepping relay 53 does not energize. With this condition existing switching relay 59 energizes over the following circuit: from ground by way of release trunk conductor 42, switching relay 59, off normal springs 52, armature 58 and its resting contact, winding of relay 53 to battery. Stepping relay 53, however, does not energize over this circuit on account of the relatively high resistance of switching relay 59. Relay 59, upon energizing, removes ground from armature 40 of release relay 37 at armature 46, disconnects test wiper 49 from the point between switching relay 59 and stepping magnet 53 and connects it to ground by way of release trunk conductor 42 at armature 61, thus making the seized trunk busy immediately; and at armatures 33 and 34 disconnects the trunk conductors 25 and 28 from the windings of line relay 35 and extends them by way of the working contacts of these armatures, wipers 48 and 50, bank contacts 62 and 64, trunk conductors 108 and 111 to the line relay of the connector H. Connector H therefore places ground upon the release trunk conductor 109, thereby establishing the usual holding circuit for the selector E and the line switch C before the slow acting release relay 37 of selector E has had time to deenergize.

When the calling subscriber dials the second figure—3 of the called number, the connector H will raise its wipers to the third level of bank contacts. The calling subscriber now dials the final figure—6 of the called number, as a result of which the connector rotates its wipers six steps into connection with the line extending to the station A'. Upon the completion of the connection to the called line a signalling circuit is established in the connection in the usual manner and the bell at the called station is operated to notify the subscriber that he is wanted. When the called party answers the conversation will proceed as desired, and when the conversation is completed the calling subscriber will replace his receiver, bringing about the release of the connection in the usual manner.

The attendant's telephone A<sup>2</sup> is available for telephone service to the other stations of the system, A' for example, when the key K' is in its normal position. Removing the receiver of A<sup>2</sup> actuates the line switch C<sup>2</sup>, in a manner heretofore described for line switch C, to extend the line to a selector such as E, from which the call proceeds in the well known manner.

An explanation of the normal operation of the watchman's system will now be given, it being assumed that station A, Fig. 1, is the first station on the route. When the watchman removes the receiver at station A the line switch C will operate in the usual manner to extend the connection to a first selector, it being assumed that selector E is the one first found to be idle. The watchman now dials the figure 9, and as a result thereof the selector E raises the wipers 48, 49 and 50 opposite the ninth level of bank contacts, following which it will select an idle trunk line; it may be assumed that the trunk comprising conductors 112, 113 and 114 is the one first found to be idle. The switching relay 59 of the selector E, upon operating, disconnects the trunk conductors 25 and 28 from the windings of line relay 35 and extends them by way of working contacts of armatures 33 and 34, wipers 48 and 50, bank contacts 115 and 116, conductors 112 and 114, through the double wound line relay 117 of the holding bridge D, Fig. 2, to battery and ground, respectively. The line relay 117, upon energizing, closes the circuit of release relay 118 at armature 119; the latter relay, upon energizing, places ground upon the release trunk conductor 113 at armature 120, thereby establishing the usual holding circuit for the selector E and the line switch C. A further result of the energization of the relay 118 is the closing of a circuit from ground at armature 121, resting contact and armature 122, winding of relay 123 to battery. Relay 123, upon energizing, opens its own circuit, and

therefore will operate as a buzzer so long as armature 121 remains operated. The operation of relay 123 produces a tone which is placed on the negative line by way of armature 122, condenser 124, armature 125 and its resting contact and conductor 112. This tone is audible in the receiver at substation A and advises the watchman that his call-in has been recorded. The watchman then restores his receiver, and as a result, the release of the switches involved in this connection takes place in the usual manner.

Returning to a consideration of selector E at the time of the energization of switching relay 59; the above mentioned operation results in the deenergization of line relay 35 followed after a time by the release of the slow acting release relay 37. During the interval of time elapsing between the energization of relay 59 and the deenergization of relay 37 a circuit may be traced as follows: from ground at armature 46 of relay 59, and its working contact, armature 71 and its working contact, springs 72 which are closed by the shaft only when raised to the ninth level, conductor 26, bank contact 22, wiper 19, working contact and armature 45, conductor 8, lower winding of relay R', Fig. 2, winding of magnet M', upper winding of relay 126 to battery. As a result of the short impulse of current over the above traced circuit, relay 126 will energize only momentarily, the locking circuit of its lower winding being open at the wiper 130 as the switch S is at this time in normal position. The before mentioned impulse of current will also cause a momentary operation of magnet M', resulting in the production of a permanent record of the number of the station calling and the time of operation. As a further result of the short impulse of current over the above traced circuit, relay R' will energize and close a locking circuit for its upper winding in series with marginal relay 146, by way of armatures 127 and 128. It is to be noted that armature 127 is associated with the next R relay in the group. Relay R' also closes the circuit of lamp L' at armature 129, the lamp L' indicating to the supervisor that the watchman has called in from station A. The marginal relay 146 is so adjusted that it will not operate at this time. A further result of the energization of relay R' is the closure of a circuit through relay 179 at armature 131. Relay 179, upon energizing, closes a locking circuit for itself by way of armatures 132 and 133, thus becoming independent of the further operation of relay R'. It is to be noted that armature 132 is associated with the last R relay in the group; relay 179 will, therefore, remain energized until a call-in is made from the last station on the route. A further result of the energization of relay 179

is the closure of a circuit traceable from ground at armature 134 and its working contact, armature 135 and its resting contact, conductor 136, armature 137 and its resting contact, working contact and armature 138, winding of stepping magnet 139 to battery. Stepping magnet 139 will energize over the above traced circuit, but the wipers 130 and 140 will not be operated at this time. A branch of the above circuit may be traced from the grounded conductor 136 through the winding 141 of thermostat T to battery. After a certain interval of time the winding 141 will heat up and, at armature 142, will cause the closure of a circuit through winding 143 of thermostat T'. After a certain interval of time, winding 143 will heat up and close a circuit through relay 145, the said circuit being traceable from ground at armature 134 and its working contact, winding of relay 145, armature 144 and its working contact to battery. Relay 145, upon energizing, removes ground from conductor 136, thus opening the circuit of winding 141 of thermostat T and of the stepping magnet 139 of switch S. The deenergization of the stepping magnet 139 causes the wipers 130 and 140 to be advanced into engagement with the first contacts in their respective banks. After a certain interval of time, the winding 141 will cool off and open the circuit of winding 143 at armature 142. Winding 143, after a certain interval of time, will in turn cool off and open the circuit of the slow acting relay 145 at armature 144. After a certain interval of time, relay 145 will deenergize and again close the circuit of winding 141 and of stepping magnet 139, whereupon the stepping magnet will again energize, and the winding 141 will again heat up thus starting the cycle of operations over again. From the foregoing it will be seen that, so long as the relay 179 remains energized, the thermostats T and T' will serve to actuate the stepping magnet 139 in such a way that the wipers 130 and 140 will be slowly rotated step by step over the contacts in their respective banks.

The normal operation of the system requires that the watchman call in from the second station on the route before the wiper 140 reaches the seventh contact in its bank. In further explanation, we may assume that station A', Fig. 1, is the second station on the route. When the watchman removes the receiver at station A' the line switch C' will extend the connection to a first selector such as the selector E. The watchman then dials the Figure 9 as a result of which the selector extends the connection to a talking bridge, such as the talking bridge D, Fig. 2. The watchman, upon hearing the tone delivered by the talking bridge, will restore the receiver, thus bringing about the release of the

connection. As previously explained in connection with selector E, we know that a short impulse of current will flow over the watchman's conductor 7 associated with line switch C', Fig. 1, through the lower winding of relay R<sup>2</sup>, Fig. 2, winding of magnet M<sup>2</sup>, upper winding of relay 126 to battery. Relay R<sup>2</sup> will operate in response to this short impulse of current and open the locking circuit of relay R' at armature 127, at the same time closing a locking circuit for itself in series with the marginal relay 146 at armatures 147 and 148, the latter armature being associated with the next R relay in the series. The marginal relay 146 is so adjusted that it will not operate at this time. A further result of the energization of relay R<sup>2</sup> is the closure of a circuit through lamp L<sup>2</sup> at armature 149, thus indicating to the supervisor that the watchman has called in from the second station on the route. The only result of the deenergization of relay R' is the opening of the circuit of lamp L' at armature 129. The above mentioned short impulse of current will also cause the magnet M<sup>2</sup> to operate in the usual manner to produce a permanent record of the number of the station calling and the time of operation. A further result of the above mentioned short impulse of current is the operation of relay 126, which, upon energizing, closes a locking circuit for its lower winding which may be traced from ground at armature 134 and its working contact, armature 150 and its working contact, armature 151 and its working contact, resting contact and armature 152, multiplied contacts in the bank associated with wiper 130, wiper 130, armature 153 and its working contact, working contact and armature 154, lower winding of relay 126 to battery. A branch of the above circuit may be traced from the grounded multiplied contacts in the bank associated with wiper 130, wiper 130, interrupter contact 155, winding of stepping relay 139 to battery. Because of the fact that relay 126, upon energizing, removed the conductor 136 from connection with the stepping magnet 139 at armature 137, the said stepping magnet may be considered to be at normal when the above traced circuit is established, and as a result the stepping magnet now operates in the manner of a buzzer to advance the wipers 130 and 140 step by step rapidly over the associated bank contacts. The automatic rotary circuit is broken when the wiper 130 leaves the last contact in the bank, as is also the circuit of the lower winding of relay 126. The latter relay, upon deenergizing, again connects the conductor 136 with the stepping magnet 139 at armature 137. Since relay 179 is still in an operated position the thermostats T and T' will again function to cause the magnet 139 to slowly advance the wipers 130 and 140 step by step

across their respective banks. From the foregoing it will be seen that as the result of the second and all subsequent call-ins, the switch S rapidly advances its wipers to normal position, the wipers then resuming the slow step by step movement under the control of the thermostats.

We may assume that, according to normal operation, the watchman calls in from the remaining stations in the proper order, and without exceeding the time limit between any two successive calls. When the watchman calls in from the last station on the route the relay 126 will energize momentarily, but will not lock up as the circuit of its lower winding is open at armature 153 due to the deenergization of relay 179, as will be explained hereinafter. The magnet M<sup>50</sup> will operate in the usual manner to make the permanent record while relay R<sup>50</sup> operates and forms a locking circuit for its upper winding in series with the marginal relay 146 at armatures 156 and 157, the latter armature being associated with the first R relay. A further result of the energization of relay R<sup>50</sup> is the opening of the circuit of the upper winding of the preceding R relay and the closing of the circuit of lamp L<sup>50</sup> at armature 158. A still further result is the opening of the locking circuit of relay 179 at armature 132. The latter relay, upon deenergizing, opens the circuit of the lower winding of relay 126 at armature 153, therefore relay 126 cannot be depended upon to bring about the advancement of switch S to its normal position. For the above reason provision is made whereby the deenergization of relay 179 closes a circuit traceable from ground at armature 134 and its resting contact, resting contact and armature 152, multiplied contacts in the bank associated with wiper 130, wiper 130, interrupter contacts 155, winding of stepping magnet 139 to battery. The magnet 139 will operate over the above traced circuit in the manner of a buzzer to rapidly advance the wipers 130 and 140 to their normal position, the automatic rotary circuit being broken when wiper 130 leaves the last contact in its bank. As the relay 179 is now deenergized there will be no further operation of the thermostats, and consequently no slow motion imparted to the wipers of switch S.

It may be mentioned that the relay R<sup>50</sup> will remain locked up through armature 157, relay R', until the watchman again calls in from the first station on the route. There is, however, no prescribed time interval within which the call-in from the first station on the route must follow the call-in from the last station.

An explanation will now be given of the alarms produced should there be a delay of longer duration than the prescribed time in-

5 interval between the calling in from any two successive stations on the route. We may assume that the switch S is operating under the control of the thermostats and that for some reason the next call does not come in. When the wiper 140 engages the seventh contact in its bank, a circuit is closed which may be traced from ground at armature 134 and its working contact, armature 150 and its resting contact, conductor 159, wiper 140 in engagement with the seventh bank contact, winding of relay 160 to battery. Relay 160, upon energizing, forms a locking circuit for itself from the grounded conductor 159 by way of armature 161, thus becoming independent of the wiper 140; and furthermore closes the circuit of buzzer B at armature 162. The supervisor, upon hearing the buzzer, will realize that the next call-in is overdue, and will glance at the lamps L to determine the location from which the last call was made. We will assume he then goes to the assistance of the watchman. The operation of the switch S continues in the usual manner, and if the next call-in is made before the wiper 140 reaches the twenty-first contact in its bank, the relay 126 will operate as usual to cause the switch S to advance its wipers to normal position, at the same time opening the circuit of relay 160. The latter relay will then deenergize and open the circuit of the buzzer B, the operation of the switch S continuing in the usual manner. If the wiper 140 reaches the twenty-first contact in its bank before the next call-in is made, a circuit is closed which may be traced from grounded conductor 159, wiper 140 in engagement with the twenty-first contact in its bank, winding of relay 162 to battery. Relay 162, upon energizing, will form a locking circuit for itself from grounded conductor 159 by way of armature 163, and thus becomes independent of the further advancement of wiper 140. A further result of the energization of relay 162 is the placing of current from the generator G, by way of armatures 165 and 166, and armatures 167 and 168 and their respective resting contacts, upon conductors 169 and 170, thus causing the ringer at station A<sup>s</sup> to be operated. The attendant at station A<sup>s</sup>, presumably police headquarters, will immediately send a patrol to investigate the watchman's system associated with station A<sup>s</sup>. The operation of the switch S continues in the usual manner, and when the next call-in is finally made the relay 126 operates in the usual manner to cause the switch S to advance its wipers to normal position, at the same time causing the release of relays 160 and 162 by removing ground from conductor 159. Relay 162, upon deenergizing, removes generator from conductor 169 and 170, and thus the operation of the ringer at station A<sup>s</sup> will cease as a noti-

fication to police headquarters that the normal operation of the watchman's system has been resumed.

An explanation will now be given of the operation should an error occur in the order in which the stations are called. Under normal operation the call-in from each station causes an R relay to unlock the next preceding R relay, thus the current flow through the marginal relay 146 is such that the said relay will not operate. If an error is made and one or more stations are passed the next call-in will operate an R relay, but the R relay so operated will be unable to release the R relay locked up by the last preceding call. As a result, two R relays are now drawing current through relay 146, and this relay will now energize and open the locking circuit of relay 126 at armature 152. There will, therefore, be no ground on the multiplied contacts in the bank associated with wiper 130, and the switch S will continue to operate under the control of the thermostats. When wiper 140 engages the seventh contact in its bank the buzzer B will operate to attract the supervisor's attention. The supervisor will see that two L lamps are lighted and will realize that an error has been made in the order of calling in from the stations. The supervisor will then get in touch with the watchman, who will go back to the station that was overlooked and call-in from each station in order. When only one R relay remains energized, the relay 146 will deenergize causing the normal operation of the system to be resumed. If this has been accomplished before the wiper 140 reaches the twenty-first contact in its bank, no alarm will be given station A<sup>s</sup>; otherwise, relay 162 will operate to ring station A<sup>s</sup> as previously explained.

An explanation will now be given of the means provided whereby the supervisor may talk to the watchman at any station or to the attendant at station A<sup>s</sup>. The supervisor may operate the non-locking key K<sup>2</sup> to impress generator upon station A<sup>s</sup> by way of armatures 167 and 168, and conductors 169 and 170, the operation of key K<sup>2</sup> preferably taking the form of a code ring to distinguish it from the ring produced by relay 162. The attendant will then operate the non-locking key K' which will close the circuit of relay 173 and connect station A<sup>2</sup> with station A<sup>s</sup> through talking condensers 171 and 172. The station A<sup>s</sup> is now disconnected from the line switch C<sup>2</sup> and receives its talking battery through the two windings of relay 174. Station A<sup>s</sup> receives its talking battery through the two windings of relay 175, by working contacts and armatures 167 and 168, and conductors 169 and 170. Upon the restoration of the non-locking key K' to normal, the circuit returns to normal.

If the supervisor desires to talk to the

watchman the next time he calls in the non-locking key K' is operated, talking battery being received through relay 174 as before. It should be noted that A<sup>3</sup> is connected to A<sup>2</sup> by means of relay 173 when the attendant operates K' to talk to the watchman. A<sup>3</sup>, however, is not signalled in this instance since the attendant has not operated K<sup>2</sup>. By this arrangement the police station A<sup>3</sup> may listen in on the conversation between the attendant and watchman. When the watchman calls in the relays 117, 118 and 123 of the holding bridge D will operate as previously described. The tone produced by relay 123 will not pass to the negative side of the line because of the open circuit at armature 125 of relay 174. The absence of the accustomed tone will indicate to the watchman that the attendant is waiting to talk to him. The conversation will be carried on through the talking condensers 177 and 178. The restoration of the non-locking key K', and of the receiver at the calling station, will cause the return of the apparatus to its normal position.

The object and scope of the invention having been described, what is considered to be new and what it is desired to have protected by Letters Patent will be pointed out more specifically in the appended claims.

What I claim is:

1. In a combined telephone and watchman's service system, a plurality of outlying stations, a central station, means operable by the watchman at the outlying station to extend talking connections therefrom to said central station in a definite order, and means responsive to the watchman's call for sounding an alarm at the central station if the watchman calls in from one of said outlying stations out of its regular turn.

2. In a combined telephone and watchman's service system, a plurality of reporting stations, a central station, means operable by the watchman at the outlying stations to extend talking connections therefrom to said central station in a definite order, a signal at the central station and means responsive to the watchman's call for actuating said signal in case the watchman calls from one of said stations without having called in from the preceding station.

3. In a combined telephone and watchman's service system, a central station, a plurality of outlying stations, means operable by the watchman at said outlying stations for extending talking connections therefrom to said central station in a definite order, and means responsive to the watchman's call for notifying the attendant at said central station in case the watchman fails to observe the prescribed order

in which said outlying stations are to be reported from.

4. In a combined telephone and watchman's service system, a central station, a plurality of outlying stations which are used by the watchman in a certain predetermined order to report to said central station, a signal at the central station for each outlying station actuated when the associated station is reported from, and a special signal actuated whenever any station is reported from out of its regular turn.

5. In a combined telephone and watchman's service system, a plurality of outlying stations, a central station, means operable by the watchman at said outlying stations for extending talking connections therefrom to said central station at regular intervals, and means for automatically notifying the attendant at the central station if any interval between successive calls exceeds a predetermined limit.

6. In a combined telephone and watchman's service system, a plurality of outlying stations, a central station, means operable by the watchman at said outlying stations for extending talking connections therefrom to said central station at regular intervals, a signal at the central station, and means for automatically actuating said signal if any interval between successive calls exceeds a predetermined limit.

7. In a combined telephone and watchman's service system, a plurality of outlying stations, a central station which the watchman calls from said outlying stations at regular intervals, signals at the central station operated responsive to calls from the outlying stations, and a special signal at the central station operated in case any interval between successive calls exceeds a predetermined limit.

8. In a combined telephone and watchman's service system, a plurality of outlying stations, a central station which the watchman calls from said outlying stations at regular intervals, a signal at the central station and means for operating it in case any interval between successive calls exceeds a predetermined limit, a third station and signal thereat, and means for operating said last mentioned signal in case the abnormal time interval exceeds a predetermined limit.

9. In a combined telephone and watchman's service system, a plurality of outlying stations, a central station which the watchman calls from said outlying stations at regular intervals, means for notifying the attendant at the central station in case the watchman encounters some obstacle which prevents him from calling in from one of said outlying stations on time, another station, and means for notifying the attendant at said last mentioned station in case the de-

layed call is not received within a certain predetermined additional time.

10. In a combined telephone and watchman's service system, a plurality of outlying telephone stations, a central station, means operable by the watchman at said outlying stations for extending talking connections therefrom to said central station in a definite order, means for notifying the watchman that his call has been registered at the central station, and means responsive to the watchman's call for notifying the attendant if the watchman calls from the stations in other than the prescribed order.

11. In a combined telephone and watchman's service system, a plurality of outlying stations, a central station, means controlled by the watchman for calling the central station from each outlying station, a signal at the central station for each outlying station, operated when the watchman calls from the associated station, and means for notifying the watchman in each instance that the signal has been operated.

12. In a watchman's service system, a central station, a plurality of calling sta-

tions, means controlled from the calling stations for extending calls to the central station and operating a signal thereat, an automatic switch at the central station, means controlled by each call for starting the operation of said switch, and means controlled by said switch for automatically operating a signal after a predetermined time.

13. In a watchman's service system, a central station, a plurality of calling stations, means controlled from the calling stations for extending calls to the central station and operating a signal thereat, an automatic switch at the central station, means controlled by each call for starting the operation of said switch, means controlled by said switch for automatically operating a signal after a predetermined time, and means for preventing the operation of said last signal if another call is received at the central station during said predetermined time.

In witness whereof, I hereunto subscribe my name this 4th day of January, A. D., 1923.

CLARENCE E. LOMAX.