

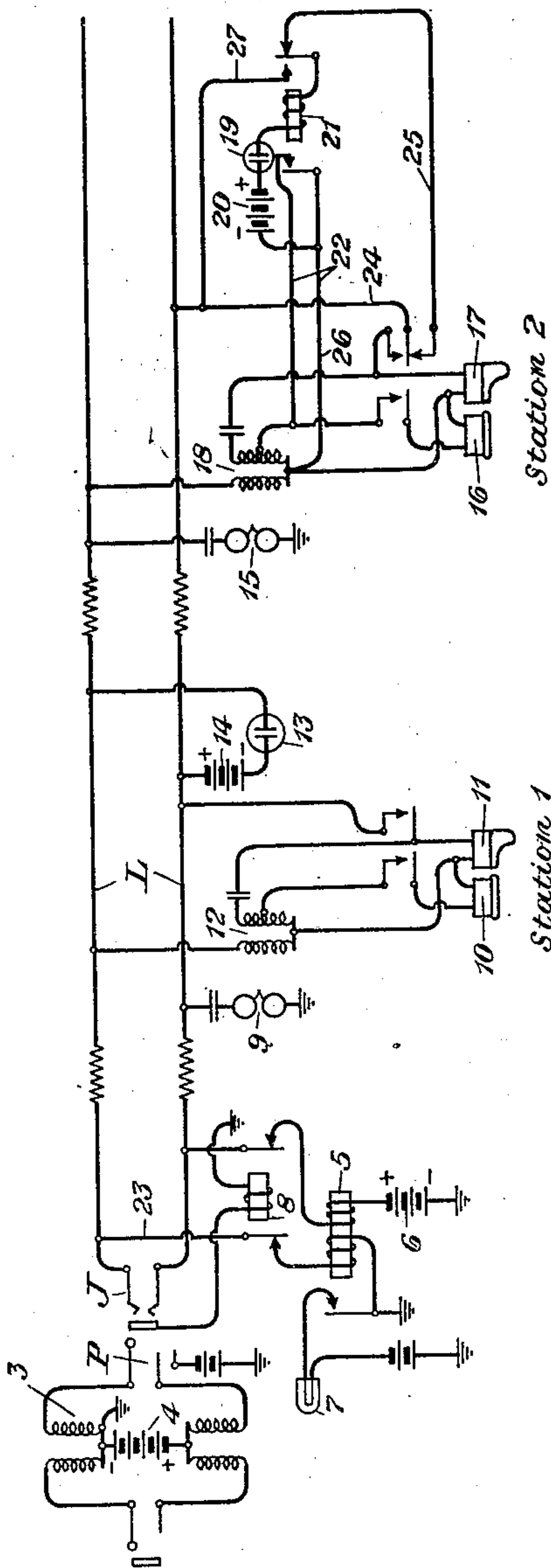
June 28, 1932.

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1,864,646

TELEPHONE SIGNALING ARRANGEMENT

Filed June 27, 1931



Station 1
Station 2
Fig. 1

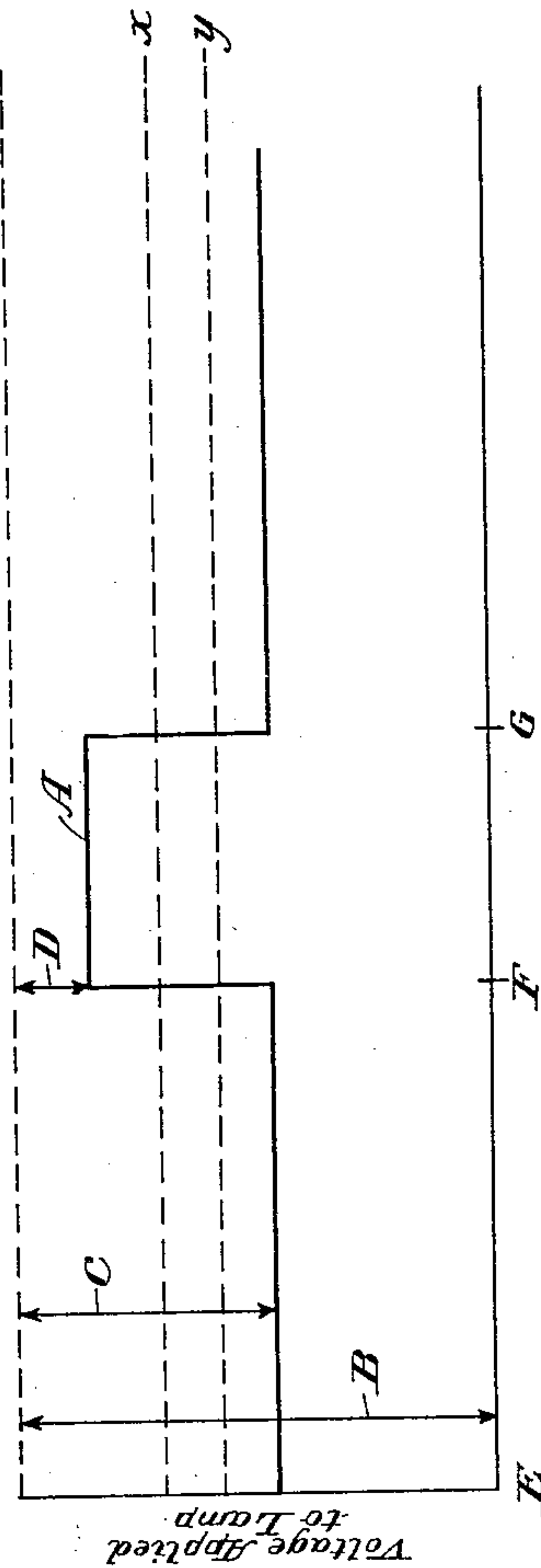


Fig. 2

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TELEPHONE SIGNALING ARRANGEMENT

Application filed June 27, 1931. Serial No. 547,337.

This invention relates to transmission systems and, more particularly, to improvements in signaling arrangements adapted to be associated with the lines of such systems.

5 The signaling arrangements of the invention are particularly adapted for use on lines to which a plurality of stations are connected such, for example, as a party telephone line. One of the objects of the invention consists
10 in providing signaling means at each of the stations on the line operable whenever one station establishes a connection with the line to indicate at one or all of the stations that the line is in use. A further object of the
15 invention consists in providing means at the various stations which will prevent them from establishing connections with the line when one of the other stations has already established a connection with the line. Other
20 objects and features of the invention will appear more fully from the detailed description hereinafter given.

In the arrangements of the invention, as applied to party telephone lines for purposes
25 of illustration, a cold cathode discharge tube such as a neon lamp is provided at one or all of the subscribers' stations. The full open circuit voltage of the line battery will normally oppose the voltage of the battery in
30 circuit with the neon lamp, so that the voltage across the lamp will be below the breakdown value and the lamp will not operate. When a subscriber removes his receiver from the switchhook the line battery is disconnected from the line and the talking battery
35 which may be of equal voltage compared with the line battery will oppose the voltage of the battery in circuit with the neon tube. However, as the talking battery circuit is
40 closed at the station thru a comparatively low resistance subscriber set circuit when the receiver is off the switchhook, the voltage at the station due to the talking battery is considerably less than that due to the full
45 voltage of the line battery when the receiver is on the hook. Consequently the net voltage across the tube will be increased so that it will break down and operate. This will give
50 a signal at each subscriber's station provided with the device that the line is in use. When

the receiver is restored to the switchhook the full voltage of the line battery will again cause the net voltage across the lamp to be so reduced that it will be extinguished. Relay means may be provided in circuit with
55 the neon tube to short circuit the receiver at the subscriber's station so that the subscriber at such station may not listen in on the line when it is in use.

The invention may be more fully understood from the following description together with the accompanying drawing in
60 Figures 1 and 2 of which the invention is illustrated. In Fig. 1 is shown a circuit diagram illustrating the arrangements of the invention as applied to a party telephone
65 line. In Fig. 2 is a curve illustrating the voltage characteristics of the currents applied to the signaling devices under various conditions.

In Fig. 1 is shown a party telephone line
70 L. A plurality of subscribers' stations may be connected to this line. Two such stations are shown namely, station 1 and station 2. The telephone line L may terminate at a
75 central office in the jack J. An operator's cord circuit 3 terminating in the plug P adapted to cooperate with the jack J is shown. Included in the operator's cord circuit 3
80 would be the talking battery 4. This might have a voltage of approximately 24 volts. Associated with the line L at the central office
85 would be the line relay 5 having connected thereto the line battery 6. The line battery might have a voltage of 24 volts for purposes
90 of illustration, altho use of a 48 volt battery provides additional operating margin. Controlled by the line relay would be a signal
95 lamp 7. A relay 8 in the sleeve circuit is also provided. At station 1 is shown the ringing
100 apparatus 9 connected to the ring side of the line. Bridged across the line is the subscriber's telephone apparatus comprising the induction coil 12, the receiver 10 and the transmitter 11. Bridged across the line would be
provided a cold cathode discharge tube such as the neon lamp 13. A battery 14 would be provided in series with the lamp. At station
2 is shown the ringing apparatus 15 connected to the tip side of the line. Bridged across

the line is the subscriber's telephone apparatus comprising the induction coil 18, the receiver 16 and the transmitter 17. Connected across the line is a cold cathode discharge tube 19 in series with the battery 20. A relay 21 is also provided in series with the tube 19. This relay may control a short circuit 22 across the subscriber's talking set.

The operation of the arrangements of the invention is as follows: When the subscriber's telephone instrument at station 1 is on the switchhook the full open circuit voltage of the line battery 6 will oppose the voltage of battery 14, so that the voltage across the tube 13 will be below the minimum voltage needed to break the tube down and cause it to operate. The tube 13 will thus be extinguished. When the subscriber removes his instrument from the switchhook in response to a ringing signal the following circuit will be completed. From ground, battery 6, right-hand winding of relay 5, right-hand contact of relay 8, over the ring side of the line, through the subscriber's telephone set to the tip side of the line, over conductor 23, left-hand contact of relay 8, winding of relay 5, to ground. This will operate relay 5 and light the signal lamp 7. The operator's cord circuit 3 will then be connected with the line L to extend the connection. This will close a circuit over the sleeve of cord 3 and line L through the winding of relay 8, and will operate relay 8. The operation of relay 8 will break the previously traced circuit from the line battery 6 through the line relay 5, and will disconnect the line relay 8 from the line. Accordingly, the full open circuit voltage of the battery 6 will no longer oppose the voltage of the battery 14. The only voltage which will now oppose the battery 14 will be the voltage across the line L which is due to the talking battery 4. As has been pointed out, the voltage of the line battery 6 might be either 24 or 48 volts and under normal line insulation conditions the full amount of the voltage is available under the open circuit conditions in opposition to the battery 14. However, the 24 volt talking battery 4 is subject to considerable voltage drop in the central office equipment and line resistance, and consequently only about 10 volts is available at the station to oppose the battery 14. Accordingly, the net voltage across the tube 13 will be increased and the tube will operate. At station 2 the discharge tube 19 is bridged across the line L in the following manner: from the ring side of the line over the conductors 24 and 25, winding of relay 21, through tube 19 and battery 20, over conductor 26 to the tip side of the line. Accordingly, when the subscriber's instrument at station 1 remains on the switchhook and the line battery voltage is applied to the line, the voltage of the battery 20 will be so reduced by the voltage of the line battery 6 that the tube 19 will not operate. However,

when the removal of the subscriber's instrument at station 1 from the switchhook removes the line battery from the line and connects thereto the talking battery 4, the voltage across the line at the station is reduced considerably, and the net voltage across the tube 19 will be increased so that the tube will break down and operate. This will give a visual signal to the subscriber at station 2 that the line L is in use. When the tube 19 breaks down the relay 21 will operate. This will change the circuit for the tube 19 at station 2 so that it will be completed as follows: From the ring side of the line, over conductor 27, contact and armature of relay 21, tube 19, battery 20, and conductor 26 to the tip side of the line. The tube will thus remain operated under such conditions. The operation of the relay 21 will also close a short circuit 22 across the receiver of the subscriber at station 2 so that the subscriber at station 2 cannot listen in on a connection on the line L while the subscriber at station 1 is talking.

In a manner similar to that heretofore described, if the subscriber at station 2 removes his instrument from the switchhook the net voltage across the discharge tubes at each of the stations will be increased so that they will operate. The subscriber at station 1 will thus get a visual indication that the line is in use by some other subscriber such as the subscriber at station 2. A relay such as the relay 21, and a short circuit such as the short circuit 22 might also be provided at station 1, if desired. Provision might also be made to disconnect a station by means of the relay 21 to prevent connection to the line when it is in use.

When the telephone instrument at station 1 is again restored to the switchhook, current ceases to flow over the line and the full voltage of the central office talking battery is in opposition to the battery 14 which will reduce the voltage across the tube 13, so that it will be extinguished. Subsequently, when the operator's cord circuit 3 is disconnected from the line L, line battery 6 will again be connected to the line L and will oppose the voltage of the battery 14.

In Fig. 2 is shown a curve A illustrating the voltage applied to the lamp under various conditions. The dotted line X indicates the breakdown voltage of the neon lamp. The dotted line Y indicates the maximum voltage needed to maintain the lamp in an operating condition after discharge. The voltage applied to the lamp by the battery 14 is indicated by the line B. The opposing voltage of the line battery 6 is indicated by the line C. Thus, before the receiver is removed from the switchhook, or in other words, between the points E and F, the voltage applied to the lamp will be below the dotted line Y and the lamp will not operate. When the receiver is removed from the switchhook as

at the point F, the voltage of the line battery 6 is removed and the voltage of the talking battery 4 opposes the voltage of battery 14. The opposing voltage of the talking battery is indicated by the line D. This will increase the net voltage applied to the lamp by the battery 14 to a point such as shown on the curve A. As this point is above the dotted line X, or above the voltage needed to break down the tube, the tube will break down and operate. When the receiver is again restored to the switchhook such as the point G, and the open circuit voltage of the talking battery and subsequently of the line battery is again connected to the line, the net voltage applied to the lamp will again drop below the dotted line Y and the lamp will be extinguished.

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

What is claimed is:

1. A telephone line connected to a central office and extending to a plurality of subscribers' stations, a talking circuit connected across the line at each station and a signaling circuit connected across the line at each station, a cold cathode discharge tube and a battery in each of said signaling circuits, a line battery at said central office opposed to the voltage of the batteries in said signaling circuits and adapted to be connected to said line when the line is idle, the voltage of the line battery being such that when connected to the line the voltages across said tubes will be so reduced that they will not operate, and a talking battery at said central office opposed to the voltage of the batteries in said signaling circuits and adapted to be connected to said line when the line is in use, the voltage across the line at the station due to the talking battery with the line in use being less than that of the line battery so that when connected to the line, the voltages across said tubes will be sufficient to cause them to operate.

2. A telephone line connected to a central office and extending to a plurality of subscribers' stations, a signaling circuit connected across the line at each of said stations, a cold cathode discharge tube and a source of potential therefor in each of said signaling circuits, a line battery at the central office adapted to be connected to said line when it is idle and disconnected therefrom when it is in use, a talking battery at the central office adapted to be connected to said line when in use and disconnected therefrom when idle, and means for utilizing the different voltages at the station of said line and talking bat-

teries to control the voltage applied to said tubes in said signaling circuits.

3. A telephone line connected to a central office and extending to a plurality of subscribers' stations, a signaling circuit connected across the line at each of said stations, a cold cathode discharge tube and a source of potential therefor in each of said signaling circuits, line and talking batteries of approximately equal open circuit voltages adapted to be connected to said line at the central office, and means for utilizing the difference in open circuit potential of said batteries across the line when the line is not in use and the closed circuit potentials when the line is in use to control the effective voltages of said sources of potential in said signaling circuits.

4. A telephone line connected to a central office and extending to a plurality of subscribers' stations, a signaling circuit connected across the line at each of said stations, a cold cathode discharge tube and a source of potential therefor in each of said signaling circuits, a central office battery adapted to be connected to said line at the central office under different circuit conditions, means for utilizing the different voltages across the line at said stations due to said different circuit conditions to control the effective voltages of said sources of potential in said signaling circuits, and relay means in one of said signaling circuits operative when the discharge tube therein functions for controlling the operativeness of the subscriber's talking set thereat.

In testimony whereof, I have signed my name to this specification this 26th day of June, 1931.

WILLIAM H. EDWARDS.