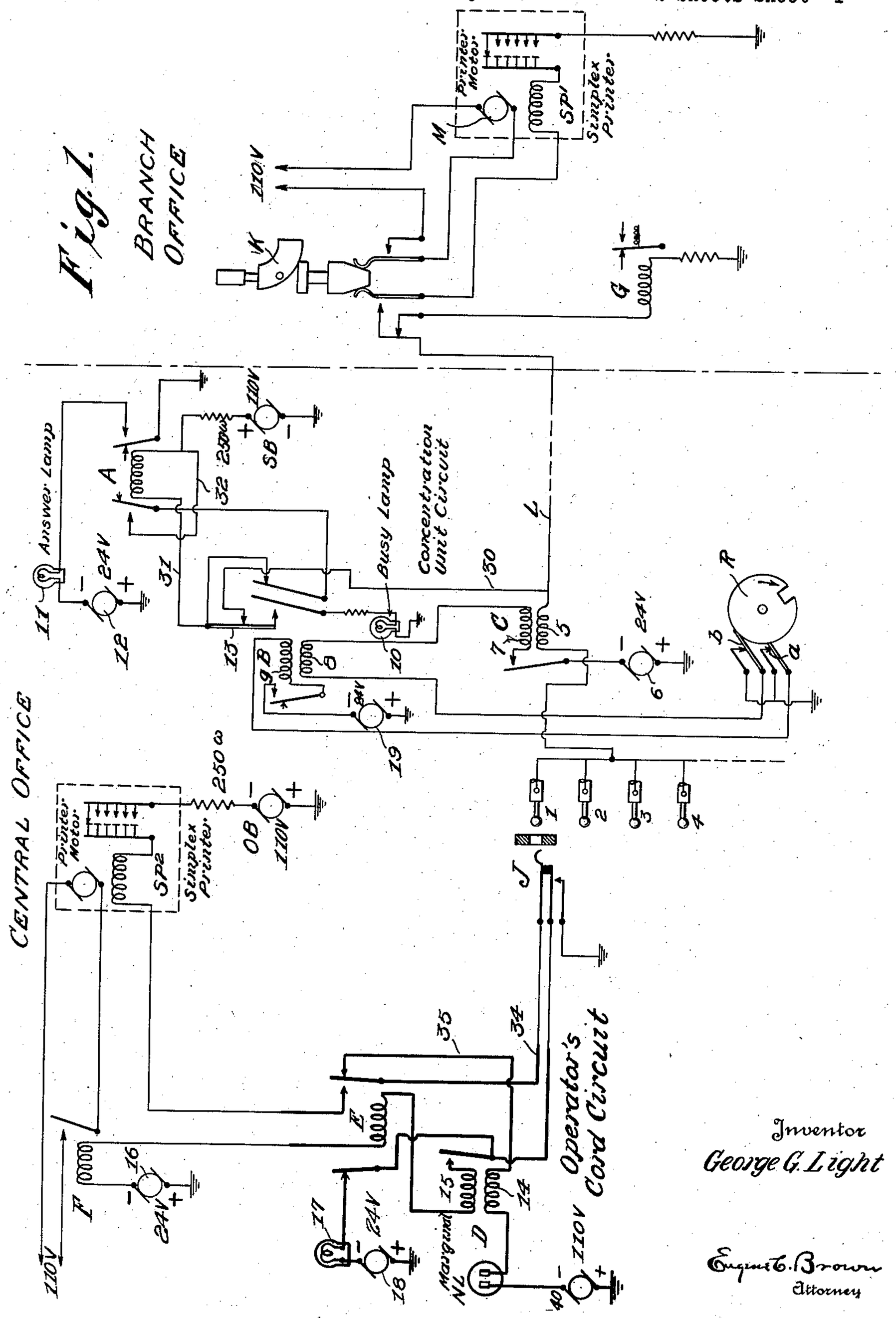
May 24, 1932. G. G. LIGHT 1,860,343

MULTIPLE TURRET SIMPLEX PRINTER CONCENTRATION CIRCUIT

Filed July 24, 1931 2 Sheets-Sheet 1

Fig. 1.



Inventor
George G. Light

Eugene G. Brown
Attorney

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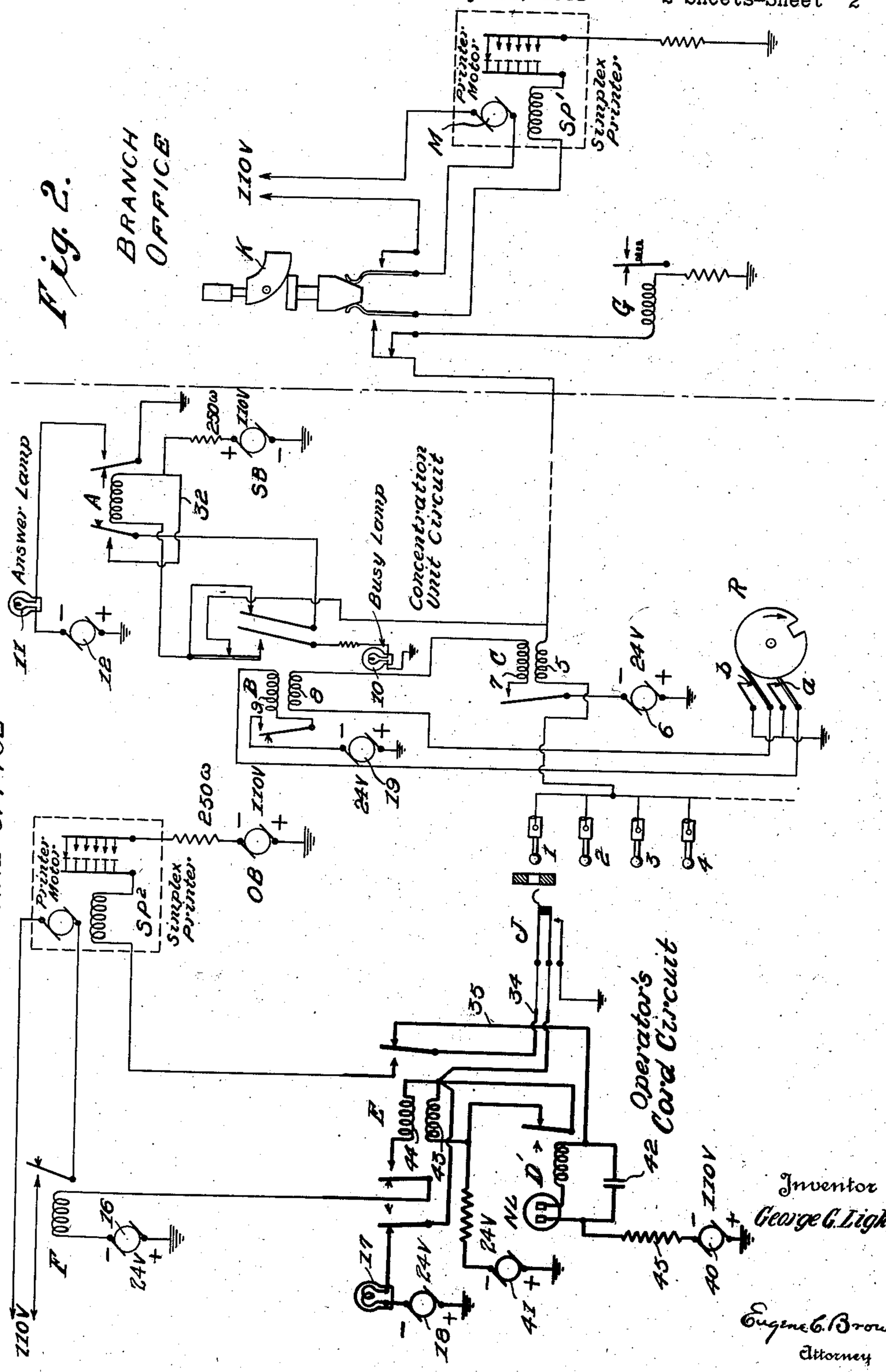
Fig. 2.



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UNITED STATES PATENT OFFICE

GEORGE G. LIGHT, OF KEW GARDENS, NEW YORK, ASSIGNOR TO THE WESTERN UNION TELEGRAPH COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

MULTIPLE TURRET SIMPLEX PRINTER CONCENTRATION CIRCUIT

Application filed July 24, 1931. Serial No. 552,983.

This invention relates to the circuit arrangement for handling traffic at a central station where the terminals of a large number of simplex printer lines from outlying branches terminate, each line being connected to multipled jacks or multipled plugs located at the various operator's positions or turrets so that the traffic of said lines may be handled by a small number of simplex printers at the central station.

This invention is an improvement upon prior Patent No. 1,804,327, dated May 5, 1931, and pertains more particularly to the central station operator's cord circuit. In said prior patent, the closing of the circuit to the operator's simplex printer or the indication that a line was busy was effected by means of a hot cathode vacuum tube which required the continuous expenditure of energy from a battery or other generator. I have devised an arrangement for accomplishing this purpose which eliminates this expenditure of energy by employing statically controlled devices which are normally inert but instantly break down under predetermined conditions.

In the following description I shall refer to the accompanying drawings, in which—

Figures 1 and 2 are diagrammatic illustrations of concentration units for simplex printer telegraph circuits showing different forms of my improvements in the operator's cord circuit.

Inasmuch as I have shown my invention applied to the concentration circuit arrangement disclosed in said prior Patent 1,804,327, it will be unnecessary to describe the same in detail in this case.

The operation of my improvement in the operator's cord circuit will be understood from the following examples:—

Referring to Figure 1, assume that a call is initiated at a branch office. By operating key K, the operator closes her circuit to start the motor M or her simplex printer SP′ and connects its transmitting circuits to the line L. By depressing any one of the keys of the printer the line is momentarily opened, thereby deenergizing the relay at the central station which is held in this condition by the short circuit around its winding through its left hand armature and back contact. The circuit may be traced from ground at the branch office through the printer, contacts of switch K, line L, conductor 30, contact and spring arm 13, conductor 31, winding of relay A, and signaling battery or generator SB to ground. The right hand armature and back contact of relay A close a circuit for the answer lamp 11. Upon noting the signal an idle operator plugs her jack J upon the line plug in her turret corresponding to this line. This applies a positive potential of approximately 85 volts to one electrode of the neon lamp NL over a circuit from the generator SB, conductor 32, left hand armature of relay A, outer right hand armature and back contact of relay B, spring arm 13 and upper contact, conductor 30, winding 5 of relay C, turret plug and jack J, conductor 34, right hand armature and back contact of relay E, conductor 35, and winding 14 of relay D to the right hand electrode of neon lamp NL. Since the other electrode is connected to the negative terminal of 110 volt generator 40, the breakdown value of the neon lamp is exceeded and current passes through it and winding 14 of relay D. The operation of relay D completes a circuit from the 24 volt generator 16 through the windings of relays F and E and the holding winding 15 of relay D to ground through the jack J. Although a circuit through the busy lamp 17 was closed at the grounded contact of the jack J, the operation of relay E opens this circuit at its left hand armature and back contact, connects the printer SP^2 to the line through its right hand armature, and disconnects neon lamp NL. Operation of relay F completes the circuit to the operating motor of the printer SP^2. The printer circuit is now ready to be operated from the operating battery or generator OB.

In case the line is busy when an operator connects her jack to a line plug, approximately 85 volts negative will be applied to the neon lamp whenever the transmitter of the central office printer in the busy line is closed, and as the other terminal of the lamp is negative it will not break down and hence no cur-

rent will flow through it or winding 14 of relay D.

Whenever the transmitter of the central office printer in the busy line is opened to send a spacing signal, the 110 volt negative battery is removed from the line. At the same time, an induced voltage of positive polarity is set up in the line due to the inductance of the branch office equipment, which will be applied to the neon lamp and may be sufficient to break it down. The resulting current through the neon lamp and winding 14 of relay D will be small and of short duration compared to the current resulting from the positive voltage being applied to the lamp when the cord circuit is connected to an idle line. This tendency of relay D to operate on account of induced voltage is obviated by employing a marginal relay at D which will not operate on the current resulting from the induced voltage.

Inasmuch as relay D does not operate when the central office operator connects her jack J to a busy line plug, the circuit from the 24 volt generator 18, through the busy lamp 17, left hand armature and back contact of relay E and the jack J to ground is not opened. Consequently, a busy signal appears as long as the jack is connected to the plug of the busy line.

In the arrangement disclosed in Figure 2, I am enabled to dispense with the use of a marginal relay while retaining the advantage of the statically controlled connecting mechanism.

When a central station operator responds to a call by inserting her jack J upon a terminal plug, approximately 85 volts positive will be applied over conductor 35 to one electrode of the neon lamp or tube NL and to the corresponding plate of the condenser 42, the other electrode and plate being connected to the negative terminal of 110 volt generator 40 through a high resistance 45 of from ½ to 2 megohms. As the breakdown value of the neon lamp is approximately 170 volts the voltage applied is sufficient to cause a breakdown of the lamp. This will not occur immediately however since the drop across the resistance 45, due to the charging current of the condenser, will reduce the voltage at the lamp terminal below its breakdown value.

When the potential between the condenser plates reaches the breakdown value of the neon lamp, the condenser will discharge through the lamp and winding of relay D′. The operation of relay D′ removes the short circuit around the winding 43 of relay E, permitting relay E to operate and establish a circuit from the negative terminal of generator 16, through the winding of relay F, inner left hand armature and winding 44 of relay E to ground through the jack. The operation of relay E removes the relay D′, neon lamp and condenser 42 from the circuit and connects the simplex printer SP² to line.

If the operator at the central office should connect her jack to the plug of a busy line, approximately 85 volts negative will be applied to the neon lamp and condenser whenever the transmitter of the central office printer in the busy line is closed. Under this condition approximately 25 volts is applied across the terminals of the neon lamp and condenser since there is 110 volts negative on one side and 85 volts negative on the other side. The lamp will not break down and consequently relay D′ will not be operated.

Whenever the transmitter of the central office printer in the busy line is opened to send a spacing signal, the 110 volt negative battery will be removed from the line. At the same time the condenser will begin to charge due to the permanently applied 110 volt generator 40 and an induced voltage of positive polarity set up by the inductance of the branch office equipment. The charging rate of the condenser is retarded by the series resistance 45, and since the induced voltage is of short duration, the energy due to it is dissipated therein before the condenser reaches an appreciable charge. The maximum charge on the condenser therefore will be due to the permanently connected 110 volt generator 40. This is not sufficient to cause a breakdown of the neon lamp and consequently relay D′ is not operated.

Whenever the transmitter of the central office printer is closed to send a marking signal, the charge on the condenser will be lowered to 25 volts since 85 volts negative is then applied to the line side of the condenser.

The advantages of a cord circuit employing a control device of the electrostatically controlled type, such as a neon lamp, will now be appreciated. I have disclosed two circuit arrangements which may be employed but it will be evident to engineers that various changes may be made within the scope of my invention.

I claim:

1. In an intercommunication system embodying a central station, a plurality of sub-stations, a line from each sub-station terminating in multipled jack-plugs at a number of turrets or operator's positions, a simplex printer at each operator's position, and an operator's cord circuit adapted to connect the printer with one of said plugs, relay means controlling said connection including an electrostatically controlled arc discharge path.

2. In an intercommunication system embodying a central station, a plurality of sub-stations, a line from each sub-station terminating in multipled jack-plugs at a number of turrets or operator's positions, a simplex printer at each operator's position, and an operator's cord circuit adapted to connect the

printer with one of said plugs, relay means controlling said connection including an electrostatically controlled arc discharge tube, and a potential source continuously connected to one terminal of said tube.

3. In an intercommunication system as defined in claim 2, and means for retarding at predetermined rate the accumulation of any charge applied to the terminals of said tube.

4. In an intercommunication system embodying a central station, a plurality of substations, a line from each sub-station terminating in multplied jack-plugs at a number of turrets or operator's positions, a simplex printer at each operator's position, and an operator's cord circuit adapted to connect the printer with one of said plugs, relay means controlling said connection and auxiliary means determining the operation of said relay means including a gaseous path adapted to break down upon the application of a predetermined voltage.

5. In an intercommunication system as defined in claim 4, and means for retarding at a predetermined rate the accumulation of any change applied to the terminals of said tube.

6. A cord circuit for simplex printers comprising, in combination with the printer, a jack adapted to connect to multipled line plugs, a circuit connecting the jack and the printer including a normally open contact, and an electrostatically controlled arc discharge path connected to said jack and operating to cause the closing of said open contact.

7. A cord circuit for simplex printers comprising, in combination with the printer, a relay provided with a winding in a holding circuit, and a normally short-circuited winding, a busy line signal and a contact in the printer circuit controlled by said relay, a second relay controlling said short-circuited winding and a neon lamp in series with the winding of said second relay and arranged to break down upon the application of a predetermined potential.

In testimony whereof, I affix my signature.

GEORGE G. LIGHT.