May 30, 1944. C. S. RHOADS 2,350,193

AUXILIARY TELEPHONE APPARATUS

Filed Aug. 21, 1943 2 Sheets-Sheet 1

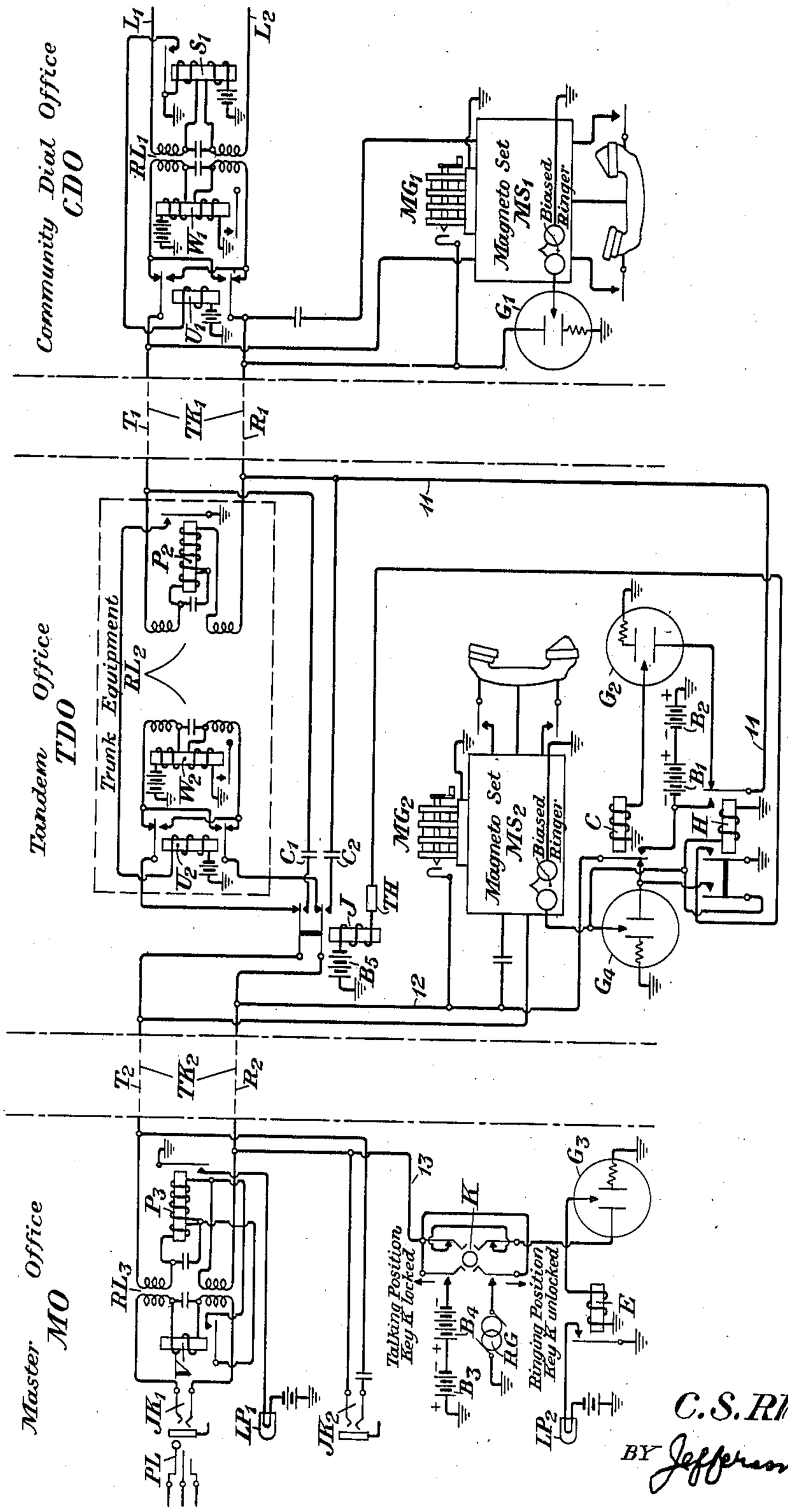

Fig. 1

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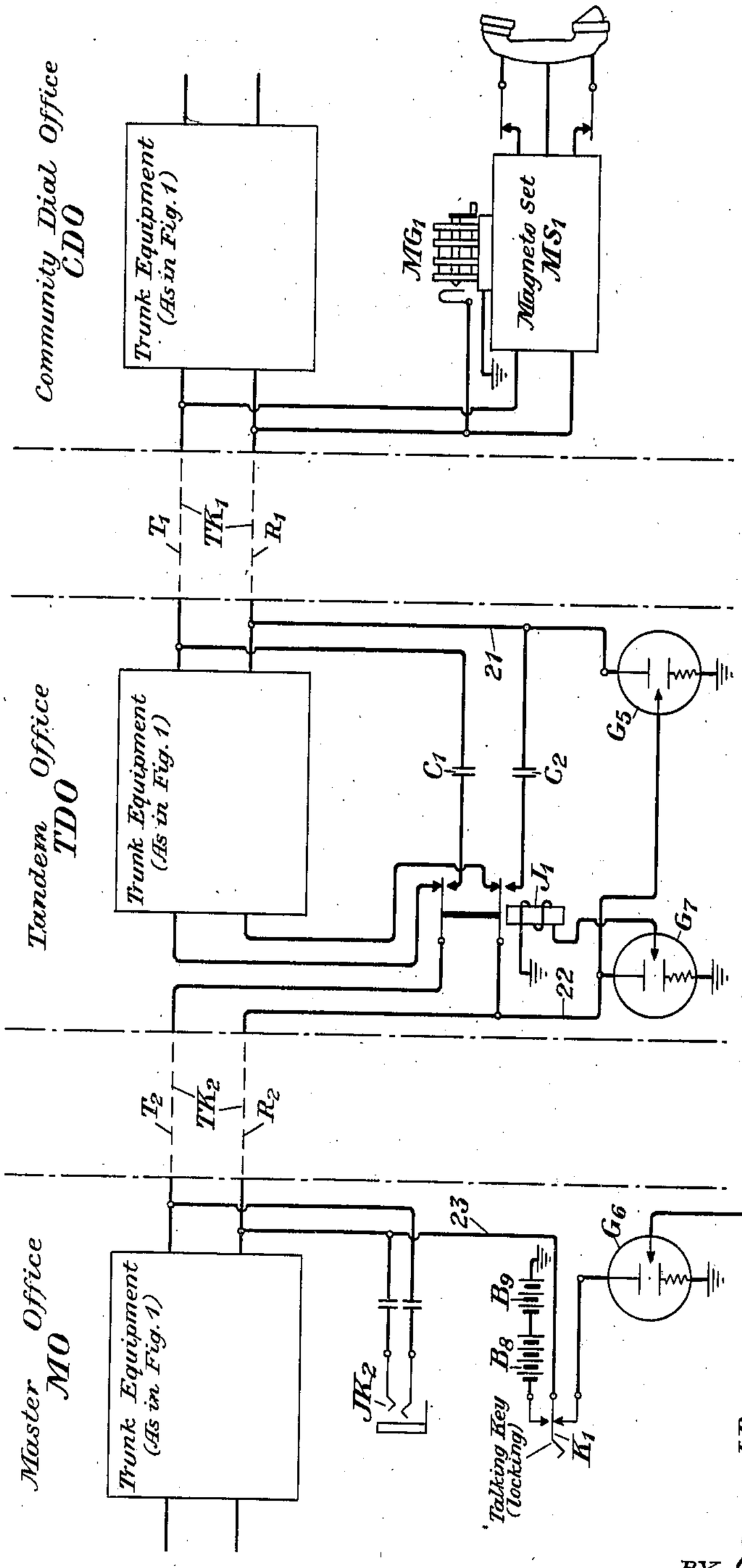

Fig. 2

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UNITED STATES PATENT OFFICE

2,350,193

AUXILIARY TELEPHONE APPARATUS

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Application August 21, 1943, Serial No. 499,494

14 Claims. (Cl. 179—43)

This invention relates to telephone systems. More particularly, this invention relates to apparatus for signaling between two or more telephone offices over the trunk or other lines interconnecting said offices. Still more particularly, this invention relates to auxiliary or emergency equipment for use at telephone offices to provide facilities for signaling between two offices which are separated from each other by one or more intermediate offices.

It has heretofore been proposed to provide emergency telephone equipment suitable for signaling between a community dial office—which usually is unattended and has automatic switching machinery for its subscribers to dial each other—and a master or operator office—which usually is located near a city and is attended by an operator and includes facilities to connect telephone subscribers in the community dial office area to subscribers in the master office area and elsewhere over the trunk circuits extending between the two offices. An arrangement in which the emergency telephone equipment is permanently connected to the trunk conductors and yet does not interfere with normal signaling and conversation over the trunk conductors is disclosed in my copending application Serial No. 483,983, filed April 22, 1943.

However, it often happens that the community dial office is connected to the master or operator office by one or more intermediate or tandem offices which may also be unattended and that the emergency equipment must be used to signal from the community dial office to the operator at the master or operator office through the tandem or intermediate offices whenever desired. The present invention is intended to provide simple and inexpensive equipment for this purpose that will operate unfailingly at all times. The invention will include apparatus not alone for connecting the community dial office to the master office through the intermediate or tandem office but also for simultaneously disconnecting the trunk equipment at the intermediate or tandem office or offices.

This invention will be better understood from the more detailed description hereinafter following, when read in connection with the accompanying drawings in which Figure 1 shows the invention applied to a telephone system including a master office and a community dial office which are connected to each other through an intermediate or tandem office, and Fig. 2 shows generally a modification of the arrangement of Fig. 1.

Referring to Fig. 1 of the drawings, a community dial office CDO is connected through a tandem office TDO to a master or operator office MO. The community dial office CDO is connected to the tandem office TDO by a loop dialing trunk TK_1 which includes conductors T_1 and R_1. The tandem office TDO is connected to the master office MO by another loop dialing trunk TK_2 which includes conductors T_2 and R_2. One of a plurality of subscribers' lines in the area of the community dial office CDO may include conductors L_1 and L_2, and telephone calls may be transmitted in both directions in a well-known manner between the subscriber's line such as L_1—L_2 over the trunks TK_1 and TK_2 to the office MO and to any subscriber in the area of the master office or elsewhere. Any subscriber's line such as L_1—L_2 in the community dial office area may gain access to trunk TK_1 (or to any other such trunk) merely by dialing "0," for example, whereupon the subscriber's line will be connected to a trunk such as TK_1. The regular office equipment at the three offices, so far as it may relate to this invention, is shown for illustrative purposes, together with additional equipment different from that heretofore used at these offices, which is suitable, in accordance with this invention, to provide auxiliary signaling apparatus for use, for example, in emergencies.

The regular equipment of the two offices will now be only briefly described. The windings of the relay W_1 at the community dial office CDO and the windings of the relay P_2 at the tandem office TDO are connected in a series circuit which includes battery, the upper winding of relay W_1, the upper secondary winding of the repeating coil RL_1, the upper armature and back contact of the relay U_1, the conductor T_1 of trunk TK_1, the upper primary winding of a repeating coil such as RL_2, the windings of the polarized relay P_2, the lower primary winding of the repeating coil RL_2, the conductor R_1 of trunk TK_1, the lower armature and back contact of relay U_1, the lower secondary winding of the repeating coil RL_1, the lower winding of relay W_1, and ground. The current that traverses the windings of relays W_1 and P_2 will not operate these relays but they may be operated, as will be described hereinafter, whenever a call is made from, for example, the subscriber having the line L_1—L_2 connected to the community dial office CDO to a subscriber connected to the master office MO. A similar circuit interconnects the windings of relay W_2 at the tandem office TDO

and the relay P_3 at the master office MO although this circuit includes also the armatures of relay J and their back contacts.

When a call is being made by a subscriber having the line L_1—L_2, for example, connected to the community dial office CDO, to a subscriber in the area of the master office MO, then in response to a predetermined dialed number, battery will be connected to the subscriber's circuit L_1—L_2, causing relay S_1 to operate. The operation of the relay S_1 will cause relay U_1 to operate over an obvious circuit completed by the armature and make contact of relay S_1. When relay U_1 operates, its armatures will reverse the direction of current flow to the windings of relay W_1 and the windings of relay P_2. This reversal of current is brought about by the upper armature of relay U_1 which connects the conductor T_1 of trunk TK_1 to the lower secondary winding of repeating coil RL_1 and by the lower armature of relay U_1 which connects the conductor R_1 of trunk TK_1 to the upper secondary winding of the repeating coil RL_1. Upon the reversal of current to the windings of relay P_2, relay P_2 will be operated.

Upon the operation of the polarized relay P_2, relay U_2 will then be operated due to the completion of an obvious circuit established by the armature and contact of relay P_2. Relay U_2 will likewise reverse the direction of current flow through the windings of relay W_2 at the tandem office TDO and through the windings of polarized relay P_3 at the master office MO, thereby also causing the relay P_3 to become operated. Upon the operation of relay P_3 a lamp LP_1 will be lighted to attract the attention of the operator at the master office MO. Both relays P_2 and P_3 are of the polarized type and, before relays U_1 and U_2 operate, the armatures of the respective relays P_2 and P_3 are retained against their back stops. The relays P_1 and P_2 will operate only when the currents therethrough are reversed by relays U_1 and U_2 respectively. It is to be noted that the trunk equipment at the tandem point TDO will connect the trunk TK_1 to a trunk such as TK_2 automatically after the subscriber having the line L_1—L_2 has dialed "O" and been connected to trunk TK_1. The relay U_2 of the selected trunk will be operated because the polarized relay P_2 has operated.

In response to the visual signal given to the operator by the lamp LP_1, the operator at the master office MO may answer the call by inserting the plug PL of her answering cord into the jack JK_1 in the usual way. This will connect battery to the tip and ring terminals of the jack JK_1 to establish a flow of current through the secondary windings of the repeating coil RL_3 and through the winding of relay V, thereby operating relay V. Relay V will close a circuit in shunt with the right-hand portion of the windings of the polarized relay P_3, thereby substantially reducing the resistance in the circuit of the windings of relay P_3. This reduction in the resistance will allow a greater current to flow through the windings of relay P_3 and cause other apparatus (not shown) to be operated to control coin collector apparatus and to control other circuits.

Suppose that in an emergency a repairman or other authorized person who is at the community dial office CDO or who has been dispatched to that office, upon arriving at the office finds the regular equipment out of order and he is therefore unable to use the regular equipment to communicate with the operator at the master office MO. He may then use the auxiliary equipment provided by this invention to signal and converse with the operator at the master office MO.

To signal the operator at the master office it is necessary to use the magneto generator MG_1 of the magneto set MS_1 at the community dial office CDO in the usual way by operating the magneto or hand generator MG_1 while the receiver of the magneto set MS_1 is retained on its switchhook. The gas tubes G_1 and G_2—which may be of the 333A type and are otherwise known as cold cathode tubes—will both be flashed simultaneously. The circuit for ionizing the gas tube G_1 includes the hand generator MG_1, the two cathodes of the tube G_1 (otherwise known as the control gap of the tube and shown here by two parallel lines) and the resistance of the tube and ground. The circuit of the tube G_2 at the tandem office TDO includes the hand generator MG_1, the conductor R_1 of trunk TK_1, conductor **11**, the right armature and back contact of relay H, the cathodes or control gap of tube G_2, and the resistance of the tube and ground. As the tube G_2 becomes ionized, relay C becomes operated, the operating circuit including the generator MG_1, conductor R_1, conductor **11**, the right armature and back contact of relay H, the lower cathode and anode of tube G_2 (otherwise known as the main gap of the tube), the winding of relay C and ground. The winding of relay C will receive from generator MG_1 only that portion of the generated current that flows in a positive direction from the anode to the lower cathode of tube G_2. The armature of relay C will therefore vibrate between its contacts at a rate corresponding to the frequency of the hand generator MG_1, which may be, for example, 20 cycles per second. Each closure of the make contact of relay C will cause tube G_3 at the master office MO to become ionized, the ionizing circuit including batteries B_1—B_2, the armature and make contact of relay C, conductor **12**, conductor R_2 of trunk TK_2, conductor **13**, the upper right swinger of key K and its contact, the lower right swinger of key K and its contact, the cathodes (or control gap) of tube G_3 and its resistance to ground. As the tube G_3 becomes ionized, the relay E—which may be a drop of any well-known type—will become operated, the operating circuit including batteries B_1—B_2, the armature and make contact of relay C, conductors **12**, R_2 and **13**, the upper and lower right swingers of key K and their contacts, the left cathode and anode (or main gap) of tube G_3, the winding of relay E and ground. The operation of relay E will cause the lamp LP_2 to be lighted by the completion of an obvious circuit established by the armature and make contact of relay E. The illuminated lamp LP_2 will signal the operator at the master office MO that she is wanted on the emergency circuit.

The operator at the master office may answer the call made over the emergency or auxiliary circuit by inserting the plug PL of her answering cord into the additional jack JK_2. To complete the talking path to the calling party the operator will operate the key K to its upper position and the key K will be locked in that position. By so operating key K, the gas within tube G_4 at the tandem office TDO will become ionized, the ionizing circuit including battery B_3—B_4, the left upper swinger of key K and its contact, conductor **13**, conductor R_2 of trunk TK_2, conductor **12**, the armature and back contact of relay C, the cathodes (or control gap) of tube G_4 and its resistor to ground. As soon as tube G_4 is so ionized, the

relay H will become operated, the operating circuit including batteries B_3—B_4, the upper left swinger of key K and its contact, conductors 13, R_2 and 12, the armature and back contact of relay C, the right cathode and anode (or main gap) of tube G_4, the winding of relay H and ground. The operation of relay H will complete a circuit to the winding of relay J, the circuit including battery V_5, the winding of relay J, the thermistor TH, the inner left armature and make contact of relay H and ground. The thermistor TH is inserted in series with the winding of relay J to allow the relay J to become operated only if the battery B_5 supplies current thereto for a predetermined interval of time, such, for example, as 6 seconds. Such an interval of time will normally elapse upon the closure of the key K to its upper or talking position. Thus relay J will become operated in response to the movement of the key K to its talking position.

It is noted that relay J is employed for the purpose of connecting the trunk TK_2 to the trunk TK_1 at the tandem office TDO, the interconnected circuit including the two armatures of relay J and their make contacts together with condensers C_1 and C_2, respectively. Thus the master office MO and the community dial office CDO are connected to each other through the tandem office TDO by equipment including relay J controlled by the operator at the master office MO. The outer left armature and make contact of relay H are employed to provide a shunt path around the anode and right cathode (or main gap) of tube G_4 to extinguish the tube G_4 immediately after the relay H operates. This will preserve the tube G_4 against destruction and increase its active life. Moreover, the winding of relay H will be connected to batteries B_3—B_4 through the by-pass circuit provided by the outer left armature and make contact of relay H and the armature and back contact of relay C.

It has been shown that upon the operation of the hand generator MG_1 a signal is transmitted to the master office operator to attract her attention and that the master office operator may control the connection of the trunks between the various offices to enable her to converse with the calling party. The conversation will take place over the circuit of jack JK_2, trunk TK_2, the two armatures of relay J and their make contacts, condensers C_1 and C_2, trunk TK_1 and the magneto set MS_1 at the community dial office CDO. After the conversation is completed the operator will restore the key K to its normal position. This will release both relay H and relay J at the tandem office TDO and return the equipment at that office to its normal condition.

Should the operator at the master office MO desire to recall the calling party at the community dial office CDO, she may operate her key K to its lower or ringing position which will close the key K only for a brief interval of time. When key K is thus operated to its lower or ringing position, the tube G_4 at the tandem office TDO will be flashed over a circuit which includes the ringing generator RG, the lower left swinger of key K and its contact, conductor 13, conductor R_2 of trunk TK_2, conductor 12, the cathodes and resistance of tube G_4 and ground. Whenever the gas of tube G_4 becomes ionized, relay H will operate for a brief interval over a circuit similar to that just described except that the winding of relay H is substituted for the left cathode and resistor of the tube G_4. The relay J will remain unoperated, however, because the flow of current from battery B_5 through its winding and through the thermistor TH will be insufficient in duration to cause the relay to become operated. Whenever the instantaneous value of the ringing generator RG voltage recedes below a predetermined value, tube G_4 will be extinguished and relay H will be released. Relay H will therefore be repeatedly operated at a frequency corresponding to the frequency of the current of ringing generator RG. This frequency may be, for example, 20 cycles per second.

Each closure of the make contact of the right armature of relay H in response to the operation of relay H will connect batteries B_1—B_2 to the cathodes of tube G_1 over a circuit which includes batteries B_1—B_2, the right armature and make contact of relay H, conductor 11, conductor R_1 of trunk TK_1, the cathodes (or control gap) of tube G_1 and its resistor and ground. The tube G_1 will therefore becomes ionized upon each operation of relay H. But, as already noted, relay H will release at regular intervals. Upon each release of relay H the batteries B_1—B_2 will be disconnected from the tube G_1. The tube G_1 will therefore become ionized and deionized at the frequency of generator RG. And so on.

As the tube G_1 becomes ionized, the biased ringer of the magneto set MS_1 at the office CDO will receive a pulse of current from batteries B_1—B_2 over the circuit just described for the ionization of tube G_1 except that the ringer will be substituted for the lower cathode and resistor of tube G_1. In other words, the biased ringer of the magneto set MS_1 will be operated by properly poled pulses of current produced by the vibration of the right armature of relay H which reach the ringer through the main gap of tube G_1. The current through the ringer will be interrupted upon each deionization of gas of tube G_1. Thus the ringer will be repeatedly operated according to the ionization and deionization of the gas of tube G_1 and this will attract the attention of the party that previously made the call to the master office operator. After so signaling the calling party the operator may again move the key K to its upward or talking position to complete the talking path to again converse with the calling party.

It has been shown that the operator may recall the calling party by ringing over the conductors of the trunks between the various offices without connecting the trunks to each other. The trunks are connected to each other only when the operator is to converse with the calling party and this occurs only upon the operation of the relay J at the tandem office TDO in response to the operation of key K to its upper or talking position in which position the key K remains locked.

It is observed that the ringer of the magneto set MS_1 is operated in response to pulses of current transmitted through the gas tube G_1. The ringer does not receive the actual ringing current of the ringing generator RG but it merely receives pulses derived from the ringing generator RG by the equipment including relay H, as already explained hereinabove. The ringer is biased so as to respond to the polarized pulses derived from the ringing current.

An authorized party may also use the magneto generator MG_2 at the tandem office TDO to similarly signal the operator at the master office. By operating the hand generator MG_2, the hand generator circuit is completed and the

generated current is supplied over the conductor 12, conductor R_2 of trunk TK_2, conductor 13 and through the right contacts of key K to the tube G_3 to flash the tube G_3 in a manner similar to that already described hereinabove. This will again operate relay E at regular intervals and light the lamp LP_2 to attract the operator's attention. The operator may then converse with the calling party at the tandem office TDO by operating the key K to its upper or talking position or, if desired, she may call the party at the tandem office TDO by operating the key K to its lower or ringing position. The circuits completed by the manipulation of key K to signal the magneto set MS_2 at the tandem office TDO are similar to those already referred to hereinabove and therefore need not be further described.

Fig. 2 illustrates a modification of the arrangement of Fig. 1, excluding, however, the trunk and other equipment not required to an understanding of the features of the Fig. 2 modification. When an authorized party operates the magneto generator MG_1 at the community dial office CDO, the gas tube G_5 at the tandem office TDO will become ionized, the interconnected circuit for ionizing the gas of tube G_6 including the hand generator MG_1, conductor R_1 of trunk TK_1, conductor 21, the cathodes (or control gap) of tube G_6 and the resistor of that tube and ground. As soon as tube G_5 becomes ionized, tube G_6 at the master office MO will also become ionized, the interconnected circuit for ionizing the tube G_6 including the resistor, the lower cathode and anode of tube G_5, conductor 22, conductor R_2 of trunk TK_2, conductor 23, the swinger and normal contact of key K_1, the cathodes (or control gap) of tube G_6, and the resistor of the tube and ground. Upon the ionization of the gas of tube G_6, the relay E_1 will become operated, the operating circuit including battery B_7, the winding of relay E_1, the anode, lower cathode and resistor of tube G_6 and ground. Upon the operation of relay E_1 the lamp LP_2 will become illuminated by the completion of an obvious circuit controlled by the armature of relay E_1, and this lamp will signify to the operator at the master office MO that she is wanted to answer a call on the emergency or auxiliary circuit.

It will be observed that the voltage generated by the hand generator MG_1 is not only sufficient to ionize the gas within the tube G_5 but at the same time produces a voltage at the anode of tube G_5 of sufficient magnitude to ionize the gas of the tube G_6. This arrangement of tandem-connected tubes has been tried and found to operate satisfactorily. However, if additional voltage is required to insure the operation of the gas within tube G_6 under special conditions (such as, where the interconnected circuits include very large impedances), a properly poled battery may be inserted in series with the anode of the tube G_5. That is, a battery may be inserted in the conductor connecting the anode of tube G_5 and the terminal to the upper cathode of tube G_7 and poled so that the positive terminal of the battery is adjacent to the anode of tube G_5. As already explained, this additional source of voltage is not required except in unusual circumstances.

A relay J_1 is employed as in Fig. 1 to connect the trunk TK_1 to the trunk TK_2 under the control of the key K_1 at the master office MO. Relay J_1 is shown with its winding connected to the anode of the tube G_7 but this relay will remain unoperated in response to the voltage produced by the hand generator MG_1. The relay J_1 will become operated only upon the operation of the key K_1 at the master office as will now be described.

In response to the illumination of lamp LP_2 at the master office MO, the operator may insert the plug of her answering cord into the jack JK_2 to converse with the calling party at the community dial office CDO. To complete the connection the operator will operate key K_1 and thereby ionize the gas of the tube G_7 at the tandem office TDO. The operating circuit for the tube G_7 includes batteries B_8—B_9, the swinger and upper contact of key K_1 (which is a key of the locking type), conductor 23, conductor R_2 of trunk TK_2, conductor 22, the cathodes and resistor of tube G_7 and ground. As tube G_7 becomes ionized, relay J_1 will become operated, the operating circuit including batteries B_8—B_9, the upper contact and swinger of key K_1, conductors 23, R_2 and 22, the upper cathode and anode (or main gap) of tube G_7, the winding of relay J_1 and ground. In response to the operation of relay J_1 the tip and ring conductors T_2 and R_2 of trunk TK_2 will become connected to the tip and ring conductors T_1 and R_1 of trunk TK_1, through the upper and lower armatures of relay J_1 and their make contacts and condensers C_1 and C_2, respectively. This will complete the talking path between the jack JK_2 at the master office MO, and the magneto set MS_1 at the community dial office CDO through the tandem office TDO. Upon the completion of the conversation the key K_1 may be returned to its normal position to release relay J_1 and to return all the equipment to its normal condition. As in the case of the arrangement of Fig. 1, the operation of relay J_1 is employed not alone to connect the two trunks TK_1 and TK_2 to each other at the office TDO whenever desired by the operator, but also to remove all the trunk equipment from the interconnected talking path at the office TDO.

In the arrangements of both Figs. 1 and 2 a relay, such as E_1 of Fig. 2, has been employed to control the illumination of the lamp LP_2 to signal the master office operator. If desired, a ringer may be used in place of the relay and lamp. The ringer may, for example, be connected between the anode of tube G_6 and ground and it should be biased to respond to the pulses traversing the anode circuit (or main gap) of tube G_6 in response to the operation of the hand generator MG_1 at the community dial office CDO. The ringer may, for example, be connected berate which corresponds to the frequency of the current produced by the generator MG_1. The lamp LP_2 at the master office MO heats slowly and hence will be illuminated in response to each operation of the hand generator.

The arrangement of Fig. 2 illustrates a modified scheme for establishing a talking path through a tandem or intermediate office. Although it does not illustrate additional equipment for recalling the calling party whenever desired, equipment for signaling the calling party is set forth in Fig. 1 and may be added to the arrangements of Fig. 2 if so desired.

Although the arrangements of both Figs. 1 and 2 illustrate a community dial office CDO connected to a master office MO through but one intermediate or tandem office TDO, it is clear that the arrangement is readily applicable for interconnecting the two offices CDO and MO through

any desired number of intermediate or tandem offices such as TDO. To accomplish this it is simply necessary to insert equipment similar to that at the office TDO at each of the other intermediate offices. In this case, however, it may be necessary to insert additional sources of potential in series with the anode of the tube G_5 at each intermediate or tandem office, as already noted hereinabove.

While this invention has been shown and described 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 as defined in the appended claims.

What is claimed is:

1. The combination of a ringing generator, two three-element gas tubes, each having two cathodes and an anode, the generator being connected to the cathodes of one of said tubes, the anode and one of the cathodes of which are connected to the cathodes of the other of said tubes, an indicating device, and a relay connected to the anode and one of the cathodes of said other tube, said indicating device being controlled by said relay.

2. The combination of a source of alternating current, first and second gas tubes each comprising two cathodes and an anode, means for connecting said source to the cathodes of said first tube, the cathodes of the said second tube being connected to the anode and one of the cathodes of said first tube, indicating means, and means connected between the anode and one of the cathodes of said second tube to operate said indicating means.

3. Signaling apparatus comprising a source of ringing current, first and second gas tubes each including two cathodes and an anode, means for connecting said source to the cathodes of said first tube, means for connecting the anode and one of the cathodes of said first tube to the cathodes of the second tube, an indicating device, and means connected to the anode and one of the cathodes of the second tube to operate said indicating device.

4. Signaling apparatus comprising a source of alternating current of predetermined frequency, an indicating device which is selectively responsive to current of said predetermined frequency, first and second gas tubes each including two cathodes and an anode, means for connecting said source to the cathodes of said first tube, means for connecting the anode and one of the cathodes of said first tube to the cathodes of said second tube, and means connected to the anode and one of the cathodes of said second tube to operate said indicating device.

5. Signaling apparatus comprising a source of alternating voltage of predetermined frequency, an indicating device selectively responsive to pulses of current of said predetermined frequency, first and second gas tubes each including two cathodes and an anode, means for connecting said source of alternating voltage to the cathodes of said first tube, a source of unidirectional voltage, a relay having its winding connected between the anode and one of the cathodes of said first tube, means controlled by said relay for connecting said source of unidirectional voltage in series with the cathodes of said second tube, and means connected to the anode and one of the cathodes of said second tube to operate said indicating device.

6. The combination of a source of alternating voltage, a source of direct voltage, a gas tube having two cathodes and an anode, means for connecting either of said sources to the cathodes of said tube to ionize the gas within said tube, a first relay having its winding connected between the anode and one of the cathodes of said tube, a second relay, and a thermistor connected in series with the winding of said second relay, said second relay being controlled by the armature of said first relay.

7. The combination of a gas tube having two cathodes and an anode, means for applying alternating voltage between said cathodes to periodically ionize the gas within said tube, means for applying unidirectional voltage between said cathodes to continuously ionize the gas within said tube, a translating device connected between the anode and cathode of said tube and responsive to the ionization of the gas within said tube, a relay, a thermistor connected in series with the winding of said relay in a circuit controlled by said translating device, said relay being operated only when the gas within said tube is continuously ionized.

8. The combination of a gas tube having two cathodes and an anode, the gas within said tube being periodically ionized upon the application of alternating voltage to said cathodes and continuously ionized upon the application of unidirectional voltage to said cathodes, a relay, and means interconnecting said relay with the anode of said tube for operating said relay when the gas within said tube is continuously ionized and for preventing the operation of said relay when the gas is periodically ionized.

9. The combination of a gas tube which is continuously ionized in response to unidirectional voltage and periodically ionized in response to alternating voltage, a relay, means responsive to the continuous ionization of said tube to operate said relay, and means to prevent the operation of said relay when said tube is periodically ionized.

10. The combination of a gas tube which is continuously ionized in response to unidirectional voltage and periodically ionized in response to alternating voltage, a relay, an indicating device, means responsive to the continuous ionization of said tube to operate said relay and to prevent the operation of said indicating device, and means responsive to the periodic ionization of the gas within said tube to operate said indicating device and to prevent the operation of said relay.

11. The combination of a gas tube which is continuously ionized in response to unidirectional voltage and periodically ionized in response to alternating voltage, a translating device, a frequency selective device, means responsive to the continuous ionization of the gas within said tube to operate said translating device, and means responsive to the periodic ionization of the gas within said tube at a predetermined frequency to operate said frequency selective device.

12. A claim according to claim 11, with the addition of means to prevent the operation of said translating device when the gas within said tube is periodically ionized.

13. The combination of two lines, a relay for controlling the connection between said lines, a gas tube which is continuously ionized in response to unidirectional voltage and is periodically ionized in response to alternating voltage, a ringer, means responsive to the continuous ionization of said tube to operate said relay to connect said

lines to each other, and means responsive to the periodic ionization of said tube to operate said ringer and to prevent the operation of said relay.

14. In a telephone system, the combination of a master office, a community dial office, a tandem office connected to said community dial office by a first trunk and to said master office by a second trunk, first and second gas tubes located at said tandem office and said community dial office respectively, each gas tube having two cathodes and an anode, means for transmitting alternating voltage from said master to said tandem office to ionize the gas between the cathodes of said first tube, means responsive to the ionization of the gas of said first tube to transmit a unidirectional voltage from said tandem office to said community dial office to ionize the gas between the cathodes of said second tube, an indicating device at said community dial office connected to the anode and one of the cathodes of said second tube and responsive to the ionization of the gas within said second tube, a relay at said tandem office connected to the anode of said first tube for controlling the connection between said first and second trunks, a thermistor connected in series with the winding of said relay, and means for transmitting unidirectional voltage from said master office to said tandem office to ionize the gas between the cathodes of said first tube and for operating said relay.

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