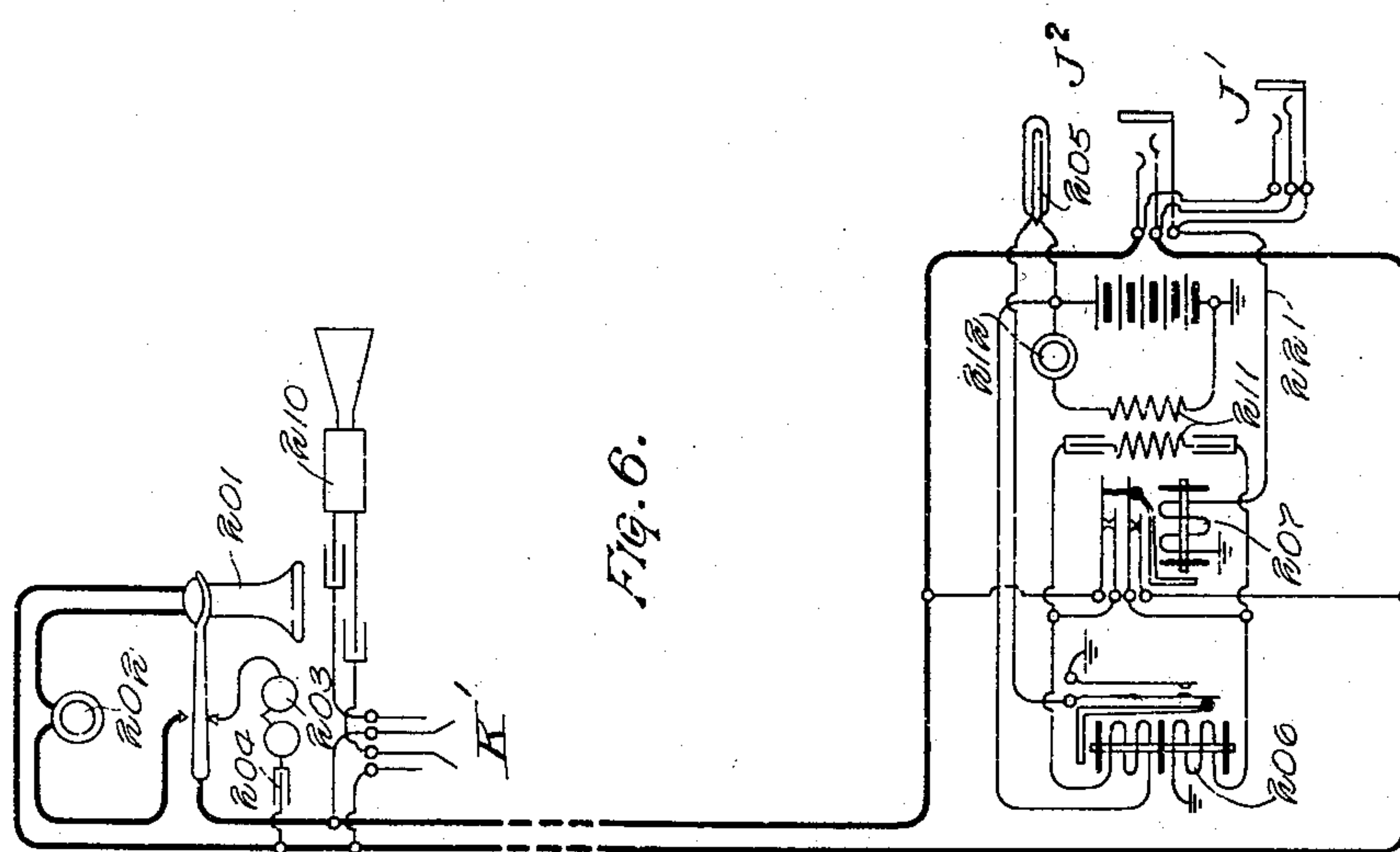
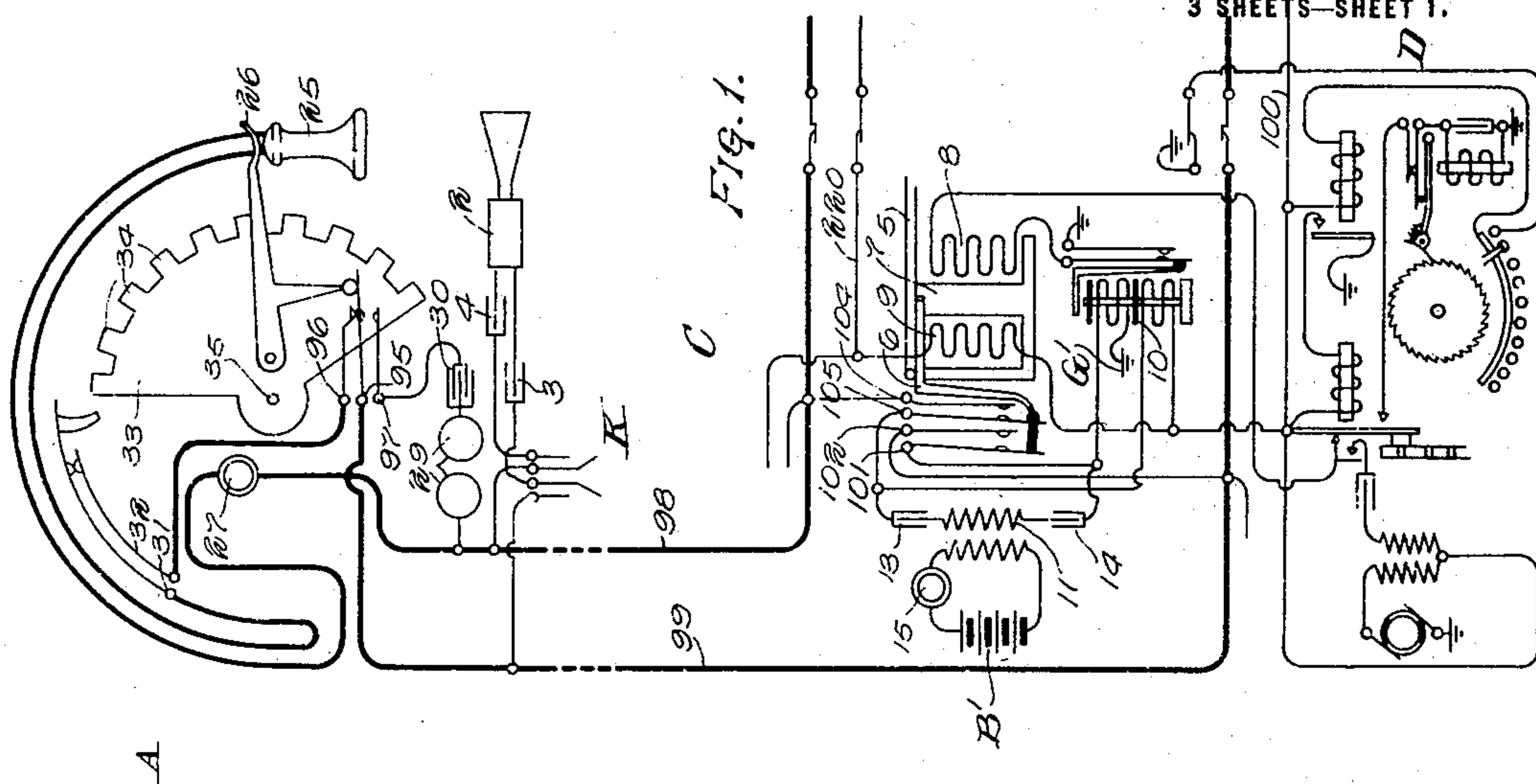


1,159,855.

3 SHEETS—SHEET 1.



A. J. Ray.

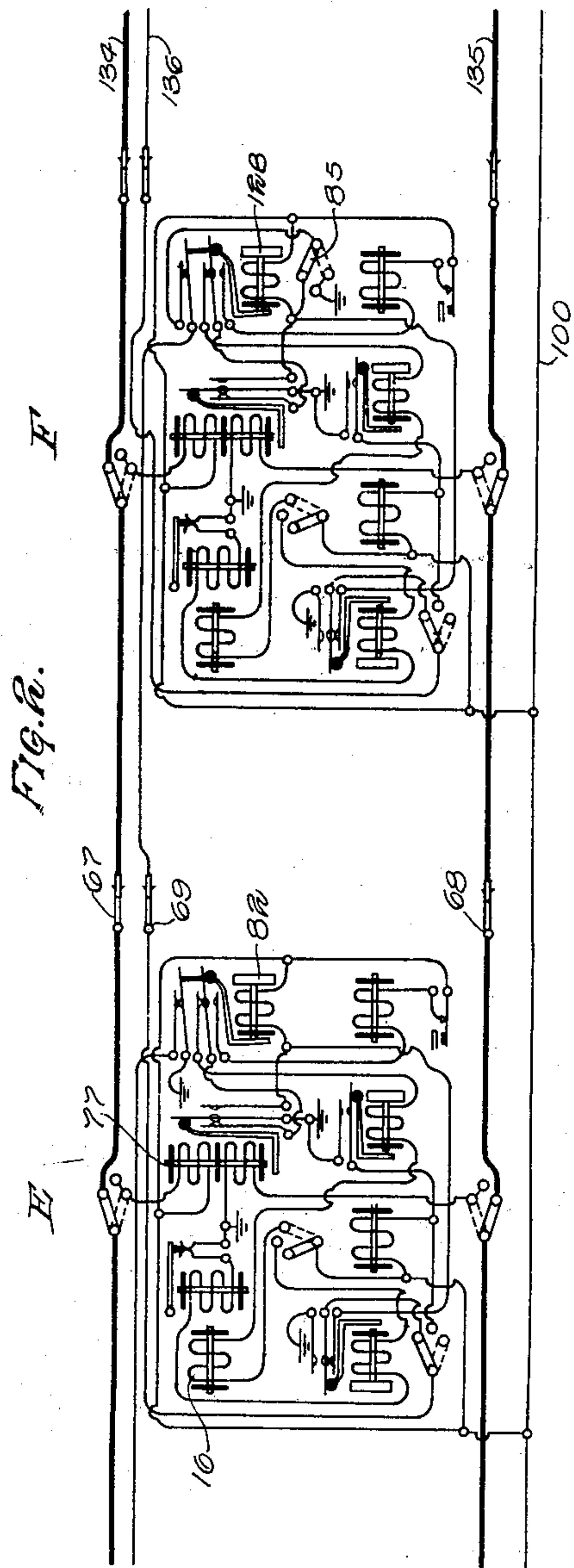
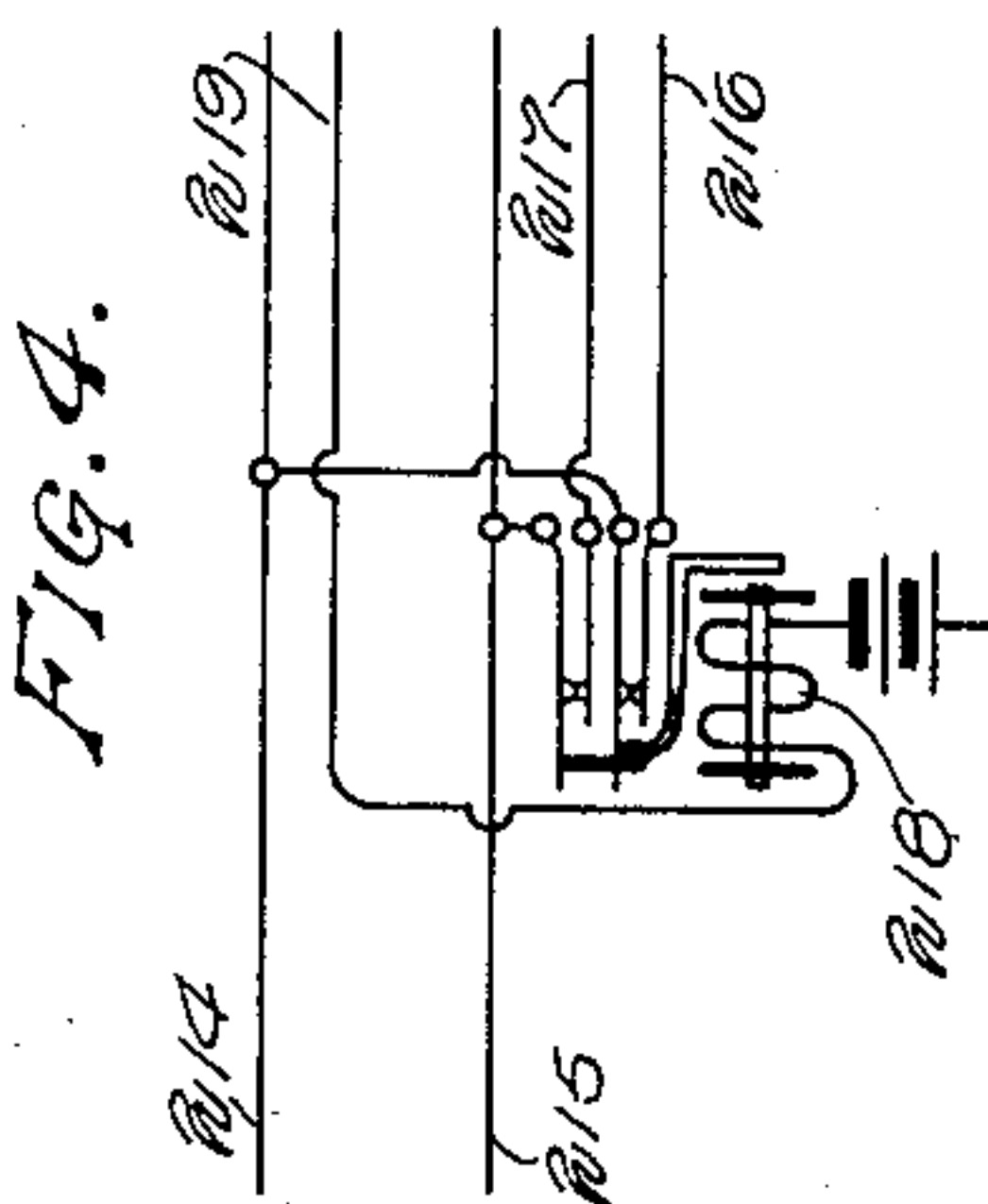
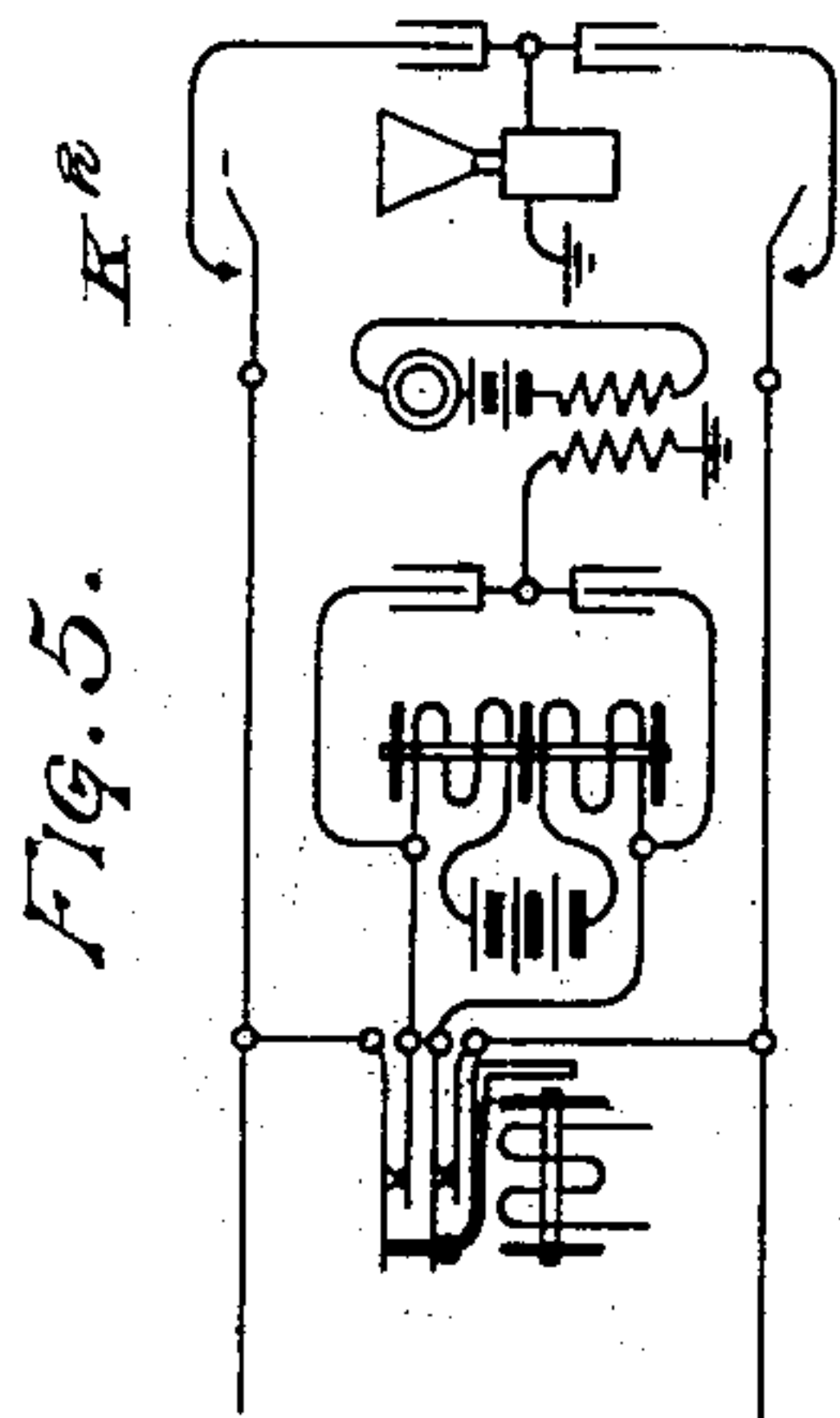
Walter G. Martin
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APPLICATION FILED MAY 11, 1912.

1,159,855.

Patented Nov. 9, 1915.

3 SHEETS—SHEET 2.



WITNESSES
A. Andersen.
A. J. Ray

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3 SHEETS—SHEET 3.

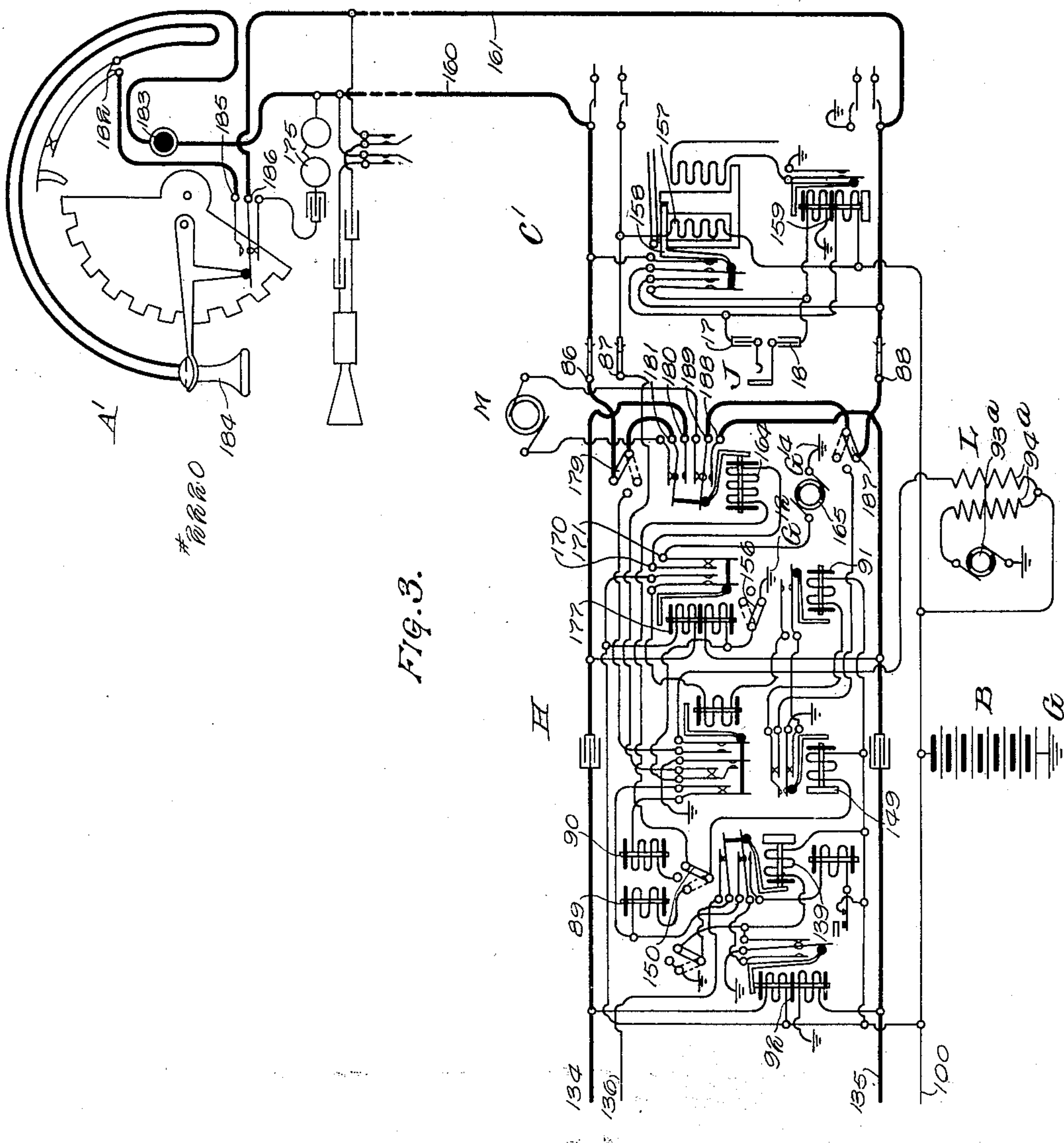


FIG. 3.

WITNESSES
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UNITED STATES PATENT OFFICE.

TALBOT G. MARTIN, OF CHICAGO, ILLINOIS, ASSIGNOR TO AUTOMATIC ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

SPECIAL-SERVICE TELEPHONE SYSTEM.

1,159,855.

Specification of Letters Patent.

Patented Nov. 9, 1915.

Application filed May 11, 1912. Serial No. 696,584.

To all whom it may concern:

Be it known that I, TALBOT G. MARTIN, a citizen of the United States of America, and resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Special-Service Telephone Systems, of which the following is a specification.

My invention relates to special service telephone systems, and comprises an arrangement of circuits whereby the subscribers of a telephone system, either manual or automatic, may be automatically supplied with music, news or information of any kind from a central distributing source. In order to accomplish this result I provide a loud speaking telephone receiver which may be bridged across the subscriber's line, and at the central station I provide a special transmitting circuit which is normally bridged across the line, and thus the subscriber, by merely operating a key, or throwing a switch in some other manner, can connect his loud speaking receiver directly with this special transmitting circuit. I likewise provide means whereby, when a subscriber wishes to establish connection with some other subscriber, this special transmitting circuit is automatically disconnected from the line, so that it does not in any way interfere with the establishment of such connection.

My invention is adapted for and associated with either an automatic or a manual line. In connection with the automatic system I provide means whereby the special service circuit is automatically disconnected as soon as a subscriber removes his receiver from the hook preparatory to making a call. I also provide means whereby the circuit is disconnected when a connector switch connects with a line. In connection with the manual system, however, this special service circuit is automatically disconnected by the operator plugging into the jack of the line, whether this line be a calling or a called line.

These and other objects of my invention will be more readily understood by reference to the accompanying drawings, in which similar reference characters refer to similar parts.

Figures 1, 2 and 3 show a complete connection between a calling substation A (Fig. 1) and a called substation A' (Fig. 3) in a system embodying the principles of my in-

vention. In Fig. 1 there is represented an automatic substation A to the line conductors of which there is allotted at the central office an individual or line switch C. At D there is shown a master switch for controlling a group of line switches C. All the line switches of this group have common access to a number of trunk lines which lead to first selector switches, one of which is represented at E in Fig. 2. A number of first selectors have common access to a plurality of second selectors, one of which is represented at F. The second selectors in turn have access to connector switches, one of which is shown at H in Fig. 3, by means of which connections may be completed with the subscribers' lines. Figs. 4 and 5 represent diagrammatical modifications of the circuits, which will be fully described hereinafter. Fig. 6 is a diagram showing how my invention may be applied to a manual telephone system.

The automatic substations A and A' may be of any suitable or approved type. Those with which I have chosen to illustrate my invention, and as illustrated at A in Fig. 1, comprise the usual receiver 25, switch hook 26, transmitter 27, ringer 29 and condenser 30. In addition, the substation A is provided with the impulse springs 31 and 32 and an impulse wheel 33. The impulse wheel 33 carries upon its periphery the impulse teeth 34 and is secured to a shaft 35, to which latter there is also attached a dial (not shown) provided with finger holes, through the medium of which holes the impulse wheel may be rotated. As the impulse wheel is returned to normal position by a spring (not shown) after it has been rotated for any digit, each of the teeth 34 which passes the end of the spring 31 forces said spring out of engagement with the spring 32. The number of times these springs are separated depends upon the digit called. The substation A is also provided with a loud speaking receiver 2 which may be of any suitable type. This receiver is normally disconnected from the line, but may be bridged across the line conductors 98 and 99 through the condensers 3 and 4 by means of the manually-operated key K.

The line switch C, which is individual to the line of substation A, and the master switch D are modified forms of the general type of line switch and master switch dis-

closed in British patent to R. W. James No. 26,301 of 1906, the master switch D, however, being of the particular type shown in British patent to T. G. Martin No. 1419 of 1910.

5 The line switch C is a slightly modified construction of the particular type of line switch shown in said British Patent No. 1419 of 1910. As shown herein, the usual plunger arm 5 and cut-off armature 6 are

10 controlled by a double-wound magnet 7. Of the two windings upon this magnet only the winding 8 is strong enough to attract the plunger arm 5 from its normal position, while the winding 9 can only attract the

15 cut-off armature 6 from its normal position, but can hold the plunger arm 5 in its operated position after it has once been pulled down by the winding 8. The usual line relay, instead of comprising a single winding

20 upon the same core as the pull-down and cut-off windings 8 and 9, as is shown in said British Patent No. 1419 of 1910, in the present instance comprises an entirely independent double-wound relay 10. This relay

25 is preferably slightly slow acting. Connected in multiple with the line relay 10 of the line switch C, and therefore normally bridged across the line of the substation A, there is the secondary winding of an induction

30 coil 11. Condensers 13 and 14 are inserted in this bridge on either side of the induction coil. The primary winding of the induction coil is included in the local circuit with the battery B' and the transmitter 15.

35 This transmitter is of suitable character to operate in conjunction with the loud speaking receiver 2 at the telephone, and may be simply a transmitter to be spoken into by an exchange attendant or other person, or

40 may be controlled by a phonograph or in any other manner to transmit any kind of message that may be desired to be transmitted to the substation through the medium of the loud speaking receiver 2. The selector

45 E is of the general type of selector disclosed in United States Letters Patent No. 815,321, granted March 13, 1906, to Keith, Erickson and Erickson, being modified, however, as shown in said British Patent No. 1419 of

50 1910 so as to operate in a two-wire system, *i. e.*, a system in which the central office apparatus is controlled from the calling substation over the two sides of the line in series. The selector F is similar to the selector E, with the addition of the side switch wiper 85. As the specific structure of these line switches and first and second selectors forms no part of my present invention, it is

55 not thought necessary to describe the same more in detail, as the construction and operation of the same are well known in the art.

The connector H is of the general type of connector switch disclosed in United States Letters Patent No. 815,176, granted March

60 13, 1906, to Keith, Erickson and Erickson,

but, like the selectors, is modified in order to operate in a two-wire system. Like the selectors, the connector is provided with a shaft (not shown) carrying the wipers 86, 87 and 88 and is controlled by the vertical magnet 89 and the rotary magnet 90. The usual side switch is controlled by the private magnet 91 in the usual manner. The connector is provided with a so-called back-bridge relay 177 through which the called

70 substation is provided with talking battery current, and with a ringer relay 164 through the medium of which ringing current may be applied to the called line after connection is completed therewith.

The substation A' and the line switch C' are similar to the substation A and the line switch C, respectively. With the line switch C' there is not shown a transmitting circuit similar to that comprising the transmitter

85 15 and induction coil 11 shown in connection with the line switch C, but, instead, there is shown a jack J which is normally bridged across the line through the medium of the condensers 17 and 18. With this arrangement a transmitting circuit similar to that shown in connection with the line switch C (Fig. 1) may be provided with an ordinary plug, and may be connected with or disconnected from the line at will through the

90 95 medium of the jack J.

At M there is shown a ringing current generator and at L a busy signaling machine is shown comprising a current interrupter 93^a and an induction coil 94^a. For operating the central office apparatus and for furnishing talking current there is provided a battery B having one pole, preferably the positive, grounded at G.

Having given a general description of the apparatus I will explain in a general way the operations by which connection may be established between two automatic substations in the system shown. For example, it will be explained how the substation A

105 110 may obtain connection with the substation A', the number of which latter is assumed to be 2220. When the calling subscriber removes his receiver preparatory to making a call, the switch hook rises, permitting the

115 spring 95 to pass out of engagement with the spring 97 and into contact with the spring 96, whereby the circuit of the ringer 29 and the condenser 30 is broken and a bridge consisting of the substation transmitter and receiver is closed across the line conductors 98 and 99. The closure of this bridge across the line completes an energizing circuit through the line relay 10 of the switch C. This circuit extends from ground

120 125 G' through the upper winding of the relay 10, springs 101 and 102, line 99, springs 95 and 96, 32 and 31, receiver 25, transmitter 27, line 98, springs 104 and 105 and the lower winding of the relay 10 to the battery

130

lead 100, thence through battery B to ground G. The energization of the relay 10 serves to close the circuit of the operating winding 8 to cause the line switch to operate in the usual and well-known manner to select an idle trunk line leading to the first selector E. The winding 8, upon energizing, besides attracting the plunger arm 5 to cause the connection to be extended to the selector, also attracts the cut-off armature 6, which not only disconnects the line relay 10 from the line, but also disconnects the secondary winding of the induction coil 11 from the line as well, so that the calling subscriber can receive no voice currents from the transmitter 15 through his telephone receiver 25. The calling subscriber now operates his calling dial in the usual manner for the first digit 2 of the desired number. As the impulse wheel 33 returns to normal position after being rotated for this digit, the impulse springs 31 and 32 are separated twice momentarily. Each time the springs 31 and 32 are separated, the energizing circuit of the line relay 77 of the selector E is broken, allowing said relay to be momentarily deenergized. This operation of the line relay 77 causes the vertical magnet 16 to operate to raise the switch wipers 67, 68 and 69 to a position opposite the second level. These wipers are then rotated automatically to select the first idle trunk in this second level, which trunk leads to one of the second selectors F. Connection is thus extended to the second selector. The calling subscriber now operates his calling device for the second digit 2. The second selector F operates in response to the impulses for this digit in the same manner as the selector E and extends connection to an idle connector H over the trunk lines 134 and 135. The calling subscriber now operates his dial for the third digit 2, momentarily separating the impulse springs 31 and 32 in the same manner as described for the first digit. Each time the impulse springs are separated for the third digit, the energizing circuit for the connector line relay 92 is broken momentarily. This operation of the line relay operates the connector in the well-known manner to raise it up to the second level. The connector is then in position to receive impulses for the last digit 0. The operation of the substation calling device for this digit breaks the energizing circuit of the relay 92 ten times. The rotary magnet 90 then receives ten impulses and operates to rotate the wipers ten steps onto the contacts of the line No. 2220. The private magnet relay 149 is energized by the first impulse to the rotary magnet and again closes the circuit of the private magnet 91. The circuit of the relay 149 is not open long enough to permit it to deenergize until after the last impulse has been delivered to the rotary magnet.

The relay 149 then deenergizes and breaks the circuit of the private magnet 91, which, if the called line is not already busy, in turn deenergizes and permits the side switch to pass to third position, whereby connection is completed between the calling and called lines.

The side switch wiper 156, when in third position, extends the guarding potential from ground G^{12} through the private wiper 87 to the connector private bank contacts of the called line, and also provides an energizing circuit for the cut-off winding 157 of the line switch C'. The winding 157, upon energizing, attracts the armature 158, which operates to disconnect the line relay 159 and the jack J from the called line. When the side switch wiper 150 of the connector reaches third position, the energizing circuit is established for the ringer relay 164. This circuit extends from ground G^{14} through the interrupter 165, springs 171 and 170, relay 164 and the side switch wiper 150 to the battery lead 100. Since this circuit includes the interrupter 165, the relay 164 is energized only intermittently. Each time the relay 164 is energized it operates to disconnect the calling line from the called line and to bridge the generator M across the called line so as to ring the bell 175. When the called subscriber removes his receiver, or as soon thereafter as the relay 164 deenergizes, if it happens to be energized at the time, the called substation is provided with talking battery current from the central office. The circuit over which this talking current flows extends from ground G^{12} through the side switch wiper 156, lower winding of the relay 177, ringer relay springs 188 and 189, side switch wiper 187, shaft wiper 88, line 161, springs 186 and 185, impulse springs 182, receiver 184, transmitter 183, line 160, shaft wiper 86, side switch wiper 179, ringer relay springs 181 and 180 and the upper winding of the relay 177 to the battery lead 100. The connector back-bridge relay 177 is energized by this talking current and by separating the springs 170 and 171 destroys the energizing circuit of the ringing relay 164 so as not to ring the called subscriber after he has answered.

After the conversation is completed the release of the central office apparatus is initiated by the hanging up of the receiver at the calling substation. When the receiver 25 is restored to the switch hook 26, the springs 95 and 96 are separated, thereby breaking the energizing circuit through the connector line relay 92. The relay 92, upon deenergizing, breaks the holding circuits of the release relays 139, 128 and 82 of the switches H, F and E, respectively, whereby they are released in the well-known manner. The relay 82 of the selector E, upon deenergizing, also destroys the circuit of the

holding winding 9 of the line switch C, whereby the plunger arm 5 is permitted to restore to normal position to disconnect the line from the first selector E, and the cut-off armature 6 is permitted to restore to normal position to again connect the line relay 10 and the central office transmitting circuit with the line of the substation A.

In the above description it will be seen that the transmitting circuit comprising the induction coil 11 and the transmitter 15 (Fig. 1) and the jack J (Fig. 3), by means of which a similar transmitting circuit may be connected with the subscriber's line, is disconnected from the subscriber's line, either when the subscriber removes his receiver from the switch hook to initiate a call, or when a connector switch H completes connection with the called line. Thus it will be seen that when a subscriber wishes to call another subscriber in the ordinary way, no sounds are transmitted to the connected subscribers from the special transmitting circuit at the central office. If, however, a subscriber wishes to receive the message that is being transmitted from the special transmitting circuit at the central office, he simply operates the key K to bridge the special receiver 2 across the line. Since this receiver is bridged across the line through the condensers, it does not form a conductive path for direct current, and therefore does not energize the line relay 10 to operate the line switch C; and since the induction coil 11 is connected with the line as long as the line switch C is not operated or its winding 9 energized, the subscriber may, through the medium of the special receiver 2, hear the message which is being transmitted through the transmitter 15 and the induction coil 11. It will be seen that while any subscriber is receiving the information from this special transmitting circuit, his line is not prevented from being called by some other subscriber, and that in case his line is called this special transmitting circuit will be disconnected from the line by the energization of the cut-off winding of the line switch C of the called line as soon as the connector switch completes connection therewith.

In Fig. 6 there is shown a manual telephone substation comprising the usual receiver 201, transmitter 202, ringer 203 and condenser 204. At the central office there are allotted to the lines of this manual substation the usual answering jack J², one or more multiple jacks J', line lamp 205, line relay 206 and cut-off relay 207. At the substation there is provided a receiver 210 similar to the receiver 2 (Fig. 1) which may be manually connected with the line through the medium of the key K'. At the central office there is shown a special transmitting circuit comprising an induction coil 211 and

transmitter 212, which circuit is normally connected with the line in multiple with the line relay in the same manner as described in connection with the automatic substation in Fig. 1. In this instance the subscriber may hear the sounds which are being transmitted by this special transmitting circuit by simply operating the key K' to connect the receiver 210 with the line in the same manner as explained in connection with Fig. 1. When the subscriber wishes to call some other subscriber, or is called, the induction coil 211 is disconnected from the line by the energization of the cut-off relay 207 whenever a plug of the operator's cord circuit is inserted into a jack of the line.

It may often be more convenient to connect the special central office transmitting circuit to the line at some other point than at the line switch in an automatic system, or at the regular cut-off relay in a manual system, as has been hereinbefore described. For instance, it may be more desirable to connect this transmitting circuit to the line at the distributing frame. This circuit may be connected to the line at any point desired by the use of a special relay, such as shown in Fig. 4. In this figure the conductors 214 and 215 represent a portion of the line circuit between the substation and its terminus at the central office. The conductors 216 and 217 are assumed to lead to the transmitting circuit at the central office. These conductors are connected to the line circuit through the normally closed contact of a relay 218. The relay 218 should be connected in multiple with the cut-off relay of the line—that is, the conductor 219 should be connected with the conductor corresponding to the conductor 220 in Fig. 1, or the conductor 221 in Fig. 6. The battery terminal of the relay should, of course, be connected with the same terminal of the battery to which the cut-off relay of the line switch with which it is associated is connected.

In all the circuits hereinbefore described the central office transmitting circuit and the special receiver at the substation are bridged across the line. In Fig. 5 there is represented diagrammatically circuit arrangements whereby this apparatus is operated over a circuit, one side of which includes the two sides of the telephone line in parallel, while the other side of the circuit is formed through the ground or a common return—that is, the transmitting circuit and receiver are included in ground taps which are taken off from a point between two condensers which are bridged across the line.

It will thus be seen that I have provided a very convenient and efficient circuit arrangement whereby the subscribers of an automatic or a manual exchange can be supplied with music or with news or any other desired information. While I have illus-

trated in Fig. 1 merely a transmitter for supplying the desired information, it is obvious that the information or music could be supplied from a record and, furthermore,

that the vibrations received from such record could be amplified to a sufficient degree so that a single record and master transmitter operated thereby could be employed for supplying a large number of subscribers.

Various other modifications will readily suggest themselves to those skilled in the art and come within the scope of my invention.

What I claim as my invention is:—

1. In a telephone system, a subscriber's line, a special service telephone set normally connected with said line, and means for extending connection from said line to a second subscriber's line and for automatically disconnecting said special service set from the line, the said means comprising a magnet for performing said automatic disconnection.

2. In a telephone system, a subscriber's line, a telephone receiver adapted to be bridged across said line, a special service set normally bridged across said line at the central station, and means for automatically disconnecting said set from the line, the said means comprising a magnet for performing said automatic disconnection.

3. In a telephone system, a subscriber's line, a substation set located thereon, a special service telephone receiver at said substation, means for bridging said receiver across said line, a special service transmitter normally bridged across said line at the central station, and means for disconnecting said special service set from the line when the receiver at the substation is removed from the hook.

4. In a telephone system, a subscriber's line, a special service set normally bridged across said line at the central station, an automatic switch for extending connection from said line, and means controlled by the operation of said switch for disconnecting said set from the line.

5. In a telephone system, a subscriber's line, a special service set normally bridged across said line, and automatic means for disconnecting said set from the line when connection is made with said line, the said means comprising a magnet for performing said automatic disconnection.

6. In a telephone system, a subscriber's line, means for extending connection from said line, a telephone receiver, means for bridging said receiver across the line without operating said first mentioned connecting means, a special service set normally bridged across said line at the central station, and means for automatically disconnecting said set from said line.

7. In a telephone system, a subscriber's line, a substation set thereon including a

receiver, means for bridging said receiver across said line, a special telephone receiver, means for bridging said special receiver across said line in series with a condenser, a special service set normally bridged across said line at the central station, and means for automatically disconnecting said service set from said line, the said means comprising a magnet for performing said automatic disconnection.

8. In a telephone system, a subscriber's line, a substation set thereon including a receiver, means for bridging said receiver across said line, a special telephone receiver, means for bridging said special receiver across said line in series with a condenser, a special service set normally bridged across said line at the central station, means for extending connection from said line, and means for automatically disconnecting said special service set from the line when said connection is extended therefrom, the said means comprising a magnet for performing said automatic disconnection.

9. In a telephone system, a subscriber's line, a substation set thereon including a receiver, means for bridging said receiver across said line, a special telephone receiver, means for bridging said special receiver across said line in series with a condenser, a special service set normally bridged across said line at the central station, and means for automatically disconnecting said service set from said line, the said means comprising a magnet for performing said automatic disconnection.

10. In a telephone system, a subscriber's line, a substation set thereon including a receiver, means for bridging said receiver across said line, a special telephone receiver, means for bridging said special receiver across said line in series with a condenser, a special service set normally bridged across said line at the central station, means for extending connection from said line, and means for automatically disconnecting said special service set from the line when said connection is extended therefrom, the said means comprising a magnet for performing said automatic disconnection.

11. In a telephone system, a subscriber's line, a substation set thereon including a telephone receiver, means for extending connection from said line, said means controlled by the switch hook to extend the connection upon removal of the receiver, a second telephone receiver, means for bridging said second receiver across said line without operating said means, and a special service set bridged across said line at the central station.

12. In a telephone system, a subscriber's line, a substation set thereon including a telephone receiver, means for extending connection from said line, said means controlled

by the switch hook to extend the connection upon removal of the receiver, a second telephone receiver, means for bridging said second receiver across said line without operating said means, a special service set bridged across said line at the central station, and means for automatically disconnecting said special service set from the line when connection is extended therefrom.

13. In a telephone system, a subscriber's line, a telephone receiver, means for bridging said receiver across said line, a special service set normally bridged across said line at the central station, a cut-off relay associated with said line, and means controlled by the operation of said cut-off relay for disconnecting said set from the line.

14. In a telephone system, a subscriber's line, a substation set thereon, a trunk-selecting switch for extending connection from said line, means for operating said switch upon the removal of the receiver from the hook at the substation, a loud speaking telephone receiver associated with said line and means for bridging said loud speaking receiver across said line without causing the operation of said trunk-selecting switch, and a special service set bridged across said line at the central station.

15. In a telephone system, a subscriber's line, a substation set thereon, a trunk-selecting switch for extending connection from said line, means for operating said switch upon the removal of the receiver from the hook at the substation, a loud speaking telephone receiver associated with said line and means for bridging said loud speaking receiver across said line without causing the operation of said trunk-selecting switch, a special service set bridged across said line at the central station, and means for automatically disconnecting said special service set from the line when said trunk-selecting switch is operated.

16. In a telephone system, a subscriber's

line, a substation set thereon, a trunk-selecting switch for extending connection from said line, means for operating said switch upon the removal of the receiver from the hook at the substation, a loud speaking telephone receiver associated with said line and means for bridging said loud speaking receiver across said line without causing the operation of said trunk-selecting switch, a special service set bridged across said line at the central station, a cut-off relay associated with said trunk-selecting switch, and means controlled by the operation of said cut-off relay for disconnecting said special service set from the line.

17. In a telephone system, a subscriber's line, a trunk-selecting switch for extending connection from said line, a telephone receiver, means for bridging said receiver across said line to cause the operation of said switch, a second receiver, means for bridging said second receiver across said line in series with a condenser to thereby prevent operation of said switch, and a special service set bridged across said line at the central station.

18. In a telephone system, a subscriber's line, a trunk-selecting switch for extending connection from said line, a telephone receiver, means for bridging said receiver across said line to cause the operation of said switch, a second receiver, means for bridging said second receiver across said line in series with a condenser to thereby prevent operation of said switch, a special service set bridged across said line at the central station, and means for automatically disconnecting said special service set from the line when said switch is operated.

Signed by me at Chicago, Cook county, Illinois, this 8th day of May, 1912.

TALBOT G. MARTIN.

Witnesses:

ARTHUR J. RAY,

ALBERT ANDERSEN.