

July 6, 1926.

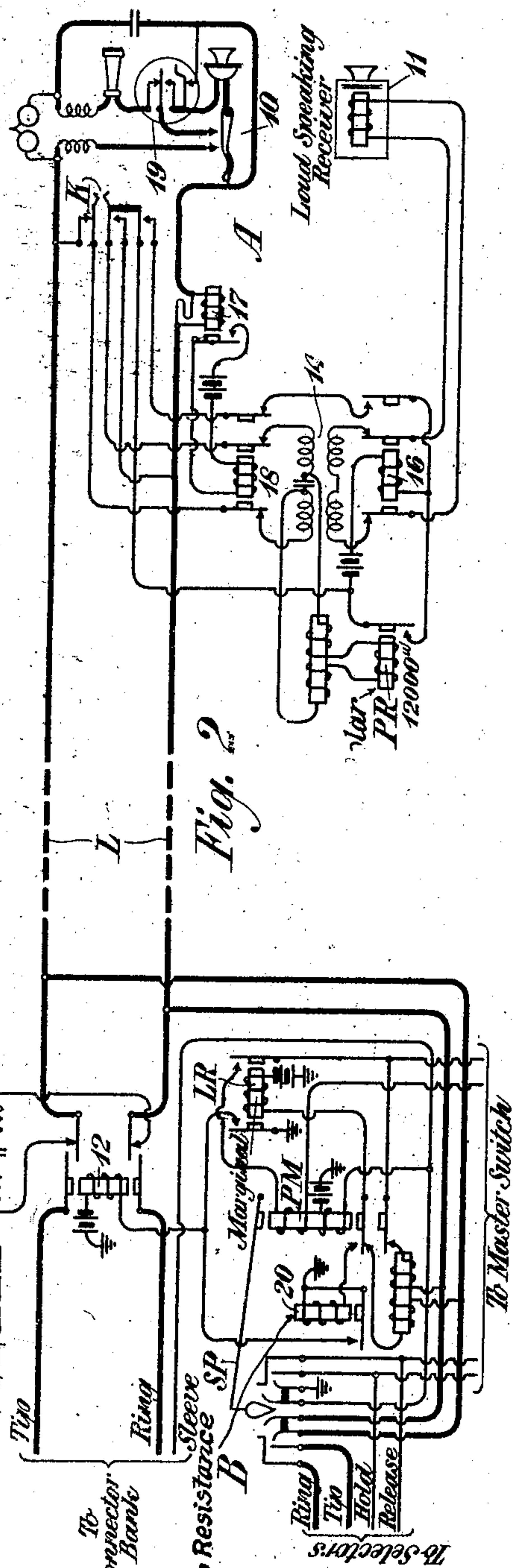
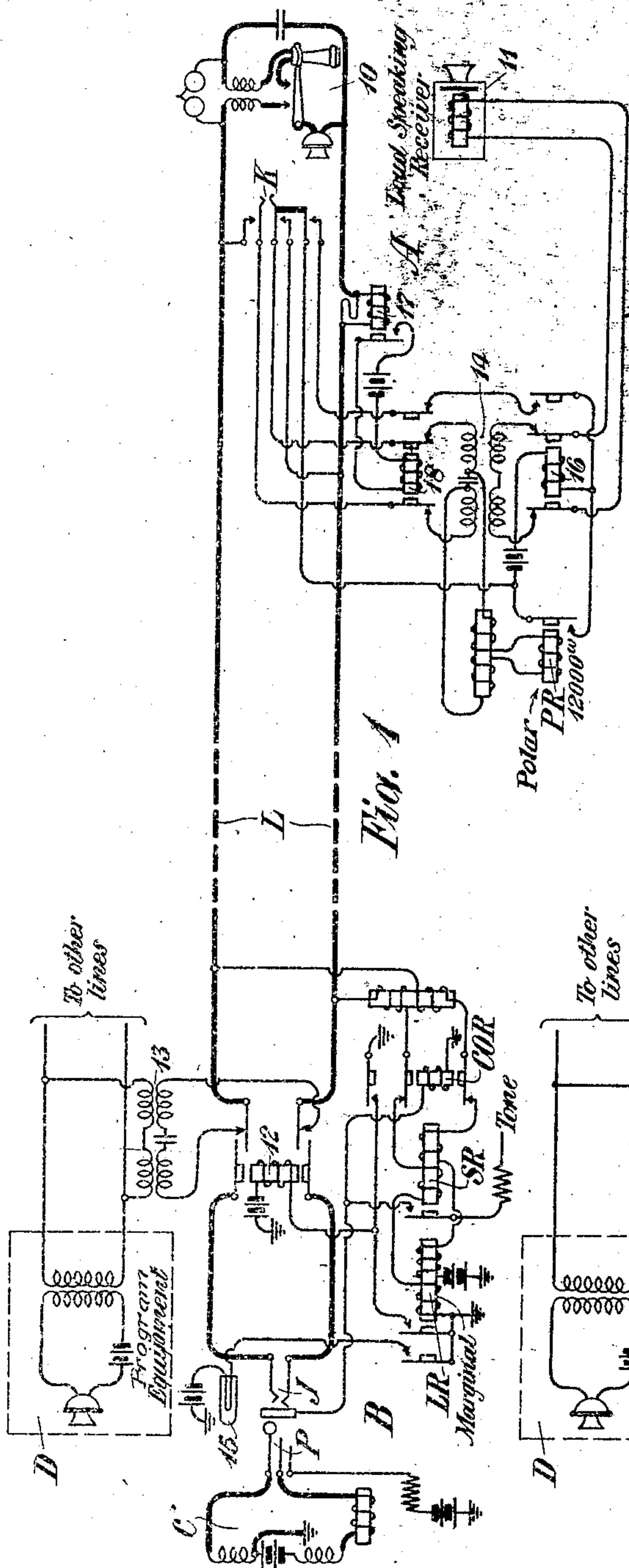
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J. F. TOOMEY ET AL.

PROGRAM TRANSMISSION OVER WIRES

Filed Nov. 11, 1922

2 Sheets-Sheet 1



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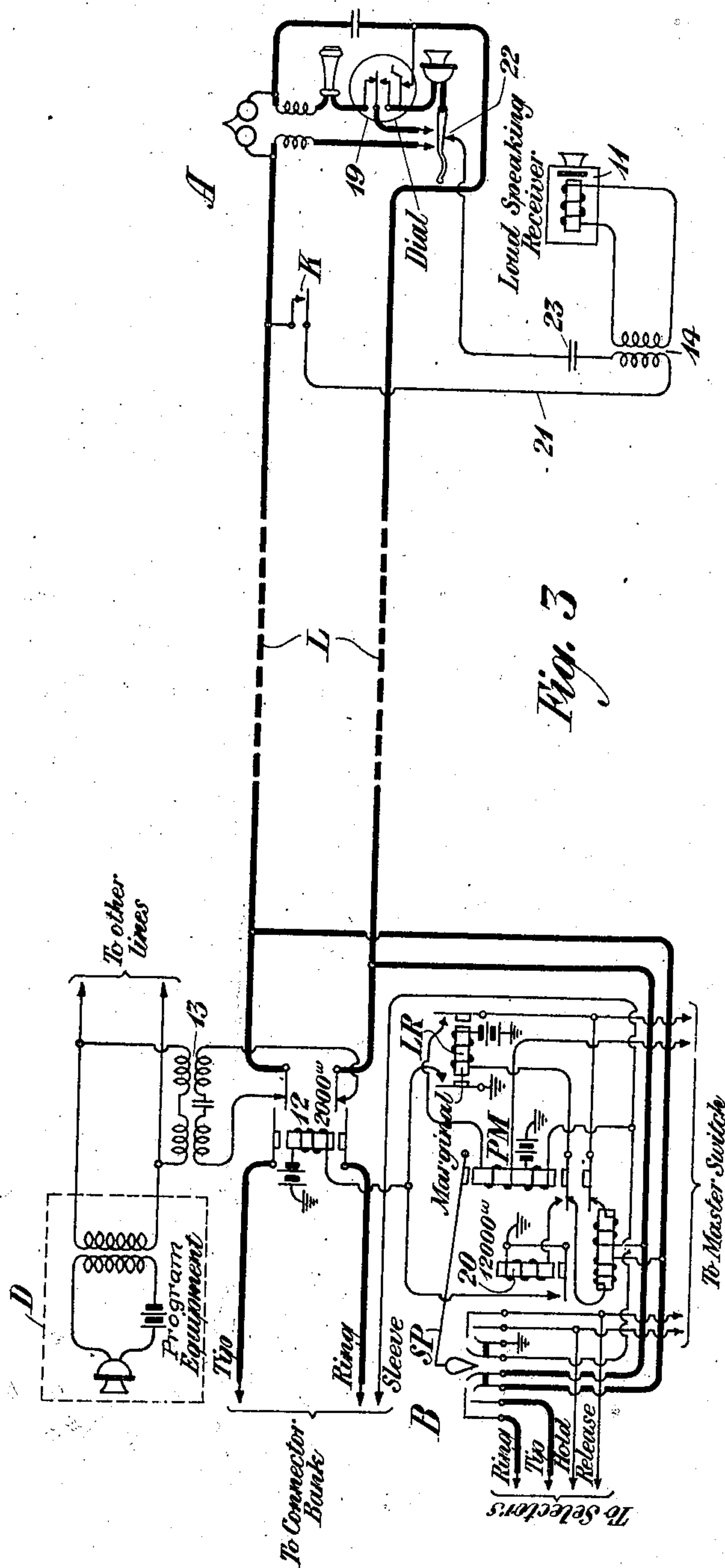


Fig. 3

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UNITED STATES PATENT OFFICE.

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PROGRAM TRANSMISSION OVER WIRES.

Application filed November 11, 1922. Serial No. 600,354.

This invention relates to systems of communication and more particularly to systems for disseminating news, information, music or the like.

5 Various schemes have been proposed heretofore for program transmission. The only one of these schemes which has been exploited to any extent is radio broadcasting, that is, the broadcasting of news, information or entertainment by means of radio
10 telephone equipment so that persons provided with suitable radio receiving sets tuned to the proper wave length may receive the transmitted entertainment or the like.

15 This method, however, has very serious objections. In the first place, numerous broadcasting stations in the same area operate on wave lengths sufficiently close together to interfere with each other. Furthermore, radio telephonic transmission necessarily involves the use of a much wider band of the frequency spectrum than is used for wireless telegraph purposes, and in view
20 of the fact that the number of wave lengths available for radio communication are necessarily limited it is undesirable that wave lengths necessary for commercial communication should be utilized for purposes of mere entertainment. Finally, in order to
25 avail himself of the desired information or entertainment, each individual subscriber must provide himself with a radio receiving equipment which involves storing upon his premises extensive storage batteries which
30 are constantly in need of re-charging, together with a considerable amount of delicate and elaborate electrical apparatus, such as coils, detectors, amplifiers, etc., all of which involve careful maintenance. Moreover, the radio receiving set as now known
35 is, at its best, an inherently ugly thing, absolutely out of place in the home and requiring for its operation a network of unsightly wiring.

40 Realizing the inherent limitations of radio broadcasting, proposals have been made to use existing wire systems, such as telephone, telegraph or power networks for program
45 distribution purposes by transmitting carrier frequencies over such existing power or communication lines. Such a method, however, would be extremely expensive as well as complicated, as it involves a very considerable reorganization of the telephone

plant or power plant, and requires the use of quite complicated and expensive apparatus.

The ordinary telephone plant, however, offers unusual facilities for program distribution by the use of ordinary telephonic methods and without the employment of
50 any high frequency or carrier methods of signaling. When it is realized that the average subscriber's telephone set is in use for telephonic purposes only during an extremely small part of the time it becomes at once apparent that if the telephone line, during
55 its idle periods, could be used for distributing news, information or entertainment, the plant could be used much more economically and the information or the like to be distributed could be transmitted to the subscriber in the simplest manner possible. It
60 may further be observed that the average subscriber to a broadcasting service, particularly a service for distributing entertainment, would only desire to avail himself of the service during the late afternoon or during the evening, at which times
65 the average subscriber's telephone is only used for social purposes and is rarely or never used for business calls.

Having these circumstances in mind, it is proposed by this invention to provide
70 simple, practical and economical arrangements by which news, information, music or other forms of entertainment may be transmitted at ordinary telephonic frequencies from a central program station over
75 subscribers' telephone lines. It is also proposed by this invention to provide a system whereby the telephone subscriber may receive the program service without interfering in any way with the use of his line for
80 ordinary telephone purposes. This invention also renders available a distribution system in which the apparatus not only at the central station but more particularly at the subscriber's station will be extremely
85 simple and economical and yet efficient.

The invention may now be more fully understood by reference to the following detailed description thereof, when read in connection with the accompanying drawing, in
90 which Figure 1 is a circuit arrangement illustrating a program distribution system as applied to an ordinary subscriber's line involving manual switching between subscribers, while Figs. 2 and 3 illustrate a program
95 100 105 110

distribution system applied to a subscriber's line involving machine switching at the central office.

Referring to Fig. 1, L designates an ordinary telephone subscriber's line terminating at one end at a subscriber's station A and at the other end in a central office B. At the station A, the usual form of telephone set 10 is provided for ordinary telephonic purposes and a supplemental key K is provided for associating with the line a program receiving equipment comprising a loud speaking receiver 11 and other apparatus to be described later.

At the central station B, the line terminates in the usual type of switching jack J, whereby telephonic communications may be established through the cord circuit C between the line L and other lines terminating at the exchange. Normally, the line is disconnected from the jack J and is connected to a common program equipment over the contacts of a relay 12 and through a transformer 13. The central program distribution equipment itself is illustrated at D and is of a very simple type, consisting, in its most fundamental form, of an ordinary telephone transmitter and energizing battery, such as is in common use in telephone substations today.

As the program equipment is normally connected with the line L, the subscriber may avail himself of the service at any time by merely operating the key K at the substation, the key K serving to connect the loud speaking receiver 11 to the line through a transformer 14. At the central office, in addition to the usual line relay LR, a special relay SR is bridged across the line, the latter relay operating when the key K is actuated to put a busy tone upon the sleeve conductor of the jack J to notify the central operator testing the terminal that the subscriber is using the line for receiving the special service. The line relay LR is marginal and does not operate through the high resistance connection established by the key K, and will only operate when the line is closed through the low impedance telephone set 10 by taking the receiver from the switch-hook.

If the subscriber should desire to use the line for ordinary telephone purposes, the line relay LR will operate as soon as the receiver is taken from the hook to disconnect the line L from the program equipment and connect it to the jack J over the contacts of the relay 12 and operate the line lamp 15, so that the central office operator may establish the connection in the usual manner by means of the cord circuit C. If, upon an incoming call, the operator desires to establish a connection with the line L, the busy tone on the jack J may be disregarded if the subscriber is receiving the program

service and a connection established by inserting the plug of the cord C in the jack J. This operates the cut-off relay COR, which in turn operates the relay 12 to disconnect the line L from the program station and connect it to the jack J.

At the subscriber's station, the transformer 14, which serves to associate the loud speaking receiver 11 with the line, is provided with a condenser shunted by the high resistance winding of a polar relay PR. Owing to the high resistance of the latter, when the key K is thrown, only sufficient current flows through the bridge, including the windings of the relays SR and LR at the central station to operate the relay SR; the line relay LR not being operated when the set is used for program purposes. The polar relay PR controls a relay 16, whereby the loud speaking receiver 11 may be disconnected from the line, even though the key K is actuated. The polar relay PR is so poled as to energize the relay 16 for this purpose only when battery is supplied to the line from the cord circuit, the battery connections through the windings of the relays LR and SR being reversed, with respect to the cord circuit. Consequently, the relay PR disconnects the loud speaking receiver only when the operator inserts the plug of the cord circuit C into the jack J to establish an ordinary telephone connection. A low resistance relay 17 is included in series with the subscriber's set 10, said relay operating to disconnect the polar relay PR and loud speaking receiver 11 from the line L through an auxiliary relay 18 whenever the subscriber takes down the receiver to use his set for ordinary telephonic purposes. This arrangement is provided so that the program receiving equipment will be disconnected under these circumstances even though the subscriber should fail to restore the key K.

The detailed operation is as follows: Assuming that the subscriber at station A desires to receive the program service, the key K is actuated, thereby closing a circuit through the winding of the high resistance polar relay PR, over the normal contacts of the relay 18, over the make contacts of the key K, over the line L, normal contacts of the cut-off relay COR and through the winding of the special relay SR and the line relay LR. The special relay SR is operated over this circuit but the current flow is not in a direction to operate the relay PR. The relay SR connects a tone to the sleeve of the jack J to apprise the central office operator when testing the terminal that the subscriber is receiving the disseminated information. The actuation of the key K serves to connect the loud speaking receiver 11 with the line over the normal contacts of the relay 16 through the transformer 14 and the normal

contacts of the relay 18. The subscriber is now enabled to hear by means of the loud speaker 11 the news, information, music or other entertainment distributed from the broadcasting station D.

If while the line is thus in use, a sufficiently urgent call should come into the central switching office for the line L, the operator may disregard the busy tone on the sleeve of the jack J and insert the plug of the cord C in the jack, which thus completes a circuit over the sleeve of the jack J through the cut-off relay COR. The cut-off relay is thereupon energized and at its upper front contact closes a circuit of the switching relay 12 to disconnect the line L from the program station, and connect it to the tip and ring of the jack J. At the same time, the remaining contacts of the cut-off relay COR disconnect the special relay SR and the line relay LR from the line L. The direct current supplied to the line L through the windings of these relays was not in such a direction as to actuate the high resistance polar relay PR but as soon as the cord circuit is connected to the line and the relays SR and LR disconnected, the direct current supplied through the cord circuit will be in such a direction as to actuate the polar relay PR to close the circuit of the relay 16, which at once disconnects the loud speaking receiver 11 from the transformer 14. The relay 16 is locked over its right-hand front contact, right-hand back contact of relay 18 and lower make contact of key K, so that said relay 16 will be held up independently of the polar relay.

The subscriber may now be rung in the usual manner by the operator and upon removing the receiver from the hook the talking circuit will be established to the central office. Direct current from the central office battery flows through the cord circuit over the subscriber's line and through the relay 17, this relay being energized as long as the receiver is removed from the hook. The relay 17 completes the circuit of the relay 18, which disconnects the special receiving apparatus from the line independently of the key K and at its right-hand contact opens the locking circuit of the relay 16, which is restored to normal. At the end of the conversation, the subscriber may hang up his receiver, thereby giving the usual disconnect signal and deenergizing the relay 17, which (if the key K has not been restored) again connects the polar relay PR to the line. Current flows through polar relay in such a direction as to cause it to energize and lock up the relay 16. As soon as the operator withdraws the plug of the cord circuit C from the jack J, the cut-off relay COR is deenergized, thereby causing the relay 12 to fall off and connect the line L to the central program station. The cut-off relay COR

also connects the windings of the relays SR and LR to the line, the former being energized to restore the busy tone to the sleeve of the jack J. The direction of the battery current over the line L is now reversed so that the armature of the polar relay PR falls off. The relay 16 remains locked up however, and it is necessary to restore the key K to unlock the relay 16. The key K may then be again actuated if the subscriber desires program service.

If, while the line is being used for receiving disseminated information, the subscriber should desire to use the line for establishing a telephone call the receiver may be removed from the hook, thereby energizing in addition to the already energized relay SR, the line relay LR and the relay 17. The relay 17 actuates relay 18 to disconnect the special receiving equipment independently of the key K and the line relay LR completes the circuit over its inner front contact for the relay 12. The relay 12 disconnects the line L from the program station and connects it to the jack J, while the line lamp 15 is energized over the outer front contact of the marginal line relay LR. The operator will answer the call by inserting the plug of the cord circuit C in the jack J, thereby causing the cut-off relay COR to establish a holding circuit for the relay 12 and to disconnect the relays LR and SR from the line as before. At the end of the conversation, the subscriber may hang up his receiver, and again obtain program reception in the manner already described.

When the subscriber no longer desires to receive the program service he will simply restore the key K, thereby disconnecting the loud speaker and associated apparatus from the line and opening the circuit of the special relay SR. The latter relay will at once be deenergized and disconnect the busy tone from the jack J.

Fig. 2 illustrates an arrangement for applying the program service to telephone lines terminating at a central office, equipped for machine switching. At machine switching offices no operators will be provided to exercise discretion with regard to the urgency of incoming calls, and in practice the circuits might be arranged either to exclude all incoming calls while the special equipment is in use or to permit all incoming calls to interrupt the broadcasting service. The circuit illustrated in Fig. 2 is arranged so that incoming calls will disconnect the program service. The subscriber himself can interrupt the service to make outgoing calls at any time by simply removing his receiver from the switchhook as in the case of the circuit shown in Fig. 1.

In this form of the invention the equipment at the subscriber's station A, both for broadcasting and for ordinary telephonic

purposes, is identical with that shown in Fig. 1, except that the subscriber's telephone set is provided with the usual form of dial 19 for operating the switching machinery at the central office. The program equipment at the station D and its association with the line L at the central office is also identical with that illustrated in Fig. 1. The line L terminates at the central office for the purpose of establishing incoming connections in the usual form of connector bank (not shown) while for the purpose of establishing outgoing connections the line terminates in the well known Keith line switch and its associated master switch. As these elements are well known in the art only a portion of the circuits thereof are illustrated and the detailed construction thereof need not be described. A marginal line relay LR is provided as in the manual system, this relay being only operated when the receiver is removed from the switchhook. The line relay controls a double wound plunger magnet SP of well known construction, which performs the double function of acting as a cut-off relay and of operating the plunger P to connect the line to the dial operated switching machine (not shown). A relay 20 is controlled by the plunger magnet SP over one of its cut-off contacts to energize the relay 12, which functions to disconnect the broadcasting equipment from the line. The windings of the plunger magnet, as is well known, are so arranged that the upper winding, when energized, will cause the plunger SP to operate. The lower winding, however, will not operate the plunger SP but will hold the plunger SP in operated position if it has been already operated.

Further details of the invention will be understood from the description of the operation which is as follows: Assuming that the subscriber desires to receive disseminated information or the like, the key K is actuated to connect the high impedance polar relay PR and the loud speaking receiver 11 to the line as before. This establishes a direct current circuit from battery, through the line relay LR, over the upper contact of the plunger magnet PM, through a winding of the retard coil to the tip side of the line L, upper make contact of key K, left-hand contact of relay 18, winding of polar relay PR, inner right-hand contact of relay 18, make contact of key K, ring side of the line L, through the right-hand winding of the retard coil at the central station and over the lower contact of the plunger magnet to ground through the circuits of the master switch (not shown). The current flowing through this circuit is not sufficient to operate the line relay LR and is not in such a direction as to operate the polar relay PR. Consequently, the

disseminated information from the station D is transmitted over the normal contacts of relay 12 and over the line L to the loud speaking receiver 11.

It will be noted that while the line is in this condition no busy potential is applied to the sleeve conductor leading to the connector bank at the central office. Therefore, if, while the line is being thus used, some other subscriber desires to converse with the subscriber on the line L, switching machinery (not shown) will be operated at the central station in a well known manner to make connection with the tip, ring and sleeve conductors at the central station, thereby connecting ground to the sleeve circuit to energize the lower winding of the plunger magnet PM. The plunger SP is not operated over this circuit but the plunger magnet operates as a cut-off relay to disconnect the line relay LR from the line L and completes a circuit for the relay 20 from ground, through the winding of said relay, over the upper front contact of the plunger magnet PM and through the winding of the line relay LR to battery. The relay 20 is of high resistance so that the line relay LR is not operated in series therewith, but the relay 20 is energized and completes a circuit for the relay 12, whereby the line L is disconnected from the special equipment at station D and connected with the tip and ring conductors leading to the connector bank. Ringing current will now be transmitted from the connector switch in a well known manner to call the subscriber at A.

The battery supplied to the line through the connector switch will be in the same direction as that supplied through the cord circuit in Fig. 1, i. e., it will be of opposite polarity to that supplied through the line relay LR, and if battery current is connected to the line through the connector switch before the first ringing signal is transmitted the polar relay PR will be operated to lock up the relay 16 and disconnect the loud speaking receiver 11 from the transformer 14. The subscriber, upon hearing his bell ring, will remove his receiver from the switchhook, thereby completing a circuit through the relay 17, which energizes relay 18. Relay 18 opens the locking circuit of the relay 16 and at its inner contacts disconnects the loud speaker and associated equipment from the line independently of the key K.

At the conclusion of the conversation, the connector switch will be released in a well-known manner, thereby opening the circuit over the sleeve conductor for the lower winding of the plunger magnet, which at once releases, opening the circuit of the relay 20 and connecting the line relay LR again to the line L. Assuming that the subscriber at station A has in the meantime

the contacts of the relay 12 at the central office, the subscriber at once receives through the loud speaker 11 the information or the like which is being transmitted. The condenser 23 in the circuit 21, however, prevents the actuation of the line relay LR so that the Keith line switch will not be operated.

If, while the line is being thus used another subscriber desires an ordinary telephone connection with the subscriber at A, the switching machinery at the central office will establish connection with the tip, ring and sleeve conductors leading to the connector bank (not shown), thereby connecting ground to the sleeve conductor to operate the lower winding of the plunger magnet PM. The energization of this winding does not operate the plunger SP but disconnects the line relay LR from the line L and connects the line relay in series with the high resistance relay 20. The line relay, being marginal, is not energized in series with the relay 20 but the relay 20 is energized and completes a circuit for the switching relay 12, which disconnects the line L from the program station D and connects the line to the tip and ring conductors leading to the connector bank. A ringing signal is now transmitted from the connector to the subscriber at A. The latter, upon hearing his bell ring, may remove the receiver from the switchhook without disturbing the key K to complete a connection through his telephone set, at the same time opening the bridge 21 at contact 22 of the switchhook so that the loud speaker 11 is no longer effective. At the termination of the conversation the subscriber at A, by the mere act of hanging up his receiver, again completes the bridge circuit 21 so that the loud speaking receiver 11 is again connected to the line. The release of the switching machinery at the central office removes the ground from the sleeve conductor leading to the connector bank, thereby denenergizing the lower winding of the plunger magnet PM and releasing the relay 12 so that the line L is again connected to the station D, and the subscriber at A receives program transmission.

If, while receiving from the program station, the subscriber at A should desire for any reason to make a telephone call, he may remove the receiver from the switchhook as before without disturbing the key K. The operation of the switchhook opens the bridge 21 at contact 22 as before and a low resistance path is established through the subscriber's telephone set to operate the line relay LR, as described in connection with Fig. 2. The line relay at its left-hand contact closes a circuit for the relay 12 which disconnects the line L from the broadcasting station D. At its right-hand

contact the line relay LR completes a circuit for the upper operating winding of the plunger magnet PM, thereby causing the plunger P to be actuated to extend the line L to the circuits of the selectors (not shown). The operation of the plunger magnet PM also disconnects the line relay LR from the line L and connects it in series with the high resistance relay 20. This causes the deenergization of the line relay, but relay 20 completes a locking circuit for the relay 12. The actuation of the plunger in the meantime has closed a holding circuit through the lower winding of the plunger magnet so that the plunger is held in actuated position. The subscriber may now manipulate his dial 19 to set up the desired call by means of the selector switches (not shown). At the termination of the conversation, the subscriber hangs up his receiver, thereby again connecting the bridge circuit 21 to the line and opening the low resistance direct current path extending to a line relay in the connector switch (not shown). This causes the release of the switching machine, thereby disconnecting ground from the release conductor and opening the circuit through the holding winding of the plunger magnet PM. This releases the plunger and restores the circuits to their normal condition so that the relay 12 is released and again connects the program station to the line L so that the subscriber can again receive disseminated information or the like. If the subscriber no longer desires to receive program transmission he will open the key K, thereby disconnecting the loud speaking receiver 11 from the line L.

It will be obvious that the general principles herein disclosed may be embodied in many other organizations widely different from those illustrated without departing from the spirit of the invention as defined in the appended claims.

What is claimed is:

1. In a telephone system, a telephone line terminating at one end in a subscriber's station and at the other end in a central office, a telephone set at the subscriber's station, means at said central office for interconnecting said line with other telephone lines for ordinary telephonic intercommunication, a special receiving apparatus at the subscriber's station adapted to be associated with said line for receiving program transmission, a program transmitting station, means whereby said program station and said special receiving apparatus may be associated with said line when it is not being used for ordinary telephonic communication, and means to prevent said special receiving apparatus from being connected to the line when it is used for ordinary telephone communication.

hung up, the line relay LR will not be energized. Relay 20, upon being deenergized, opens a circuit of the relay 12, which disconnects the line L from the connector bank and connects it to the program station. The hanging up of the subscriber's receiver deenergizes the relay 17, which in turn opens the circuit of the relay 18 so that the loud speaking receiver and associated apparatus may be again connected to the line in the manner described in connection with Fig. 1. The information transmitted from the program station will now again be received as before.

If, while the special receiving apparatus is associated with the line by means of the key K so that the loud speaker 11 is being operated, the subscriber at station A should desire to use the line for ordinary telephone purposes, the subscriber may remove the receiver from the switchhook, thereby establishing a low resistance connection over a circuit previously traced through the line relay LR and the relay 17. Relay 17 is energized to complete the circuit from relay 18, thereby disconnecting the loud speaking receiver and associated equipment from the line independently of the key K. The marginal line relay LR is operated over the low resistance circuit through the substation set and at its left hand contact completes a circuit for the relay 12, which disconnects the line from the central program station. Over its right hand contact the line relay LR completes a circuit through the upper winding of the plunger magnet PM, (the portion of this circuit extending through the master switch is not shown). The plunger SP is actuated by means of the upper winding of the plunger magnet to complete a circuit from the line L over the switches controlled by the plunger magnet to the selector (not shown). The plunger magnet, upon being energized, disconnects the line relay LR from the line and connects the winding of said line relay in series with the relay 20. The line relay LR now becomes deenergized but the relay line 20 is energized to complete a holding circuit for the relay 12. The actuation of the plunger switches completes a circuit from battery through the lower winding of the plunger magnet and over the inner right-hand contact of the plunger switch (the complete circuit not being shown). The lower winding of the plunger magnet remains energized during the entire connection to hold the plunger in actuated position. The upper operating winding of the plunger magnet is deenergized as soon as the armature of the line relay falls off.

The line circuit L, having been extended over the contacts of the Keith line switch under the control of the plunger SP to the tip and ring conductors extending to the selectors (not shown), the subscriber may

manipulate the dial 19 in a well known manner, thereby transmitting impulses over the line to the switching machinery and establishing the desired connection. At the conclusion of the conversation, the subscriber at station A hangs up his receiver. This causes the release of the switching machinery in a well known manner and as soon as the switching machinery is released the ground applied through such machinery to the conductor marked "Release" at the station B is removed therefrom, thereby opening the holding circuit extending over the inner right-hand contact of the plunger switch to the holding winding of the plunger magnet PM. The plunger magnet is now deenergized, releasing the plunger SP, which disconnects the line from the switching apparatus. The plunger magnet, upon deenergizing, also connects the line relay LR to the line over the circuit previously described. Relay 17 is deenergized when the receiver is hung and the circuit may be placed in condition for receiving the disseminated information as before.

If the subscriber desires to terminate the reception of disseminated information he merely restores the key K to normal, thereby opening the circuit through the line relay LR and polar relay PR (without producing any circuit changes). The loud speaking receiver and associated equipment is now disconnected from the line at the contacts of the key K and all of the apparatus is in normal condition.

Fig. 3 illustrates a circuit somewhat similar to that of Fig. 2, but involving a simpler form of special receiving organization at the subscriber's station. The circuit arrangement at the central office is identical with that illustrated in Fig. 2. At the subscriber's station the subscriber's set is also substantially the same as illustrated in Fig. 2. The program receiving arrangement, however, is a much simpler arrangement comprising essentially the loud speaker 11 connected through a transformer 14 with a circuit 21, which may be bridged across the line L through the key K and an extra contact 22 on the switchhook of the subscriber's set. The key K in this case is also a single contact key, thus further simplifying the apparatus.

Further details of the invention may be understood from the description of the operation which is as follows: If the subscriber at A desires to receive information or entertainment transmitted from the station D, he simply operates the key K, thereby closing the bridge 21 through the contact of the key K, transformer 14, condenser 23, contact 22 of the switchhook, the transmitter of the subscriber's telephone set, and a contact of the dial 19. As the program station D is normally connected to the line L over

2. In a telephone system, a telephone line terminating at one end in a subscriber's station and at the other end in a central office, a telephone set at the subscriber's station, means at said central office for interconnecting said line with other telephone lines for ordinary telephonic intercommunication, a special receiving apparatus at the subscriber's station adapted to be associated with said line for receiving program transmission, a program transmitting station transmitting frequencies lying within the ordinary telephone range, means whereby said program station and said special receiving apparatus may be associated with said line when it is not being used for ordinary telephonic communication, and means to prevent said special receiving apparatus from being connected to the line when it is used for ordinary telephone communication.

3. In a telephone system, a subscriber's line terminating at one end at a subscriber's station and at the other in a central office, a telephone set at said subscriber's station, switching means at the central office whereby said telephone line may be interconnected with other telephone lines for ordinary telephonic intercommunication, a program transmitting station normally connected with said telephone line, and means responsive to an incoming call from said station for disconnecting said line from said program station and connecting it to said switching means.

4. In a telephone system, a subscriber's line terminating at one end at a subscriber's station and at the other in a central office, a telephone set at said subscriber's station, switching means at the central office whereby said telephone line may be interconnected with other telephone lines for ordinary telephonic intercommunication, a program transmitting station normally connected with said telephone line, and means responsive to the connection of another line through said switching means to disconnect said line from said program station and connect it to said switching means so that it may be used for ordinary telephone purposes.

5. In a telephone system, a telephone line terminating at a subscriber's station at one end and in a central office at the other end, a telephone set at said subscriber's station, switching means at said central office for interconnecting said line with other lines for ordinary telephonic intercommunication, a program transmitting station normally connected to said line, special receiving equipment at the subscriber's station for receiving program transmission, means to associate said equipment with the line at the will of the subscriber, and means operating when said telephone set is used for ordinary tele-

phone purposes to disconnect said special receiving equipment from the line.

6. In a telephone system, a telephone line terminating at a subscriber's station at one end and at a central office at the other end, a telephone set at said subscriber's station, switching means at said central office for interconnecting said line with other lines for ordinary telephonic intercommunication, a program transmitting station normally connected to said line, special receiving equipment at the subscriber's station for receiving program transmission, means to associate said equipment with the line at the will of the subscriber, and means operating when said telephone set is used for ordinary telephone purposes to disconnect said special receiving equipment from the line and to disconnect the line from said program station and connect it to said switching means.

7. In a telephone system, a telephone line terminating at a subscriber's station at one end and in a central office at the other end, a telephone set at said subscriber's station, switching means at said central office for interconnecting said line with other lines for ordinary telephonic intercommunication, a program transmitting station normally connected to said line, special receiving equipment at the subscriber's station for receiving program transmission, means to associate said equipment with the line at the will of the subscriber, and means responsive to the connection of another line to said switching means to disconnect said special receiving equipment from said line.

8. In a telephone system, a telephone line terminating at one end at a subscriber's station and at the other in a central office, a telephone set at said subscriber's station, switching means at said central office for interconnecting said line with other lines for ordinary telephonic intercommunication, a program transmitting station normally connected to said line, special receiving equipment at the subscriber's station for receiving program transmission, means to associate said equipment with the line at the will of the subscriber, means responsive to the connection of another line to said switching means to disconnect said special receiving equipment from said line, and to disconnect said line from said program station and connect it to said switching means.

9. In a telephone system, a telephone line terminating at a subscriber's station at one end and at a central office at the other end, a telephone set at said subscriber's station, switching means at the central office interconnecting said line with other lines for ordinary telephonic intercommunication, a special receiving arrangement at said subscriber's station for receiving program transmission, a program transmitting station,

means to connect said special receiving arrangement and said program station with the line when it is not being used for ordinary telephone purposes, and means associated with said switching means for indicating when the line is being used for program reception.

10. In a telephone system, a telephone line terminating at one end at a subscriber's station and at the other end in a central office, a subscriber's set at said subscriber's station, switching means at said central office for interconnecting said line with other lines for ordinary telephonic intercommunication, a program transmitting station adapted to be connected with said line when it is not being used for ordinary telephonic purposes but to be disconnected therefrom when it is being so used, a special receiving arrangement at the subscriber's station for receiving program transmission, a key for associating said special receiving arrangement with the telephone line, and automatic means operating

in response to a call incoming to said subscriber's station or outgoing therefrom for disconnecting said special receiving arrangement.

11. In a telephone system, a plurality of telephone lines terminating at one end in a central office, switching means at said central office associated with each of said lines but normally disconnected therefrom whereby any one of said lines may be connected with another line for ordinary telephonic intercommunication, a program transmitting station normally connected to each of said lines, and means for disconnecting any one of said lines from the program station and connecting it to said switching means when it is connected with another line for ordinary telephonic intercommunication.

In testimony whereof, we have signed our names to this specification this 10th day of November, 1922.

JOHN F. TOOMEY.
HENRY E. PHELPS.