

Nov. 23, 1937.

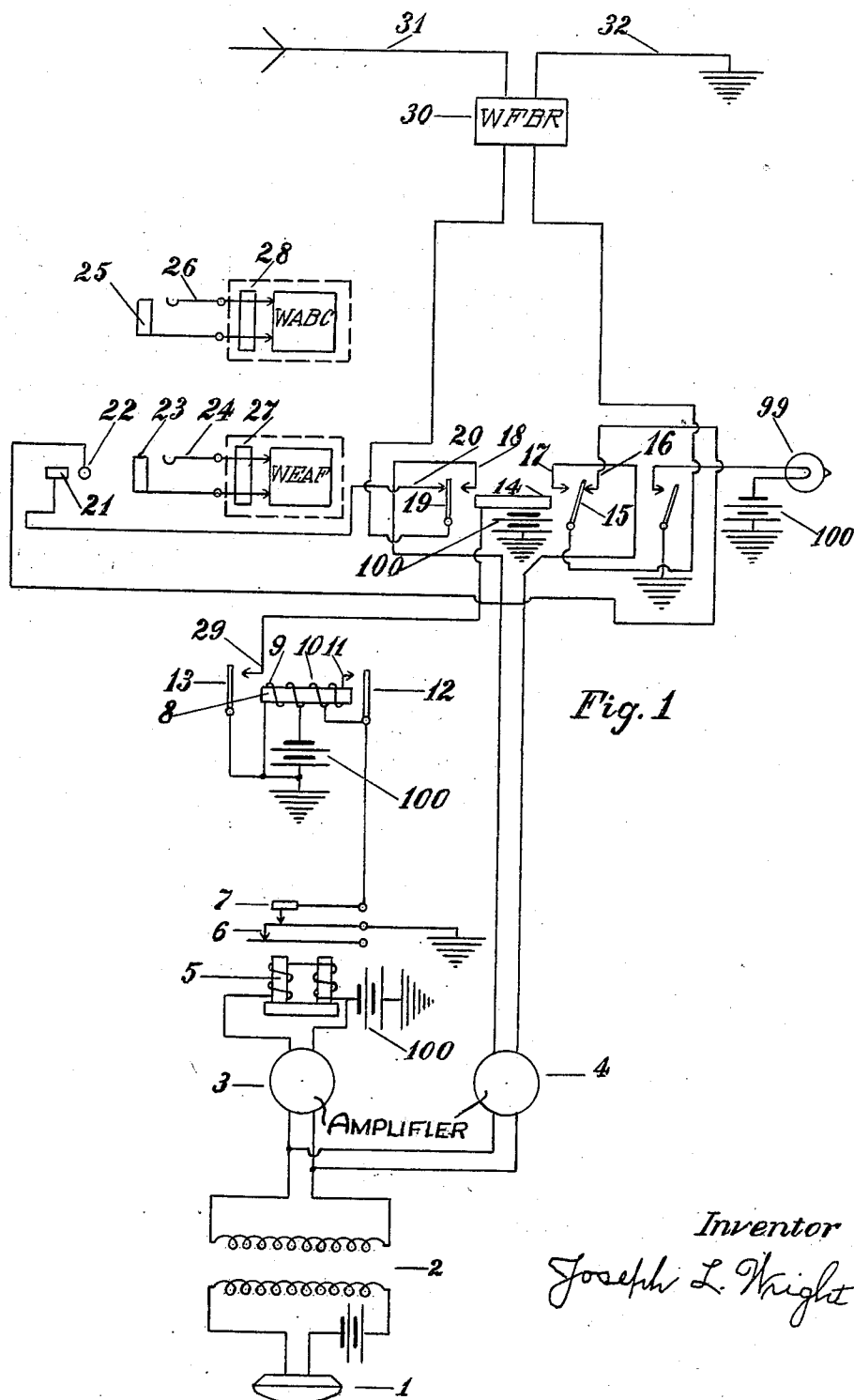
J. L. WRIGHT

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RADIO BROADCASTING SYSTEM

Original Filed Dec. 18, 1933

2 Sheets-Sheet 1



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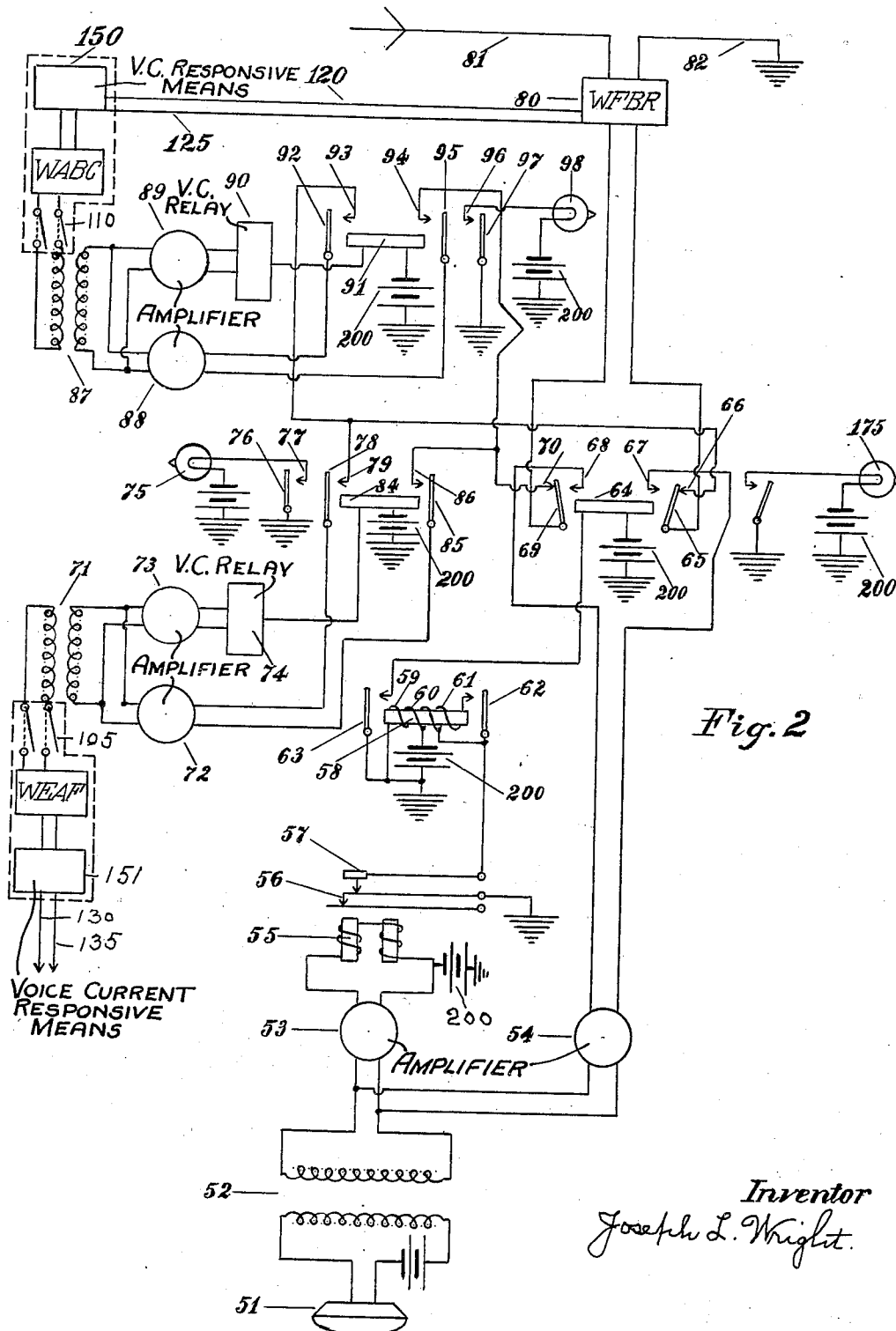


Fig. 2

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UNITED STATES PATENT OFFICE

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RADIO BROADCASTING SYSTEM

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assignments, to Radio Corporation of America,
New York, N. Y., a corporation of Delaware

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6 Claims. (Cl. 250—6)

My invention relates to improvements in radio broadcasting systems, and especially to such systems wherein one station receives for broadcasting, the programs transmitted by one or a number of other broadcasting stations.

The main object of my invention is to provide program automatic control whereby a program while being broadcast from one station is automatically transmitted to another station from where it is broadcast. The transmission of the broadcasted program automatically operates voice-current responsive devices at another station whereby the transmitted broadcast program operates the voice-current responsive device which operates so as to effect connection between the transmitted broadcast program to the transmitter of the station which is to broadcast the transmitted program.

Means are provided whereby the local announcer may automatically disrupt the transmitted program from the distant station and connect in its place the local program to the local transmitter station from where it is broadcast.

Provision is made whereby a plurality of distant stations may transmit their programs to a local station whereby the respective programs are broadcast by the local station.

With this arrangement, the various programs originating at distant stations may be controlled automatically and broadcast at the local station without the necessity of employing an operator in the control-room.

Various features of my invention will be pointed out in the detailed description to follow.

My invention is illustrated in the accompanying drawings, wherein—

Figure 1 shows schematically one form of the broadcasting system; and

Figure 2 is a modification of Figure 1.

Referring to Figures 1 and 2, relays 5 and 55 are designed to respond to voice currents and may be of the type disclosed in United States Letters Patent No. 1,221,299 issued April 3, 1917, to C. J. Erickson.

Relays 8 and 58 are balanced differential relays—that is, the two windings have equal and opposite effects and thereby neutralize each other when energized at the same time. Therefore, when the windings of each of these relays are energized simultaneously, the relays remain unoperated. The third winding, 10 and 61 respectively, of relays 8 and 58, is employed to render these relays slow to release, in the well known manner, although if desired these relays

may be provided with copper sleeves surrounding the cores, or be provided with copper slugs.

Referring to Fig. 1, the microphone 1 of the local announcer is preferably located in a room separate from the remainder of the control room apparatus shown, and the transmitter station 80 of WFBR, may be located in an adjoining room, or at a distant point from the control-room. I have shown two jacks connected to conductors extending to distant stations, WABC and WEAFF. Inserted in these conductors are resistance coils 27 and 28, or regulators, which are utilized to give the proper volume or regulation from the two stations in question. The plug, provided with the tip and sleeve 22 and 21 when inserted in the jacks connects either one of the stations WEAFF or WABC with the transmitter station WFBR through contacts of relay 14.

The operation of the system shown in Fig. 1 is as follows:—When the operator in the control-room wishes to connect either station, WABC or WEAFF, so that the programs therefrom may be broadcast by station WFBR, he places the plug into the proper jack and the program being broadcast from either one of these two stations will be transmitted over the two conductors extending to station WFBR through the contacts of the jack and the plug to contacts 19—20 and 15—16 of relay 14, as relay 14 is in its normal position at this time. The connection from the selected distant station will be connected to the two conductors shown extending to the transmitter station 80, whereby the transmitted program is broadcast from WFBR from the antenna system 31—32.

Any standard type of transmitter station may be used, such as shown on pages 502 and 507 of the Radio Hand-Book published in 1931 by Moyer and Wostrel.

If, at the end of the distant broadcast, the local announcer wishes to broadcast, or in case a local program is to be broadcast, the microphone 1 is utilized. The sounds taken up by microphone 1 cause voice currents to pass from the primary to the secondary of the transformer 2, in the usual manner, where they divide, a portion of the current entering the input of the amplifier illustrated by the circle at 3, and to the input of the amplifier illustrated by the circle 4. The details are not shown as such an arrangement is illustrated and described in United States Patent No. 1,889,005, issued November 29, 1932, to H. H. Smith.

A portion of the voice currents passing through the amplifier 3 enters the windings of

the voice-current relay 5, which thereupon responds and causes its contacts 6 and 7 to vibrate, thereby momentarily removing ground during such vibrations from the winding 10 of relay 8.

- 5 The removal of ground from this winding allows current to flow through the winding 9 alone, thereby unbalancing the relay 8 and causing it to energize. The energizing of relay 8 causes contacts 11 and 12 to close, thereby completing
10 the circuit for a third winding to establish a path for eddy currents to render relay 8 slow to release.

- Because of the slow-to-release feature of relay 8, this relay will remain operated for a short interval after the contacts of relay 5 cease vibrating, following the cessation of voice currents originating in the circuit of microphone 1. The interval during which relay 8 remains energized is greater in length than the ordinary
20 pause between words in conversation in order that relay 8 will remain operated during such pauses. The relay 8 may be constructed or adjusted to remain energized for any time interval desired.

- 25 The energizing of relay 8 closes contacts 13—29 and causes the energization of relay 14. Relay 14 operating closes contacts 18—19 and 15—17 causing the voice currents from 4 to pass to the antenna system 31—32 of WFBR
30 thus causing the program or announcement from transmitter 1 to be broadcast and at the same time disrupting the circuit extending to the plug which may be inserted in any one of the jacks.

- 35 The lamp 99 is lighted when relay 14 is energized, thus notifying the local announcer that he has control of the transmission to station WFBR.

- In practice, it may not be necessary to provide the amplifier represented at 4; resistances or
40 regulators corresponding to 27 and 28 may be inserted in place of or in addition to amplifier 4.

- When the local broadcasting is finished, a long pause will occur, and the vibrating contacts of relay 5 will remain quiet for a period longer
45 than the time required for relay 8 to restore. This relay accordingly falls back and breaks the circuit of relay 14.

- Referring now to the modification shown in Fig. 2, I have provided means whereby the distant stations may automatically take control of
50 the local transmitter station WFBR instead of utilizing the services of a control operator to place the switching plug into the jacks extending to the distant stations, or by using some
55 other manually-operated switching means.

- The conductors terminating in the local exchange from stations WABC and WEAFF terminate in transformers 87 and 71 respectively connected to amplifiers 88—89 and 72—73 respectively which are in turn connected to voice-current relays corresponding to relay 55 and the differential relays corresponding to relay 58. These two relays are represented by the blocks
60 74 and 90. We will assume that a program being broadcast from station WABC is to be transmitted to the local station WFBR from where it is to be broadcast. The operator in the control-room at station WABC by any suitable switching means connects the two conductors
65 terminating in WABC station to the proper points in the transmitter station of WABC, whereupon the voice current relay at 90, corresponding to relay 55, vibrates and unbalances the differential relay corresponding to 58, causing
70 it to become energized. The armature of that

relay, corresponding to the armature 63 of relay 58, engages its associated contact and completes the circuit of relay 91. Relay 91 operating, causes its armature 92 to engage its associated contact 93 and armature 95 to engage its associated contact 94, thereby connecting the conductors extending from the output of amplifier 88 to the transmitter station WFBR through normally closed contacts 66—65, and 70—69, of relay 64. This program being broadcast from
10 WABC will then also be broadcast from station WFBR.

The operation of relay 91 completes the circuit of lamp 98, notifying the local announcer at WFBR that the program is being transmitted
15 from station WABC.

After the program is completed—which will naturally be at a certain fixed time—and in case the next program should be from station WEAFF, then the same method of operation will take place. In this instance relay 84 will be operated instead of 91, closing its contacts 78—79, and 85—86, thereby connecting the transmitted program from WEAFF to WFBR from the output of amplifier 72 through the normally closed contacts of relay 64.
25

In case the local announcer wishes to broadcast, or in case of a local broadcast, the microphone 51 is utilized, thereby operating the voice-current relay 55, which in turn unbalances the differential relay 58, which becoming energized completes the circuit of relay 64; relay 64 operating, opens its normally closed contacts and causes the local transmitted program to pass to transmitter station WFBR through contacts
30 67—65 and 68—69. In this instance, the operation of relay 64 causes the lamp 175 to light, thereby notifying the local announcer that he has possession of his broadcasting station.

Instead of having the programs transmitted to one or more distant stations for broadcasting, the programs may be transmitted to a plurality of distant stations where they are broadcast. This chain or broadcasting by a plurality of stations is described in prior patents and disclosed
40 in the following publications:—

Telephone Circuits Used as an Adjunct to Radio Broadcasting—Published in Electrical Communication, vol. 3, No. 3, June 1925.

Telephone Circuits for Program Transmission—Transactions of the A. I. E. E.—vol. 48—pages 1045 to 1049—July, 1929.

Wire Line Systems for National Broadcasting—Proceedings of I. R. E.—vol. 17—pages 1998 to 2005—November, 1929.

Long Distance Cable Circuit for Program Transmission—Presented at summer convention of A. I. E. E., Toronto, Canada—June, 1930.

In a chain system, each station which is to rebroadcast programs is provided with voice current relay control as illustrated and described in connection with Fig. 2.

With the arrangement disclosed in Fig. 2, it is possible to dispense with attendants for switching in the control-room of local or sub-stations, as it is only necessary to provide the proper amplifiers, regulators, etc., in the leads from each main station to give the proper volume and regulation for broadcasting.

In Fig. 2, I have shown the switch 105 associated with station WEAFF, and switch 110 associated with station WABC. These switches are preferably located in the control-room of their respective stations and operated by the control-operator at the proper times to connect the trans-
70 75

mitted programs to station WFBR for broadcasting.

While I have shown the automatic apparatus at station WFBR, it naturally follows that duplicate apparatus can readily be located in stations WABC and WEAJ so that these stations may broadcast the programs of one another or of WFBR. The arrangement of the apparatus at each station would be the same as at WFBR with conductors extending between each station and connected as shown at WFBR. It has not been thought necessary to illustrate such an arrangement as it would be a mere duplication of that already shown and described.

For instance, station WFBR could be designated as WABC or WEAJ, and one of the stations WABC or WEAJ as station WFBR.

If programs from WFBR were to be broadcast by station WABC, then the transmitter circuit would be tapped and connected to conductors 125—120 extending to voice-current responsive means represented by block 150, which when operated as described would cause the program from WFBR to be broadcast from WABC.

The foregoing arrangement would permit of automatic interchange of programs between a plurality of stations which would be especially advantageous in case of a cancellation of a program which is scheduled to be broadcast by one of the stations.

The conductors 120—125 extending from the transmitter station or equipment to the control devices at 150 preferably extend from the control-room of WFBR to the control-room of WABC. As described on page 509 of the "Radio Hand Book" by Moyer and Wostrel, the radio input system may be disconnected from the transmitter and utilizing it as a studio announcing system. Page 509 and page 503 of this publication also describes the connection or use of telephone lines for outside program circuits.

When I speak of voice-current responsive devices, I mean devices which will respond to currents over conductors which are tapped to proper points in the transmission circuit whether located in the control-room or at the transmitter station proper as is customary in standard practice.

In case of using a studio announcing system wherein the transmitter is disconnected, the tap or taps would be made to the proper point in the announcing system and extend to the control-rooms of the other station or stations.

Various modifications and changes may be

made without departing from the spirit and intent of my invention.

Having thus described my invention, what I desire to secure by Letters Patent is:

1. In a broadcasting system, a first station and a second distantly located station each having transmitting means adapted to broadcast its respective program, switching means at the first station controlled by said second station whereby the program of said second station may be broadcast over the transmitting means at said first station, said switching means comprising a voice current responsive device, and relay means controlled thereby for connecting said transmitting means at said first station to broadcast the program of said second station.

2. The system defined in claim 1, together with voice current responsive means at said first station, and relay means controlled thereby for automatically connecting said transmitting means at said first station to broadcast the respective program initiated thereat.

3. The system defined in claim 1, together with switching means at said first station whereby said second station may be automatically disconnected and said transmitting means at said first station connected for broadcasting from said first station.

4. The system defined in claim 1, together with voice current responsive switching means at said first station whereby said second station may be automatically disconnected and said transmitting means at said first station connected for broadcasting from said first station.

5. The system defined in claim 1, together with means at said first station for indicating when said second station is connected for broadcasting therefrom, and means at said first station whereby said second station may be automatically disconnected and transmission therefrom to said first station inhibited and whereby said transmitting means at said first station may be connected for directly broadcasting therefrom.

6. A plurality of separate broadcasting stations, lines connecting said stations, and switching means at one station connected to the line terminating thereat from another station for transmitting the broadcast of said other station from said one station, said switching means comprising a voice current responsive device, and relay means governed thereby for connecting said other station for broadcast over said one station.

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