

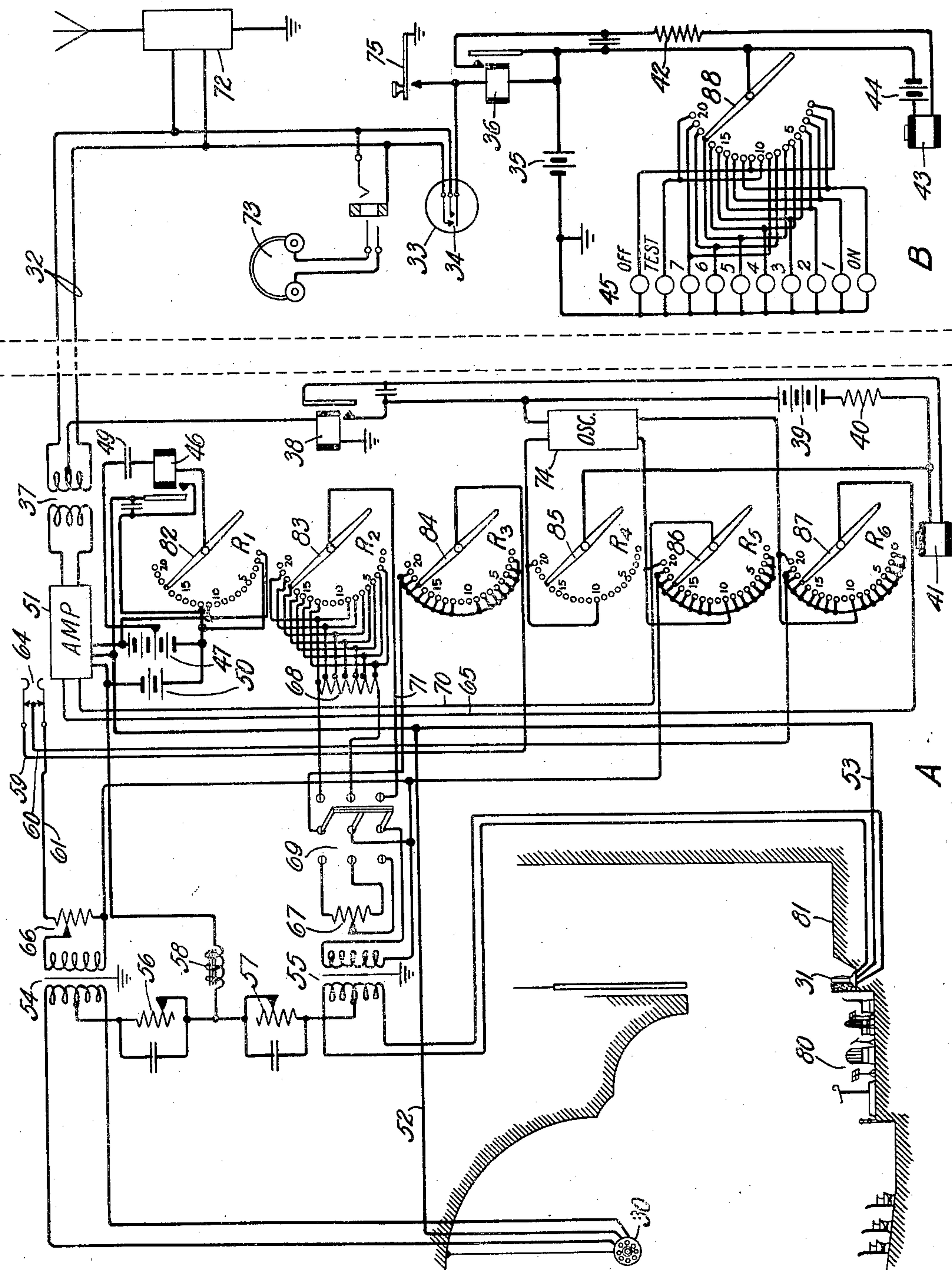
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W. F. VIETH

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REMOTE CONTROL SYSTEM

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INVENTOR
WILLIAM F. VIETH
By *W. Griggs* ATTORNEY

UNITED STATES PATENT OFFICE

WILLIAM F. VIETH, OF JACKSON HEIGHTS, NEW YORK, ASSIGNOR TO BELL TELEPHONE LABORATORIES, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

REMOTE-CONTROL SYSTEM

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This invention relates to remote control systems, and particularly to a broadcasting system in which apparatus located in one portion of the system is controlled by means located in another portion of the system.

In systems such as are commonly employed in connection with radio broadcasting, a program to be broadcast is often picked up at a location remote from the radio transmitting station to which the program is transmitted over a telephone line. Moreover, it is not unusual when programs are picked up in theaters, auditoriums, etc., to employ a plurality of microphones located remotely from each other for picking up sound mainly from different sources, respectively. The relative attenuation of the sound frequency currents flowing in the circuits in which the different microphones, respectively, are connected is varied by an operator at the pick-up point in accordance with the type of program to be broadcast in order that the sound-frequency currents corresponding to the sound energy picked up by the different microphones, respectively, may reach the radio transmitting station in proper amplitude relation. For example, when programs are to be picked up from the stage of a theater one microphone (sometimes called the arch microphone) for picking up music from a large orchestra may be located at such a position with respect to the orchestra that the best reproduction of orchestral music is obtained. Another microphone for picking up vocal or instrumental music from the stage may be located near the floor of the stage so as to be closer to the singer or instrumental soloist than to the orchestra. It is apparent that the relative attenuation offered to currents flowing in the circuits associated with the "arch" microphone and the "stage" microphone respectively, must be varied for different types of program, such as orchestra alone, soloist alone, or orchestra and soloist combined. In the case where vocal music with orchestra accompaniment is to be picked up, the relative attenuation offered by the circuits also needs to be different for different singers, respectively, and will de-

pend upon the position the singers occupy with respect to the stage microphone.

In accordance with the embodiment of the present invention herein shown and described, for the purpose of illustration, means are provided at a radio transmitting station for controlling the operation of apparatus at a station at which programs to be broadcast are picked up, these stations being connected by a transmission medium, specifically a two-conductor telephone line. The control apparatus comprises an impulse sender and an impulse selector, similar to those commonly employed in automatic telephone systems, located, respectively, at the radio transmitting station and the pick-up station and coupled to the telephone line over which the program is transmitted. This apparatus serves to connect and disconnect battery for energizing the microphone and the vacuum tube amplifiers and to vary the setting of a potentiometer associated with one of the microphone circuits. A second impulse selector is provided at the radio transmitting station for indicating the condition of the controlled apparatus at the pick-up station.

These and other features of the invention will be described in detail below, reference being made to the drawing which shows a radio broadcasting system embodying features of this invention.

Referring now to the drawing, station A at which a program to be broadcast is picked up by microphones 30 and 31, is connected by a pair of electrical conductors 32 to radio transmitting apparatus 72 located at station B. A dialing device 33 which may be similar to that disclosed in Patent No. 1,161,854 granted to O. F. Forsberg November 30, 1915 is employed for sending impulses over the line 32, this being accomplished by closing contacts 34 of the dialing device a certain number of times depending on the position at which the dial is set. Each time the contacts are closed, the line 32 is short-circuited and a circuit is completed from a grounded battery 35, through the winding of relay 36, both conductors of line 32, differentially through the two halves of the sec-

ondary winding of transformer 37, the winding of relay 38 and thence to ground. It is thus apparent that the operation of the dialing device 33 causes a predetermined number of current impulses to be transmitted over the line 32 and through the windings of relays 36 and 38. In response to these impulses the contacts of relay 38 are closed, thus completing a circuit through battery 39, resistance 40 and the winding of selector magnet 41. This selector magnet causes the contact arms 82 to 87, inclusive, of the selector switch at station A to move to a desired set of contacts in response to a predetermined number of impulses sent over the line 32.

At the same time that impulses are sent over the line 32 to control the operation of the selector switch at station A, a selector switch at station B is actuated in synchronism with the selector switch at station A for indicating at all times the setting of the latter. This is accomplished by the closing of the contacts of relay 36 in response to the current passing through its winding upon the operation of the dialing device 33 and the closing of these contacts in turn completes a circuit through resistance 42, winding of selector magnet 43 and battery 44. Each contact of the selector switch at station B is connected to a terminal of one of the bank of lamps 45. The remaining terminals of the lamps are connected together to one terminal of battery 35, while the arm 88 of the selector switch at station B is connected to the opposite terminal of this battery. It is thus apparent that the position of the contact arms of the selector switch at station A is indicated at station B by one of the bank of lamps 45 which is energized by the battery 35.

When the arms of a selector switch at station A are set on contact 1, the contacts of an impulse operated locking relay 46 are open. When the dial 33 is operated so as to send a single current impulse over the line, the arms of the selector switch are moved forward to contacts 2. This causes a circuit to be completed from the negative terminal of battery 47 through contact 2 of row R_1 of the selector switch, contact arm 82, winding of impulse-operated locking relay 46, condenser 49, to an intermediate terminal of battery 47. The current impulse sent through the winding of relay 46 serves to close its contacts in which position they remain locked until a current impulse is sent through the winding in an opposite direction. The positive terminal of battery 50 and the negative terminal of battery 47, which batteries supply cathode current and space current, respectively, to the vacuum tubes of amplifier 51, are now connected to the amplifier 51 through the contacts of relay 46. Another circuit is completed from

the positive terminal of battery 50 through the contacts of relay 46, conductors 52 and 53 to the mid terminals of microphones 30 and 31, respectively. The remaining terminals of microphones 30 and 31 are connected to the primary windings of transformers 54 and 55, respectively. These windings at their mid points are connected through rheostats 56 and 57, respectively, to choke coil 58 and thence to the negative terminal of battery 50. It is thus apparent that a single impulse transmitted over the line 32 for moving the switch arms from contacts 1 to contacts 2 serve to connect energizing battery to the amplifier 51 and the microphones 30 and 31. The switch 64 permits an operator at station A to switch either one or both microphones into circuit with the amplifier 51 provided that switch 69 is closed. When in normal position, switch 64 connects together conductors 59, 60 and 61 and when moved to either side of the normal position, it connects only conductor 59 or 61 with conductor 60. Conductor 60 is connected through all of contacts except 1, 10, 11 and 20 of row R_0 of the selector switch to conductor 65 which in turn is connected to one of the input terminals of the amplifier 51. Conductor 61 connects directly to the upper terminal of potentiometer 66 which in turn is connected to the secondary winding of transformer 54, while conductor 59 is connected through any of the contacts of row R_3 of the selector switch except contacts 1, 10, 11 and 20 to the upper terminal of the manually controlled potentiometer 67 or to the upper terminal of the remotely controlled potentiometer 68, depending on the position of switch 69, these potentiometers being connected through switch 69 to the secondary winding of transformer 55. The lower terminal of potentiometer 66 and of either potentiometer 67 or 68 are connected through any of the contacts of row R_5 of the selector switch except contacts 1, 10, 11 and 20 to conductor 70 which connects to the lower terminal of amplifier 51.

Assuming that the switch 64 is set in its normal position, it will be noted that the circuits associated with both microphones 30 and 31 are connected to the input terminals of amplifier 51 when the switch 69 is closed to the left as viewed in the figure and the arms of the selector switch are positioned on contacts 2. When the switch 69 is thrown to the right, the circuit associated with the stage microphone 31 is not connected through to amplifier 51 since there is no connection from contact 2 of row R_2 of the selector switch to the potentiometer 68. When an additional single impulse is now sent over the line 32 for causing the arms of the selector switch at station A to move to contacts 3, a circuit is completed from

the potentiometer 68, through contact 3, row R_2 of the selector switch, conductor 71, switch 69, to the upper terminal of transformer 55. It is thus apparent that either microphone 30 alone or both microphones 30 and 31 may be connected to the input terminals of amplifier 51 through the operation of the dialing impulse sender 33 at station B.

As successive single impulses are now transmitted over the line 32, the arm 83 of row R_2 of the selector switch is connected successively to different contacts of the potentiometer 68 and the attenuation introduced by this potentiometer in the circuit associated with the microphone 31 is decreased in steps of suitable magnitude as, for instance, three or four transmission units per step. The minimum attenuation is obtained when the arm 83 is positioned on contact 9.

If, for any reason, the selector switch at station A should get out of synchronism with the one located at station B, an operator at station B may return them to synchronism by connecting the receivers 73 across the line 32, sending successive single impulses over the line 32 and listening for a tone which is produced by the oscillator 74 when the arms of the selector switch at station A are positioned on contact 10. For this position of the selector switch arms, there is completed a circuit from the negative terminal of battery 39, through resistance 40, arm 85 of row R_4 of the selector switch and thence to one of the battery terminals of oscillator 74, the other battery terminal of the oscillator being connected to the positive side of battery 39. The tone output terminals of oscillator 74 are connected to contacts 10 of rows R_5 and R_6 , respectively, of the selector switch, the arms 86 and 87 of the switch being connected to conductors 70 and 65, respectively, which in turn are connected to the input terminals of the amplifier 51. It is apparent, therefore, that for this setting of the selector switch the tone generated by the oscillator 74 is transmitted over the line 32 and may be heard in the receiver 73. The arm 88 of the selector switch at station B is now caused to move independently of the arms 82 to 87 inclusive of the selector switch at station A until the two selector switches are in synchronism, that is, until the arm 88 of the selector switch at station B reaches contact 10 and the "test" lamp is caused to light. This is accomplished by sending current impulses through the winding of relay 36 by closing a circuit from the grounded battery 35, through the winding of relay 36, key 75 and thence to ground. These current impulses in turn cause the closing of the contacts of relay 36 which contacts close a circuit through resistance 42, winding of selector magnet 43 and battery 44.

The resulting current impulses through the winding of the selector magnet 43 causes the movement of the arm 88 of the selector switch at station B independently of the arms 82 to 87 inclusive of the selector switch at station A.

When a single current impulse is now sent over the line 32 and in response thereto the arms of the selector switches move forward from contact 10 to contact 11, a circuit is completed from the positive terminal of battery 47, through the arm 82, row R_1 of the selector switch at station A, winding of the impulse-operated locking relay 46, condenser 49 to an intermediate terminal of battery 47. It will be noted that the direction of the resulting current impulse through the winding of relay 46 is opposite to the direction of the current impulse received by this relay winding when the arm 82 of row R_1 of the selector switch was moved to contact 2. It is apparent, therefore, that the result of moving the arm 82 from contact 10 to contact 11 is to open the contacts of relay 46 and thereby open the circuit which supplies energizing current to the amplifier 51 and the microphones 30 and 31.

The circuits connected to contacts 1 to 10, inclusive, of the selector switches are correspondingly connected to contacts 11 to 20 inclusive so that the operation of the system when the arms of the selector switches are positioned on contracts 11 to 20 in succession is exactly the same as when they are positioned successively on contacts 1 to 10. When the arms of the selector switches are positioned on contacts 20, a single impulse set up by the dialing impulse sender 33 causes them to return to contacts 1.

In tracing the operation of the system, it is apparent from the above description that when the selector switches are set in the "off" position (i. e. with the arms on contacts 1 or 11), a single current impulse sent over the line 32 in response to the operation of the dialing device 33 causes the proper connections to be made for supplying energizing battery to the amplifier 51 and to the microphones 30 and 31, respectively. Assuming now that the switch 64 is in the normal position and that switch 69 is thrown to the right as viewed in the figure, the circuit is in such condition that acoustic energy originating from an orchestra or other source is picked up by the "arch" microphone 30 and the corresponding electrical energy is transmitted through transformer 54, potentiometer 66, the selector switch, amplifier 51, transformer 37, line 32 to the radio transmitting equipment 72 at station B. For this condition, the circuit between the "stage" microphone 31 and the amplifier 51 is not complete, but upon sending another single current impulse over line 32 this circuit is

completed from microphone 31 through transformer 55, potentiometer 68, the selector switch, amplifier 51, transformer 37, line 32, to the radio transmitting equipment 72. It should be noted that the microphone 31 is padded on the side remote from the stage so that it will pick up orchestral sounds originating at location 80 with much lower efficiency than the sounds originating on the stage 81. When it is desired to broadcast vocal or instrumental music from the stage 81 with orchestral accompaniment, it has been found practicable in many cases to allow the attenuation of the circuit associated with microphone 30, which attenuation is determined by the setting of potentiometer 66, to remain fixed throughout the duration of the program. It has been found necessary, however, to vary the attenuation of the circuit associated with the stage microphone 31 in accordance with changes in the initial intensity of the sound from the source on the stage 81 and in accordance with the variations in distance between the source and the microphone 31. This attenuation is varied by the potentiometer 68, the setting of which may be varied in steps of three transmission units or in other convenient steps by means of impulses sent over the line 32 in response to the operation of the dialing device 33.

It is apparent that the invention is not limited to the specific embodiment herein shown and described for the purpose of illustration. For instance, one or more pick-up stations may be coupled to a plurality of listening stations, and control apparatus, such as described above, may be provided for opening or completing the circuits between the pick-up stations and the various listening stations. It is apparent, moreover, that the control apparatus need not be located at the broadcasting apparatus but may be located remotely from both the pick-up point and the broadcasting station. In this case the apparatus located at the broadcasting station may also be remotely controlled. Instead of employing a plurality of microphones for picking up sound from different sources all located at a single station, it is obvious that a plurality of pick-up stations may be provided each having one or more microphones.

What is claimed is:

1. A broadcasting system comprising a plurality of stations associated with a broadcasting transmitter, a transmission medium connecting said stations and said broadcast transmitter, means for impressing on said transmission medium for transmission to said broadcast transmitter signals from a plurality of sources, means for adjusting the relative intensity of the signals impressed by the first mentioned means upon said transmission medium from said different

sources, respectively, and means remote from said adjusting means for transmitting control waves over said transmission medium to vary the setting of said adjusting means.

2. A broadcasting system comprising a plurality of stations, a broadcast transmitter at one of said stations, a transmission medium connecting said stations, means for impressing on said transmission medium for transmission to said broadcast transmitter signals from a plurality of sources, means for adjusting the relative intensity of the signals impressed upon said transmission medium from said different sources, respectively, and means coupled to said transmission medium at a location remote from said adjusting means and independent of said signals for controlling said adjusting means over said transmission medium.

3. A broadcasting system comprising a plurality of stations, a transmission medium connecting said stations, means at one of said stations for impressing on said transmission medium signals from a plurality of sources, means at said one station for differentially varying the intensity of the signals impressed upon said transmission medium from said different sources, respectively, and means connected to the transmission medium at a location remote from said aforementioned means for transmitting control waves independent of said signals over said medium to control said intensity varying means.

4. A broadcasting system comprising a transmission medium, a plurality of circuits each of which includes a microphone, for picking up acoustic energy mainly from different sources, respectively, and for impressing upon said transmission medium electrical wave energy corresponding to the acoustic energy from said different sources, respectively, means connected to said transmission medium for transmitting control energy independent of said electrical wave energy thereover to said microphone circuits, and means responsive to the transmitted control energy for varying the relative attenuating effect of the different microphone circuits, respectively on the wave energy propagated therethrough.

5. A broadcasting system comprising a plurality of stations, a transmission medium connecting said stations, a plurality of circuits, each including a microphone, for picking up acoustic energy mainly from different sources, respectively, and for impressing on said transmission medium electrical wave energy corresponding to the acoustic energy from said different sources, respectively, variable attenuating means associated with at least one of said circuits, and means located remotely from said variable attenuating means and connected to said transmis-

sion medium for transmitting thereover control energy independent of said electrical wave energy to control said variable attenuating means.

6. A broadcasting system comprising a plurality of stations, a broadcast transmitter at one of said stations, a transmission medium connecting said stations, means at one of said stations for impressing on said transmission medium for transmission to said broadcast transmitter signals from a plurality of sources, means for adjusting the relative intensity of the signals impressed on said transmission medium from said sources means remote from said adjusting means for controlling the setting of said adjusting means, and means located near said controlling means and controlled directly thereby for indicating the operating condition of said adjusting means.

7. A broadcasting system comprising a plurality of stations, a transmission medium connecting said stations, means at one of said stations for impressing on said transmission medium signals from a plurality of sources, means at said station for differentially varying the intensity of said signals impressed upon said transmission medium, means connected to the transmission medium at a location remote from said aforementioned means for controlling said intensity varying means, and means located near said controlling means and controlled directly thereby for indicating the setting of said intensity varying means.

8. A broadcasting system comprising a plurality of stations, a transmission medium connecting said stations, a plurality of circuits, each including a microphone, for picking up acoustic energy mainly from different sources, respectively, and for impressing on said transmission medium, electrical wave energy corresponding to the acoustic energy from said different sources, respectively, a vacuum tube amplifier associated with said circuits, a potentiometer associated with at least one of said circuits for controlling the relative amplitude of the sound frequency currents impressed on said transmission medium, controlling means remote from said microphone circuits and operating through said transmission medium, and independent of said electrical wave energy for controlling the operation of apparatus including said microphones, said vacuum tube amplifier and said potentiometer, and indicating means located near said controlling means for indicating the operating condition of said apparatus.

9. A broadcasting system comprising a radio station including a broadcast transmitter, a pick-up station, a transmission medium connecting said radio station and said pick-up station, a plurality of means at said pick-up station for impressing on said trans-

mission medium for transmission to said broadcast transmitter electrical wave energy corresponding to acoustic energy from different sources at said pick-up station, means for adjusting the relative intensity of the electrical wave energy impressed on said medium due to said different sources, and means remote from said adjusting means and independent of said electrical wave energy for controlling said adjusting means over said transmission medium.

10. A broadcasting system comprising a radio station including a broadcast transmitter, a pick-up station, a transmission medium connecting said radio station and said pick-up station, a plurality of means at said pick-up station for impressing on said transmission medium for transmission to said broadcast transmitter electrical wave energy corresponding to acoustic energy from different sources at said pick-up station, means for adjusting the relative intensity of the electrical wave energy impressed on said medium due to said different sources, and means connected to said transmission medium at a location remote from said adjusting means and independent of said electrical wave energy for controlling said adjusting means over said transmission medium.

In witness whereof, I hereunto subscribe my name this 9th day of June, A. D. 1927.

WILLIAM F. VIETH.