

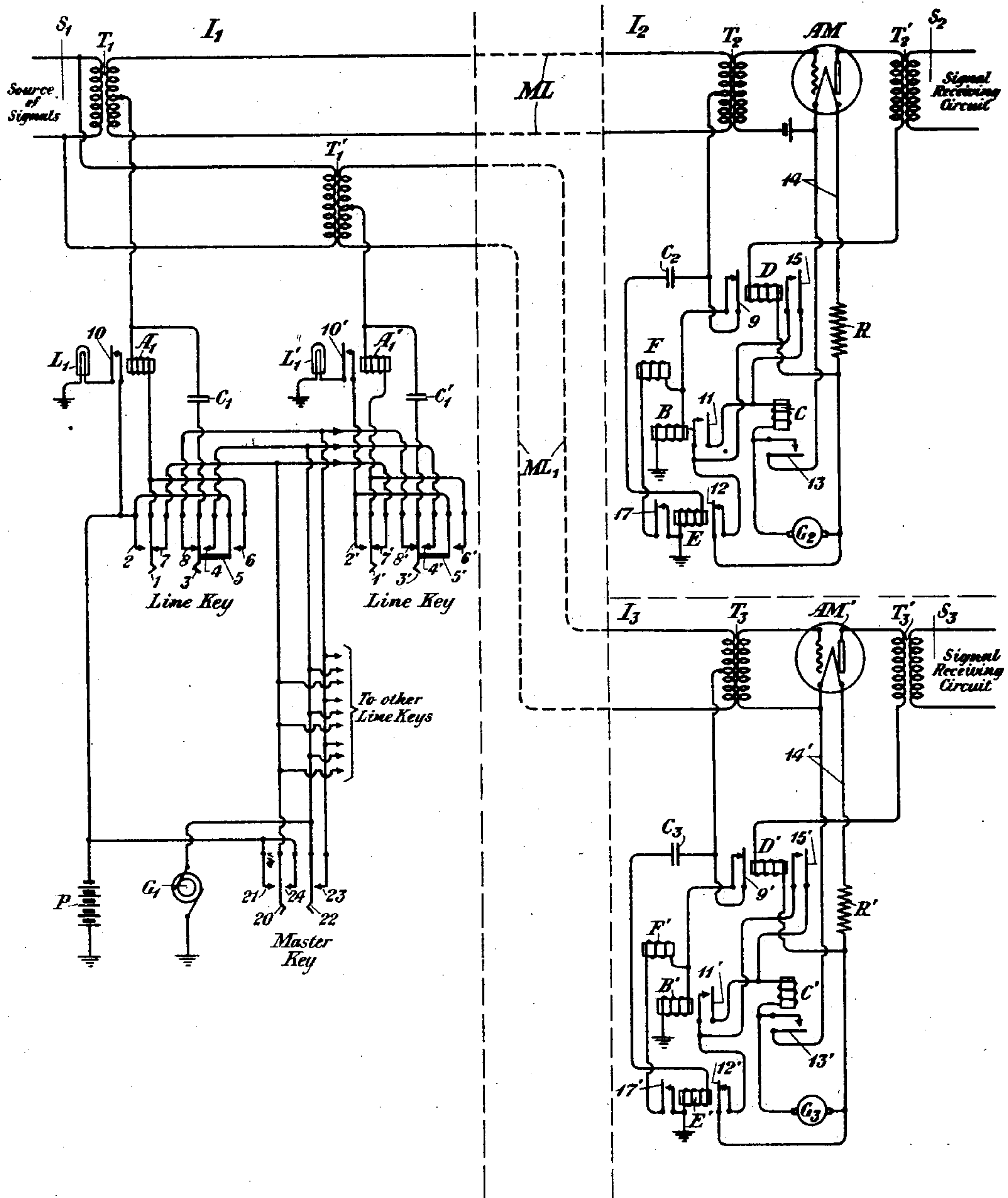
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REMOTE CONTROL SYSTEM

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REMOTE-CONTROL SYSTEM.

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This invention relates to remote control systems, and particularly to arrangements for controlling from a main or central station a plurality of vacuum tube amplifiers each located at a remote station.

In wire and radio broadcasting and similar systems it frequently occurs that amplifiers are placed at subscribers' residences and other points remote from the main or central program distributing center. Heretofore in order to turn such amplifiers on or off and to supervise their operation it has been necessary to provide an attendant for each amplifier or group of amplifiers. Thus, considerable expense has been incurred, especially in systems in which the amplifiers were isolated. Wherever an attendant is not present to care for an amplifier, a failure of the amplifier may not be evident at the main or central station until the subscriber or receiving station reports to the main or central station that no program is being received. In a system where more than one amplifier is used a report from the subscriber does not of itself locate the trouble and a large amount of time is lost in tracing it.

This invention discloses a system which is comparatively cheap and simple to operate in which some or all of a plurality of amplifiers each located at a remote station may be turned on or off simultaneously from the main or central station and signals obtained at the main or central station indicating which amplifiers are operating. Thus when a program is being supplied to the various amplifiers at the remote stations signals are given to the operator at the main or central station by means of signaling devices thereat indicating which amplifiers are being supplied with the program. Furthermore, when the operation of one or more amplifiers fails to remain in an operating condition, the operator at the main or central station will be notified of such failure by the various signals thereat.

This invention will be better understood from the detailed description hereinafter following when read in connection with the accompanying drawing showing one embodiment of the invention.

A main or central station I_1 is connected by main lines ML and ML' to remote stations I_2 and I_3 , respectively, each of these remote stations having a vacuum tube amplifier thereat for receiving the program trans-

mitted by the main or central station I_1 . It will be understood, however, that while only two remote stations have been shown herein the invention is not so limited, but a plurality of remote stations may be connected to the main or central station without departing from the spirit of the invention and the scope of the appended claims.

A source of signals S_1 is connected to the main line ML through a transformer T_1 . Signals are received from the main line ML at the signal receiving circuit S_2 at station I_2 , the signals being transmitted through transformer T_2 , the amplifier AM and the transformer T'_2 .

There are line keys at the main station I_1 each corresponding to one of the remote stations. The line key corresponding to the remote station I_2 may be turned to its "on", "off" or "neutral" position. When the line key is turned to its "on" position a swinger 1 closes a contact 2. When the line key is thrown to its "off" position a swinger 3 closes a contact 4 and a swinger 5 closes a contact 6, said swingers 3 and 5 moving synchronously, being connected by a strip of insulation. When the line key is thrown to its neutral position swinger 1 closes contact 7 and swinger 3 closes contact 8. Similarly the line key corresponding to the remote station I_3 may be turned to its "on", "off" and "neutral" positions, the apparatus at the main station I_1 employed in connection with the remote station I_3 being primed. It will be understood, however, that while only two line keys have been shown at the main station, one corresponding to each of the remote stations, a plurality of line keys may be provided at the main station I_1 to operate a plurality of remote stations, each line key corresponding to a remote station.

When the line key corresponding to the remote station I_2 is thrown to its "on" position, line relay A_1 at the main station and line relay B at the remote station are energized, the circuit including a source of direct current P, contact 2 and swinger 1 of the line key, the winding of line relay A_1 , the secondary winding of transformer T_1 , both conductors of the main line ML in parallel, the primary winding of the transformer T_2 , the armature contact 9 of a relay D and the winding of the relay B. When the line relay A_1 becomes energized its armature 10 is attracted closing a circuit which includes a signal

lamp L_1 , or other indicating device at the main station, the circuit including a source of direct current P , the armature 10 and its contact and a signal lamp L_1 . When the line relay B at the remote station I_2 becomes energized, a circuit is closed energizing a control relay C at the remote station, this circuit including the armature 11 and the contact associated with the line relay B, the winding of the control relay C, source of potential G_2 and the armature 12 and its contact associated with the alternating current relay E. When the control relay C becomes energized its armature closes a circuit interconnecting the source of potential G_2 with the cathode of the amplifier AM, this circuit including the armature 13 and the contact associated with the control relay C, the source of potential G_2 , a resistance R and the cathode of the amplifier AM. Furthermore, when the control relay C becomes energized, the plate circuit of the amplifier AM is closed, the circuit including the armature 13 and the contact associated with the control relay C, the source of potential G_2 , the winding of the relay D, the primary winding of the transformer T_2 , the anode and cathode of the amplifier AM and the leads 14.

The current flowing in this plate circuit, and consequently the current flowing through the winding of the relay D increases until a normal state is reached. When this normal state is reached the relay D operates attracting its armatures 9 and 15, armature 15 closing its contact so as to form a path parallel to the path established by the armature 11 and the contact associated with the line relay B. Thus the control relay C remains operated even when the line relay B becomes deenergized. When the relay D operates opening the contact associated with the armature 9, a circuit is opened which includes the line relay B at the remote station, the line relay A_1 and the source of direct current P at the main station. When the line relay A_1 at the main station becomes deenergized, its armature 10 is released, opening the circuit which includes the signal lamp L_1 .

The line key at the main station remains in its "on" position so that when the current in the plate circuit of the amplifier AM diminishes for any reason whatsoever, as, when the filament thereof burns out, or when the source of potential G_2 fails, etc., the relay D will release its armatures because insufficient current flows through the winding thereof to hold these armatures closed. Thus the armature 9 will close the contact associated with it and the line relay B at the remote station I_2 will be connected in circuit with the line relay A_1 and the source of direct current P at the main station thereby operating these line relays. Consequently, the signal lamp L_1 at the main station lights also. When the line relay B at the remote station operates, it

again energizes the winding of the control relay C so that the amplifier AM may start up again if the interruption is only momentary. However, if the amplifier AM' does not operate, that is if insufficient current flows through the plate circuit thereof, the signal lamp L_1 at the main station will remain lighted. Similarly when there is trouble with the amplifier AM' associated with the remote station I_3 , the signal lamp L'_1 at the main station will become lighted.

When the line key is thrown to its "off" position, the swinger 3 closes contact 4 and connects the source of alternating current G_1 to an alternating current relay E at the remote station, the circuit including the generator G_1 , contact 4 and swinger 3 of the line key, condenser C_1 , the secondary winding of the transformer T_1 , both conductors of the main line ML in parallel, the primary winding of the transformer T_2 , a condenser C_2 and the winding of the alternating current relay E. When the winding of the alternating current relay E is energized its armatures 12 and 17 are attracted, the armature 12 opening the circuit interconnecting the winding of the control relay C and the source of potential G_2 . When the winding of the control relay C becomes deenergized, its armature 13 is released opening the circuit which interconnects the source of potential G_2 and the cathode and the anode of the amplifier AM. When the armature 17 associated with the alternating current relay E closes its contact, a shunt path is established around the winding of the relay B, this shunt path including the choke coil F, the armature 17 and its contact. When the current flowing in the plate circuit decreases, the armatures 9 and 15 associated with the relay D are released so that the line relay A_1 and the source of direct current P at the main station are again connected to the remote station I_2 , the circuit now including armature 17 and its contact, the choke coil F, the armature 9 and its contact associated with relay D, the primary winding of the transformer T_2 , both conductors of the main line ML in parallel, the secondary winding of the transformer T_1 , the winding of the line relay A_1 , contact 6 and swinger 5 of the line key and the source of direct current P . Thus, when the line relay A_1 becomes energized the signal lamp L_1 associated therewith lights, indicating that the amplifier AM at the remote station I_2 has been turned off. Just as soon as the signal lamp L_1 lights indicating that the relay D at the remote station I_2 has released its armatures, the line key is then thrown to its neutral position, removing the source of direct current and the source of alternating current from the main line ML.

A master key is provided for simultaneously turning on or off the amplifiers located at a plurality of remote stations. When the

master key is thrown on, a swinger 20 closes contact 21. When the master key is turned off a swinger 22 closes a contact 23 and swinger 20 closes contact 24. When the master key is thrown into its neutral position, the swingers 20 and 22 are isolated from their contacts. If it is desired to turn on the amplifiers corresponding to some of the remote stations and to leave the other amplifiers at other remote stations off, the line keys corresponding to the amplifiers to be turned off are connected to the off positions and then the master key is turned on.

Inasmuch as the arrangements of this invention have been described with particular reference to the connection of the cathode and anode of an amplifier to a source of direct current, it is to be distinctly understood that with slight modifications a source of alternating current may be employed instead of a source of direct current within the scope of the invention.

It will be understood that while the arrangements of the invention have been shown with particular reference to a wire broadcasting system, this invention may be embodied in the radio broadcasting and other systems without departing from the spirit of the invention and the scope of the appended claims.

While the arrangements of this invention have been shown in one particular embodiment, it will be understood that the invention may be embodied in other and widely varied organizations without departing from the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. In a system for controlling from a main station a plurality of vacuum tube amplifiers each located at a remote station, in combination, a plurality of line relays at the main station one corresponding to each remote station, a plurality of line relays one at each remote station, a source of potential at the main station, a plurality of sources of potential one at each remote station, a plurality of line keys at the main station one corresponding to each remote station, each line key operating a circuit interconnecting the source of potential and the line relay at the main station and the line relay at the corresponding remote station, a plurality of control relays one at each remote station, each control relay being associated with the corresponding line relay at the remote station and controlling the operation of the corresponding vacuum tube amplifier by the source of potential at said remote station, a plurality of indicating devices at the main station one corresponding to each remote station, each indicating device indicating whether or not the vacuum tube amplifier at the corresponding remote station is operating, and means for rendering each indicating device operative when the vacuum tube amplifier at the corresponding

remote station has failed, due to unsatisfactory operation.

2. In a system for controlling from a main station a plurality of vacuum tube amplifiers each located at a remote station, in combination, a plurality of line relays at the main station one corresponding to each remote station, a plurality of line relays one at each remote station, a source of direct current at the main station, a source of alternating current at the main station, a plurality of sources of potential one at each remote station for energizing the vacuum tube amplifier thereat, a plurality of alternating current relays one at each remote station, a plurality of line keys at the main station one corresponding to each remote station, each line key closing a circuit which includes a source of direct current and the line relay at the main station and the line relay at the corresponding remote station when the vacuum tube amplifier at said remote station is to be energized, each line key closing a circuit which includes the source of alternating current at the main station and the alternating current relay at the corresponding remote station when the vacuum tube amplifier at said remote station is to be deenergized, a plurality of control relays, one at each remote station, each control relay being associated with the corresponding line relay at the remote station and controlling the operation of the corresponding vacuum tube amplifier by the source of potential at said remote station, and a plurality of indicating devices at the main station, one corresponding to each remote station, each indicating device indicating whether or not the vacuum tube amplifier at the corresponding remote station is operating.

3. In a system for controlling from a main station a plurality of vacuum tube amplifiers each located at a remote station, in combination, a plurality of line relays at the main station one corresponding to each remote station, a plurality of line relays one at each remote station, a source of potential at the main station, a plurality of sources of potential one at each remote station, a master key at the main station operating a plurality of circuits, each circuit interconnecting the source of potential and the line relay at the main station and the line relay at the corresponding remote station, a plurality of control relays one at each remote station, each control relay being associated with the corresponding line relay at the remote station and controlling the operation of the corresponding vacuum tube amplifier by the source of potential at said remote station, a plurality of indicating devices at the main station one corresponding to each remote station, each indicating device indicating whether or not the vacuum tube amplifier at the corresponding remote station is operating, and means for rendering each indicating device opera-

tive when the vacuum tube amplifier at the corresponding remote station has failed to operate satisfactorily.

4. In a system for controlling from a main station a plurality of vacuum tube amplifiers each located at a remote station, in combination, a plurality of line relays at the main station one corresponding to each remote station, a plurality of line relays one at each remote station, a source of direct current and a source of alternating current at the main station, a plurality of sources of potential, one at each remote station for energizing the vacuum tube amplifier thereat, a plurality of alternating current relays one at each remote station, a plurality of line keys at the main station, one corresponding to each remote station, each line key closing a circuit which includes the source of direct current and the line relay at the main station and the line relay at the corresponding remote station when the vacuum tube amplifier at said remote station is to be energized, each line key closing a circuit which includes the source of alternating current at the main station and the alternating current relay at the corresponding remote station when the vacuum tube amplifier at said remote station is to be deenergized, a master key at the main station for simultaneously operating all of the line keys thereat, a plurality of control relays one at each remote station, each control relay being associated with the corresponding line relay at the remote station and controlling the operation of the corresponding vacuum tube amplifier by the source of potential at said remote station, and a plurality of indicating devices at the main station one corresponding to each remote station, each indicating device indicating when the vacuum tube amplifier at the corresponding remote station is operating.

5. In a system for controlling from a main station a plurality of vacuum tube amplifiers each located at a remote station, in combination, a plurality of line relays at the main station one corresponding to each remote station, a plurality of line relays one at each remote station, a source of direct current at the main station, a source of alternating current at the main station, a plurality of sources of potential one at each remote station for energizing the vacuum tube amplifier thereat, a plurality of alternating current relays one at each remote station, a master key at the main station operating a plurality of circuits two corresponding to each remote station, one circuit including the source of direct current and the line relay at the main station and the line relay at the corresponding remote station, the other circuit including a source of alternating current at the main and the alternating

current relay at the corresponding remote station, a plurality of control relays one at each remote station, each control relay being associated with the corresponding line relay at the remote station and controlling the operation of the corresponding vacuum tube amplifier by the source of potential at said remote station, and a plurality of indicating devices at the main station one corresponding to each remote station, each indicating device indicating when the vacuum tube amplifier at the corresponding remote station is operated.

6. In a system for controlling from a main station a plurality of vacuum tube amplifiers each located at a remote station, in combination, a plurality of line relays at the main station one corresponding to each remote station, a plurality of line relays one at each remote station, a source of potential at the main station, a plurality of sources of potential one at each remote station, a plurality of indicating devices at the main station, one corresponding to each remote station, a plurality of line keys at the main station one corresponding to each remote station, each line key operating a circuit interconnecting the source of potential and the line relay at the main station and the line relay at the corresponding remote station, the indicating devices indicating which amplifiers are connected to the main station, the line relay at each remote station connecting the amplifier to the source of potential thereat, and means whereby the source of potential at each remote station may be disconnected from the amplifier thereat on the failure of said amplifier, said indicating devices also indicating which amplifiers have failed.

7. A system for controlling from a main station an amplifier located at a remote station, comprising two relays one at the main station and the other at the remote station, means whereby said relays may become energized when the amplifier at the remote station is to be started and stopped in operation, a source of potential at the remote station, means for connecting said source of potential to the amplifier when the relay at the remote station becomes energized, and means for deenergizing said relays when the amplifier is receiving sufficient operating current from the source of potential, and indicating means at the main station for indicating when the amplifier at the remote station has started operating and has stopped operating, said indicating means also indicating a failure in the satisfactory operation of said amplifier.

In testimony whereof, I have signed my name to this specification this 19th day of April, 1926.

FRED W. SCHRAMM.