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REGULATION OF LEVEL IN BROADCAST TRANSMISSION

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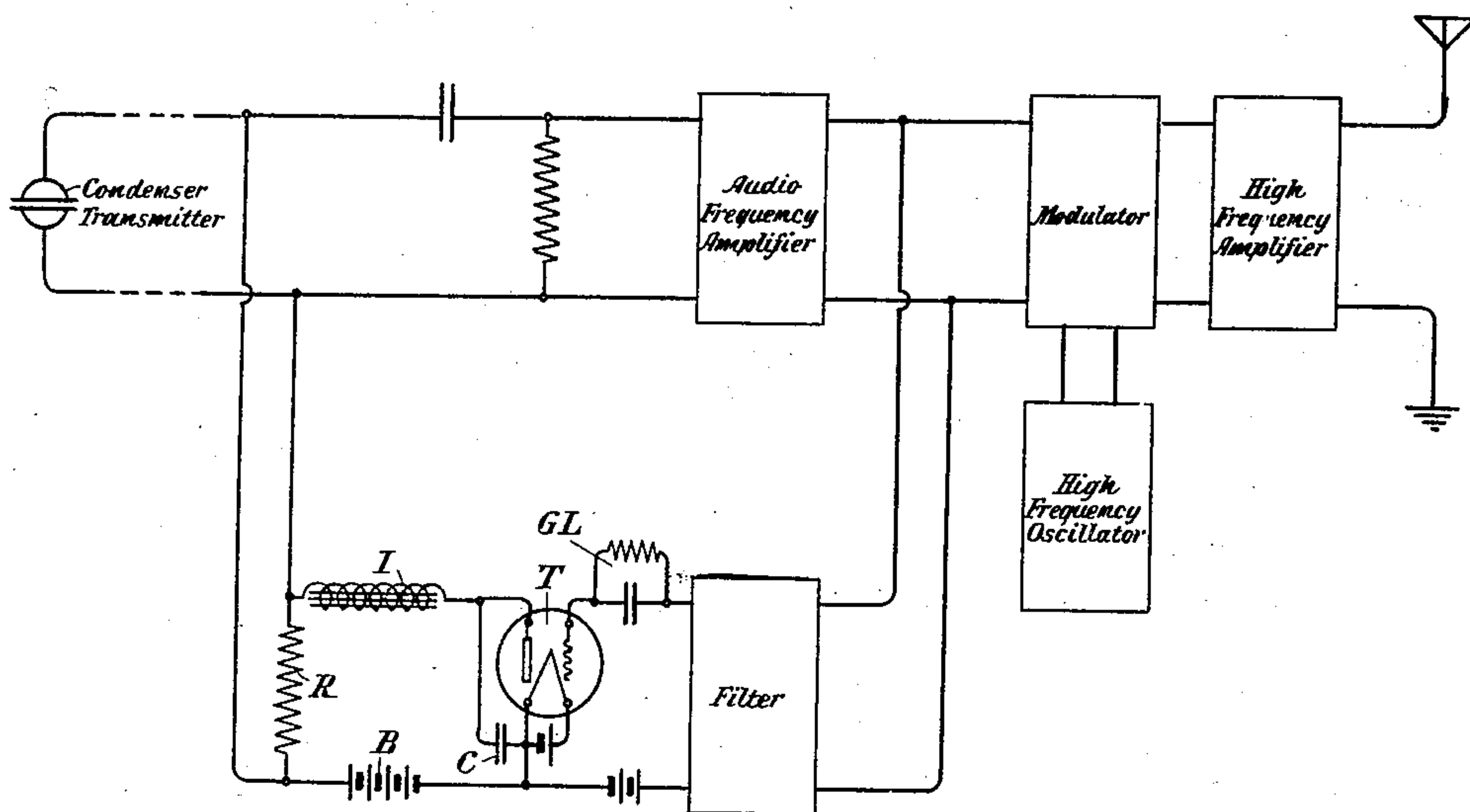


Fig. 1

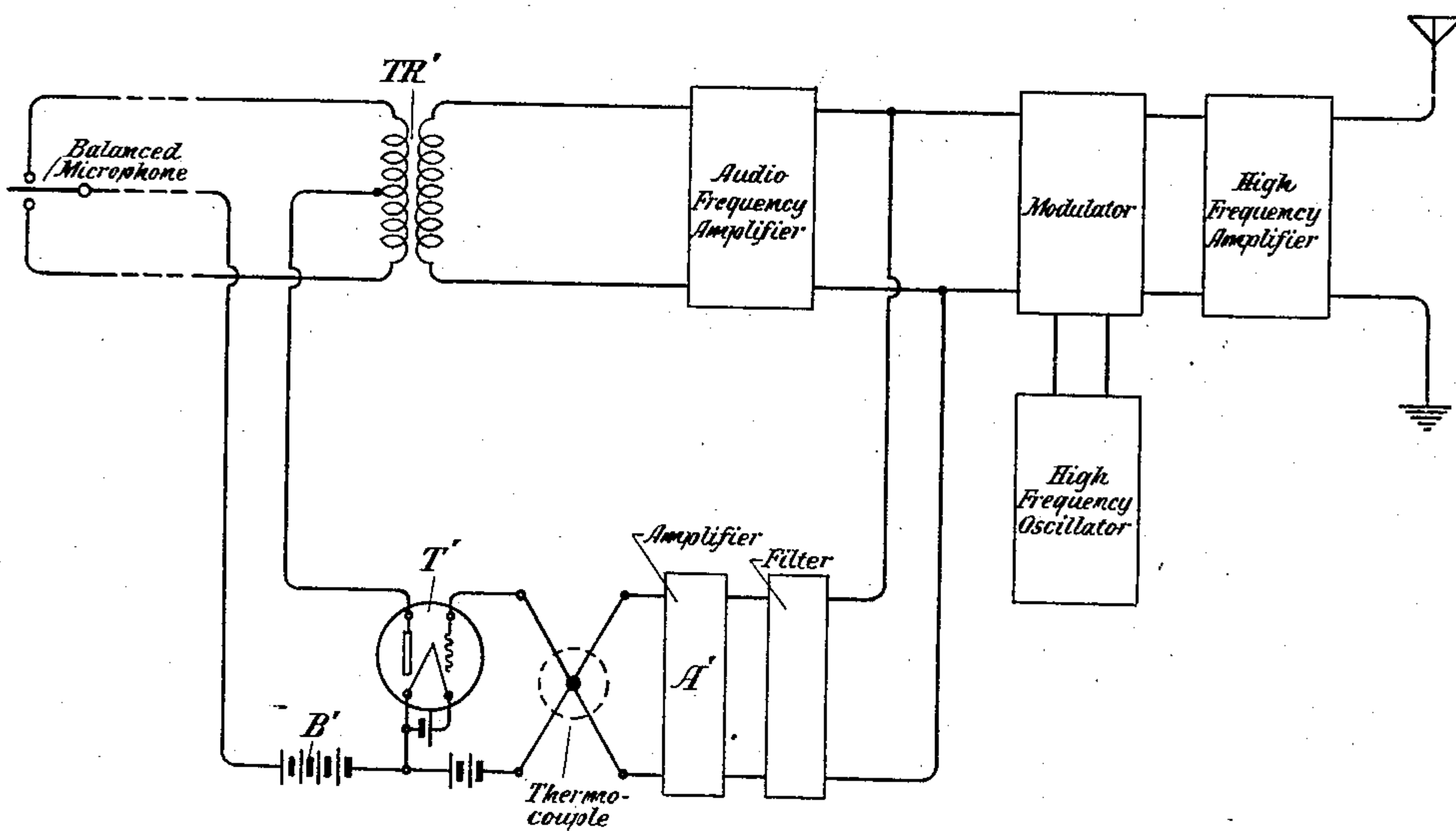


Fig. 2

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REGULATION OF LEVEL IN BROADCAST TRANSMISSION

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This invention relates to signaling systems, and more particularly to systems for radio broadcast transmission, including a sound pick-up device—or telephone transmitter—and a radiating device—or transmitting antenna, joined together by an intermediate wire transmission path.

The object of the invention is regulation of the volume of the signal transmitted, so that a substantially uniform output will be maintained—that is, so that there will be a decrease in the change of volume of the transmitted signal.

This object the applicant accomplishes by methods which are broadly stated as follows: He regulates the sensitivity of the sound pick-up device in accordance with variations of the signal level so as to offset in part the departures from the signal level. This regulation is accomplished automatically in response to the variations of level.

The invention will be more clearly understood when the following detailed description of two embodying circuit arrangements and the operations thereof, is read with reference to the accompanying drawings, of which Figure 1 shows diagrammatically an arrangement adapted to the use of a condenser transmitter, and Fig. 2 shows in like manner an arrangement for use with a balanced microphone.

With reference to the drawings, and first with particular reference to Fig. 1 thereof, a condenser transmitter is shown in a transmitting circuit of a usual type including an audio frequency amplifier, a modulator, a high frequency oscillator, a high frequency amplifier and an antenna circuit. Added to this circuit are the applicant's means responsive to signal level variations for effecting a regulation of the sensitivity of the transmitter so that a uniform volume of transmitted signal will be maintained. The battery B and the voltage drop across a resistance R, which will be further discussed hereinafter, furnish the polarizing potential which is impressed across the condenser transmitter. The alternating current output of a condenser transmitter, given a constant level of impressed sound, varies in direct relation to the applied con-

stant potential. For a more detailed discussion of certain characteristics of condenser transmitters, reference may be had to an article by E. C. Wentz, entitled "Absolute measurements of sound intensity," published in July, 1917, in the Physical Review, Volume X, No. 1, page 39.

It is, of course, understood that the condenser transmitter of Fig. 1 is connected across the input of the audio frequency amplifier, in which the signal is brought to the proper level for modulation upon a carrier in the modulator. The high frequency carrier is supplied to the modulator by the high frequency oscillator. After modulation, the wave is amplified in the high frequency amplifier, and is then radiated from the antenna.

In accordance with the applicant's arrangement, a portion of the output of the audio frequency amplifier is diverted into a branch path, and is directed into a filter. It is the purpose of this filter to furnish the desirable frequency selection of the audible signal components. The characteristic of this filter would ordinarily be equivalent in its effect upon the audible signal to the combined effect of the modulator, the high frequency amplifier and the antenna circuit. In addition to preventing the affecting of the amplitude of the transmitted frequencies by frequencies outside the band of the transmitted frequencies, this filter serves to prevent a low frequency "sing" around the circuit from the output to the input of the audio-frequency amplifier.

The output of the filter described above is impressed upon a device which will regulate the polarizing potential across the condenser transmitter. A suitable arrangement is that shown in the drawing, involving the use of the vacuum tube T. As the level of the signal at the output of the audio frequency amplifier changes—increases, for instance—the mean potential of the grid of the tube T becomes negative. Consequently, the plate resistance of the tube is increased, and the plate current is decreased. This decrease of the plate current flowing through the resistance R causes a corresponding decrease in the polarizing potential impressed across the con-

denser transmitter. This decrease results in a reduction of the output of the transmitter. It will be understood that the transmitter output is reduced by the automatic arrangement just described until the point of equilibrium is reached. It will be understood further that a decrease of level of the output of the audio frequency amplifier results in an increase of the polarizing potential of the condenser transmitter and a resultant rise of the output level of the transmitter.

Since response in the form of variation of the polarizing potential should be to changes in the mean level at the output of the audio frequency amplifier, and not to each individual fluctuation, means are provided for preventing response to such fluctuations. An inductance *I* is connected in the plate circuit of the tube *T*, and a capacity *C* is connected across this circuit, as shown in the drawing. Furthermore, a grid-leak *GL* is included for purposes well understood by persons skilled in the art.

In Fig. 2 of the drawings, there is shown a circuit arrangement which is a modification of that shown in Fig. 1 and is adapted to use with a balanced microphone. The main part of the transmission circuit connecting the sound pick-up device and the radiating antenna is substantially like that shown in Fig. 1, the only difference being the coupling of the microphone circuit to the audio frequency amplifier circuit, which, in the case of Fig. 2, is inductive through the transformer *TR'*. In this case, as in the former, a part of the audible signal is diverted and passed through a filter, this filter having the characteristic discussed above. The filter output is then passed through an amplifier *A'* and is impressed upon a thermocouple device. Through the instrumentality of this device, a uni-directional potential is produced and is impressed upon the grid of the vacuum tube *T'*. The plate voltage of this tube is furnished by the source *B'*, and the plate circuit is associated with the transmission circuit as shown in the drawings. Variation in the signal level automatically produces a corresponding variation of potential on the grid of the tube *T'*, and the plate current is varied as a result. Since the plate circuit is associated with the transmission circuit as shown, a change of the plate current directly affects the sensitivity of the balanced microphone and produces the desired regulation of the transmitter output level. It is, of course, understood that an increase of the signal level automatically produces an offsetting decrease in the transmitter output, and, conversely, a fall of the signal level results in an increase in the response of the microphone.

In the arrangement of Fig. 2, the thermocouple functions to permit regulation only for the average changes in level, causing a

deliberate response to current fluctuations instead of the instantaneous response to individual changes which would otherwise take place.

While the applicant's invention has been disclosed specifically in two circuit arrangements which are deemed desirable, it is to be understood that such specification is for the purpose of clear illustration and does not limit the scope of the invention, which is defined by the appended claims.

What is claimed is:

1. In a system including a device for converting sound into electrical energy, a radiating antenna, and an intermediate path, the method of decreasing changes in volume of transmitted signals which consists in impressing a constant normal polarizing potential on the sound converting device and regulating said potential in accordance with level variations in the intermediate path.

2. In a system including a device for converting sound into electrical energy, a radiating antenna, an intermediate path, and means for impressing a constant normal polarizing potential on said sound converting device, the method of decreasing changes in volume of transmitted signals which consists in diverting from the intermediate transmission path a portion of the energy therein, and regulating the polarizing potential in accordance with variations in the amount of said energy.

3. In a system including a device for converting sound into electrical energy, a radiating antenna, an intermediate path, and means for impressing a constant normal polarizing potential on said sound converting device, the method of decreasing changes in volume of transmitted signals which consists in diverting from the intermediate transmission path a portion of the energy therein, and varying the polarizing potential to offset changes in the amount of said energy.

4. In a signal transmitting system including a microphone, a radiating antenna, and an intermediate transmission path, the method of substantially maintaining a volume level of transmitted signals which consists in diverting from the transmission path a portion of the energy therein, rectifying the diverted energy, and causing variation of the rectified energy, to effect an offsetting variation of the sensitivity of the microphone.

5. In a signal transmitting system including a microphone, a radiating antenna, and an intermediate transmission path, the method of substantially maintaining a volume level of transmitted signals which consists in diverting from the transmission path a portion of the energy therein, rectifying the diverted energy, and causing variations of the rectified energy to vary the sensitivity of the microphone so as to offset departures from the signal level.

6. In a signal transmitting system including a microphone having a constant normal polarizing potential impressed thereon, a radiating antenna, and an intermediate transmission path, the method of regulating the signal volume transmitted which consists in diverting from the transmission path a portion of the wave caused therein by the sound impressed on the microphone, rectifying the diverted energy, and varying in accordance with changes of said energy the polarizing potential impressed on the microphone.

7. In a signal transmitting system including a microphone, a radiating antenna, and an intermediate transmission path, the method of regulating the signal volume transmitted which consists in impressing on the microphone a constant normal polarizing potential, impressing the sound on the microphone, diverting from the transmission path a portion of the energy therein, rectifying the diverted energy, and regulating the polarizing potential in accordance with the amount of said energy.

8. In a signal transmitting system including a microphone, a radiating antenna, and an intermediate transmission path, the method of regulating the signal volume transmitted which consists in impressing on the microphone a constant normal polarizing potential, impressing the sound on the microphone, diverting from the transmission path a portion of the energy therein, rectifying the diverted energy, and varying the polarizing potential to offset variations in the amount of said energy.

9. In a signal transmitting system, a device for converting sound into electrical energy, a radiating antenna, an intermediate transmission path, means responsive to changes of energy in said path, and means associated therewith for regulating the sensitivity of the sound converting device.

10. In a signal transmitting system, a device for converting sound into electrical energy, a radiating antenna, an intermediate transmission path, means responsive to changes of energy in said path, and means associated therewith for effecting an offsetting variation of the sensitivity of the sound converting device.

11. In a signal transmitting system, a device for converting sound into electrical energy, means for impressing a constant normal polarizing potential thereon, a radiating antenna, an intermediate transmission path, means responsive to changes of energy in said path, and means associated therewith for regulating said polarizing potential.

12. In a signal transmitting system, a device for converting sound into electrical energy, means for impressing a constant normal polarizing potential thereon, a radiating antenna, an intermediate transmission path, means responsive to changes of energy in said

path, and means associated therewith for effecting an offsetting variation of said polarizing potential.

13. In a signal transmitting system, a microphone, a radiating antenna, an intermediate transmission path, a branch path for diverting from said transmission path a portion of the energy therein, means for rectifying the diverted energy, and means responsive to variations in the amount of said energy for effecting offsetting variations in the sensitivity of said microphone.

14. In a signal transmitting system, a microphone, a radiating antenna, an intermediate transmission path, a branch path for diverting from said transmission path a portion of the energy therein, means for rectifying the diverted energy, and means for varying the response of the microphone in accordance with variations in the amount of said energy.

15. In a signal transmitting system, a microphone, means for impressing a constant normal polarizing potential thereon, a radiating antenna, an intermediate transmission path, a branch path for diverting from said transmission path a portion of the energy therein, means for rectifying the diverted energy, and means responsive to variations in the amount of said energy for effecting offsetting variations in the polarizing potential impressed on the microphone.

In testimony whereof I have signed my name to this specification this 18th day of October, 1927.

RALPH K. POTTER.