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2,241,145

SIGNALING SYSTEM

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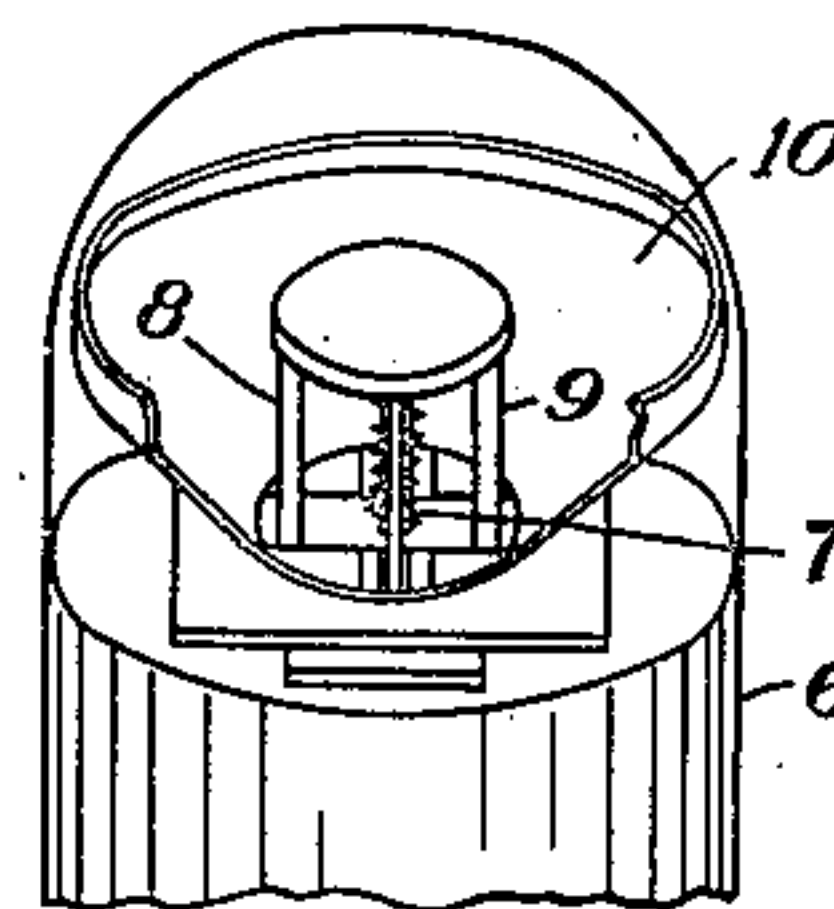
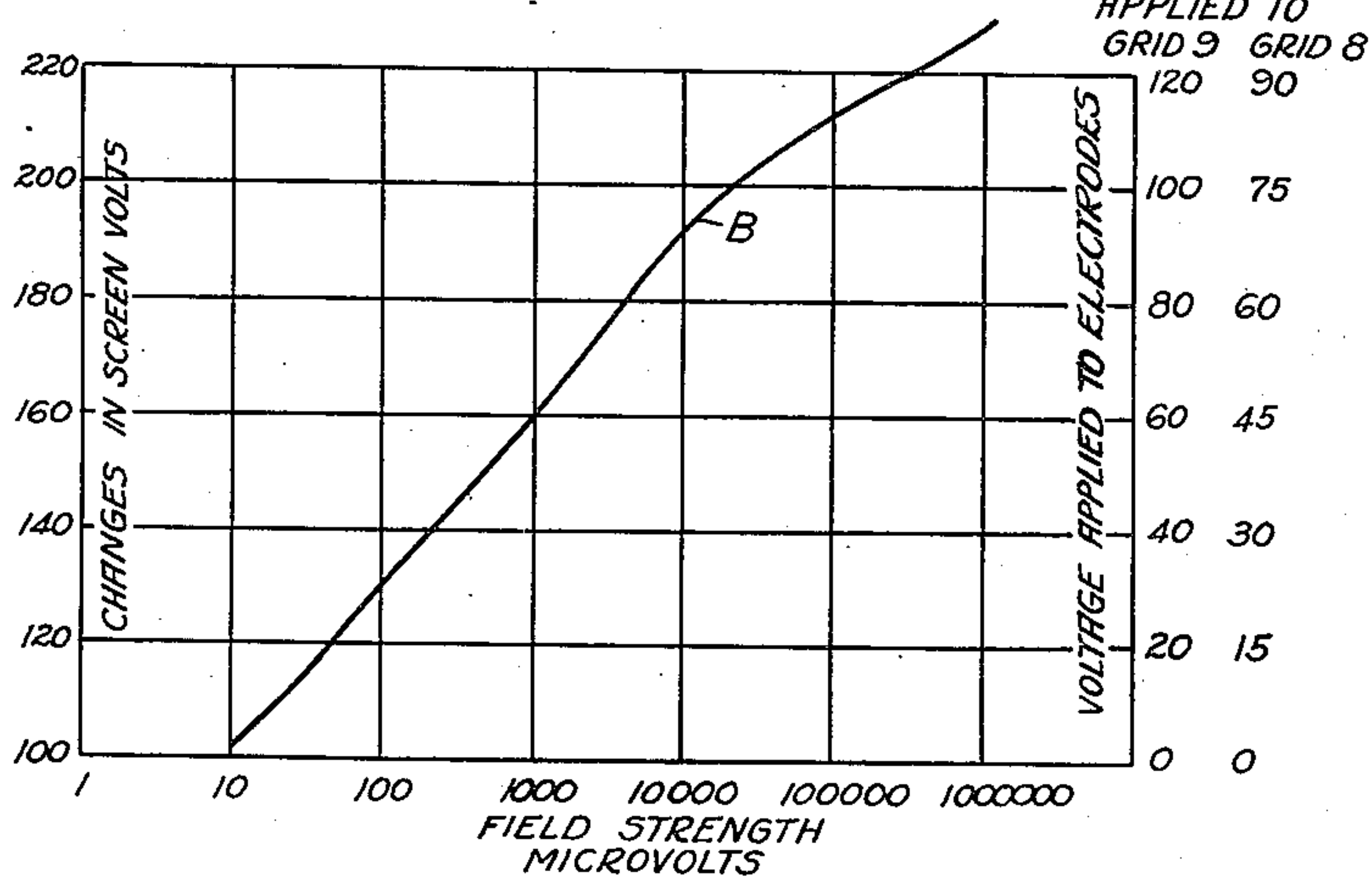
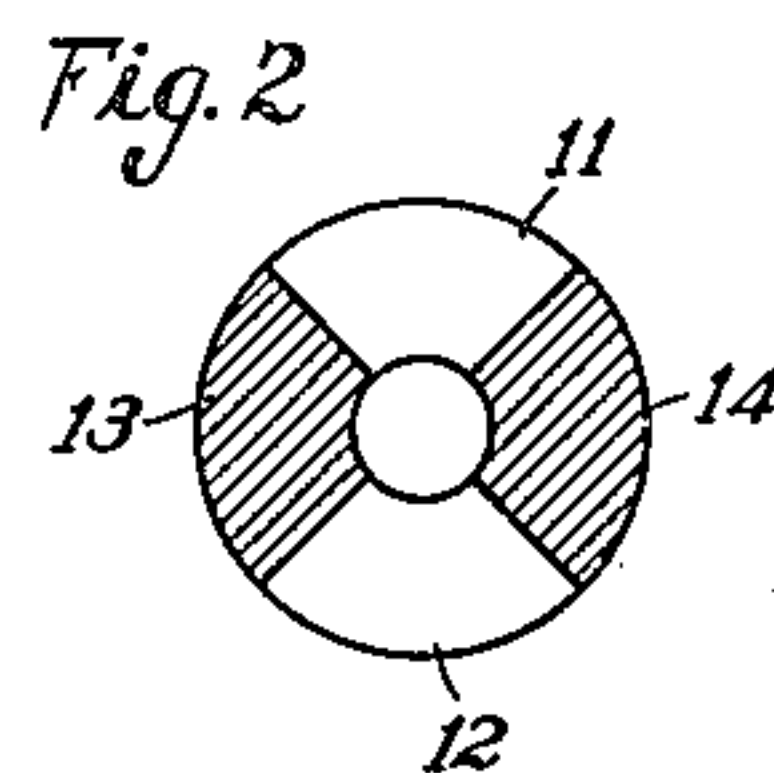
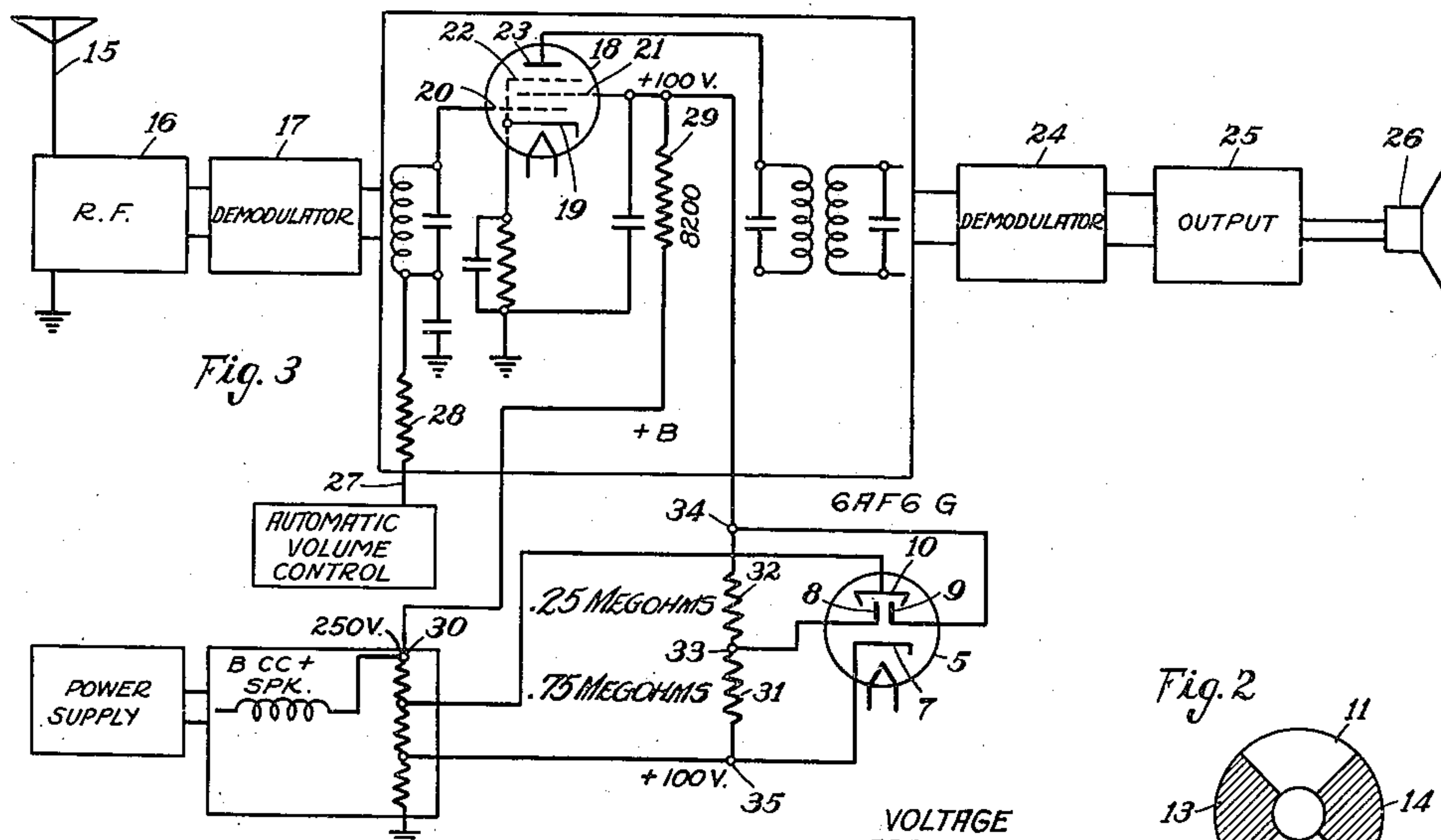


Fig. 1

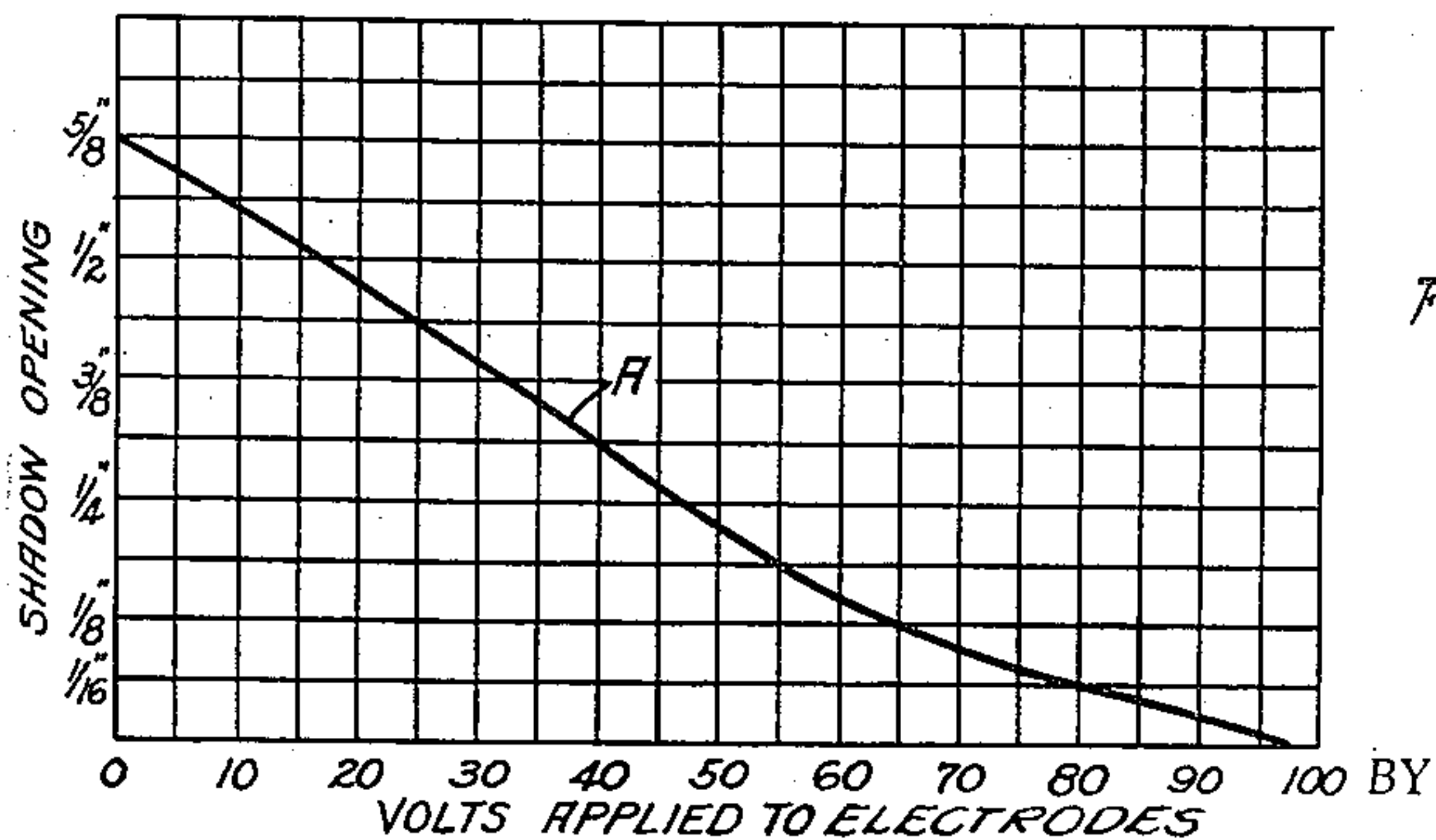


Fig. 4

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SIGNALING SYSTEM

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6 Claims. (Cl. 250—40)

This invention relates to signaling systems and more particularly to radio receiving systems.

In such a signaling system and especially in a radio receiving system, it is now the practice to utilize an electron-ray tube having a fluorescent screen, to indicate by its area of fluorescence whether or not the radio receiving system is tuned to reproduce a signal at its maximum efficiency. More recently an indicator of this type has been provided in which one portion of the target of the electron-ray tube functions to indicate by its shadow area, the proper tuning of the radio receiver, while weak signals are being received, and another portion thereof functions by reason of its resulting shadow area to give an indication when the receiver is receiving stronger signals. In order to operate this last-mentioned tube in the manner described, its two control electrodes govern shadow areas between the fluorescent areas on its target. Prior to this time, it has been necessary to provide in the radio receiver, a separate amplifying tube the only purpose of which was to operate the indicating, electron-ray tube satisfactorily.

In accordance with the present invention an arrangement has been provided whereby a special amplifying tube is unnecessary but instead, one of the tubes utilized for amplifying the incoming signal, is also employed in connection with a related circuit arrangement to apply voltages of the proper value to operate the indicating, electron-ray tube efficiently.

The various features and advantages of the invention will appear from the detailed description and claims when taken with the drawing in which

Fig. 1 is a fragmentary perspective view of an indicating tube;

Fig. 2 is a view of the fluorescent and shadow patterns on the target of the electron-ray tube;

Fig. 3 is a diagrammatic showing of a radio receiver circuit in which the electron-ray indicating tube of Fig. 1 and its related control network are employed and

Figs. 4 and 5 are charts useful in explaining the invention.

In Fig. 1 there is illustrated, an electron-ray indicating tube generally designated 5, which comprises a base 6 for the glass envelope and for suitable electrodes contained therein, having connection terminals (not shown) in the bottom of the base. These electrodes include a cathode 7, independent control electrodes 8 and 9, and an annular target 10. A heater is adapted to be connected through certain of said ter-

minals to a source of current, for heating the cathode 7 to incandescence so that it emits electrons. The stream of electrons emitted by the heated cathode are controlled by the two independent control electrodes 8 and 9, thereby varying the number of emitted electrons which strike the target 10. The upper surface of this target as illustrated is coated with a material adapted to fluoresce when bombarded by electrons so that in the operation of this indicating tube the areas 11 and 12 (Fig. 2) of the target will fluoresce while the areas 13 and 14 thereof will be dark to provide shadow angles. The area of the shadow angle 13 is governed by the voltage applied to the control electrode 8 which is connected in the circuit arrangement to give a more distinguishable indication on weak signals whereas the area of the shadow angle 14 is governed by the control electrode 9 connected into the circuit network to afford a more distinguishable indication when strong signals are being received.

The invention will best be understood by describing the operation of the circuit arrangement illustrated in Fig. 3. In this arrangement there is provided a well-known antenna system 15 on which signals to be received are intercepted. The intercepted signal is then amplified in a radio frequency amplifier 16. This amplifier is coupled to a well-known demodulator in which the frequency of the amplified signal is translated into a lower or intermediate frequency. The signal thus translated in frequency is introduced into an intermediate frequency amplifier including the vacuum tube 18 of the screen grid type, which includes a cathode 19, a control grid 20, a screen 21, a suppressor grid 22 and a plate or an anode 23. The translated signal from the demodulator is introduced into the input circuit of this intermediate amplifier stage which input circuit includes the control grid 20. The output circuit of this tube includes the plate or anode 23 which is coupled to a detector 24 wherein the amplified intermediate frequency signal is translated into an audio frequency signal. This detector is coupled to an audio frequency amplifier 25, the output of which is connected to a loud speaker 26 preferably of the moving coil type. The radio receiver also includes well-known automatic volume control means (not shown), whereby a negative voltage, proportional to the strength of the incoming signal is applied thru conductor 27 and resistor 28, to the control grid of a vacuum tube in an amplifying stage, for example, grid 20, to control automatically the volume of the reproduced sig-

nal to a desired volume. The portion of the radio receiver thus far described, may be of any well-known type in which an amplifying tube of the screened grid type is employed, in one of its amplifying stages.

In order to give a visual indication of the proper tuning of the radio receiver, the electron-ray tube 5 is connected in the circuit network of the radio receiver in such a manner that two variable shadow angles are developed on the fluorescent target 10 of the tube during the tuning of the radio receiver. One of these shadow areas or angles is intended to give a more distinctive indication on weak signals, whereas, the other shadow angle is intended to afford a more distinctive indication on strong signals.

It will be noted from the graph A of Fig. 4 that the shadow angles such as 13 or 14 are a maximum when zero voltages are applied to control grids 8 and 9 and are a minimum when a voltage of approximately 100 volts is applied to these control electrodes. It will further be noted from the graph B in Fig. 5 that the voltages on the screen 21 are proportional to the field strength of the incoming signal, in other words, proportional to the signal amplified in the intermediate amplifying stage under the control of the automatic volume control means. In the arrangement shown, the screen 21 of the intermediate frequency amplifying tube is connected in series with a resistor 29 having a resistance, for example of 82000 ohms, and thence to the terminal 30 of the power supply device, which terminal normally is at a voltage of 250 volts. Thus, the screen 21 is at a voltage of 100 volts when no signal is being amplified in the stage including the vacuum tube 18, but this voltage varies in accordance with the incoming signal as shown by the graph B.

In order to operate the electron tube to vary its shadow angles 13 and 14 in the manner described, the control electrodes 8 and 9 of this tube are connected to appropriate points on a circuit connected to the screen 21. This circuit which is connected at 35 to a 100 volt terminal of the power supply device, has included therein, a resistor having two sections 31 and 32, the section 31 having a resistance of .75 megohm while the section 32 may have a resistance of .25 megohm. It will be noted that the control electrode 8 is connected to the terminal 33 common to the two sections 31 and 32 while the control electrode 9 is connected to the terminal 34 of the section 32. By reason of the connections just mentioned, when no signal is being received, the terminals 33, 34 and 35 of the resistor sections will all be at the same voltage, namely 100 volts, consequently, the control electrodes 8 and 9 each have substantially like control effect at zero signal level so that equal shadow angles 13 and 14 will appear on the target. However, by reference to the chart of Fig. 5 it will be seen that for a given signal of low field strength, the voltage at the control electrode 9 will have a greater effect than the resulting voltage on the control electrode 8 and consequently, there will be a greater variation in the shadow angle 14 controlled by the electrode 9 than there will be in the variation of the shadow angle 13. However, on strong signals, the shadow angle 14 controlled by the electrode 9 will close and then the variation in the shadow angle 13, controlled by electrode 8, will give an indication of the proper tuning of the radio receiver.

What I claim is:

1. In combination, a signaling system including

a signal amplifying stage provided with a vacuum tube, said vacuum tube comprising electrodes including a cathode, a control grid, a screen and an anode, a power device, circuits from said power device to certain of said electrodes for energizing the same, an electron-ray tube having electrodes consisting of an electron source, a fluorescent target and two control electrodes, and means conductively connecting one of said circuits with said last-mentioned electrodes and responsive to the current in said last-mentioned circuit for differently governing said control electrodes.

2. In combination, a signaling system including a signal amplifying stage provided with a vacuum tube, said vacuum tube comprising electrodes including a cathode, a control grid, a screen and an anode, a power device, circuits including a screen circuit from said power device to certain of said electrodes for energizing the same, an electron-ray tube having an electron source, a fluorescent target and two control electrodes, and means conductively connecting said screen circuit with said control electrodes and responsive to the current in said screen circuit for differently governing said control electrodes.

3. In combination, a signaling system including a signal amplifying stage provided with a vacuum tube, said vacuum tube comprising electrodes including a cathode, a control grid, a screen and an anode, a power device, circuits from said power device to certain of said electrodes for energizing the same, an electron ray tube having an electron source, a fluorescent target and two control electrodes, said electron source being normally maintained at a voltage above ground potential and voltage dividing means conductively connecting one of said circuits with said control electrodes for simultaneously developing voltages varying as different functions of the current in said circuit to differently govern said control electrodes.

4. In combination, a signaling system including a signal amplifying stage provided with a vacuum tube, said vacuum tube comprising electrodes including a cathode, a control grid, a screen and an anode, a power device, circuits including a screen circuit from said power device to certain of said electrodes for energizing the same, an electron ray tube having electrodes consisting of an electron source, a fluorescent target and two control electrodes, and voltage dividing means conductively connected to said screen circuit for simultaneously developing voltages varying as different functions of the current in said screen circuit to differently govern said control electrodes.

5. In combination, a signaling system including a signal amplifying stage provided with a vacuum tube, said vacuum tube comprising electrodes including a cathode, a control grid, a screen and an anode, a power device, circuits including a screen circuit from said power device to certain of said electrodes for energizing the same, an electron-ray tube having an electron source, a fluorescent target and two control electrodes, a branch circuit connected to said screen circuit and to said power device at points thereon at different voltages during the amplification of signals by said amplifying stage but at substantially equal voltages while no signals are being amplified by said stage, voltage dividing means connected into said branch circuit, and means for conductively applying to said control electrodes, differential voltages developed by said voltage dividing means.

6. In combination, a signaling system including a signal amplifying stage provided with a vacuum tube, said vacuum tube comprising electrodes including a cathode, a control grid, a screen and an anode, a power device, circuits including a screen circuit from said power device to certain of said electrodes for energizing the same, an electron-ray tube having an electron source, a fluorescent target and two control electrodes, a branch circuit connected to said screen 10

circuit and to said power device at points thereon at different voltages during the amplification of signals by said amplifying stage but at substantially equal voltages while no signals are being amplified by said stage, and a resistor connected in series in said branch circuit, said control electrodes being connected respectively to said resistor at points therein spaced from the connection of said resistor to said power device.

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