

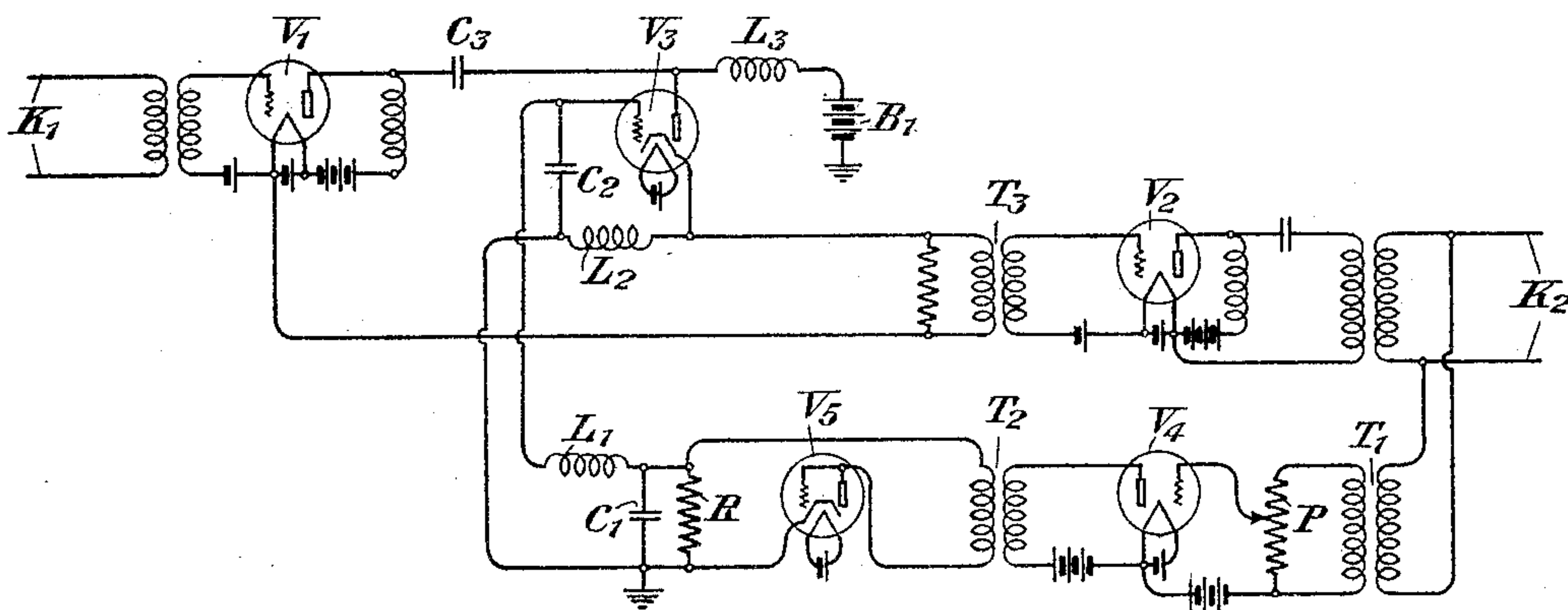
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GAIN CONTROL APPARATUS

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GAIN CONTROL APPARATUS

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This invention relates to signaling systems. More particularly, this invention relates to apparatus for the control of the level of signaling energy.

5 One of the objects of this invention is to automatically control the gain of a signal translating system. Another of the objects is to maintain the level of signaling energy constant in value or variable within very narrow
10 limits.

The arrangements of this invention are believed to have many advantages over prior arrangements for the control of the gain of signaling systems. The elements are so set
15 up as to cause substantially no modulation or distortion of the transmitted signals or currents, the gain of which the apparatus is intended to control. Especially will the modulation or distortion be negligible if the level
20 of the transmitted signals is quite low. This invention is particularly adaptable to voice frequency circuits and, in general, to multi-channel carrier amplifiers or other systems. No moving parts are required.

25 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 merely for the purpose
30 of illustration.

Referring to the drawing, the reference characters V_1 and V_2 designate two vacuum tubes forming an amplifying system, the gain of which is to be automatically controlled.
35 This amplifying system transmits signaling currents from an input circuit K_1 to an output circuit K_2 . A tube V_3 of the heater type forms an essential element of the control apparatus, as will become apparent from the detailed description hereinafter following, and
40 it will be shown that the plate electrode and the heater of tube V_3 are connected in series in a circuit interposed between the vacuum tubes V_1 and V_2 . The impedance between
45 these elements will be varied in accordance with the level of energy transmitted by the system.

Part of the energy in the output circuit K_2 is transmitted to the amplifier V_4 through
50 a transformer T_1 and a potentiometer P .

The amplified energy is then transmitted through another transformer T_2 to a rectifying tube V_5 which is also of the heater type. The rectifying circuit includes the secondary
55 winding of the transformer T_2 , the plate electrode and the cathode of the tube V_5 and a resistance R . The rectified current will produce a voltage across the terminals of the resistance R and this voltage will vary in accordance with the level of the energy trans-
60 mitted by circuit K_2 to the amplifier V_4 . It will be shown that as the voltage impressed across the resistance R increases above or decreases below some predetermined value, cor-
65 responding changes will be made in the impedance between the plate electrode and the cathode of the tube V_3 .

The grid electrode of the tube V_3 is connected to the upper terminal of the resistance R through a winding L_1 . Moreover, resist-
70 ance R is shunted by a condenser C_1 . The lower terminal of the resistance R is connected to the heater of the tube V_3 through a winding L_2 and this winding, together with a condenser C_2 , are interposed in a circuit be-
75 tween the grid electrode of the tube V_3 and its cathode. It will be apparent that the winding L_1 and the condenser C_1 form a section of a low-pass wave filter which is intended to suppress alternating currents in
80 order that the bias of the grid electrode of the tube V_3 may be effected only by direct current potentials. Other sections may be added to this filter and these will, of course, include further series inductive elements and shunt
85 capacitive elements.

The plate electrode and the cathode of the tube V_3 are connected in series with the circuit including condenser C_3 and the primary winding of transformer T_3 .
90 The battery B_1 supplies the necessary positive potential to the plate electrode of the tube V_3 through winding L_3 . The condenser C_3 prevents the potential of the battery B_1 from reaching the plate electrode of the tube V_1 .
95

As the current rectifier by the tube V_5 increases above a predetermined value, the voltage drop in resistance R will increase above its normal value. Then there will be an increase in the bias of the grid electrode of the
100

tube V_3 . Hence, the impedance between the plate electrode and the cathode of the tube V_3 will be increased and, consequently, the loss introduced in the circuit interposed between the tubes V_1 and V_2 will be correspondingly increased.

As the rectified current flowing through the resistance R is reduced below its normal, predetermined value, there will be a corresponding decrease in the bias of the grid electrode of the tube V_3 . Then the impedance between the plate electrode of tube V_3 and its cathode will be correspondingly decreased and the loss interposed in the circuit between the tubes V_1 and V_2 will, accordingly, be reduced.

While this invention has been shown and described in one particular arrangement merely for the purpose of illustration, it will be understood that the general principles of this invention may be applied to 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 gain control system, the combination of a circuit transmitting signals, a tube having elements forming a space discharge path and a control electrode, the elements forming the space discharge path being connected directly in series in said circuit, and means responsive to variations in the level of the energy transmitted through said circuit to continuously produce a rectified potential and thereby vary the potential applied to the control electrode of said tube, the control electrode of said tube being affected solely by the rectified potential.

2. In a system for controlling the gain of transmitted signals, the combination of an input circuit, an output circuit, elements forming a space discharge path connected directly in series with said input and output circuits, means for continuously producing a direct current voltage always variable in accordance with the level of the transmitted signals, and means solely responsive to said direct current voltage variations to simultaneously change the impedance of said space discharge path.

3. In a signaling system, the combination of a circuit transmitting signals, a tube having at least three electrodes one of which is a control electrode, two of the electrodes of said tube normally presenting a predetermined impedance and being connected directly in series with said circuit, a source of direct current potential for said control electrode, and continuously acting means responsive to variations in the level of the energy transmitted by said circuit to simultaneously vary the direct current potential applied to said control electrode, said control electrode being affected solely by the varying direct current potential.

4. In a signaling system, the combination of a circuit transmitting signals, a tube having at least three electrodes one of which is a control electrode, two of the electrodes of said tube presenting a space discharge path and being connected directly in series in said circuit, means for continuously rectifying a portion of the current flowing through said circuit, and means for producing a direct current potential of a value proportional to the magnitude of the rectified current and impressing said direct current potential on the control electrode of the tube, said control electrode being affected solely by the magnitude of the rectified current.

In testimony whereof, I have signed my name to this specification this 15th day of December 1930.

WILLIAM H. T. HOLDEN.