

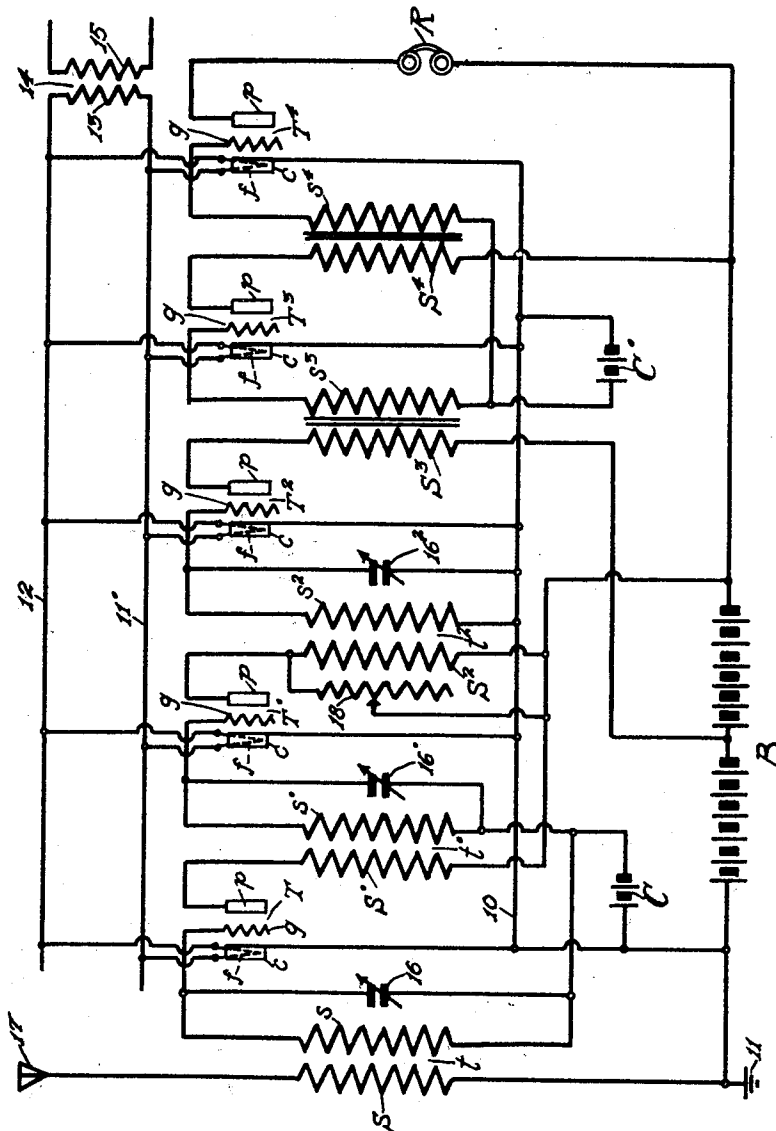
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RECEIVING CIRCUITS

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UNITED STATES PATENT OFFICE

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RECEIVING CIRCUITS

Application filed January 22, 1926. Serial No. 82,905.

This invention relates to improvements in radio receiving circuits using radio tubes and particularly to means for controlling or altering the output volume of the circuit.

5 The principal object of the invention is the provision, in a receiving circuit employing tubes having cathodes of comparatively large mass, of simple means for controlling the volume which will cause no undesirable distortion of the sound waves received, yet, will
10 operate to vary the volume accurately and substantially instantaneously in accordance with the adjustment of the volume controlling means.

15 It is believed the further disclosure of the invention will be understood most readily from a detailed description thereof taken in connection with the accompanying drawings, which schematically indicate the essential
20 elements of a receiving circuit embodying the present invention.

Referring now to the drawings, T, T', T², T³, and T⁴ represent five vacuum or radio tubes of the character in which the cathode is
25 heated by a heater wire which may be electrically separate and distinct therefrom as disclosed in an application of Frederick S. McCullough Serial No. 27,679, filed May 4, 1925. Each of these tubes T, T', etc. comprises a cathode *c*, a heater *f* for heating the
30 cathode, a grid *g*, and an anode or plate *p*.

The cathodes *c* are connected in multiple to the conductor 10 which is connected to ground at 11. The filaments *f* are bridged in
35 parallel across the conductors 11' and 12 which are joined by the secondary 13 of induction coil 14, the primary coil 15 of which is in series with an appropriate source of alternating current whereby the heaters *f*
40 and consequently the cathodes may be heated.

The grids *g* of tubes T and T' are joined to the positive pole of battery C through the secondary *s* and *s'* of the transformers *t* and
45 *t'*. The grid of tube T² is joined through the secondary *s*² of the transformer *t*² to the conductor 10 and consequently to ground. The grid of tubes T³ and T⁴ are joined through the secondaries *s*³ and *s*⁴ to the positive or
50 non-grounded side of battery C'. The plates

p of tubes T, T', T³ and T⁴ are all joined to the positive pole of the whole battery B through the primaries S', S², S⁴ respectively. The plate of tube T² is joined to the battery B, intermediate its ends through the primary
55 S³.

In parallel with the secondary windings *s*, *s'*, *s*² are the condensers 16, 16' and 16² respectively. The usual antenna 17 is indicated
60 which is joined to ground at 11 through the primary S of transformer *t*. The receiver R may be of any desired type such as the usual loud speaker or other device.

It may be here explained that each of the cathodes employed with the tubes herein disclosed comprises a small cylindrical tube
65 having a porcelain lining and heater therein. On account of this structure the mass of the cathode does not permit it to respond readily to the operation of a rheostat placed in series with the heater and primary of the induction
70 coil. The present invention, therefore, provides a variable resistance 18 in parallel with the primary S² of the transformer *t*² whereby the volume of the output of the receiving
75 circuit may be readily controlled without distortion of the sound waves. The resistance 18 being in parallel with the resistance of the primary S² operates to vary the effective resistance between the plate and battery
80 B and also operates to shunt out or by-pass variable portions of the current which would otherwise pass through the primary S². Thus the adjustment of the variable resistance or rheostat 18 operates to effectively
85 control the volume of the sound oscillations passing to the receiver R.

The present invention provides a very simple and convenient means whereby the output volume of the circuit may be regulated and wherein the changes in volume
90 follow instantaneously upon the adjustment of the resistance 18. Thus when the volume adjusting knob is moved back and forth, there is no lag in the corresponding changes
95 in volume.

It is to be understood that the circuit herein disclosed is of the character in which two stages of amplification of the radio frequency oscillations are provided by the tubes T and
100

T¹ and two stages of amplification of the audio frequency oscillations are provided by the tubes T³ and T⁴ and associated circuits, tube T² being the detector tube.

It is to be understood that the disclosure in the accompanying drawing is merely diagrammatic and that the present invention may be employed with many arrangements other than the single embodiment herein disclosed. The invention, therefore, should be limited only by the scope of the appended claims.

Having described my invention, what I claim is new and desire to secure by Letters Patent of the United States is:

1. A receiving circuit including an audion amplifier, a cathode for said audion amplifier, a U-shaped heater adapted to receive alternating current for heating said cathode to render the same active, said cathode being relatively slow to respond to changes in the heater current, an anode for said audion amplifier, a grid, a source of direct current connected between the grid and the uni-potential cathode to potentialize the same, a source of battery current connected between said cathode and anode, a second audion amplifier, a transformer connecting said first audion amplifier to said second audion amplifier, and variable means for regulating the flow of direct current from said source between said anode and cathode to control the strength of the signal supplied to the grid of the second audion amplifier by said transformer.

2. A receiving circuit including an audion amplifier, a cathode for said audion amplifier, a U-shaped resistance wire for heating said cathode to render the same electronically active, a transformer for supplying alternating current directly to the said resistance wire, said cathode structure being such that it has a time constant and is relatively slow to respond to changes of heater current, an anode for said audion amplifier, a winding connected in a circuit between said cathode and anode, a source of current included in said circuit, and a variable resistance having one of its terminals connected to said source of current and its other terminal connected to one terminal of said winding and controlling the strength of the oscillations adapted to be repeated through said winding by said audion amplifier thereby controlling the volume output of the receiving circuit.

3. A receiving circuit including an audion amplifier having an indirectly heated cathode which is relatively slow to respond to voltage changes of heater current, a control electrode for said audion, a source of battery current connected between said control electrode and said cathode for potentializing the same, a source of direct current supply a circuit including said source of cur-

rent supply extending from the cathode of said amplifier to the anode thereof, a winding included in said circuit, and a variable resistance connected in the cathode anode circuit for controlling the signal repeated by the amplifier through said winding.

In testimony whereof I have signed this specification.

HIRAM D. CURRIER.