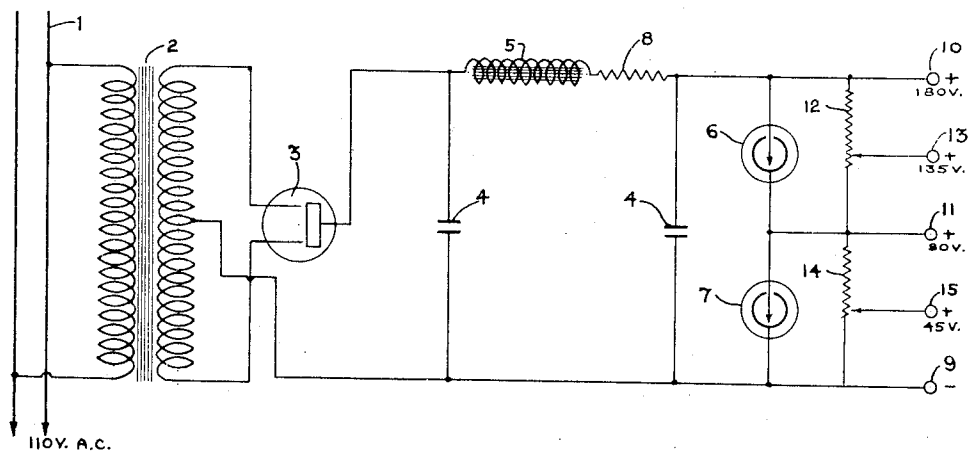


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H. C. RENTSCHLER
VOLTAGE REGULATING SYSTEM

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VOLTAGE REGULATING SYSTEM

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This invention relates to a system for obtaining constant voltage of different magnitudes from a variable voltage source and more particularly to a voltage regulating system for supplying the plate current for radio receiving apparatus at a constant voltage from a source of rectified and filtered alternating current.

One of the objects of the present invention is to provide an efficient and reliable means for obtaining from a fluctuating voltage source a series of voltages of different magnitudes and permitting certain of said voltages to be adjusted without affecting others thereof.

Another object is to provide a simple and effective source of current supply for the plate circuit of a multi-stage radio receiving apparatus which will permit voltages of different values to be supplied to the various stages from a source of constant or fluctuating voltage and in which adjustment of the voltage applied to one stage will not vary the voltage applied to the other stages.

Other objects and advantages will hereinafter appear.

In the present day construction of radio receiving apparatus it is the very usual practice to provide one or more stages of radio frequency amplification followed by a stage of detection and a plurality of stages of audio frequency amplification. Each of these stages require, in order to obtain the highest quality and maximum sensitivity, plate voltages of different values. For instance, in certain types of receiving sets best results are obtained when a plate potential of about 90 volts is supplied to the radio frequency amplifying tubes, 45 volts to the detector tube, 135 volts to the intermediate audio frequency amplifying tubes and 180 volts to the last stage of audio frequency amplification for supplying a large volume of undistorted output for the loud speaker.

When employing as the source of plate current rectified and filtered alternating current through the use of so-called "B" eliminators, the various voltages desired for the different tubes is obtained by the use of resistances of varying values. However, ad-

justment of the voltage supplied to one tube or set of tubes, varies the voltage supplied to the other tubes and consequently it is difficult to obtain an accurate adjustment of the voltage supplied to each tube. Moreover, fluctuations in the output voltage of the current supply apparatus causes undesirable fluctuations in the voltages applied to each stage of the receiving apparatus.

In accordance with the present invention a plurality of regulating devices are connected in series with each other across the circuit. These voltage regulating devices are designed so as to maintain a constant voltage across the terminals thereof, thus providing an invariable source of potential, the value of which depends upon the characteristics of the regulating devices. By suitably choosing the characteristics of the voltage regulator device a plurality of constant voltages of the desired values may be obtained and through suitably disposed resistances, voltages intermediate the terminal voltages of the regulating devices may also be obtained and such intermediate voltages adjusted to any desired value without affecting the other voltages applied to the receiving apparatus.

In order that this invention may be more fully understood reference will be had to the accompanying drawing in which the single figure represents a system for supplying a series of voltages of different values, such as for the operation of radio receiving apparatus.

Alternating current supplied from the mains 1 is stepped up by suitable transformer 2 and rectified by any suitable rectifier 3. The form shown diagrammatically is of the gaseous discharge type operating on the point-to-plate principle. A rectifier of this nature is described and claimed in copending application of Rentschler et al., Serial No. 154,987, filed Dec. 15, 1926 and entitled Rectifier. The direct current obtained from the rectifier 3 is smoothed out and rendered substantially uniform in value by the capacities 4 and inductance 5.

A plurality of voltage regulating devices 6 and 7 are connected across the line and maintain the voltage constant irrespective of

fluctuations in the voltage of the alternating current source or of changes in the load. A resistance 8 may be provided for limiting the current to the desired maximum value. The
 5 current regulating devices preferably are of the gaseous discharge type such as described in applicant's copending application Serial No. 59,986, filed October 2, 1925, and entitled Electric discharge device. Briefly, such de-
 10 vices preferably comprise a cathode of large effective area and an anode of small area, the cathode consisting at least in part of misch metal of the cerium group of rare earth metals and the gaseous filling being argon
 15 at a pressure of from 3 to 7 mms. of mercury. Such devices have desirable characteristics, the voltage across the terminals being approximately 90 volts for considerable fluctuations in the load and the operating and start-
 20 ing potentials being relatively close together so that the device comes into operation readily.

In the embodiment shown, two such devices are connected in series across the line, thus
 25 making the total voltage difference between the terminals 9 and 10 approximately 180 volts and between the terminals 9 and 11 approximately 90 volts. A resistance 12 may be connected across the terminals 10 and 11
 30 for supplying a voltage intermediate that of terminals of the regulator 6, through a tap 13 and a similar resistance 14 may be joined across the terminals 11 and 9 to supply a voltage intermediate that of the termi-
 35 nals of the regulator 7, through a tap 15. With such an arrangement the taps 13 and 15 may be adjusted to supply any intermediate voltage as for operating the detector tubes and intermediate stages of audio fre-
 40 quency amplification without effecting each other or without varying the voltage obtained at the terminals of the regulating devices 6 and 7. Of course, if desired to employ higher voltages a third regulator might be
 45 joined in series with the regulator 6 and 7 and a maximum potential of 270 volts obtained.

It will be noted that the system described provides a source of supply of various volt-
 50 ages from a single voltage source, some of which voltages may be varied without effecting others and that such voltages are not effected by fluctuations in the alternating current source or in the load.

Obviously, many changes and modifica-
 55 tions might be made in the arrangement shown without departing from the invention and I do not desire to be limited to the exact arrangement shown.

60 What is claimed is:

1. A system for obtaining a plurality of substantially constant voltages of different magnitude from an electric current source having a variable voltage, comprising a plu-
 65 rality of glow discharge tubes of substan-

tially constant voltage drop connected in series across said source, the sum of the voltage drop of all tubes being less than the minimum potential of said source and a resistance connected in shunt with one of said tubes for obtaining potentials intermediate the terminal voltages of said tube, whereby the load connected across one voltage may be changed or adjusted without producing any substantial change in the voltage of the other circuits.

2. A system for obtaining a plurality of substantially constant voltages of different magnitude from an electric current source having a variable voltage, comprising a plurality of glow discharge tubes of substantially constant voltage drop connected in series across said source, the sum of the voltage drop of all tubes being less than the minimum potential of said source and a resistance connected in shunt with each of said tubes for obtaining potentials intermediate the terminal voltages of said tube, whereby the load connected across one voltage may be changed or adjusted without producing any substantial change in the voltage of the other circuits.

In testimony whereof, I have hereunto subscribed my name this 19th day of January, 1927.

HARVEY CLAYTON RENTSCHLER.