

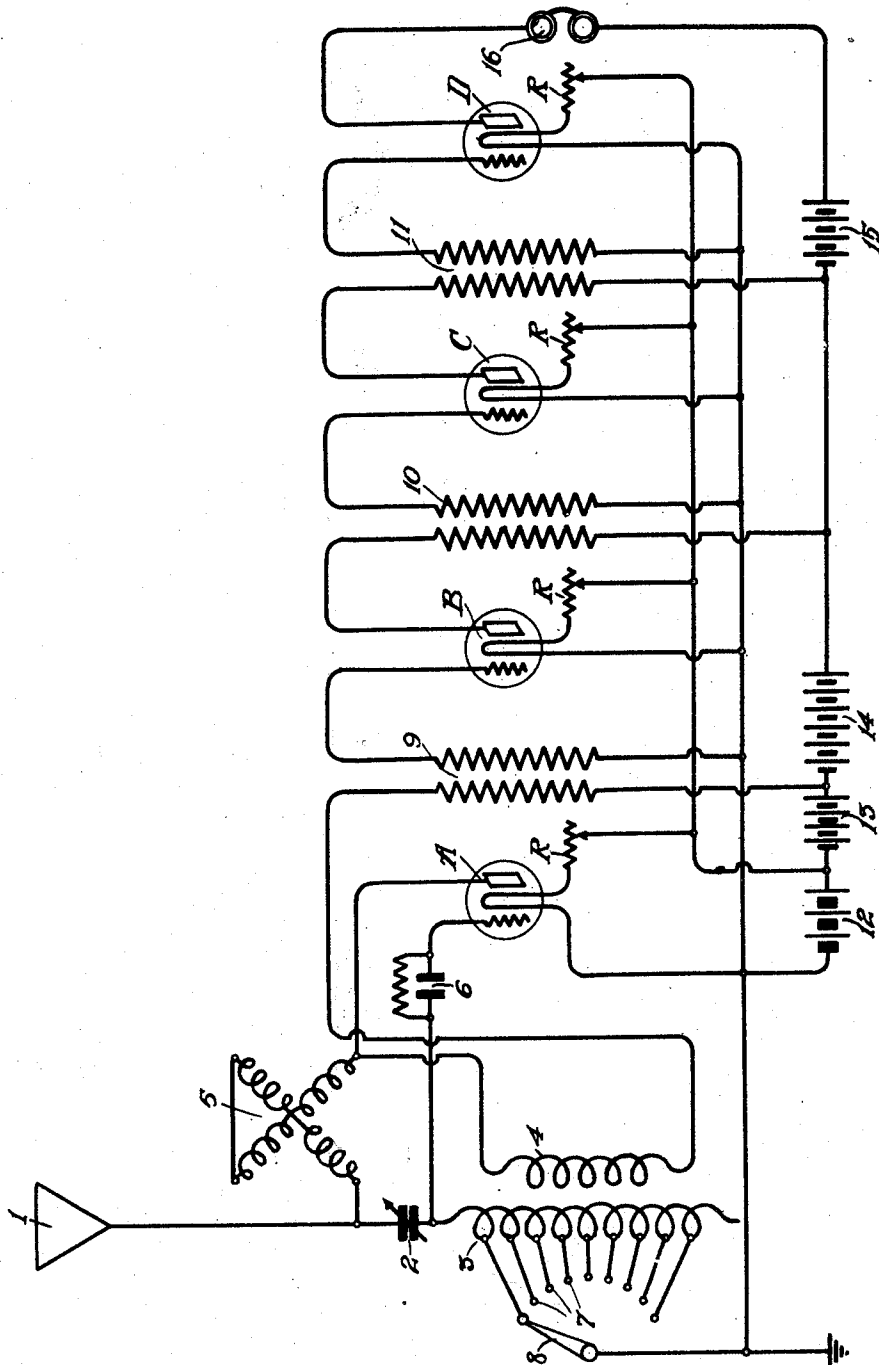
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RECEIVING CIRCUIT

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UNITED STATES PATENT OFFICE

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RECEIVING CIRCUIT

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My invention has to do with systems using high frequency oscillatory currents for signaling purposes and is directed to a certain improved arrangement for the intensification of weak signals and for accurate tuning of the circuits and instrumentalities employed. In the accompanying diagram, I have illustrated the invention as embodied in a preferred form of signal receiving circuit although it is not limited to receiving purposes only. The system as shown, may be employed for short-wave reception in which case the tube A is used as the detector, or the system may be used for long wave reception by which I mean reception of waves from say 10,000 meters up in which case the rheostat for tube A is turned down and the tube B is used as the detector tube for the long waves.

Referring now to the drawing the system there illustrated for receiving purposes has in series with antenna 1 the usual tuning condenser 2 and the primary 3 of the usual variocoupler with taps connected to contacts 7, with which contacts is associated the rotary switch lever 8 connected to ground. The secondary 4 of the variocoupler is rotatably supported with reference to the primary 3 so that the closeness of the coupling between 3 and 4 may be varied as desired. Between condenser 2 and primary 3, a tap having connected in it the grid condenser 6 and associated grid leak, leads to the grid of detector tube A whose plate connects with secondary 4 and the primary of transformer 9 and thence to plate battery 13, the whole forming what is often referred to as a regenerative feed-back circuit. The filament of detector tube A is connected to the storage battery 12 through rheostat R in the usual way, and the same battery 12 is used to heat the filaments of the amplifier tubes B, C, and D, each of said latter tubes having its rheostat R. Bridged from the antenna to the plate, is the variable inductance or variometer 5 and this is a most important element in the present invention. When the circuit illustrated, is used for relatively short wave reception as, for example, that of the present day broadcasting stations, condenser 2 and the lever 8 associated with variocoupler primary 3 are adjusted to bring in the signals and then secondary 4 and variometer 5 are adjusted to control the sharpness of tuning and the volume of reception, condenser 2 being also adjusted as necessary in the operation.

The incoming signals when tuning is properly made, are effective upon the grid of tube A to vary the electron flow between plate and filament in the usual manner and the plate potential variations are brought back to the grid by the feed-back coil 4 which serves to impress said variations upon the grid of tube A by way of primary 3 and condenser 6. The variometer 5 being connected to the plate of tube A serves to accurately tune the plate variations and bring them into resonance with the impressed oscillations so that electrostatic regeneration is effective upon the grid from the plate of tube A by the agency of condenser 2. At the same time a second path is provided for the oscillations impressed upon the antenna 1. This path may be traced through variometer 5, the plate of tube A and thence to the filament of tube A. This arrangement provides supplementary means for rectifying the oscillatory currents impressed upon the antenna and adds to the efficiency of the system as a whole as well as sharing in the regenerative process of the organization.

The rectified currents of the detector-stage apparatus are amplified in the usual manner by the audio frequency transformers 9, 10 and 11 and their associated amplifying tubes B, C and D, the telephonic receiving instrument being indicated at 16. At 13, 14, and 15 are indicated the usual so-called B batteries connected in the usual manner to the plates of the various tubes.

By adjusting the rheostat R associated with the tube A so that no current flows through the filament of the tube it will be rendered inoperative as to its normal functioning and the oscillations from antenna 1 of such relatively low lengths as to normally come within the scope of the tuning agencies associated with tube A are, of course, prevented from being rectified due to the condition of tube A and will no longer be audible

in the telephonic receiving instrument 16. By means of the tap from antenna 1 which leads through the variometer 5, the oscillations impressed on the antenna have a path which leads them direct to the step-up transformer circuits. The primary and secondary windings of such transformers, being of the usual types are effective now as tight coupled tuning inductances and on account of the very large number of turns used in amplifying transformers the length of wave for which the system is adapted to be tuned is enormously increased. The tuning circuit in such a case comprises the variometer 5, the secondary 4 and the primary and secondary windings of the transformer 9. Using a well known type of audio frequency amplifying transformer and by properly adjusting the tuning condenser 2 in the antenna lead any of the principal long wave length stations may be readily heard, such, for example, as Carnarvon, Wales; Nauen, Germany; Nantes, France; Annapolis, Md., etc.

With the tube A having its rheostat adjusted so that no current flows in the filament and with the tuning means just described the tube B serves as the detector tube and the tubes C and D serve as amplifiers for the signals received on waves of from ten to twenty thousand meters.

In the appended claims, I desire not to be limited to the precise arrangements and uses shown and described as the invention may be employed in various relations, but what I do claim and desire to protect by Letters Patent of the United States is:

1. A vacuum tube wireless system including an audion tube, an antenna, means for tuning said antenna including a variable condenser and a variable inductance, a grid element for said tube conductively connected between said variable condenser and said variable inductance to the antenna circuit, a plate element for said tube conductively connected to said antenna and receiving a portion of the impressed oscillations independently of said grid, a tuning device in said antenna plate circuit for assisting in the resonating of the receiving circuit to the incoming oscillations, and a winding in the plate cathode circuit in inductive relation to the variable inductance in the antenna circuit for sustaining the oscillations impressed upon the grid.

2. An audion wireless circuit including an audion tube, an antenna, tuning apparatus including a variable condenser and a variable inductance connected thereto, a grid for said audion conductively connected with said antenna between said variable condenser and said variable inductance, a plate for said audion tube conductively connected to said antenna, a variable inductance in said plate antenna circuit, a reproducing device coupled to the plate cathode circuit, and a winding in said plate cathode circuit mounted in induc-

tive relation to the variable inductance in the antenna circuit.

3. A wireless circuit including an oscillation receiver, a variable condenser and a variable inductance connected to the oscillation receiver, an audion tube provided with a grid element connected directly to the oscillation receiver between the variable condenser and variable inductance, a plate element for said tube having a direct connection to said oscillation receiver between said oscillation receiver and said variable condenser, a continuously variable tuning device in said plate oscillation receiver circuit for tuning purposes, a branch plate circuit extending from said plate to the cathode of said audion tube and a feed-back winding connected in said branch circuit inductively related to the variable inductance in the antenna circuit for sustaining impressed oscillations.

Signed by me at New York in the county of New York and State of New York, this 20th day of February, 1923.

SAMUEL SEAMAN JONES.