

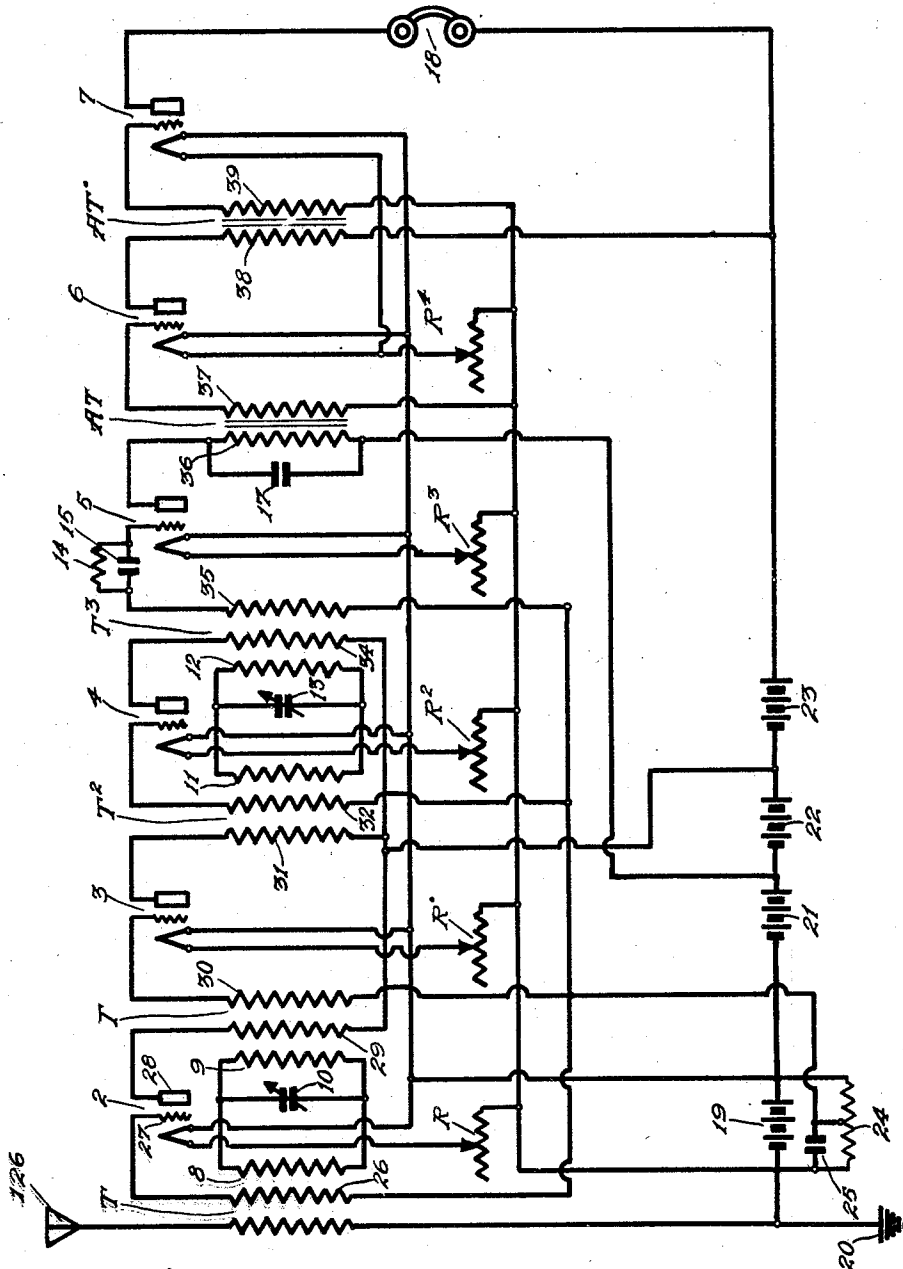
May 31, 1932.

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1,860,996

RECEIVING CIRCUIT

Filed April 20, 1925



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UNITED STATES PATENT OFFICE

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RECEIVING CIRCUIT

Application filed April 20, 1925. Serial No. 24,321.

My invention relates to wireless telegraphy and telephony and resides particularly in certain novel circuit arrangements and apparatus for systems of this character.

5 My invention as shown is adapted for the reception of radio signals, however, it is not limited to receptive use only. It is an object of my invention to provide a novel and improved organization of the elements comprising such a system which arrangement provides sharpness of tuning, ease of tuning, power, and clearness in respect to the signals received.

15 My invention as illustrated in the circuit diagram of the accompanying drawing is shown in a receiving circuit arrangement having radio frequency amplification, and is particularly illustrated in connection with so called tuned radio frequency amplification, 20 in which inductances are tuned or controlled by variable capacities to permit the amplification of the desired signals and the exclusion of the undesired signals. Prior systems of this character are generally provided with 25 one tuning device or condenser per stage of radio frequency amplification. Such systems are objectionable in that they necessitate one tuning device per stage of amplification, and where it is desired to use several stages of 30 amplification, it is necessary to adjust a tuning device or condenser for each stage, which may make the tuning rather complicated.

It is an object of my invention to reduce the number of tuning devices required for a 35 given number of stages of radio amplification. I accomplish this result by using one tuning device for two or more stages of amplification.

Referring particularly to the drawing T, 40 T', T² and T³ represent, radio frequency transformers which may be of the air core type. Each of these transformers comprise a primary winding, a secondary winding and a tertiary winding. AT and AT' represent 45 audio frequency iron core transformers. The radio frequency tubes 2, 3 and 4, as well as the detector tube 5 and the audio frequency tubes 6 and 7 are each provided with the usual filament, grid and plate elements. I provide 50 rheostats R, R' and R² for controlling the

heating current applied to the filaments of the radio frequency audion tubes 2, 3 and 4 respectively. A rheostat R³ is provided for controlling the supply of heating current to the filament of detector tube 5, and a rheostat R⁴ for controlling the supply of heating current to the filaments of tubes 6 and 7. 55

The tertiary windings 8 and 9 of the transformers of the first two stages of radio frequency amplification, are connected together and bridged by a variable condenser 10, likewise, the tertiary windings 11 and 12 of the transformers of the third stage and the detector stage are connected together and bridged by a variable tuning condenser 13. 60 I provide the usual grid leak 14 and grid condenser 15 in the grid circuit of the detector tube 5. The primary of the audion frequency transformer AT is bridged by a small condenser 17. At 18, I have shown a pair of receivers in the plate circuit of the second audio tube. This may be replaced by the usual loud speaker now in use. The battery 19 is the usual A battery for supplying heating current to the filaments of the audion tubes, one pole of which may be grounded at 20. The batteries 21, 22 and 23, are the usual secondary or B batteries for supplying current to the plates of the audion tubes. 65 70 75

I have shown at 24, a resistance connected across the primary battery 19, the center point of which is tapped and connected to the grid returns of the tubes 2, 3, 4 and 5. Connected to the center point of said resistance is a by-pass condenser 25, the other terminal of which connects to ground 20. At 126, I illustrate the usual antenna or collector device which is used to pick up the signals that are to be received. 80 85

Having described in general the apparatus used in connection with my arrangement, I will now briefly describe the functioning of the same. 90

The collector 126, is connected through the primary winding of the transformer T to ground and the signals which are operative on said collector antenna 126 pass through said primary winding to ground. These signals are reproduced in the secondary winding 26 of the transformer T and 100

are operative upon the grid 27 of the audion tube 2. The audion tube 2 operates to repeat these signals from the grid 27 thereof to the plate 28 thereof and through the primary winding 29 of the transformer T' to one pole of the B battery 22, which battery is connected in series with the other B batteries 21 and 23. The signals are inductively reproduced in secondary winding 30 of the transformer T' and are operative on the grid of the audion tube 3, and are repeated thereby through the primary winding 31 of the transformer T². Again the impulses are inductively operative through the secondary winding 32 of the transformer T² upon the grid of audion tube 4, which repeats the signals through the primary winding 34 of the transformer T³. Here again the signals are operative through the secondary winding 35 of transformer T³ upon the grid of the detector tube 5. The detector audion tube 5 relays the signal through the primary 36 of the audio frequency transformer AT, where they are inductively repeated in the secondary 37 thereof, and are operative upon the grid of the audion tube 6. The audion tube 6 repeats the signals through the primary 38 of the audio frequency transformer AT, and the signals are then inductively reproduced, upon the grid of audion tube 7, through the secondary 39 of audio transformer AT'. The audion tube 7 reproduces the signals upon the plate circuit of the audion tube 7 which includes the reproducing device 18.

Referring now to transformers T and T', as before noted, the tertiary windings of these transformers are bridged by a variable condenser 10. This arrangement permits the tuning of the tertiary windings 8 and 9, which tuning inductively tunes the secondaries 26 and 30 of the transformers T and T' to permit the passage of only the desired signals and to exclude the undesired signals. The same is true of the variable air condenser 13 which tunes the tertiary windings 11 and 12 of the transformers T² and T³, which in turn inductively tune the secondaries 32 and 35 of the transformers T² and T³, to resonance with the desired incoming signal thereby excluding the undesired signals. It is thought unnecessary to go into further detail of operation as the above description is thought sufficient to enable any one skilled in the art to practice the invention.

From the foregoing, the ease of control of the tuning, will readily be appreciated as it is only necessary to operate the variable condensers 10 and 13, each of which tunes two stages of amplification to adjust the set to any desired signal. The condenser 10 tunes the tertiary windings in multiple of the transformers T and T' and the condenser 13 tunes the tertiary in multiple of the transformer T² and T³. Of course, the

rheostats R', R², R³ and R⁴ are adjusted to supply the correct heating current to the filaments of the audion tubes. I have found it possible to control more than two windings in multiple by one condenser.

I have found with the two main control variable condensers 10 and 13 that three stages of radio frequency amplification and a detector stage may be readily controlled to receive signals with great selectivity, clearness and amplification.

While I have shown a specific circuit arrangement, I do not desire to be limited to the exact arrangement shown but aim to cover all such changes and modifications as come within the spirit and scope of the appended claims.

What I claim as new and desire to secure by United States Letters Patent is:

1. A system of the character described including a plurality of transformers having primary, secondary and tertiary windings, and a single device having only one rotatable and only one stationary element for tuning said tertiary windings thereby simultaneously inductively tuning said secondary windings to a predetermined desired frequency.

2. A system of the character described including a plurality of transformers having primary, secondary and tertiary windings, and a single condenser bridged across said tertiary windings for simultaneously inductively tuning said secondary windings to predetermined desired frequencies.

3. A system of the character described including a multistage amplifying unit provided with transformers having input and output circuits, audion tubes having elements connected to said input and output circuits of said transformers, tertiary windings for said transformers, and a single device connected in multiple with said tertiary windings for simultaneously tuning said tertiary windings, the tuning of said tertiary windings inductively tuning said output windings to resonate the same to a desired predetermined frequency.

4. An amplifying system of the character described including a pair of transformers having input and output windings, audion tubes associated with and having elements connected to the said windings of said transformers, tertiary windings for said transformers, and a tuning device with a single stationary element for simultaneously tuning said tertiary windings thereby inductively tuning said output windings to resonate the same to a desired frequency.

5. A system of the character described including a pair of transformers having primary and secondary windings, audion tubes having elements connected to the said windings of said transformers, and a tertiary winding on each of said transform-

ers adapted to be tuned by a device having one movable and only one stationary element to inductively tune said secondary windings, the tuning of said tertiary winding constituting the sole means for tuning the secondary windings to resonate the same to desired frequency.

tuned amplification, audion tubes having elements, transformers having windings, circuits connecting the elements of said tubes to the windings of said transformers, other windings for said transformers, means including tuning devices having one stator element and only one rotor element bridged across a plurality of said other windings for tuning said other windings of certain of said transformers thereby automatically simultaneously tuning the said other windings of the remainder of said transformers.

Signed by me at Chicago, in the county of Cook and State of Illinois, this 17th day of April, 1925.

HIRAM D. CURRIER.

6. A system of the character described including a plurality of stages of tuned amplification including transformers having primary and secondary windings, audion tubes having elements connected to the said windings of said transformers, tertiary windings for said transformers, and a single tuning device for multiple tuning of a plurality of said tertiary windings of said transformers to tune said transformers.

7. A system of the character described including a plurality of stages of tuned radio frequency amplification, transformers for said stages of amplification, and means including a single device having one movable and only one stator portion connected across windings associated with said transformers for simultaneously inductively tuning said transformers, the said last means constituting the sole means for tuning said transformers to a desired predetermined frequency.

8. A system of the character described including a plurality of stages of amplification involving audion tubes and transformers, circuit connections extending from the windings of said transformers to the elements of said tubes, and a single tuning device having one movable and only one stator element for simultaneously resonating windings of said transformers for inductively tuning said plurality of stages of amplification, said tuning devices constituting the sole means for resonating said stages to a desired frequency.

9. A tuning system of the character described including a plurality of stages of tuned amplification involving audion tubes and transformers, circuit connections extending from the windings of said transformers to the elements of said tubes, a plurality of tuning devices each having one movable and only one stationary element for simultaneously inductively tuning a greater number of said stages of tuned amplification, said tuning devices constituting the sole means for tuning said stages of amplification.

10. A system of the character described including a plurality of stages of tuned amplification involving transformers, audion devices having elements connected to windings of said transformers, and a plurality of tuning condensers each provided with a single rotor element and a single stator element for simultaneously multiply inductively tuning said stages of amplification, each condenser being operable separately to tune a plurality of said stages of amplification.

11. A tuning system of the character described including a plurality of stages of

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