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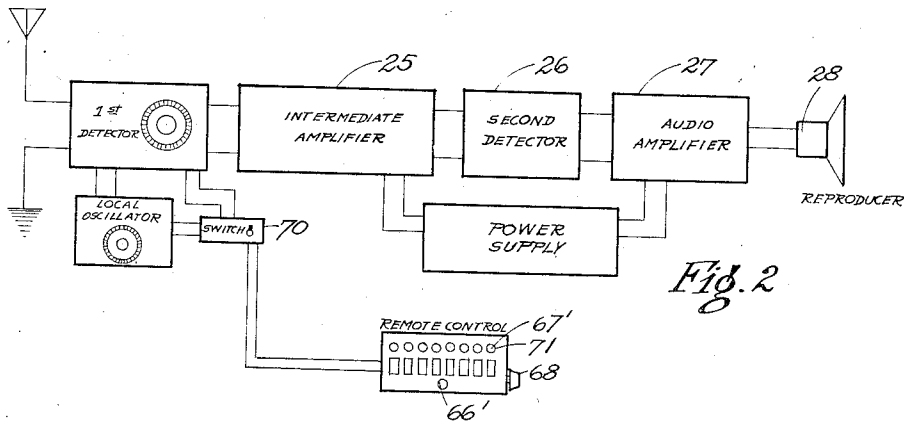
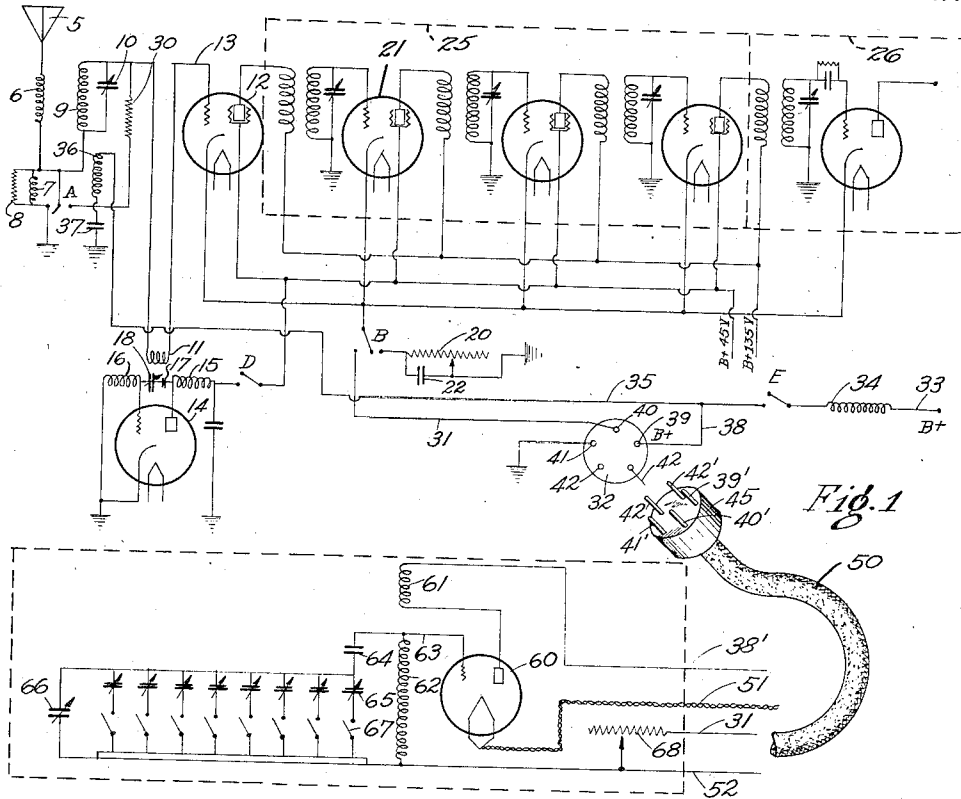
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REMOTE CONTROL FOR RADIO RECEIVERS

Filed Sept. 5, 1931

2 Sheets-Sheet 1



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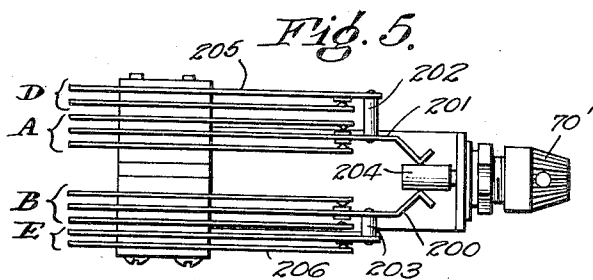
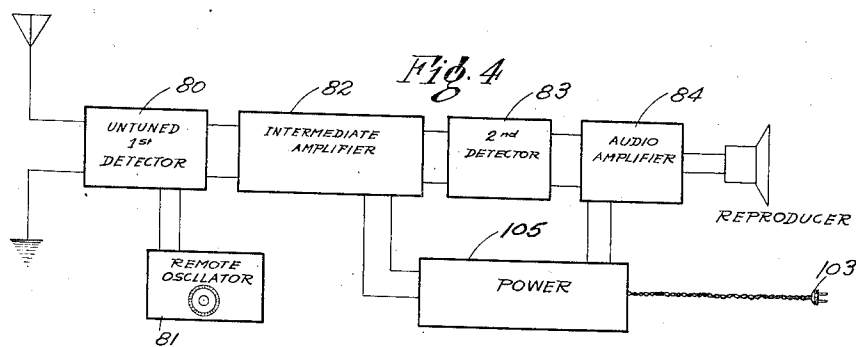
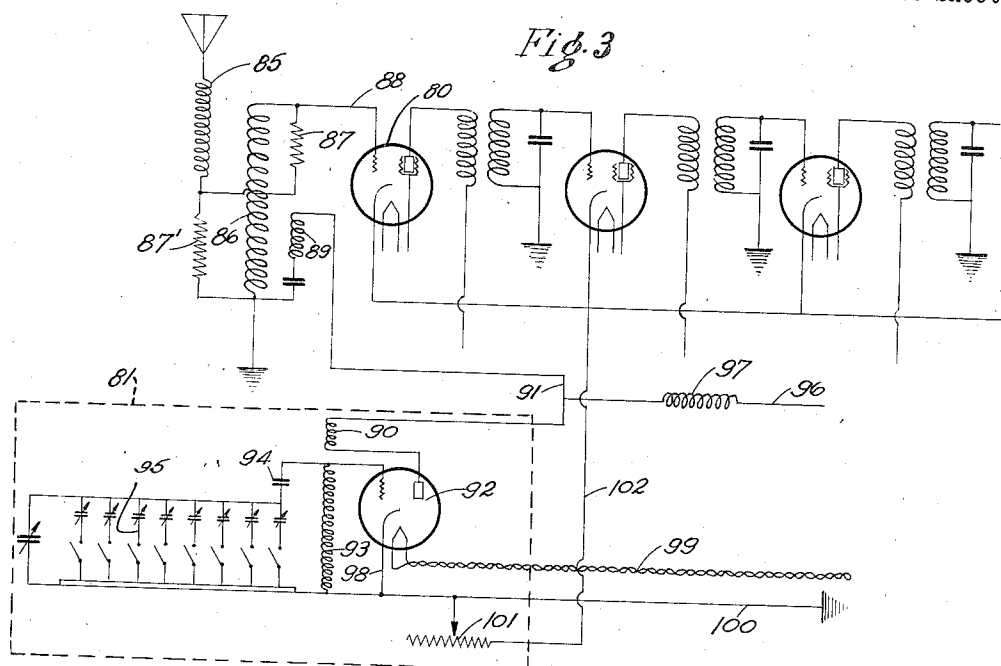
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REMOTE CONTROL FOR RADIO RECEIVERS

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4 Claims. (Cl. 250—20)

This invention relates to improvements in radio broadcasting receivers and more particularly relates to means and methods for selectively controlling reception in a receiver of the superheterodyne type.

Remote controls for radio receivers have but recently attained the recognition of different manufacturers. However, nearly all of the so-called "remote controls" relate to a means for changing the tuning control within the receiver itself. This has been accomplished in many ways, among the more prominent are, the provision of a motor which may be actuated from a remote point to rotate or move the condensers increasing or decreasing capacities, or to move other tuning controls to a predetermined position whereby a certain station, which has been previously selected from a point within the radio broadcast band, is "tuned in".

Nearly all of the known controls are subject to certain inherent defects among which may be enumerated the addition of complicated mechanisms to accomplish the foregoing, and the fact that a slight shift in the allocation of a certain station in the broadcast wave band, necessitates a complicated readjustment beyond the comprehension of the average broadcast receiver audience.

Further difficulties are presented in proper control of volume. What would be sufficient volume for a local station may be totally insufficient for the distance station and vice versa.

It is therefore among the objects of this invention to provide a mechanism, which is simple to adjust and which will not readily lose its adjustment, whereby a predetermined broadcast station may be readily selected from a plurality of such stations from a point remote from the receiver.

Another object of this invention is to provide a control for instantaneously selecting stations at the receiver without the necessity of going through a number of stations to tune in the desired station.

Another object of the invention resides in the provision of a control which is particularly adaptable for superheterodynes and wherein the receiver may be controlled either at the receiver or remotely therefrom.

Another object resides in providing a control for a radio receiver wherein the receiver may be controlled only from a remote point.

Another object of the invention is to provide a remote control which not only selects the station desired, but wherein the volume may also be controlled at a point remote from the receiver

and which is portable within the range of a connecting cable.

Another object of the invention resides in the provision of a remote control wherein the number of stations which may be selectively received, is limited only by the range of the receiver.

Another object relates to the provision of a control for a radio broadcast receiver wherein the operation of selecting a broadcast station is extremely simplified.

Other objects of the invention and the invention itself will become more apparent from the following description of some embodiments of the invention, in which description reference is had to the accompanying drawings.

In the drawings:

Fig. 1 is a circuit diagram of a heterodyne receiver equipped with both a local and remote control;

Fig. 2 is a diagrammatic view showing the allocation of the various units of this receiver and their relation to each other;

Fig. 3 is a circuit diagram of a heterodyne receiver adapted to be controlled from a remote point only; and

Fig. 4 is a diagrammatic view showing the allocation of the parts of the receiver of Fig. 3 and their relation to each other.

Fig. 5 is a plan view of a control switch.

Briefly, the invention as illustrated in Figs. 1 and 2, includes a receiver of the superheterodyne type in which a local oscillator is built in the receiver; and a means for rendering the local oscillator inactive, connecting in a remote oscillator in place thereof, and rendering the tuned stage of the receiver untuned and responsive to signals throughout the broadcast band in such a manner that by varying the frequency of the remote oscillator the stations may be selectively received through a beat frequency to which the intermediate amplifier and detector tube is responsive.

Referring more particularly to Fig. 1, the antenna circuit may comprise the usual antenna with an antenna inductance 6 in series therewith. An inductance 7 which is paralleled by a resistance 8 is in series between the inductance 6 and the ground. A secondary radio frequency inductance 9 is coupled directly to the antenna and may be tuned to resonance by a variable capacity 10. A resistance 30 is adapted to be shunted across the capacity 10 by a single pole double throw switch "A", which switch is also adapted to short circuit the inductance and resistance 8.

An oscillator pickup coil 11 is interposed in

the grid circuit 13 of a screen grid tube 12. An oscillator is inductively coupled to the pickup coil 11, and includes a tube 14 having an inductance 15 in series with the plate circuit and an inductance 16 in series with the grid circuit. A fixed capacity 17 and a variable capacity 18 control the feed back between the plate and grid. The plate potential may be applied through a single pole single throw switch "D".

The signal volume is controlled by variable resistance 20 in series between the ground and the cathode 21; the radio frequency currents being bi-passed by a capacity 22. A single pole double throw switch "B" is adapted to connect or disconnect the local volume control and the remote volume control.

In operation, with the control at the receiver wherein the local oscillator is used, the switch "A" is thrown in such a manner that the coil 7 and resistance 8 are shorted and the effective antenna circuit includes only the primary inductance 6.

The single throw switch "D" connects the positive screen of the first detector tube 12 to the plate circuit of the oscillator tube 14 furnishing a plate potential for the oscillator, which as designated in the drawing may be 45 volts. The single pole double throw switch "B" closes the circuit between the cathode 21 and the local volume control 20.

Signals collected by the antenna 5 pass through the inductance 6 and induce a current in the secondary 9. The secondary 9 is tuned to resonance at a particular wave length or kilocycle by a variable capacity 10, the signals are then communicated through the pickup coil 11 to the grid of the tube 12. The oscillator which is tuned by the variable capacity 18 between the plate and the grid generates an oscillatory current, the frequency of which is predetermined by the amount of the capacity 18, which induces an oscillatory signal in the pickup coil 11 and which is mixed with the incoming signal. This first radio frequency stage is commonly called the first detector. The output from the first stage which includes the received signal and the generated signal mixed to form a beat frequency is then conducted to an intermediate radio frequency amplifier 25. The radio frequency amplifier has been illustrated as including three stages of radio frequency amplification which are resonant to the beat frequency furnished by the received signal and the oscillator in the so-called first detector stage.

The beat frequency signal is amplified in the radio frequency amplifier, the output of which is connected to a detector 26 wherein the modulated beat note of radio frequency is rectified to audio frequency. The output of the detector may be connected to an audio frequency amplifier 27 the output of which is conducted to a reproducer 28.

When it is desired to control the receiver from a remote point, the switch "A" is thrown to the right as shown in the drawings wherein the resistance 30 is shunted across the capacity 10 and the secondary inductance 9. The switch A which had previously short circuited the inductance 7 and its parallel resistance 8 which are in series with the antenna coil 6 and the ground, is now open. The result of by-passing the tuned secondary 9 with the resistance 30, and the inductance 7 with the resistance 8, is to render the first stage, which was previously a tuned stage, an untuned stage, broad enough to be responsive

to signals throughout the range of the broadcast band. The switch "D" is opened rendering the local oscillator ineffective.

The switch "B" is thrown to disconnect the local volume control from the cathode and connect the cathode to the conductor 31 which leads to a terminal 40 of a junction block or socket 32 for coupling the same to the remote control.

The single pole single throw switch "E" makes contact introducing positive "B" power from the line 33 through a radio frequency choke coil 34 which keeps radio frequency currents out of the B supply and which is also connected by the conductor 35 to the primary inductance coil 36 located in inductive relation with the secondary inductance coil 9 of the antenna circuit. The primary inductance coil 36 is connected to the ground through a blocking capacity 37. The conductor 38 which connects to conductor 35 leads to a terminal 39 of the junction block 32. A terminal 41 of the junction block is grounded. The terminals 42 of the junction block are connected to the filament current supply not specifically shown.

The remote oscillator is coupled to the set by a plug 43 the conductors leading to the plug all being disposed in a flexible cable 50. The plug is provided with prongs 42', 41', 40', and 39' which are adapted to contact with the terminals 42 to 39 respectively, of the junction block 32 and provides an outlet for the necessary conductors essential to the operation of the remote control. The conductors contained in the flexible cable 50, comprise the plate circuit wire 38', which connects to conductors 38 through pin and contact 39' and 39 respectively of plug and junction block, the filament wires 51 connect to filament contact 42, the volume control 63 connects to cathode wire 21 through conductor 31 and the ground 52 connects to the ground contact 41.

The remote oscillator includes a vacuum tube 60 having an inductance in the form of a tickler coil 61 disposed in the plate circuit; plate potential is provided through the conductor 38'. A primary inductance 62 is connected in the grid return circuit between the ground wire 52 and the grid 63. The filament of the tube is heated by current from the filament wires 51.

The primary inductance is tuned by a fixed capacity 64, a plurality of semi-fixed capacities 65 and a trimmer variable capacity 66. The capacities 65 are adapted to be selectively connected into the circuit across the inductance 62 in series with the capacity 64 by a plurality of switches 67. A volume control connects the cathode of the receiver, through a variable resistance 68 to the ground wire 52.

In operation, a single control serves to simultaneously make or break the various portions of the circuit necessary to switch over to remote control, the local oscillator is rendered ineffective by opening the switch "D"; the first tuned stage is changed to an untuned stage by the single pole double throw switch "A"; the local volume control is rendered ineffective by the single pole double throw switch "B" which disconnects the local volume control and connects the remote volume control to make the same effective; the plate current is communicated to the remote oscillator by means of the switch "E". The operation then will be substantially as follows:

Signals are picked up by the antenna 5 and are communicated into the first tube 12 through the coil 11 from the untuned secondary 9.

Such a switch is illustrated in Fig. 5 wherein

a control knob 70' is provided which is adapted to actuate a cam element 204 extending between contact blades 200 and 201 which are the movable blades of the single pole double throw switches A and B. The movable blades of the switches are connected to the movable blades 205 and 206 of the single pole single throw switches D and E by insulated members 202 and 203. In the position shown the switches A, B, D and E are adapted to contact or be broken as previously described for tuning control at the receiver, in which position the local oscillator is connected through the switch D and the switch E is open, the local volume control connected and the antenna circuit is a tuned antenna circuit. When the knob is rotated the cam forces the blades outwardly shifting the switches A and B, opening the switch D and closing the switch E.

As previously described, the addition of the resistance across the capacity broadens the tuning of the first stage so that it is substantially untuned and responsive to an entire broadcast band. The remote oscillator generates an oscillatory current by means of the feed back from the tickler coil 61 into the primary coil 62 setting up an oscillatory signal in the oscillator, which signal is communicated through the plate circuit 38' and conductor 35' to the primary inductance 36, which is inductively coupled to the untuned secondary 9, and thence by-passed through the blocking condenser 37 to the ground.

The capacities 65 which tune the primary inductance 62 of the oscillator and which may be selectively connected into the circuit, are provided with a variable control in order that the capacity may be varied to generate the desired beating frequency in the oscillator and when once adjusted needs little or no attention thereafter.

The radio frequency energy from the oscillator which is conducted to the primary inductance coil 36 of the receiver mixes the locally generated signal with the incoming signals which are then impressed on the grid of the first tube 12 producing a beat note dependent upon the frequency of the local oscillator and on the received signal which beat note is of a frequency to which the intermediate frequency amplifier will select and amplify. The output of the first stage is then conducted to the intermediate frequency amplifier in a manner similar to that previously described for the local oscillator operation.

A diagrammatic view of Fig. 2 illustrates, by the blocks, the aforesaid circuit.

As previously stated the various switches are controlled by a single lever which throws the switch "A", "B" and "E" in one direction to render the first radio frequency stage tuned; the local volume control effective and to render the local oscillator effective and when the lever is thrown in the opposite direction switch A renders the first radio frequency stage untuned, switch B uncouples the local volume control and couples the remote volume control; switch E uncouples the local oscillator and couples the remote oscillator, this switch is indicated at 70 in Fig. 2 and may be of the so-called jack type.

The remote oscillator which includes the primary inductance, the tickler coil, volume control and the necessary capacities, as shown diagrammatically, are housed in the remote control box 71; the switches 67 being actuated by buttons 67' and the trimmer capacity by a knob 66' and the volume control by a knob 68' substantially as shown.

The trimmer capacity merely serves to add or

subtract a slight amount of capacity in the remote oscillator to more sharply tune stations which have slight variations sometimes due to climatic conditions or variations which may be in the receiver itself.

It is to be understood that although I have illustrated a control which selects the stations by tuning the oscillator by the introduction of predetermined capacities across the primary inductance, it can readily be seen by one skilled in the art, that the semi-fixed capacities might be replaced by single variable capacities and a single control dial provided in substantially the same manner as the changing of the capacity is accomplished directly within the receiver.

It is also understood that the tuning of the oscillator might be varied by the introduction of inductances instead of capacities. The power supply is provided for within the receiver itself and the remote control receives its power through the cable 50 as previously described.

Referring now to Figs. 3 and 4, where I have illustrated by a circuit diagram and by the diagrammatic view, a receiver adapted to be operated from a remote point only which comprises Fig. 4, an untuned first stage 80, a remote oscillator 81 and an intermediate frequency amplifier 82, detector 83 and an audio frequency amplifier 84. The antenna circuit consists of a primary inductance 85 and a secondary inductance 86, the secondary inductance is bridged by resistances 87 and 87'. One end of the secondary inductance is connected in the grid circuit 88 and the other end to the ground.

The remote oscillator 81 is coupled to the secondary inductance by a primary inductance 89 which is disposed in inductive relation thereto, being connected to the tickler coil 90 which is in the plate circuit of the oscillator, by a conductor 91. The oscillator may be operated with a heater cathode type tube 92 and includes a primary inductance 93 in the grid circuit 92 tuned by capacities 94 and 95 in a similar manner to that described for the remote oscillator of the other embodiment. The plate current is supplied to the plate of the oscillator from the power supply through the conduit 96, a radio frequency choke coil 97 being interposed to stop the radio frequency currents from entering the power supply. The grid return connects to the cathode 98. Filament current is supplied through conductors 99.

The volume control comprising variable resistance 101 is connected to a conductor 102 to vary the amount of power supplied to the cathode of the tubes in the main receiver.

The conductors 91, 96, 100 and 99 may all be disposed in a single flexible covered cable. The operation of this embodiment is exactly the same as that of the previously described embodiment except it is operable through the remote control only. Either method of tuning the inductance in the oscillator may be used, such as the semi-fixed condensers and switches described for the other embodiment or the single tuning condenser operated by the usual dial.

Signals throughout an entire broadcast band are received by the detector 80. Oscillatory signals of a definite frequency are generated in the oscillator and mixed with the incoming signals to provide a beat frequency, to which the intermediate amplifier is resonant, after which the amplified signals are demodulated by the detector and then further amplified by a suitable audio amplifier, the output of the audio am-

plifier being connected to a suitable reproducer. Power is supplied to the separate stages by power supply 105 which may be connected by a plug 103 to the local lighting circuit.

5 With a remote control constructed as I have described it may readily be seen that signals may be heterodyned into a receiver, from a point distant from the receiver within the range of the connecting cable which may be as long as 60 feet without affecting the operation of other local receivers. It may also be seen from the foregoing disclosure that numerous other oscillators might be connected to a receiver to operate the receiver from different points.

15 With such an installation, a local receiver could be installed in an out of the way or a hidden place with reproducers built into the walls, and various controls disposed at various convenient points.

20 Although I have not specifically illustrated a power line switch for the remote control, the same might be readily incorporated in the present control with but the addition of one or two wires.

25 Having thus described my invention I am aware that numerous and extensive departures may be made therefrom but without departing from the scope of the invention.

I claim:

30 1. In a heterodyne radio receiver, a first detector stage, means for tuning said first stage resonant to an incoming signal, an oscillator coupled to said first stage for generating a sine wave adapted to be mixed with the incoming wave to provide a beat frequency wave, an intermediate frequency amplifier resonant to the beat frequency wave, a detector for rectifying the signal, an audio frequency amplifier to amplify the output of the detector, and means to convert the signal to audibility, a second oscillator coupled to said first stage, means to convert said first tuned stage to a substantially aperiodic stage and simultaneously switch-out the first oscillator and switch-in the second oscillator whereby the set may be controlled from a remote point by the second oscillator.

2. In a radio receiver of the heterodyne type including an antenna coupler comprising primary and secondary inductances, a variable capacity for tuning the secondary inductance a first detector coupled to the said secondary inductance, an oscillator inductively coupled in the secondary, for providing a beat note with an incoming signal, an intermediate radio-frequency amplifier, a detector for demodulating the beat note signal, an audio frequency amplifier and a loud speaker, a second oscillator dependable and remotely coupled to said receiver, a resistance adapted to be bi-passed around said tuning means for the secondary inductance to render the capacity ineffective and cause the inductance to be responsive to the entire broadcast range,

an inductance connected with the remote oscillator and in inductive relation with the said secondary inductance, a multi-polar switch means for disconnecting the local oscillator, connecting the remote oscillator and connecting the detuning means for the antenna coupler, said remote oscillator being portable within the range of a connecting cable and powered from the receiver and adapted to tune the receiver when connected in the circuit.

3. In a radio receiver of the heterodyne type, comprising a first stage having a tuning means therefor, a local oscillator and an intermediate frequency amplifier, said local oscillator having means for coupling it to the input circuit of the first stage and means for energizing and de-energizing said oscillator, said first stage and oscillator adapted to heterodyne received signals of various frequencies to the intermediate frequency amplifier, a detector for demodulating said heterodyned signals, an audio frequency amplifier for amplifying the demodulated signals and a reproducer to render audible the amplified signals; an auxiliary portable oscillator having means for coupling it to the input circuit of the first stage and means for energizing and de-energizing the same, said oscillator adapted to be directly connected to said first stage, a resistance adapted to be coupled across the tuning means for the first stage, switch means to de-energize said local oscillator and energize said portable oscillator, and connect said resistance across the tuning means of the first stage to render said first stage aperiodic.

4. In a radio receiver of the heterodyne type, comprising a first stage having a tuning means therefor, a local oscillator and an intermediate frequency amplifier, said local oscillator having means for coupling it to the input circuit of the first stage and adapted to generate an oscillatory wave of selected frequency, and means for energizing and de-energizing the same, said generated frequency adapted to be combined with an incoming signal of known frequency and heterodyned to the intermediate frequency amplifier, a detector for demodulating said amplified heterodyne signals, an audio frequency amplifier for amplifying said demodulated signals and a reproducer to render audible said amplified signals, an auxiliary portable oscillator having means for coupling it to the input circuit of said first stage and means for energizing and de-energizing the same, a resistance adapted to be connected across the tuning means for the first stage, switch means to de-energize said local oscillator and energize said portable oscillator and to connect said resistance across the tuning means of the first stage to render the first stage aperiodic, tuning means to tune the portable oscillator for heterodyning a selected signal to the intermediate frequency amplifier.

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