Feb. 26, 1935. W. T. POWELL 1,992,326

REMOTELY CONTROLLED RADIO RECEIVING SYSTEM

Filed Nov. 12, 1930 4 Sheets-Sheet 1

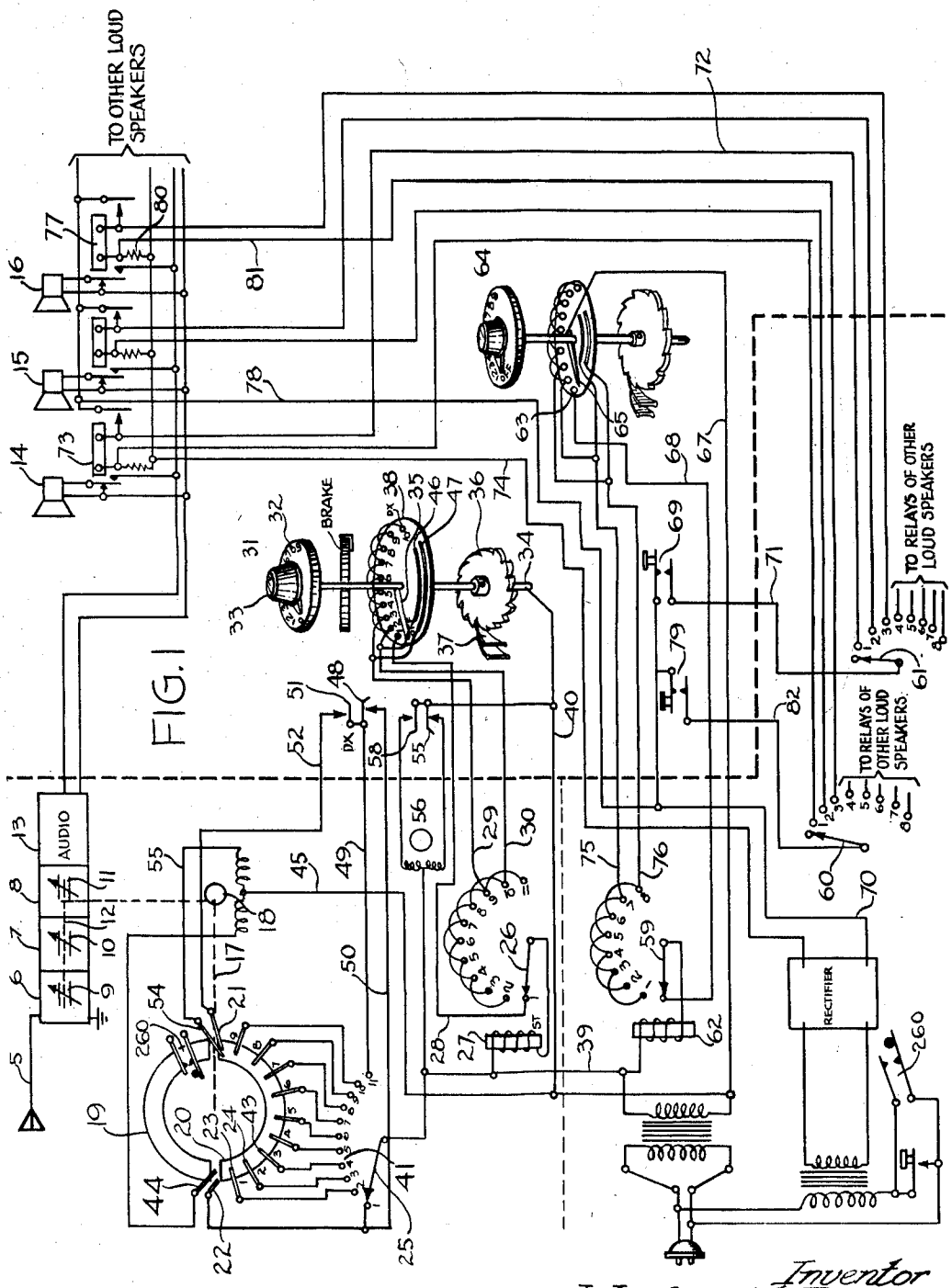


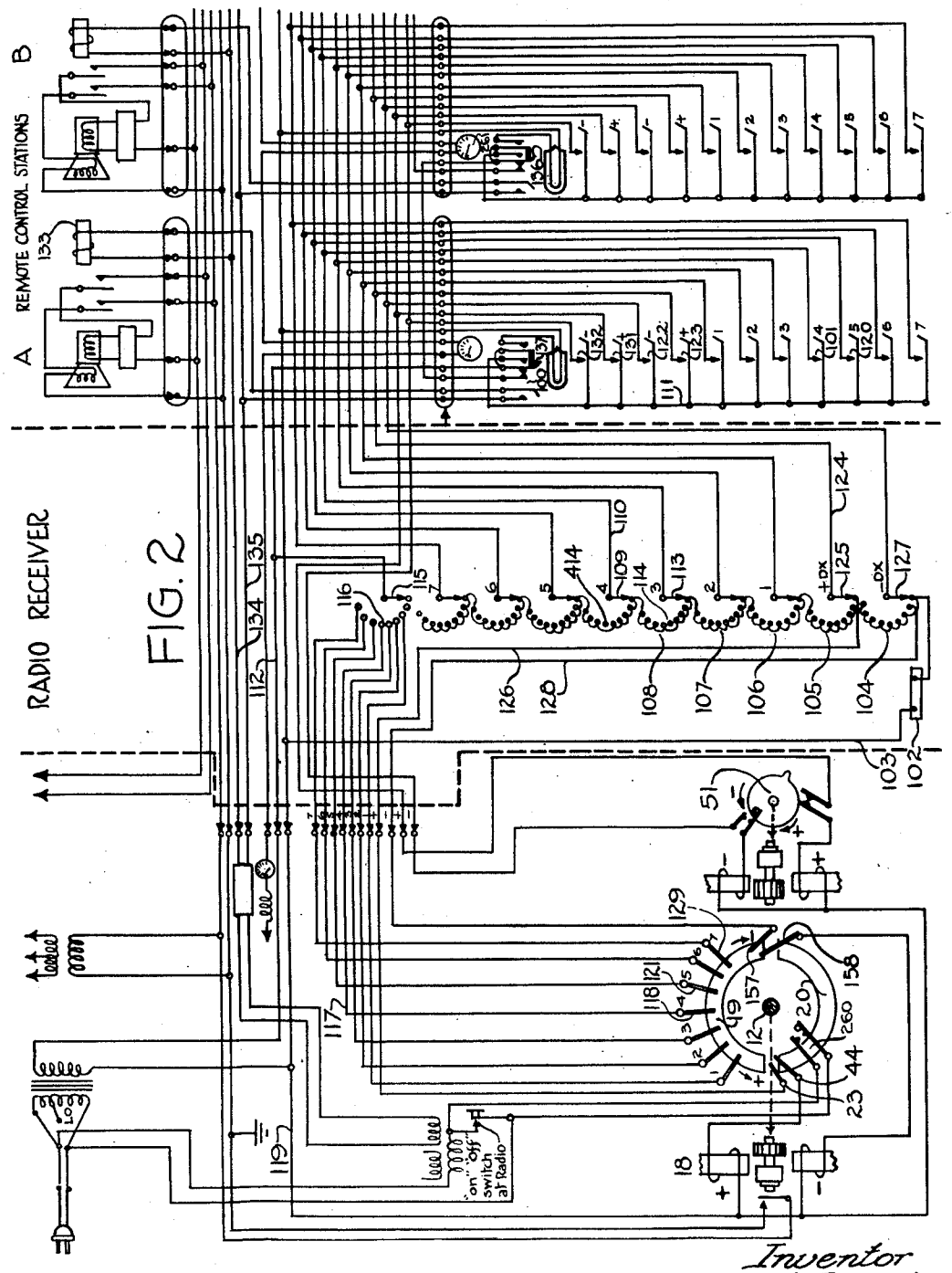
FIG. 1

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REMOTELY CONTROLLED RADIO RECEIVING SYSTEM

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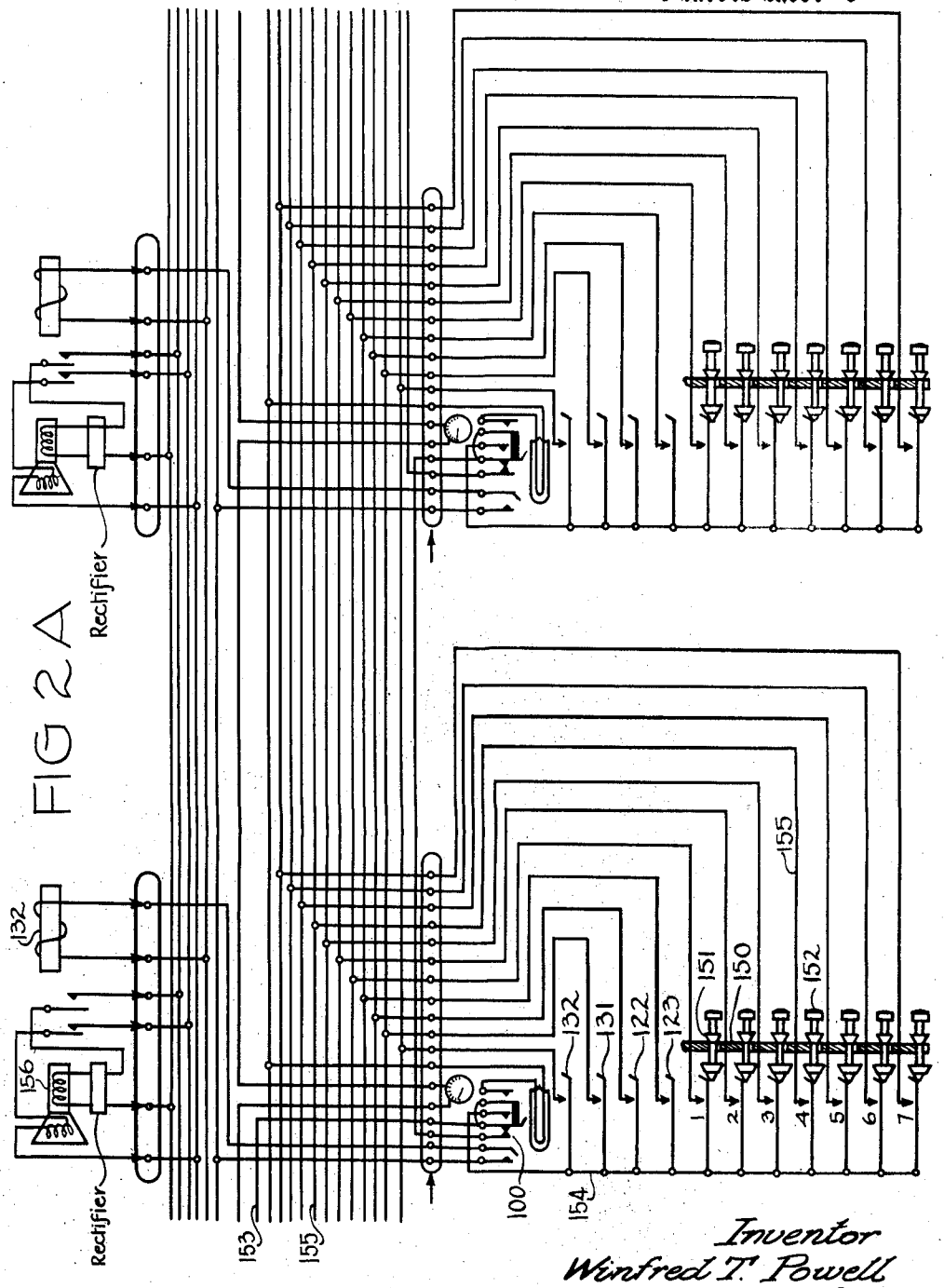


FIG 2A

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REMOTELY CONTROLLED RADIO RECEIVING SYSTEM

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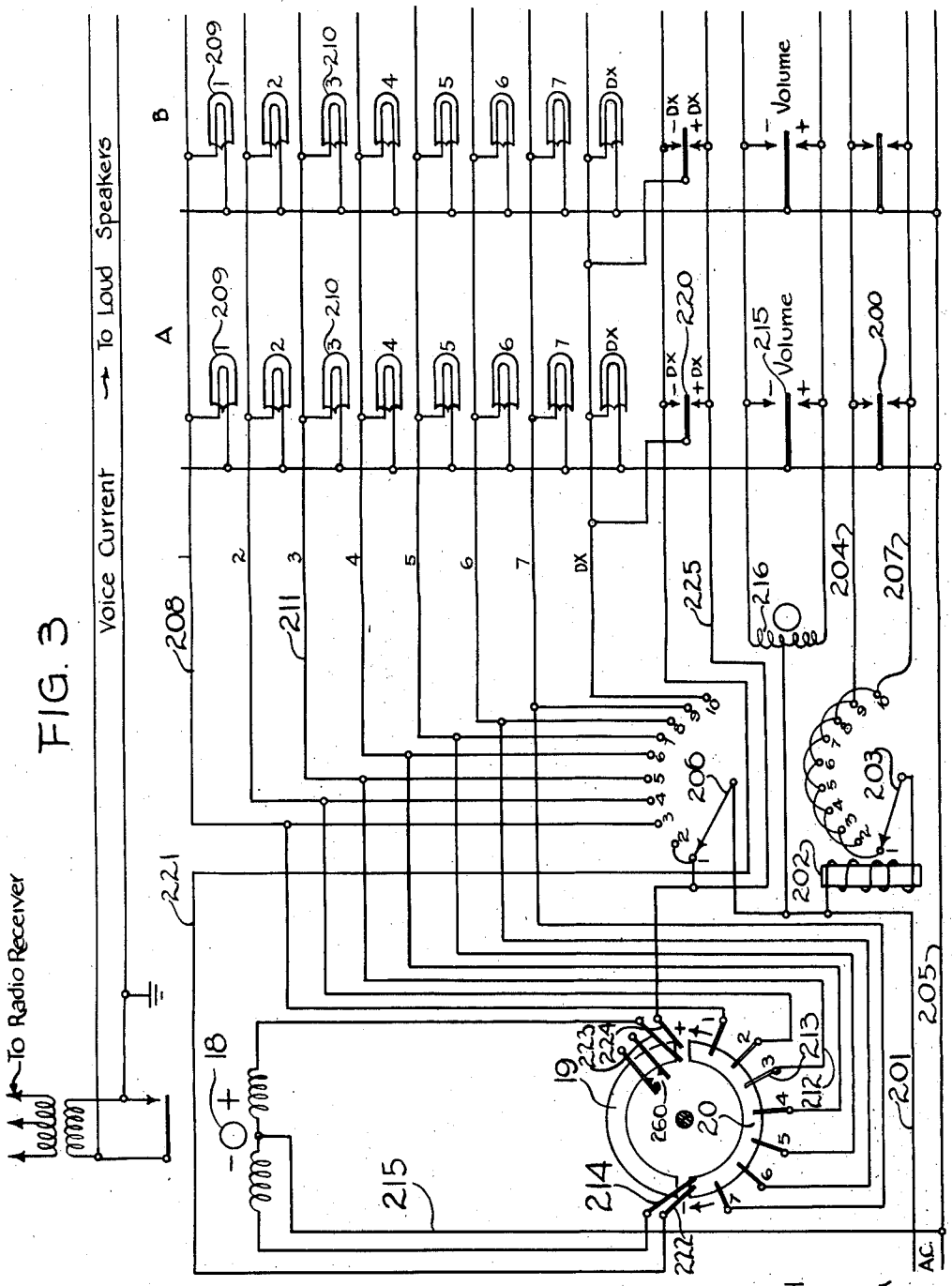


FIG. 3

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UNITED STATES PATENT OFFICE

1,992,326

REMOTELY CONTROLLED RADIO RECEIVING SYSTEM

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Application November 12, 1930, Serial No. 495,130

8 Claims. (Cl. 250—40)

This invention relates to signalling systems and more particularly to radio receiving systems that can be selectively controlled from one or more remote control stations. In such systems, it is desirable that the operator should be able to effect a desired adjustment of the radio receiving system with a minimum number of selecting operations which can be effected in a brief interval of time. It is, furthermore, essential that the number of controlling conductors between the radio receiver and the remote control station or stations be kept at a minimum.

The present invention has for its purpose the achievement of all of these highly desirable results with a minimum amount of equipment which is simple in construction and which may be kept in operation with a minimum amount of maintenance. A further feature of the invention involves the use of a progressively movable switch which may be directively controlled from a remote control station or stations to effect a desired operation of the radio receiver whereby the number of necessary conductors between the remote control station and the radio receiver may be either greatly reduced or additional functions controlled over the number of conductors now in use. A further feature of the invention includes such a remote control system in which each of the remote control stations are provided with interlocking keys whereby there is shown the ultimate setting of the radio receiver and whereby it is unnecessary to hold a selected key in its depressed condition until the radio receiver has completed its station selecting operation. A still further feature of the invention includes the use of a progressively movable switch whereby any loud speakers of the system which are widely separated in different rooms may be selectively rendered effective over a minimum number of control conductors.

For a clearer understanding of the invention reference is made to the drawings in which Fig. 1 is a diagrammatic showing of a radio receiver together with remote control station equipment and selecting mechanism controlled thereby for effecting the desired adjustment or tuning of the radio receiver; Fig. 2 is a modified form of the invention in which there is diagrammatically represented a plurality of remote control stations each of which is provided with a plurality of station selecting keys cooperating with a progressively movable switch for effecting the desired adjustment of the station selecting mechanism, whereby the radio receiver may be tuned to receive a program from a desired station; Fig. 2A is an additional modification, similar to that of Fig. 2, in which there is provided at each remote control station a plurality of interacting keys effective to selectively control the station selecting mechanism and at the same time to give an indication of the desired adjustment of the selecting mechanism. Fig. 3 is a still different modified form of the invention in which but a single key is provided at each remote control station for effecting a predetermined operation of the station selecting mechanism.

Referring to Fig. 1, the portion of the diagram at the left of the heavy broken line represents the radio receiver, the motor with its station selecting mechanism, and the two progressively movable switches, one of which serves to govern the station selecting mechanism, and the other of which serves to render effective and ineffective desired loud speakers located at several remote points. At the right of the heavy broken line of this diagram, there is represented a plurality of loud speakers remotely placed with respect to each other, such as in the different rooms of a building, and there is also represented one remote control station having a selecting device for controlling the operation of the several loud speakers as well as other selecting mechanism which selectively controls the mechanism associated with the radio receiver whereby it may be tuned to receive any desired program.

In Fig. 1, 5 designates an antenna connected to a radio receiver such as a tuned radio frequency receiver or a superheterodyne receiver, although for convenience in disclosure, it is assumed that a tuned radio frequency receiver is employed. This receiver may include several tuned radio frequency stages such as 6 and 7 and a detector 8, the input circuits of which are tuned by condensers 9, 10, 11 the rotors of which are actuated from a single control shaft 12. The output circuit of the detector is coupled to an audio amplifier 13 which may include one or more audio stages with the last audio stage connected in multiple to a plurality of loud speakers such as 14, 15, 16, etc., herein indicated as being of the magnetic type, although the system is equally effective with loud speakers of the electrodynamic type.

For the purpose of remotely controlling the adjustment of the rotors of the tuning condensers 9, 10 and 11, the common actuating shaft 12 therefor is arranged to be operated either directly or indirectly from the shaft 17 of a motor 18. This shaft carries two semicircular split conduct-

ing rings 19 and 20 arranged to be engaged by a plurality of contactors 21, 22, 23, 24, etc. which will be further referred to in the course of this description of the station selecting mechanism. There is also located near the radio receiver a progressively movable switch of the type well-known in the automatic telephone art comprising two sets of fixed contacts arranged in the arc of a semicircle, into engagement with which brushes 25 and 26 are progressively advanced through pawl-and-ratchet mechanism not shown but actuated by a motor magnet 27. One set of fixed contacts of this switch is connected by conductors to the contactors such as 22, 23, 24, etc., of the station selecting mechanism and the other set of fixed contacts engaged by the brush 26 serves as terminals for conductors 28, 29, 30, which terminate at the remote control station generally designated 31. At this station, there is provided a fixed scale 32 marked with graduations indicating certain desired station settings with which a dial 33 comprising a knob and a pointer cooperates. The dial 33 is mounted on a rotary shaft 34 to which at an intermediate point, there is secured a wiper or contactor 35 while at the lower end of this shaft there is fastened a ratchet wheel 36 engaged by pawl 37 to insure that the dial 33 is always turned in a clockwise direction. The wiper 35 is arranged to engage a series of individual contacts and two segemental contacts 46 and 47 mounted on a fixed disk of insulation 38.

In effecting the selection of a desired station or program from a remote control station, the dial 33 is advanced slowly from its normal position to position No. 1 in which a circuit is closed over conductor 39 from the alternating current source, stepping magnet 27, brush 26 in position 1, conductor 28, wiper 35 in position 1, conducting shaft 34, conductor 40 to the other side of the alternating current source. This circuit energizes the magnet 27 which advances the brushes 25, 26 of the stepping switch from position 1 into position 2 where an operating circuit for the motor magnet is now effective from the alternating current source, conductor 39, magnet 27, brush 26 in position 2, conductor 30, wiper 35 now in position 2, conducting shaft 34, conductor 40 to the other side of the alternating current source. This circuit advances the brushes 25 and 26 of the stepping switch into position 3 and when the wiper engages the No. 3 contact of the station selecting mechanism the magnet 27 is again energized to advance the stepping switch brushes 25 and 26 over a circuit now including the conductor 29.

From the foregoing, it will be seen that as the contactor 35 engages contacts bearing odd numbers, the stepping magnet 27 is energized over conductor 29, and as the contactor 35 engages contacts bearing even numbers the stepping magnet 27 is energized over a circuit including the conductor 30. By this arrangement, as the dial 33 is slowly moved clockwise to any desired station selecting position for example, station No. 4, the motor magnet 27 of the stepping switch operates in response to this movement so that the brushes 25 and 26 of its stepping switch take a corresponding position, for example the No. 4 position as just described. It will be understood, of course, that the operation of the stepping switch is very fast since in commercial switches of this type, the brushes may be advanced 60 or 70 steps per second.

With the brushes 25 and 26 of the stepping switch advanced to position 4 as just described, the station selecting mechanism associated with the radio receiver is operated to tune the radio receiver to select the No. 3 program or station. This is effected by completing an operating circuit for the operation of the motor 18 from one side of the alternating current source, conductor 39, brush 25, contact 41, contactor 43, split ring contact 20, contactor 54, right hand winding of the motor 18, conductor 45, to the other side of the alternating current source. Under the control of this circuit, the motor 18 rotates the rotors of the tuning condensers and the split rings 19 and 20 until they are rotated to the point where contactor 43 occupies the non-conducting space between these rings at which time the operating circuit of the motor is opened causing it to stop with the tuning condensers 9, 10 and 11 of the radio receiver tuned to receive the desired program.

When it is desired to turn off the radio receiver, the dial 33 is rotated clockwise until its pointer is opposite the designation "Off". During this movement, the stepping magnet 27 of the stepping switch will have its operating circuit successively completed over conductors 29 and 30, as the contactor 35 successively engages the fixed contacts 5 to 9, inclusive, and DX of the station mechanism and then through the contact segments 46 and 47 until the brushes 25 and 26 are advanced to their No. 1 or normal position. When the stepping switch brush reaches this position, the station selecting mechanism is rotated to its normal position by a circuit completed for the motor 18, including conductor 39, brush 25 in position 1, contactor 22 now assumed to be in engagement with the split ring contact 19, brush 44, left hand winding of the motor 18 and thence over conductor 45 to the other side of the alternating current source. Under the control of this circuit, the station selecting mechanism is rotated until the split ring contacts 19 and 20 occupy such a position that the contactors 22 and 44 engage the non-conducting space between these two contactors.

In the event that it is desired to hunt for a station other than those selectible through predetermined adjustments of the dial 33, then this dial is advanced until its pointer is opposite the designation No. 10 at which time the contact 35 is in engagement with the fixed contacts marked DX. In response to this adjustment of the contactor 35, the motor magnet 27 has an operating circuit alternately completed over conductors 29 and 30 until the brushes 25 and 26 are in engagement with the No. 11 set of fixed contacts of this switch. If it is desired to cause the station selecting mechanism to control the motor 18 so that it rotates the rotors of the tuning condensers in one direction, then DX key 48 is depressed to close a circuit from one side of the alternating current source over conductor 39, brush 25, contact 11, conductor 49, key 48, conductor 50, brushes 22 and 44, assumed to be in engagement with the ring 19, left hand winding of the motor 18, conductor 45, to the other side of the alternating current source. As long as the key 48 is depressed, the motor 18 will rotate until the selecting mechanism has reached one of its extreme positions at which time the brushes 22 and 44 will be out of engagement with both of the split rings 19 and 20. During the time that the station selecting mechanism is operating, and while the key 48 is depressed the operator listens for a desired program and im-

mediately on hearing this program releases the key 48 which interrupts the last described circuit to stop the rotation of the motor. If it is desired to cause the station selecting mechanism to rotate in the other direction, then key 51 is depressed whereupon a circuit is completed from one side of the alternating current source, conductor 39, brush 25 fixed contact #11, conductor 49, key 51, conductor 52, contactors 54 and 21 in engagement with ring 20, right hand winding of the motor 18, conductor 45 to the other side of the alternating current source. In this instance, also the operator holds the key 51 depressed until a desired program or station is heard at which time key 51 is released to interrupt the last described circuit and thereby stop the operation of the motor.

If it is desired to increase the volume of the reproduced signal, the key 55 is depressed to close a circuit from one side of the current source over conductor 39, lower winding of the motor 56, which drives the shaft of the volume control device, contacts of the key 55, conductor 40, to the other side of the alternating current source. As long as the key 55 is depressed, the motor 56 turns up the volume control device to increase the volume. If, however, it is desired to reduce the volume of the reproduced signal, the key 58 is depressed to close a circuit similar to that last described except that it now includes the upper winding of the motor 56 and the key 58 and thereby rotates the motor backward.

In the present arrangement, it has been assumed that there are a series of loud speakers such as 14, 15, 16, etc., which are distributed in the various rooms of a building. In order to cause any one or more of these loud speakers to be effective in different rooms, the present arrangement is provided with means whereby desired ones of these loud speakers may be turned on or rendered effective at will. For this purpose, there is provided at a central point such as at the radio receiver, a progressively movable switch of the type previously referred to including brushes 59, 60 and 61 each arranged to be progressively advanced into engagement with a set of fixed contacts arranged in the arc of a circle which brushes are advanced by pawl-and-ratchet mechanism not shown but actuated by a stepping magnet 62. There is also provided at each remote control station, a dialing device generally designated 64 which may be similar in construction to the station dialing mechanism previously referred to.

It is believed that the operation of this portion of the system will best be understood by describing the steps performed in turning on loud speakers 14 and 16. In order to effect this operation, the operator slowly rotates the dial 64 first with the pointer opposite position 1 and then opposite position 3. As the dial is thus moved, the contactor 65, first engages contact 63, of the dial position thereby completing a circuit from one side of the current source, conductor 67, contactor 65, contact 63, conductor 68, brush 59 in its normal position, winding of the stepping magnet 62 to the other side of the current source. Under the control of this circuit, the motor magnet 62 advances the brushes 59, 60 and 61 of the stepping switch into position #1. Since it is desired to turn on loud speaker #1, the operator depresses the "on" key 69 to complete a circuit from the alternating current source, over conductor 70, contacts of the key 69, conductor 71, brush 61 in position 1, conductor 72, winding of relay 73, conductor 74 to the other side of the alternating current source. The relay 73 is thus energized and at its left hand armature and front contact connects the loud speaker 14 across the output of the audio amplifier and at its right hand armature and contact, it closes a locking circuit for itself including conductors 74 and 78. As the dial is moved through position #1, the stepping magnet 62 is energized over a circuit including conductor 67, contactor 65, contact #1, conductor 75, brush 59 in position #1, winding of the stepping magnet 62 to the other side of the alternating current source. The stepping magnet 62, is again operated over this circuit and advances its brushes 59, 60 and 61 into position #2. Then as the dial 64 is further advanced past position #2, the contactor 65 engages contact #2 and completes a circuit for the operating magnet 62 including the conductor 76. This circuit causes the brushes of the stepping magnet to move the switch brushes out of position #2 into position #3. Since it was assumed that it is desired to make the loud speaker 16 operative, the "on" key 69 is depressed to complete a circuit similar to that described except that in this instance, it includes the winding of the relay 77 which is energized to connect the loud speaker 16 across the output of the audio amplifier 13. When the relay 77 is operated it closes a locking circuit for itself through its right hand front contact and armature thence over conductor 78 to the other side of the current source.

From the foregoing, it will be understood that in order to turn on any loud speaker, the dial is turned opposite the number of the speaker and the "on" key is depressed. In this way, all of the loud speakers such as 14, 15, 16, etc., may be turned on or any of the speakers may be left inoperative. If at any time, it is desired to turn off a loud speaker, the dial 64 is operated until its pointer is opposite the designation of that speaker whereupon the "off" key is depressed to unlock the operated relay. For example, if it is desired to turn off the No. 3 speaker, the dial 64 is turned to position 3 and key 79 is depressed which short-circuits the winding of the relay 77 causing it to release. This short-circuit includes the conductor 74, resistance 80, conductor 81, brush 60 in position #3, conductor 82, contacts of the key 79 and thence over conductor 78 leading to the other side of the direct current source.

In the modified form of the invention shown in Fig. 2, the loud speaker selecting arrangement has been changed but the motor for operating the tuning condenser shaft of the radio receiver, as well as the station selecting mechanism is unchanged. However, the stepping switch has an increased number of wipers and a correspondingly increased number of sets of fixed contacts while the dial equipment at the remote control stations has been replaced by a set of keys at each station, one key being provided for each predetermined station selection and other keys for hunting and controlling the volume of the reproduced signal. The keys controlling the predetermined setting of the station selecting mechanism may be of the non-locking type or may be mechanically locked, as desired, but in the present disclosure, these keys are assumed to be non-locking keys.

Since the mechanical equipment directly associated with the radio receiver is substantially the same as that employed in the system of Fig. 1, it is believed that this modified form of the invention will best be understood by describing the operation of selecting a program such as the No. 4

program. Let it be assumed that the operator at remote control station A desires to select a program, the "off" and "on" switch 100 is thereupon operated to reverse the normal condition of its contacts. The operator then depresses the key 101 corresponding to the No. 4 program which is effective to close an operating circuit for the stepping magnet 102 from one side of the alternating current source, conductor 103, winding of this magnet, thence through the wire connected to the sets of fixed contacts 104, 105, 106, 107, 108, brush 109 of the stepping switch, conductor 110, the #4 key 101, conductor 111, contacts of the key 100 now closed, conductor 112, to the other side of the alternating current source. Under the control of this circuit, the stepping magnet 102 is repeatedly energized and de-energized to progressively advance all of the brushes similar to 109 of the stepping switch until the brush 109 engages the contact 414, at which time the operating circuit of the magnet 102 is opened causing the stepping switch brushes, including brush 115, to stop in engagement with the #6 set of fixed contacts. With the stepping switch brush 115 in engagement with the 6th contact designated 116, an operating circuit is closed for the motor 18, causing it to rotate the shaft 12 of the tuning condenser and also to rotate the split ring contacts 19 and 20 of the station selecting mechanism connected thereto. This motor circuit may be traced from the alternating current source over conductor 112, stepping switch brush 115, contact 116, conductor 117, contactor 118, ring contact 19, contactor 158, lower winding of the motor 18 and thence over conductor 119 to the other side of the alternating current source. This circuit is effective to operate motor 18 until contactor 118 engages the non-conducting space between rings 19 and 20. It will be understood that if any of the other keys, such as #5 key designated 120, is depressed, the stepping switch will be positioned to complete the circuit including the #5 contactor designated 121 whereupon a circuit for the motor 18 will be closed until the station selecting mechanism has rotated to the point where the contactor 121 is resting in the non-conducting space between the contacts 19 and 20.

If it is desired to cause the station selecting mechanism to effect a hunting operation either the DX key 122 or the key 123 is depressed. Let it be assumed that the DX key 123, which is effective to cause rotation of the station selecting mechanism in one direction, is depressed. In this instance, the magnet 102 of the stepping switch, is not operated. The motor 18, however, is operated in a circuit including the conductor 112, contact of the "off-and-on" switch 100, conductor 111, key 123, conductor 124, stepping switch brush 125 in its normal condition, conductor 126, contactor 23, ring 19, contactor 44, upper winding of the motor 18 thence over conductor 119 to the other side of the alternating current source. Under the control of this circuit the motor 18 rotates the station selecting mechanism and the shaft of the tuning condenser until a desired station is heard or until the contact 44 engages the non-conducting space between the contacts 19 and 20. When the operator hears a desired station, key 123 is released, breaking the circuit of the motor causing it to stop with the tuning condensers adjusted to receive the desired station.

In the event that it is desired to rotate the station selecting mechanism in the opposite direction, the DX key 122 is depressed in response to which action, a stepping circuit for the motor magnet 102 is completed through the brush 127 of the stepping switch in its normal condition which is effective to advance all of the switch brushes into their second positions. The station selecting mechanism is now under the control of the DX key 122 which completes an operating circuit for the motor 18 from one side of the alternating current source, conductor 112, contacts of the key 100, conductor 111, DX key 122, brush 127 in its second position, conductor 128, contactors 157 and 158, lower winding of the motor 18, conductor 119, to the other side of the alternating current source. This circuit for the motor remains closed as long as the key 122 is closed or until the station selecting mechanism has reached the limit of travel at which time the contactor 158 will be resting in the non-conducting space between the contact 19 and 20. When, however, the operator hears a desired station, the key 122 is released and the rotation of the motor is stopped.

In this modification, the volume control mechanism is also rotated by a reversible motor 51 which may be rotated forward or backward at will, under the control of the forward volume key 131 or the backward volume key 132. In this arrangement, an electrodynamic loud speaker is associated with each remote control station and each speaker is rendered effective by a relay 133, one of which is associated with each loud speaker. When the "off-and-on" switch, such as 100, of a remote control station is moved to the "on" position, the relay 133 is bridged across the conductors 134 and 135 leading to the direct current source which energizes this relay, and at its armature and front contacts it closes a circuit for the field winding of the speaker and also connects the voice coil to the output of the audio amplifier. In this arrangement, preferential control is given to remote control station A over remote control station B, that is, if the "off-and-on" switch 100 at station A is in its "on" position, its contacts 137 are opened so that even if the "off-and-on" switch 136 at a second station is operated, this station will be ineffective to control the station selecting mechanism since the control circuit thereof is opened at the contacts 137. Although only two remote control stations have been shown in the disclosure, it will be understood that other remote control stations and loud speakers may be connected to the several conductors in the same manner as the equipment at remote stations A and B.

In the arrangement shown in Fig. 2A, it will be understood that the equipment directly associated with the radio receiver will be the same as that shown at the left of the broken line in Fig. 2, and for this reason this portion of Fig. 2 has not been duplicated. It will be noted that the conductors terminating at the left hand margin of Fig. 2A may be connected with corresponding conductors at the left of the heavy broken line of Fig. 2. The key sets at the individual remote stations of this modification may be identical in construction to that of the interlocking keys commonly used in intercommunicating telephone systems, in that there is provided a longitudinally movable, perforated bar 150 through each perforation of which a key extends. Each key is provided with a wedge-shaped shoulder 151 which engages the underside of the bar to lock an operated key in its depressed condition. The wedge-shaped portion of this shoulder tends to move the bar 150 longi-

tudinally so that if any other key of the strip is at that time in locked position, its shoulder 151 will be disengaged from the underside of the bar 150 causing this key to release.

In this form of the invention, if it is desired to adjust the station selecting mechanism to select the #4 program, the key 152 corresponding to the #4 program at the remote control station is depressed until the key is locked in its actuated position. This, of course, closes the contacts of the key 152 thereby completing an operating circuit for the motor 18 which circuit extends from one side of the alternating current source over conductor 153, the normally opened contacts of the "off-and-on" switch 100, conductor 154, contacts of the key 152, conductor 155, conductor 117 (Fig. 2), contactor 118, ring contact 19, contactor 158, lower winding of the motor 18, conductor 119, to the other side of the alternating current source. Similarly the depression of some other one of the locking keys closes a circuit through the corresponding contacts of the station selection mechanism, so that this mechanism rotates until the tuning condensers are adjusted to receive the desired program. The DX keys 122 and 123 are non-locking. In this arrangement, also, the reversible motor 51 (Fig. 2) is rotatable forward or backward respectively while either volume control key 131 or 132 is depressed. As in the arrangement of Fig. 2, the loud speaker 156 at the related remote control station is rendered effective by a relay 132 which is operated as soon as the "off-and-on" switch of that station is actuated.

In the modified form of the invention shown in Fig. 3, the equipment associated with the radio receiver, including the station selecting mechanism of the operating motor and the stepping switch, are identical with the corresponding equipment in the arrangement of Fig. 1. The remote control station equipment, however, differs from that of each of the other forms in that but a single double-throw key is provided for effecting the several predetermined station selections effected by the station selecting mechanism. For causing the station hunting or DX operation of the station selecting mechanism, a single double-throw key or its equivalent, two non-locking keys of the depression type, may be employed. In this arrangement, a lamp is provided for each predetermined station that may be selected. However, it is not necessary to have an "off-and-on" switch since the stepping switch may be advanced under the control of the remote control station equipment to a normal position wherein the radio receiver is turned off.

It is believed that the operation of this modified system will best be understood by effecting the selection of a predetermined station or program. When the operator desires to tune in any predetermined station, he simply operates the double-throw key 200 forward and backward until the lamp at the remote station corresponding to the desired program or station is lighted. The operator on moving the blade of the key 200 to its upper position, closes a circuit from one side of the alternating current source over conductor 201, winding of the stepping mgnet 202, switch brush 203 in its first position, conductor 204, upper contacts of the key 200, conductor 205, to the other side of the alternating current source. The stepping magnet is thus operated and advances the brushes 203 and 206 into position 2. The operator then moves the blade of the switch 200 downward whereupon the circuit is completed for the stepping magnet 202 from one side of the alternating current source over conductor 201, winding of the stepping magnet 202, stepping switch brush 203, conductor 207 and lower contacts of the switch 200 and thence to the other side of the alternating current source over conductor 205. Under the control of this circuit, the stepping switch brushes are advanced in position 3, where brush 206 of the stepping switch is effective to control the station selecting mechanism to select a predetermined station or program #1. Also in this position of the stepping switch, a circuit is completed for lighting the #1 lamps 209 at all of the remote control stations. The circuit for effecting the lighting of these lamps is traceable from the alternating current source, conductor 201, brush 206, in position 3, conductor 208, multiple lamps 209 at the several remote control stations and thence over conductor 205 to the other side of the alternating current source. However, let it be assumed that it is desired to select the #3 program and consequently the operator moves the blade of the switch 200 again upward, whereby a circuit is completed from the stepping magnet 202 which circuit is similar to that previously described except that it now extends through brush 203 of the stepping switch in its third position and thence over the conductor 204. This energizes the stepping magnet 202 which advances the brushes 203 and 206 into their fourth position. The operator then moves the blade of the switch 200 downward which completes another operating circuit for the stepping magnet 202, in this instance through the brush 203 in position 4, conductor 207. This circuit is effective to advance the brushes of the stepping switch into position 5, where the lamps 210 individual to the No. 3 program are lighted in a circuit similar to that described for the lamp 209, except that in this instance, the circuit is extended through the stepping switch brush 206 in position 5, and through conductor 211. Also with the stepping switch in position 5, an operating circuit for the motor 18 is completed from one side of the alternating current source, conductor 201, brush 206 in its fifth position, conductor 212, contactor 213, contact ring 20, contactor 214, left hand winding of the motor 18, conductor 215 to the other side of the alternating current source.

When the radio receiver has thus been tuned to receive the desired program, the volume of this program may be regulated by moving the key blade 215 either into its upper position or into its lower position depending on whether it is desired to increase or diminish the volume. If the key blade is moved into its upper position, a circuit is closed from one side of the laternating current source, over conductor 201, upper winding of the motor 216, which operates the volume control device, key blade 215 to the other side of the alternating current source over conductor 205. If the key blade is moved to its lower position, a similar circuit is completed through the lower winding of the motor 216 so that the volume control device is operated in the opposite direction from that in which it was moved over the motor circuit nicluding the upper motor winding.

In the event that it is desired to receive some program other than those obtainable through predetermined adjustment, that is, if it is desired to obtain a DX operation of the radio receiver, key blade 200 is moved upward and downward successively to complete circuits from the motor magnet 202 in the manner already de-

scribed so that the brushes 203 and 206 are advanced into the position 10 which is the DX or hunting position. The DX key 220 may then be moved to its upper or to its lower position depending on the direction in which it is desired to have the motor 18 rotate the tuning shaft of the radio receiver. If the blade 220 is held in its upper position, the circuit from the motor 18 is completed from the alternating current source, conductor 201, brush 206, in its 10th position, key blade 220 in its upper position, conductor 221, contactor 222, ring contact 20, contactor 214, left hand winding of the motor 18 and thence over conductor 215 to the other side of the alternating current source. If the ring contacts 19 and 20 on the shaft of the motor 18 have been rotated to the extreme position in which the contactors 214 and 222 are in the non-conducting space between these contacts, then contacts 19 and 20 will have been so positioned that the contactors 223 and 224 are in engagement with the contact 19, then when the blade 220 is moved into its lower position, the circuit for the motor 18 is completed from the alternating current source, conductor 201, brush 206 in its 10th position, blade 220 in its lower position, conductor 225, contactors 223 and 224 in engagement with contact 19, right hand winding of the motor 18 to the other side of the alternating current source over conductor 215. It will be understood that as long as the blade 220 is held either in its upper or lower position, station selecting mechanism will continue to rotate to its extreme position in either of its two directions of adjustment. When, however, a desired station is heard, the blade 220 is released to its neutral position causing the motor 18 to stop rotating leaving the tuning of the radio receiver in condition to receive the desired program.

The radio receiver may be turned off from the remote control station by moving the key blade 200 up and down to complete an operating circuit for the stepping magnet 202, thereby, advancing the brushes 203 and 206 into their first position. With the brush 206 either in position 1 or position 2, the station selecting mechanism, including the split ring contacts 19 and 20, is rotated until the brushes 223 and 224 are in the non-conducting area between the contacts 19 and 20. At this time, the contacts 260 which may be connected in multiple with the contacts of the "off-and-on" switch of the radio receiver, as best shown in Figs. 1 and 2, are opened to disconnect current from the radio receiver. It will be understood that the contacts 260 function in like manner in the arrangements of Figs. 1, 2, and 3 to disable the radio receiver, when a radio program is no longer wanted. In Figs. 2 and 2A, visual tuning meters 261 are provided to indicate visually when the radio receiver is tuned into exact resonance with the signal of a desired broadcasting station. Such visual tuning meters may be provided at each of the remote control stations of all of the different arrangements herein disclosed.

What I claim is:

1. In a radio signal receiving system, a radio receiver having at least one tuning element, a motor for operating said tuning element, means at said motor including a plurality of conductors for selectively controlling the operation of said motor to predetermined and non-predetermined positions, selectively operable circuit-controlling means for including desired ones of said conductors in an operating circuit for said motor, a remote control station, other conductors connecting said remote control station and said selectively operable circuit-controlling means, mechanism at said remote control station for including said last-mentioned conductors in a circuit to selectively govern the operation of said circuit-controlling means to operate said motor to a predetermined position, and means at said remote control station for operating said motor at will to any desired position.

2. In a radio signal receiving system, a radio receiver having at least one tuning element, a motor for operating said tuning element, means at said motor including a plurality of conductors for selectively controlling the operation of said motor to predetermined and non-predetermined positions, a progressively movable switch for including desired ones of said conductors in an operating circuit for said motor, a remote control station, other conductors connecting said remote control station and said progressively movable switch, mechanism at said remote control station for including said last-mentioned conductors in a circuit to selectively govern the operation of said progressively movable switch to operate said motor to predetermined positions, and means at said remote control station for operating said motor at will to any desired position.

3. In a radio signal receiving system, a radio receiver having at least one tuning element, a motor for operating said tuning element, means at said motor including a plurality of conductors for selectively controlling the operation of said motor, one of said conductors being provided for each desired position of adjustment of said element, a progressively movable switch for completing a circuit for said motor including one of said conductors, a remote control station, conductors connecting said remote control station and said progressively movable switch, and mechanism including a plurality of keys at said remote control station for selectively extending said conductors terminating at said remote control station to complete a circuit for directively operating said progressively movable switch.

4. In a radio signal receiving system, a radio receiver having at least one tuning element, a motor for operating said tuning element, means at said motor including a plurality of conductors for selectively controlling the operation of said motor, selectively operable circuit-controlling means for completing a circuit for said motor including one of said conductors, a remote control station, conductors connecting said remote control station and said selectively operable circuit-controlling means, and mechanism including a plurality of interlocking keys at said remote control station for selectively extending said conductors terminating at said remote control station to complete a circuit for directively operating said circuit-controlling means, said keys being interacting so that the actuation of one key releases a previously actuated key.

5. In a radio signal receiving system, a radio receiver having at least one tuning element, a motor for operating said tuning element, means at said motor including a plurality of conductors for selectively controlling the operation of said motor, a progressively movable switch for completing a circuit for said motor including one of said conductors, a remote control station, conductors connecting said remote control station and said progressively movable switch, and mech-

anism including a plurality of interlocking keys at said remote control station for selectively extending said conductors terminating at said remote control station to complete a circuit for directively operating said progressively movable switch, said keys being interacting so that the actuation of one key releases a previously actuated key.

6. In a radio signal receiving system, a radio receiver having at least one tuning element, a motor for operating said tuning element, a commutator actuated by said motor, said commutator comprising two rotating contact plates and a plurality of contactors including one contactor for each tuning position of said tuning element, said contactors being adapted to engage said rotating plates, a progressively movable switch including two sets of fixed contacts, brushes, one brush for each set of contacts, a plurality of conductors, each terminating in a contactor and a fixed contact of said switch, a remote control station including mechanism for selectively indicating the desired adjustment of said tuning element, conductors terminating at said mechanism and in the other set of fixed contacts of said progressively movable switch, said mechanism being selectively adjustable to complete certain of said circuits for effecting a desired setting of said progressively movable switch, and an operating circuit for said motor including the one of said first mentioned conductors terminating in the fixed contact with which the switch brush is in engagement.

7. In a radio signal receiving system, a radio receiver having at least one tuning element, a motor for operating said tuning element, a commutator actuated by said motor, said commutator comprising two semicircular contact plates and a plurality of contactors including one contactor for each predetermined tuning position of said tuning element, said contactors being adapted to engage one or the other of said plates in the several positions thereof, a progressively movable switch including sets of fixed contacts and a brush cooperating with each set of contacts, a magnet for advancing said brushes to successively engage said sets of fixed contacts, a plurality of conductors each terminating in a contactor and a fixed contact of one of said sets at said switch, said mechanism being selectively adjustable to complete a circuit including one of said conductors for operating said magnet to effect a desired setting of said progressively movable switch, and an operating circuit for said motor including the one of said first mentioned conductors terminating in the fixed contact with which one of the switch brushes is in engagement.

8. In a radio signal receiving system, a radio receiver having at least one tuning element, a motor for operating said tuning element, a commutator actuated by said motor, said commutator comprising two semi-circular contact plates and a plurality of contactors including one contactor for each predetermined tuning position of said tuning element, said contactors being adapted to engage one or the other of said plates in the several positions thereof, a progressively movable switch having a plurality of sets of contacts, and a brush cooperating with each set of contacts, a magnet for advancing said brushes to successively engage said sets of fixed contacts, a plurality of conductors each terminating in a contactor and a fixed contact of one of said contact sets of said switch, a remote control station including mechanism for selectively indicating the desired adjustment of said tuning element, said mechanism comprising contacts and a contactor movable into engagement therewith, conductors terminating at contacts of said mechanism and the other set of fixed contacts of said switch, said mechanism being selectively adjustable to complete a circuit including certain of said last mentioned conductors for operating said magnet to indicate a desired setting of said progressively movable switch, and an operating circuit for said motor including the one of said first mentioned conductors terminating in the fixed contact with which one of the switch brushes is in engagement.

WINFRED T. POWELL.

DISCLAIMER

1,992,326.—*Winfred T. Powell*, Rochester, N. Y. REMOTELY CONTROLLED RADIO RECEIVING SYSTEM. Patent dated February 26, 1935. Disclaimer filed March 31, 1936, by the assignee, *Stromberg-Carlson Telephone Manufacturing Company*.

Hereby enters this disclaimer as to claims 1, 2, 3, 4, and 5 of said patent.

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