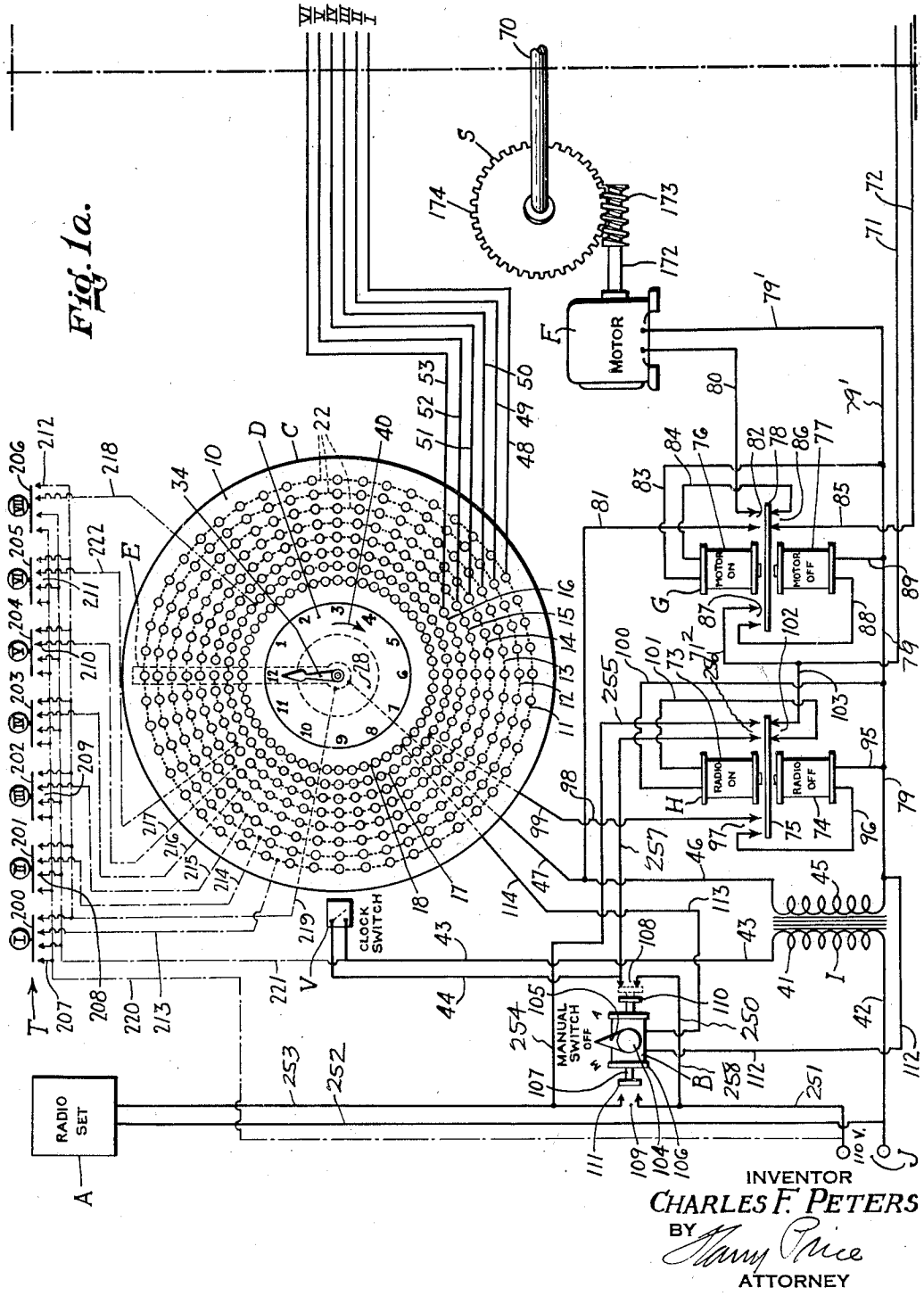
July 8, 1941. C. F. PETERS 2,248,116

AUTOMATIC TUNING SYSTEM FOR RADIO SETS

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Fig. 1a.



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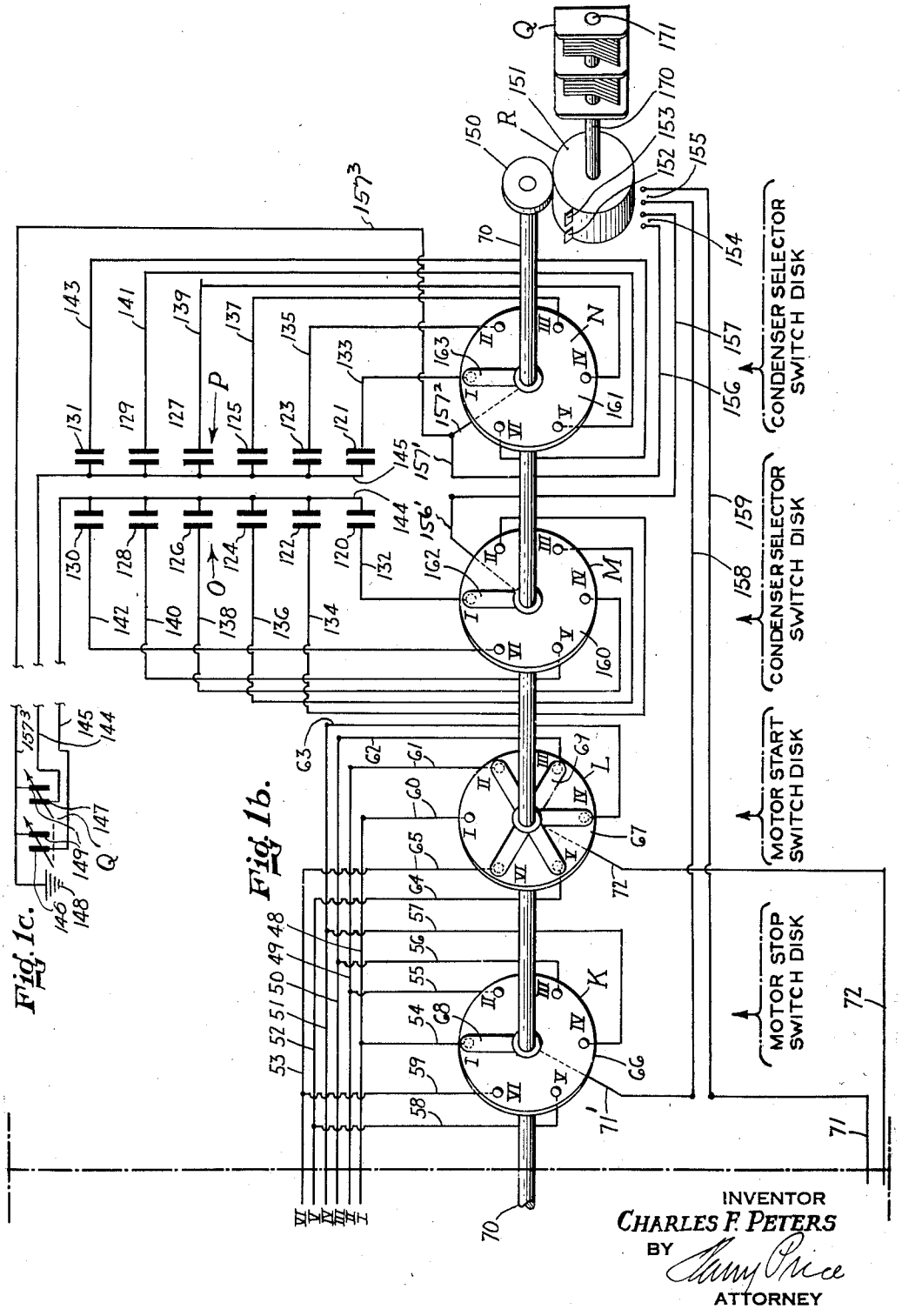


Fig. 1c.

Fig. 1b.

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AUTOMATIC TUNING SYSTEM FOR RADIO SETS

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Fig. 2.

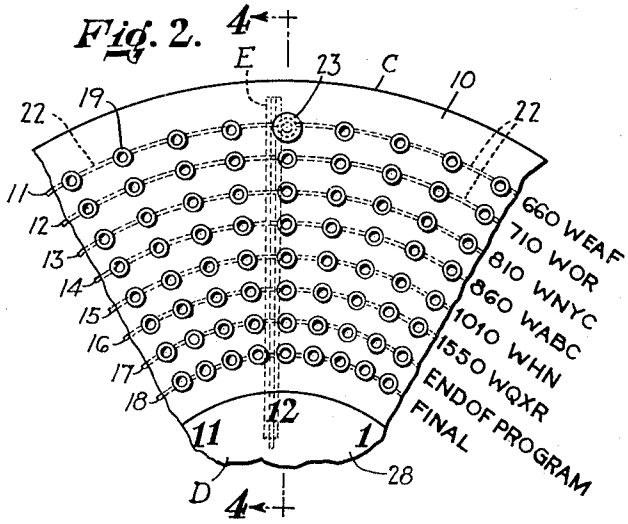


Fig. 3.

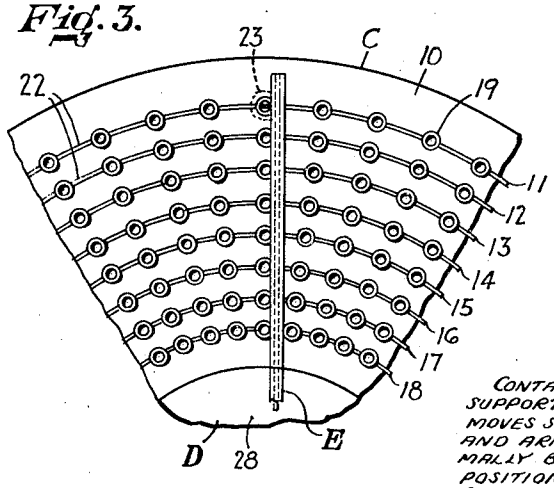


Fig. 4.

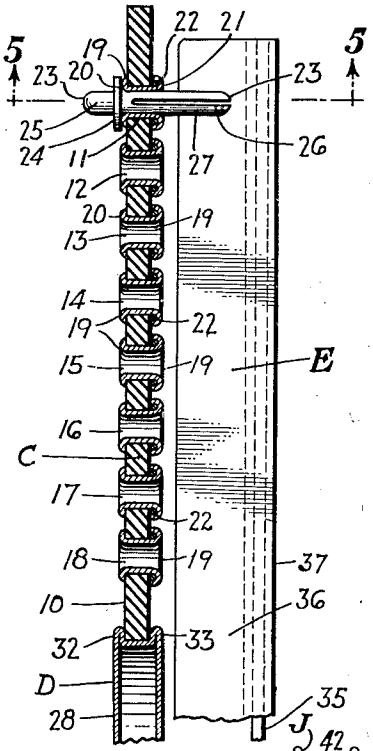
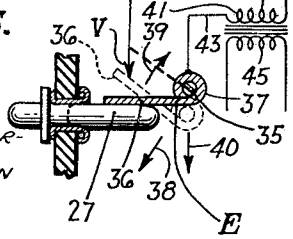
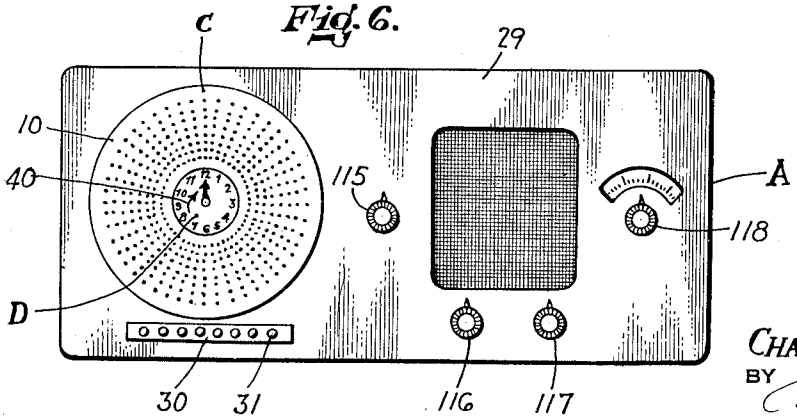


Fig. 5.



CONTACT V IS SUPPORTED BY AND MOVES SHAFT 35 AND ARM 36 IS NORMALLY BIASED TO POSITION SHOWN IN SOLID LINES

Fig. 6.



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AUTOMATIC TUNING SYSTEM FOR RADIO SETS

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Fig. 7.

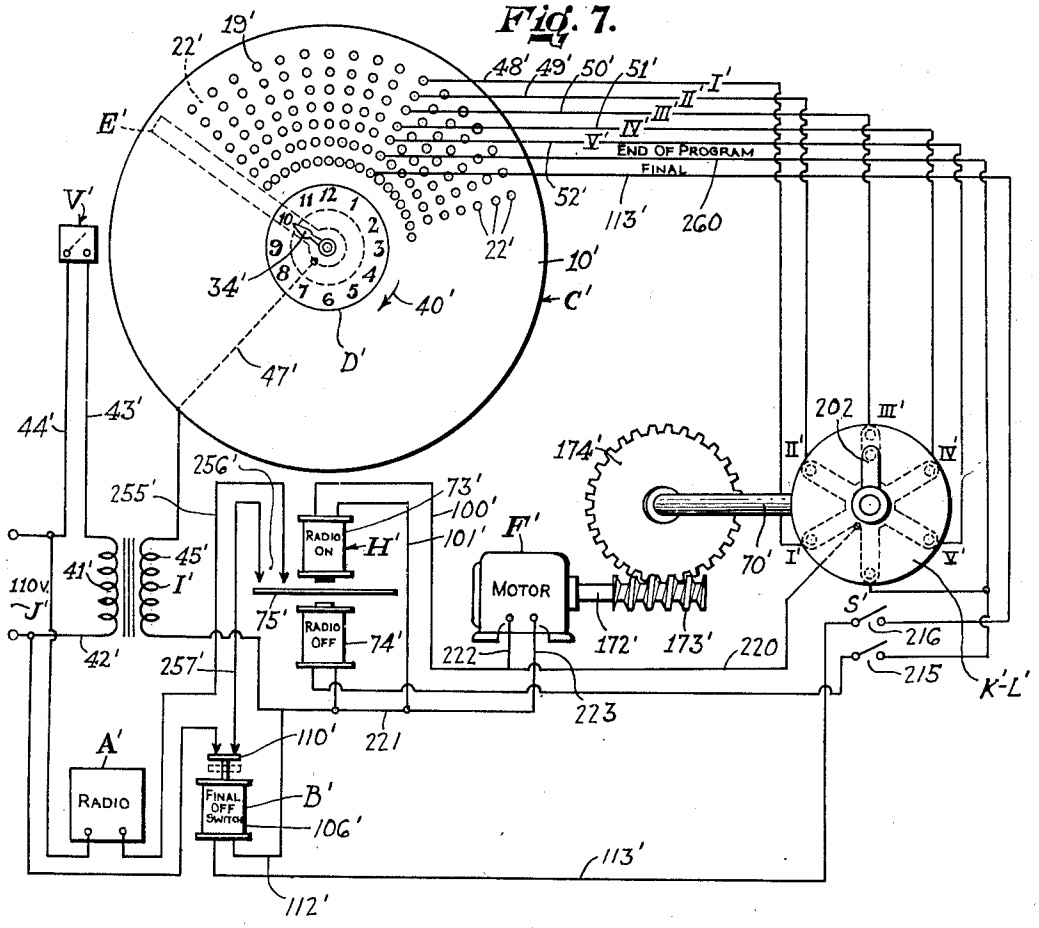


Fig. 8.

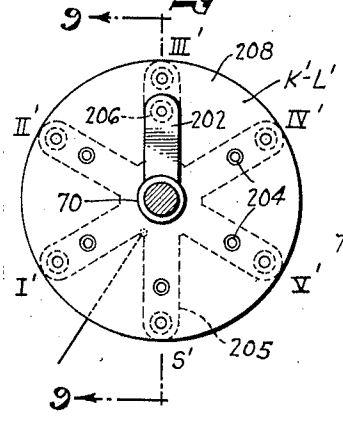


Fig. 9.

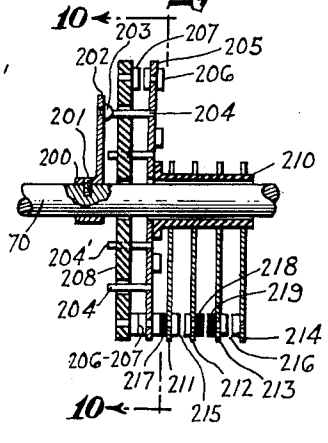
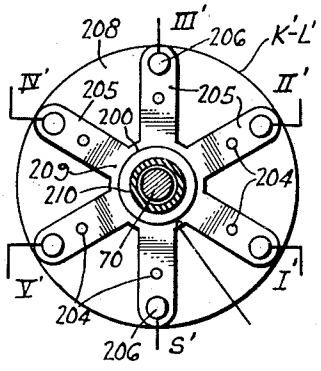


Fig. 10.



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2,248,116

UNITED STATES PATENT OFFICE

2,248,116

AUTOMATIC TUNING SYSTEM FOR RADIO SETS

Charles F. Peters, Great Kills, Staten Island, N. Y.

Application September 24, 1938, Serial No. 231,458

5 Claims. (Cl. 250—20)

The present invention relates to tuning and tuning control systems and it particularly relates to automatic tuning and tuning control systems for radio reception apparatus.

Although the present invention will be particularly described and illustrated in connection with its application to a home radio set, it will be apparent that it may have other applications in controlling or regulating radio sets and in tuning or adjusting various types of equipment other than radio receiving sets which is to be set in a predetermined fashion at different time intervals and for different periods.

It is among the objects of the present invention to provide an inexpensive, reliable, automatic timing and tuning arrangements for home radio sets or for other equipment which it is desirable to adjust in a predetermined manner at different times and for different periods, which will be relatively simple and inexpensive, be readily operable by available equipment from the usual sources of electrical power and which may be readily adjusted or repaired and which may be made in a separate unit for attachment to a radio set.

Another object is to provide a simple, durable, inexpensive and automatic station and time control for a home radio station, which will automatically tune in different stations for different programs without making it necessary for the householder or owner of the set manually to turn off the program at its termination, or without the necessity of utilizing complicated, expensive and intricate control mechanisms and circuits readily subject to derangement.

In accomplishing the above objects it has been found most satisfactory to provide a clock control which may be positioned in the radio set equipment or which may be positioned at some other point, which control will be provided with a contact or electrical circuit closer arm connected to or moving with the hour hand over a dial.

The dial may carry a plurality of contact elements or holders, preferably arranged in concentric circles and in radial rows, a radial row of contact holders being provided for each quarter hour and a separate concentric circle of contact holders being provided for each of the stations to be tuned in. Two extra circles are also provided, one for the end of the program and the other for turning off the set when it is not desired to receive any further programs.

Although various forms of contactors may be positioned upon this dial to cooperate with the swinging contact arm moving with the hour hand at predetermined quarter hour intervals and corresponding to predetermined stations, it has been found most desirable according to one embodiment of the invention to provide a series of radial and concentric rows of holes in a dial of an insulating material, which holes are provided with threaded or resilient-grip eyelets to receive contact plugs which strike or contact with a moving element on the hour hand shaft of the clock.

A transformer may be used to step down the available 110 or 220 volt supply which transformer may be connected at one side to the clock control.

In one desired construction the contact at the clock will energize or actuate a circuit leading from a transformer to a switch or to relays, which cause a motor to be switched on. The set may be turned on simultaneously or only after the motor has tuned the set to the desired station. The motor may operate a rotary switch device having a rotating arm or arms and a plurality of relatively fixed elements or switch elements corresponding to the stations which are to be tuned in.

One of the elements may provide a circuit from the transformer passing through the clock control to start the motor. Another element stops the motor when the set has been tuned to the desired station. Additional switches may be used to provide predetermined capacities in the radio receiving circuit corresponding to the various stations.

When the contact arm moving with the hour hand contacts a plug at the end of the radio program circle, the radio set will be switched off and when it contacts a plug in the final stop circle, the set will automatically be switched off. This will avoid repetition of programs in the next twelve hour period. A manual switch may also be provided to switch the set on and off manually or to turn on or off the automatic arrangement at any desired time or interval.

At the same time, if desired, the arrangement described may be controlled by providing buttons or manually controlled elements, one for each station, at an adjacent point or at a remote point to tune in a desired station without adjustment or manipulation of either the dial or the various knobs of the set.

In the preferred construction there is also provided an arrangement by which the variable condenser may be tuned to a zero position automatically without need of manual control.

In the construction as shown and described it will be possible to throw the set from automatic

to manual control by a readily available button or lever arrangement.

Referring to the drawings which show one form of the construction according to the present invention, but to which the present invention is by no means restricted, since many changes and variations may be made, all within the scope thereof:

Figs. 1*a* and 1*b* represent diagrammatically the circuit arrangements of the tuning and timing control system of the present invention which may be utilized for tuning the radio set to a predetermined station, wave length or frequency from a remote point or directly at the set, Fig. 1*a* showing the left hand side of the arrangements and Fig. 1*b* showing the right hand side of the arrangements.

Fig. 1*c* is a diagrammatic showing of a portion of the arrangements as connected to the various condensers.

Figs. 2 and 3 are fragmentary elevational views of a portion of the control dial upon an enlarged scale as compared to Fig. 1*a*, Fig. 2 being a front view and Fig. 3 being a rear view.

Fig. 4 is a fragmentary transverse sectional view upon the line **4**—**4** of Fig. 2 and upon an enlarged scale as compared to Fig. 2.

Fig. 5 is a transverse sectional view upon the line **5**—**5** of Fig. 4.

Fig. 6 is a diagrammatic view in elevation illustrating how the arrangements of the present invention may be combined with the usual radio set.

Figs. 7 to 10 show an alternative installation, Fig. 7 being a diagrammatic lay-out similar to Figs. 1*a* and 1*b*, Fig. 8 being an enlarged diagrammatic showing of the rotary switch shown in smaller scale at the right of Fig. 7, Fig. 9 being a transverse sectional view upon the line **9**—**9** of Fig. 8, and Fig. 10 being a rear sectional view upon the line **10**—**10** of Fig. 9.

Referring to the drawings, the radio set A is provided with the main switch B which permits either manual or automatic control as may be desired.

The main control dial C is associated with the clock D. The clock is provided with an extra arm E which controls circuits to the motor F and the circuits to the motor on and off relay G and the radio set or program on and off relay H. The relays G and H are so constructed that their armatures will remain in operative position after the magnets are deenergized.

The transformer I is positioned in said circuits to reduce the 110 voltage obtained from the source of supply J. The rotary or dial switches K and L control the tuning to a station, K being the motor stop switch and the switch L being the motor start switch.

The rotary or dial switches M and N select the fixed condensers shown in groups or banks at O and P. It has been found most convenient to connect fixed condensers in groups or banks of two for each station. These fixed condensers may each be adjusted to bring in the particular station with the desired volume and then they may be set so that thereafter they will not be varied.

The variable condenser Q may be controlled so that it will be turned to zero by means of the driving connection R. The variable condenser Q is turned to zero and rendered inoperative when the fixed condensers O and P are being utilized and/or when such fixed condensers are being adjusted to bring in the stations with proper volume.

The switches K, L, M and N are driven from the motor F through the reduction unit S.

The dot-and-dash line circuits shown upon Fig. 1*a* lead to the remote control elements T, by which the tuning of the set may be accomplished without setting the disk C.

Referring specifically to Figs. 1*a* and 1*b*, the disk C may consist of a circular panel **10** having the concentric rows of spaced openings **11**, **12**, **13**, **14**, **15**, **16**, **17** and **18**, which are arranged at quarter hour intervals. Each row of the circles, with the exception of the two innermost rows **17** and **18**, may correspond to a station.

For example, as indicated upon Fig. 2, the row **11** may correspond to a frequency of 650 or station WEAF. The row **12** may correspond to a frequency of 710 or station WOR. The row **13** may correspond to a frequency of 810 or station WNYC.

The row **14** may correspond to a frequency of 860 or station WABC. The row **15** may correspond to a frequency of 1010 or station WHN. The row **16** may correspond to a frequency of 1550 or station WQXR.

The row **17** may correspond to the end of the program or to the intermediate stop, while the row **18** may correspond to the final shut-off of the set.

As indicated best in Fig. 4, a metal eyelet **19** is inserted in each of the openings and the front edges are turned or hammered over as indicated at **20**. The rear end of the sleeve, as indicated at **21**, is also turned over to engage a wire **22** which extends over all the eyelets in each of the concentric rows **11** to **18**, respectively.

These eyelets **19** are each designed to receive a pin or plug member **23** which has a disk portion **24** to be stopped against and to contact with the bent over portion **20** of the eyelet **19**. These eyelets may be threaded for threaded plugs.

The plug **23** is also provided with the hand grip portion **25** and with the slot **26** on its long shank **27** to give it resiliency and permit it to be tightly grasped in the opening of the sleeve **19**, since the split inside end portions of the plug **23** will normally be further spaced than the internal diameter of the sleeve **19**. The center of the disk may be provided with the sheet metal holder member **28** which may receive a clock mechanism D, as best shown in Figs. 1*a* and 6. It will be noted that the support **28** has the upturned edge portions **32** and **33** for holding the dial C in position.

As shown in Fig. 6, the dial C and the clock mechanism D may be mounted upon the panel or front **29** of a usual radio set. The panel may also carry a manual push button tuning arrangement **30** having the button elements **31**.

The clock D, which may also have a minute hand, is shown as having an hour hand **34** only, since this hand is used to control the operation of the circuits.

On the shaft of the hour hand and moving with the hour hand is carried the radial swinging switch element E. The element E has a bar or rod **35** and a sheet metal member **36** which has a turned over portion **37** to embrace said rod **35**. The sheet metal member **36** is normally pressed in the direction indicated by the arrow **38** by resilient means or by a spring (not shown).

When it is moved against the extension **27** of the plug **23**, it is forced in the direction **39** until it is pressed sufficiently back to pass the plug **23**, in which case it will be snapped back into position. Before this occurs, however, the set will have been tuned to the desired station

by the radial switches K to N, the motor F and the relays G and H.

The contact of the swinging plate 36 with the plug 23 as shown in Fig. 5 will turn on the radio set and also establish the motor starting circuit.

At the base of the clock is provided a clock switch V for connecting the 110 volt source to the set, which switch is shown diagrammatically in Figs. 1a and 5 to simplify the showing, since its detailed construction forms no part of the invention. The actuating mechanism for the switch V may be so constructed that elements thereof travel around with the arm E in order that it may be in position to be actuated by said arm whenever said arm contacts with the plug and is actuated in the manner shown in Fig. 5.

As the arm E rotates the first contact will be made with the pin 23, establishing the circuit with the wire connection 22 running around the circle 11 to 18, as the case may be. Then the flange 36 will close the switch V, connecting the transformer I to the 110 volt source J in the manner which will be more fully described. During this period the clock is moving in the direction indicated by the arrow 40.

As indicated diagrammatically upon Fig. 1a and Fig. 5, the transformer I has the primary 41 having the lines 42 and 43, 42 passing to the 110 volt source J and 43 passing to the clock switch V.

From the clock switch V there is another lead 44 back to the set switch B and the lines 250 and 251 to the 110 volt source. From the secondary 45 of the transformer there is a connection 46 to the lead 47 to the arm E.

Each of the wires 22 connecting the eyelets in each of the circles 11 to 16 together is provided with a lead designated respectively 48, 49, 50, 51, 52 and 53.

These leads correspond respectively to the circles 11 to 16 on the dials. These leads are respectively connected as indicated upon Fig. 1b by the leads or connections 54, 55, 56, 57, 58 and 59 to the points numbered I to VI upon the insulating dial 66 of the switch K and by the connections 60, 61, 62, 63, 64 and 65 to the connections numbered I to VI upon the insulating dial 7 of the switch L.

The switch K is provided with a single radial contact finger 66. The switch L is provided with five radial contact fingers 69, which contact the points not contacted by the finger 66. These fingers 68 and 69 all turn with the shaft 70 and are in electrical connection with lines 71 and 72 leading to the relays G and H. The switch K through the line 71 controls the relay G to stop the motor and the relay H turns on the set when the desired station has been tuned in. The switch L through the line 72 controls the relay G to start the motor upon making a contact at the clock.

Referring again to Fig. 1a, the radio or program on and off relay is provided with an upper electro-magnet 73 for the "on" position and the lower electro-magnet 74 for the "off" position.

Operated by the electro-magnets is the armature 75 which is shown in the off or down position.

The motor start and stop relay G is also provided with an upper on electro-magnet 76 and a lower off electro-magnet 77 and with the armature 78 which is shown in down or off position.

The secondary 45 of the electro-magnet is provided with the leads 79 and 79', which are connected to one side of the motor F. The other side of the motor is connected by a lead 80, the armature 78 across the points 82, and the connection 81 and 46 to the other side of the secondary 45 of the transformer.

The motor F drives the shaft 70 by the shaft 172, the worm 173 and the gear wheel 174.

When the motor is not operating, the armature 78 is down, opening the circuit between the contact points 82. To operate the motor F it is necessary to energize the motor-on electro-magnet 76.

The circuit of this motor-on element 76 from the secondary 45 includes the connection 79, the connection 83, the electro-magnet 76, the connection 84, the armature 78 which closes the contact points 86, the connection 85, and the connection 72, which forms part of the clock circuit as already described.

When the motor-on electro-magnet 76 is energized, the armature will be drawn upwardly, opening the circuit across the contact points 86 and closing it across the contact points 82 and this will close the motor circuit and cause the motor to operate.

As soon as the motor has turned to a predetermined station, a circuit will be established through the connections 71 and 71^2, the contact points 87, the armature 78, the connection 88, the electro-magnet 77, and the connections 89 and 79 to the secondary 45.

It will be noted by reference to the switches K and L that it will be necessary to turn the arm 68 to the desired station I to VI and the arms 69 to omit the desired station I to VI before the motor will be stopped through operation of the relay G.

At this time, a circuit will be established through the clock circuit by the arm 68 and the lines 71 and 71', the switch 153—155, the line 103, the contacts 102, the line 101, the radio-on electro-magnet 73, the lines 100 and 79 to the secondary 45 turning on the radio across the contacts 256.

The contacts 256 are in the 110 V set circuit consisting of the lines 252, 253, 254, 255, the contacts 256, the line 257, the switch B, and the lines 258 and 251.

As shown in Fig. 1b, it may be regarded that the motor has turned the switches K and L to tune in station I, which may be WEAF, and that the motor has stopped. The program then continues to come in from WEAF or station I until the set is turned off by contact of the arm E with a plug 23 on the stop circle 17.

The stopping of the program is controlled primarily by the radio relay switch H. This switch H is provided with the circuit consisting of the conduit 79, the lead 95, the electro-magnet 74, the lead 96, the contact points 97, the armature 75, the leads 98 and 99 to the stop circle 17.

When the set is operating the armature 75 will normally be up, closing the contact points 97. The circuit thus established would energize the electro-magnet 74, pulling down the armature 75 and throwing the armature 75 to off position and discontinuing the radio receiver.

The final off circle 18 is connected to the set switch B. The switch B is provided with the handle 104 having the pointer 105, which may be turned off or to manual or automatic positions.

The casing 106 includes a coil carrying the armature 107, which is designed to close circuits across either the contact points 108 or the contact points 109 by its contact faces or plates 110 and 111, respectively.

Upon starting when the pointer 105 has been

turned to A or to automatic operation the plate 110 is thrown into the dotted line position, closing the contacts 108, a circuit will be established through the clock switch V and the leads 43 and 44. Upon final stoppage, a circuit will be established from the secondary 45 through the lead 112, coil of B the lead 113 and the lead 114 to the circle 18. The other side of the circuit is formed by the leads 46 and 47 and the arm E. This will restore the plate 110 to full line position.

With manual operation, however, when the contacts 109 are closed by the plate 111, the set may be tuned directly by the various knobs 115, 116, 117 and 118 shown in Fig. 6.

The fixed condensers O and P are provided and are connected in pairs by means of the switches M and N.

The fixed condensers 120 and 121 correspond to station I of circle 11. The fixed condensers 122 and 123 correspond to the circle 12. The fixed condensers 124 and 125 correspond to the circle 13.

The fixed condensers 126 and 127 correspond to the circle 14. The fixed condensers 128 and 129 correspond to the circle 15, and the fixed condensers 130 and 131 correspond to the circle 16.

These condensers are respectively connected to the contact points I to VI on the switch M and I to VI on the switch N by means of the leads or connectors 132 and 133, 134 and 135, 136 and 137, 138 and 139, 140 and 141, 142 and 143.

The leads 144 and 145 are connected respectively to one side of each of the banks of fixed condensers O and P and these leads 144 and 145 are also connected to the plates or sides 146 and 147 of the manually controlled variable condenser Q. The other plates 149 of the manually controlled variable condenser Q have connections to the lines 157^3, 157^2 and 157' and also to the ground 148 through the line 149.

The variable manual control condenser Q is provided with the main drive wheel 151 which is connected by the shaft 170 to the shaft 171 of the variable condenser elements. Ordinarily the variable condenser Q, as best shown in Fig. 1*b*, is turned to zero by the friction drive wheel 150 on the shaft 70 which presses against and turns the friction drive wheel 151 until stopped with the contact elements 152 and 153 closed against the contact points 154 and 155. At this point the variable condenser Q will be in zero position. This will establish circuits through the conduits or connections 156, 156', 157 and 157', and 71', 158, 159 and 71 respectively. It is apparent that the motor F will not be stopped until the circuit has been closed across the contacts 155 by the contact plate 153 and after the circuit has once been closed at the contacts 155, the friction roll 150 will slide upon the main roller 151. Further movement of the roller 151 is prevented by the abutment between the plate 153 and the contacts 155. After the plate 153 touches the contacts 155, the motor F will continue to operate until the switch elements 68 and 69 of the switches K and L have been turned to proper position.

The switches M and N are also each provided with the stationary insulating disks 160 and 161 carrying the metal points I to VI, which are designed to cooperate with the arms 162 and 163, the arms turning with the shaft 70 until the connection at the predetermined station I to VI has been made.

As an optional remote control unit, one switch may be provided for each station and for the stop, these switches being indicated at the top of Fig. 1*a*.

These switches are respectively provided with manually actuated contact elements 200, 201, 202, 203, 204, 205, 206 corresponding respectively to circles 11 to 17. Each of these switches are provided with four contact points 207, 208, 209, 210, 211 and 212. The third point on each one is connected to the respective circles 11 to 17 by the leads 213, 214, 215, 216, 217, 218 and 222.

The last point on each switch 200 to 206 is connected to the arm E by the lead 219. The first point is connected by the lead 220 to one side of the 110 volt source J, while the second point is connected by the leads, 221 and 43 through the primary 41 of the transformer.

In automatic operation the manual switch B will be thrown with the pointer 105 to A, indicating automatic position and causing the plate 110 to close the contact points 108, as indicated in dotted line position in Fig. 1*a*. The user of the set then may adjust the dial C in the following manner.

For example, it may be desirable to tune in the station WEAF at 12 o'clock, as indicated by the plug 23, being inserted in position in Figs. 2, 3 and 4. As soon as the arm E hits the plug, as shown on Figs. 4 and 5, it will press the flange or plate 36 over into the dotted line position, as shown in Fig. 5, closing the clock switch V.

This will energize the primary 41 through the circuit 42, 43, 44, the contact points 108, the contact plate 110 and the lines 250 and 251. This circuit extends to and from the 110 volt source J.

As soon as the primary 41 is energized, the secondary 45 will establish a circuit through the lines 46, 47, the swinging arm E, the contact plug 23, the wire 22 extending around the eyelets in the circle 11, the conduit 48, the conduit 60 to the contact point I on the dial 67 of the switch L.

If the station I, that is WEAF, has been previously tuned in, as is indicated by the position of the arms 68, 162 and 163 on the switches K, M and N, there will be an open circuit at the switch L and the motor F will not turn, since the set will already be in tune, but the radio set will be turned on by the circuit via arm 68, lines 71 and 158, contacts 115, lines 159, 71 and 103, contacts 102, line 101, solenoid 73, lines 100 and 79 and the secondary 45.

However, if another station other than the station I, corresponding to WEAF, has been tuned in, one of the arms 69 will be against the contact point I of the switch L and the circuit will continue through the line 72, the line 85, the contact points 86, the line 84, the motor-on magnet 76 of the relay G, the line 83 and the line 79 back to the secondary 45.

Energization of the magnet 76 of the motor on-off relay G will swing the armature 78 to upper portion closing the contacts 82, which will establish the circuit to the motor F. This circuit extends from the secondary 45 through the lines 46, 81, the contacts 82, the armature 78, the line 80, the line 79', and the line 79.

The motor then having started rotating will continue to rotate, driving the shaft 70 through the worm 173 and the gear 174 until the arms 68, 162 and 163 have been turned to the new station which is to be tuned in.

At this time the arm 69 on the switch L will be out of contact with the contact point corre-

sponding to the station tuned in and in contact with every other contact point upon the dial L.

When the motor has tuned the set to the desired station, a circuit will be established through the electro-magnet **77** by the arm **68** of the switch K.

For example, if the station was the station I, corresponding to WEAF, the circuit would consist of the lines **46**, **47**, the arm E, which would not have yet passed the plug or contactor **23** but would still be in contact, as indicated at **25**, the line **48**, the line **54**, the arm **68** on the dial K, the line **71'**, the contact points **155**, the contact element **153** (which would have been turned down by the connection between the friction disks **150** and **151** to tune the variable condenser Q to zero) the line **159**, the line **71**, the line 71^2, the contact points **87** and the armature **73**, the line **88**, the lower electro-magnet **77** of the motor on-off relay G, the lines **89** and **79** back to the secondary **45**.

The period of contact of the arm E with the plug **23** is sufficient to permit of this tuning operation.

At the same time that the station has been tuned, a circuit will be established through the lines **46**, **47**, the swinging arm E, the lines **48**, **54**, the arm **68**, the lines **71'**, **158**, the contact points **155**, **159**, the lines **71**, **103**, the contact point **102**, the line **101**, the electro-magnet **73** and the lines **100** and **79** back to the secondary **45**.

This last circuit will swing the armature **75** to upper position. In such upper position a circuit will be established to the radio set A from the source J through the lines **252**, **253**, **254**, **255**, the contact points **256**, the line **257**, the contact point **108**, the lines **258**, **251** and back to the source J.

When tuning has been completed for station WEAF or the station designated I, it will be noted that the arms **162** and **163** are in contact with their contact points, as indicated at I. This will connect in the circuit of the set the two fixed condensers **120**, **121** which have been adjusted to bring in the station WEAF or I with the proper volume.

It will be noted that the condensers are connected in pairs by the contact element **152** upon the element R, which will have been turned down to establish connection between the lines **156** and **157** by the friction gear **150**, **151**. In manual operation the switch **154—155** will be open.

It will be noticed that the condenser circuit for the station WEAF or I consists of the contact points **154**, the lines **156** and **157**, the lines **156'** and **157'**, the line 157^2, the arms **162** and **163**, the lines **132** and **133**, the condensers **120** and **121**, the lines **144** and **145**, the plate **147** and the line 157^3.

Upon contact with a plug which has been placed upon the end of the program circle **17**, the electro-magnet **74** will be energized, breaking the radio set circuit, previously described, through the lines **46**, **47**, the arm E, the next to the innermost circle **17**, the line **99**, the line **98**, the contact points **97**, the armature **75** (which is in up position when the set is operating), the line **96**, the electro-magnet **74**, the lines **95** and **79**.

However, when the arm E meets a plug in the final shut-off circle **18**, a circuit will be established from the secondary **45**, the line **112**, the coil (not shown) of the switch B, the lines **113** and **114**, the arm E and the lines **47** and **46** back to the secondary **45**.

This will have the effect of automatically throwing the pointer **105** back to off position and moving the plate **110** from dotted line to full line position, as shown in Fig. 1*a*, opening the circuit of the clock switch, V, which will then be thrown back to its initial position.

In a similar manner by providing the remote control buttons I to VII, as indicated at the top of Fig. 1*a*, the set may be tuned in at a desired station at the desired moment. This may be accomplished without providing any plugs or adjusting plugs in the dial C.

For example to tune station I or WEAF, a circuit will be established through the dot-and-dash lines, indicated at **220** and **221**, which will close the power circuit of the primary I.

At the same time the circuit ordinarily established by the contact **23** in the circle **11** will be established by the button **200** making connection between the dot-and-dash lines **213** and **219**. The rest of the circuits will remain the same. When it is desired to turn the set off, this may be accomplished by means of the manual switch B or a new button I to VII may be pressed to tune in a new station.

It is thus apparent that the applicant has provided a simple, inexpensive control system for enabling remote or adjacent control of a radio set to tune in a predetermined station at desired time intervals and for periods as may be desired.

The automatic tuning system may be readily associated with a radio set, as indicated in Fig. 6, and the buttons **200** to **206** may be placed upon the set or at a remote point. The system is readily adjusted, corrected and repaired.

Referring to the embodiment in Figs. 7 to 10, the relay G has been omitted and the switch construction K and L has been somewhat compacted. In the construction of Fig. 7 correspondingly functioning parts as those in Figs. 1 to 5 are indicated by the same numerals prime.

Briefly referring to Fig. 7 the said switch V', the transformer I', the switch B', the radio "on and off" relay H' and the radio set A' function substantially in the same manner as previously described.

For purposes of simplicity of showing however only circles for five stations are provided on the dial C' and the contact arm A' is of the same construction as already described in connection with Figs. 4 and 5. The essential difference between the construction of Figs. 7 and 10 and that of the construction of Figs. 1 and 5 resides in the construction of the switch shown in small scale in Fig. 7 and shown in substantially larger scale in Figs. 8 to 10.

This switch is provided with a central shaft **70** carrying the sleeve **200** held in position by the said screw **201**. The sleeve in turn carries the arm **202**, which has a presser member **203**, which may contact with the pins **204** carried by the six arms **205**. Each of the arms carries a contact **206** which is positioned opposite to the contact **207** on the dial **208** and when the button **203** is in contact with the pin **204** these contacts **206** and **207** will be separated opening the circuit as shown at the upper portion of Fig. 9. However, usually the contacts will be closed as indicated at the lower portion of Fig. 9.

The spider **209**, which carries the arms **205**, also has a sleeve **210** which carries the arms **211**, **212**, **213** and **214**. The arms **211** and **212** are provided with the contacts **215** while the arms **213** and **214** are provided with the contacts **216**. The insulating blocks **217**, **218** and **219** are provided to assure that there will be no electrical

connection between the arms 211 and the spider 209 and the arms 212 and 213. As indicated in the lower portion of Fig. 9 the contacts 215 and 216 will be separated, unless the presser member 203 on the arms 202 contacts the lower main pin 204. When this occurs the contacts 215 and 216 will be closed, and the contacts 206 and 207 at the lowermost part of the discs 208 will be opened.

In operation, when a circuit is closed on the dial C' say for example corresponding to the station I', the circuit will extend from the secondary 45' to the arm E' to the line 48' to the contacts 205, 207, corresponding to the arm I' of Fig. 7 to the conduit 220 through the upper electro-magnet 73' by means of the conduits 100' and 101' and through the line 221 back to the secondary 45. The electro-magnet 73' when energized will lift the armature 75' closing the circuit across the contacts 256' and starting the set.

The motor F' also will be energized by means of the connections 222 and 223 which are also upon this circuit. The motor will turn the arm 202 until contacts at position I' are opened and at this time the motor circuit will be opened and the motor will stop. When a plug is positioned at the end of the program circle or the final circle the contacts 215 and 216 will be actuated when the arm 202 moves to lowermost position on the dial, namely, position indicated at S'. In this position the contacts 215 and 216 will be closed and the contacts 206 and 207 will be opened. When the plug is in the end of the program circle, the switch 215 will energize the electro-magnet 74' switching off the set in the manner previously described. When, however, the plug is in the final circle the switch or contacts 216 will be closed and this will energize the electro-magnet B' so as to move the contact plate 111' from upper to lower position.

It will be apparent that plugs should be placed both in the "end of program" circle and the "final" circle when the radio set is to be turned off.

As is indicated upon contact with a plug in the "end of the program" circle, a circuit will be set up through the line 260, the closed contacts 206—207 at the position S' on the switch of Figs. 8 to 10. The circuit will then continue through the line 220 to the motor F' and back to the secondary 45'. The motor will turn until the arm 202 moves to position S', at which time the contacts 206—207 at position S' will be opened, stopping the motor and the contacts 215 and 216 will be closed.

When the contacts 216 are closed, the lower electro-magnet 74' will be energized, drawing the armature 75' downwardly and opening the circuit across the contacts 256'.

The final off-switch B', however, will not be operated unless there is also a plug in the "final" circle. If there is such a plug in the "final" circle, the movement of the arm 202 to the position S' will close the switch 216, energize the electro-magnet 106', and move the contact plate 110', from full line position down to the dotted line position, shutting off the set. The operation of the switch B' prevents repetition of the same programs during the next twelve hours.

It is, of course, possible to eliminate the "final" circle where the switch B' is manually operated or where the set will be automatically turned off by outside arrangement not shown.

It will be noted in connection with both the switches of Fig. 1b and Figs. 8 and 9, that these switches both present a closed circuit to the motor control relay G or to the motor F', which is open at the clock. As soon as the plug in a desired circle strikes the arm E or E', this circuit will be closed and the motor will turn the switch to the position corresponding to the station to be tuned in.

When this is accomplished the motor circuit will be opened and the motor will stop. In the switch shown in Fig. 1b, the set may be turned off with the rotary switch in any position, while in the construction of Figs. 8 to 10, the switch arm 202 must always be vertically downwardly in the position S' when the set is turned off. This last mentioned position S' in the embodiment of Figs. 7 to 10 may be regarded as a neutral position.

The operation other than just described is the same as previously described in connection with Figs. 1 to 6, and if desired, the other attachments designated with M, N, O, P, Q, R and T, can also be included in the arrangement of Figs. 7 to 10.

It is to be understood that other tuning means, impedances, or reactors could be utilized in lieu of the fixed condensers O and P and the variable condenser Q for tuning the set. It is also to be understood that other types of switches than the relays G and H could be used for turning off and on the motor and the radio set. Other types of circuit selectors could also be utilized in lieu of either the manual selector indicated at the top of Fig. 1a or the clock selector indicated at the upper central portion of Fig. 1a.

As many changes could be made in the above construction, and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In combination with a radio set, a tuning arrangement comprising a clock driven contact element, a motor for tuning the set to a predetermined station, a switch for starting and stopping the motor, establishing a motor circuit to start the motor when said motor is stopped and cutting off the motor circuit when the desired station has been tuned in, a switch for turning on and off the set establishing a circuit to turn on the set when the motor has tuned the set in to the desired station and establishing a circuit to turn off the set at the end of the program and connecting circuits actuated by said contact element to control said switches, said circuits including a rotating switch having a plurality of contact points one for each station to be tuned, each of said points establishing a circuit to actuate the motor switch to motor starting position except the point corresponding to the station to be tuned in, said last mentioned point establishing a circuit to actuate the motor switch to motor stopping position, said contact element including a contact arm and a dial of non-metallic material having concentric and radial rows of contact points corresponding to stations and time intervals, said points cooperating with said arm.

2. In an automatic tuning installation for a radio receiving set, a plurality of selectively energized circuits, one circuit corresponding to each station to be tuned in, means to select and cause energization of one of said circuits, manually controlled variable tuning means, a plurality of fixed tuning means, one for each station

to be tuned in, and control means responsive to the energization of the selected circuit to set said manually controlled tuning means to zero and to select a fixed tuning means corresponding to the station of the circuit which has been selected and energized.

3. The installation of claim 2, said control means including a motor operated upon energization of one of said circuits, and a switch actuated by said motor provided with a plurality of spaced circuit closing contacts respectively corresponding to each of said plurality of selectively energized circuits.

4. The installation of claim 2, said means to select and cause energization of one of said circuits including a clock, a plurality of adjustable circuit closing contacts corresponding to different times and to each station to be tuned in and an arm driven by said clock to close the contacts corresponding to the circuit selected.

5. The installation of claim 2, in which said control means includes a rotary switch having a plurality of contacts corresponding to each of said stations to be tuned in, each contact being connected to one of said fixed tuning means corresponding to one of said stations.

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