Jan. 12, 1932. A. J. FLEIG 1,841,283

DISTANT CONTROL EQUIPMENT

Filed Feb. 17, 1930 3 Sheets-Sheet 1

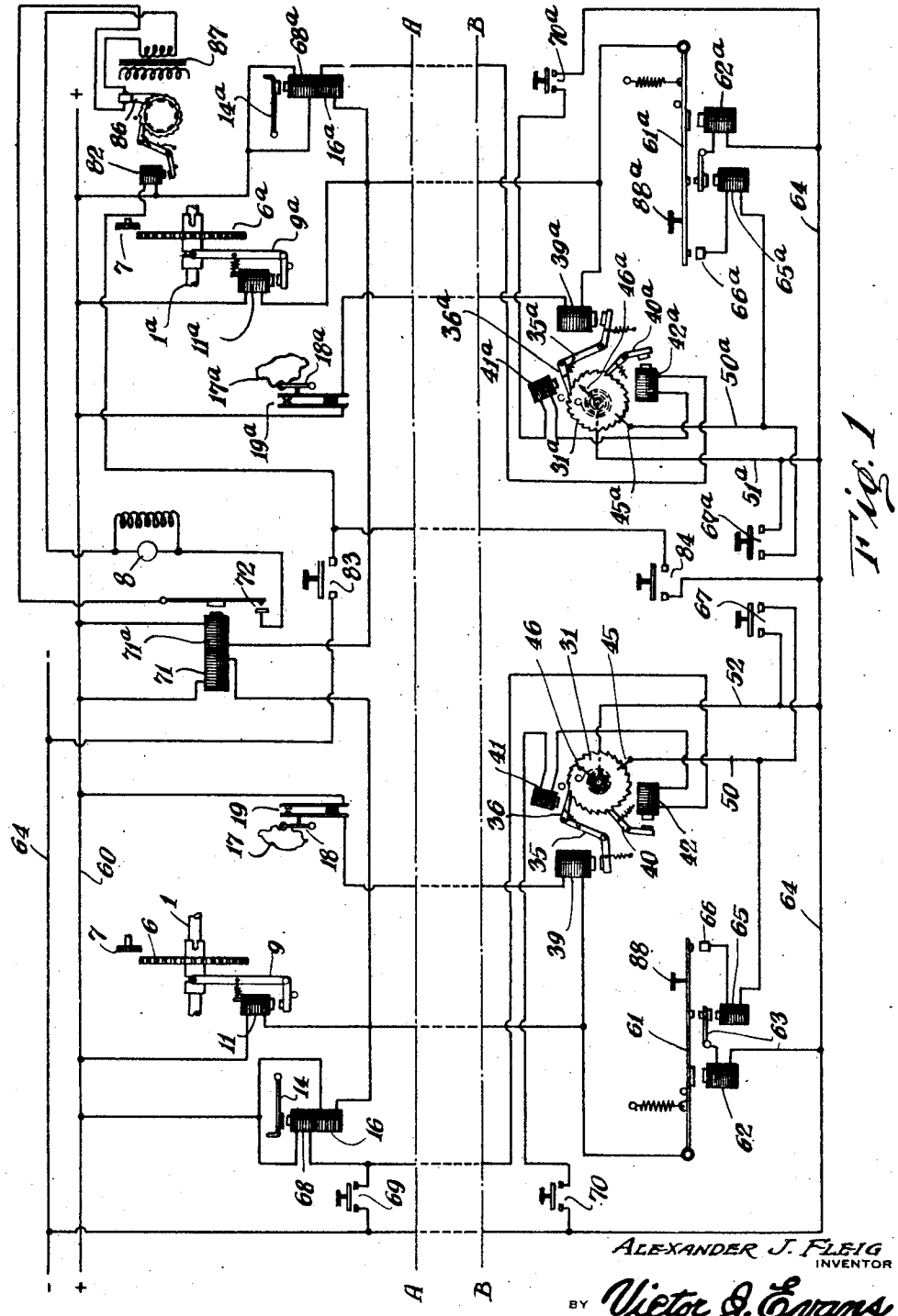


Fig. 1

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DISTANT CONTROL EQUIPMENT

Filed Feb. 17, 1930 3 Sheets-Sheet 2

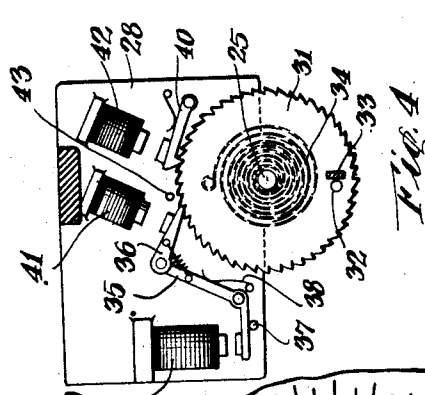


Fig. 4

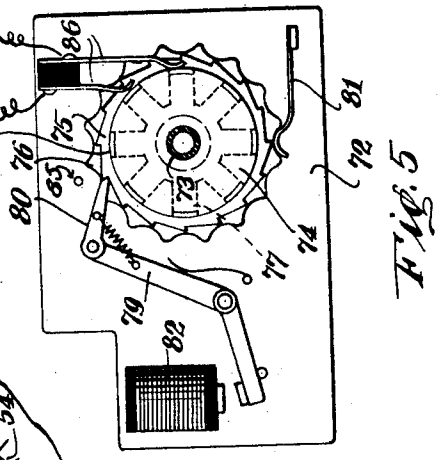


Fig. 5

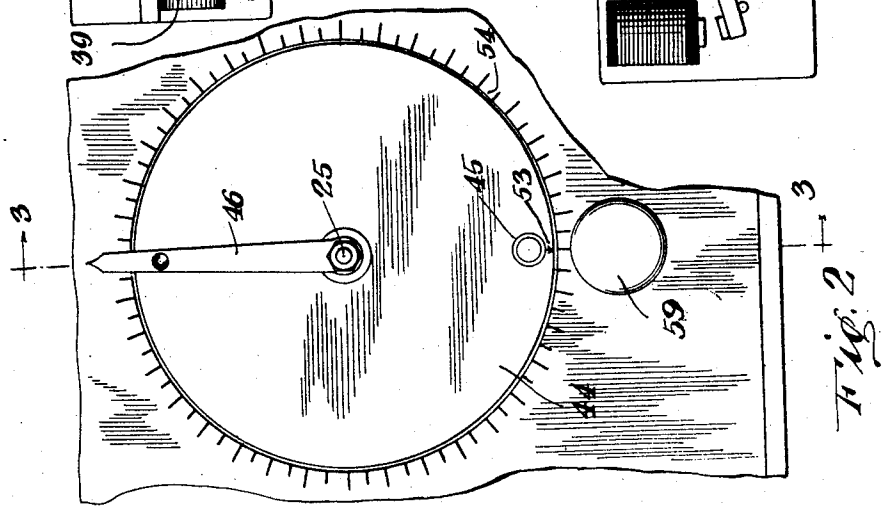


Fig. 2

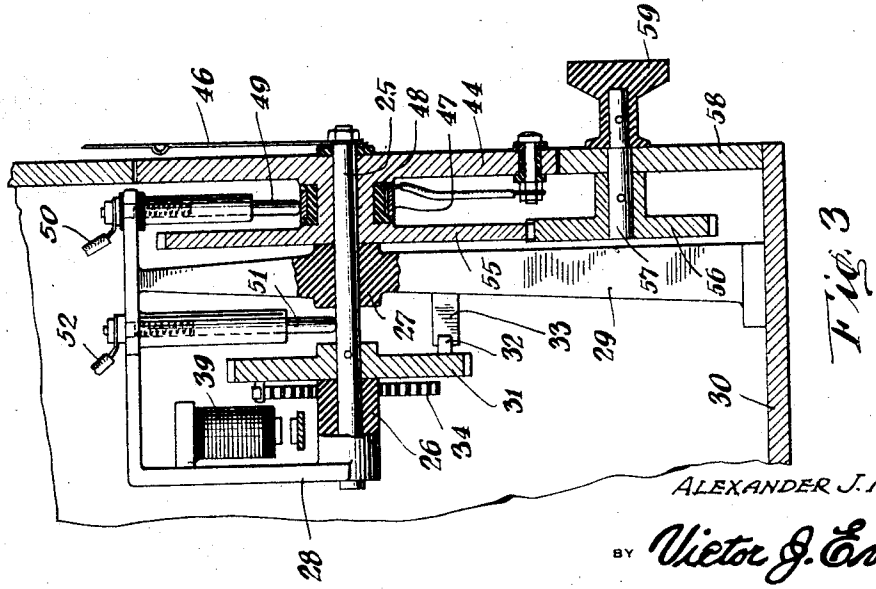


Fig. 3

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Jan. 12, 1932. A. J. FLEIG 1,841,283

DISTANT CONTROL EQUIPMENT

Filed Feb. 17, 1930 3 Sheets-Sheet 3

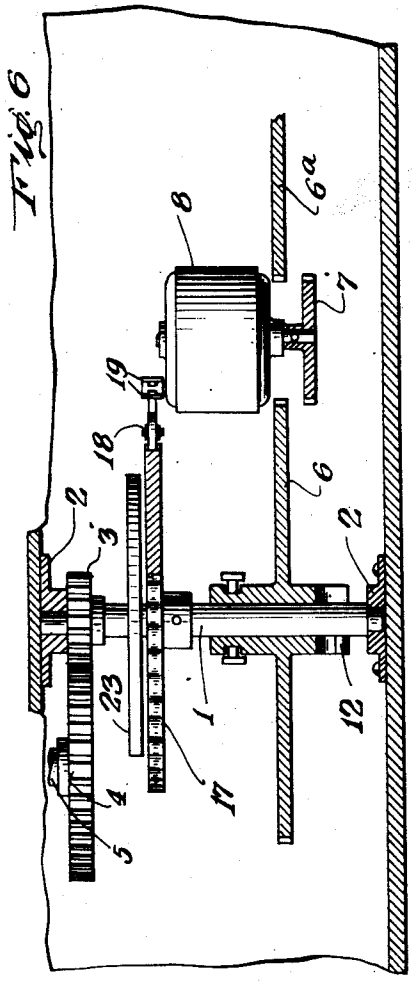


Fig. 6

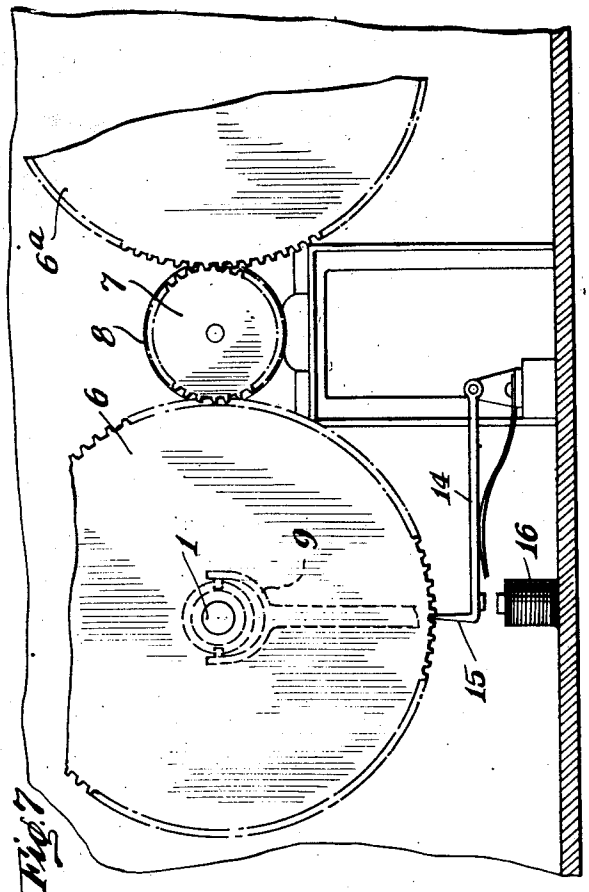


Fig. 7

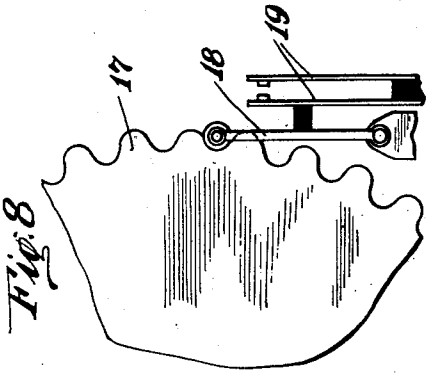


Fig. 8

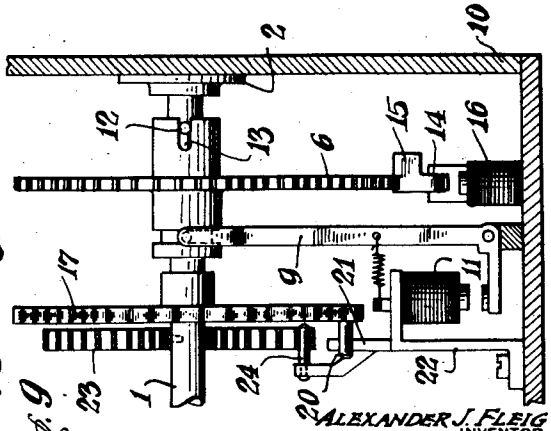


Fig. 9

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UNITED STATES PATENT OFFICE

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DISTANT CONTROL EQUIPMENT

Application filed February 17, 1930. Serial No. 429,198.

This invention relates to systems for the control of radio apparatus in general.

The broad object of the present invention is to provide an improved system for controlling the operation of radio apparatus particularly from a point remote from the apparatus.

An object of this invention is to provide a control system for effecting tuning from a point which may be some distance from the place where the radio apparatus is installed.

Another object is to provide a control for the volume of a loud speaker at a point remote from the radio apparatus.

A more specific object is to provide an improved system of control for a radio receiving apparatus at a point remote from the receiving apparatus.

A specific object is to provide an improved control system and apparatus for the power supply to the radio apparatus.

Another specific object is to provide an automatic arrangement of apparatus for tuning a radio receiving apparatus to a predetermined frequency or wave length.

A further specific object is to provide a system of apparatus for tuning a radio apparatus by ear or when the exact wave length or frequency is unknown.

Another object is to provide automatic means for controlling the volume of the loud speaker which may also be used to control the volume by ear.

Further objects are to provide apparatus and devices for accomplishing all of the foregoing objects and also to provide means for disabling and rendering ineffective certain parts of the control system or apparatus.

Other objects and advantages of the invention will be hereinafter specifically pointed out, or will become apparent, as the specification proceeds.

With the above indicated objects in view, the invention resides in certain novel construction and combinations and arrangement of parts, clearly described in the following specification and fully illustrated in the accompanying drawings, which latter show embodiments of the invention as at present preferred.

In said drawings:

Figure 1 is a diagram showing the arrangement of apparatus and system of connections for accomplishing tuning and volume control and control of the power supply.

Figure 2 is a front elevation of the controlling device for tuning and volume.

Figure 3 is a vertical section on the line 3—3 of Figure 2 showing the disc bearing the manually adjustable contact stud displaced 180° from its normal position.

Figure 4 is a detail view illustrating the construction of the driving mechanism of the movable contact arm.

Figure 5 is an elevation showing the construction of the push-button controlled power supply switch.

Figure 6 is a plan view showing the motor and its clutch connections for driving the tuning shaft or the volume control shaft under the control of the movable contact arms and correlated adjustable contact discs.

Figure 7 is an elevation of the mechanism shown in Figure 6.

Figure 8 is a detail view of the circuit closing spring contact member and the actuating disc therefor which is mounted upon the tuning drive shaft.

Figure 9 is a detail view showing the arrangement of the magnetically controlled locking pawl and engaging means associated with each of the shafts for tuning the volume control respectively.

The primary purpose of the present invention is to provide a system and apparatus which will permit the control of a radio receiving equipment located in a given place from a number of more remote points through the medium of operating devices and apparatus mounted upon the radio receiving equipment and adapted to be controlled by a remote control station connected to said operating devices by means of a multi-conductor cable. Preferably the multi-conductor cable will be provided with numerous outlets comprising sockets adaptable to receive a suitable plug attached to a length of flexible cable connected to the remote control station so that it will be possible to operatively connect the remote control station with the

operating devices and apparatus mounted upon the radio receiving equipment. The remote control station, in order to effect complete control over the operation of the radio receiving equipment, should preferably embody in compact relation means for starting or stopping the flow of power to the receiving equipment, means for tuning the receiving equipment to a desired incoming signal such as a program from a broadcasting station, means for controlling the volume of sound from the sound reproduer, and also means for restoring the various devices and apparatus to their normal positions after they have been moved from normal position to effect tuning, volume control and the like.

This invention contemplates the provision of a remote control station which embodies a controller which is manually settable to a desired wave length or frequency and a similar controller settable to a desired volume of sound, both controllers being adapted to be actuated electrically by a circuit controlled by mechanical means associated with the operating devices at the radio receiving equipment so that after the operating devices have been started by suitable controls at the remote control station the operating devices will be stopped the instant the desired wave length or volume is attained and locked against return to normal position until it is desired to re-tune the receiving equipment or alter the volume of the sound from the reproducer.

Figures 6 to 9 inclusive refer to the operating means for controlling tuning or volume at the radio receiving equipment. Since the mechanism for controlling and operating the tuning devices and the volume control devices are indentical in every respect a description of the mechanism involved in the operating means for controlling the tuning devices will be sufficient to an understanding of the operating means for the volume control devices.

The numeral 1 represents a rotatable shaft journaled in suitable bearings 2. A gear 3 fast upon the shaft 1 meshes with a gear 4 fast upon the shaft 5. The shaft 5 extends into the cabinet containing the radio receiving equipment and has mounted thereon the usual variable condensers and the like such as are commonly coupled mechanically together in a radio receiving equipment embodying single dial control. Preferably the ratio between the gears 3 and 4 is such that rotation of shaft 1 and gear 3 through a complete rotation will cause the shaft 5 to turn so as to be capable of effecting tuning throughout the range of wave lengths or frequencies which the radio receiving equipment is capable of receiving.

Slidably mounted upon the shaft 1 is a gear wheel 6 adapted to be shifted so as to mesh with a gear 7 fast upon the shaft of the motor 8. Normally the gear 6 occupies the position shown in Figure 6 and is adapted to be shifted by a forked lever 9 which is pivoted to the frame 10 supporting the shafts 1 and 5 and is acted upon by a magnet 11 so disposed that the lever 9 is actuated to shift the gear 6 into mesh with the gear 7 whenever the magnet is energized electrically through circuits to be described later. A suitable pin 12 carried by shaft 1 moves in a slot 13 formed in the hub of the gear 6 and permits axial movement of the gear 6 but prevents the gear 6 from rotating with respect to the shaft.

A locking mechanism comprising a spring urged locking arm 14 provided with a wide tooth 15 normally locks the gear 6 against rotation, the wide tooth 15 being of sufficient width to permit the gear 6 to be slid sidewise without disengagement from the locking arm. The locking arm 14 is adapted to be released by a magnet 16 through the establishing of a circuit by means to be described more fully hereinafter.

A toothed wheel 17 is fast upon the shaft 1 and is engaged by an arm 18 pivoted to the main frame. The arm 18 is spring urged into contact with the toothed wheel 17 by means of one member of a pair of flat spring contact members 19, a suitable insulating block being interposed between the arm 18 and the spring contact member. The shape of the teeth of the wheel 17 is such that the roller on the arm 18 rests between the teeth so that the two contact points of the contact members 19 are separated. The construction just described is such that whenever the wheel 17 is rotated the teeth of the wheel will impart a vibratory motion to the arm 18 and effect the alternate closing and opening of a circuit. The wheel 17 is preferably provided with a large number of teeth for a purpose to be more fully explained later herein.

The wheel 17 is also provided with a fixed stop pin 20 co-operating with a stop 21 which forms part of the support 22 for the magnet 11. A spiral spring 23, one end of which is fast to the shaft 1 and the other end of which is fast to a pin 24 carried by the support 22, normally holds the pin 20 against the stop 21. Whenever the wheel 17 is turned from normal by rotation of the shaft 1 under the influence of the motor 8, the spiral spring 23 will be wound up and will become effective to restore the wheel 17 and hence shaft 1 to the normal position, whenever the locking arm 14 is released.

The mechanism just described refers particularly to the operating mechanism for the tuning devices, but the same description applies to the operating mechanism for the volume control devices. Referring to Figure 1, the reference character 1*a* refers to a shaft similar to the shaft 1 and is adapted to drive the volume control devices. The shaft 1*a* is provided with a gear 6*a*, adapted to engage the gear 7 of motor 8, and a toothed

wheel 17*a* similar, respectively, to the gear 6 and toothed wheel 17. The reference characters 9*a*, 11*a*, 14*a*, 16*a* and 17*a* to 19*a* inclusive refer to parts identical with and for the same purpose as the parts 9, 11, 14 and 16 to 19 inclusive. It is thought that the construction of the operating mechanism for the volume control devices will be clearly understood from the foregoing description and it will be understood hereinafter that the subscript "*a*" applied to a reference character will refer to a part or circuit corresponding to one described in connection with the tuning control circuit and mechanism so as to avoid superfluous description and duplication.

The mechanism which will be hereinafter referred to as the "controller" is provided for the purpose of controlling the movements of the operating mechanism for the tuning devices and is illustrated in detail in Figures 2 to 4 inclusive. The controller comprises a shaft 25 which is journaled in suitable bearings 26, 27 supported by a frame 28 and an arm 29 mounted upon the main frame 30 of the controller. A ratchet wheel 31 is fast to the shaft 25 and bears a pin 32 co-operating with a stop 33 carried by the arm 29. A spiral spring 34, one end of which is fastened to the ratchet wheel 31 and the other to the bearing 26, normally holds the pin 32 against the stop 33.

Pivotally mounted upon the frame 28 is a bell crank 35, one arm of which is provided with a spring urged pawl 36 co-operating with the teeth of the ratchet wheel 31. The other arm of the bell crank 35 is held against a stop 37 by means of a spring 38 and is provided with an armature co-operating with a magnet 39. A spring urged pawl 40 pivotally mounted upon the frame 28 normally co-operates with the ratchet wheel 31 so as to retain the ratchet wheel in the progressive positions to which it may be moved under the influence of the pawl 36 when the magnet 39 is energized. In order to permit the ratchet wheel 31 to be restored to normal position under the influence of the spiral spring 34 there are provided magnets 41 and 42 co-operating respectively with armatures carried by the pawls 36 and 40. Whenever the magnets 41 and 42 are energized the pawls 36 and 40 will be raised out of contact with the ratchet wheel 31 which will then be acted upon by the spiral spring 34 and returned to normal position, assuming that the ratchet wheel has been previously moved away from its normal position.

It will be clear that whenever the magnet 39 is energized the bell crank 35 will be rocked and the ratchet wheel turned against the tension of spring 34 a distance of one tooth, the pawl 40 acting to prevent the ratchet wheel from being returned by the spiral spring. Since the magnet will impart a very rapid motion to the bell crank 35 there is provided a pin 43 adapted to limit the motion of the pawl 36 and prevent overthrow of the ratchet wheel 31 due to the effect of inertia by wedging the pawl 36 into the tooth space in the ratchet wheel 31.

Loosely mounted upon the shaft 25 is a disc 44 provided with a contact stud 45 which is adapted to co-operate with a contact arm or pointer 46 mounted upon the end of the shaft 25. The contact stud 45 is connected to a metallic collar 47 supported upon an insulating bushing 48 carried by the hub of the disc 44 while a spring pressed contact brush 49 bearing on the collar 47 provides a means for an electric current to flow from the contact stud 45 to an external wire 50. A similar spring pressed brush 51 bears on the shaft 25 and is connected to an external wire 52.

The disc 44 is adapted to be manually set with an index point 53 thereon pointing to any desired division on a scale 54 which may be graduated in either wave lengths or frequency in kilocycles as desired, in the case of the tuning controller. In a case of the volume controller the graduation need not be so fine and the words "Low", "Medium", "Loud" and "Very loud" suitably spaced may be used instead of graduations. A gear 55 fast on the hub of the disc 44 meshes with a gear 56 fast on a shaft 57 which projects through the exterior wall 58 of the cabinet containing the tuning controller and volume controller. A knob 59 fast on the shaft 57 permits the disc 44 to be turned manually to bring the index point into coincidence with the desired graduation on the dial 54. Preferably the disc 44 should be set flush with the wall of the cabinet.

Since each graduation on the dial 54 should preferably correspond with a graduation on the dial attached to the main tuning shaft, there must be as many teeth on the ratchet wheel 31 as on the gear 6 and the toothed wheel 17, respectively. To secure fineness in tuning it is desirable to have as many graduations on the dial 54 as possible and consequently the ratchet wheel 31, gear 6 and wheel 17 must also have a large number of teeth.

It will be clear from the foregoing description that the step-by-step progressive motion imparted to the racthet wheel 31 by the bell crank 36 will be transmitted to the shaft 25 and the contact arm 46 which will describe an arc. The home position of the arm 46 and contact stud 45 is at the point where the arm 46 is pointing vertically upward. In Figures 2 and 3 the arm is shown in its home position while the disc 44 has been moved 180° from the home position so that the contact stud is likewise displaced 180° from normal. If the magnet 39 is given successive electrical impulses by external

means which includes a circuit leading to the contact member 19 a progressive step-by-step motion will be imparted to the contact arm 46 and eventually the end of the contact arm will strike the contact stud 45 establishing a circuit which, through relays later to be described, will act to shut down the motor 8, disconnect the gear 6 from the motor, and also render the locking arm 14 effective.

The operating mechanism for directly turning or controlling the various tuning condensers and the like is connected to the controller just described through the medium of electrical circuits which, by energizing or de-energizing the various magnets already mentioned and others about to be described, controls the tuning operations of the operating mechanism.

Figure 1 represents diagrammatically the arrangement of the various circuits for controlling the operation of the radio receiving equipment. In Figure 1 the broken lines A—A and B—B serve to indicate that the circuits and apparatus above the line A—A are at or in close proximity to the operating mechanism for the radio receiving equipment while the circuits and apparatus below the line B—B are within the remote control station. The portions of the circuits shown in dotted lines in the space between the lines are carried in a suitable cable having eight conductors, excluding the loudspeaker conductors. The cable may be connected to suitable 8-point outlets or sockets and the remote control station may be equipped with a length of cable having eight conductors and an 8-point plug adapted to be received in any one of the several outlets as desired.

The magnet 39 is actuated electrically by means of the circuit established and broken when the toothed wheel 17 is turned, one of the contact members 19 being connected to the main positive wire 60 while the other member 19 is connected to one end of the winding of magnet 39, the other end of the winding being connected to a spring contact strip 61. The magnet 11 for shifting the gear 6 is also connected to the main positive wire 60 and to the spring contact member 61. A magnet 62, co-operating with an armature attached to the member 61, is connected to a vibrating armature 63 bearing a contact which is adapted to be engaged by a similar contact carried by the member 61 and is also connected to the main negative wire 64. The armature 63 is adapted to be actuated by a magnet 65 the winding of which is connected to the external wire 50, already mentioned, and to a contact 66 co-operating with a similar contact carried by the member 61. Normally the contacts 63 and 66 are out of contact with the corresponding contacts carried by member 61 so that both of the magnets 62, 65 are de-energized. The external wires 50, 52 are connected to a push-button 67 for a purpose to be more fully explained later herein.

The magnet 16 is provided with two windings of which one winding is connected to the main positive wire 60 and to the wire leading from the magnet 11 to the member 61. The second winding 68 is connected to the main positive wire 60 and in series parallel relation with two push-buttons 69 and 70, the push-buttons being connected to the main negative wire 64, the magnets 41, 42 being also connected in series with the push-button 70. From the foregoing it will be seen that depression of the push-button 69 will energize the winding 68 and release the locking arm 14 while depression of the push-button 70 will effect release of the locking arm 14 and also will energize the magnets 41, 42 to lift the pawls 36, 40 out of engagement with the ratchet wheel 31.

The motor 8 is adapted to be started by a relay provided with two windings, one of the windings 71 being connected in parallel with the magnet 11 while the winding 71*a* is connected in parallel with the magnet 11*a*. Either of the windings 71, 71*a*, when energized, effects the closure of contacts 72 to start the motor 8. The motor may be of either the direct current type or the alternating current type, as desired.

It is desirable to provide means for controlling the supply of power to the radio receiving equipment and for that reason there is provided the mechanism shown in detail in Figure 5 and diagrammatically in Figure 1. In order to reduce the number of wires in the cable it has been found desirable to control the power supply by adding only one wire to those utilized for the other control circuits and for that reason the switch shown in Figure 5 has been devised. Mounted upon a frame 72 is a short shaft 73 which bears loosely thereon an insulated disc 74 fast to a ratchet wheel 75 and an aligning wheel 76. Moulded into the insulating disc 74 is a member 77 having eight arms, the ends of which are bent over to form commutator bars 78. The ratchet wheel 75 and the aligning wheel 76 are provided with sixteen teeth, the ratchet wheel being adapted to be driven one tooth by the actuation of a bell crank 79 bearing a spring urged pawl 80. A spring aligning member 81, provided with a sharp bend in its free end, is mounted upon the frame 72 and, by means of the sharp bend, serves the double purpose of aligning the wheel 76 and acting as a brake to prevent overthrow due to inertia. A magnet 82, co-operating with an armature carried by the bell crank 79, is connected to the main positive wire 60 and in series parallel relation with two push buttons 83, 84 to the negative wire 64. Whenever either of the push buttons 83, 84 are depressed the ratchet wheel

75 will be moved one tooth, a pin 85 serving to limit motion to one tooth and also prevent overthrow due to inertia. A pair of spring contacts 86, mounted upon the frame 72, are connected in series with the secondary of the transformer 87 supplying current to the battery eliminators and the like. The free ends of both of the spring contacts bear on the surface of the disc 74 or upon the commutator bars 78 according to the position of the disc. Since there are only eight commutator bars and sixteen teeth in the ratchet wheel 75 it will be clear that alternate impulses of the magnet 82 will either establish or open a circuit to the primary of the transformer 87. The arrangement of the parts in Figure 5 is for a closed circuit so that it will be perceived that depression of either push-button 83, 84 will cause the power circuit to be opened and a subsequent depression of either push button will re-establish the circuit. The push-buttons 83 and 84 make it possible to turn the power supply on or off at either the radio receiving equipment or at the remote control station as desired.

The operation of the various parts and circuits will now be described. When it is desired to tune the radio receiving equipment from the remote control station, the push-button 84 is depressed and, through the energization of the magnet 82 and the rotation of the ratchet wheel 75 one tooth, the power supply circuit will be closed. The knob 59 is now turned manually until the index point 53 becomes coincident with the point on the dial 54 indicating the desired wave length or frequency and a knob 88 carried by the member 61 depressed. The depression of the member 61 completes a circuit through contact 63 and magnet 62 and thereby establishes circuits through the winding 16 releasing the locking arm 14; through the magnet 11 thereby shifting the gear 6 into mesh with the motor 8; and through the winding 71, effecting the starting of the motor. The circuit through magnet 39 and the contact members 19 remains open until the motor starts turning the shaft 1 whereupon the circuit is alternately closed and opened each time a tooth of wheel 17 passes the roll carried by the arm 18 with the result that the circuit through members 19 will be alternately closed and opened so that magnet 39 receives an impulse for each tooth and consequently the ratchet wheel 31 and contact arm 46 will be driven in exact synchronism with the shaft 1. Eventually the arm 46 will come in contact with the contact stud 45 and a circuit will be established from the negative wire 64 through external wire 52, the contact arm 46, external wire 50 and magnet 65 to the contact 66 which has already been closed by the depression of the member 61. The flow of current first established through magnet 62 acts to hold the member 61 depressed after manual pressure on the knob 88 has been released, but, as soon as the contact arm 46 establishes the circuit just described, the magnet 65 will attract its armature 63 and break the circuit through magnet 62 thereby releasing the member 61 and breaking the circuit at contact 66. The magnets 11, 16, 39 and 71 will now be de-energized and in consequence the locking arm 14 will be rendered effective and the gear 6 disengaged from the motor which will also be stopped. The tuning devices will now be adjusted to the desired wave length or frequency and will be held adjusted by the locking arm 14.

The volume control is effected in a similar manner by adjusting a knob identical with the knob 58 so as to set the contact 45*a* (Fig. 1) and thereafter depressing the member 61*a*, whereupon the mechanism operating the volume control devices will be set in motion and stopped at the desired point in the same manner as the tuning devices were operated. Since the mechanism for accomplishing volume control is identical in all respects to the tuning control mechanism it is not thought necessary to go more fully into a description of its operation. Identical reference characters with the subscript "*a*" in the volume control system indicate similar parts and circuits, and the operation of volume control can be easily traced without further explanation.

When it is desired to re-tune the receiving equipment the push-button 70 is depressed, establishing a circuit through the magnets 41, 42 and winding 68 thereby releasing the locking arm 14 and the pawls 36, 40. Whereupon the spiral springs 23 and 34 will become effective to return the shafts 1 and 25 to normal position with the pins 20 and 32 against the stops 21 and 33, respectively.

It sometimes happens that it is desired to tune the receiving equipment to a transmitting station the wave length of which is unknown or it is desired to "hunt" for new stations. To accomplish tuning under such circumstances the knob 58 is turned so that the contact stud 45 is moved completely around the dial 54, in a clockwise direction as viewed in Figure 2, until the contact stud is almost in its home position again. The member 61 is now depressed as before by pressing manually on the knob 88. The various circuits will be established as before and the motor 8 will start to turn the shaft 1 and hence the tuning devices. When the desired station is heard from the sound reproducer the push-button 67 is depressed establishing a circuit through the magnet 65 and effecting the shutting down of the motor and the locking of the shaft 1 in exactly the same manner as if the contact arm 46 had been set at the correct wave length of the desired station, which, however, was not the actual case. Similarly volume control may be effected by

ear, the contact 46*a* being similarly moved nearly 360°, the knob 88*a* depressed and the push-button 67*a* depressed when the desired volume is attained.

It may be desired to tune the radio receiving equipment at the equipment, in which case the push-button 69 is depressed thereby releasing the locking arm 14 and permitting a knob connected with the tuning devices to be turned. After tuning in the foregoing manner the button 70 should be depressed before attempting to operate the tuning controller in the usual way in order to avoid displacement of the parts and inaccurate tuning.

It may be desirable to obtain a finer degree of selectivity in tuning than would be possible by using the specific arrangement of gearing and wheels shown in Figures 6 to 9 inclusive, in which the selectivity is limited by the number of teeth upon gear wheel 6 and the toothed wheel 17 since intermediate positions between the teeth cannot be secured. Selectivity is also limited by the number of the teeth on the ratchet wheel 31 since it is impossible to secure more tuning points than there are teeth in the ratchet wheel. In order to increase the degree of selectivity and secure finer tuning certain modifications may be made in the construction which has been described. For instance, the toothed wheel 17 might be placed on a separate shaft bearing a gear wheel meshing wih a gear on the shaft 1, the gear wheel on the shaft 1 having, say five times as many teeth as the gear wheel on the additional shaft just mentioned, thereby increasing the selectivity five times. It will of course be obvious that the locking arm 14 must be changed in location so that it cooperates with the smaller gear wheel. Under such circumstances if the larger gear on the shaft 1 had say 100 teeth and the smaller gear on the additional shaft had 20 teeth, the selectivity would be increased fivefold. The toothed wheel under these circumstances would have 20 teeth also. It will be clear that when the main shaft 1 is rotated so that the gear thereon moves one tooth, the smaller gear on the additional shaft would move five teeth and therefore five additional impulses could be delivered to the tuning controller. When the operating mechanism has been altered in the manner just mentioned it will be obvious that the number of teeth on the ratchet wheel 31 must be increased five times. Since this would result in an unnecessarily large gear the ratchet wheel 31 may be placed upon a separate shaft and geared to the shaft 25 so as to drive it at one fifth the speed of the shaft carrying the ratchet wheel 31, consequently the contact arm 46 would be driven at one fifth speed and if the ratchet wheel had say 100 teeth and gear ratio was 1 to 5, it would require five impulses of the magnet 39 to move the contact arm one-hundredth of a revolution. It will thus be seen that the dial 54 could be graduated with 500 graduations thus securing a finer setting of the contact stud 45.

In Figure 2 the dial 54 is shown with 100 graduations since tuning condensers are commonly provided with dials graduated from "0" to "100". In order to adapt the mechanism shown in Figures 2 to 4 to a finer degree of tuning it is merely necessary to place the ratchet wheel 31 on a separate shaft geared to the shaft 25 be gears having a ratio of 1 to 5 say and also placing the toothed wheel 17 on a separate shaft driven from the main shaft 1 by gears having a ratio of 5 to 1, the larger gear being upon the shaft 1, it of course being understoood that the location of the locking arm 14 is changed so that it co-operates with the smaller gear driven by the large gear in the main shaft 1. With this alteration in construction the dial 54 may be further graduated by subdividing the relatively coarse graduations shown in Figure 2 into five subdivisions thereby securing a total of 500 graduations upon the dial 54 which should be sufficient for ordinary purposes. It is thought that with the foregoing brief explanation a person skilled in the art could readily adapt the specific construction shown in the drawings so as to secure greater selectivity and finer tuning.

The hereinbefore described constructions and systems admit of considerable modification without departing from the invention; therefore it is the wish not to be limited to the precise arrangements shown and described, which are as aforesaid, by way of illustration merely. In other words, the scope of protection contemplated is to be taken solely from the appended claims, interpreted as broadly as is consistent with the prior art.

What is claimed as new:

1. The combination of operating means, means for normally locking said operating means against operation, a manually settable and electrically actuable controller for said operating means including a settable contact and a movable contact co-operating therewith adapted to establish a circuit at a point determined by the setting of said settable contact, means operated by said operating means for controlling the electrical actuation of said movable contact, manually controlled means for releasing said locking means and starting said operating means, and means adapted to become effective when said circuit is established to render said locking means effective and said operating means ineffective.

2. The combination of driving means including a motor and an electrically controlled engagaing device; electrically controlled means for normally locking said driv-

ing means against movement; a manually settable and electrically actuable controller comprising a manually settable contact and an electrically driven contact co-operating therewith, adapted when a desired point is reached to become effective to establish a circuit to stop said motor, shift said engaging device out of engagement with said motor and render said locking means effective; means operated by said driving means for electrically actuating said electrically driven contact; and means controlled by the establishing of said circuit for rendering said locking means effective and stopping said driving means and said motor.

3. The combination of driving means including a motor and a shifatable engaging device for operatively connecting said motor to said driving means; means for normally locking said driving means against movement; a manually settable and electrically actuable controller comprisng a manually settable contact and an electrically driven contact co-operating therewith, adapted when a desired point is reached to establish a circuit to stop said motor, shift said engaging device and render said locking means effective; means operated by said driving means for electrically actuating said electrically driven contact; and manually controlled means for releasing said locking means, shifting said engaging device, and starting said motor.

4. The combination of operating means, means for controlling the operation of said operating means, means for holding said operating means and said controlling means in an abnormal position, means for restoring said operating means and said controlling means to normal position, and means for releasing said holding means and rendering said restoring means effective to return said operating means and said controlling means to normal position.

5. The combination of operating means, means for driving said operating means, means for locking said operating means against operation, a controller for controlling the operation of said driving means and said locking means, means operated by said operating means for actuating said controller, means for holding said operating means and said controller in a normal position, means for holding said controller in an abnormal position, and means for releasing both said locking means and said abnormal holding means to permit restoration of said controller and said operating means to normal position.

In testimony whereof I hereby affix my signature.

ALEXANDER J. FLEIG.