April 25, 1933. J. M. SCHAEFER 1,906,106

KEY OPERATED DEVICE FOR RADIO SYSTEMS

Filed May 17, 1928 2 Sheets-Sheet 1

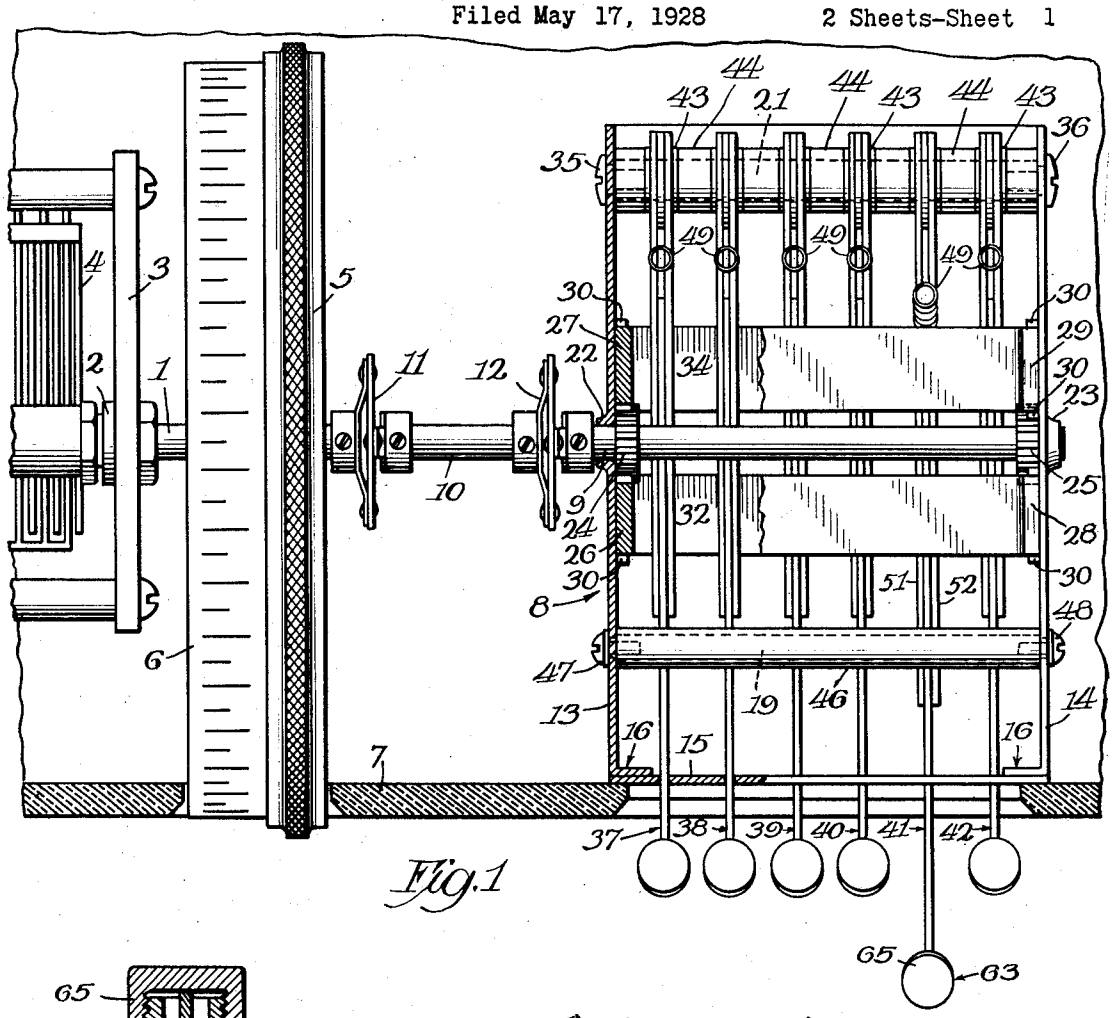


Fig.1

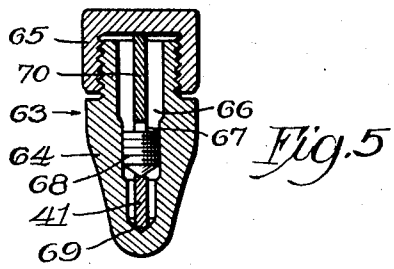


Fig.5

Fig.4

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KEY OPERATED DEVICE FOR RADIO SYSTEMS

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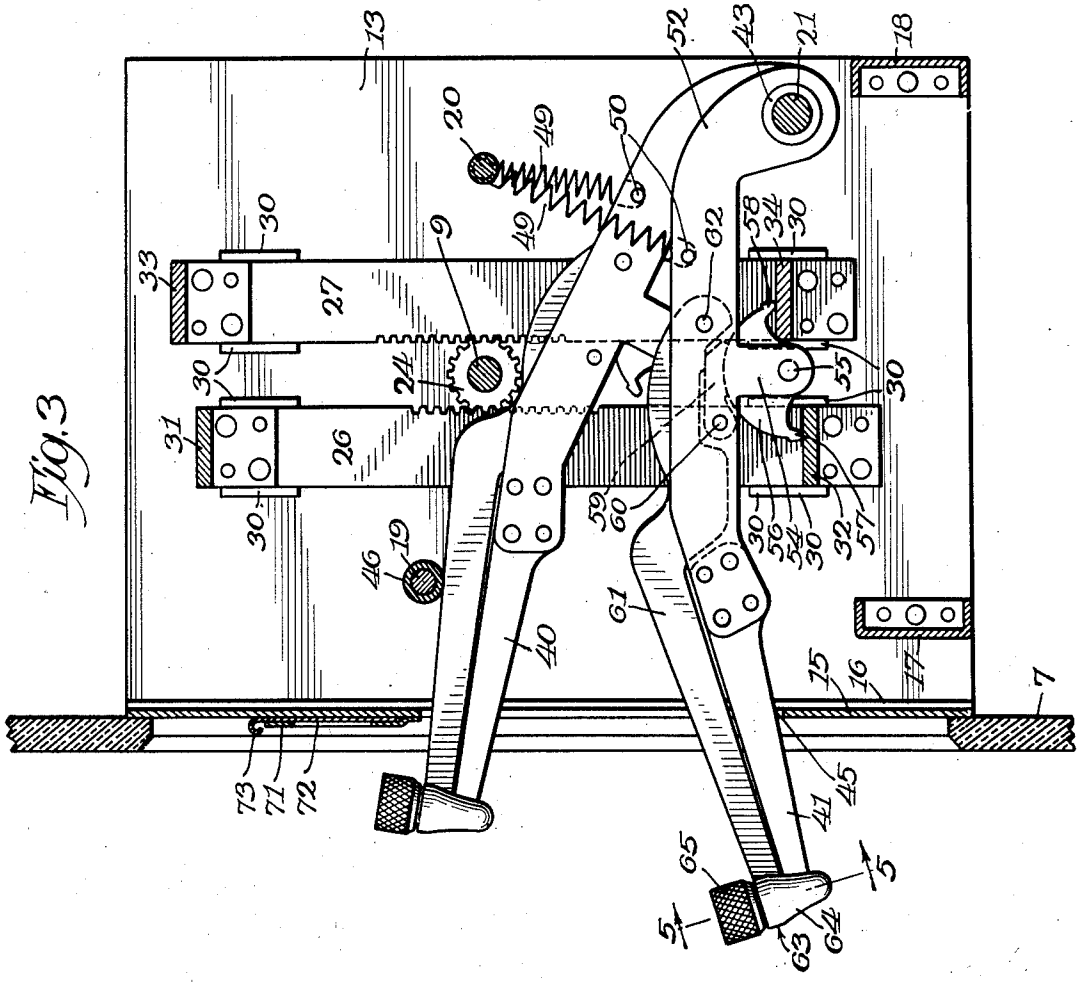


Fig. 3

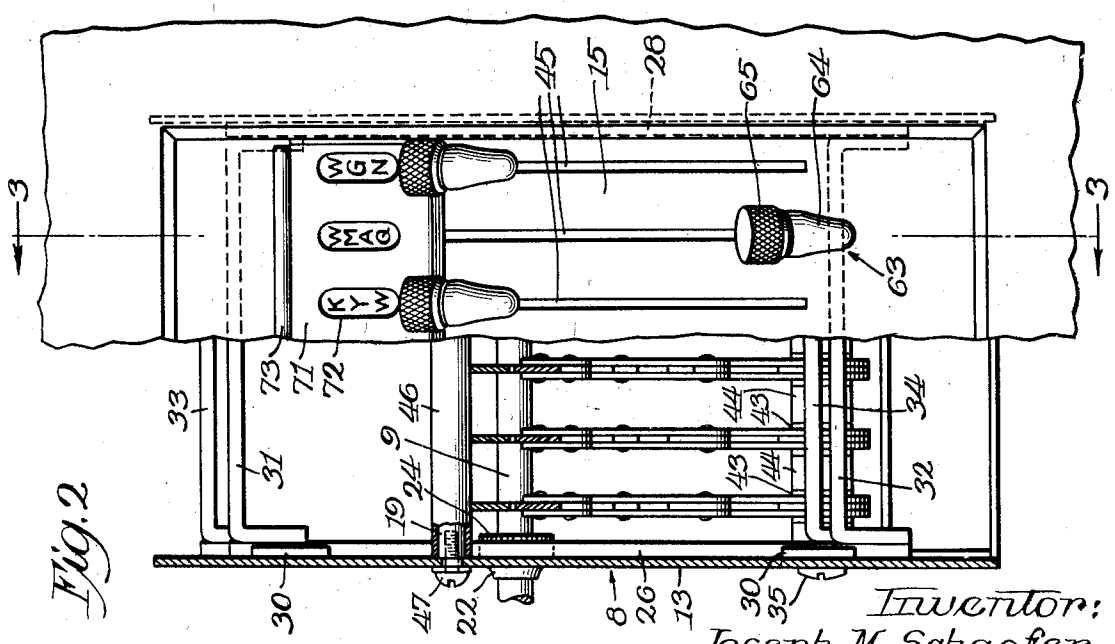


Fig. 2

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UNITED STATES PATENT OFFICE

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KEY-OPERATED DEVICE FOR RADIO SYSTEMS

Application filed May 17, 1928. Serial No. 278,542.

This invention relates to radio systems of communication, and more particularly concerns the provision of means whereby the adjustable controlling devices of such systems may be quickly, conveniently, and positively moved with unerring accuracy to predetermined positions. It also concerns the provision of easily and conveniently adjustable means whereby such positions may be established, changed, and re-established at will.

While the invention, as embodied in the construction herein shown, may be used just as well in connection with radio transmission or broadcasting apparatus, the present arrangement has been more especially designed for service in radio receiving systems, and it has been shown and will be described as associated therewith.

In the drawings—

Fig. 1 is a plan view, partly in broken horizontal section, showing the device operatively connected with the adjustable controlling devices of a standard type radio receiving set;

Fig. 2 is a front elevational view, partly in broken vertical section, of the device;

Fig. 3 is a vertical sectional view of the device, taken upon the line 3—3 of Fig. 2;

Fig. 4 is a fore-and-aft sectional view of one of the keys and its immediate connections; and

Fig. 5 is a front sectional detail view, taken upon the line 5—5 of Fig. 3, through a fingerpiece, one of which is carried at the forward end of each key.

Radio receiving systems now usually comprise a plurality of stages of amplification consisting of individually controllable electrical circuits and, in tuning such receiving systems to the various frequencies or wavelengths of the carrier wave currents employed by the different broadcasting stations, it has been necessary to re-tune each of the circuits of the aforesaid amplification stages to bring them into resonance with each other and with the frequency or wave-length of the station desired. Popular desire for simplification in the selective tuning operations has resulted in the development of different methods of associating and connecting the adjustable controlling devices of each of the several circuits so that they may be operated by a single manual, these methods being known as "uni-control". The present embodiment of this invention is shown as operatively connected with the tuning element of one of these uni-control types of receiving systems and is designed to still further simplify the selective tuning of the system.

Many owners of radio receiving sets prefer to listen to the broadcasting programs of a few favored stations and, while not wishing to be limited in any sense thereto, generally "tune in" one or another of such stations and, at times, desire to shift quickly from one to another thereof. A certain degree of skill and familiarity with the particular receiving set is necessary in order to obtain the best reception, and it is often desired to use the apparatus when the services of one so skilled are not available. With the key-operated device here shown and about to be described, instant and accurate selective tuning may be effected by one not at all acquainted with the operation of radio apparatus and totally unfamiliar with the particular instrument or with any radio receiving set. This desirable feature is represented in the present construction by a series of individually and selectively operable keys, herein shown as conveniently disposed in compact arrangement for manual operation, there being one key for each of the aforesaid favored stations. The invention is not limited to any particular number of keys and there may be as many as desired, but, for average requirements, six have been found sufficient and that number has been shown. The arrangement and connection of the device are such that there is no interference with the functioning and usual manual operation of the controlling devices. Dial-control may be employed at any time without any preliminary adjustment or preparation.

Two very important and novel features of the invention have to do with the instant, positive, and accurate selective adjustment of the instrument to bring in a desired station by the simple movement of the respective key in one direction, and with the ease and con-

venience with which each key may be set or re-set at any time to bring in any desired station. With the present arrangement, the instrument may be carefully and accurately adjusted, by one competent to do so, in resonance with the frequency or wave-length of a desired station and, by a simple movement of the finger-piece of a chosen key and the operation of that key, it may be released from a previous adjustment and instantly re-set, so that the operation of that key thereafter, even by the most unskilled person, will bring the instrument into the predetermined accurate adjustment for that particular station. Each key, after being operated, returns to its original inactive position, and the instrument will remain tuned for that station until re-adjusted for another, either by the operation of another key or the manipulation of the dial-control, or by other means. As each key is operated, it effects the instant, direct, and positive movement of the controlling devices of the instrument in the proper direction from any position to the exact position for which the key has been set. For the further convenience of the unskilled or uninitiated, provision is made for the use of a chart, which may be marked or changed as desired, to indicate the stations represented by the different keys.

Referring now to the drawings, Figure 1 shows one end part of the main control-shaft 1 of a standard type of uni-control radio receiving set. Shaft 1 is rotatably supported, as at 2, in a frame 3 and has fixed thereupon the movable elements of the usual condensers, such as 4, or other controlling devices comprised in the radio receiving system. It is to be understood that the controlling devices adjustable through the rotation of shaft 1 may be condensers, variometers, vario-couplers, rheostats, or any other adjustable devices which have to do with the control of the radio receiving system, and that the selection, arrangement, and connection thereof are immaterial to, and do not form a part of, this invention. Shaft 1 also has fixed thereupon the knurled adjusting wheel 5 which carries a graduated scale 6, each of which are arranged to project peripherally through an opening in the front panel 7 of the instrument casing, where they may be respectively operated and observed in the well known manner usually practiced in tuning dial-controlled receiving sets.

The key-operated device forming the subject of this invention is shown as a separately complete and removable unit 8, the shaft 9 of which is connected with shaft 1 by a short shaft 10 through universal couplings 11 and 12, the purpose of the couplings, besides providing for the placing and removal of the unit, being to allow for any slight misalignment between shafts 1 and 9 and to guard against any binding or unevenness in their rotation. The framework of unit 8 comprises sides 13 and 14, front plate 15, and top and back cover-plates (not shown). Sides 13 and 14 have their forward vertical edges inwardly turned, as at 16, and secured (preferably by brazing or spot welding) to front plate 15, and are rigidly spaced and held near their lower edges by braces 17 and 18 (the ends of which are also turned and preferably brazed or spot welded to the sides). Rods 19, 20, and 21 serve to further connect the sides 13 and 14, and each serves an additional purpose to be later described. Shaft 9 is rotatably supported at 22 and 23 in sides 13 and 14, projects through side 13 and is connected with universal coupling 12, and carries a pair of similar pinions 24 and 25 fixed thereupon, the pinion 24 being disposed close to the inner surface of side 13 and the pinion 25 being likewise disposed with respect to the side 14.

A pair of vertically disposed reciprocable racks 26 and 27 mesh with opposite sides of pinion 24, and a similar pair of racks 28 and 29 are similarly disposed to mesh with opposite sides of pinion 25. The upper and lower end parts of each rack travel between and are guided by a pair of ears, 30—30, preferably struck up to project inwardly from the respective sides 13 and 14, and each rack of one pair is connected with its complemental rack of the other pair by upper and lower horizontally extending bars 31, 32, 33, and 34. The upper end parts of racks 26 and 28 are connected by bar 31 and their lower end parts are connected by bar 32, and the upper end parts of racks 27 and 29 are connected by bar 33 and their lower end parts are connected by bar 34, the ends of the several bars being turned and secured to the respective racks (preferably by brazing or spot welding) to form a pair of vertically reciprocable, rectangular frames, disposed one to the front and the other to the rear of shaft 9. With this arrangement of the two frames, it will be observed that there is no possibility of lost motion in their operation of shaft 9, since each frame is bodily supported by the meshing of its racks with the two pinions fixed upon the shaft, and it will also be seen that the slightest downward movement of one frame must be instant and co-extensive with the upward movement of the other.

Rod 21 is secured to sides 13 and 14 by end screws 35 and 36 (Fig. 1) and serves as a fulcrum for a plurality of key-levers 37, 38, 39, 40, 41, and 42. Each key-lever is fitted with a tight bushing 43 which projects slightly beyond opposite sides thereof, and the several levers are spaced in position along rod 21 by spacer-collars 44 at distances sufficient to provide proper clearance at the forward ends of the levers for manual operation. In the present arrangement, all of the key-levers project forwardly below shaft 9 and over bars 32 and 34, but it will be seen that a similar row could

be arranged over bars 31 and 33, if desired. The forward ends of the levers extend through respective slots 45 in front plate 15, all of the slots being long enough to avoid interference with the vertical swing of the levers, and rod 19 is covered with sound-deadening material 46 and serves as a stop-bar to limit the upward movement of all the levers and properly align them in their inactive positions. Rod 19 is secured to sides 13 and 14 by end screws 47 and 48, and rod 20 may be likewise secured. Rod 20 provides a fixed point of attachment for a plurality of light tension springs 49 (Fig. 3), each of which is connected, as at 50, with one of the key-levers and acts to return it to its inactive position against the sound-deadening material 46 on rod 19.

The several key-levers are exactly alike in construction, and a description of one will serve as a description for all. Taking key-lever 41 for example, the inner part thereof is bifurcated to provide a boxing, open at top and bottom, for housing and pivotally supporting the adjustable setting elements to be next described. In the present construction, this bifurcation is formed by a pair of side plates 51 and 52, properly spaced and secured, at their rearward ends by the bushing 43, and at their forward ends by the interposed end of the forward part of the lever, to which interposed end said forward ends are firmly secured, as by riveting or spot welding.

Downwardly projecting arms or extensions 53 and 54 (Figs. 3 and 4) of plates 51 and 52 embrace and pivotally support at 55 a semi-circular rocker 56. The lower surface of rocker 56 is undercut at each side of its pivotal point 55 to provide proper operating clearance between it and the bars 32 and 34 and to define the diametrically opposite contact-toes 57 and 58, and the other contour of each of said contact-toes extends slightly beyond the arcuate upper surface of the rocker to provide abutments which serve to stop the rocker from being swung too far in either direction. (See Fig. 4.)

The arcuate upper surface of rocker 56 is engaged by a clamp-shoe 59, one end of which is pivotally supported at 60 by and between side plates 51 and 52 and the free end of which rests beneath and is engaged by the clamp-lever 61. A substantial part of the under surface of clamp-shoe 59 is concaved to fit the curve of the arcuate upper surface of rocker 56. Clamp-lever 61 is pivotally supported at 62 by and between side plates 51 and 52 and extends forwardly above and along the forward part of key-lever 41, through the respective slot 45 in front plate 15. The point of engagement of clamp-lever 61 with clamp-shoe 59 is preferably near its pivotal support 62, the leverage thus provided in the action of the clamp-lever against the clamp-shoe, combined with the substantial friction surface of the clamp-shoe upon rocker 56, serving to hold the rocker firmly locked in any position of adjustment when the forward end of said clamp-lever is adjusted for that purpose in a manner to be next described.

The forward end of key-lever 41 carries a removably attached finger-piece 63, comprising a body 64 formed with an upwardly extending exteriorly threaded hub, and an adjustable cap 65 screwed thereupon. Body 64 is provided with a central bore or axial cavity 66, and the wall thereof is cleft by a radial slot 67 which extends nearly, but not quite, to the bottom of said cavity. The upper portion of cavity 66 is of slightly greater diameter than the lower portion thereof, to allow the free insertion of, and access to, a pointed headless set-screw 68 which is threaded into said lower portion, and the bottom of said cavity forms a socket which accommodates a downwardly extending projection 69 formed at the forward end of key-lever 41. Centered with this projection 69, the upper surface of key-lever 41 is nicked or indented to accommodate the point of set-screw 68. The forward end of clamp-lever 61 terminates in an upwardly projecting prong 70 which, when finger-piece 63 is in position, occupies the upper portion of cavity 66, over set-screw 68, and engages beneath the center of screw-cap 65.

To place and secure finger-piece 63 in position, screw-cap 65 is first removed, set-screw 68 is turned back to give sufficient clearance therebeneath for the entrance of the forward end of key-lever 41, and clamp-lever 61 is swung upwardly out of the way. Slot 67 of body 64 is then introduced over the end of key-lever 41 and held, with projection 69 in engagement with the aforesaid socket at the bottom of cavity 66, while set-screw 68 is tightened down, with its pointed end engaging the aforesaid nick or indentation in the upper surface of the end of the key-lever. When the set-screw has been so tightened, body 64 will be firmly held in position upon the end of the key-lever, and may neither be twisted or rocked thereupon. Clamp-lever 61 is then swung downwardly into slot 67, and the screw-cap 65 applied. As cap 65 is screwed upon the hub of body 64, it contacts with the projected end of prong 70, and the tightening of the cap effects the clamping movement of clamp-lever 61 and clamp-shoe 59 and locks rocker 56 in position.

The operation of the device is as follows: Assuming that none of the keys have been set for any desired station, the first of such station may be "tuned in" as usual by the careful manipulation of the adjusting wheel 5. This adjustment of wheel 5 acts, through shaft 1 to adjust the controlling devices of the radio receiving system, such as the con-

denser 4, and at the same time acts, through the connected shafts 9 and 10, pinions 24 and 25, and racks 26 to 29, to bring bars 32 and 34 into a certain relative position. With wheel 5 held from movement by the finger of one hand, the screw-cap 65 of the chosen key-lever may be loosened by the fingers of the other hand and that lever depressed to the limit of its movement, and the screw-cap tightened while the lever is held thus depressed. This loosening of cap 65 releases rocker 56 from the clamping action of clamp-lever 61 and clamp-shoe 59 and, as key-lever 41 is depressed, one of the contact-toes 57 and 58 will contact with its respective bar 32 or 34 and swing the rocker until the downward movement of the key-lever is arrested by the other one of said contact-toes coming to rest upon its respective bar. The tightening of the screw-cap 65 now acts, through clamp-lever 61 and clamp-shoe 59, to set or lock rocker 56 in its newly found position, and it will be seen that any subsequent depression of the same key-lever will bring the bars 32 and 34 back to the position represented by this locked position of the rocker.

With the six-key arrangement here shown, six different stations may be carefully "tuned in" at convenient times and the several keys set for the respective stations in the manner just described. When so adjusted, the several keys may then be selectively operated to bring in the stations individually represented thereby. When released, each key-lever will be returned, through the action of its tension-spring 49, to its inactive position against the sound-deadening material 46 on rod 19, with its respective rocker 56 cleared from the paths of bars 32 and 34, so that, with all the keys in their inactive positions, dial-control through manipulation of wheel 5 may be effected in the usual manner, without any interference from, or prearrangement of, the key-operated device.

Various arrangements may be employed for indicating the stations represented by the different keys. The screw-caps 65 may be stamped or otherwise marked with the call-letters of the stations, or a chart may be used for the purpose. The latter arrangement has been here shown in the form of a chart-holder fixed upon front plate 15, directly above the row of slots 45 therein. As illustrated, this chart-holder comprises a plate 71 having a series of apertures 72, one over each slot 45. A card is inserted from the top, back of the plate 71, and the station letters may be marked thereupon so as to be exposed through the apertures 72. A celluloid card may be employed, if desired, so that the markings, once made, may be easily erased and others substituted. In such instance, the top of the card may be rolled, as at 73, for convenience in handling.

It will be observed that key-levers 37 to 42 and the parts carried thereby are entirely free from connection with the movable elements of the controlling devices of the radio receiving system, and are normally held out of contact with, and beyond the path of travel of, the devices which they directly operate; that the construction and arrangement of racks 26 to 29 and bars 31 to 34 are such that, while they are connected to move with the shafts 1, 9, and 10, they are counterbalanced throughout such movement through their connection with pinions 24 and 25 and cannot bias the movement or interfere with the usual dial-control of said controlling devices; and that the adjustment effected by the depression of each key-lever is instant, positive, direct, and unerring. If, after a previous tuning of the receiving system, the controlling devices thereof have been left in their adjusted positions for that tuning, the operation of any key-lever will effect the positive movement of said controlling devices in either direction necessary to bring them into the predetermined position for which that particular key has been set. This is exemplified in the showing in Figs. 3 and 4, where, bars 32 and 34 having been moved to the positions shown in Fig. 3 by the key-lever therein shown as in depressed position, it will be seen that, upon the release of that lever and the depression of another having its rocker 56 set in a different position, as shown in Fig. 4, the contact-toe 58 will first meet bar 34 and move it downwardly, and cause the simultaneous upward movement of bar 32 until it is met by contact-toe 57. If, now, upon release of the second-mentioned lever, the one first mentioned is again depressed, the contact-toe 57 of that lever will first meet bar 32 and move it downwardly, and cause the simultaneous upward movement of bar 34 until it is met by the other contact-toe 58. In this manner, the movable elements of the controlling devices will always be instantly, positively, directly, and unerringly moved in either direction necessary to bring them into the different positions for which the rockers of the several levers have been adjusted and locked in position, the desired changes in the positions of the controlling devices being accomplished by the selective operation of the several key-levers.

I claim:

1. The combination, with a reversely adjustable controlling device for a radio system of communication, of means free from connection with said device acting upon operation in one direction to move it in either direction of its adjustment to a predetermined position; said means being returnable from each such operating action thereof without disturbing the position to which said device has been adjusted.

2. The combination, with a reversely adjustable controlling device for a radio sys-

tem of communication, of means free from connection with said device acting upon operation in one direction to move it in either direction of its adjustment and stop it in a predetermined position; said means being returnable from each such operating action thereof without disturbing the position to which said device has been adjusted.

3. The combination, with a reversely adjustable controlling device for a radio system of communication, of means free from connection with said device acting upon operation in one direction to move it in either direction of its adjustment to a predetermined position, and an adjustable device acting upon operation of said means to determine said position.

4. The combination, with a reversely adjustable controlling device for a radio system of communication, of means free from connection with said device acting upon operation in one direction to move it in either direction of its adjustment to a predetermined position, and an adjustable device acting upon operation of said means to stop the movement of said controlling device at said predetermined position.

5. The combination, with a reversely adjustable controlling device for a radio system of communication, of means free from connection with said device acting upon operation in one direction to move it in either direction of its adjustment to a predetermined position, comprising a device carried by and adjustable with respect to said means acting upon operation thereof to determine said position; said means being returnable from each such operating action thereof without disturbing the position to which said device has been adjusted.

6. The combination, with a reversely adjustable controlling device for a radio system of communication, of means free from connection with said device acting upon operation in one direction to move it in either direction of its adjustment to a predetermined position, comprising a device carried by and adjustable with respect to said means acting upon operation thereof to positively effect and positively stop the movement of said controlling device thereby.

7. The combination, with a reversely adjustable controlling device for a radio system of communication, of a plurality of selectively operable means each free from connection with said device and acting upon operation in one direction to move said device in either direction of its adjustment to a predetermined position, and adjustable means acting upon operation of each of said selectively operable means to determine the position to which the operation thereof will effect the movement of said device.

8. The combination, with a reversely adjustable controlling device for a radio system of communication, of a plurality of selectively operable means each free from connection with said device and acting upon operation in one direction to move said device in either direction of its adjustment to a predetermined position, and adjustable means individual to each of said selectively operable means acting upon operation thereof to determine the position to which each of said selectively operable means will effect the movement of said device.

9. The combination, with a reversely adjustable controlling device for a radio system of communication, of a plurality of selectively operable means each acting upon operation in one direction to move said device in either direction of its adjustment to a predetermined position, and means carried by each of said selectively operable means and adjustable with respect thereto acting to determine the position to which the operation of each of said selectively operable means will effect the movement of said device.

10. The combination, with a reversely adjustable controlling device for a radio system of communication, of a rotatable shaft connected with said device, and means free from connection with said shaft acting upon operation in one direction to rotate said shaft in either direction and thereby move said device to a predetermined position; said means being returnable from each such operating action thereof without disturbing the position to which said device has been adjusted.

11. The combination, with a reversely adjustable controlling device for a radio system of communication, of means acting upon operation in one direction to move said device in either direction of its adjustment, comprising a plurality of elements operatively connected with said device and with each other for simultaneous movement, and a device acting upon operation of said means to engage with and move one of said elements and to engage with and arrest the movement of another of said elements.

12. The combination, with a reversely adjustable controlling device for a radio system of communication, of means acting upon operation in one direction to move said device in either direction of its adjustment and stop such movement at a predetermined position, comprising a plurality of elements operatively connected with said device and with each other for simultaneous movement, and an adjustable device acting upon operation of said means to engage with and move one of said elements and to engage with and arrest the movement of another of said elements, the adjustment of said adjustable device determining where the movement of said one element shall cease and where the move-

ment of said other element shall be arrested, and thereby determining the position to which the operation of said means will effect and stop the movement of said controlling device.

13. The combination, with a reversely adjustable controlling device for a radio system of communication, of a plurality of selectively operable means each acting upon operation in one direction to move said device in either direction of its adjustment, comprising a plurality of elements operatively connected with said device and with each other for simultaneous movement, and a plurality of devices individual to said selectively operable means and differently positioned with respect to each other, each of said plurality of devices acting upon operation of its respective said means to engage with and move one of said elements and to engage with and arrest the movement of another of said elements, whereby the movement of said controlling device to different predetermined positions may be effected by the selective operation of said plurality of selectively operable means.

14. The combination, with a reversely adjustable controlling device for a radio system of communication, of a plurality of selectively operable means each acting upon operation in one direction to move said device in either direction of its adjustment to a predetermined position, comprising a plurality of elements operatively connected with said device and with each other for simultaneous movement, and a plurality of individually adjustable devices, one for each of said selectively operable means, each of said plurality of devices acting upon operation of its respective said means to engage with and move one of said elements and to engage with and arrest the movement of another of said elements, whereby the movement of said controlling device to different predetermined positions may be effected by the selective operation of said plurality of selectively operable means, and whereby said different predetermined positions may be adjustably determined with respect to each of said selectively operable means by the adjustment of the respective said adjustable devices.

15. A key-operated device for adjusting the controlling devices of radio systems of communication, comprising a shaft operatively associated with said devices, a pair of reciprocably movable elements connected with said shaft and simultaneously operable to rotate said shaft, and reciprocably operable means acting upon operation to contact with and move one of said elements and to intercept and arrest the movement of the other of said elements.

16. A key-operated device for adjusting the controlling devices of radio systems of communication, comprising a shaft operatively associated with said devices, a pair of reciprocably movable elements connected with said shaft and simultaneously operable in reverse directions to rotate said shaft, and reciprocably operable means acting upon operation in one direction to contact with and move one of said elements and to intercept and arrest the movement of the other of said elements.

17. A key-operated device for adjusting the controlling devices of radio systems of communication, comprising a shaft operatively associated with said devices, a pair of reciprocably movable elements connected with said shaft and simultaneously operable to rotate it, reciprocably operable means, and a plurality of adjustable abutments carried by said means acting upon operation thereof to contact with and move one of said elements and to intercept and arrest the movement of the other of said elements, the adjustment of said abutments acting upon the operation of said means to determine where the movement of said one element shall cease and where the movement of said other element shall be intercepted and arrested.

18. A key-operated device for adjusting the controlling devices of radio systems of communication, comprising a shaft operatively associated with said devices, a pair of reciprocably movable elements connected with said shaft and simultaneously operable in reverse directions to rotate it, reciprocably operable means, and a plurality of adjustable abutments carried by said means acting upon operation thereof in one direction to contact with and move one of said elements in said one direction and to intercept and arrest the movement of the other of said elements in the reverse direction, the adjustment of said abutments acting upon the operation of said means to determine where the movement of said one element shall cease and where the movement of said other element shall be intercepted and arrested.

19. A selective key-operated device for adjusting the controlling devices of radio systems of communication, comprising a shaft operatively associated with said devices, a pair of reciprocably movable elements connected with said shaft and simultaneously operable to rotate it, a plurality of selectively operable keys, and an abutment-member carried by each of said keys acting upon operation thereof to engage with and move one of said elements and to engage with and arrest the movement of the other of said elements, the abutment-members of the several keys being differently positioned with respect to each other, whereby the rotation of said shaft and the adjustment of the devices operatively associated therewith may be moved to and arrested in different prede-

termined positions by the selective operation of said keys.

20. A selective key-operated device for adjusting the controlling devices of radio systems of communication, comprising a shaft operatively associated with said devices, a pair of reciprocably movable elements connected with said shaft and simultaneously operable to operate it, a plurality of selectively operable keys, and a plurality of individually adjustable abutment-members, one carried by each of said keys and acting upon operation thereof to engage with and move one of said elements and to engage with and arrest the movement of the other of said elements, whereby the rotation of said shaft and the adjustment of the devices operatively associated therewith may be moved to and arrested in different predetermined positions by the selective operation of said keys, and whereby said different predetermined positions may be adjustably determined with respect to each of said keys by the adjustment of the abutment-member carried thereby.

21. A selective key-operated device for adjusting the controlling devices of radio systems of communication, comprising a shaft operatively associated with said devices, a pinion fixed upon said shaft, a pair of racks disposed in parallel arrangement upon opposite sides of said shaft and meshing with said pinion, an abutment carried by each of said racks, a plurality of selectively operable keys, and an abutment-member carried by each of said keys acting upon operation of its respective key to contact with and move one of said abutments and to contact with and arrest the movement of the other of said abutments.

22. A selective key-operated device for adjusting the controlling devices of radio systems of communication, comprising a shaft operatively associated with said devices, a pair of pinions fixed upon said shaft, two pairs of racks, each pair thereof being disposed in parallel arrangement upon opposite sides of said shaft and meshing with one of said pinions, a pair of bars extending between and respectively connecting the complemental racks of said two pairs of racks, a plurality of selectively operable keys arranged to extend transversely across said bars, and an abutment-member carried by each of said keys each acting upon operation of its respective key to contact with and move one of said bars and to contact with and arrest the movement of the other of said bars.

23. A selective key-operated device for adjusting the controlling devices of radio systems of communication, comprising a shaft operatively associated with said devices, a pinion fixed upon said shaft, a pair of racks disposed in parallel arrangement upon opposite sides of said shaft and meshing with said pinion, an abutment carried by each of said racks, a plurality of selectively operable keys, a rocker-abutment carried by each of said keys acting upon operation of its respective key to contact with and move one of said abutments and to contact with and arrest the movement of the other of said abutments, and clamping means carried by each of said keys adjustable to alternately release and fix the positions of the respective rocker-abutments.

24. A selective key-operated device for adjusting the controlling devices of radio systems of communication, comprising a shaft operatively associated with said devices, a pair of pinions fixed upon said shaft, two pairs of racks, each pair thereof being disposed in parallel arrangement upon opposite sides of said shaft and meshing with one of said pinions, a pair of bars extending between and respectively connecting the complemental racks of said two pairs of racks, a plurality of selectively operable keys arranged to extend transversely across said bars, a rocker-abutment carried by each of said keys acting upon operation of its respective key to contact with and move one of said bars and to contact with and arrest the movement of the other of said bars, and clamping means carried by each of said keys adjustable to alternately release and fix the positions of the respective rocker-abutments.

25. A selective key-operated device for adjusting the controlling devices of radio systems of communication, comprising a shaft operatively associated with said devices, a pinion fixed upon said shaft, a pair of racks disposed in parallel arrangement upon opposite sides of said shaft and meshing with said pinion, an abutment carried by each of said racks, a plurality of selectively operable keys, a rocker-abutment pivotally supported upon each of said keys having an arcuate surface and a contact-toe at each end of said surface, the pivotal support of each rocker-abutment being concentric with the arcuate surface thereof and intermediate said contact-toes, each of said rocker-abutments acting upon operation of its respective key to move one of said abutments with one of its said contact-toes and to arrest the movement of the other of said abutments with the other of its said contact-toes, a shoe having a concave surface fitting and resting against the arcuate surface of each of said rocker-abutments, and adjustable means carried by each of said keys operable to clamp the respective shoe against its rocker-abutment and hold it fixed in a desired position.

26. A selective key-operated device for adjusting the controlling devices of radio systems of communication, comprising a shaft operatively associated with said devices, a

pair of pinions fixed upon said shaft, two pairs of racks, each pair thereof being disposed in parallel arrangement upon opposite sides of said shaft and meshing with one of said pinions, a pair of bars extending between and respectively connecting the complemental racks of said two pairs of racks, a plurality of selectively operable keys arranged to extend transversely across said bars, a rocker-abutment pivotally supported upon each of said keys having an arcuate surface and a contact-toe at each end of said surface, the pivotal support of each rocker-abutment being concentric with the arcuate surface thereof and intermediate said contact-toes, each of said rocker-abutments acting upon operation of its respective key to move one of said bars with one of its said contact-toes and to arrest the movement of the other of said bars with the other of its said contact-toes, a shoe pivotally supported upon each of said keys having a concave surface fitting and resting against the arcuate surface of the respective rocker-abutment, and adjustable means carried by each of said keys operable to clamp the respective shoe against its rocker-abutment and hold it fixed in a desired position.

27. The combination, with a reversely adjustable controlling device for a radio system of communication, of a manually operable key acting upon operation in one direction to move said device in either direction to a predetermined position, adjustable means carried by said key acting to determine said position, and means accessible for adjustment at the manually operable end of said key operable to control the adjustment of said adjustable means.

28. The combination, with a reversely adjustable controlling device for a radio system of communication, of a manually operable key acting upon operation in one direction to move said device in either direction to a predetermined position, adjustable means acting upon operation of said key to determine said position, and a finger-piece carried by said key operable to control the adjustment of said adjustable means.

29. In a key-operated device for adjusting the controlling devices of radio systems of communication, a manually operable key operatively associated with said devices acting upon operation to move said devices to a predetermined position, adjustable means acting to determine said position, and a finger-piece carried by said key adjustable to control the adjustment of said adjustable means.

30. In a key-operated device for adjusting the controlling devices of radio systems of communication, a manually operable key operatively associated with said devices acting upon operation to move said devices to a predetermined position, adjustable means acting to determine said position, and a finger-piece carried by said key comprising a screw-cap adjustable to control the adjustment of said adjustable means.

In witness whereof, I have hereunto subscribed my name this 15th day of May, A. D. 1928.

JOSEPH M. SCHAEFER.