April 22, 1941. A. S. WELLS 2,239,067

TUNING MECHANISM FOR RADIO RECEIVING SETS

Original Filed April 25, 1938 3 Sheets-Sheet 1

Fig. 1

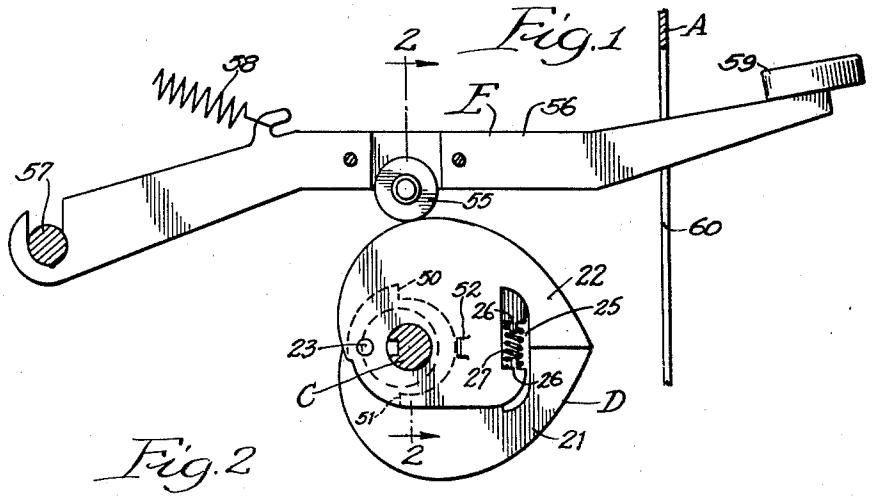
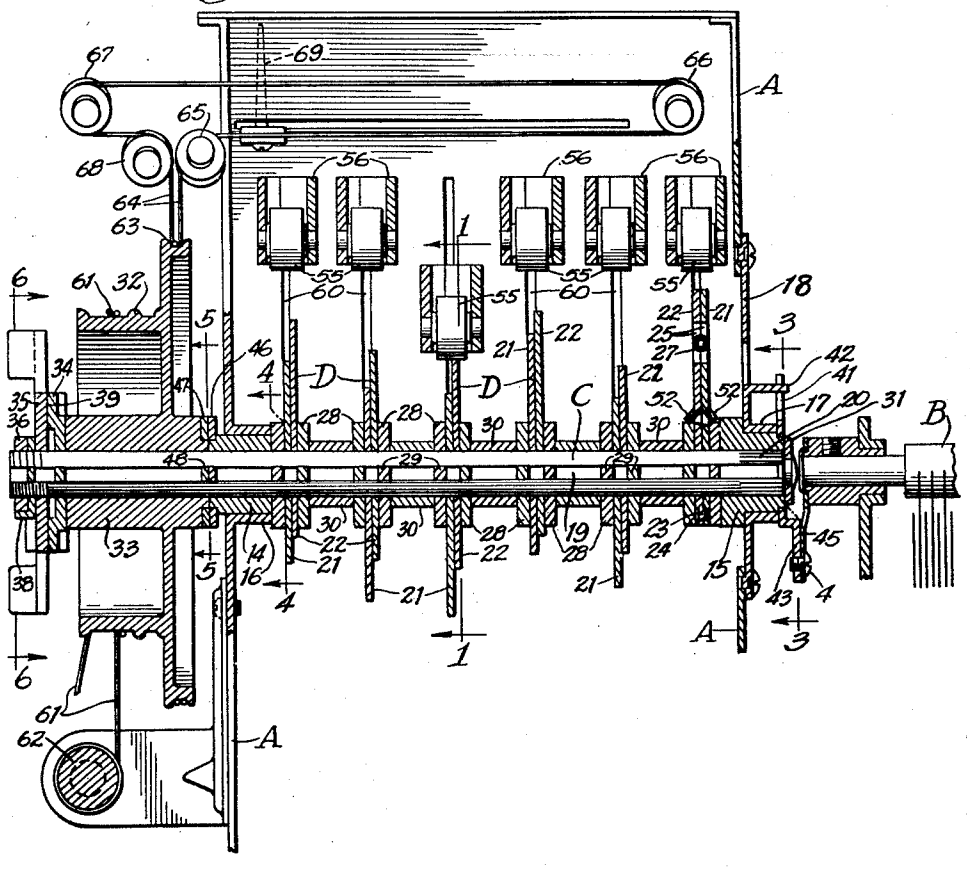


Fig. 2



INVENTOR.
Albert S. Wells

BY Dunning & Dunning
ATTORNEYS

April 22, 1941. A. S. WELLS 2,239,067

TUNING MECHANISM FOR RADIO RECEIVING SETS

Original Filed April 25, 1938 3 Sheets-Sheet 2

Fig. 3

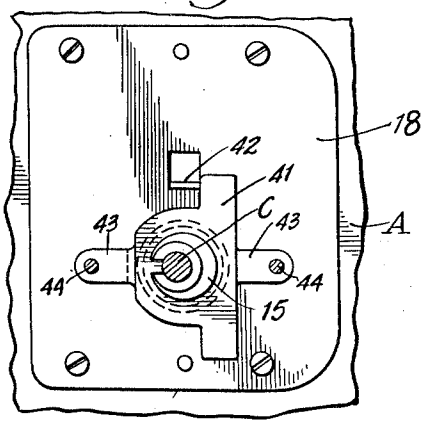


Fig. 4

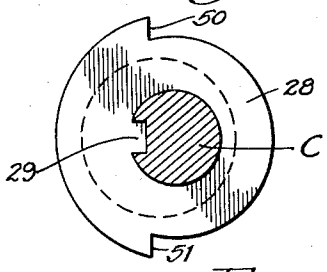


Fig. 5

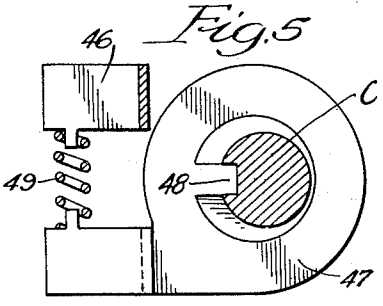
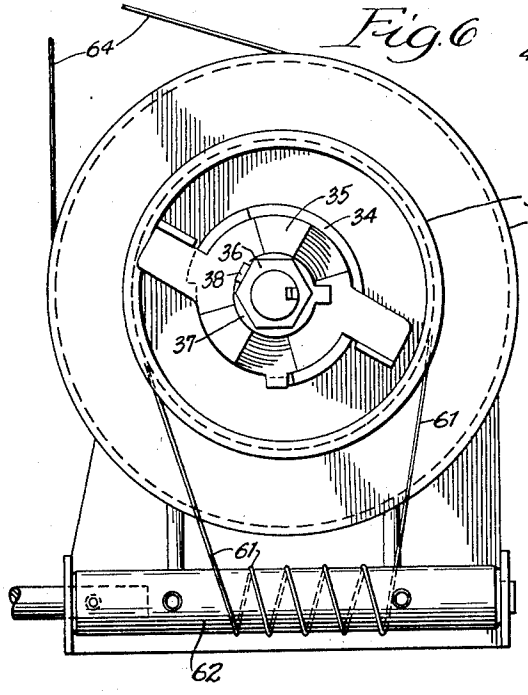


Fig. 6



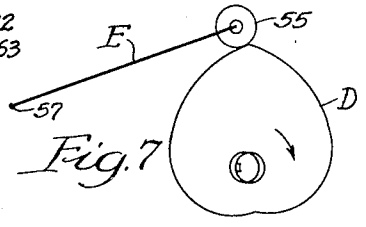


Fig. 7

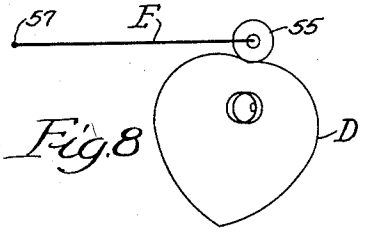


Fig. 8

INVENTOR.

BY Albert S. Wells

Cumming & Cumming

ATTORNEYS

April 22, 1941. A. S. WELLS 2,239,067

TUNING MECHANISM FOR RADIO RECEIVING SETS

Original Filed April 25, 1938 3 Sheets-Sheet 3

Fig. 9

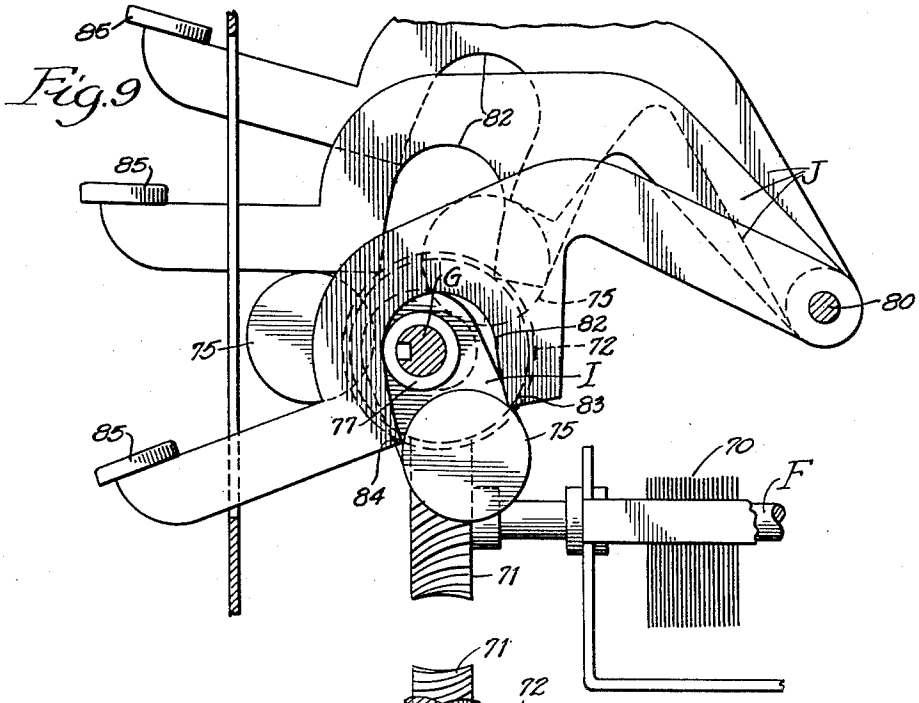
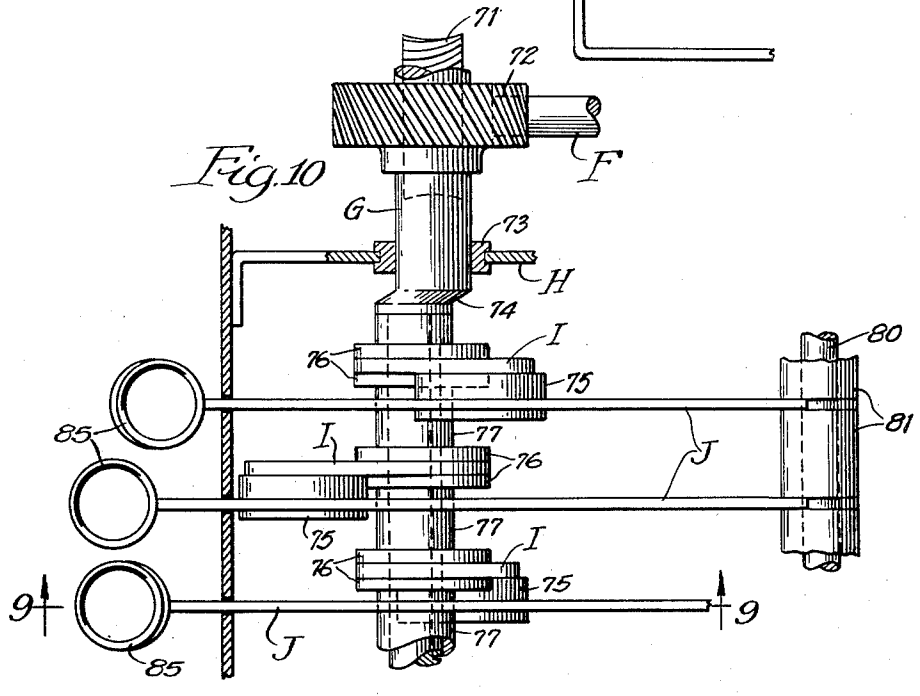


Fig. 10



INVENTOR.
Albert S. Wells
BY Fleming & Fleming
ATTORNEYS

Patented Apr. 22, 1941

2,239,067

UNITED STATES PATENT OFFICE

2,239,067

TUNING MECHANISM FOR RADIO RECEIVING SETS

Albert S. Wells, Chicago, Ill., assignor to Wells-Gardner & Company, Chicago, Ill., a corporation of Illinois

Original application April 25, 1938, Serial No. 204,021. Divided and this application September 26, 1940, Serial No. 358,499

7 Claims. (Cl. 74—10)

It is a primary object of this invention to provide a simple and efficient means for tuning a radio set into resonance with a desired station by operation of a selected manual. The mechanism employed for this purpose, as hereinafter disclosed, may be quickly and readily pre-set for a number of selected stations, enabling the user to tune in with any one of said stations by operation of a single manual. The operating connections may include a series of driving manuals each movable toward and from an eccentrically rotatable shaft on which is mounted a plurality of cams or arms one of which is adapted to be driven by each manual through the exertion of an operating force which proceeds with special mechanical advantage, all as hereinafter set forth.

The improvements which characterize this invention have been previously disclosed in my Patent No. 2,214,785, dated September 17, 1940, of which this case is a division. More particularly, these improvements have to do with certain elements mounted upon a common shaft adapted to cooperate selectively with the manuals by which the tuning operations are carried out, these elements presenting various advantages in the directions of simplicity, economy and dependability, all as fully described in the following specification and shown in the accompanying drawings in the manner following:

Figure 1 is a partial vertical section on line 1—1 of Fig. 2, showing one of the manual-cam assemblies comprised in the present mechanism;

Fig. 2 is a vertical section through the tuning mechanism assembly, taken on line 2—2 of Fig. 1, one of the tuning levers being shown as depressed while the others are in normally raised position;

Figs. 3, 4, and 5 are fragmentary sections on lines 3—3, 4—4, 5—5, respectively, of Fig. 2;

Fig. 6 is an end elevation, looking in the direction indicated by the arrows on line 6—6 of Fig. 2;

Figs. 7 and 8 are diagrammatic views illustrating the relationship of one of the manuals to its associated heart cam at two extreme positions of the latter;

Fig. 9, which is a view similar to Fig. 1, taken on line 9—9 of Fig. 10, shows a modified construction in which arms are substituted for cams on the operating shaft; and

Fig. 10 is a fragmentary top plan view of the mechanism shown in Fig. 9.

The mechanism illustrated in Figs. 1 to 8 comprises a radio chassis frame A in which is mounted a tuning shaft B (with which are associated appropriate condensers or other tuning elements) and an operating shaft C fixed eccentrically in journals 14 and 15 which are suitably mounted to rotate in bearings 16 and 17, respectively. The latter of these bearings may be carried by a closure plate 18 affixed over a large opening in one end of the chassis frame; when this plate is removed, insertion and removal of the tuning mechanism, as a unit, may be accomplished with ease. A key-way 19 extends lengthwise of the shaft which at one end is serrated as at 20 to facilitate a driving connection with the journal 15 whereto it is fitted.

Upon the shaft are affixed a plurality of elements, each adapted to be driven in response to operation of a manual, as hereinafter explained. As shown in Figs. 1 to 8, each such element may be in the form of a heart cam D made up desirably of two similar complementary plates 21 and 22 in adjacent relation. Both cam plates are apertured to receive the shaft, and at a short distance therefrom are pivotally connected as by means of a boss 23 extruded from one face of each plate to produce upon its opposite face a corresponding recess 24. By facing two adjacent cam plates in the same direction, the boss of one will enter the recess of the other to provide a pivotal connection therebetween. The plates of each cam are provided with registering slots 25 located on the shaft side opposite their pivotal interconnection and at a distance from the shaft which is relatively great; and at opposite ends of each slot are aligned lugs 26 over which are fitted the ends of compression springs 27 whose axes are disposed transversely to a line in intersection with the shaft axis and pivotal axis between the cam plates. With the spring set in place, a tension is thereby exerted against the two plates of the cam, causing them to engage tightly with the operating shaft so as to be frictionally locked against rotation with respect thereto.

On each side of each pair of cam plates I may place a friction washer 28 (see Fig. 4) having a tongue 29 which extends into the key-way so as to lock the washer with the shaft at all times. Spacers 30 may also be placed between each of these sets of friction washers.

At one end of the operating shaft is secured a washer 31 to lock the shaft of the journal 15. To the opposite end of the shaft is affixed a drum 32 concentric with the journal 14 which is formed with a hub 33 through which the shaft extends. Beyond this hub is located a pair of

relatively rotatable complementary cam disks 34 and 35 which are mounted on the operating shaft; these cam disks may be secured on the shaft as by means of a nut 36 and lock washer 37 having a tongue disposed within the shaft key-way and an ear 38 engaging the nut to prevent rotation thereof after it is once adjustably secured in place. The coacting cam disks are formed on their facing sides with complementary beveled surfaces 39, and one of these disks is provided with a tongue extending into the key-way to lock therewith, the other disk being free to rotate upon the shaft. When the high and low portions of the beveled surfaces on the two cam disks coincide, there is an absence of pressure endwise on the shaft, but by turning one of these disks relative to the other an endwise pressure is exerted along the shaft through the hub 33, the journal 14, the washers 28 and the spacers 30, to lock the several pairs of cam plates fixedly to the shaft in any selected rotative position thereupon. With the cam disks manipulated to relax pressure lengthwise of the shaft, ready adjustment of each heart cam separately will be facilitated.

The range of movement of the operating shaft, say 180°, may be fixed as by an arm 41 secured to the journal 15 which engages at either end of the shaft oscillation with a finger 42 which may be conveniently struck out from the closure plate 18. The arm 41 is also formed with opposed extensions 43 (Figs. 2 and 3) adapted to be connected as by screws 44 to the ends of a flexible driving disk 45 which is suitably connected to one end of the tuning shaft.

The journal 14 is prevented from turning about the shaft as by a washer 46 (partly shown in Fig. 5) which is similar to a second washer 47. This latter washer is formed with an inwardly extending lug 48 which passes through a slot in the end of the drum hub 33 and into the shaft key-way 19, thereby locking the hub to the shaft. The washer 46 has a similar inwardly extending lug which locks the journal 14 to the shaft. A spring 49 (Fig. 5) serves to press the washers 46 and 47 apart so as to prevent any backlash.

Each of the friction washers 28 is provided with a pair of shoulders 50 and 51 spaced apart something more than 180° (Figs. 1 and 4), each adapted to engage in turn an ear 52 which is outwardly struck from one of the cam plates 21 and 22 whereby to limit the adjustment of the heart cams to 180° or thereabouts. The heart cams may be actuated in each instance by a follower roller 55 which is mounted to move through a fixed path in response to operation of a manual E. In the drawings each manual is represented as a lever 56 hingedly mounted upon a fulcrum rod 57, the manual being normally maintained away from the cam as by a spring 58. Buttons 59, marked with the call letters of the station to which it corresponds, may be affixed to the outer ends of these manuals which are extended through slots 60 in the front wall of the chassis frame. To operate, the manual corresponding to the station desired is depressed thereby causing the follower roller to turn its associated heart cam to rotate the operating shaft; this movement continues until the roller has advanced as far as possible toward the shaft which position is reached when the roller lies in the notch opposite the point of the heart cam. By so proceeding, accurate tuning may be performed provided that the cam itself has been pre-set properly on the operating shaft.

The drum 32 may be driven by a cord 61 which is wound around a shaft 62 to which is connected a suitable knob, not shown. The drum carries a sheave 63 (Fig. 2) about which passes a cord 64 passing over suitable pulleys 65, 66, 67 and 68 to connect with an indicator 69 which moves across a scale to indicate the position of the tuning condenser. This scale may be graduated in any suitable units, or it may carry the names of the stations to which the set may be tuned.

The method of adjusting one of the heart cams for a given station may be as follows: The operator first manipulates the coacting cam disks 34 and 35 so as to relax the pressure endwise of the operating shaft. The set is then very accurately tuned by hand into resonance with a desired station. The heart cam representing this station may be adjusted by pressing the manual as far as it will go, the operating shaft meantime being held from rotation. This is easy of accomplishment because, when the cam disks are released, there is no endwise pressure exerted upon the several cams and they are accordingly free, in response to a rotative force sufficient to overcome their frictional engagement with the shaft, to take up new adjusted positions thereupon. Pressure upon one of the manuals may suffice to complete for the associated cam this adjustment which thereupon becomes very exact and accurate. The remaining heart cams, however, need not be disturbed since each retains its frictional locking engagement with the operating shaft. Each heart cam may, in turn, be adjusted in the same way. With these adjustments made, the cam disks are turned back to locking position whereby all of the heart cams are subjected to endwise pressure and thereby firmly locked once more to the operating shaft.

In Figs. 9 and 10 is shown a modification in which condensers 70 are mounted on a tuning shaft F to which is affixed a worm wheel 71 meshing with a worm 72, the latter being carried fast on an operating shaft G which is rotatably supported in bearings 73 (one only being shown) mounted on the chassis frame H. The operating shaft to the inside of each bearing is offset slightly, as at 74, this portion of the shaft being adapted to receive a plurality of driven elements I, here shown as arms, each having a roller 75 rotatably mounted thereon. These several arms are held fast between friction washers 76 with intervening spacers 77, as already described in connection with Fig. 2. Means similar to that previously described may be used for providing or releasing an endwise thrust along the operating shaft so as to permit each of the arms to be adjusted rotatively upon the shaft for purposes and in the manner which has been previously described in connection with the heart-shaped cams.

A series of manuals, here shown as levers J, one for each of the arm rollers, are mounted for movement upon a longitudinal rod 80 with spacers 81 intervening to fix the manuals apart a desired distance. Each of these manuals extends over the operating shaft where it is formed with a slot 82 within which the shaft and proximate spacer may lie when the manual is depressed. At the entrance to this slot are opposed bearing points 83 and 84 spaced apart a distance slightly less than the diameter of the arm roller with which these points are adapted

to coact. For convenience, each manual is equipped at its outer end with a button 85 on which may be displayed the call letters of a desired station to which the parts associated with this lever may be adjusted. By applying pressure to one of these buttons, the associated lever is moved to swing to its lowest position the roller on the proximate arm thereby rotating the operating and tuning shafts to the exact point required for placing of the condensers in resonance with the station selected. These several manuals may be permitted to ride up and down on the rollers, or each may be held up by a separate spring if so desired.

According to Figs. 1 and 2, the operating shaft is mounted eccentrically in journals which, when rotated, cause the shaft axis to move through an arc instead of remaining fixed in accordance with usual practice. The same result follows in the construction of Figs. 9 and 10 wherein the shaft which is offset intermediately of its ends is rotated eccentrically in consequence. The effect in both cases is the same, viz., the centers of the cams or arms with which the manuals coact, when in extreme positions, lie upon opposite sides of the shaft axis which shifts laterally as indicated best in Figs. 7 and 8. In the extreme position of Fig. 7, the manual engages the cam at a point which is off-center with respect to its axis. An initial mechanical advantage is thereby obtained which reduces the effort necessary for starting rotation of the shaft.

I claim:

1. In apparatus of the class described, a tuning mechanism comprising a rotatable shaft, a plurality of rotatively adjustable driven elements mounted on the shaft, a common means for releasably locking all the driven elements with respect to the shaft, a separate tension means in connection with each driven element acting to apply therethrough a constant force proceeding transversely against the shaft to provide for each such element a friction lock operating independently of the common locking means aforesaid, and means engageable with each driven element to cause relative rotation between the associated element and the shaft when the common locking means is released whereby to facilitate a new setting of the driven element relative to the shaft.

2. In apparatus of the class described, a tuning mechanism comprising a rotatable shaft, a plurality of driven elements spaced along the shaft, tension means associated with each driven element acting to apply therethrough a constant force proceeding transversely against the shaft to provide a friction lock for such element, a series of operating manuals, one for each driven element, and means, operable with independence of the several friction locks, for locking all driven elements to the shaft so that with the locking means released each element can be adjusted rotatively with respect to the shaft by means of its manual and with the locking means set the shaft can be turned to a position corresponding to any one of the driven elements by means of its manual.

3. In apparatus of the class described, a tuning mechanism comprising a rotatable shaft, a plurality of driven elements spaced along the shaft, tension means associated with each driven element acting to apply therethrough a constant force proceeding transversely against the shaft to provide a friction lock for such element, a series of operating manuals, one for each driven element, and means located at one end of the shaft, operable with independence of the several friction locks, for locking all driven elements to the shaft so that with the locking means released each driven element can be adjusted rotatively with respect to the shaft by means of its manual and with the locking means set the shaft can be turned to a position corresponding to any one of the driven elements by means of its manual.

4. In apparatus of the class described, a tuning mechanism comprising a rotatable shaft, a plurality of heart cams spaced along the shaft, each cam being composed of two similar sections pivotally connected at one side of the shaft and having spring means for causing them to engage the shaft whereby to frictionally lock therewith, a series of operating manuals, one for each cam, and means, operating with independence of the several spring friction locking means, for firmly locking all cams to the shaft so that with the locking means released each cam can be adjusted rotatively with respect to the shaft by means of its operating manual and with the locking means set the shaft can be turned to a position corresponding to any one of the cams by means of its manual.

5. For use with a shaft in connection with tuning condensers, a manual, and a cam on the shaft engageable by the manual, the cam comprising two complementary plates having registering apertures through which the shaft is extended, a pivotal connection between the plates at one side of the shaft, and a spring exerting a tension between the plates at an opposite side of the shaft whereby to urge the plates to swing about their pivotal connection with a consequent frictional engagement with the shaft.

6. For use with a shaft in connection with tuning condensers, a manual, and a cam on the shaft engageable by the manual, the cam comprising two complementary plates pivotally connected at a fulcrum point in engagement with opposite sides of the shaft at a weight point, and spring means acting on the plates at a power point to exert a leverage upon the shaft whereby to frictionally lock the cam against rotation relative thereto.

7. For use with a shaft in connection with tuning condensers, a manual, and a cam on the shaft engageable by the manual, the cam comprising two adjacent complementary plates having registering openings through which the shaft is extended, each plate having a boss extended laterally from one side and a corresponding recess on the other side, the boss of one plate being entered into the recess of the other plate to provide a pivotal connection therebetween, and spring means exerting a tension between the plates such as to urge the plates to swing about their pivotal connection with a consequent frictional engagement with opposite sides of the shaft.

ALBERT S. WELLS.