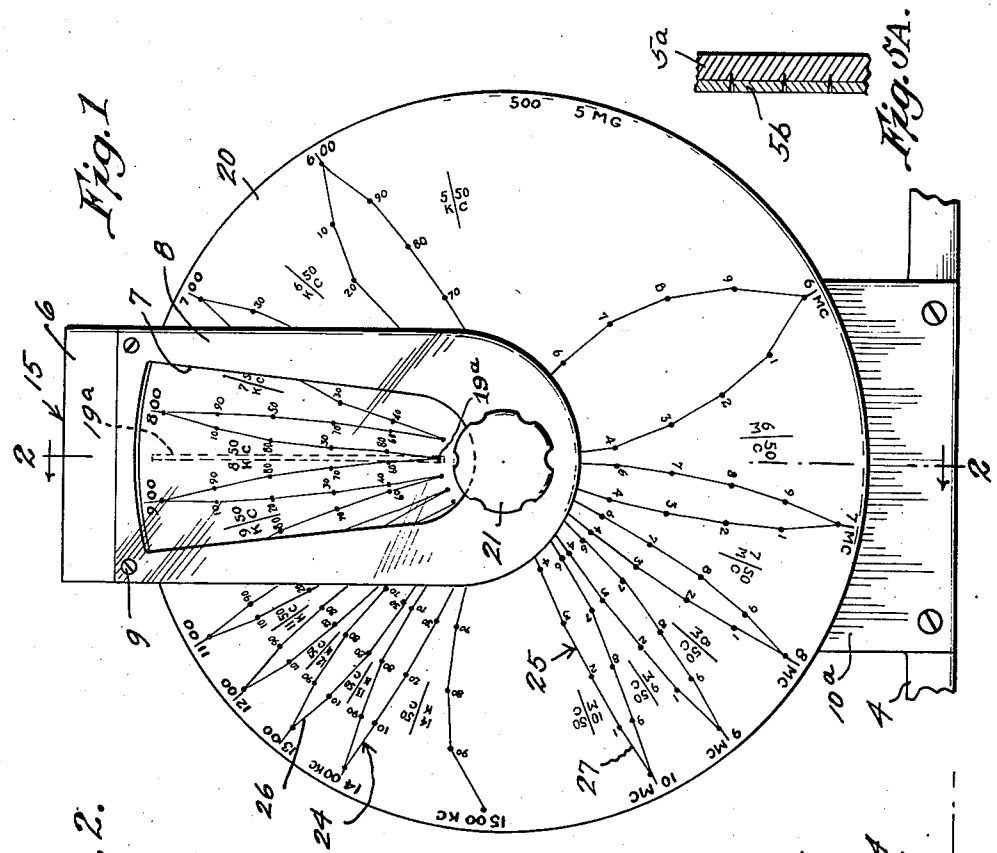
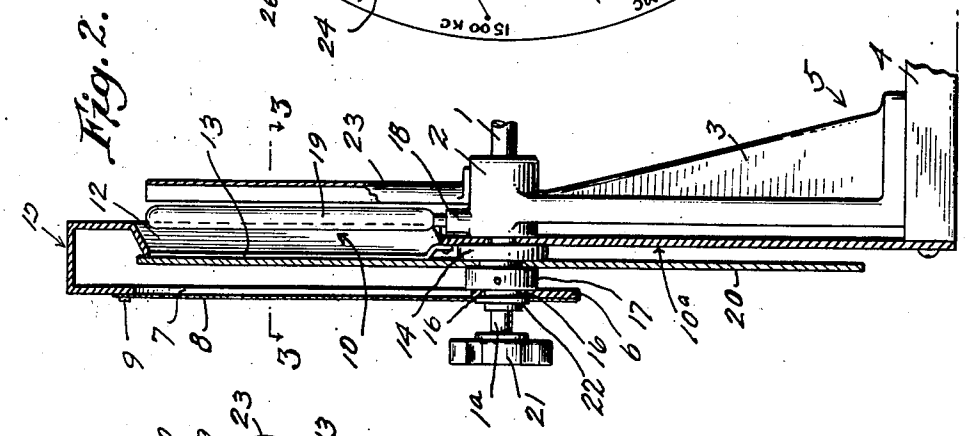
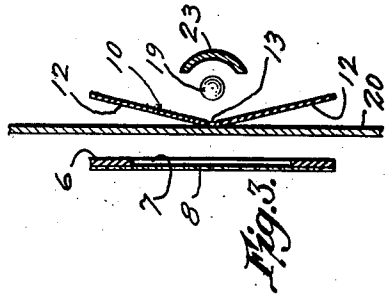
June 22, 1937. W. I. CARPENTER 2,084,942

DIAL STRUCTURE

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DIAL STRUCTURE

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Fig. 4.

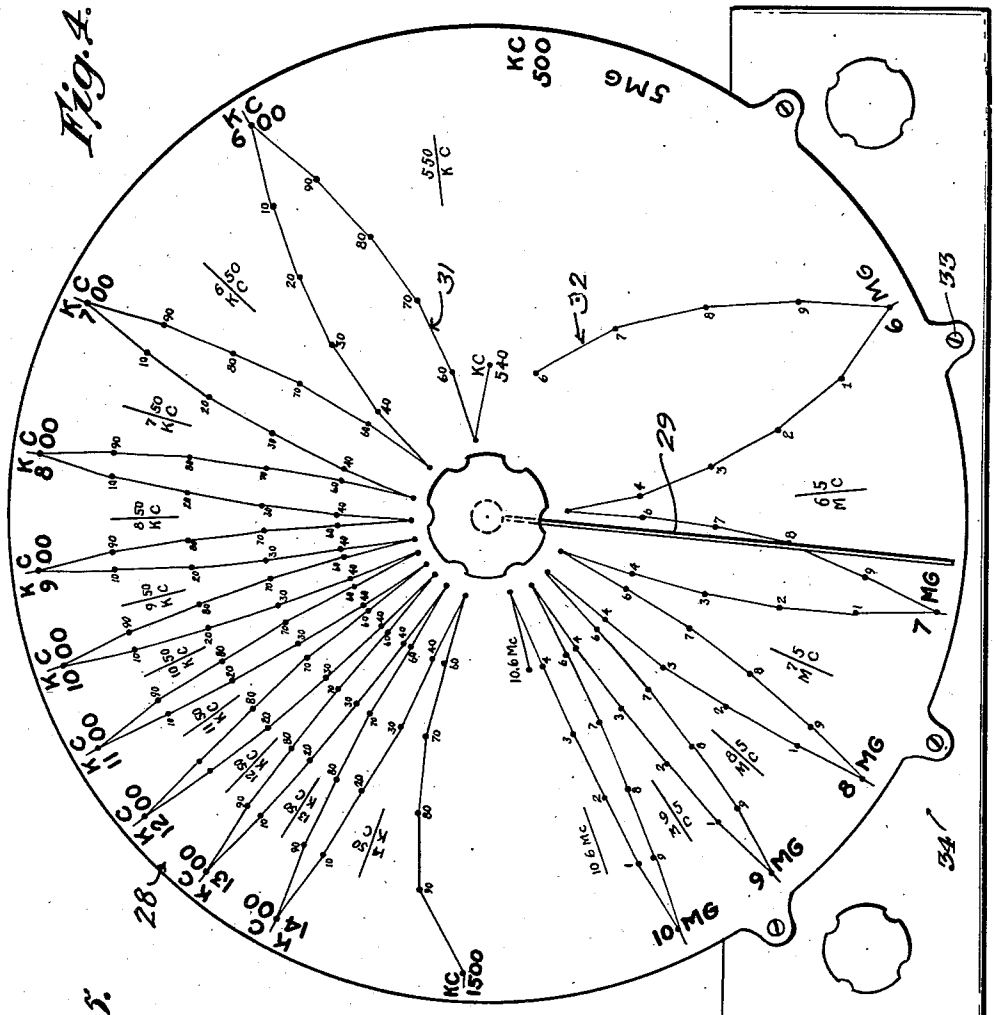
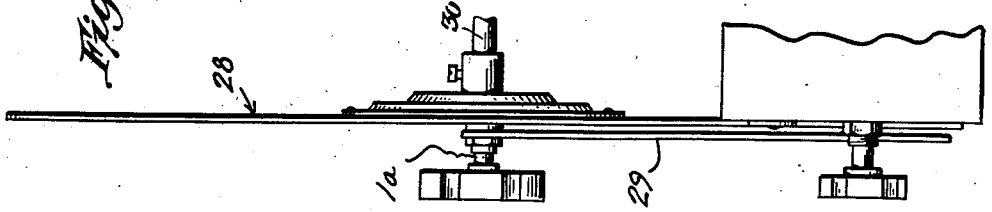


Fig. 5.



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DIAL STRUCTURE

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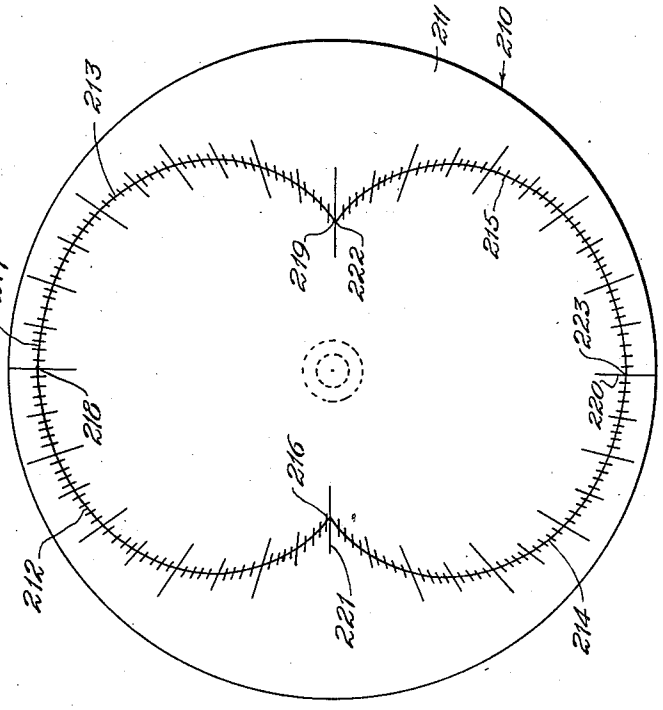


Fig. 7.

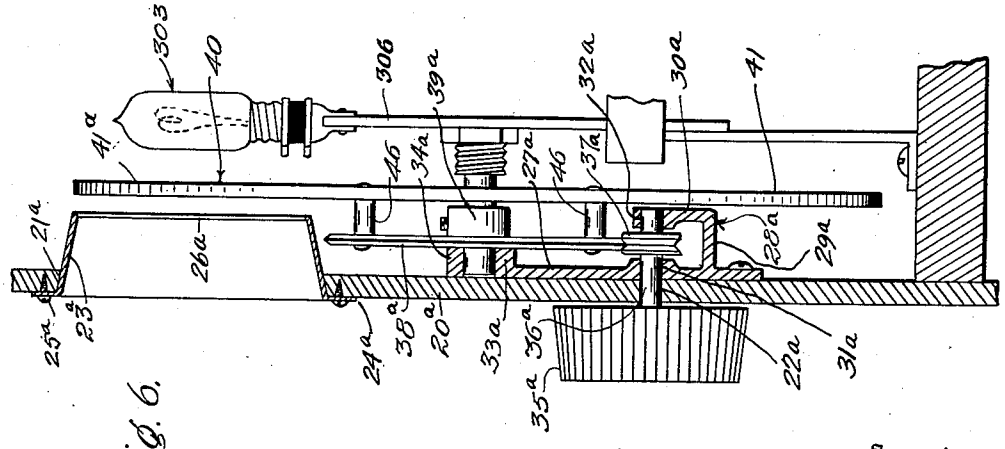


Fig. 6.

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DIAL STRUCTURE

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Fig. 8.

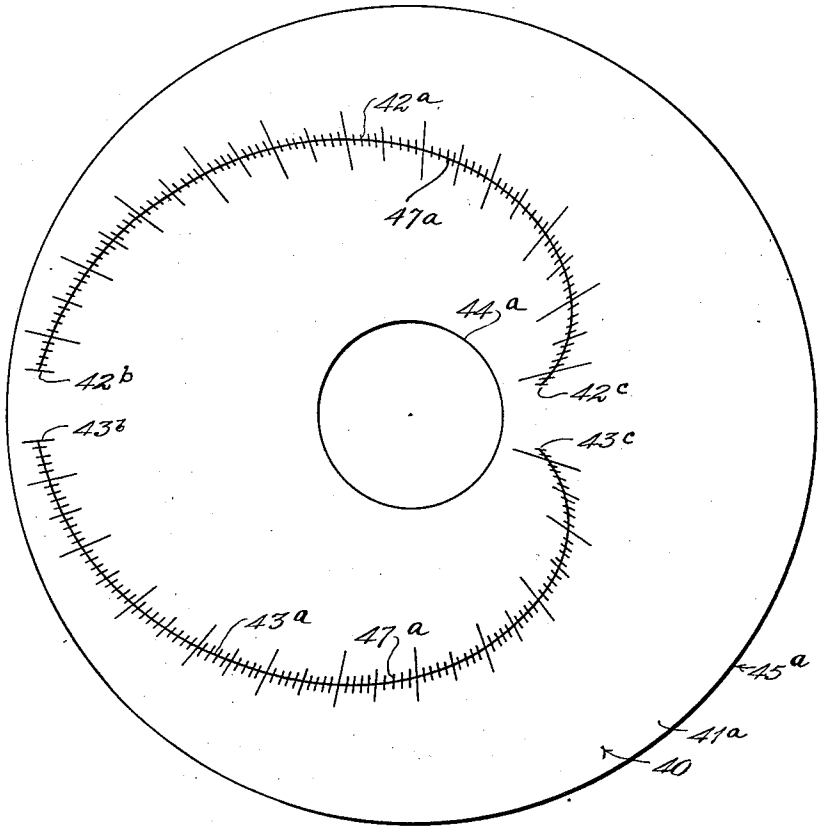
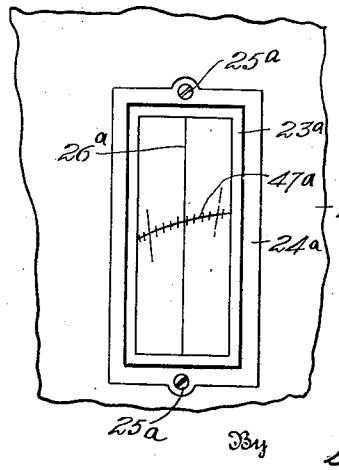


Fig. 9.



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Fig. 10.

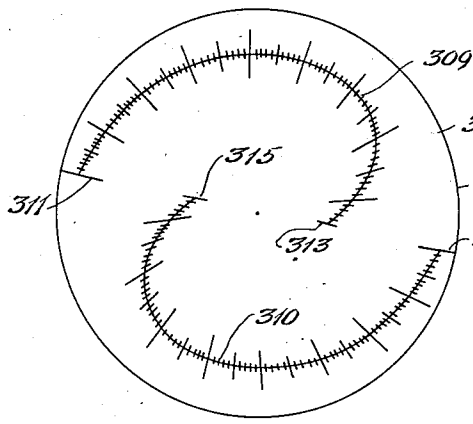


Fig. 11.

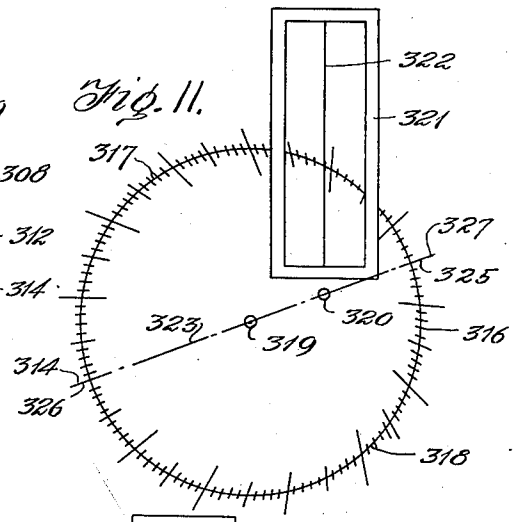


Fig. 12.

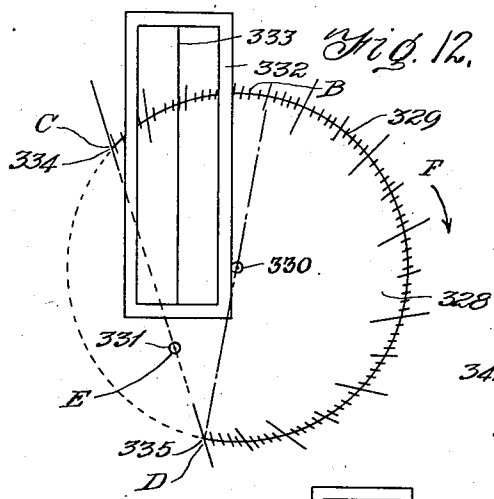


Fig. 13

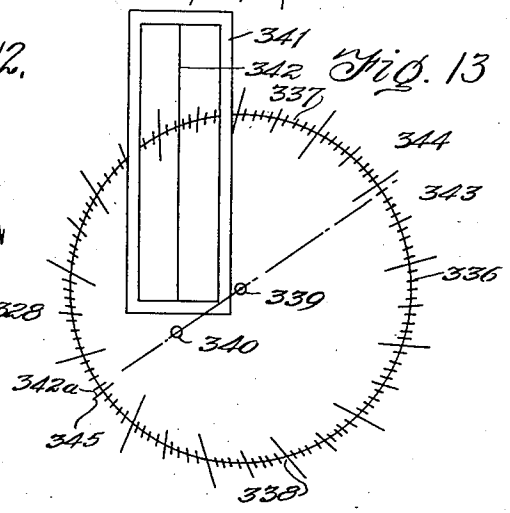
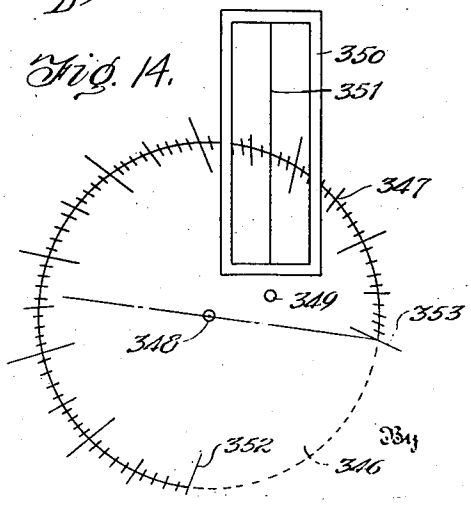


Fig. 14.



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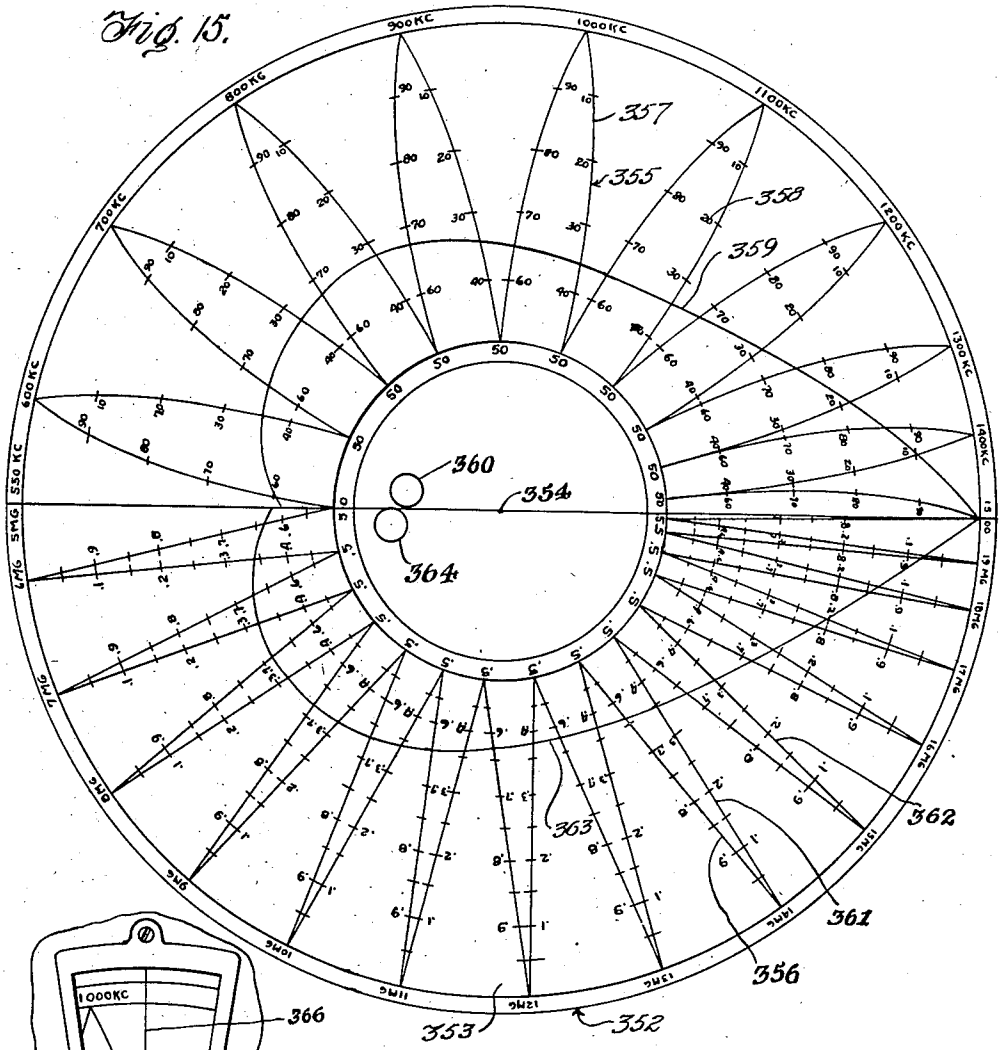
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DIAL STRUCTURE

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Fig. 15.



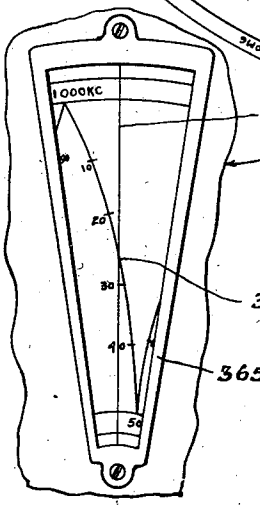


Fig. 16.

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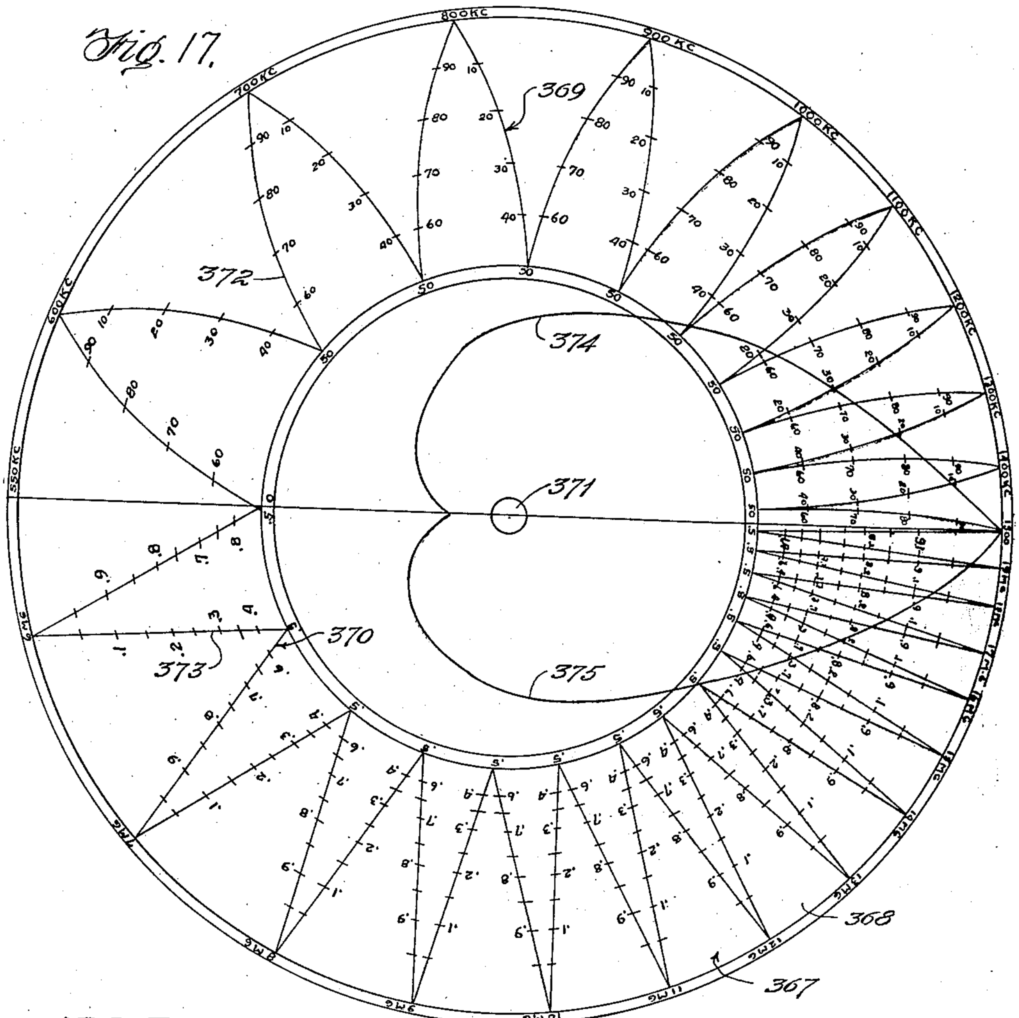
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DIAL STRUCTURE

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Fig. 17.



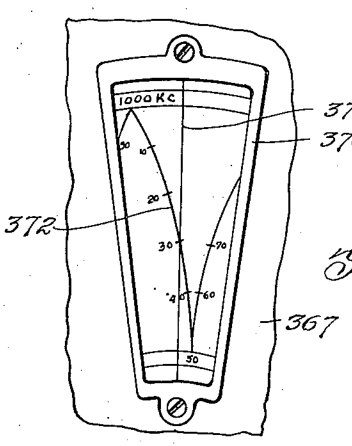


Fig. 18

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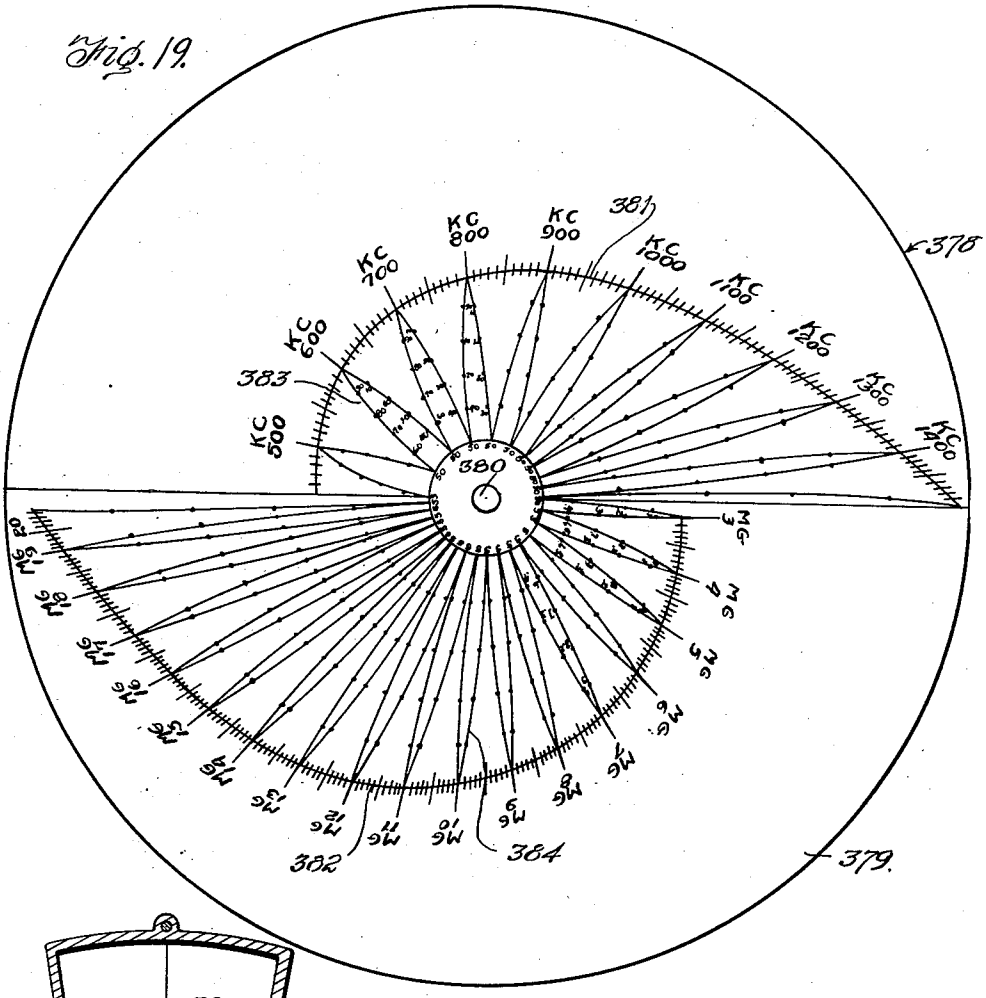
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DIAL STRUCTURE

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Fig. 19.



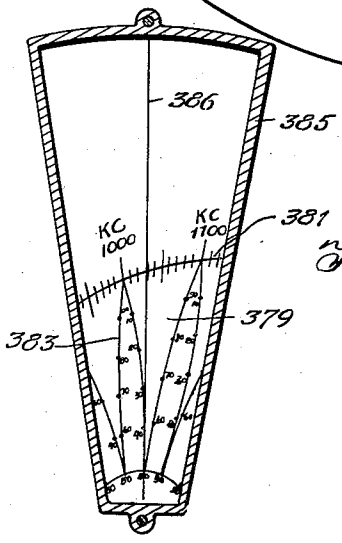


Fig. 20.

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Patented June 22, 1937 2,084,942

UNITED STATES PATENT OFFICE

2,084,942

DIAL STRUCTURE

Webster I. Carpenter, Norfolk, Va.

Application July 13, 1936, Serial No. 90,412

42 Claims. (Cl. 116—124.4)

This invention relates to a dial structure for use in connection with tuning systems for radio receivers, and has for its object to provide, in a manner as hereinafter set forth, a structure of such class including dial band scales so formed as to prevent bunching of the stations at the high frequency ends of the scales.

A further object of the invention is to provide, in a manner as hereinafter set forth, a dial structure including band spread and dial band frequency scales having minimum and maximum fixed radii and with no fixed radii between maximum and minimum to facilitate the reading as well as a more accurate setting of the dial.

A further object of the invention is to provide, in a manner as hereinafter set forth, a dial structure including frequency scales having variable radii.

A further object of the invention is to provide, in a manner as hereinafter set forth, a dial structure including a kilocycle band scale of spread form, a megacycle band scale of spread form and with the half way points in both the kilocycle and megacycle bands placed intermediate the band spread on a longer radius whereby the reading and dial setting can be more accurately set to any given frequency and means to automatically provide a sign post to the eye to attract attention to where the indicator reading is approaching.

A further object of the invention is to provide, in a manner as hereinafter set forth, a dial structure for radio receivers whereby a more equal distribution of the divisions of the kilocycle and megacycle dial band scales is obtained by the forming of said scales of volute curvature and/or of circular form working off center from its true center.

A further object of the invention is to provide, in a manner as hereinafter set forth, a dial structure including a carrier, a disc or support provided on one face with a kilocycle scale and a megacycle scale arranged in spaced relation, each of said scales having its calibrations arranged in pairs of oppositely disposed spreads, the calibrations of the spreads of each scale extending from a point adjacent the center to the outer marginal portion of said face and having minimum and maximum fixed radii and no fixed radii between minimum and maximum to facilitate the reading as well as an accurate setting of the dial.

A further object of the invention is to provide, in a manner as hereinafter set forth, a dial structure including a frequency band scale having its calibrations arranged in pairs of oppositely disposed spaced spreads and with the calibrations of each pair of spreads being disposed upon a different radii to facilitate the reading and setting of the dial.

This application is a continuation in part of my application filed December 16, 1935, Serial Number 54,752.

Further objects of the invention are to provide, in a manner as hereinafter set forth, a multi-frequency tuning system which is comparatively simple in its construction and arrangement, strong, durable, thoroughly efficient in its use, conveniently adjusted, accurate in action, readily assembled, and comparatively inexpensive to set up.

To the above ends essentially and to others which may hereinafter appear, the invention consists of such parts and such combination of parts which fall within the scope of the invention as claimed.

In the drawings:

Figure 1 is a fragmentary view of a radio receiving set looking towards one side of the latter and further showing the adaptation therewith of a dial structure in accordance with this invention.

Figure 2 is a vertical section on line 2—2, Figure 1,

Figure 3 is a section on line 3—3, Figure 2,

Figure 4 is a view similar to Figure 1 of a modified form of dial structure in accordance with this invention,

Figure 5 is a view looking towards a side edge of the modified form,

Figure 5A is a fragmentary view in vertical section of the dial structures,

Figure 6 is a vertical sectional view of still another modified form,

Figure 7 is an elevation of the dial plate of the dial provided with modified forms of scales,

Figure 8 is an elevation of the dial plate of the dial structure having a pair of oppositely disposed band scales of volute curvature.

Figure 9 is a fragmentary view in elevation illustrating the sight opening for the scales on the plate shown in Figure 8,

Figure 10 is an elevation of the dial plate of the dial structure provided with a modified form of volute dial band scales,

Figures 11, 12, 13 and 14 are diagrammatical views illustrating dial band scales upon the arc of a true circle and with each scale working upon an off-center relation with respect to its true center,

Figure 15 is a diagrammatical view of still another modified form of a revoluble dial structure having a pair of band spread dial band scales pro-

jecting from volute curves and with the focal points of the scales spaced from each other,

Figure 16 is a diagrammatical view illustrating the position of a spread of a scale, shown in Figure 15, relative to an indicator or finder,

Figure 17 is a diagrammatic view illustrating still another modified form of a revoluble dial structure having a pair of band spread dial band scales projected from volute curves and with the focal points of the scales being common to each other,

Figure 18 is a diagrammatical view illustrating the position of a spread of a scale, shown in Figure 17, relative to an indicator or finder,

Figure 19 is a diagrammatic view illustrating still another modified form of a revoluble dial structure, and

Figure 20 is a diagrammatical view illustrating a calibration of a scale, shown in Figure 19 relative to an indicator or finder.

With reference to Figures 1, 2 and 3 of the drawings, there is shown a condenser shaft 1 of a radio receiving set. The shaft 1 is rotatably mounted in and extends forwardly and rearwardly with respect to a horizontally disposed bearing 2 integral with the upper end of a standard 3 anchored to the bottom 4 of the cabinet or housing 5 of the set. The housing or cabinet includes a front wall 6 provided with an enlarged opening 7 and an escutcheon member 8 having the opening provided thereby of slightly flared contour. The inner edges of member 8 are preferably flush with the edges of opening 7. The member 8 is anchored to wall 6 by the holdfast means 9.

The dial structure shown in Figures 1, 2 and 3 includes an upstanding semi-transparent filter member 10. The member 10 at its lower end is secured to a support 10^a, which is secured to the front of bottom 4 by suitable holdfast means. The member 10 has an opening 11 for the passage of shaft 1. The member 10, from a point in proximity to its lower end to its upper end, is forwardly offset as at 12 and substantially of V contour in plan. The offset 12 has on its vertical median a narrow elongated light rays passage or light emitting slot 13 of a length to extend from the lower end to a point in close proximity to the upper end thereof. The rear face of support 10^a abuts the outer end of bearing 2. The front face of member 10 supports a vernier gear housing 14 which encompasses the shaft 1. The upper end of member 10 and the upper end of wall 6 may or may not have integral therewith means to form an open bottom lamp receptacle; however, they are shown as having integral therewith a means 15 of a form to provide an open bottom lamp receptacle. The wall 6 and escutcheon member 8 have registering openings 16 for the passage of the vernier tuning control shaft 1^a. Abutting the rear face of wall 6 and encompassing shaft 1^a is a dial supporting collar 17 of smaller diameter than that of the vernier gear housing 14. The collar 17 is fixed to shaft 1^a. Mounted on the top of bearing 2, rearwardly of and in close proximity to the upper end of support 10^a, is a socket forming member 18 for receiving a vertically disposed elongated tubular electric lamp 19 disposed in close proximity to and having its vertical axis aligning with the lengthwise median of said passage 13. The latter, when the lamp 19 is active, provides a spot light 19^a functioning as a finder for corelation with the band spread scales on the front of a semi-translucent disc 20 of a dial structure formed with an axial opening for the passage of shaft 1. The disc 20 is fixed to shaft 1^a by means of the dial supporting collar 17 to bodily rotate therewith, is arranged forwardly of and has its rear face abut the forward end of the vernier gear housing 14. The forward face of disc 20 is secured to the rear end of the collar 17. The passage 13 in part 12 of member 10 is arranged at the rear face of disc 20 radially of the latter. The shaft 1^a extends outwardly and is provided with a vernier reduction gear, not shown, in housing 14 to facilitate rotation thereof when adjusting the condenser and dial. The shaft 1^a carries a knob 21 and conventional means, indicated at 22, to prevent the sliding of escutcheon member 8 outwardly thereon. Secured to the bearing 2 rearwardly of and in proximity to lamp 19 is a vertically disposed reflector 23 of segmental contour in plan.

The disc 20 has its forward face formed with a kilocycle band spread scale 24 of the band spread type and a megacycle band spread scale 25 of the band spread type. The arrangement of the band spread scales are more completely shown in Figure 4 and attention is directed thereto. The said scales are oppositely disposed. Each scale includes a series of band spreads. The band spreads of each scale are arranged in pairs. The spreads of each pair extend outwardly on disc 20 in opposite directions from their inner ends. The spreads of each pair merge into each other at their inner ends. One of the spreads of one pair merges at its outer end into the outer end of one of the spreads of a pair of spreads adjacent thereto and the other spread of the first mentioned pair merges into the outer end of a pair of spreads adjacent thereto. Each band spread constitutes a division of a scale. One of the spreads of each pair has the degrees of the scale division provided thereby progressively increasing from its outer to its inner end and the other spread of each pair has the degrees of the scale of the division provided thereby progressively increasing from its inner to its outer end. The shape of the band spreads of each scale is such that each scale is provided with minimum and maximum fixed radii and with no fixed radii between maximum and minimum and which facilitates the reading, as well as a more accurate setting of the dial structure. The outer merged ends of the spreads are arranged in close proximity to the outer edge of disc 20 and each has associated therewith a scale degree indication. The inner merged ends of the spreads are positioned outwardly adjacent to the axis of disc 20. The spreads of scale 24 are indicated at 26 and those of scale 25 at 27.

With reference to Figures 4 and 5, the dial structure is of that type whereby the disc 28 is stationary and has associated therewith a rotatable pointer 29 of semi-translucent material bodily carried with the condenser adjusting shaft 30. The disc 28 has an arrangement of scales 31, 32 on its outer face of the same form as that shown in connection with the disc 20, with the exception that the degree indications of scale 32 are not inverted such as those in scale 25. The disc 28 is anchored, as at 33, to the bottom 34 of the cabinet or housing structure. The shaft 1^a extends through the disc 28 axially of the latter. The disc 28 may be illuminated by any suitable means. The semi-translucent pointer constitutes a refracted light finder. When disc 28 is used the cabinet of the set will be so formed at its front to make the scales 31, 32 completely visible.

The discs 20, 28, as well as the discs of the

other dial structures to be hereinafter set forth, preferably will be formed as shown in Figure 5A, that is as consisting of a very translucent section 5a of the desired thickness and a semi-translucent section 5b consisting of a coating of any suitable material, preferably shellac, which constitutes a covering for the outer face of section 5a. The band spreads scale or scales are etched through or engraved through the section 5b on the section 5a.

The finder or bright light spot is created by light shining through the engraved band spread dial and illuminating by means of refracted light a movable spot where the band spread crosses the semi-translucent rotatable pointer 29.

With reference to Figures 6, 8 and 9, the front of the cabinet or housing of a radio receiving set is indicated at 20a and it is formed with superposed openings 21a, 22a having their axes aligning. The opening 21a is arranged above and is of materially greater diameter than the opening 22a. The wall of opening 21a gradually decreases in diameter from its outer to its inner end. Extending through the opening 21a, as well as snugly engaging the wall of the latter, is a rectangular escutcheon member 23a open at its front and rear. The member 23a includes a front endless flange 24a positioned against the outer face of the front 20a, as well as being rigidly secured to the latter by the holdfast means 25a. Fixed to and within the member 23a at its inner end is a vertical indicator or finder 26a, in the form of a thin wire disposed at the lengthwise center of member 23a.

Positioned against the inner face of the front 20a is a vertically disposed bracket 27a provided near its lower end with a rearwardly extending angle-shaped arm 28a having a horizontal part 29a and a vertically disposed part 30a integral with and extending upwardly at right angles with respect to the rear end of the part 29a. The body of the bracket 27a between its transverse median and lower end is formed with an opening 31a which aligns with the opening 32a provided in the part 30a. The opening 31a registers with the opening 22a. The body of the bracket 27a, at its upper end, is enlarged, as at 33a, and formed with an opening 34a.

A tuning knob arranged forwardly of the front 20a is indicated at 35a, fixed to the outer end of a rearwardly extending rotatably short shaft 36a journaled in the openings 22a, 31a and 32a. Fixedly secured to the shaft 36a is a groove pulley 37a arranged getween the body of the bracket 27a and the part 30a of the arm 28a. Engaging in and operated from the pulley 37a is a power transmitting pulley 38a of greater diameter than the pulley 37a and formed with a hub 39a. Arranged rearwardly of the bracket 27a and member 23a is a translucent dial structure 40 consisting of an apertured disc 41a and which is adapted to have its outer face provided with a pair of band scales of volute contour of the form indicated at 42a, 42b, Figure 8. The inner ends of said scales are positioned in proximity to the inner edge 44a of disc 41a. The outer ends of the scales are arranged in proximity to the outer edge 45a of disc 41a. The leading and follower ends of the scale 42a are designated at 42b, 42c respectively. The leading and follower ends of the scale 43 are indicated at 43b, 43c respectively. The ends of the scales 42a, 43a oppose opposite sides of the horizontal diametric center of disc 41a and do not align with the axis of the latter. The inner and outer ends of said band scales are arranged in spaced alignment. The said scales have one-spot dial reading through the escutcheon member 26a. The disc 41a is fixedly secured to the pulley 38a by spaced holdfast means 46. The disc 41a is arranged in spaced relation to the pulley 38a by the holdfast means 46 and is revolved from and simultaneously with the pulley 38a. The graduations 47a of the scales 42a, 43a are radially disposed with respect to the axis of disc 41a.

There is associated with the dial structure shown in Figure 6 a suitably arranged illuminating means 303 mounted on a support 306.

Referring to Figure 7, a dial structure is shown which includes a circular disc 211. The outer face of the disc 211 is formed with four scales 212, 213, 214 and 215. The graduations of each of said scales are arranged in a row of volute curvature. The scales 212, 215 are oppositely disposed with respect to each other. The scales 213, 214 are oppositely disposed with respect to each other. Each graduation of each scale is radially disposed with respect to the axis of the disc 211. The leading end 216 of the scale 212 is at the horizontal diametric center of the disc 211. The follower end 218 of the scale 212 is at the vertical diametric center of the disc 211. The leading end 217 of the scale 213 is at the vertical diametric center of the disc 211. The follower end 219 of the scale 213 is at the horizontal diametric center of the disc 211. The leading end 220 of the scale 214 is at the vertical diametric center of the disc 211. The follower end 221 of the scale 214 is at the horizontal diametric center of the disc 211. The leading end 222 of the scale 215 is at the horizontal diametric center of the disc 211. The leading and follower ends of the said several scales are spaced from the axis of disc 211. The graduations of the said several scales are visible through an escutcheon in front of the cabinet.

Referring to Figure 10, a modified form of dial structure is shown which consists of a disc 308 revolving on a central axis. Arranged on the outer face of disc 308 is a pair of oppositely disposed dial band scales 309, 310 of volute curvature. The scale 309 has its leading end 311 flush with a point on the edge 312 of disc 308 and its follower end 313 disposed eccentrically of the disc. The scale 310 has its leading end 314 flush with a point on said edge 312 opposite the point with which the leading end 311 of scale 309 is arranged. The follower end 315 of scale 310 is disposed eccentrically of the disc. The follower end of scale 309 is arranged between and in spaced relation to the ends of scale 310. The follower end of scale 310 is arranged between and spaced from the ends of scale 309. With reference to Figure 10, the scale 309 is shown as having its leading and follower ends arranged respectively above and below the horizontal diametric center of disc 309, and the scale 310 is shown as having its leading and follower ends arranged respectively below and above the horizontal diametric center of disc 309.

Compactness, ruggedness and capacity stability are desirable in condenser construction. It is readily seen that a rotor with comparatively short blades will tend to maintain capacity accuracy more than a condenser with a rotor having long blades.

It is further desirable to have a dial structure with dial scales having band spread as a counterpart of the dial scale itself. This gives dial fre-

quency setting and band spread at one spot. This is further enhanced and made more conspicuous to the eye by the actual speed of a light spot moving rapidly before the eye made possible by means of a slotted filter, a light adjacent to filter, and a semi-translucent engraved dial structure having transverse spreads engraved thereon, presenting a shearing action as the dial is turned.

A practical advantage gained here is the elimination of extremes in both the shape and length of the condenser rotor plates, as well as the shape of the dial band scale, and reducing the frequency setting, band spread, and speed of tuning to one light spot indicator moving transversely along the spreads. The human eye cannot watch but one spot at a time accurately. Therefore, the band spread as conventionally indicated by a "second hand" should not be moving at a separate point from the dial frequency setting point indicated by another separate pointer.

Figure 11 illustrates a dial structure in which two dial band scales form elements thereof. Each scale is upon an arc of a true circle. Each scale will have a 180° operating range. The said scales are oppositely disposed. The dial structure as shown in Figure 11 includes a revoluble disc 316 provided with the scales as aforesaid. The scales are indicated at 317, 318 and are flush with the edge of the disc. The true center of each scale is common to both and is indicated at 319, which is also the axis of disc 316. The latter eccentrically thereof is connected, as at 320, to its revolving means, not shown. In Figure 11 an escutcheon is indicated at 321 and carries a finder or indicator 322 which aligns with the eccentric point 320 of connection of the disc 316 with the revolving means for the latter. The escutcheon 321 is shown to the right of the axis 319. The point 320 is disposed upon a diagonal diametric center of disc 316 indicated at 323 which intersects the true center of the scales or axis 319 of the disc. Figure 11 illustrates the point 320 above and to the right of axis 319. By the foregoing arrangement each scale is worked from a point not its true center, but off center, due to the eccentrically connecting of the disc to its operating means. The leading ends of scales 317, 318 are indicated at 324, 325, respectively. The follower ends of the scales 317, 318 are indicated at 327, 326, respectively.

Figure 12 illustrates a dial structure in which a band dial scale forms an element thereof. The scale is upon an arc of a true circle and will have an operating range greater than 180°. The dial structure as shown in Figure 18 includes a revoluble disc 328 provided with the single scale aforesaid. The scale is indicated at 329 and is flush with the edge of the disc. The true center of the arc of the scale is indicated at 330 and which is also the axis of disc 328. The latter is eccentrically connected thereof, as at 331, to its revolving means, not shown. In Figure 12 an escutcheon is indicated at 332 and carries a finder or indicator 333 which aligns with the eccentric point 331 of connection of the disc 328 with the revolving means for the latter. The escutcheon 332 is shown to the left of the axis 328. The point 331 is arranged between and in spaced alignment with the follower and leading ends 334, 335 respectively, of the scale 329. The distance between the point 331 and scale end 334 is greater than the distance therebetween and the scale end 335. Figure 12 illustrates the point 331 below and to the left of axis 330. By the foregoing arrangement the scale 329 is worked from a point not its true center, but off-center, due to the eccentrically connecting disc 328 to its operating means. It is readily seen that in rotating disc 328, from D by way of F and B to C, which is 180° turn about revolving point 331, yet more than 180° of the arc of disc 328 has been covered by finder 333. This is a form of band spread, since it makes it possible to spread the calibrations over more than 180° of arc of dial. Yet the dial has really turned thru just 180° turn. Figures 12 and 14 illustrate this from of band spread. Note Figures 12 and 14.

With reference to Figure 13, a dial structure is shown in which two dial band scales form elements thereof. Each scale is upon an arc of a true circle. Each scale will have a range of 180°. The said scales are oppositely disposed. The dial structure as shown in Figure 13 includes a revoluble disc 336 provided with the scales 337, 338. The true center of the arc of a scale is common to both, is indicated at 339, and is also the axis of disc 336. The latter is connected eccentrically thereof, as at 340, to its revolving means, not shown. In Figure 13 an escutcheon is indicated at 341 and carries a finder or indicator 342 which aligns with the eccentric point 340. The escutcheon 341 is shown to the left of the axis 339. The point 340 is illustrated in Figure 13 as below and to the left of axis 339. The leading ends of the scales 337, 338 are indicated at 342a, 343, respectively. The follower ends of the scales 337, 338 are indicated at 344, 345, respectively. In the arrangement shown by Figure 13 each scale is worked from a point not its true center, but off-center, due to the eccentrically connecting of the disc 336 to its operating means.

With reference to Figure 14, a dial structure is shown in which a single band dial scale forms an element thereof. The scale is upon an arc of a true circle and will have an operating range greater than 180°. The dial structure as shown in Figure 14 includes a revoluble disc 346 provided with a circular scale 347 which is flush with the edge of the disc. The true center of the scale is indicated at 348 and is also the axis of disc 346. The latter is eccentrically connected thereof, as at 348, to its revolving means, not shown. In Figure 14 an escutcheon is indicated at 350 and carries a finder or indicator 351 which aligns with the eccentric point 349 of connection of the disc 346 with the revolving means for the latter. The escutcheon 350 is disposed at the right of the axis 348. The point 349 of connection of the disc 346 with its operating means is above and to the right of the axis 348. The leading and the follower ends of the scale 347 are indicated at 352, 353, respectively. By the foregoing arrangement the scale 347 is worked from a point not on its true center, but off-center due to the eccentrically connecting disc 346 to its operating means.

The graduations of each of the scales shown in Figures 11, 12, 13 and 14 are radially disposed with respect to the off-center working points of said scales. The graduations of the scales shown in Figure 10 are radially disposed with respect to the axis of disc 308.

The form, arrangement and manner of working of the dial scale bands shown in Figures 7, 8, 10, 11, 12, 13 and 14 will provide for a more equal distribution of the 10 kilocycle bands of the scales than that obtained by the form and working of the dial scale bands now generally employed.

The graduations of each of the band dial scales shown are arranged in units, fives and tens.

The disc 308 is to be operated from the tuning

condenser in the same manner as the disc 41. The discs 316, 329, 336 and 346 are to be operated from the tuning condenser, but said discs 316, 329, 336 and 346 will be eccentrically connected thereof with the condenser shaft.

The finders or indicators 322, 333, 342 and 351 are arranged forwardly of the discs 316, 329, 336 and 346. The discs as shown in Figures 16, 17, 18, 19, 20 are translucent to make visible the scales thereon when an illuminating means is associated therewith.

As an explanation as to operation relative to the dial structures shown by Figures 12, 14, reference will be had to all the points indicated at B, C, D, E and F, Figure 12, and in this connection it will be stated that one always obtains band spread when the showing is such that when the condenser is turned, say 180°, the scale circumference turns through more than 180° circumference, as shown at B. For instance, C, E and D are on a straight line. Now if one pivots C on point E until it reaches point D by way of F, then there has been traversed more than 180° of the circumference arc, yet the condenser shaft has been turned at E just 180°. The result is band spread and the latter is obtained by operating a circular dial band scale from a point off center.

With reference to Figures 15 and 16 a revoluble dial structure 352 is shown and it includes a revoluble disc 353 connected, at its axis 354 to a revolving means, not shown therefor. The disc 353 is provided with a pair of band dial scales 355 and 356. Each scale includes a series of spreads. The spreads of scale 355 are of flared-like form and indicated at 357. Each spread 357 merges into a pair of adjacent spreads 357. Each spread 357 is calibrated in progressively increasing units of ten to constitute a hundred, as at 358. The calibration of each spread 357 indicates kilocycles. The spreads 357 are projected from a volute curve 359. The spreads 357 progressively decrease in width from one end of the series to the other end of the series of spreads. The inner ends of the spreads 357 are spaced from each other.

One half of the disc 353 is provided with spaced outer kilocycle calibrations 550, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400 and 1500 and which in connection with the calibrations on the spreads 357 provide the standard broadcast band. Each spread 357 coacts with a pair of outer calibrations, with the exception of the outer calibration 550 to indicate the kilocycles between the pair of outer calibrations with which it coacts. The focal center of scale 355 is indicated at 360 and is spaced from the axis 354 of the disc 352. The spreads 357 are radially disposed and extend inwardly from said outer calibrations.

The straight spreads of scale 356 are of flared-like form and indicated at 361. Each spread 361 merges into a pair of adjacent spreads 361. Each spread 361 is calibrated in progressively increasing units of hundredths to constitute a tenth as at 362. The calibrations of each spread 361 indicate megacycles. The spreads 361 are projected from a volute curve 363. The spreads 361 progressively decrease in width from one end of the series to the other end of the series of said spreads 361. The inner ends of the spreads 361 are spaced from each other.

The megacycle half of the disc 353 is provided with spaced outer megacycle calibrations, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 and 19 and which in connection with the calibrations on the straight spreads 361 provides a short wave band spread. Each spread 361 coacts with a pair of outer megacycle calibrations, with the exception of the outer megacycle calibration 5, for the purpose of indicating the megacycles between the pair of outer megacycle calibrations with which it coacts. The focal center of the scale 356 is indicated at 364 and is spaced from the axis 354 of the disc 352. The straight spreads 361 are radially disposed and extended inwardly from the said outer megacycle calibrations, and gradually decrease or increase in length as you read respectively from outer megacycle calibrations to inner midway megacycle calibrations, or from inner midway megacycle calibrations to outer megacycle calibrations.

An escutcheon is indicated at 365 and an indicator or finder at 366 which is disposed at the lengthwise median of the escutcheon 365 and is shown relative to a spread 357.

With reference to Figures 17 and 18, there is shown a revoluble dial structure 367 of substantially the same form as the structure 352, with the exception that the focal centers of the band spread dial bands scales are common to each other and common to the axis of the disc. The structure 367 includes a disc 368 provided with a band spread dial band scale 369 which constitutes the standard broadcast band of kilocycles. The disc 368, is also provided with a band spread dial band scale 370 which constitutes a short wave band of megacycles. The focal centers of said scales and the axis of disc 368 are common and indicated at 371. The spreads of the band scale 369 are designated at 372 and the spreads of the band scale 370 at 373. The volute curve from which the spread 372 is projected is indicated at 374. The volute curve from which the spreads 373 are projected is indicated at 375. The spreads 372 progressively decrease in width from one end to the other end of the series of said spreads. The variable length spreads 373 progressively decrease in width from one end of the series to the other end of the series thereof. The spreads 372 are wider than the spreads 357. The spreads 373 are wider than the spreads 361, otherwise than that as stated the dial structure 367 will be the same form as the dial structure 352.

An escutcheon is indicated at 376 and an indicator or finder at 377 which is disposed at the lengthwise median of the escutcheon 376. A spread 372 is shown in position relative to the indicator 377.

The band spread form of dial is based on all of the other forms shown in general principle, except that it is projected off to a circle of larger radius for ease of reading. It is the projection of the volute band scale with the band spread feature added to make simple the reading of the dial scale.

In both of the Figures 15 and 17 the dial is set at 1030 kilocycles, note particularly the readiness with which the eye at a glance detects the setting of the dial at 1030 kilocycles. Now if this scale was graduated in the conventional way it would be difficult to detect the exact setting of the dial with the small graduations. To overcome this, I have set up the frequency band on an oblique reverse course across the path of the dial indicator. This shears the oblique reversible band scale at an oblique angle, and since it travels over a very long course in both directions the eye can easily and quickly detect the dial setting on the band spread.

The comparable band spread is appreciated when you compare the distance directly say from 1000 kilocycles along the arc of the circle, and then note the increased distance by way of the reversible band spread course. When the dial indicator shears along the band spread scale the speed of movement is very fast compared to the actual slow speed of the dial itself. The eye has an appreciable sense of motion, and there is not just a band scale, but a band spread scale.

With reference to Figures 19 and 20, a revoluble dial structure **378** is shown and it includes a revoluble disc **379** connected, at its axis **380** to a revolving means, not shown, therefor. The disc **379** is provided with a pair of oppositely disposed band spread dial band frequency scales **381**, **382** of volute curvature. The scale **381** is calibrated in kilocycles and the scale **382** in tenths of megacycles. The band spreads of the scales are indicated at **383** and **384**. An escutcheon is indicated at **385** and an indicator or finder at **386** which is disposed at the lengthwise median of the escutcheon and is shown relative to a calibration of scale **381**. The band spread line of the scales **381**, **382** increases directly with the radio frequency i. e., the longer radii represent the higher radio frequency. The dial tunes very sharp at the higher frequency end, therefore by having a longer band spread radius whereby the shearing action is faster at the high frequency end of the band, the eye can therefore detect evidence of a very small amount of dial movement. At the low frequency end of the band scale, the radius is shorter. The dial does not tune sharp at the low frequency end of the dial, therefore I employ the shorter band spread. In other words, the band spread varies directly with the volute curve band scale. It is automatic and varies by degrees in length.

It will be noted that the graduation between both the megacycles and kilocycles are uniformly spaced, on the volute band scale. This gives the eye a constant uniform graduated scale to read at it goes up and down in the escutcheon.

It will also be noted that the intermediate graduations are on the volute band scales and that the band spread scale lines are left clear for uninterrupted shearing action with the indicator to the eye. The scales (Figures 17 and 19) show variable length band spread lines. Figure 19 increases directly with the frequency of the incoming wave to the radio.

What I claim is:

1. A dial structure comprising a semi-translucent rotatable element provided with oppositely disposed dial band scales on one face thereof, each of said scales being formed with translucent spreads, each spread constituting a division of a scale, and means arranged rearwardly of said element for forming a movable bright spot on said spread to constitute a finder common to both scales, for one spot band spread and frequency setting.

2. A dial structure comprising a semi-translucent rotatable element provided with oppositely disposed dial band scales on one face thereof, each of said scales being formed with translucent spreads, each spread constituting a division of a scale, and means arranged rearwardly of said element for forming a movable bright spot on said spread to constitute a finder common to both scales, each of said scales being formed to have minimum and maximum fixed radii and with no fixed radii between maximum and minimum.

3. A dial structure comprising a translucent element provided with oppositely disposed dial band scales on one face thereof, each of said scales being formed with spreads, each spread constituting a division of a scale and extending in a direction from the axis towards the edge of said element, and a finder element common to said scales, one of said elements being rotatable relative to the other.

4. A dial structure comprising a translucent element provided with oppositely disposed dial band scales on one face thereof, each of said scales being formed with spreads, each spread constituting a division of a scale and extending in a direction from the axis towards the edge of said element, and a finder element common to said scales, one of said elements being rotatable relative to the other, each of said scales being formed to have minimum and maximum fixed radii and with no fixed radii between maximum and minimum.

5. In a dial structure for radio receiving sets, an element having one of its faces provided with a dial band scale formed with pairs of spreads, each pair of spreads extending in a direction from the axis towards the edge of said element, each spread forming a division of the scale, the spreads of each pair extending in opposite relation and merging into each other at their inner ends, the outer ends of the spreads of each pair merging into the outer ends of a spread of pairs of adjacent spreads, said scale being formed to have maximum and minimum radii and with no fixed radii between maximum and minimum, and a finder element common to the spreads of said scale.

6. In a dial structure for radio receiving sets, an element having one of its faces provided with a dial band scale formed with pairs of spreads, each pair of spreads extending in a direction from the axis towards the edge of said element, each spread forming a division of the scale, the spreads of each pair extending in opposite relation and merging into each other at their inner ends, the outer ends of the spreads of each pair merging into the outer ends of a spread of pairs of adjacent spreads, said scale being formed to have maximum and minimum radii and with no fixed radii between maximum and minimum, means for rotating said element, and a finder common to each of and traversed by said spreads intermediate their ends during the rotation of said element.

7. In a dial structure for radio receiving sets, an element having one of its faces provided with a dial band scale formed with pairs of translucent spreads, each pair of spreads extending in a direction from the axis towards the edge of said element, each spread forming a division of the scale, the spreads of each pair extending in opposite relation and merging into each other at their inner ends, the outer ends of the spreads of each pair merging into the outer ends of a spread of pairs of adjacent spreads, said scale being formed to have maximum and minimum radii and with no fixed radii between maximum and minimum means for rotating said element, and means to provide a bright light of strip-like form on the said face constituting a finder and band spread common to each of and traversing said spreads intermediate their ends during the rotation of said element.

8. In a multi-frequency tuning system for ra-

dio receivers, a carrier, a dial scale of volute curvature on one face of the carrier, and means arranged adjacent to and opposing a face of the carrier, said means being free of connection to the carrier and providing for the reading of the scale at one spot on the latter.

9. In a multi-frequency tuning system for radio receivers, a plurality of oppositely disposed dial scales arranged in spaced relation, each scale being of volute curvature and having one-spot dial reading, and each scale for independent exposure relative to each other.

10. In a multi-frequency tuning system for radio receivers, a dial structure including a revoluble disc, said disc being connected eccentrically thereof to the revolving means therefor, a band dial scale of graduations, said scale being of segmental contour throughout and having its true center corresponding to the axis of the disc, the said true center of the scale being spaced from the point of eccentric connection of the disc to its revolving means, and the graduations of the scale being radially disposed with respect to the eccentric point of connection of the disc.

11. In a multi-frequency tuning system for radio receivers, a dial structure including a revoluble semi-translucent disc, said disc being connected centrally thereof to the revolving means therefor, translucent band dial scales of graduations, said scales being of segmental contour throughout and having their true center eccentric to the axis of the disc, the said true center of the scales being spaced from the point of central connection of the disc to its revolving means, the graduations of the scales being radially disposed with respect to the central point of connection of the disc, and an indicator or finder disposed outwardly of the disc, cooperating with the graduations of said scales and arranged over and aligning with the eccentric point of connection of the disc.

12. In a multi-frequency tuning system for radio receivers, a dial structure including a disc connected to a revolving means therefor, a pair of oppositely disposed band dial scales of graduations, said scales being of segmental contour throughout, a center common to said scales, the said center being spaced from the point of connection of the disc to its revolving means, and the graduations of each of said scales being radially disposed with respect to the point of connection of the disc to its revolving means.

13. In a multi-frequency tuning system for radio receivers, a dial structure including a revoluble disc, said disc being connected eccentrically thereof to the revolving means therefor, a pair of oppositely disposed band dial scales of graduations, said scales being of like form and of segmental contour throughout, the axis of said disc being the true center for and common to said scales, said disc being connected eccentrically thereof to the revolving means therefor, the said true center common to said scales being spaced from the point of eccentric connection of the disc to its operating means, the graduations of each of said scales being radially disposed with respect to the eccentric point of connection of the disc, and an indicator or finder disposed outwardly of the disc, cooperating with the graduations of said scale and arranged over and aligning with the eccentric point of connection of the disc.

14. In a multi-frequency tuning system for radio receivers, dial scales of volute curvature, each for independent exposure, said scales having no fixed radius to prevent bunching of the frequencies at the high frequency ends thereof.

15. In a multi-frequency tuning system for radio receivers, a dial band scale of volute curvature, an indicator, said scale having no fixed radius to prevent bunching of the frequencies at one end thereof.

16. In a multi-frequency tuning system for radio receivers, a dial structure including a pair of oppositely disposed frequency band scales of curved contour, an indicator, and means whereby the bunching of the frequencies are prevented at the high frequency ends of the scales.

17. In a multi-frequency tuning system for radio receivers, a dial structure including a revoluble disc provided with a pair of oppositely disposed frequency band scales of volute curvature, an indicator, said band scales being so disposed relative to each other and to the disc to provide for the focal centers of the scales being located at the operating point of the disc.

18. In a multi-frequency tuning system for radio receivers, a dial structure including a revoluble disc provided with a pair of oppositely disposed frequency band spread scales, and an indicator, each of said band spread scales being so disposed relative to the indicator to provide an oblique reverse course across the path of the indicator to provide a band spread on the revolving of the disc.

19. In a tuning system for radio receivers, a dial structure including a revoluble disc provided with a frequency band spread scale, and an indicator, said band spread scale being so disposed relative to the operating point of the disc and to said indicator to provide an oblique reverse course across the path of the indicator to provide a band spread on the revolving of the disc.

20. In a multi-frequency tuning system, a revoluble dial structure including a pair of dial band frequency scales, each scale including a series of spreads, each spread being calibrated in progressively increasing units of tens, the spreads of said scales being projected outwardly in relation to a pair of oppositely disposed volute curves.

21. In a multi-frequency tuning system, a revoluble dial structure including a pair of dial band frequency scales, each scale including a series of spreads, each spread being calibrated in progressively increasing units of tens, the spreads of said scales being projected outwardly in relation to a pair of oppositely disposed volute curves, said scales having their focal centers spaced from each other and from the axis of said structure.

22. In a multi-frequency tuning system, a revoluble dial structure including a pair of dial band frequency scales, each scale including a series of spreads, each spread being calibrated in progressively increasing units of tens, the spreads of said scales being projected outwardly in relation to a pair of oppositely disposed volute curves, each of said spreads of each scale being flared and merging into a pair of adjacent spreads.

23. In a multi-frequency tuning system, a revoluble dial structure including a pair of dial band frequency scales, each scale including a series of spreads, each spread being calibrated in progressively increasing units of ten kilocycles, the spreads of said scales being projected outwardly in relation to a pair of oppositely disposed volute curves, one of said scales including means to

provide an outer set of spaced progressively increasing kilocycle calibrations and an inner set of progressively increasing kilocycle calibrations for each of its spreads extending from one of the outer kilocycle calibrations to an adjacent outer kilocycle calibration, the other one of said scales including means to provide an outer set of progressively increasing single spaced megacycle calibrations and an inner set of progressively increasing megacycle calibrations for each of the spreads extending from one of the single outer megacycle calibrations to an adjacent outer single megacycle calibration.

24. In a multi-frequency tuning system, a revoluble dial structure including a pair of dial band frequency scales, each scale including a series of spreads, each spread being calibrated in progressively increasing units of tens, the spreads of said scales being projected outwardly in relation to a pair of oppositely disposed volute curves, one of said scales including means to provide an outer set of spaced progressively increasing kilocycle calibrations and an inner set of progressively increasing kilocycle calibrations for each of its spreads extending from one of the outer kilocycle calibrations to an adjacent outer kilocycle calibration, the other one of said scales including means to provide an outer set of progressively increasing single spaced megacycle calibrations and an inner set of progressively increasing megacycle calibrations for each of the spreads extending from one of the single outer megacycle calibrations to an adjacent outer single megacycle calibration, the spreads of each scale being flared, and the spreads of each scale progressively decreasing in width from one outer spread of the series to the other outer spread of the series.

25. In a multi-frequency tuning system for radio receivers, a revoluble dial structure including a pair of oppositely disposed band spread dial band frequency scales, said scales having variable length spread lines that increase directly with the frequency of the incoming wave.

26. In a multi-frequency tuning system for radio receivers, a revoluble dial structure including a pair of oppositely disposed band spread dial band frequency scales, one of said scales being calibrated in kilocycles and the other in megacycles, the graduations between both the megacycles and kilocycles being uniformly spaced on the scales.

27. In a multi-frequency tuning system for radio receivers, a revoluble dial structure including a pair of oppositely disposed band spread dial band frequency scales of volute curvature having their focal points spaced from the axis of said structure.

28. In a multi-frequency tuning system for radio receivers, a revoluble dial structure including a pair of oppositely disposed band spread dial band frequency scales of volute curvature, each of said scales having variable length band spread lines increasing directly with the frequency of the incoming wave to the radio.

29. In a multi-frequency tuning system for radio receivers, a dial structure including a revoluble disc provided with a band scale and a frequency band spread scale of curved contour, said band spread scale including graduations, the curvature of such scale being such to equally space the graduation points along the band spread scale.

30. In a multi-frequency tuning system for radio receivers, a dial structure including a revoluble disc provided with a band scale of volute curvature and a curved band spread scale having equally spaced graduations, the length of the band spread scale varying directly with the increase in frequency along the band scale.

31. A dial structure including a disc-like element having one of its faces provided with a pair of oppositely disposed dial band calibrated scales, each of said scales being formed of spreads of variable curvature, the spreads of each of said scales being of like length.

32. A dial structure including a disc-like element having one of its faces provided with a pair of oppositely disposed dial band calibrated scales, each of said scales being formed of straight spreads, the spreads of each of said scales progressively increasing in length from one end to the other end of the scale.

33. In a multi-frequency tuning system for radio receivers, a rotatable carrier, a plurality of curved frequency band scales of calibrations on one face of said carrier, each of said scales being formed with successive spaced spreads alternately merging into each other, each spread including a plurality of calibrations, and an indicator arranged adjacent to said face, free of connection to the carrier and disposed in shearing relation with respect to a spread of a scale to provide for reading the scale at one spot of a spread.

34. In a tuning system for radio receivers, a dial structure including a rotatable carrier means provided with a pair of oppositely disposed frequency band scales of calibrations, each scale being formed throughout with spreads, each spread including a plurality of calibrations, and an indicator common to said scales, the spreads of each scale being so disposed relative to the indicator to form an oblique reverse course relative to the path of the indicator to provide for the reading of a scale at one spot of a spread of the latter.

35. In a tuning system for radio receivers, a dial structure including a rotatable carrier-means provided with a plurality of frequency band scales of calibrations, each of said scales being formed throughout with successive inwardly extending spreads, each of said spreads including a plurality of calibrations, and an indicator common to said scales, each of the spreads of each scale being so disposed relative to the indicator to provide an oblique reverse course across the path of the indicator to provide for reading a scale at one spot of a spread of the latter.

36. In a multi-frequency tuning system for radio receivers, a circular disc having a frequency band scale of the spread type, and an indicator for coaction with said scale, said disc and indicator being movable relatively to the other, said indicator being so arranged in correlation to the scale that the speed of movement of one relative to the other sets up a correlated point of indication that moves at an irregular and a greater speed than the combined speed of movement of both the scale and indicator.

37. In a dial structure for radio receivers, a carrier, means on said carrier to constitute a frequency band scale of calibrations formed with spreads, each consisting of a plurality of calibrations, and an indicator for correlation with said scale, said carrier and indicator being arranged in movable relation with respect to each other to provide for the indicator having a different angle shearing action relative to each of the

calibrations of the spreads to provide a one spot reading.

38. In a tuning system for radio receivers, a dial structure including a carrier means provided with a frequency band scale of calibrations formed with angularly disposed successive spreads, each of said spreads including a plurality of calibrations, and an indicator, said means and indicator movable relatively and said indicator and spreads being so correlated to each other to provide an irregular oblique indicating course to provide for the indicator reading a spread at one point of the latter.

39. In a multi-frequency tuning system for radio receivers a circular disc, said disc being provided on one face with means to constitute a frequency band scale formed with spreads arranged in successive relation, each of said spreads including a plurality of calibrations, an indicator, said disc and indicator movable relatively to each other, said indicator being so arranged in correlation with said scale to provide a varying angle of intersection between the the indicator and the calibrations of each successive spread to form a one spot reading.

40. In a dial structure for a multi-frequency tuning system for radio receivers, a disc, said disc being formed on one face with means to constitute a frequency band scale formed with successive straight spreads of calibrations and with the calibrations of the spreads being disposed along curved lines, an indicator, said disc and indicator movable relatively to each other, said indicator being so arranged in correlation to said scale to provide a varying angle of intersection between the indicator and the calibrations of each successive spread to provide a one spot reading.

41. In a dial structure for a multi-frequency tuning system for radio receivers, a circular disc, said disc being provided on one face with means to constitute a frequency band scale formed with successive curved spreads of calibrations and with the calibrations of the spreads being disposed along curved lines, an indicator, said disc and indicator movable relatively to each other, said indicator being so arranged in correlation to said scale to provide a varying angle of intersection between the indicator and the calibrations of each successive spread to form a one spot reading.

42. In a dial structure for multi-frequency tuning system for radio receivers, a circular disc, said disc being provided on one face with means to constitute a frequency band scale formed with unequal length successive straight spreads of calibrations and with the calibrations of the spreads being disposed along straight lines, an indicator, said disc and indicator movable relatively to each other, said indicator being so arranged in correlation to said scale to provide a varying angle of intersection between the indicator and the calibrations of each successive spread to form a one spot reading.

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