

June 15, 1926.

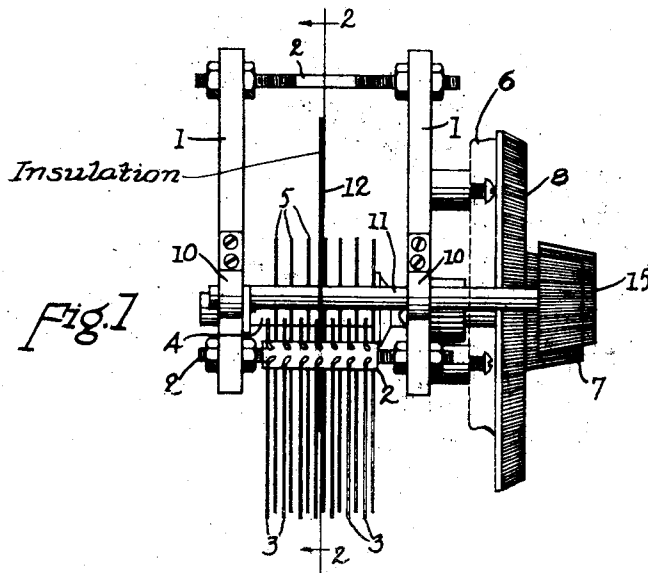
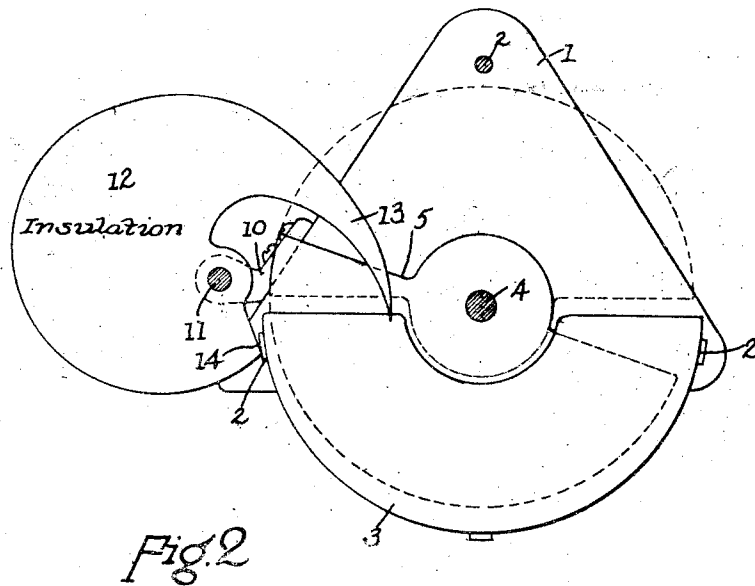
J. B. KIRBY ET AL

1,589,008

RADIOCONDENSER

Filed August 5, 1925

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

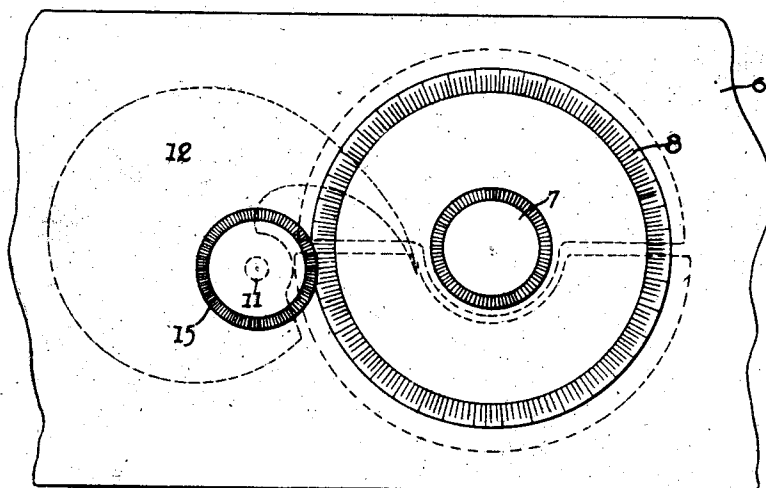
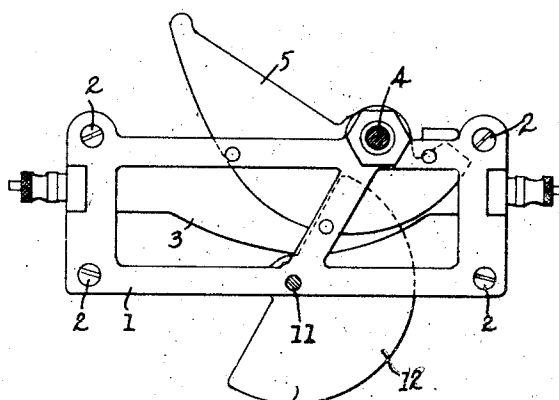


Fig. 3



Insulation

Fig. 4

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3 Sheets-Sheet 3

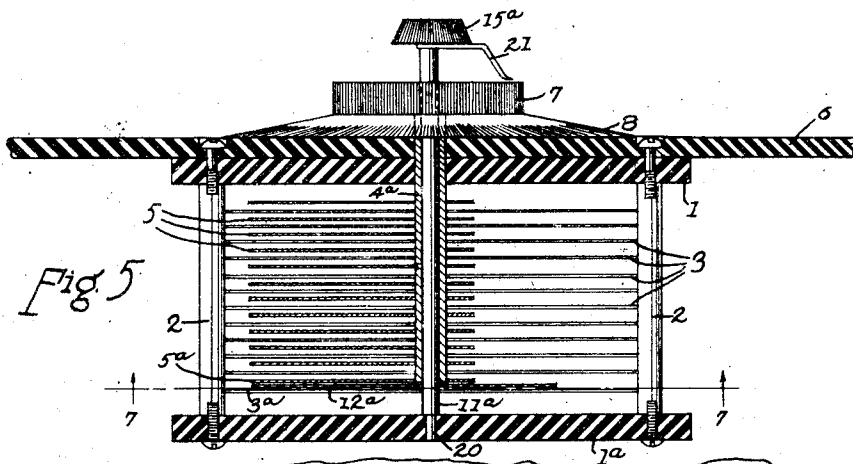


Fig. 6

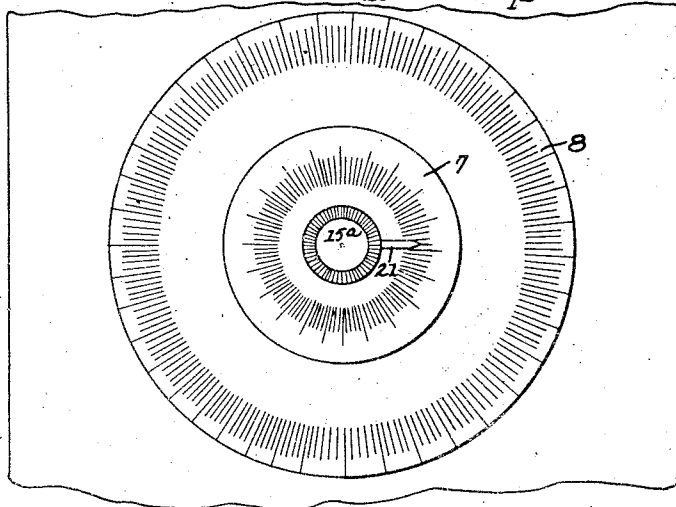
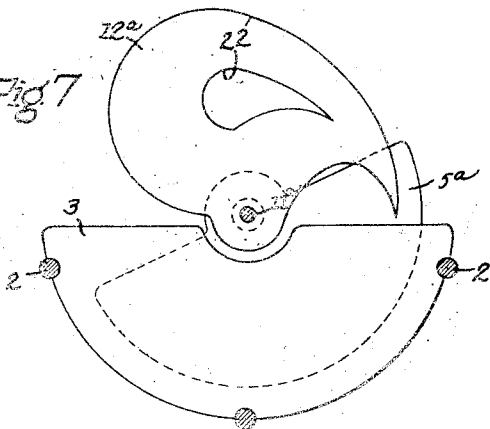


Fig. 7



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UNITED STATES PATENT OFFICE.

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RADIOCONDENSER.

Application filed August 5, 1925. Serial No. 48,258.

This invention relates to the variable condensers used in radio reception and has for its object the provision of a new, simplified and improved means for adjusting the capacity more accurately than heretofore possible. With the continual increase in the number of broadcasting stations, the wave lengths emitted thereby have become so nearly equal that in some parts of the range as many as three different sending stations fall within about 1° of condenser adjustment. At the same time the capacity of the condenser, both maximum and minimum, is practically determined by the range of wave lengths which are desired to be received; and while it is possible by reducing the capacity of the condenser to increase correspondingly the distance of movement necessary to produce a given change in that capacity, this same reduction likewise limits the range of wave lengths receivable on that instrument.

In order to effect this accurate adjustment necessary to separate stations of closely adjacent wave lengths many mechanical expedients have been suggested for effecting slow, regulated movement of the condenser plates, some of which are impractical as requiring undue manipulating skill on the part of the user and all of which tend to render the instrument unduly complicated and expensive. We have discovered that the same essential result can be obtained, and this in a much simpler and more expeditious manner by a slight change in the dielectric value of the condenser by interposing between one or more sets of plates a substance other than air. This substance may take the form of a strip of insulating material such as hard rubber, bakelite, mica, etc., or the same may be formed as a plate or disk adapted to be inserted and removed by rotation of a suitable shaft.

In the drawings accompanying and forming a part of this application we have illustrated our improvements as applied to certain well known forms of standard radio condensers, although it will be understood that a great many other forms of construction can be employed within the scope of our invention and that we do not limit ourselves to any of the features of design or arrangement set forth herein. Fig. 1 is a side elevation of a standard form of variable condenser containing our improvements; Fig.

2 is a sectional view on the line 2—2 of Fig. 1 looking in the direction of the arrows; Fig. 3 is a face view of a section of a panel board provided with the device shown in Fig. 1, the internal parts being shown in dotted lines; Fig. 4 illustrates a modified form of our invention applied to a different construction of condenser; Fig. 5 is a central sectional view through another form of condenser showing another modified form of our invention; Fig. 6 is a plan view of the parts shown in Fig. 5; and Fig. 7 is a sectional view corresponding to the line 7—7 of Fig. 5 and looking in the direction of the arrows.

Variable condensers are made in a great many different shapes, but generally comprise in some form a pair of spaced frame members 1—1 connected by suitable bolts or other cross pieces 2. Suitably secured in this frame, sometimes by engagement with the members 2—2 as shown in Figs. 1, 2, 5 and 7, are a plurality of spaced parallel metal plates 3—3 which constitute one side of the condenser. Tightly secured to a rotatable shaft 4 which projects through this frame are other spaced metal plates 5 generally of slightly smaller size than the plates 3, but arranged so as to project more or less completely between the same as the shaft 4 is rotated. Often times the plates 3 and 5 are made to approximately semi-circular in form as shown in Figs. 1, 2, 5 and 7, although sometimes they are made of other shapes, such as the logarithmic spiral shown in Fig. 4. This frame is in use ordinarily secured to the inner side of the panel board 6, the shaft 4 projecting through a hole therein and provided at its end with a knob 7 and dial plate 8 whereby it can be turned and its rotation measured.

In Figs. 1 and 2 we have shown the side members of the frame 1—1 as provided with aligned bearing members 10—10 in which is mounted a rotatable shaft 11 closely adjacent to, but outside of the limits of motion of the movable plates, and tightly secured to this shaft is a thin plate 12 of some material having a dielectric value other than unity. We have had excellent success with hard rubber for this purpose made in a strip about 5/100th of an inch in thickness, although bakelite, mica, or even glass can be employed or other insulating substance. Preferably, as shown in Figs. 2 and 3, this

plate is made with a long tapering point 13 adapted to project between the adjacent plates, and in the form shown in these views we have shown another part of the same as formed with a shoulder 14 adapted to engage some fixed part of the frame such as the cross piece 2 to limit the withdrawing movement of the dielectric plate. We have found it advantageous to make the point 13 of such length as always to project a short distance between the fixed plates in order to constitute a pilot and facilitate the movement of the disk.

The advantage of making the point 13 long and tapering is that it necessitates a substantial degree of movement of the shaft 11 to effect a minor change in the capacity of the condenser and thus constitute a fine adjustment. The outer end of the shaft 11 is provided with a suitable knob 15, also preferably graduated to facilitate its adjustment, which is now being located a short distance from the edge of the dial 8.

However, we do not limit ourselves to this particular shape of the plate 12 since the same may be made semicircular as shown in Fig. 4 or of any other shape desired; and we do not limit ourselves to the use of only a single plate of dielectric material since plural plates may be employed on the same shaft as illustrated in Fig. 4.

In Figs. 5 to 7 we have shown another arrangement of parts whereby the shaft carrying the dielectric plate is located concentrically of the condenser for which purpose the main shaft 4^a of the condenser is made hollow and terminated short of the frame member 1^a. Projecting through this hollow shaft is the shaft 11^a having one end journaled in the frame part 1^a as shown at 20 and having at its outer end a knob 15^a concentric with the knob 7. We have shown the knob 15^a as provided with a pointer 21 playing over a graduated scale carried by the outer face of the knob 7. The hollow shaft 4^a terminates at the last movable plate 5^a and inside of the last fixed plate 3^a. Tightly secured to the shaft 11^a at this point is a dielectric plate 12^a which is asymmetric in shape so that upon the rotation of the shaft 11^a a larger or smaller amount of the same will be inserted between the plates 3^a and 5^a. It is easy by a device of this character to produce a device wherein it shall require a rotation of the dielectric plate through an arc of several degrees to which the capacity of the condenser be an amount equivalent to the rotation of the movable plates of 1° or fraction thereof.

It will be understood that in order to modify the rate of change of the dielectric value it is possible to vary the thickness of the dielectric plate as well as its pattern, and to form apertures therein as shown for example at 22 in Fig. 7, and that the material of this plate will also influence its shape and

thickness owing to the wide variations in dielectric strength between different substances.

It will be obvious that the added dielectric member herein described can either be assembled with the other parts of the condenser at the factory, prior to sale, and thus delivered to the user in completed form, or that the same can be sold independently of the condenser as an attachment to be installed by the user. Thus, in the form shown in Figs. 1, 2, and 3 the fine adjustment device of our invention appears as an attachment to an existing variable condenser, the latter being entirely unchanged. In this embodiment the insulating plate 12 is supported and moved by a shaft member 11 which is secured in operative relation to the condenser by the brackets 10—10, but it will be obvious that the plate 12 can take other forms or be supported and manipulated in other manners and that other means could be employed for holding the same in proper position relative to the condenser.

It will be understood, moreover, that in illustrating certain physical forms in which our invention can conveniently be embodied we do not propose to limit ourselves to those forms since we claim broadly the method of fine tuning of a radio condenser which comprises interposing between the plates an adjustable member having a dielectric value other than unity.

Having thus described our invention what we claim is:

1. The combination with a variable radio condenser having relatively movable metallic plates adjustable to vary the capacity of the condenser, of an auxiliary member of insulating material movable independently of said metallic plates and insertable therebetween to vary the dielectric value of the condenser and thereby effect a fine adjustment of the capacity.
2. In a radio condenser, the combination with relatively movable metallic plates of a plate of insulating material movable independently of said metallic plates and insertable therebetween to vary the dielectric value of the condenser and thereby effect a fine adjustment of the capacity.
3. In a variable condenser, the combination with metallic plates movable relatively to each other of a member of material having a dielectric value other than unity and means for inserting said member more or less between adjacent metallic plates to vary the dielectric value of the condenser.
4. In a radio condenser the combination with opposed spaced metallic plates, adjacent plates being insulated from each other and alternate plates connected together and movable bodily with respect to the remaining plates, of a movable member having a dielectric value other than unity adapted to

be interposed between said first plates to vary the dielectric strength and hence the capacity of the condenser.

5 In a radio condenser the combination with opposed spaced metallic plates, adjacent plates being insulated from each other and alternate plates connected together, of means for holding said plates in fixed position relative to each other, a rotatable shaft at one side of said plates and a member of 10 a substance having a dielectric value other than unity secured to said shaft and adapted upon rotation of the same to be inserted more or less between adjacent plates.

15 6. In a radio condenser the combination with opposed spaced metallic plates, adjacent plates being insulated from each other and alternate plates connected together, of means for holding said plates in fixed position relative to each other, a rotatable shaft 20 journaled at one side of said plates, and a thin plate of insulating material having a dielectric value other than unity carried by said shaft and adapted to be inserted to 25 varying degrees between said plates upon

rotation thereof, said plate having at its margin an elongated tapering point to render the variation of dielectric value gradual.

7. In a variable radio condenser, having 20 fixed and movable metallic plates, a dielectric member movable independently of said plates to vary minutely the capacity as determined by the relative positions of said plates. 35

8. An attachment for variable radio condensers of the type having two sets of metallic plates movable relatively to each other to vary the capacity, said attachment comprising a plate of insulating material 40 adapted to be inserted to a variable extent between certain of said first plates, a member for supporting and moving said last plate, and means for securing said member in operative relation to said condenser. 45

In testimony whereof, we hereunto affix our signatures.

JAMES B. KIRBY.
HOYT S. SCOTT.