

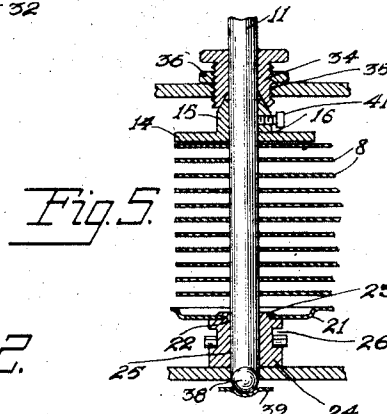
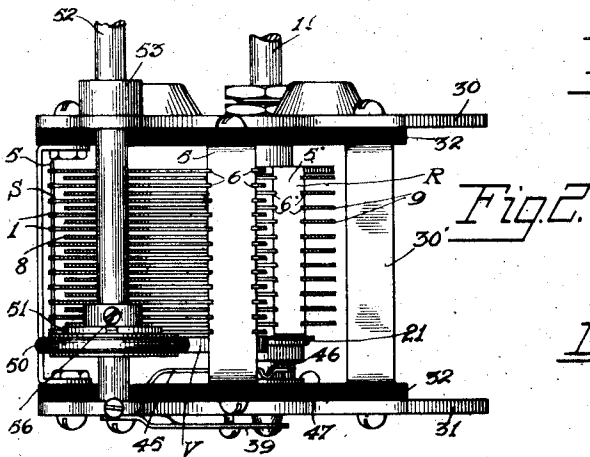
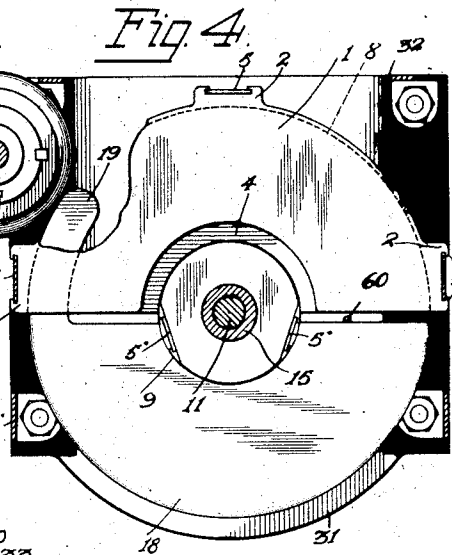
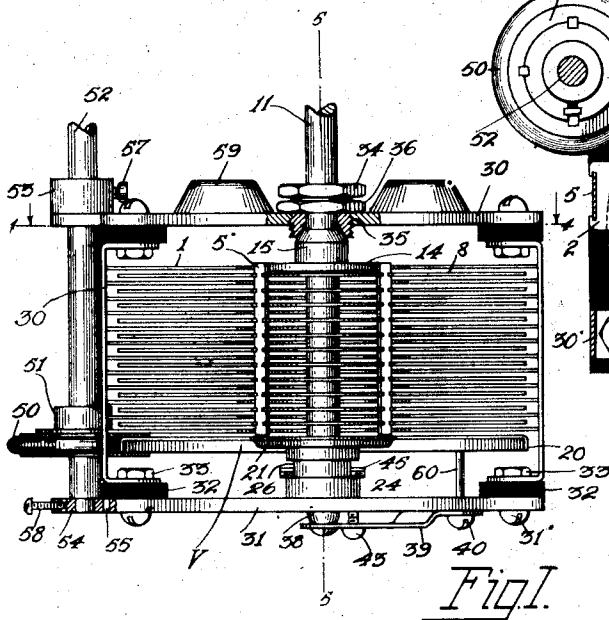
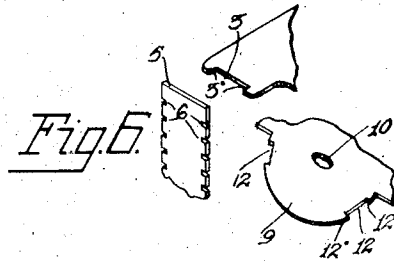
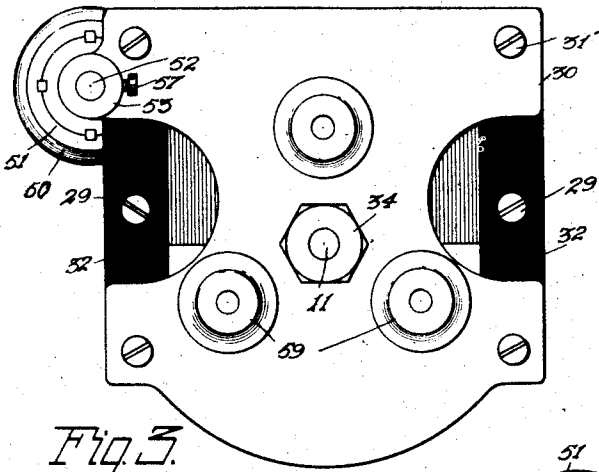
Aug. 12, 1930.

G. A. YANÓCHOWSKI

1,772,598

VARIABLE CONDENSER

Filed June 27, 1924



Inventor:
George A. Yanochowski.
By Antisocamp
Attorney.

UNITED STATES PATENT OFFICE

GEORGE A. YANOSCHOWSKI, OF LA GRANGE, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

VARIABLE CONDENSER

Application filed June 27, 1924. Serial No. 722,711.

My invention relates to condensers and has to do more particularly with variable condensers with an air dielectric, such as are now in general use in radio or wireless receiving sets, and an object of my invention is the provision of an improved condenser of the variable type, which is provided with structural features which will facilitate assembly of a condenser of this type and, at the same time, provide an improved condenser structure which will permit the efficient operation of the same and be of the low loss type.

The condenser of my invention is of the type in which the rotary plate element is operatively located in position relative to the fixed plates of the stator element so that the capacity of the condenser may be made to vary in the desired manner, which of course, is well understood by those skilled in the art. One of the features of my invention is the means provided and the manner in which I support and space the conducting plates of the rotor element to form a single mountable unit, and also the plates of the fixed or stator element of my condenser to form a single mountable unit.

Another feature of my invention is the provision of a vernier element for my condenser which consists in the provision of a suitable conducting plate which is loosely and rotatably supported on the rotatable shaft supporting the rotor element of my condenser, and also the provision of means for rotatably and vernierly adjusting said conducting plate on said shaft to obtain a better and finer adjustment of my condenser without disturbing the adjustable position of the said rotor element.

Still a further feature of my invention is the provision of frictional means for maintaining the vernier element of my condenser in its adjusted position.

The above features as well as others, will be more specifically pointed out in the ensuing specification and appended claims, and for a clearer understanding of the same reference may be had to the accompanying drawings, in which like reference characters in the several views denote like parts.

Referring to the drawings:

Fig. 1 is a view in elevation of the condenser of my invention;

Fig. 2 is another view in elevation of the condenser of my invention taken from a different angle;

Fig. 3 is a top plan view of Fig. 1;

Fig. 4 is a view along the line 4—4 of Fig. 1 looking in the direction of the arrow;

Fig. 5 is a sectional view along the line 5—5 of Fig. 1; and

Fig. 6 is a partial perspective view of one of the spacing and supporting members of my invention, and also a partial perspective view of one of the conducting plates of the stator element and of one of the plates of the rotor element of my condenser, and also having the means provided for spacing and securing the said plates in position.

Referring now in detail to my invention as illustrated in the accompanying drawings, R is the rotor element and S is the stator element, while V is the vernier element of the condenser of my invention.

Referring first to the stator element of my condenser the same comprises a plurality of semi-circular plates 1 suitably formed of brass or some other suitable conducting material by a punching operation. Integrally formed with each of the plates 1 are three outwardly extending portions 2, each of which is provided with a slot 3. The slots 3 of the plates 1 are adapted to be in alignment with each other when the plates 1 are arranged one above the other. An arcuate shaped recess 4 is provided in each of the plates 1 for purposes to be later pointed out. Spacing and supporting members 5 are provided, each of which is provided with a plurality of pairs of slots 6, there being as many pairs of slots 6 as there are plates 1. Each pair of slots 6 is of a size to permit the portion between the pair of slots 6 to fit into a slot 3 of the plate 1 while the slots 6 are of a size to receive the inner edges 3' forming the ends of the said slot 3. To assemble the plates 1 the same are placed in a suitable fixture provided for assembling purposes, and then the spacing and supporting members 5 will be inserted into the slots 3 of the plates 1 while the inner edges 3' of the ends of said

slots 3 will protrude through the pairs of slots 6, and when the members 5 are engaging the plates 1 as just pointed out, solder is applied to the protruding inner edges 3' whereby said members 5 are soldered to said plates 1 in the slots 3 of the protruding portions 2 of the plates 1, said plates 1 and members 5 now forming a single mountable unit. The two spacing members 5 secured to the ends of the plates 1 are longer than the other member 5 and their free ends are turned over at right angles to the main body of said members, said turned over ends being provided with openings and adapted to support the stator element S in its mounted position as will be more clearly pointed out in the ensuing specification.

The rotor element R comprises a plurality of substantially semi-circular plates 8, each of which is provided with a reduced semi-circular portion 9 integrally formed therewith and provided with an opening 10 for receiving the rotatable shaft 11, the said plates 8 being stamped and suitably formed out of brass or some other suitable material by a punching operation. Each plate 8 is provided with a pair of slots 12, formed in the semi-circular portion 9, each of which is of a size to receive a spacing and supporting member 5' which is substantially the same in construction as the members 5 of the stator element S. Each member 5' is provided with a plurality of pairs of slots 6', corresponding in number to the number of plates 8, said members 5' being adapted to fit into the slots 12 while the end portions 12' of said slots 12 engage and protrude slightly through the said pairs of slots 6', and when the members 5' are engaging the slots 12 as just described solder is applied to the protruding end portions 12' whereby said plates 8 and members 5' are secured together to form the rotor element R of my condenser. It will be seen that the plates 8 are separated from each other since only one plate will engage a pair of slots 6', said plates 8 being placed one above the other so that the openings 10 in said plates are in alignment with each other. A disk member 14 having a hub portion 15 integrally formed therewith is provided and is of a size to fit between the extending ends of the members 5' so that the central opening 16 coincides with the aligned openings 10 in the plates 8, and when the disk member 14 is in this position solder is applied at the point of engagement of said members 5' and said member 14 whereby said member 14 is secured to said members 5'.

The vernier plate element V comprises a substantially semi-circular plate 18 which has an integrally formed extending member 19, the said plate 18 and extending member being provided with an integrally formed flange 20. The plate 18 is provided with a saucer shaped portion 21 in the center of which is a

suitable opening 22 for receiving the reduced end 23 of a cylindrical member 24, the said reduced end 23 being staked over to prevent the displacement of said cylindrical member 24. The member 24 is provided with a central opening 25 and a circumferential groove 26 for purposes to be subsequently pointed out.

To assemble and operatively support the rotor element R and the stator element S of my condenser in position, a pair of mounting members 30 and 31, suitably formed of brass or some other suitable material, are provided. The mounting members 30 and 31 are secured together and separated from each other by means of the bridging members 30' which have their ends turned over and are secured to and between the members 30 and 31 by suitable screws 31' which pass through suitable openings in the members 30 and 31, insulating strips 32, and openings in the turned over ends of the bridging members 30' and then have screw threaded engagement with the nuts 33. The stator element is disposed between the mounting members 30 and 31, as shown in Fig. 1, and is secured therebetween to the insulating strips 32 by means of screws 29 which pass through suitable openings in the said insulating strip 32 and then extend through the openings in the turned over ends of the spacing and supporting members 5 and have screw-threaded engagement with suitably tapped nuts, whereupon the stator element S is secured to the strips 32 and supported between the mounting members 30 and 31, and is insulated from said mounting members by the insulating strips 32. A cylindrical screw-threaded member 34 is provided which has screw threaded engagement with a suitably tapped opening 35 in the member 30 and is adjustable therein and is held in its adjusted position by a nut 36. The rotor element R is now inserted between the mounting members 30 and 31 so that the plates 8 of said rotor element are disposed between the plates 1 of the stator element S, and the cone-shaped end of the hub member 15 fits into the cone shaped portion of the central opening in the adjustable member 34. The rotatable shaft 11 is now inserted through the central opening in the member 34, opening 16 in the hub member 15 and disk 14, aligned openings 10 in the plates 8, through the central opening 25 in the member 24, and its concave end brought to rest in a suitable opening in the mounting member 31 and in engagement with the ball bearing 38. The ball bearing 38 is held in engagement with the concave end of the shaft 11 by a spring member 39 secured to the mounting member 31 by means of a suitable screw member 40. The rotor element R is adjustably secured on the shaft 11, against movement relative thereto, by the set screw 41 which when tightened has frictional engagement with the said shaft 11. The plates 8 of

the rotor element R may be adjusted relative to the plates 1 of the stator element S by operating the screw-threaded member 34, and when the desired adjustment is obtained the nut 36 is tightened down to hold the member 34 in its adjusted position. The tension of spring member 39 is sufficient to maintain the hub member 15 in constant engagement with the member 34 whereby the rotor element R is maintained in its longitudinally adjustable position. A screw 43 extends through an opening in the spring member 39 and has screw-threaded engagement with a tapped orifice in the mounting member 31 for providing the right amount of tension on said spring member 3. The vernier plate member 18 and cylindrical member 24 are disposed between the end plate 1 of the stator element S and the mounting member 31, the said member 24 fitting loosely on the shaft 11 so that said shaft will rotate independently of said member 24. The member 24 and plate 18 are maintained out of engagement with the end plate 1 of the stator element S by means of a spring member 45 which has its one end secured to the mounting member 31 by a pair of suitable screws which have screw threaded engagement with suitably tapped openings in the member 31, the other end of said spring member 45 being bifurcated and adapted to fit around the cylindrical member 24 in the circumferential groove 26 of said member 24. The bifurcated end of the spring member 45 is distorted to provide a pair of arcuate portions 46 which have frictional engagement with the face 47 of the groove 26 in the member 24. The tension of the spring member 45 is such as to maintain the end of the member 24 in engagement with the mounting member 31 and the vernier plate 18 away from the end plate of the stator element S. The mounting plates 30 and 31 are so designed that they protect the rotor, stator and vernier elements from injury.

To rotate the vernier plates 18 and member 24 on the shaft 11, a rubber ring member 50 is provided which is suitably secured on a suitable cylindrical member 51, and a rotatable shaft 52 is provided which extends through a collar member 53, a suitable opening in the member 30, through the cylindrical member 51 and has its one end reduced and adapted to fit into a bushing member 54, said bushing 54 resting in an elongated slot 55 formed in the member 31. The rubber ring 50 is adapted to be adjusted on the shaft 52 so that it will engage the flange 20 of the vernier plate 18 and its extension 19 and when adjusted, a set screw 56 is rotated into frictional engagement with the shaft 52 to hold the said rubber ring member 50 and member 51 in their adjusted position on the shaft 52. The collar member 53 is secured on the shaft 52 by a set screw 57 which has frictional engagement with said

shaft 52. As the rubber ring member 50 is worn and reduced in size, due to its frictional engagement with the flange 20 of the vernier plate, the set screw 58 will be rotated and moved inwardly to move the bushing member 54 in the slot 55, thereby moving the shaft to bring the rubber ring 50 into better frictional engagement with the flange 20 of the vernier plate 18 to overcome the wearing effect of the rubber ring 50.

To mount my condenser in position on a suitable mounting panel the same may be accomplished by means of suitable screws which pass through suitable openings in the mounting panel and then have screw-threaded engagement with suitably tapped orifices in the members 59 which are integrally formed with the mounting member 30. The free ends of the shafts 11 and 50 extend through suitable openings in the mounting panel, and the collar member 53 engaging the panel prevents endwise movement of the shaft 52. Suitable control members are secured on the shafts 11 and 52 for rotating said shafts.

In operating my condenser the operator grasps the dial secured to the shaft 11 and rotates the same to adjust the rotor element R relative to the stator element S, and when adjusted the same is held in its adjusted position by the frictional engagement of the hub member 15 and adjustable member 34. The recesses 14 in the plates 1 permit the rotation of the rotor element R. The operator now grasps the member secured on the shaft 52 and rotates the same whereupon the rubber ring member 50 engaging the flange 20 will rotate the vernier plate 18 to adjust the same relative to the end plate of the stator element S, thereby effecting a finer adjustment of my condenser as will be readily understood by those skilled in the art. To limit the amount of rotary movement of the vernier plate 18, a stop pin 60 is provided and suitably secured to the mounting member 31 and adapted to be engaged by the said vernier plate 18 to permit approximately only 180 degrees of rotation of said plate 18. The vernier plate 18 will be held in its adjusted position by the frictional engagement of the bifurcated end of the spring member 45 and the face 47 of the circumferential groove 26 in the cylindrical member 24 which will bear the said member 24 down on the inner face of the supporting member 31.

From the foregoing it will be at once seen that I have produced a condenser which is simple in construction and inexpensive to manufacture as practically all of the parts are formed by a punching operation. Also that I have provided very simple and dependable means for supporting and separating the conducting plates of my condenser to form single mountable units and which have been referred to throughout the above de-

scription of my condenser as the rotor element and stator element.

It will further be seen that I have provided a very neatly designed vernier plate which is rotatably supported on the same shaft which supports the rotor element of my condenser, and that simple means are provided for effecting a minute adjustment of the said vernier plate relative to the end plate of the stator element, thereby obtaining a finer and better adjustment of my condenser, and further, that simple means are provided for maintaining the vernier plate element in its adjusted position. Other features and advantages are obviously present in my condenser as pointed out above and as will also be set forth in the appended claims.

Although I have described a particular embodiment of my invention, it is to be understood that I do not wish to be limited to the exact structure, as shown and described, but that I intend to cover all changes and modifications which may come within the spirit and scope of the appended claims.

Having described my invention what I claim as new and desire to secure by Letters Patent is:—

1. A device of the class described including a rotor element comprising a plurality of conducting members having slots formed therein, a rotatable shaft for supporting said rotor element, means for longitudinally adjusting said rotor element on said shaft, members provided with slots and arranged in pairs, said pairs of slots adapted to register with the slots in said conducting members so that said second members will engage and rest in the slots in said conducting members, the slots in said second member being the same size as the thickness of said first members, said slots in said conducting members being the same size as the portion between opposite notches of the other members so that the said members fit tight when placed together, and portions of said conducting members will engage and protrude through the slots in said second members, said first and second members being supported on each other to form a single mountable unit, an auxiliary rotor element comprising a single plate, frictional means engaging the periphery of said plate for rotating the same, and means for adjusting the frictional relationship of said means and said plate.

2. A device of the class described including a rotor element having a plurality of conducting plates, said plates being provided with slots, supporting members provided with slots, said members adapted to engage the slots in said plates, the slots in said second member being the same size as the thickness of said first members, the portions of said members between opposite slots being substantially the same size as the slots in said conducting plates so that the said plates and

members form a solid unit when placed together, and said plates adapted to engage the slots in said supporting members, means for holding said plates and members in their assembled position to form a single mountable unit, a shaft for supporting said rotor element, means for longitudinally adjusting said rotor element along said shaft as a unit, an auxiliary rotor element comprising a single plate, frictional means engaging the periphery of said plate for rotating the same, a rotatable shaft for supporting said frictional means, and means for adjusting said shaft to vary the frictional engagement of said frictional means and said plate.

3. A device of the class described including a rotor element, an auxiliary rotor element comprising a single plate, frictional means engaging the periphery of said plate for rotating the same and means for adjusting the frictional engagement of said means and said plate, a shaft for rotatably supporting said rotor element, means for longitudinally adjusting said rotor along said shaft, said rotor element having members provided with slots in their peripheral edges, other members provided with slots and arranged in pairs, a pair of said slots adapted to register with and receive the end portions of one of said first members forming a slot therein, and the portion of the member between said pair of slots adapted to engage the said slot in said one first member, so that said first members are supported and separated by said second members, the slots in said second member being the same size as the thickness of said first members, the portions of said members between opposite slots being substantially the same size as the slots in the first member so that the said members form a solid unit when placed together.

4. A device of the class described including a rotor element and a stator element, a shaft for rotatably supporting said rotor element, means for longitudinally adjusting said rotor element relative to said stator element, said elements each comprising a plurality of conducting members, each of said members being provided with a slot, another conducting member provided with slots arranged in pairs, a pair of said slots adapted to receive one of said first members and to permit said other member to fit into the slot provided in said one member, the slots in said second member being the same size as the thickness of said first members, the portion of said second member between the pairs of slots being substantially the same size as the slot in said first member so that the said members form a solid structure when placed together, the other of said members engaging the other pairs of said slots in like manner, means for securing said members and said other member together to form a single mountable unit, an auxiliary rotor element

comprising a single plate, frictional means engaging the periphery of said plate for rotating the same, a rotatable shaft for supporting said frictional means, supporting members for said shaft, and means for positioning said shaft in one of said supporting members for adjusting said frictional means relative to said plate.

5. A device of the class described including a rotor element and a stator element, a shaft for rotatably supporting said rotor element, means for longitudinally adjusting said rotor element relative to said stator element, said elements each comprising a plurality of plates provided with openings, another member provided with openings arranged in pairs said pairs of openings being uniformly spaced one from another, said plate adapted to engage the pairs of openings in said member, and said member adapted to engage the openings in said plates, whereby said plates are uniformly spaced from each other, the openings in said member being substantially the same in size as the thickness of said plates, the portion of said second member between said pairs of openings being substantially the same size as the opening in the first member so that the said members form a solid structure when placed together, means for securing said plates in their assembled position against displacement, an auxiliary rotor element comprising a single plate, frictional means engaging the periphery of said plate for rotating the same, a rotatable shaft for supporting said frictional means, supporting members for said shaft, and means for positioning said shaft in one of said supporting members for adjusting said frictional means relative to said plate.

6. A device of the class described including a pair of mounting members, a rotor element and a stator element, a shaft for rotatably supporting said rotor element, means for longitudinally adjusting said rotor element relative to said stator element, said elements each comprising a plurality of conducting members provided with slots, supporting members provided with slots uniformly spaced from each other, the said conducting members adapted to engage the slots in said supporting members and the said supporting members adapted to engage the slots in said conducting members, whereby said members form a single mountable unit, the slots in said second member being the same size as the thickness of said first members, the portions of said supporting members between opposite slots being substantially the same size as the slots in said conducting members so that the said members form a solid structure when said mounting member engages the slots in said conducting members, means including said supporting members for securing said single mountable

unit to said pair of mounting members, an auxiliary rotor element comprising a single plate, frictional means engaging the periphery of said plate for rotating the same, a rotatable shaft for supporting said frictional means, supporting members for said shaft, and means for positioning said shaft in one of said supporting members for adjusting said frictional means relative to said plate.

7. A device of the class described including supporting members, a fixed plate element supported by said supporting members, a rotor plate element, a shaft for rotatably supporting said rotor plate element on said supporting members, means co-operating with one of said supporting members for longitudinally adjusting said rotor element on said shaft, a vernier plate element rotatably supported on said shaft, a non-conducting ring member for engaging said vernier plate element, another rotatable shaft for rotatably supporting said ring member, said ring member and shaft adapted to rotatably and vernierly adjust said vernier plate element relative to one of the plates of said fixed plate element, and means for adjusting said ring member and said second shaft relative to said vernier plate element.

8. A device of the class described including a stator element, a rotor element, a shaft for rotatably supporting said rotor element in operative position relative to said stator element means for longitudinally adjusting said rotor element on said shaft, a conducting plate, means for rotatably supporting said conducting plate on said shaft and in operative position relative to said stator element, means including a non-conducting ring member supported on a second shaft and adapted to engage the said conducting plate for rotatably and vernierly adjusting said conducting plate relative to said stator element, and spring means having a bifurcated portion for engaging said first means for holding said first means and said conducting plate in their adjusted position on said first shaft.

9. A device of the class described including a pair of mounting members, a fixed plate element supported by said members, a rotor plate element, a shaft for rotatably supporting said rotor plate element, means for longitudinally adjusting said rotor element on said shaft, a conducting plate, means for rotatably supporting said plate on said shaft, means including a non-conducting ring member and a rotatable shaft for rotatably supporting said ring member, said ring member adapted to engage the peripheral edge of said conducting plate for vernierly adjusting said conducting plate relative to a plate of said fixed plate element, and spring means secured to one of said mounting members and having a bifurcated portion adapted to

engage said first means to hold said conducting plate in its adjusted position.

10. A device of the class described including a pair of mounting members, a fixed plate element supported by said members, a rotor plate element, a shaft for rotatably supporting said rotor plate element, means for longitudinally adjusting said rotor element on said shaft, a conducting plate, means for rotatably supporting said plate on said shaft, means including a non-conducting member and a rotatable shaft for rotatably and vernierly adjusting said conducting plate relative to a plate of said fixed plate element, spring means secured to one of said mounting members and adapted to engage said first means to hold said conducting plate in its adjusted position, and stop means for limiting the degree of rotation of said conducting plate.

11. A device of the character described including a stator element and a rotor element, a shaft for rotatably supporting said rotor element relative to said stator element, means for adjusting said rotor element longitudinally along said shaft, an auxiliary rotor element adapted to be rotated concentrically with respect to said first rotor element, an independently mounted rotary shaft frictionally connected to said second rotor element for operating said second rotor element, and means for adjusting said frictional connection of said shaft and said second rotor element.

12. A device of the character described including a stator element and a rotor element, a shaft for operating said rotor element, means for longitudinally adjusting said rotor element along said shaft, a second rotor element rotatable concentrically with respect to said stator element, an independently mounted shaft for rotating said second rotor element, a non-conducting ring member affixed to said second shaft and having frictional engagement with said second rotor element for rotating the same and means for adjusting said second shaft to regulate the degree of frictional engagement.

13. A device of the character described including a rotor element and a stator element, a rotatable shaft for supporting said rotor element, means for longitudinally moving said rotor element along said shaft to space said rotor and stator elements, an auxiliary rotor element, operating means including a member frictionally engaging said auxiliary rotor element for operating the same, and means for adjusting said frictional member relative to said auxiliary rotor element.

14. A device of the character described including a stator element and a rotor element, a rotatable shaft for supporting said rotor element, means for longitudinally moving said rotor element along said shaft to space said rotor and stator elements, an aux-

iliary rotor element rotatable concentrically with respect to said stator element, means including a frictionally engaging disk for operating said auxiliary rotor element, and means for adjusting the degree of said frictional engagement of the disk and auxiliary rotor element.

15. A device of the character described including a pair of mounting plates, a stator element secured to said mounting plates, a rotor element, a shaft supported by said mounting plates for rotating said rotor element, means for longitudinally adjusting said rotor element along said shaft, an auxiliary rotor element rotatably mounted upon said shaft, an auxiliary shaft independently supported by said mounting plates, a non-conducting ring member supported on said auxiliary shaft having a frictional engagement with said auxiliary rotor element for rotating said auxiliary rotor element, and means for regulating the frictional engagement of said ring member and said auxiliary rotor element.

16. A device of the character described including a pair of mounting plates, a stator element secured to said mounting plates, a rotor element, a shaft supported by said mounting plates for rotating said rotor element, means for longitudinally adjusting said rotor element along said shaft, an auxiliary rotor element rotatably mounted upon said shaft, an auxiliary shaft independently supported by said mounting plates for rotating said auxiliary rotor element, and adjusting means for regulating the position of said auxiliary shaft relative to said auxiliary rotor element.

17. A device of the character described including a pair of mounting plates, a stator element secured to said mounting plates, a rotor element, a shaft supported by said mounting plates for rotating said rotor element, means for longitudinally adjusting said rotor element along said shaft, an auxiliary rotor element rotatably mounted upon said shaft, an auxiliary shaft independently supported by said mounting plates for rotating said auxiliary rotor element, adjusting means for regulating the position of said auxiliary shaft relative to said auxiliary rotor element, and spring means for holding said auxiliary rotor element in its adjusted position.

18. A device of the character described including a rotor plate having a flanged portion, a disk adapted to frictionally engage said flanged portion of said plate to rotate the same, and means for regulating the frictional engagement of said disk and said plate.

19. A device of the character described including a stator element and a rotor element, a shaft for operating said rotor element, means for longitudinally adjusting said rotor element along said shaft, a second rotor ele-

ment rotatable concentrically with respect to said first rotor element, an independently mounted shaft, means operated by said shaft in direct contact with said second rotor element to operate the same, spring means adapted to engage the end of said first shaft for maintaining it in its adjusted position and other spring means adapted to engage the said second rotor element to maintain it in its adjusted position.

20. A device of the character described including a rotor element and a stator element, an auxiliary rotor element, an operating member for said first rotor element, means for longitudinally adjusting said rotor element on said operating member, a second operating member, a member controlled by said second operating member directly in contact with said auxiliary rotor element for operating the same, spring means adapted to maintain said rotor element in its adjusted position and a second spring having a bifurcated portion adapted to maintain said auxiliary rotor element in its adjusted positions.

21. A device of the character described including a stator element and a rotor element, a concentrically mounted auxiliary rotor element, a shaft for said first rotor element, means for longitudinally adjusting said rotor element on said shaft, an independently mounted shaft for said auxiliary rotor element, a device for said second shaft directly in contact with said auxiliary rotor element for operating the same, and means for regulating the contactual engagement of said device and said auxiliary rotor element.

22. A device of the character described including a stator element and a rotor element, a shaft for operating said rotor element, means for longitudinally adjusting said rotor element on said shaft, a second rotor element rotatable concentrically with respect to said stator element, an independently mounted shaft, means operated by said shaft in direct contact with the periphery of said second rotor element for operating the same, and means for regulating the contactual engagement of said device and said auxiliary rotor element.

23. A device of the character described including a rotor element and a stator element, a rotatable shaft for supporting said rotor element, said rotor element comprising a plurality of conducting members each having a semi-circular extending portion, notches in said extending portion, a flat conducting strip having a plurality of pairs of slots formed therein, said conducting members being of a thickness to fit snugly in said notches, and the portion between said pairs of slots being of a size to fit snugly within said notches in said extending portion, and means for longitudinally adjusting said rotor element on said shaft.

24. A device of the character described including a rotor element and a stator element,

said stator element comprising a plurality of conducting plates each having a plurality of extensions, a flat conducting strip provided with pairs of slots, the portion of said flat strip between the slots forming a pair being of a size to fit snugly into said slots.

Signed by me at Chicago, in the county of Cook, State of Illinois, this 25th day of June, 1924.

GEORGE A. YANOCHOWSKI.