June 23, 1931. H. F. REICHENBACH 1,810,985

GANG OR MULTIPLE UNIT VARIABLE ELECTRIC CONDENSER

Filed Feb. 10, 1928 3 Sheets-Sheet 1

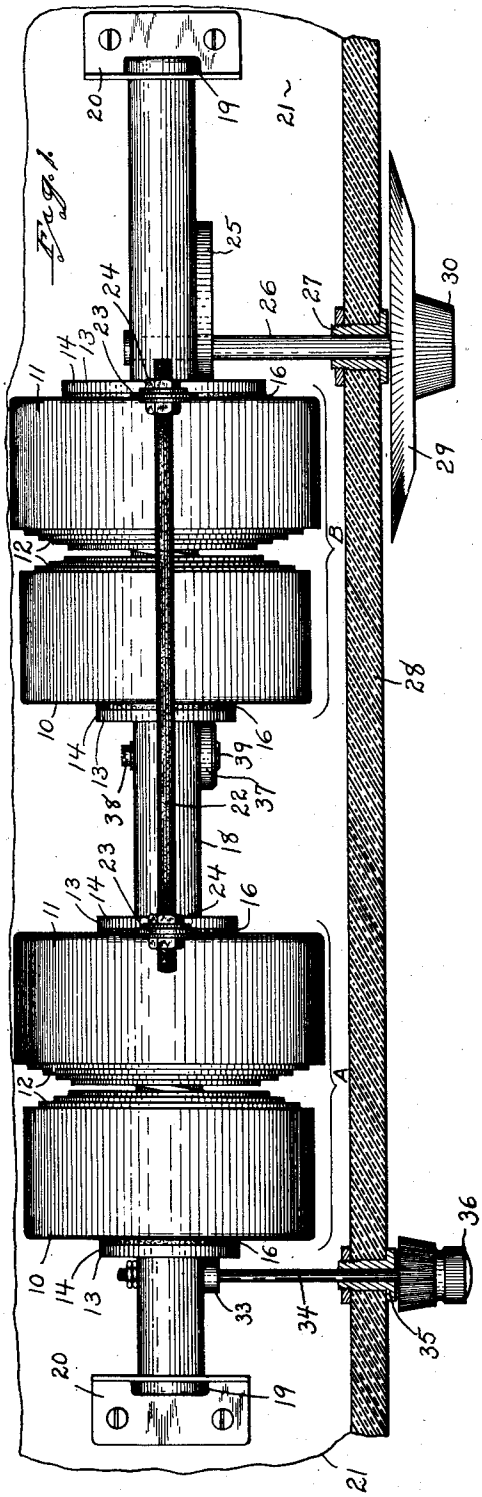


Fig. 1.

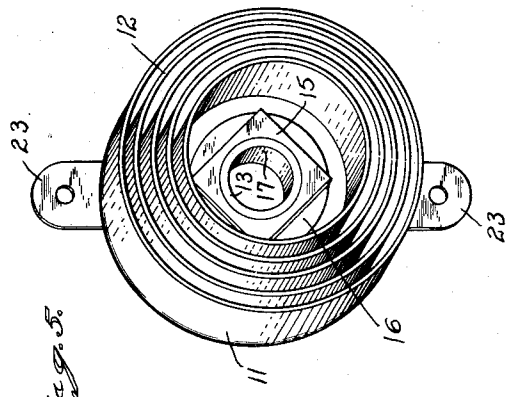


Fig. 5.

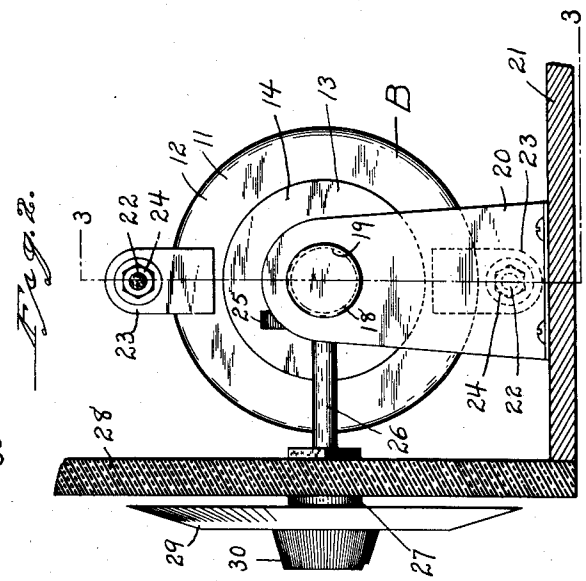


Fig. 2.

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GANG OR MULTIPLE UNIT VARIABLE ELECTRIC CONDENSER

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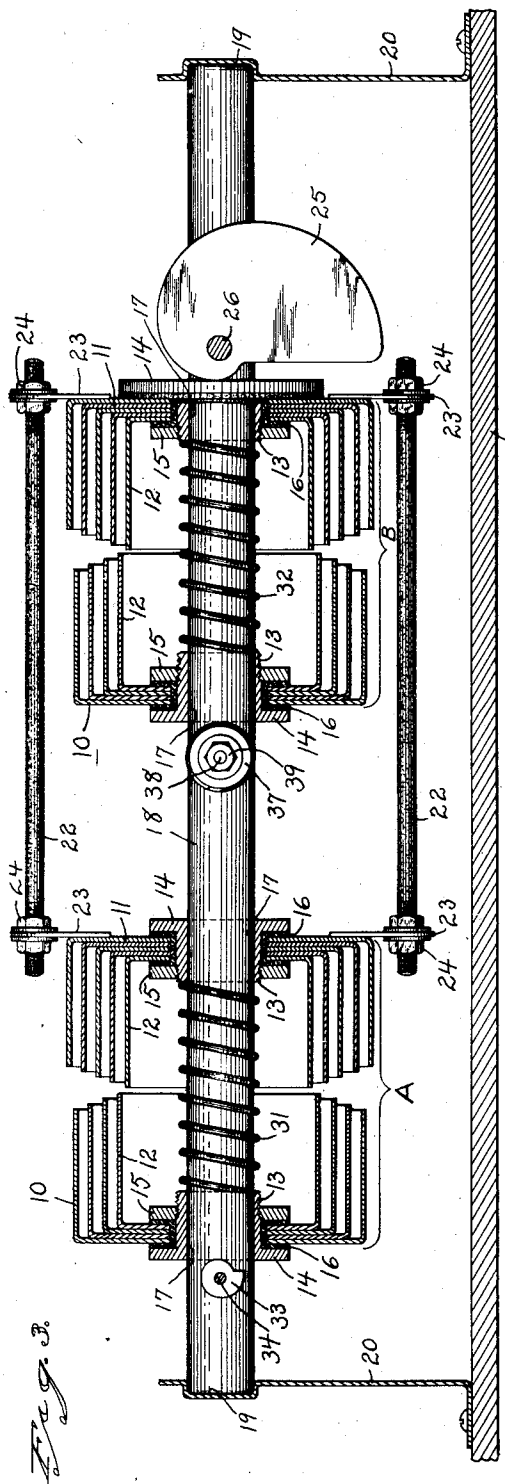


Fig. 3.

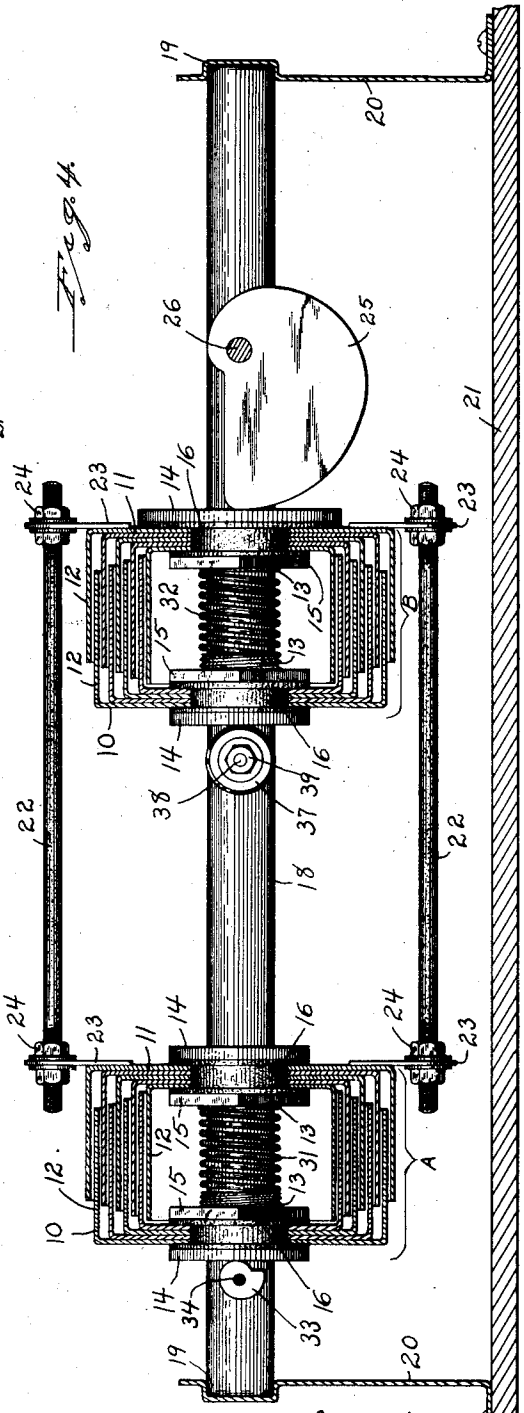


Fig. 4.

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GANG OR MULTIPLE UNIT VARIABLE ELECTRIC CONDENSER

Filed Feb. 10, 1928 3 Sheets-Sheet 3

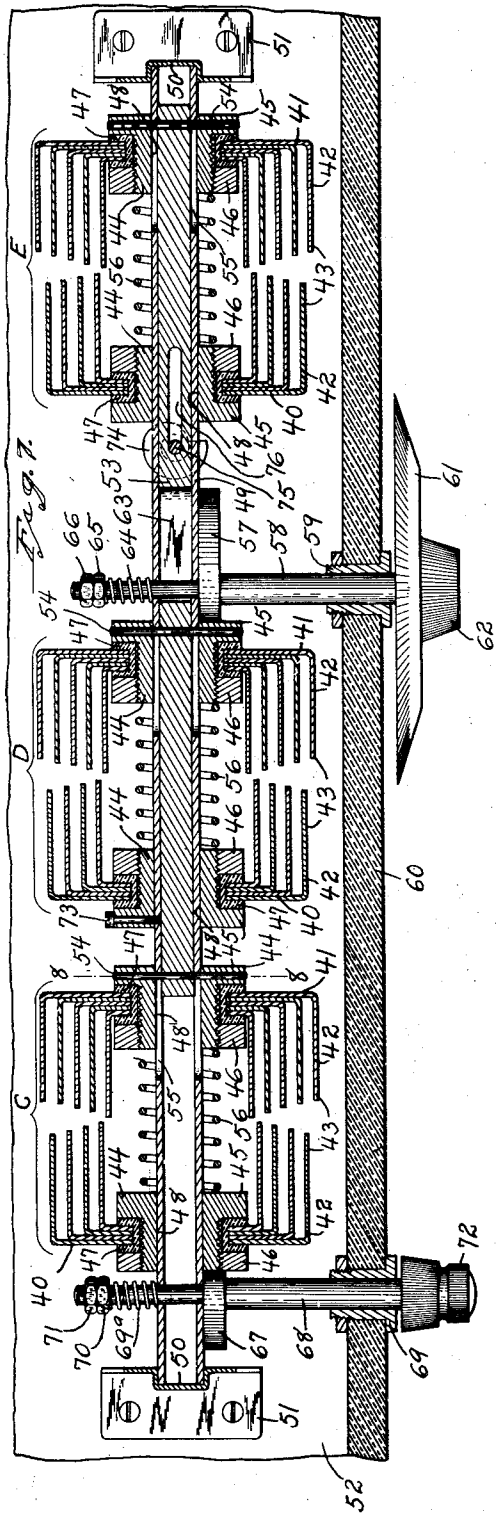


Fig. 7.

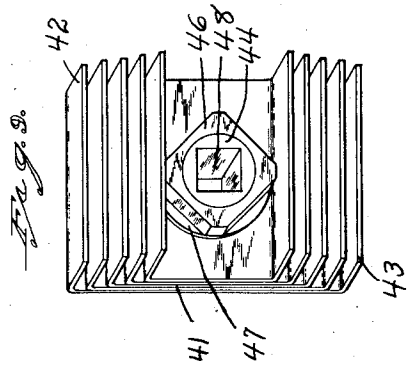


Fig. 9.

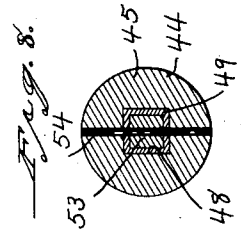


Fig. 8.

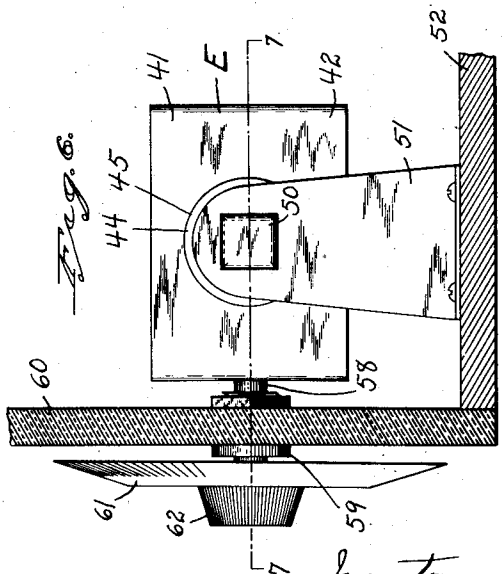


Fig. 6.

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Patented June 23, 1931 1,810,985

UNITED STATES PATENT OFFICE

HOWARD F. REICHENBACH, OF WOLCOTT, CONNECTICUT, ASSIGNOR TO CHASE COMPANIES, INC., OF WATERBURY, CONNECTICUT, A CORPORATION

GANG OR MULTIPLE-UNIT VARIABLE ELECTRIC CONDENSER

Application filed February 10, 1928. Serial No. 253,333.

This invention relates to an improvement in gang or multiple-unit variable electric condensers, and particularly to gang or multiple-unit condensers adapted for use in connection with radio-receiving sets, though not so limited.

The object of this invention is to produce a simple, accurate, and easily-adjustable, multiple-unit variable condenser constructed with particular reference to minimizing lost motion between the various units thereof.

With this object in view, my invention consists in a multiple-unit variable electric condenser characterized by a plurality of condenser-units, each comprising two complementary members having vanes offsetting from them, one of the said members having bodily movement with respect to its complementary member in a plane parallel with said vanes, so as to telescope its vanes between the vanes of the said complementary member to vary the capacity of the condenser, and means connecting the movable elements of the various units together for synchronous movement.

My invention further consists in a multiple-unit variable electric condenser characterized as above and having certain details of construction and combination of parts as will be hereinafter described and particularly recited in the claims.

In the accompanying drawings:

Fig. 1 is a top or plan view of one form of multiple-unit condenser embodying my invention, the panel being shown in horizontal section;

Fig. 2 is an end view thereof;

Fig. 3 is a view thereof in vertical longitudinal section on the line 3—3 of Fig. 2;

Fig. 4 is a corresponding view but showing the movable members of the two condenser-units telescoped into their complementary members;

Fig. 5 is a detached perspective view of one of the movable condenser-members;

Fig. 6 is an end view of another form of multiple-unit condenser embodying my invention;

Fig. 7 is a view thereof in horizontal section on the line 7—7 of Fig. 6;

Fig. 8 is a transverse sectional view on the line 8—8 of Figs. 6 and 7; and

Fig. 9 is a detached perspective view of one of the condenser-members shown in Fig. 6.

In carrying out my invention as shown in Figs. 1 to 5 inclusive, I employ two corresponding condenser-units A and B, each comprising a normally-stationary member 10 and a complementary movable member 11. Each of the said members consists of a group of centrally-perforated nested cups 12 of graduated diameters mounted upon a bushing 13 and clamped between the flange 14 thereof and a clamping-nut 15 which is screwed upon the threaded end of the said bushing. A thin body 16 of fiber serves to insulate each group of cups from its respective bushing 13 and clamping-nut 15. The bushing 13 of each of the members is provided with an axial bore 17 through which extends a long supporting-rod 18, the respective opposite ends of which enter sockets 19 formed at the upper ends of vertical sheet-metal brackets 20 upstanding from a baseboard 21.

The members 11 of the respective condenser-units A and B are coupled together for concurrent movement by means of a pair of tie-rods 22 composed of insulating material, such as fiber, and extending between a pair of ears 23 soldered to and extending outward from each of the said members 11 at diametrically-opposite points thereon. The opposite ends of each of the tie-rods 22 pass through the said ears 23 of the respective members 11 and are threaded as shown for the application of nuts 24 for adjustably coupling the said members together.

For concurrently moving both of the members 11 toward their complementary normally-stationary members 10, I provide an operating-cam 25 mounted upon a horizontal shaft 26 bearing, at its inner end, in the supporting-rod 18, from which it extends outward at a right angle so as to bear at its outer end in a bushing 27 mounted in a front panel 28 upstanding from the baseboard 21 aforesaid. The extreme outer end of the shaft 26 is provided with a graduated dial 29 and serrated control-knob 30, by means of which latter the cam 25 may be turned to

move the members 11 of both of the condenser-units A and B concurrently toward their respective complementary-members 10 against the resistance of helical springs 31 and 32 encircling the supporting-rod 18 and respectively extending between the bushings 13 of the members 10 and 11 of each of the said condenser-units A and B.

For the purpose of providing a micrometer adjustment for the condenser-unit A, independent of the unit B, as may be required in some types of radio installation, I provide a small cam 33 mounted near the inner end of a short horizontal shaft 34 bearing at its inner end in the supporting-rod 18 and at its outer end in a bushing 35 in the panel 28 aforesaid. The spring 31, before mentioned, serves to yieldingly hold the bushing 13 of the member 10 of the unit A against the cam 33, so that, as the same is turned by means of a serrated finger-button 36 secured to the outer end of its shaft 34, the said member 10 may be moved to a slight degree toward or away from its complementary member 11. The stationary member 10 of the condenser-unit B is urged by the spring 32 against a stop-disk 37 which is secured to the supporting-rod 18 by means of a bolt 38 and nut 39.

From the foregoing it will be seen that by turning the control-knob 30 and hence the cam 25, the respective members 11 of both of the condenser-units A and B will be moved so as to telescope the annular flange-like walls of the cups 12 thereof into the corresponding cups 12 of the members 10, as shown in Fig. 4. The degree to which these cups are telescoped together will correspondingly affect the capacity of the condenser-units.

As shown, provision is made for the micrometer adjustment of the condenser-unit A by providing the same with the small cam 33, by means of which the member 10, though normally stationary, may be moved with respect to the member 11 to increase or decrease the capacity of this condenser-unit, independent of the unit B. It is obvious, without further illustration, that if the exigencies of any given installation should require it, similar provision may be made for moving the stationary member 10 of the condenser-unit B toward and away from its complementary member 11.

The form of multiple-unit condenser shown in Figs. 6 to 9 inclusive of the drawings comprises three corresponding condenser-units C, D and E, each comprising a normally-stationary member 40 and a movable member 41. The condenser-members 40 and 41 are each composed of a group of centrally-perforated nested U-shaped sheet-metal plates 42, the distances between the offsetting legs or vanes 43 of which are graduated so that the vanes of one member will enter between the vanes of its complementary member. Each group of U-shaped plates comprising the individual unit members is mounted upon a bushing 44, so as to be clamped between the flange 45 thereof and a clamping-nut 46 screwed upon its upper threaded end. A thin body 47 of fiber serves to insulate each group of U-shaped members from its respective bushing 44 and clamping-nut 46.

The bushing 44 of each of the members is provided with a square axial bore 48 through which a square horizontally-arranged supporting-tube 49 extends, the respective opposite ends of which enter sockets 50 formed at the upper ends of vertically-arranged sheet-metal brackets 51 upstanding from a baseboard 52.

The movable members 41 of the respective condenser-units C, D and E are coupled together for concurrent movement by means of a square coupling-bar 53 sliding within the supporting-tube 49 and coupled to the bushing of each of the members 41 of the respective units by means of a pin 54 extending through it and diametrically through the flanges 45 of the bushings 44 of each of the said members. The opposite walls of the supporting-tube 49 are formed with longitudinal clearance-slots 55 for the passage of the said pin 54 and to permit the same to slide back and forth with reference to the said tube as may be required to adjust the condenser-units. Extending between the bushings 44 of the respective members of each condenser-unit C, D and E is a helical spring 56 which encircles the said tube 49 and exerts a constant effort to separate the respective members of each unit.

For moving all of the members 41 of the condenser-units C, D and E concurrently toward their complementary normally-stationary members 40, I provide an operating-cam 57 mounted upon a horizontal shaft 58 bearing at its inner end in the supporting-tube 49, from which it extends outward at a right angle, so as to bear at its outer end in a bushing 59 mounted in a front panel 60 upstanding from the baseboard 52 aforesaid. The extreme outer end of the shaft 58 is provided with a graduated dial 61 and a serrated control-knob 62, by means of which latter the cam 57 may be turned to move the members 41 as a unit toward the other complementary normally-stationary members 40 against the resistance of the springs 56 encircling the supporting-tube 49 as previously described. The inner end of the shaft 58 just mentioned passes through the coupling-rod 53, which is formed with a clearance-slot 63 to permit its reciprocating movement within the tube 49. The projecting inner end of the said shaft is encircled by a helical tension spring 64 which bears at its forward end against the rear face of the tube 49 and at its rear end

against an adjusting-nut 65 held in place upon the threaded inner end of the said shaft by a jam-nut 66.

For the purpose of providing a micrometer adjustment for the condenser-unit C, independent of the units D and E, as may be required in some types of radio installation, I provide a small cam 67 mounted near the inner end of a short horizontal shaft 68 bearing at its inner end in a supporting-tube 49 and at its outer end in a bushing 69 in the panel 60 aforesaid. The projecting inner end of the shaft 68 just described is encircled by a helical spring 69ª bearing at its forward end against the rear face of the supporting-tube 49 and at its inner end against an adjusting-nut 70 held in place upon the threaded inner end of the said shaft by a jam-nut 71.

The spring 56 of the said unit C serves to yieldingly hold the bushing 44 of the member 40 thereof against the cam 67, so that, as the same is turned by means of a serrated finger-button 72 secured to the outer end of its shaft 68, the said member 40 may be moved to a slight degree toward or away from its complementary member 41 to minutely vary the capacity of the unit C.

The stationary member 40 of the unit D is held in place upon the supporting-tube 49 by means of a set-screw 73 extending through the flange 45 of its bushing 44.

The normally-stationary member 40 of the unit E is urged by its spring 56 against a cam-shaped stop 74 clamped against the supporting-tube 49 by a screw 75 extending transversely through the said tube and also through the coupling-bar 53 which is provided with a clearance-slot 76 to clear the same.

I claim:

1. A gang or multiple-unit variable electric condenser, comprising a plurality of condenser-units, each consisting of a pair of complementary members each having a plurality of vanes offsetting toward the vanes of its complementary member; means for coupling one member of one unit to a member of an adjoining unit; means for imparting concurrent bodily movement to the coupled members in a plane parallel with the vanes thereof, so as to telescope the same between the vanes of their complementary members; and spring means normally urging the coupled members away from their respective complementary members; whereby the capacity of a plurality of units may be simultaneously varied with a minimum of lost motion.

2. A gang or multiple-unit variable electric condenser, comprising a plurality of condenser-units, each consisting of a pair of complementary members each having a plurality of vanes offsetting toward the vanes of its complementary member; means for coupling one member of one unit to a member of an adjoining unit; means for imparting concurrent bodily movement to the coupled members in a plane parallel with the vanes thereof, so as to telescope the same between the vanes of their complementary members; and means for moving the uncoupled member of one unit with respect to its complementary coupled member, so as to vary the capacity of one unit independent of another; whereby the capacity of a plurality of units may be simultaneously varied with a minimum of lost motion.

3. A gang or multiple-unit variable electric condenser, comprising a pair of complementary members each having a plurality of vanes offsetting toward the vanes of its complementary member; a spring interposed between the respective members of each unit for urging them apart; means for coupling one member of one unit to a member of an adjoining unit; and means for imparting concurrent bodily movement to the coupled members in a plane parallel with the vanes thereof, so as to telescope the same between the vanes of their complementary members; whereby the capacity of a plurality of units may be simultaneously varied with a minimum of lost motion.

4. A gang or multiple-unit variable electric condenser, comprising a supporting-rod; a plurality of condenser-units mounted upon the said rod and each consisting of a pair of complementary members each having a plurality of vanes offsetting toward the vanes of its complementary member; a helical spring encircling the said supporting-rod and urging the respective members of the units apart; means for coupling one member of one unit to a member of an adjoining unit; and means for imparting concurrent bodily movement to the coupled members in a plane parallel with the vanes thereof, so as to telescope the same between the vanes of their complementary members; whereby the capacity of a purality of units may be simultaneously varied with a minimum of lost motion.

5. A gang or multiple-unit variable electric condenser, comprising a supporting-rod; a plurality of condenser-units mounted upon the said rod and each consisting of a pair of complementary members each having a plurality of vanes offsetting toward the vanes of its complementary member; a helical spring encircling the said supporting-rod and interposed between the respective members of each of the said units for urging them apart; means for coupling one member of one unit to a member of an adjoining unit; and means for imparting concurrent bodily movement to the coupled members in a plane parallel with the vanes thereof, so as to telescope the same between the vanes of their complementary members; whereby the ca-

pacity of a plurality of units may be simultaneously varied with a minimum of lost motion.

6. A gang or multiple-unit variable electric condenser, comprising a supporting-rod; a plurality of condenser-units mounted upon the said supporting-rod and each consisting of a pair of complementary members each having a plurality of vanes offsetting toward the vanes of its complementary member; means for coupling one member of one unit to a member of an adjoining unit; a cam for imparting concurrent bodily movement to the coupled members in a plane parallel with the vanes thereof, so as to telescope the same between the vanes of their complementary members, and rotatable about an axis substantially perpendicular to the axis of the supporting-rod; whereby the capacity of a plurality of units may be simultaneously varied with a minimum of lost motion.

7. A gang or multiple-unit variable electric condenser, comprising a supporting-rod; a plurality of condenser-units mounted upon the said rod and each consisting of a pair of complementary members each having a plurality of vanes offsetting toward the vanes of its complementary member; means for coupling one member of one unit to a member of an adjoining unit; means for imparting concurrent bodily movement to the coupled members in a plane parallel with the vanes thereof, so as to telescope the same between the vanes of their complementary members; and a cam for moving the uncoupled member of one unit with respect to its complementary coupled member so as to vary the capacity of one unit independent of another; whereby the capacity of a plurality of units may be simultaneously varied with a minimum of lost motion.

8. A gang or multiple-unit variable electric condenser, comprising a plurality of condenser-units, each consisting of a pair of complementary members, each having a plurality of vanes offsetting toward the vanes of its complementary member; means for coupling one member of one unit to a member of an adjoining-unit; a rotary cam for imparting concurrent bodily movement to the coupled members in a plane parallel with the vanes thereof so as to telescope the same between the vanes of their complementary members; whereby a differential movement-ratio may be imparted to the said coupled-members by a substantially uniform rotation of the said cam.

In testimony whereof, I have signed this specification.

HOWARD F. REICHENBACH.