June 14, 1927. 1,632,488

R. H. MANSON

VARIABLE CONDENSER

Filed Nov. 24, 1924 2 Sheets-Sheet 1

FIG. 1

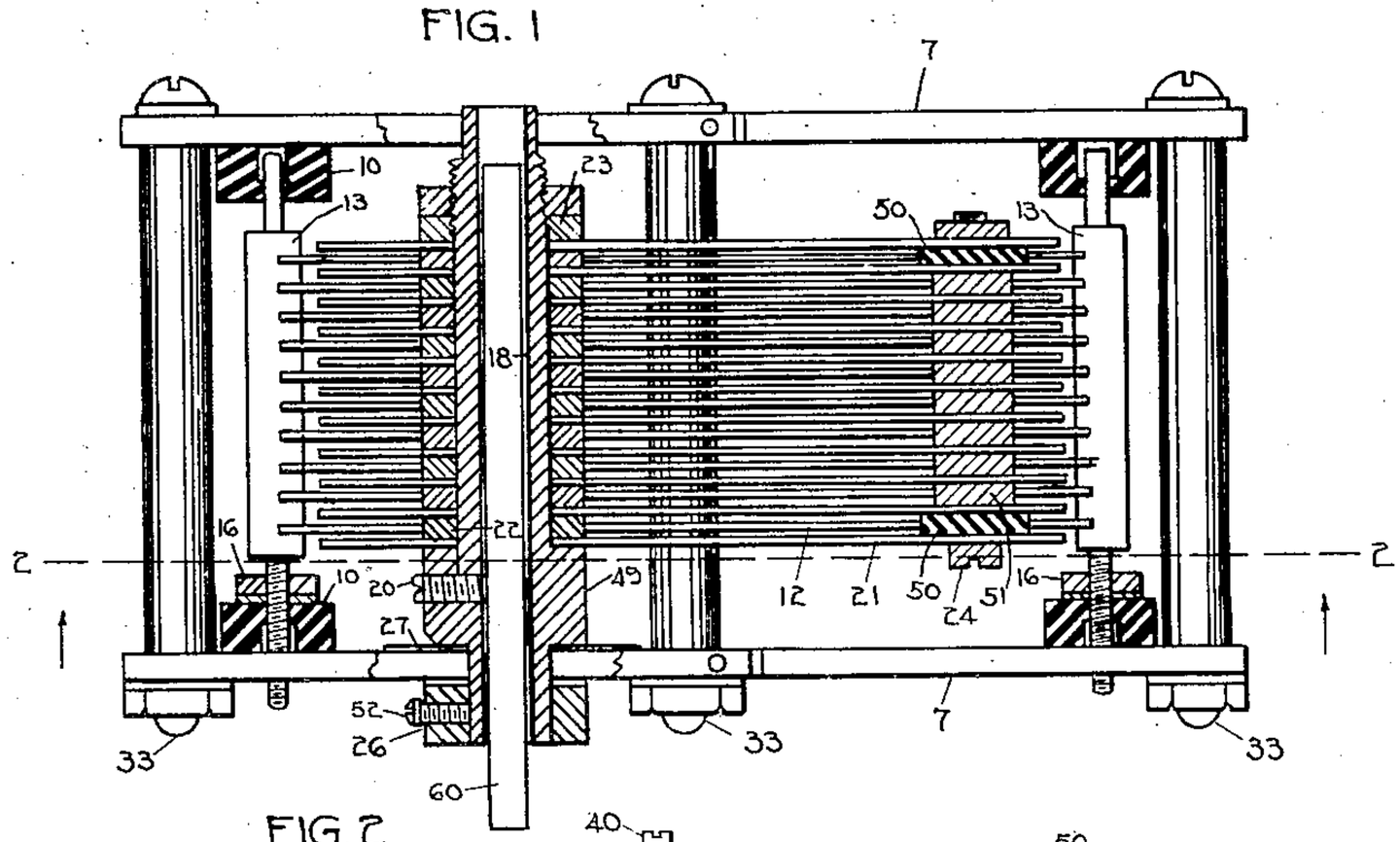
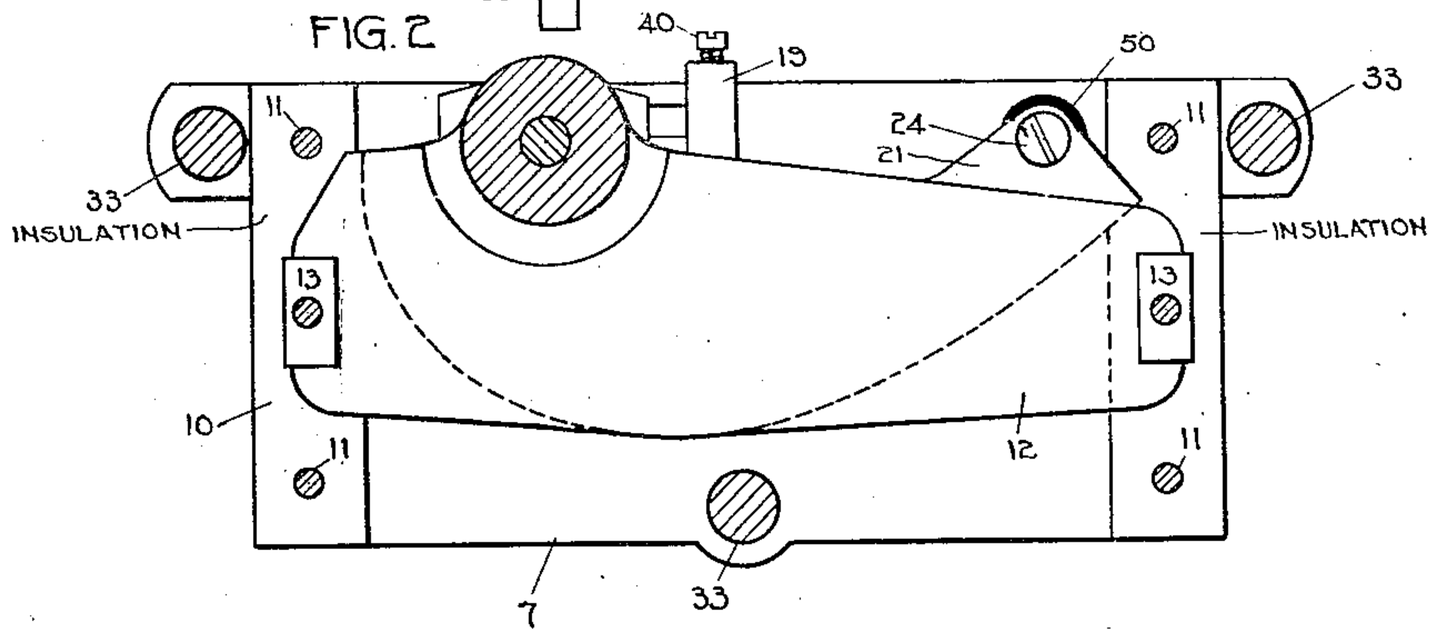


FIG. 2



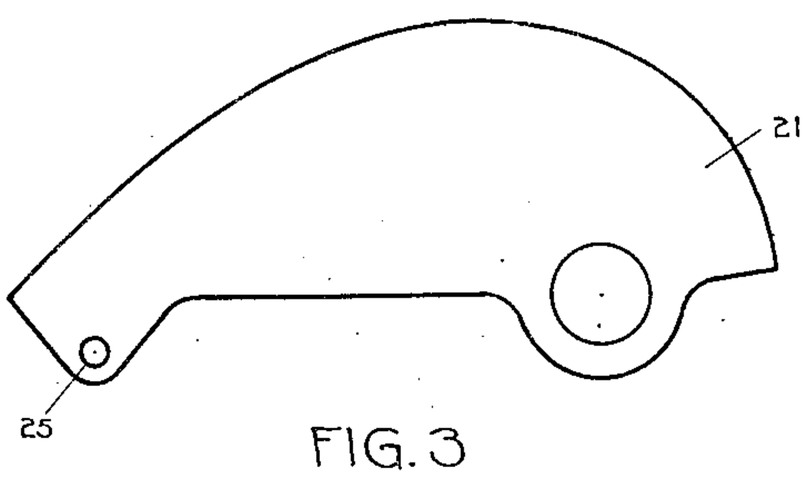


FIG. 3

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June 14, 1927. 1,632,488

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Filed Nov. 24, 1924 2 Sheets-Sheet 2

FIG. 4

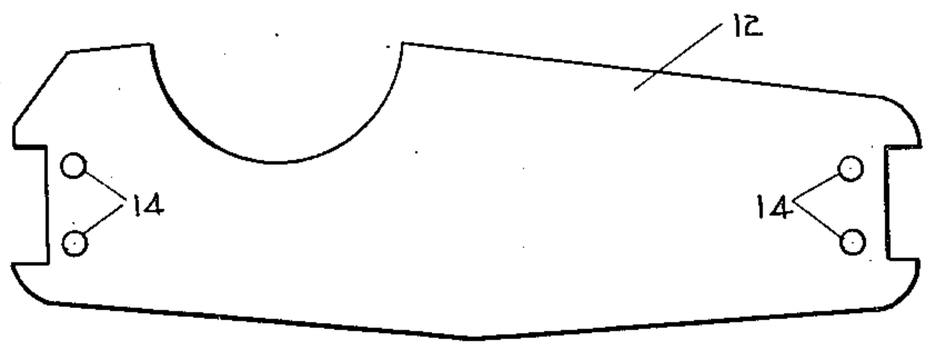


FIG. 5

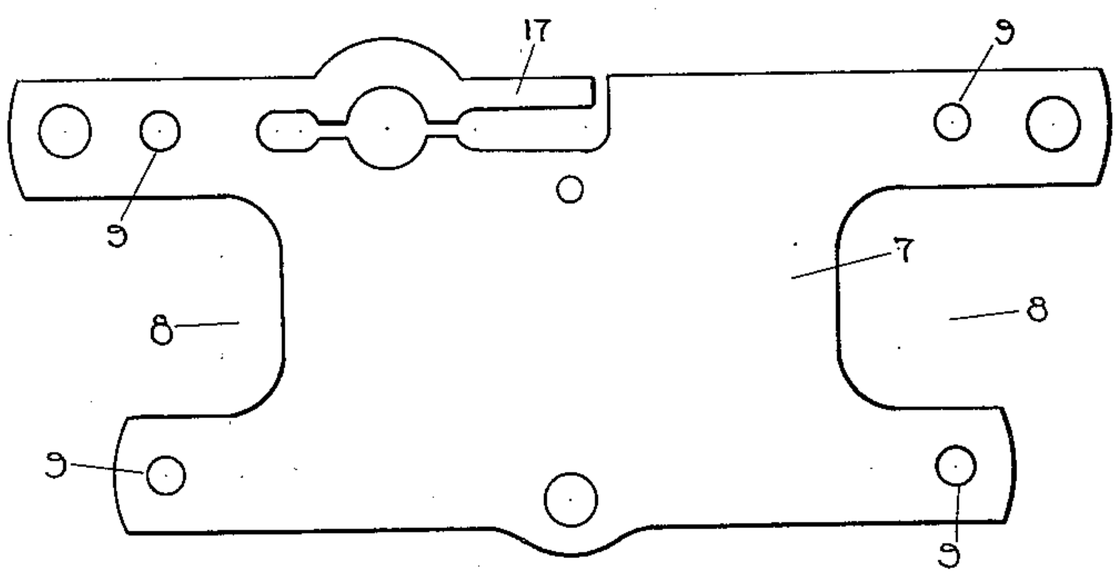


FIG. 6

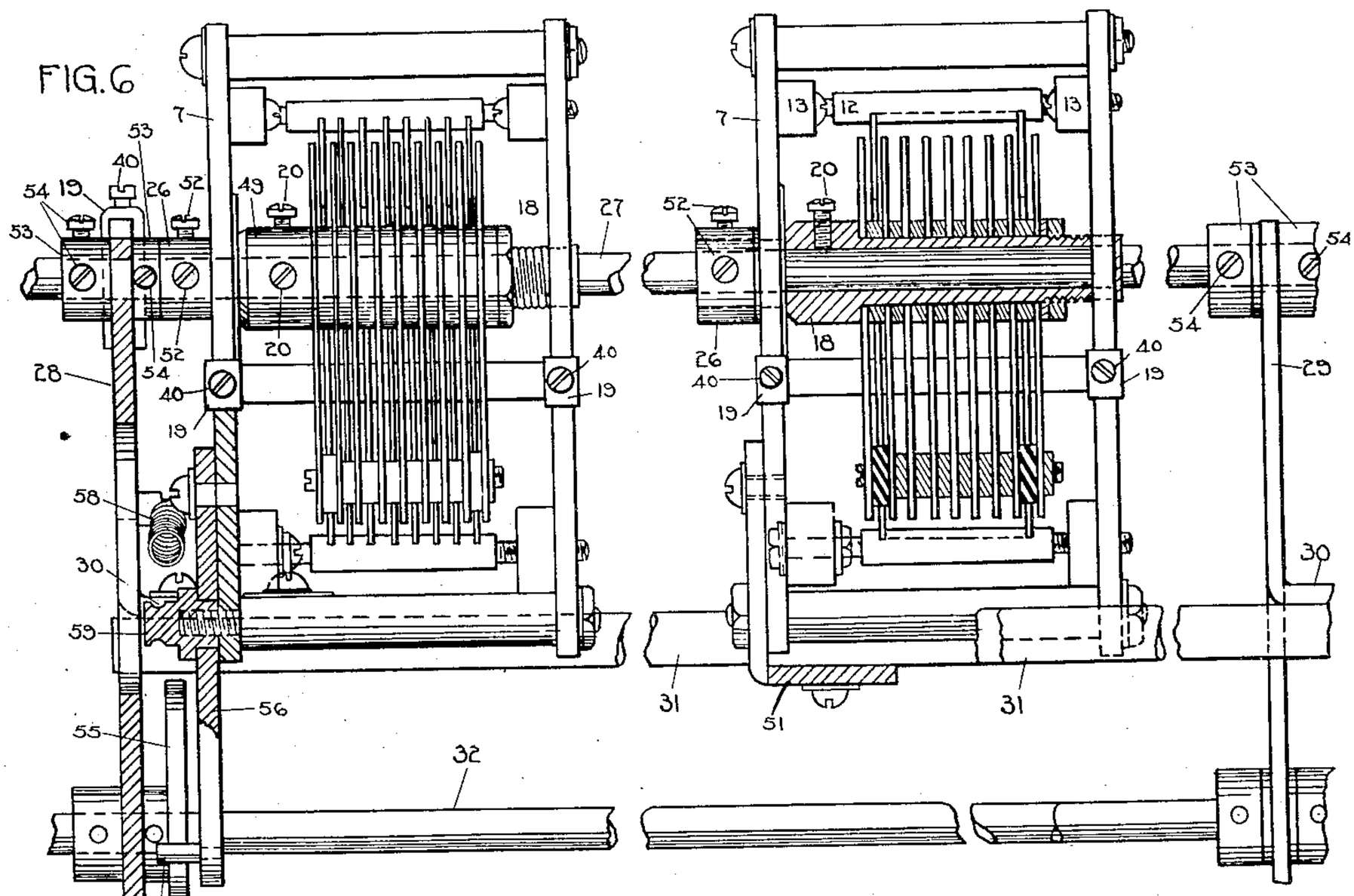
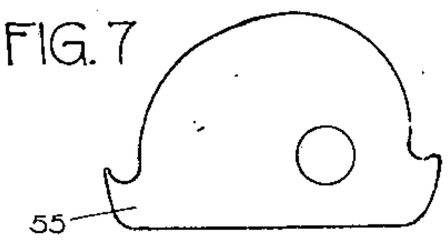


FIG. 7



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Patented June 14, 1927. 1,632,488

UNITED STATES PATENT OFFICE.

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VARIABLE CONDENSER.

Application filed November 24, 1924. Serial No. 751,889.

This invention relates to variable electrical condensers.

In former variable electrical condensers it has been customary to make the free end of the rotor shaft for mounting the dial or other controlling means of some standard fixed length, so that if it is used with panels of widely different thicknesses, certain means has been necessary to compensate for these inequalities. Furthermore when such a condenser unit is employed in a multi-unit condenser, it has been difficult to adjust the rotor plates of the several units, so that the rotation of the common shaft with its rotor units produces an equal change in capacitance in each of the condenser units.

One of the features of the present invention resides in the arrangement of parts whereby the condenser lends itself readily to mounting on panels of various thicknesses.

Another feature of this invention resides in the provision of means whereby the several rotor elements of a plurality of condenser units in a multi-unit condenser may be readily adjusted on a common shaft.

An additional feature of the invention appears in the design of various parts, whereby the condenser is efficient electrically, sturdy mechanically, as well as simple to manufacture and capable of accurate adjustment.

In the drawings Fig. 1 represents a top view of a single variable condenser which is herein referred to as a condenser unit. In this view certain of the parts have been broken away to disclose more clearly the detail arrangement. Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1, looking in the direction of the arrows. Fig. 3 is a view of one of the rotor plates, while Fig. 4 is a view of a stator plate. Fig. 5 shows a view of a side piece of the frame. Fig. 6 is a side view with certain parts omitted, showing several condenser units mounted to form a multi-unit condenser. Fig. 7 shows a detail view of a cam.

Referring to Fig. 1, 7 represents two side members, the outline of which is shown in Fig. 5. Each side member has cut-out portions 8 and pairs of threaded openings 9, on two of its sides, as shown in Fig. 5. Two blocks of insulating material 10, preferably of hard rubber, are supported across the openings 8, by means of screws 11, passing through the openings in the blocks of insulation into the threaded holes 9. A plurality of thin metallic plates 12, of substantially the outline indicated in Fig. 4 are mounted in notched metallic strips 13. Each plate 12, is inserted in a notch in each of the blocks 13 and a portion of the block 13 is forced into openings 14, to lock the plate in engagement with the block. Each block 13, as shown in Fig. 1, has two restricted end portions, one of which is threaded, which portions are mounted in openings in the blocks of insulation 10. Nuts and lock washers 16 engage two sides of the lower blocks 10, of Fig. 1, so that the stator plates 12 may be adjusted as a unit with respect to the rotor plates which will be referred to later. It will be noted that only one lock nut 16, of each pair, is shown, the second lock nut of each pair being concealed, since it lies in the plane of the lower side member 7.

Each of the side members 7 is provided with a spring bearing shown in Fig. 5. This bearing is formed by cutting an elongated opening in the frame member 7, to provide a long spring element 17. At a point intermediate of the length of this element there is located a semi-circular cut-out portion registering with a similar cut-out portion of the main part of the member 7, which together define a circular opening to receive a hollow shaft, such as 18. A U-shaped saddle 19, is secured to the main portion of the frame 7, near the free end of spring element 17, in any well known manner, while a set screw 40 is threaded into an opening in the saddle 19, so that the relation between the spring element 17 and the main portion of the frame 7 is adjustable. By this means, when shaft 18 becomes loose in the bearing, the screw may be adjusted to force the spring element 17 toward the main portion of the frame.

A hollow shaft 18 is provided with a shoul-

der 49 threaded to receive a set screw 20 and with a cylindrical portion threaded at one end on which a series of metal rotor plates 21 of the configuration, shown in Fig. 3, are mounted in spaced relation by means of metal spacers 22. Lock nuts 23 hold the rotor plates and spacers against the shoulder 49. A bolt 24 threaded through the openings 25 of the plates 21 and a series of spacer washers 50 and 51, serve to hold the free ends of the plates 21 in fixed relation. The circular spacers 50 formed of insulation and appearing at each side of the rotor unit are of larger diameter than spacers 51 and are arranged to engage the edges of two stator plates to limit the rotation of the rotor unit in one direction. A collar 26 clamped to the lowermost end of the shaft 18, as shown in Fig. 1, holds the rotor unit against end play while a leaf spring 27 frictionally holds the rotor unit in the position to which it has been adjusted. A stub shaft 60 is adjustably held in the hollow shaft 18 by a set screw 20, so that it may be extended various distances beyond the lower frame member 7. A stub shaft of greater length than that shown at 60, may be adjusted to extend from either side of the condenser.

In the modified form of the invention, a multi-unit condenser shown in Fig. 6 consists of a plurality of condenser units such as that shown in the preceding figures. This multi-unit condenser with the exception of the structural differences of the condenser unit may be substantially similar to the multi-unit condenser in applicant's co-pending application Serial No. 693,382, filed February 16, 1924. In the present multi-unit condenser, a plurality of condenser units are mounted in parallel relation on the common shaft 27, by inserting this shaft through the hollow shafts 18 of the condenser rotor units and then locking these rotor units in place by set screws 20. These units thus secured on the shaft 27 are mounted in a frame consisting of uprights 28 and 29 provided with brackets such as 30, to which side-bars such as 31 are secured to hold the uprights in spaced relation. The collars 53 secured to the shaft 27, by means of set screws 54, engage the sides of the uprights 28 and 29 to hold the shaft 27 against longitudinal movement. The uprights 28 and 29 are provided with two sets of spring bearings, such as shown and described in the preceding figures. One of these sets of bearings receives and supports the shaft 27 and the other set of bearings supports a second shaft 32, as will be further described. The stator element of the condenser unit at the right of Fig. 6 is secured in fixed position to one of the side-bars 31, by means of a bracket 51 fastened to the side-bars and to the frame 7 of this unit.

The stator element of the condenser unit at the left of this figure is mounted for limited rotation on the hollow shaft 18. This rotation is controlled as follows: The shaft 32 carries a cam 55, with which a pin 57 on arm 56 of the left hand frame member 7 is arranged to engage. A spring 58 secured to a bracket on the upright 28 and to a projection 59 carried by the frame member 7 of the stator unit, tends to rotate the stator unit in a clock-wise direction. This motion is limited by the pin 57 engaging the cam 55.

When it is desired to rotate the stator unit the shaft 32 is turned by a dial or other well known means (not shown) and the spring 58 holds the pin 57, carried by the arm 56 of the stator unit on the surface of the cam 55. In this way the rotation of the stator unit is limited and determined by the cam 55. In this multi-unit condenser the rotation of the shaft 27 simultaneously rotates the rotor units, while the stator units are held stationary. The stator unit at the right of Fig. 6 is held fixed by the frame, but the stator unit at the left of this figure is mounted for limited movement in the manner already described, so that the capacitance of both of the condensers may be adjusted to exactly the same value, even if the various elements of the condensers or connected circuits possess slight variations due to manufacturing.

While Fig. 6 shows only two condenser units, it will be understood that one or more units similar to that shown at the left of this figure may be provided. The stator units of any additional condenser units must be mounted for limited rotation in the same manner as the unit shown at the left of Fig. 6. For each unit there must be provided a shaft, such as 32, carrying a cam similar to 55 and each stator unit must be provided with an arm, such as 56 and a pin similar to 57 with a controlling spring such as 58. The manner in which three condenser units are mounted in one structure will be apparent from applicant's mentioned co-pending application.

What I claim is:

1. In an electrical condenser, a frame provided with two bearings in alignment, a stator unit secured to said frame, said unit consisting of a plurality of spaced metal plates in conducting relation, a hollow shaft mounted in said bearings, a drive shaft mounted within and adjustably coupled to said hollow shaft, and a plurality of spaced rotor plates in conducting relation secured on said hollow shaft, said hollow shaft and its rotor plates being movable with respect to said stator plates.

2. In an electrical condenser, a frame provided with two spaced bearings in alignment, a stator unit secured to said frame, said unit consisting of a plurality of spaced metal plates in conducting relation, a hollow shaft mounted in said bearings, a plu-

rality of spaced rotor plates in conducting relation secured on said hollow shaft, said hollow shaft and its rotor plates being associated with and movable with respect to said stator plates, and a drive shaft inserted within said hollow shaft and fastened thereto.

3. In a multi-unit condenser; a frame, a main shaft rotatably mounted in said frame, a plurality of rotor units mounted on said main shaft, each rotor unit comprising a hollow shaft, a plurality of metal plates secured to said hollow shaft, and a stator unit associated with each rotor unit, each stator unit consisting of a plurality of spaced metal plates, at least one of said stator units being rotatable on the hollow shaft of its associated rotor unit.

4. In a multi-unit condenser; a support, a main shaft rotatably mounted in said support, a plurality of rotor units, each rotor unit consisting of a hollow shaft, and a plurality of spaced metal plates secured thereto, the hollow shaft of each rotor unit being adjustably mounted on said main shaft, and a stator unit associated with each rotor unit, each stator unit consisting of a plurality of spaced metal plates in conducting relation, at least one of said stator units being rotatable on the hollow shaft of its associated rotor unit.

5. In a multi-unit condenser; a support; a main shaft rotatably mounted in said support; a plurality of rotor units, each rotor unit consisting of a hollow shaft, and a plurality of spaced metal plates secured thereto, the hollow shaft of each rotor unit being adjustably mounted on said main shaft, and a stator unit associated with each rotor unit, each stator unit consisting of a plurality of spaced metal plates in conducting relation, at least one of said stator units being rotatably mounted on the hollow shaft of its associated rotor unit.

6. In a multi-unit condenser; a plurality of spaced supports; a main shaft rotatably mounted in said supports; a plurality of condenser units; each of said condenser units consisting of a frame, a stator unit in said frame composed of spaced metal plates, a hollow shaft mounted in said frame, spaced rotor plates secured to said hollow shaft for movement with respect to said stator unit; said rotor plates and said hollow shafts being secured to said main shaft; one of said stator units being secured in fixed relation to said supports, a second stator unit rotatable about said main shaft, and means for causing limited rotation of said last mentioned stator unit.

7. In an electrical condenser, a frame having two uprights with bearings formed therein in alignment, a stator unit insulatedly secured to said frame, said unit consisting of a plurality of spaced metal plates in conducting relation, a hollow shaft mounted in said bearings, and a plurality of metal plates in conducting relation secured on said shaft, said shaft and its rotor plates being adjustable with respect to said stator plates.

8. In an electrical condenser, a frame having two metal uprights with portions cut out to form a spring bearing, a stator unit insulatedly secured to said frame, said unit consisting of a plurality of spaced metal plates in conducting relation, a hollow shaft mounted in said bearings, a plurality of spaced metal plates in conducting relation secured on said shaft, said shaft and its rotor plates being rotatable with respect to said stator plates, and saddles for varying the adjustment of said spring bearings.

9. In a multi-unit condenser; a frame, a main shaft rotatably mounted in said frame, a plurality of rotor units secured on said shaft, each rotor unit comprising a hollow shaft and a plurality of metal plates secured thereto, a stator unit associated with each rotor unit, each stator unit consisting of a plurality of spaced metal plates in conducting relation, at least one of said stator units being arranged for rotation about the hollow shaft of its associated stator unit.

10. In a multi-unit variable condenser, a frame including spaced uprights having bearings a main shaft rotatable in certain of said bearings, a plurality of rotor units secured in spaced relation on said shaft, each rotor unit consisting of a hollow shaft having a plurality of rotor plates secured thereto, said main shaft being threaded through said hollow shafts, a stator unit insulatedly associated with each of said rotor units, at least one of said stator units being mounted for rotation on said hollow shaft, a second shaft mounted in certain of the bearings of said uprights, a cam secured on said last mentioned shaft, an arm secured to said last mentioned stator unit and having a portion in engagement with said cam, whereby the rotation of said second shaft tends to rotate said last mentioned stator unit.

11. In an electrical condenser, a frame provided with two bearings in alignment, a stator unit rotatably mounted in said frame, said unit consisting of a plurality of spaced metal plates in conductive relation, a rotor unit consisting of a plurality of conductively connected and spaced metal plates, secured to a hollow shaft, said hollow shaft being rotatably mounted in said bearings, a drive shaft, adjustably connected to said hollow shaft, and means for rotating said stator unit.

12. In a multi-unit condenser; a plurality of spaced supports; a main shaft rotatably mounted in said supports; a plurality of condenser units; each of said condenser units consisting of a frame, a stator unit composed of spaced metal plates mounted in

said frame, a hollow shaft rotatably mounted in said frame, spaced rotor plates secured to said hollow shaft for movement with respect to said stator unit; said rotor plates and said hollow shafts being secured to said main shaft; one of said stator units being secured in fixed relation with respect to said supports; another stator unit being rotatable about said main shaft; and means including a cam for effecting limited rotation of said last mentioned stator unit.

In witness whereof, I hereunto subscribe my name this 19th day of Nov., A. D. 1924.

RAY H. MANSON.

CERTIFICATE OF CORRECTION.

Patent No. 1,632,488. Granted June 14, 1927, to

RAY H. MANSON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 93, claim 9, for the word "stator" read "rotor"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2nd day of August, A. D. 1927.

Seal.

M. J. Moore,
Acting Commissioner of Patents.