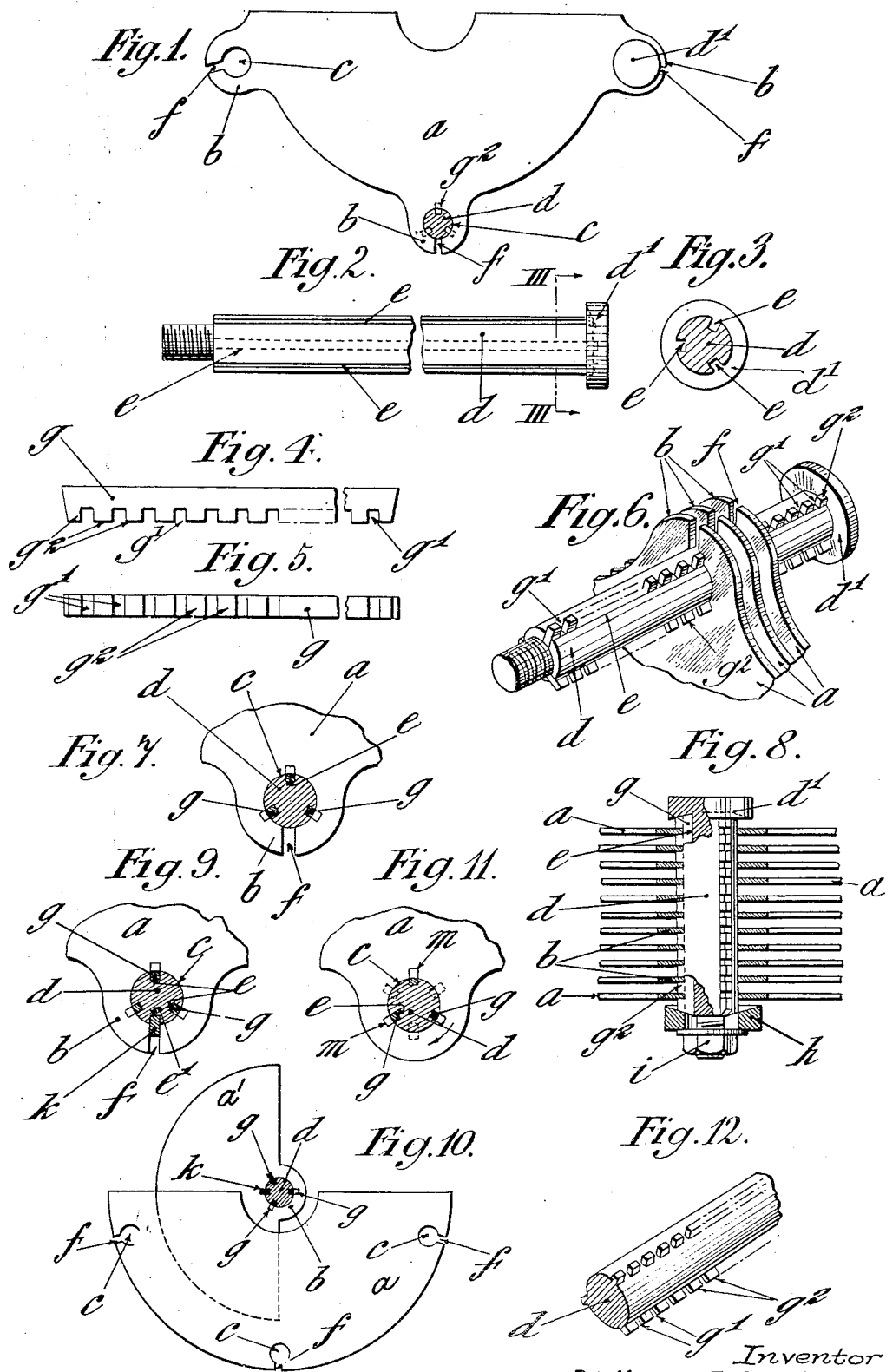


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ELECTRICAL CONDENSER

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UNITED STATES PATENT OFFICE.

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ELECTRICAL CONDENSER.

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This invention relates to improvements in the construction of electrical condensers whereby the structure of such devices is rendered exceedingly stable and their manufacture facilitated.

For this purpose, in an electrical condenser according to this invention, the parallel condenser plates in the stationary set, or in the rotary set, of such plates, or in each of such sets of plates, are held in spaced relationship to one another by successive wards or teeth associated with and projecting from one or more pins, spindles or bolts extending through the set of plates at right angles thereto. The pin, spindle or bolt, or each pin, spindle or bolt (hereinafter referred to as a bolt) may be provided with one or more rows of successive wards or teeth, which, or each of which, may be formed on a flat stem or feather piece inserted through radial slots cut in the outer peripheral portion of the plates and into a longitudinal groove cut in the bolt, and the wards or teeth caused to pass between the plates by partial rotation of the bolt. Or the row of successive teeth, or each row of successive teeth, may be formed on a feather piece fixed in a longitudinal groove in the bolt, or to be formed on the bolt, and the holes in the set of condenser plates through which the bolt extends, be formed with one or more radial slots extending outward from the inner periphery of the holes and through which the row or rows of teeth are passed, the bolt being then partly rotated to bring the teeth between the plates. The bolt, or each bolt, may, in each case, be finally fixed in position to prevent its afterwards accidentally rotating.

The invention can be carried into practice in various ways some of which will now be described with the aid of the accompanying drawings, wherein Fig. 1 represents in plan, a set of fixed condenser plates embodying one arrangement of means for securing them together in spaced relationship. Figs. 2 and 3 show respectively in side elevation and cross section, one of the grooved securing bolts used therewith. Figs. 4 and 5 show in side and edge view respectively, one of the feather pieces with a row of teeth thereon. Fig. 6 is a perspective view showing a bolt with toothed feather pieces and condenser plates. Fig. 7 shows part of a condenser plate and a bolt with toothed feather pieces in operative position, the bolt and feather

pieces being shown in cross section. Fig. 8 shows in section, a set of condenser plates with bolt and notched feather pieces. Fig. 9 shows in cross section, a modified construction of longitudinally grooved bolt. Fig. 10 shows in plan, a rotary set of condenser plates with spacing means according to the invention, associated with a modified set of stationary condenser plates adapted to be connected together according to the invention. Fig. 11 shows in plan, a modified arrangement, and Fig. 12 is a perspective view, showing a bolt with rows of teeth formed thereon. The figures are drawn to different scales.

Referring to Figs. 1 to 8 inclusive, the set of stationary condenser plates *a* is formed with peripheral lugs *b* having holes *c* therein through each set of which a bolt *d* extends, as indicated at the bottom and at one side of the set of plates shown in Fig. 1, the hole at the other side of the set of plates being, for clearness, shown without a bolt, each bolt being a sliding fit in its corresponding set of holes. Each bolt *d* is formed, as by means of a rotating saw or milling cutter, with a number of longitudinal grooves *e* spaced at a convenient distance apart around the bolt. Each lug *b* is provided with a radial slot *f* extending from its outer edge to the inner edge of the hole *c*, such slot being wide enough to allow of each of a number of flat feather pieces *g* being passed through it, and into one of the longitudinal grooves *e* in the corresponding bolt *d*, the radial width of the feather-piece being such that it will extend into the groove *e* and outward beyond the cylindrical surface of the bolt and partly into the set of slots *f*. Each feather piece is notched, as for example, by means of a gang or set of milling saws or cutters, in such manner as to form parallel sided notches *g*¹ separated by teeth *g*², each notch corresponding in width to the thickness of each condenser plate *a* and the depth of each tooth *g*² corresponding to the desired depth of the space between the plates.

The feather pieces *g*, used, are, or can be, milled or otherwise formed in batches so that they will all be alike. When one of the toothed feather pieces *g* has been inserted through the set of slots *f* in one set of lugs *b* and into one of the grooves *e* in the bolt *d* as set forth, the bolt is partly rotated so as to bring the projecting wards

or teeth of the feather piece between the plates *a*, and the next groove *e* in the bolt opposite the set of slots *f*. A second feather piece *g* is then introduced in like manner to the first one, through the set of slots *f* and into the second groove *e* in the bolt *d* which is again partly rotated as before for a similar purpose, the operation being repeated for the insertion in place of a third feather piece and the bolt again partly rotated. A collar *h* (Fig. 8) adapted to slide or screw on the said bolt and which may have a conical end face, serves to prevent axial movement of the feather pieces, and if these are formed with a sloped or chamfered end as shown, the said collar will serve to force the feather pieces firmly inwards and press them in the bolt grooves *e*. The underside of the head *d*¹ of the bolt may also be grooved and formed with an inclined surface, as shown in Fig. 8, to assist in forcing the feather pieces into the grooves in the bolt. The collar *h* may be threaded internally to run on a screw thread formed on the bolt, or may be retained in place by other known means, for example a nut *i*, as shown. When the bolt has been turned into its final position, the wards or teeth *g*² on the feather pieces *g* lying between the condenser plates or vanes *a* may be compressed or indented transversely, by the toothed jaws of a pincer adapted to pass between the said plates, such compression or indentation causing the wards or teeth referred to, to expand slightly in the direction of the bolt axis and to clamp the condenser plates firmly in place.

When the bolt is in the final position, an unnotched feather piece or locking key *k* (Fig. 9) may be inserted through the set of slots *f* in the lugs *b* and into an additional groove *e*¹ in the bolt *d* to prevent the latter rotating. Solder may be applied to the component parts arranged as herein described, in order to ensure a low contact resistance between the several parts.

A bolt *d* having only one longitudinal groove *e* and one feather piece *g* may be used if desired for each set of lugs *b*.

When the same method of spacing and fixing the condenser plates is applied to the set of rotary plates or vanes of a variable condenser, as is shown in Fig. 10, the bolt *d* used therefor may constitute the spindle by which said set of blades is rotated. Three notched feather pieces *g* and one unnotched feather or locking piece *k* are in this arrangement also desirable. Fig. 10 also shows the set of rotary plates or vanes *a*¹ associated with a set of stationary plates or vanes *a* adapted to be connected together as hereinbefore described, but in which the holes *c* for the bolts *d* are arranged within the circular periphery of the plates.

In the alternative arrangement of spac-

ing and fixing means, shown in Fig. 11, the set of condenser plates *a* is formed with one or more sets of co-axial circular holes *c* to receive, or each to receive, a bolt *d* and from the inner periphery of each hole one or more short radial notches *m* extend outwards. The bolt *d* passed through the hole carries a number of notched feather pieces *g* equal in number to the radial notches *m*, three are shown, such feather pieces being inserted in longitudinal grooves *e* formed in the bolt. The assembly of the blades *a* is made by sliding the bolt *d* with attached toothed feather piece *g* through the hole *c* and notches *m* and by then rotating the bolt, the teeth or wards on the feather pieces will be interposed between the plates. The teeth or wards may then be swelled in place, axially, by transverse compression, as hereinbefore set forth.

Alternatively, the bolt and feather pieces may be formed in one piece by extrusion of a rod of the appropriate cross section and the continuous feather pieces, say for example, three in number, be cross notched or toothed by gang mills or saws, practically without injury to the cylindrical surface of the bolt, so as to form a bolt with rows of teeth *g*² as shown in Fig. 12.

What I claim is:—

1. An electrical condenser comprising a plurality of plates, a rotary member extending through said plates at right angles thereto and formed with longitudinal grooves and feather bars each extending into a groove in said rotary member and formed with a row of wards disposed between and spacing said plates apart, said plates, member and wards being secured in fixed relationship to one another.

2. An electrical condenser comprising plates each having a hole therein of irregular form, a member adapted to be inserted in the holes of such plates, and ward means adapted also to be received by said holes, capable of being displaced by rotational movement of the member aforesaid so as to occupy spaces between the plates.

3. An electrical condenser comprising plates each having a hole therein, a longitudinally grooved member adapted to be inserted in the holes of such plates, and feather means provided with wards fitted partially within such grooved member, said wards being adapted to enter spaces between the plates.

4. An electrical condenser comprising a plurality of plates each having a circular hole therein and a slot extending radially from said hole, a longitudinally grooved bolt extending through the holes in the plates and rotatable therein and a feather bar formed with a row of wards adapted to be received by the grooved in the bolt and by the slots in the plates, the wards being

subsequently caused to enter spaces between the plates by rotating the bolt.

5 An electrical condenser comprising a plurality of plates each having a circular hole therein and an open ended slot extending radially from the edge of the plate to the hole, a longitudinally grooved bolt extending through the holes in the several plates and rotatable therein and a feather bar formed with a row of wards adapted to be inserted with a lateral movement simultaneously through the collective slots of the plates and into the groove in the bolt, leaving only the wards projecting therebeyond, 10 the bolt by subsequent rotation moving the wards to enter spaces between the plates.

6. An electrical condenser comprising plates each having a circular hole therein and a slot extending radially from said hole, 20 a bolt having a number of grooves formed longitudinally therein, a plurality of feather bars each formed with a row of wards, said bars being introduced to the grooves in the bolt by successively bringing such grooves 25 into register with the slots in the plates, the turning of the bolt, after insertion of each feather bar, causing the wards to enter spaces between the plates.

7. An electrical condenser comprising a plurality of plates each having a circular hole therein and an open ended slot extending radially from the edge of the plate to the hole, a bolt having a number of grooves formed longitudinally therein, a plurality of feather bars each formed with a row of wards, said bars being inserted with a lateral movement successively through the collective slots of the plates into the grooves upon turning the bolt so as to bring the bolt grooves serration into register with the slots aforesaid. 30 35 40

8. An electrical condenser comprising plates each having a circular hole therein and a slot extending radially from said hole, a bolt having a number of grooves formed longitudinally therein, feathered ward means adapted to be introduced through the slots in the respective plates so as to be operatively connected to the bolt for rotation by the latter and a feather similarly adapted to be introduced through the slots aforesaid but serving to lock the bolt against rotation. 45 50

Signed at London, England, this twenty-seventh day of August, 1926.

WILLIAM JOHN RICKETS.