

drawn, and the whole shellacked and allowed to dry. Care must be taken to keep the tape and insulation perfect—the cotton covering must not be frayed.

To connect the wires to commutator, slip it on shaft tight against nuts *z, z*, scrape the cotton covering from the wires where they go into slot, take the end of

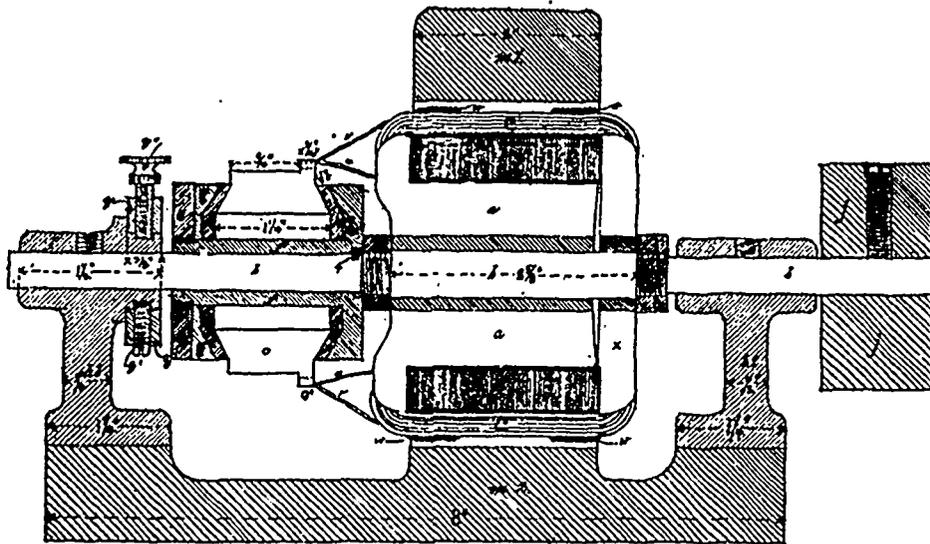


FIG. 2.  
CROSS SECTION.

The commutator, *e, f, g, k* and *o*, Figs. 2, 3 and 6, is formed of wedge-shaped slips of brass, *o* with mica  $\frac{3}{32}$  inch thick between; the lugs *o'* are slotted to receive the two No. 24 wires and room for soldering same. The brass segments, *o*, and the mica insulation, are held together by the core *f* and collar *g* tightly pressing against the segments the insulating cone-shaped rings *k, k*, of fibre or vulcanite, the

coil No. 18 and the beginning of coil No. 1, place them together in the slot that is directly opposite them in segment *o*, solder them, allowing no solder to touch anywhere but in the slot, then take the end of coil No. 1, and the beginning of coil No. 2, place them in the next slot, soldering them; continue thus around the commutator until all the coils are connected. Be sure no solder is touching the coils or other parts of the machine.

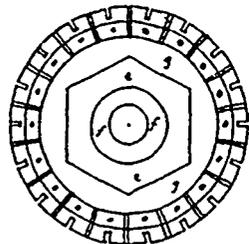


FIG. 3.  
END VIEW OF COMMUTATOR.

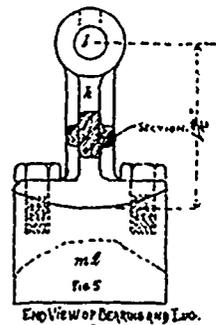


FIG. 5.  
END VIEW OF BEARING AND LUG.

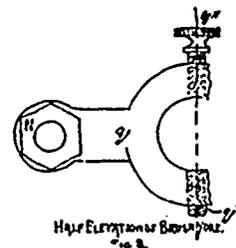


FIG. 6.  
HALF ELEVATION OF BRUSH YOLE.



FIG. 4.  
SECTION OF BRUSH HOLDER.

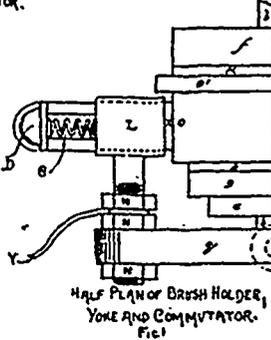


FIG. 1.  
HALF PLAN OF BRUSH HOLDER,  
YOKE AND COMMUTATOR.

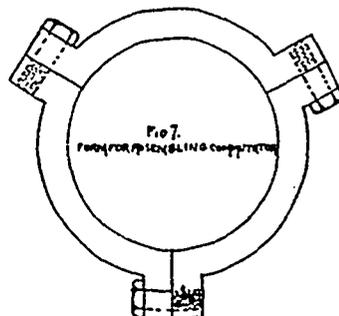


FIG. 7.  
FORM FOR ASSEMBLING COMMUTATOR.

pressure being obtained by hexagonal nut *e*. The core *f*, collar *g* and nut *e* may be of brass or cast iron. The segments, *o*, are so wedged that except by a severe blow they will not be dislodged. The core *f* is bored to fit shaft and slotted to receive pin *r*, which prevents it from slipping. A form for assembling the commutator is shown in Fig. 7; it is composed of three pieces held by screws, is turned a trifle larger inside than the finished size of commutator; the screws are loosened and the mica and brass segments are placed evenly in, and when the twenty segments are in with the mica separating same, the screws are tightened; it is chucked in the lathe, the ends are turned to the proper bevel; then the washers *k, k*, core *f*, end *g* and nut *e* having previously been prepared, are placed upon the segments and tightened, as shown; the form (Fig. 7) is removed, and the surface of *o* turned on its own shaft.

Cut the wires off flush with lugs and turn them smooth.

The field is composed of wrought iron yokes (*y*, Fig. 1)  $3\frac{5}{8}$  inches long,  $1\frac{1}{2}$  inches diameter, turned down to  $1\frac{1}{4}$  inches where they fit into pole pieces. Lowmoor iron is to be preferred. The pole pieces are castings (*m 1* and *m 2*, Figs. 1 and 2) of best stove plate iron, cooled slowly so as not to harden. The holes are drilled neat to receive the yokes, *y*, and are fitted with set screws, *s*, to fasten the yokes. The lower pole piece has projecting arms to receive the bearings, which arms are turned to the same diameter as the bore of the field,  $3\frac{5}{8}$  inches. The turning should be carefully done.

The completed armature should be balanced on a pair of level straight edges, and any deficiency made up by fastening small strips of lead on the arms of the spider.