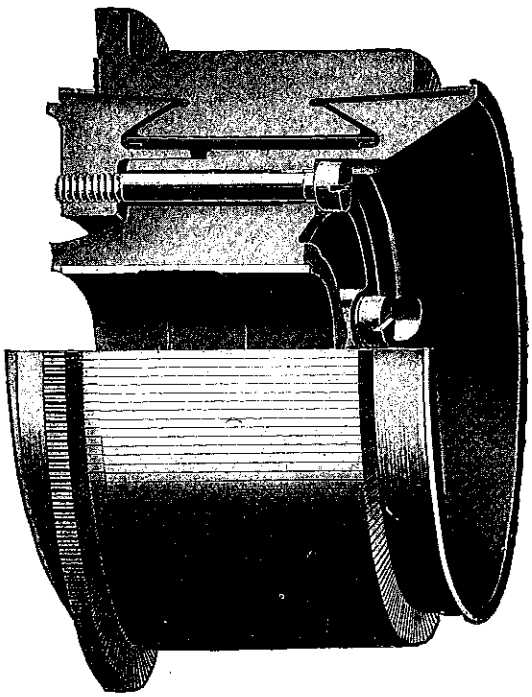
THE REPAIR OF RAILWAY MOTOR COMMUTATORS

G-E railway motor commutators are of either the *bolted* or *ring nut* construction. The bolted type usually has the cap at the back and the shell which presses on the shaft or spider in the front, the two members being held together by bolts. The ring nut type of commutator has the cap in front and the shell in back, the two members being held together by a ring nut threading on the shell which extends through to the front end of the commutator. The commutator ring nut is locked in place by a set screw. When it is necessary to repair either type, the process is very similar after the shell or cap, as the case may be, is removed.



Bolted Type Commutator

Replacement of Segments

Bolted Type Commutator

When replacing the copper segments in bolted type commutators, operations should proceed as follows: Remove thrust collar from shaft and draw a few turns of wire tightly around the commutator to prevent segments from separating during the removal of the shell which frequently entails more or less pounding and jarring. Remove the leads directly connected to the segments to be replaced; remove all of the bolts and pull out the shell; next remove the mica cone; then take off the wire band, drive forward and take out *one* of the segments to be replaced. A new segment should be made using the old one as a template. This should be cut from solid copper since commutator segments are not interchangeable and must be of the same bar gauge or taper as the old segment. Place the two segments together with the bottom edges or thin side even, then lay out and form the new segment from the old one, taking care that the 30 degree and 3 degree angles are exact. Insert new side mica and place the new segment in the commutator. If necessary to replace several segments, proceed, *one segment at a time*, as described above. The mica cone, if not damaged while being removed, should be put back. If it is damaged, insert a new cone. Then press the shell back on the shaft until it is approximately one inch from its original position. Insert the bolts and take them up all around a little at a time to insure that the cap at the back of the commutator is drawn up evenly as the shell is being pressed home. The commutator should next be heated with a gas ring to approximately 115 degrees centigrade and the bolts tightened while it is still hot. It is highly important that the segments be clamped as tightly as possible so they will not loosen in service —test for this by tapping them with a light hammer. After cooling, turn the face of the commutator and regroove if necessary.

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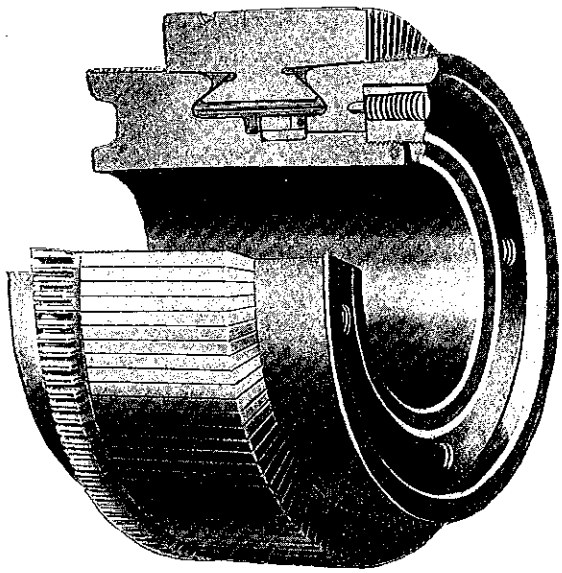


Ring Nut Type Commutator

Replacement of Segments

Ring Nut Type Commutator

In order to replace the segments on a commutator of the ring nut type, remove the thrust collar, band some wire around the segments, and disconnect the coil leads from the segments to be replaced. Take out the set screw and unscrew the commutator nut. Remove the cap and mica cone. Next replace the copper segments as described in the preceding paragraph; reassemble the mica cone and cap; and thread in the nut as far as possible while the commutator is cold. Heat the commutator as described above and tighten the ring nut. Turn the face and regroove if necessary.

Turning the Commutator

Before turning a commutator, a suitable head covering should be made to prevent chips or dust from working into the armature. This is best accomplished as follows: Take a strip of cotton several inches wider than the length of the end connections and long enough to encircle the commutator; wrap it around the commutator, binding the inside edge with cord as closely to the end connections as possible; then turn the cloth up over the latter and bind with cord to the outside of the armature. Make sure that the turning post is so set that the ways are absolutely parallel to the commutator and are securely fastened and braced. Use a side-cutting tool with point ground to about a $\frac{1}{16}$-in. radius. The cutting side and point should be given considerably more rake than is customary for working iron or steel. The tool must be sharp enough to make a clean, smooth cut without dragging copper over the mica.

While turning, the commutator surface should be run at a speed of approximately 300 feet per minute. This is about as fast as a tool will cut without burning. It is important to round off the ends of the copper segments to at least a $\frac{1}{16}$-in. radius with a file while the commutator is in the lathe. If this is not done and sharp corners are left at the ends of the copper segments, the mica is easily broken out and a short circuit may be established by oil and dust at these points.

Commutator Hand Scraper

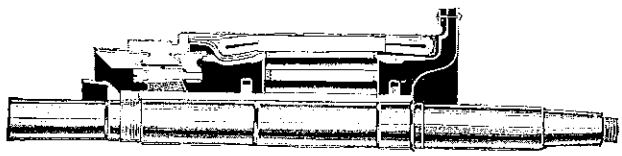
Grooving the Commutator

After turning the commutator, the side mica should be grooved to a depth of approximately $\frac{3}{64}$ of an inch. Refer to G-E Railway Supplies Catalog No. 6002, pages 303 and 304, for commutator grooving machines, to Descriptive Sheet No. 64407.

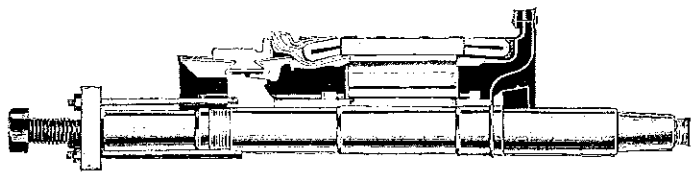
The finishing of the slots left by the grooving saw is an important operation because good commutation and brush wear depend very much upon the condition in which the commutator goes into service. The hand scraper, Cat. No. 775854G1, illustrated above is used for removing mica fins which are left in the slot by the grooving saw. The grooving saw is usually 0.005 of an inch less in thickness than the mica between the commutator segments. The grooving saw generally cuts into the copper and leaves projections which must be removed. A curved triangular file is sometimes used for removing these copper projections, but the removal of a very thin portion of the commutator surface by turning in a lathe is recommended. For this final turning, a special high speed steel tool (trade name No. 3 Stellite) will give good results. The remaining copper burr which projects into the slot on the trailing edge of each commutator segment can be removed by the hand scraper above illustrated. Final polishing with sandpaper will make the smooth surface necessary for good commutation and long brush life.

In making repairs to the commutator, especial care should be taken to keep all parts clean and free from dust and forcign material. Careful work is essential for the best results.

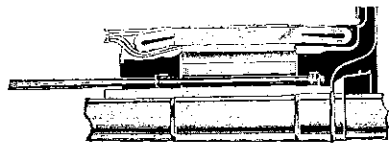
Views of Armature with Bolted Type Commutator



Normal Operating Condition

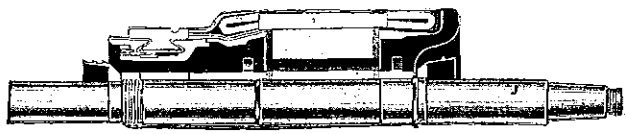


Showing Bolts for Removing Commutator

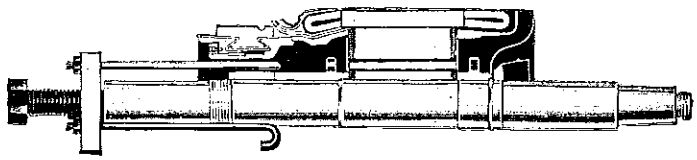


Shaft and Commutator Removed

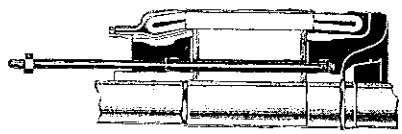
Views of Armature with Ring Nut Type Commutator



Normal Operating Condition



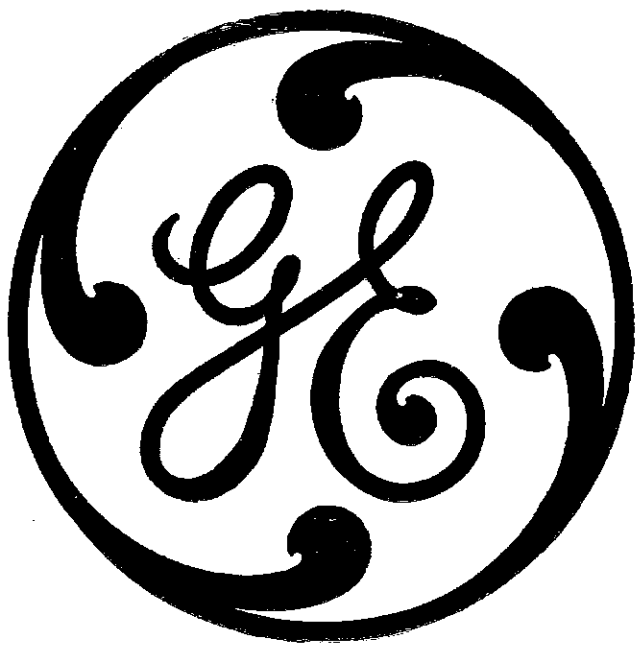
Showing Hook Bolts for Removing Commutator



Shaft and Commutator Removed

Removal and Replacement of Complete Commutators

In case the commutator as a whole must be replaced, the above illustrations show methods of removing it from the shaft for both the bolted and the ring nut types of commutators. Note the bolts used for clamping the core laminations together while the armature nut is removed.



The Initials of a Friend