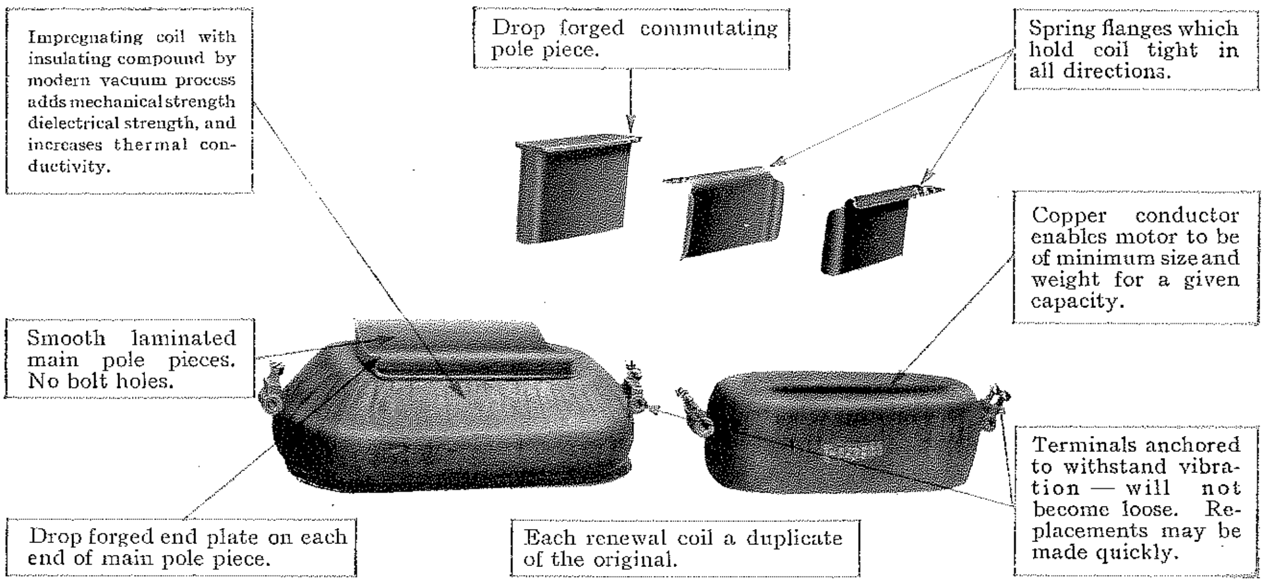
Railway Motor Field Coils



Field Coils, Pole Pieces and Spring Flanges

In general, G-E railway motors are equipped with the *mummy type* field coils but in some instances among the older motors the *spool type* construction is utilized. This latter consists of a metal spool with strip or round conductor. The term "mummy" denotes a coil which is form wound and completely wrapped with insulating material.

INSULATION

After the coil (either mummy or spool type) has been wound, it is filled with an asphaltum compound by a vacuum pressure process. The compound penetrates all the interstices of the winding, hermetically sealing the coil against the entrance of moisture and so improving its thermal conductivity that the heat generated is rapidly dissipated.

The mummy type of coil, after impregnation, is dipped in heavy insulating varnish and given a number of wrappings, half lapped, of wet varnished cambric. The number of wrappings depends upon the voltage for which the coil is designed. The coils are then wrapped with heavy cotton webbing, half-lapped, and given several dippings in black baking varnish, a baking period following each dipping —some of the smaller coils are wrapped with stay binding instead of cotton webbing—the coils thus produced have very high insulation resistance and are impervious to moisture.

CONDUCTOR

Copper conductor is used in all G-E railway motor field coils. Its advantages over other conductors are that it allows the motor to be of minimum size and weight for a given capacity. Aluminum, for example, is lighter in weight but must be approximately 59 per cent larger in cross section for the same conductivity. Such increase in size would necessitate the use of a larger magnet frame and larger pole pieces. The increased weight of these parts would more than offset the reduction in weight of the coils themselves.

Ask our nearest office for complete information

General Electric Company, Schenectady, N. Y.

SALES OFFICES IN ALL LARGE CITIES

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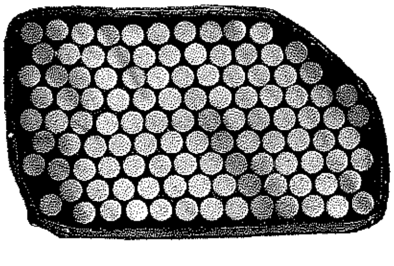
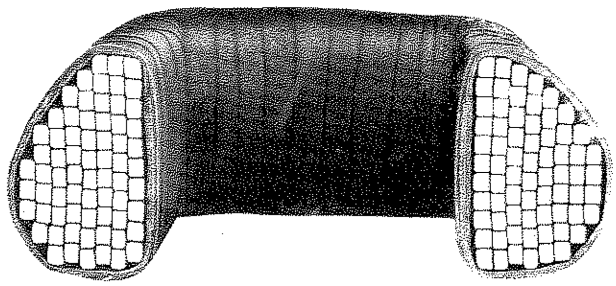


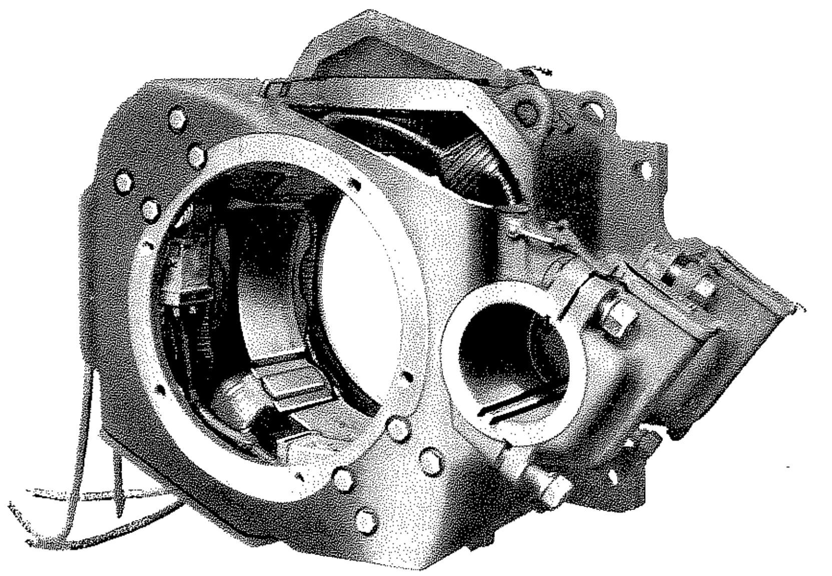
Round Conductor



Rectangular Conductor

The question of using aluminum field coils for replacements in existing motors is one which should be decided upon only with full knowledge of the motor design. In any case, the use of aluminum field coils does not obtain maximum capacity from the motor. It may be possible in an extremely small number of cases to use rectangular conductor aluminum insulated between turns by an oxide film instead of round conductor copper with thicker insulation and retain the same field strength and same resistance. In such cases, the use of rectangular conductor copper coils would actually increase the capacity of the motor, while the use of aluminum coils may actually reduce the capacity.

Most modern railway motors are designed with rectangular copper conductor field coils. No space is available around the coils except that necessary for proper ventilation. Aluminum field coils substituted in these motors must be of higher resistance or have a smaller number of turns. If the number of turns is affected, the field strength and speed of the motor is changed and commutation troubles may be expected. If the resistance is increased, the heat will increase, and the temperature rise in the armature as well as in the field coils may be destructive. Even though aluminum oxide is sufficient insulation between turns, the insulation between conductor layers and on the outside of the coil must be of higher dielectric and mechanical strength. Materials of such insulation must be similar to those used on copper coils which are affected by high temperature.



G-E Railway Motor Showing Field Coils in Place

Summarizing the above statements, the following features are embodied in or result from the use of G-E copper field coils.

1. Minimum weight of motor
2. Minimum size of motor
3. Proper ventilation of motor
4. Proper commutation
5. Reliable insulation
6. Minimum heating
7. Long life
8. Few renewals
9. Low initial cost of motor
10. Minimum total cost