sulation, spaced properly, withstands corona attack very well.

The rotor of a turbo-generator is one of the simplest, most rugged structures in the industry. A turbo-rotor consists of edge-wound strap coils with insulation between turns, which are carefully placed, and are held very strictly to tolerances. The coils are spaced properly, they are heavily braced, and the end turns are secured with retaining rings or guards which are lined with insulation.

The auxiliaries which go with turbo-generators are the kid brothers of the turbo-generator family. The smaller machines usually are of voltages of 2300 to 4150 and therefore are not built with continuous mica tape insulation unless there is a special requirement. The insulation usually consists of a sheet of mica which is adequate for the voltage and, depending on whether it is Class A or B, the suitable supporting insulation on the end-turns. On Class A end-turns, varnished cambric is used, while mica tape is used for Class B. In building mica tape, paper cloth or glass is used. These are permissible structural materials under A.I.E.E. definitions and are recognized as such in that they do not deteriorate or carbonize under normal operating temperatures. These materials have been found to be entirely adequate by examination after long service.

Of course we have the "super-dupers" which the chemical industry placed before us in recent years. You might call them "war babies" since wars make progress one way or another (sometimes it is hard to believe) and they have given generously to the insulation field. You have heard of silicones, silastics, teflons, polyethylenes, and mylar (Du Pont product)—some of these are good as insulators, a lot of them have very definite limitations. On some of the powerhouse auxiliary applications where we have terrific ambient temperatures and have experienced short life in the lower temperature insulations, the silicones and silastics are replacing the other insulations and have minimized, and often eliminated, breakdowns. They are premium insulations and, as the advertisements say, "They cost more, but you get more," and that is true with silicones. They are tougher to process; the manufacturers have had a lot to learn. There have be many developmental changes, there are still changes being ma the silicone business, that it is development in production. manufacturer has to do a te amount of work, on the side, a with his regular production, to as user service.

This article has been concer with general-purpose insulation plications; another side of this sto special applications. Cinders and ash are some of the problems countered with rotating equipme and methods to alleviate these g up from the cement industry and problems, 30 years ago. This dustry found that motors had to protected against cement dust. Wh is to be done? Should a hard coat varnish be applied? No! You wa something like a rubber heel—som thing that is resilient. So, from th use of protective coatings we four out how to protect powerhou auxiliaries. Special means are no taken to enclose field windings, wher necessary, in the special applicatior of synchronous motors for power house auxiliaries or for drives in othe parts of the industry.

FAST CLEANING OF SMALL TUBES

THE Elliott Jiffy Gun, a device for automatically applying water or air pressure for the purpose of shooting plugs or brushes through the small tubes of condensers and heat exhangers, was described in an article in the Autumn, 1953, issue of *Powerfax*. While the Jiffy Gun is not new, it has been improved and the introduction of a nylon brush, fitted with rubber bumpers, has greatly improved the effectiveness of this method of cleaning over the use of ordinary plugs.

Here are a few instances of the speeding up of small tube cleaners about which we have heard.

Two buildings in Chicago employed the Jiffy Gun in cleaning the tubes of intercoolers used with 450-ton refrigeration compressors. These intercoolers have 400 to 500 ⅝-in. OD, 18-gage tubes, 14 ft long. In one of the buildings the Jiffy Gun was operated on 45-psi water pressure; the intercooler was cleaned and the end-plates bolted back on in eight hours, whereas previously it had taken two to two-and-one-half days to complete the cleanout (by hand brushing and washing). Incidentally, it was the first time in two years this intercooler had been cleaned. The water pressure is lower than we recommend. One hundred pounds pressure is better and the gun has been used on water pressures up to 200 psi without damaging the brushes.

In the other building, a similar unit was cleaned and the ends closed in approximately 12 hours where formerly it had taken 32 hours to do the job. The tubes were coated with a rather heavy mud deposit, and the 45-psi city water pressure would not fire the nylon brushes through every tube. Therefore, the procedure was to soften the mud in the tubes with water, and then the brushes were shot through the tubes with 80-psi air pressure.