New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Radial-Flow Reaction Turbine

The Brush Electrical Engineering Company, Ltd., London, England, has recently taken up the manufacture of a radial-flow reaction steam turbine designed by Messrs. Birger Ljungström and Fredrick Ljungström, of Stockholm, Sweden. Steam is admitted between two disks and in its travel from their center to the circumference passes between concentric blading rings carried alternately by the two disks. Both disks revolve, driving their shafts at equal speeds but in opposite directions. To each shaft is coupled an electric generator, and at the end of one of the generator shafts is mounted a small exciter for the fields of both machines.

Fig. 1 shows a 1000-kw Brush-Ljungström turbo-generator mounted on a condenser. The lower half of the turbine casing is formed into an exhaust branch, which is bolted directly to the condenser beneath. Springs contained in cast-iron boxes support each generator. The turbine shafts themselves have no bearings; but each is fastened by means of a flange connection to its own generator shaft, the bearings belonging to the latter.

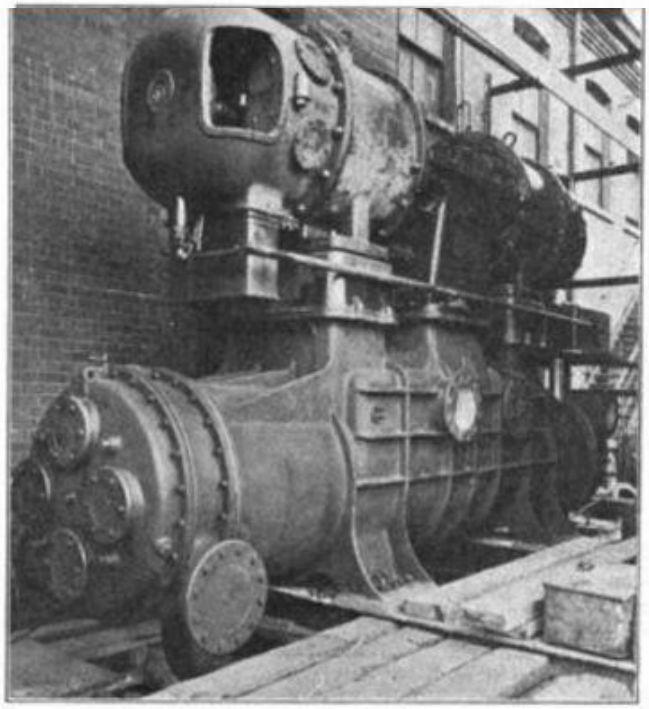

FIG. 1—1000-KW BRUSH-LJUNGSTRÖM TURBO-GENERATOR SET

The turbine is very small, considering the amount of power developed, being only 27.75 in. in diameter and 20.875 in. long. Each turbine shaft is about 10.5 in. long, and the weights of the two running disks complete with blading are 265 lb. and 303 lb. respectively. In Fig. 2 is shown a 1000-kw set with the turbine removed. The two branches of the Y steam pipe can be clearly seen in this illustration.

Each turbo-set is provided with a steel cable held under tension which holds shut an oil relief valve actuating the stop-valve and by means of which the machine can be stopped either automatically by the melting of a fusible metal plug in any of the bearings or by hand with a small lever at the stop-valve. In case this cable breaks, gets loose or is released by the overheating of any of the bearings, the turbine is automatically shut down. An excess-speed device on each generator shaft will also release the cable and cause the machine to stop.

The whole of the turbine is surrounded by exhaust space, so that there is no need, therefore, of lagging the surface of the casing, the temperature of which never exceeds that of the condenser. The absence of a split-iron casing eliminates distortion troubles, and consequently a higher superheat is practicable than is the case with the ordinary reaction turbine.

After "warming up" the machine for about ten minutes the full speed of 3000 r.p.m. can be obtained. When the speed rises to about 1400 r.p.m. the exciting current becomes strong enough to cause the two generators to synchronize themselves automatically and thereafter run electrically as one machine. The automatic synchronization of the machine can be seen by watching the behavior of the switchboard instruments. The fields of the two units are connected in series so that only a single field rheostat is needed. In case one of the generators becomes disabled, it can be bolted to the casing and the other generator can then be operated alone, the result being a reduction in output by one-half and a higher steam consumption per unit.

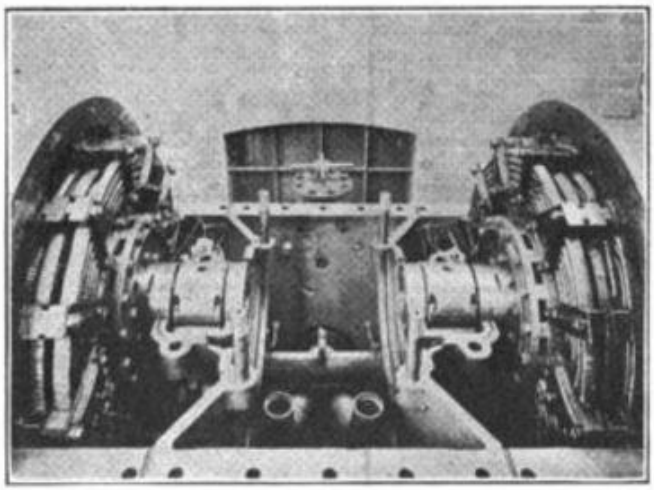

FIG. 2—1000-KW BRUSH-LJUNGSTRÖM SET WITH TURBINE REMOVED