WATERWHEEL GENERATORS

WATERWHEEL generators have recently been built to conform with the rapid development of hydraulic power for driving electric generators. The increased demands for such service require almost infinite combinations of capacity and speed range. Refinement in the design of both generators and waterwheels has made these changes possible; the successful operation of many high-voltage transmission lines and

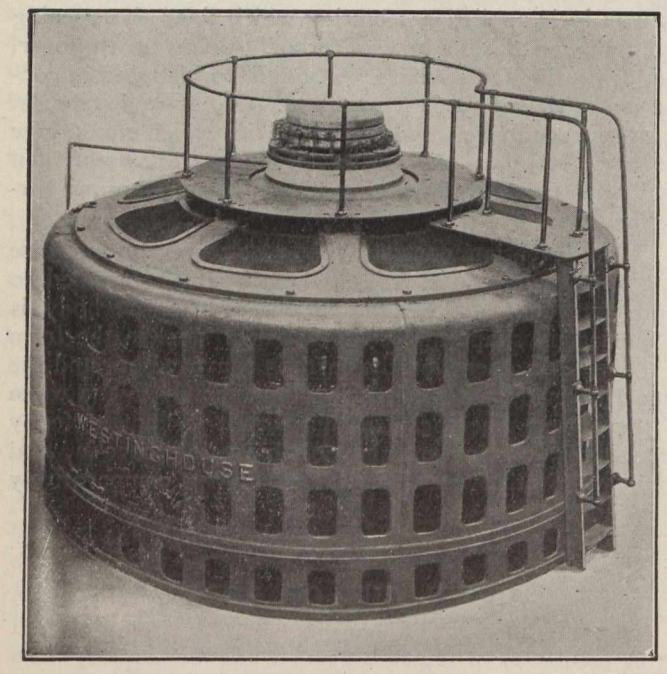

Fig. 1.—A 12,500-Kva., 6,600-Volt, 50-Cycle Generator Complete.

the ever-increasing demand for power, all aid materially in the utilization of many water powers heretofore considered either impracticable or inaccessible.

Two types of waterwheel generators are built—horizontal and vertical—depending upon the local conditions in each case.

Horizontal Type.—The standard horizontal unit is of the two-bearing, coupled type construction; that is, the generator includes shaft, two bearings, and a bedplate usually designed to allow for sliding the stator to one side in case ready access to either the stationary or rotating winding is desired. The stationary frame is made of a strong, rigid iron casting, into which soft steel laminations are dove-tailed and securely fastened.

Ventilating ducts are spaced at frequent intervals across the face of the armature punchings, allowing for perfect ventilation to all parts of the active material.

Form-wound, interchangeable armature coils fit into parallel open slots punched in these laminations, and these coils are held firmly in place by means of fibre wedges. The coils are insulated and impregnated with fabrics and compounds of high insulating qualities.

No single type of construction will meet the varied requirements in rotor design, therefore several well-tested methods are employed. When comparatively low peripheral speeds are encountered a cast-iron spider with bolted-on, or dove-tailed poles, is usually employed. For higher speeds cast steel, or steel plate construction may be used. In the case of very large relatively high-speed machines, the difficulty of securing perfect castings may lead to the well-proven laminated rim structure.

All field poles are made of thin steel laminations riveted together with overhanging pole tips provided to support the field windings.

Field coils are wound of heavy copper strap on edge, insulated in such a way that each individual turn is exposed to the ventilating air, and thus perfect radiation results. The coil is securely fastened between the rotating spider and the tips of the field poles by heavy coil supports.

All parts are carefully inspected during each step in the process of manufacture, and before the succeeding operation is started. When completed, the machine is carefully tested under conditions as nearly identical as possible to those which its future service will demand.

Vertical Type.—Westinghouse standard practice recommends that the generator be fitted with two guide bearings which are supported by brackets fastened to the stator frame. Also, a bedplate or pad on which the stationary part rests.

The roller, or thrust bearing, which supports the weight of the revolving part, may be mounted on top of the generator frame, between generator and turbine, or

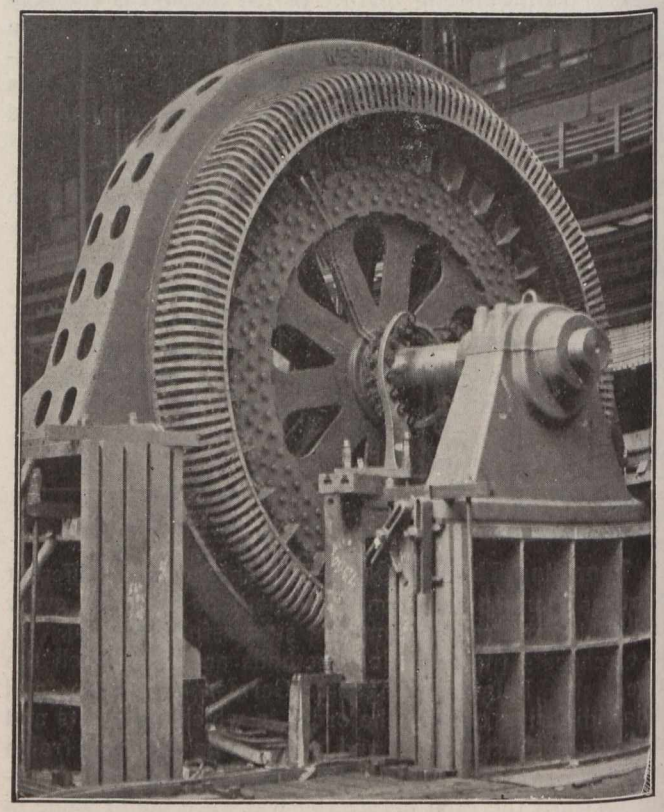

Fig. 2.—A 9,375-Kva., 6,600-Volt Unit, in Shop Testing Rig.

underneath the turbine. In case it is mounted on top of the generator frame, this frame must, of course, be made heavier and more expensive than in cases where it has only to support the stator punchings, winding and guide bearings. Wherever placed, this bearing usually supports not only the rotor of the generator, but also the turbine runner, and in addition takes care of any unbalanced water thrust.

A rigid cast iron frame, into which soft steel laminations are securely dove-tailed, forms the basis of the stator.