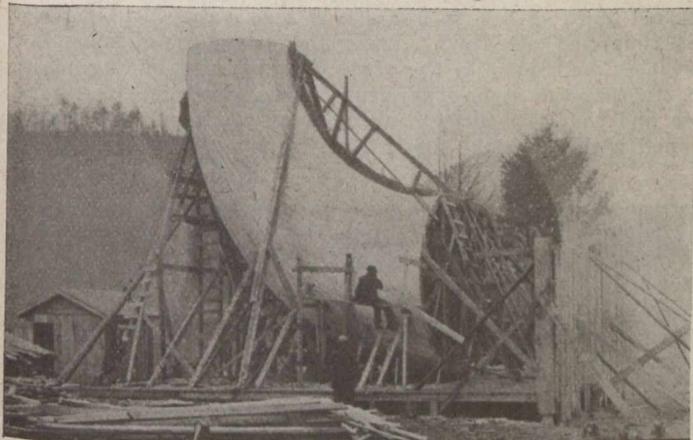


the surge pipe. His party gave line and grade for concrete anchorages and supports for the 5-ft. penstocks and the line for the penstocks themselves.

The fascination of hydro-electric construction lies in the great diversity of work which the engineer is called upon to do, particularly on the construction of the powerhouse. For instance, Mr. B.'s party had first to lay out the location of the powerhouse on the ground, taking advantage of the topography that would involve the least excavation as well as the least concrete and the shortest length of penstocks.

As centre lines are laid down on paper before starting a drawing, so must the field engineer establish his centre lines by means of permanent hubs from which all lines of the construction are referred. At the same time he must establish his bench marks, running his elevations from a known bench from which all elevations are referred. When



DRAFT TUBE FORM BEING LAGGED, APPALACHIAN POWER CO.

these lines and elevations are positively checked, he is ready to start actual construction.

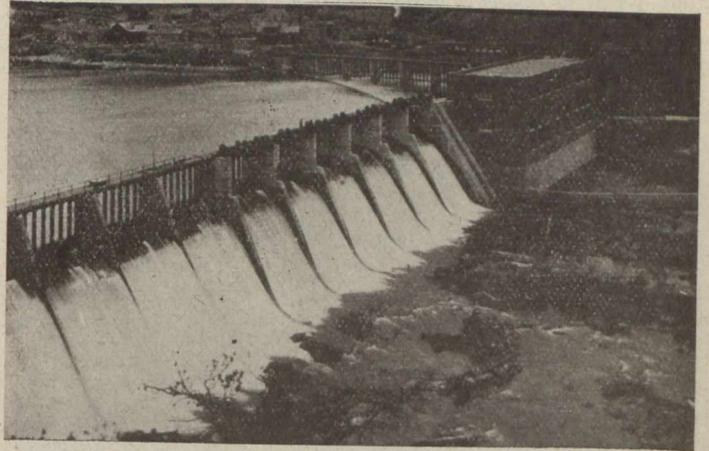
In successive steps Mr. B.'s party laid out the cofferdams, the powerhouse excavation, gave lines and grade for getting the steel draft tubes, the points for arches and floors, the position of reinforcing steel, anchor bolts, castings, etc., holding the centre lines both ways until the concrete reached the main floor elevation. The erection of the powerhouse steel followed, but without much attention from the engineers, aside from setting column anchor bolts and plumbing the columns. They followed the steel erector, giving grade for concrete floors, laying out the partitions, windows and doors of the superstructure. In the meantime the erector of the hydraulic machinery started his work and the party, using the same hubs, gave points to him for the centres of the turbines as well as elevations. Anchor bolts for mis-



DRAFT TUBE FORM CUT IN SECTIONS TO FACILITATE MOVING, APPALACHIAN POWER CO.

cellaneous machinery were set and the innumerable detail taken care of. In conjunction with this work the party made the weekly and monthly progress reports.

The pioneer work of the engineer for transmission lines is similar to that of railroad location. He determines the best route to the market and furnishes necessary information to the right-of-way man who purchases the right of way

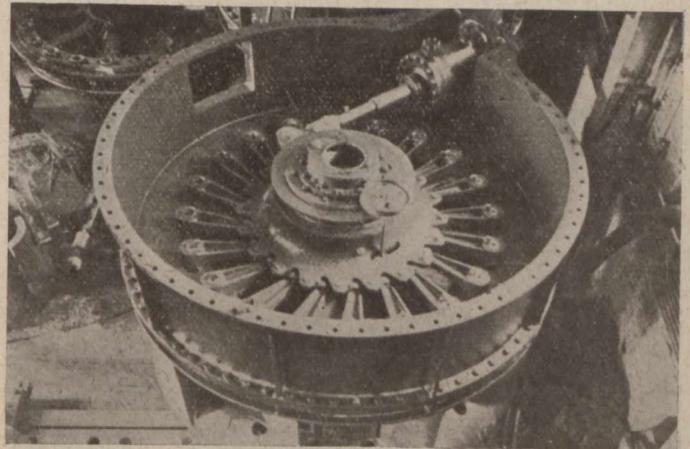


DEVELOPMENT NO. 2, APPALACHIAN POWER CO.

and makes the final maps. He then stakes out the lines on the ground, locating the tower footings.

In order to standardize the work so that the maximum amount may be accomplished in the shortest time and at the least expense, it is the custom to divide the construction force into the following small gangs: No. 1 clears the right-of-way; No. 2 excavates for footings; No. 3 places the concrete for footings.

In the meantime, steel and bolts for each tower have been checked at the railroad and distributed along the line.



TURBINE ASSEMBLED IN SHOP, APPALACHIAN POWER CO.

Gang No. 4 assembles the towers, No. 5 bolts them up and No. 6 sets them on their bases. The line gangs follow, putting up insulators and stringing wires. Rivalry and speed records between the different gangs lend interest to the work.

On long crossings special structures have to be built which furnish the engineer with many interesting problems. It is necessary to erect at each market centre a step-down transformer station from which the power is distributed to the consumer at a voltage suitable for his use.

In connection with a hydro-electric system without adequate storage reservoir, it is almost always necessary to install an auxiliary steam plant to help carry the peak loads and augment the power supply at times of low water.