with a corresponding elevation of 4 ft. in grade. The spillway section of the dam is divided into twelve 17-ft. openings and there is in addition a low-level sluiceway controlled by a 72-in. valve. This provides for a flood discharge of over 47,000 cu. ft. per second with a 3-ft. overtop on the spillway section. There is 215 lineal ft. of free overflow in the length of the dam, high-level water being 20 ft. above the lowest stop-log opening. The wing walls, which add to the dam proper a length of 75 ft., run well into the banks at either side.

The sluiceway and stop-log sections are furnished with a deck 20 ft. in width, narrowing to 10 ft. in width over the other sections. This deck carries an electrically operated winch for the handling of stop-logs.

Owing to the earth structure below the dam being of soft shale and very seamy in spots, in order to prevent seepage the foundation was grouted. Two-inch holes were drilled about 20 in. apart on both sides of the dam and were filled with cement grout under pressure. In some places the foundation structure was so seamy as to require a very large quantity of grout before leakage ceased.

Canal and Head-works.—The canal itself has been constructed sufficiently large to carry the amount of water necessary for the maximum of the plant at low velocity. It is over 700 ft. in length and is of trapezoidal cross-section, 50 ft. wide at the bottom, 80 ft. wide at the top, with an operating depth of 15 ft. This is where it passes through gravel, as shown in Fig. 3. The canal section in rock is rectangular and approximately 50 ft. wide with a depth of 15 ft. The former portion has been lined with concrete from the forebay to the head-works. The rock portion forms a natural dam for the canal. It is in general of a seamy shale nature and alternating with occasional beds of sandstone. From the head-works two 60-ft. concrete penstocks 35 ft. wide by 13 ft. high at the head gates and 12 ft. by 12 ft. at the wheel-case, feed directly to the scroll chambers. These tunnels are located in solid rock, as are also the draft tubes, tailrace tunnels, etc.

The head gates, which are riveted steel Tainter gates, operated by electric winches in the gate house above, are equipped with stop-logs to allow for repairs to the main gates, as well as with gratings to prevent intrusion of floating debris. Fig. 3 shows them under construction. The concrete-lined pressure tubes leading from the gates develop into scroll chambers formed in concrete in which are set the turbines. The forms and method of reinforcing of these chambers are shown in Fig. 5. The draft tubes into which the turbines discharge are 30 ft. in length, varying in cross-section from 9 ft. square at the wheel pit to 16 ft. by 13 ft. at the tailrace tunnels, from which point the water flows directly into the river, as shown in Fig. 6.

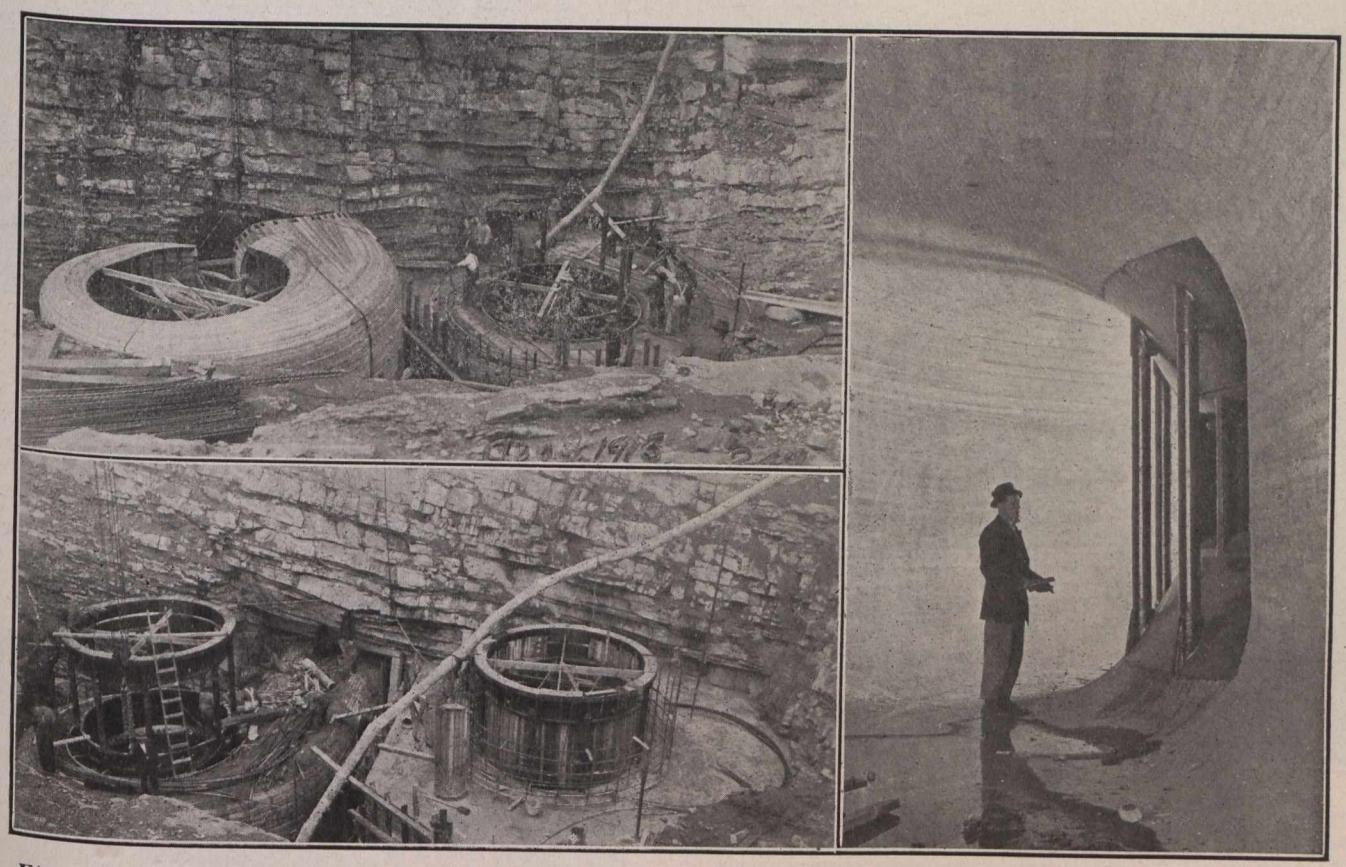

Fig. 5.—Scroll Chambers During Construction. Also Interior View of One with Forms Removed, Showing Turbine Frame in Place.

Construction Details.—The building itself is 90 ft by 60 ft., and is placed on a solid concrete foundation over rock. The lower 15 ft. of the walls are of concrete, while the structure is finished in clay brick. Sand and gravel for the concrete was obtained quite near the site. Mixing was done by steam-driven one-yard mixers in both the construction of the dam and head-works. The building of the dam itself was effected by the construction, during the winter season with low-water level, of a temporary discharge channel cut through the rock, built up with concrete and furnished with stop-log apparatus. A cofferdam was then constructed extending into the river as the current would permit. The flood season, however,