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PROGRESS ON THE SHANNON

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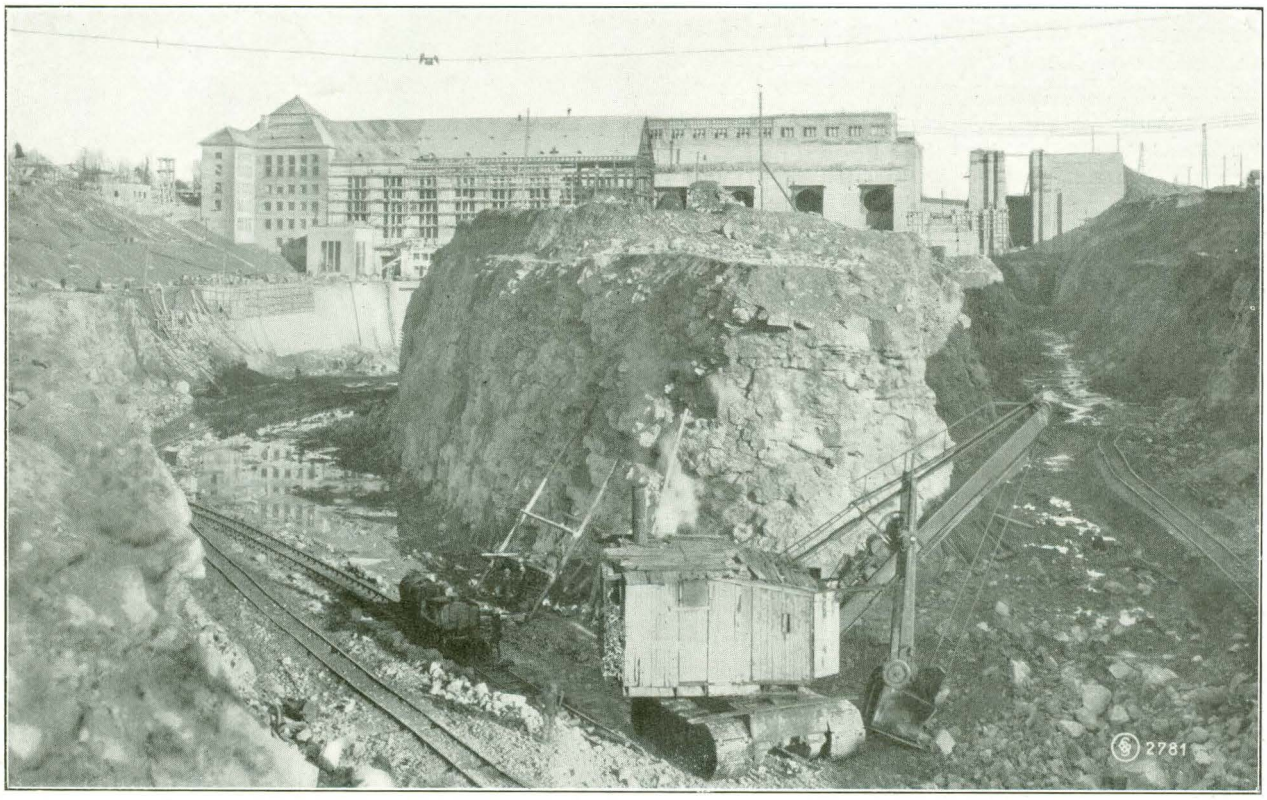
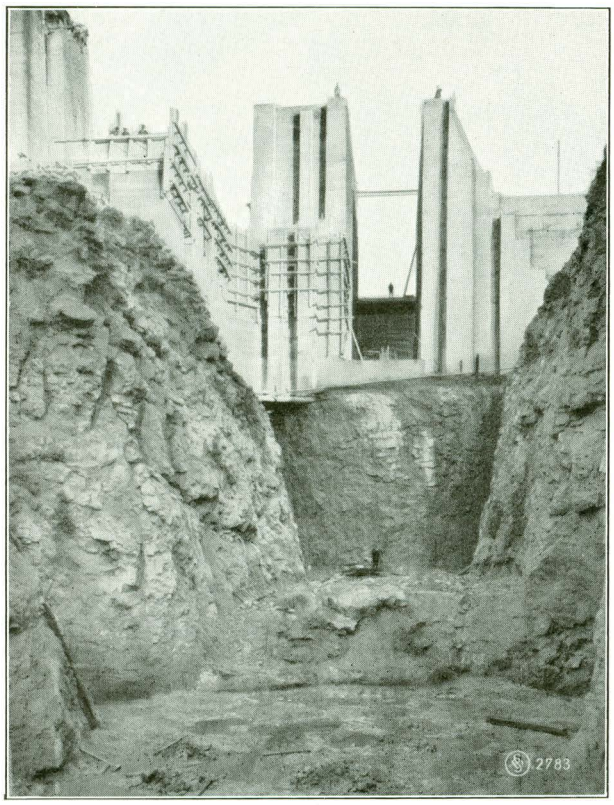
Locks at Ardnacrusha

Part I

Navigation from Limerick to Lough Derg by way of the old Shannon Navigation Canal will no longer be possible with the Shannon Scheme in operation. The boats from Limerick will have first to go up the Abbey River, then the Shannon again, the Tail Race, and finally a specially provided short navigation channel running along side the Tail Race to the Locks at the Ardnacrusha Power Station. At this point the water level in the Navigation Canal; which is the same as that of the Tail Race, is some 100 ft. below that of the Head Race.



Tail Race on the left and Navigation Canal on the right running to the locks. Walls of upper lock finished



Excavated pit for the lower lock. The upper lock in the background

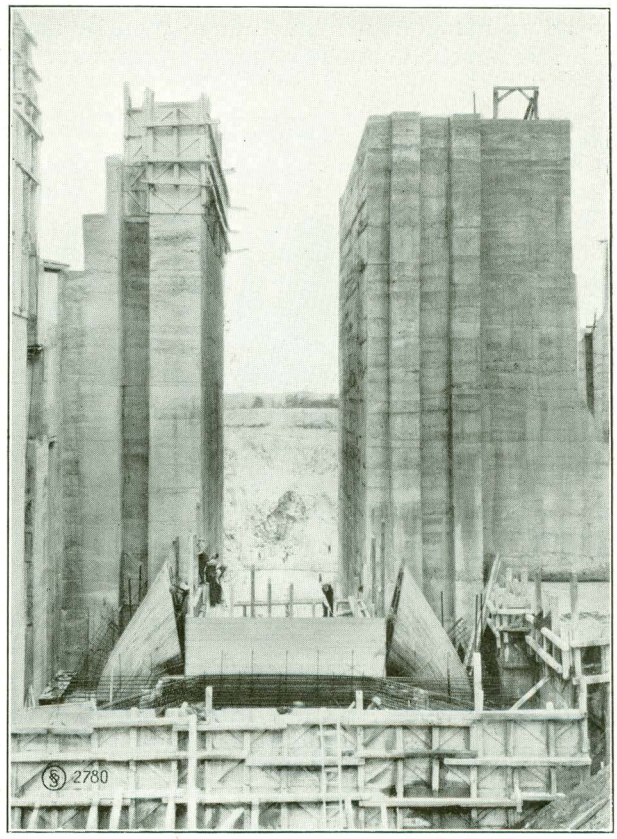
In order to enable the ships to proceed further, 2 locks for 150 ton craft have been provided and are now nearing completion. These 2 locks, situated on the left of the Intake Sluice Building between the left Head Race bank and the overflow channel, will each lift the ships about 50 ft. Once through the locks the ships will go up the Head Race, through the ships' pass at the Intake Building opposite Parteen Villa, and back into the Shannon, which, at this point, with the Scheme working, will be at the same level as Lough Derg owing to the water being raised by the new weir.

The 2 locks at Ardnacrusha consist of an upper and lower lock or chamber. The ships going up enter the lower lock first. The lower gate, facing the Navigation Canal already mentioned, is then closed and the lock filled by emptying the upper lock into it. As the capacity of this latter is larger than that of the lower lock during full development, an overflow is provided. When the water level in both is equalised, a condition reached when the lower lock is full and the upper has just the minimum specified water depth of 2,50 m., the middle gate, namely the one between the 2 locks, is opened and the ship is moved into the second or upper lock. The gate is then closed and the lock filled from the Head Race. When the water level in both becomes the same, the upper gate facing the Head Race is opened and the ship allowed into the Head Race where it can either proceed up the canal or moor alongside a specially provided landing stage about 30 m. long built of timber and situated along the left bank some 50 m. away from the upper entrance to the locks. Ample mooring accomodation has also been provided inside the locks for the ships to moor when docking.

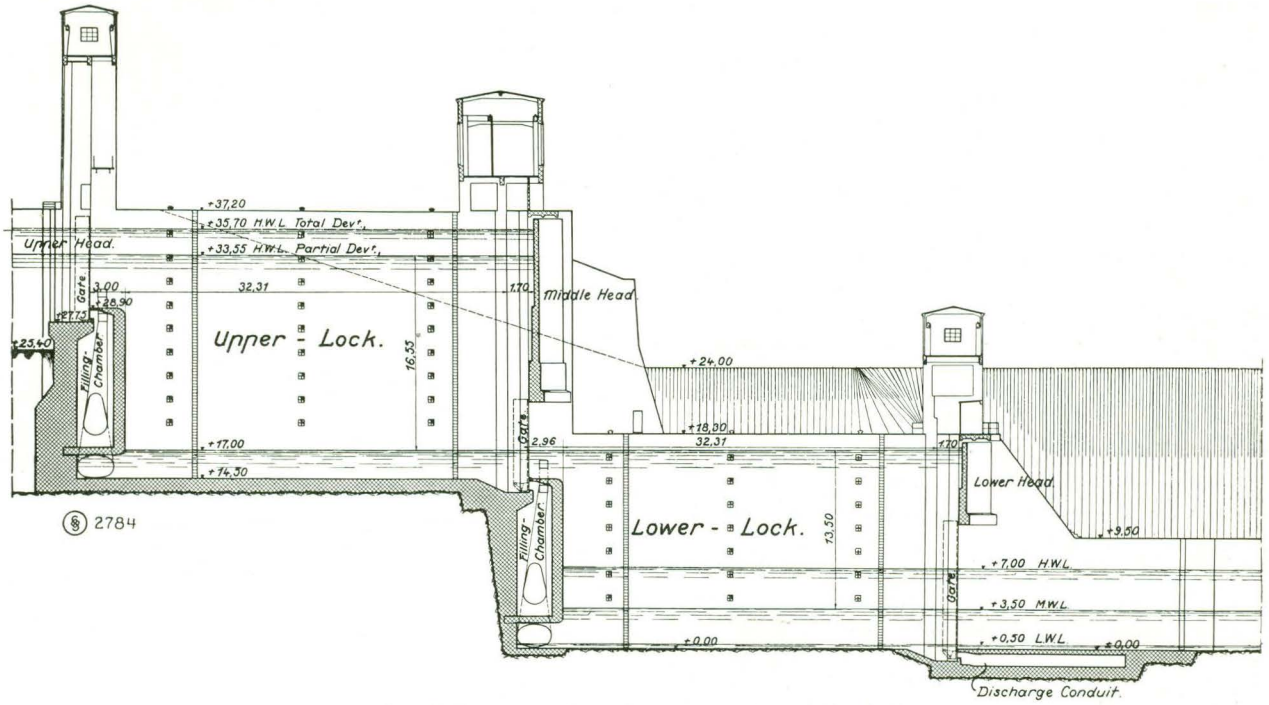
When the ships are going down from the Head Race into the Tail Race, the reverse process to the one just described takes place, except that the lower lock empties directly into the overflow channel through a special conduit and not into the Navigation Canal; this is necessary in order not to endanger the safety of the ships moored there.

The dimensions of both locks are considerable; the upper one is 32.31 m. in clear length, 6.10 m. wide and 22.70 m. deep from the top of the side walls to the bottom; the lower one is of the same dimensions except for the depth which is 18.30 m.

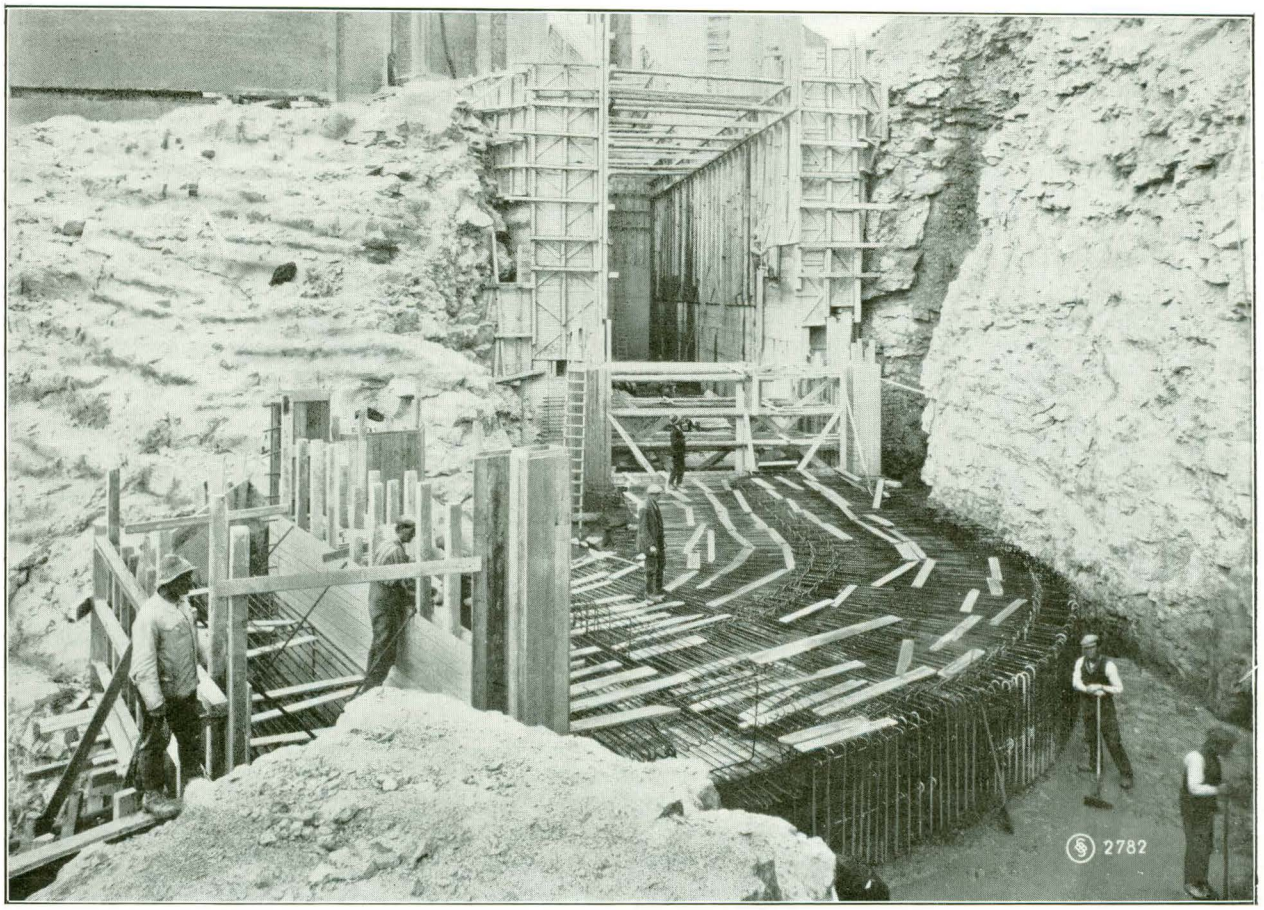
The upper lock consists essentially of 2 heavy concrete side walls placed just below the original rock bed. The one on the overflow channel side is 7.80 m. wide at the top at level + 37.20, and widens in steps to 14.30 m. at the bottom at level + 13.50. The one on the other side is 2.50 m. wide at the top, 11.00 m. at the bottom and also built in steps. This wall has furthermore a wing at right angles to it at the entrance to the lock, connecting it with the left Head Race bank. The



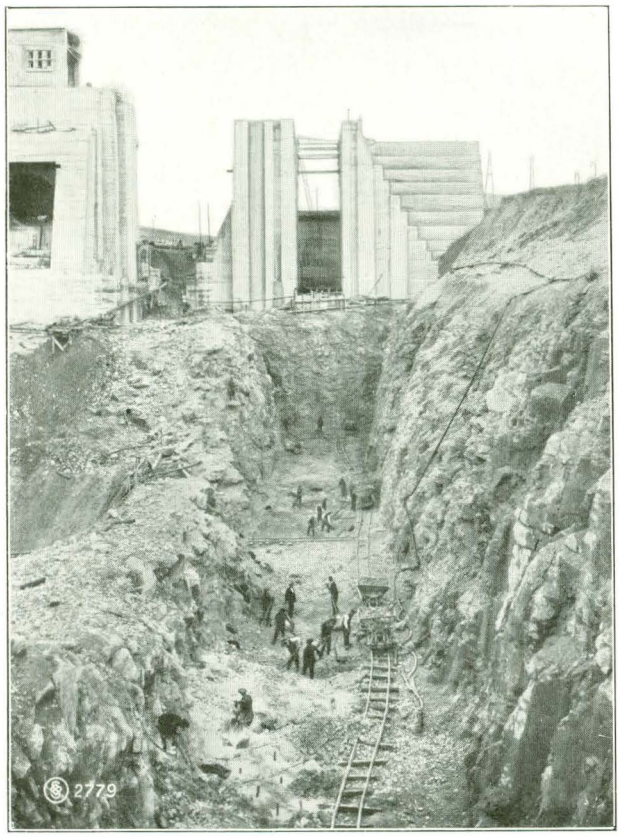
Walls of upper lock from the Head Race. The form work and reinforcement round the upper filling chamber and outlet conduits being placed into position



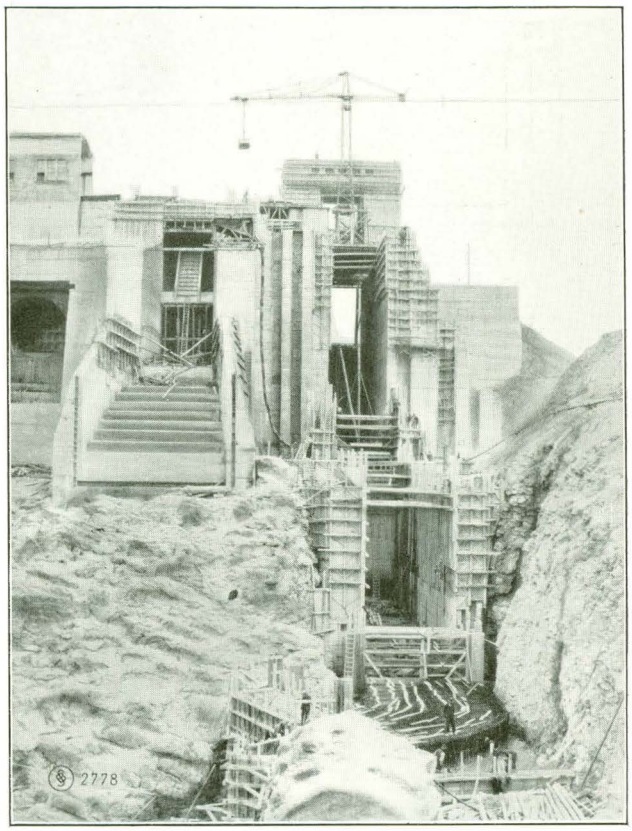
Sectional Elevation along the centre line of the locks



The lower lock in course of construction. Reinforcement of the discharge conduit



Excavation of the site for the lower lock and Navigation Canal. The upper lock in the background



The upper and lower lock and the overflow channel in course of construction. The reinforcement of the discharge conduit of the lower lock is seen in the foreground

bottom of the lock between these 2 walls is thus the original rock bed with approximately 1 m. thick concrete lining. The place for the second lock had to be excavated in rock down to level ± 0.00, namely that of the Navigation Canal running alongside the Tail Race and joining with it some 270 m. lower down. The concrete side walls extending down to level — 0.50 taper out from 1 m. at the bottom to about 4 m. at the rock level. Above this level they are built in steps to level + 18.30. To ensure their stability they were anchored in their lower part by round steel bars grouted into the slopes of the rock cutting.

The method of filling the locks is a novel one and up to now has only been applied for the new Ladenburg Locks in Germany. Instead of being filled in the usual way from the sides by means of a pipe running inside the side walls with several outlets at intervals, they are filled from underneath the upper and middle gates by means of a special construction. This method of filling has tremendous advantages over the first one; it first of all creates much less disturbance in the lock and secondly allows it to be filled much faster. The model experiments carried out show that even at a very high rate of filling no disturbance or whirlpools will be created, thus making the whole operation perfectly safe for the ships. The special construction mentioned above underneath the upper and middle gates consists essentially of a reinforced concrete chamber spanning the two side walls. On opening a special segmental gate in the lower part of the main gate, the water is admitted at the top through a slot 6.10 m. long and 0.60 m. high; it then drops down 10.50 m. inside the 3.00 m. wide and 6.10 m. long chamber, where the kinetic energy of the falling water is destroyed. The water then quietly leaves the chamber through two side, oval-shaped, stream-lined conduits and enters the lock underneath the chamber.

The shape of these filling chambers determined by model experiments is very complicated, and the form work for concreting them was difficult to make. The concreting was not simple either on account of the comparatively thin walls and the large amount of reinforcement that had to be placed. Basalt concrete was used on account of it being stronger than limestone concrete, and was placed direct by the cable crane. The size and shape of the discharge conduit in the lower lock for emptying it into the overflow channel was also determined by model experiments. It is situated below the bottom of the lock in a specially excavated pit and measures inside 6.10 m. × 1.00 m.; the top is heavily reinforced. Basalt concrete was also used in this case.

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