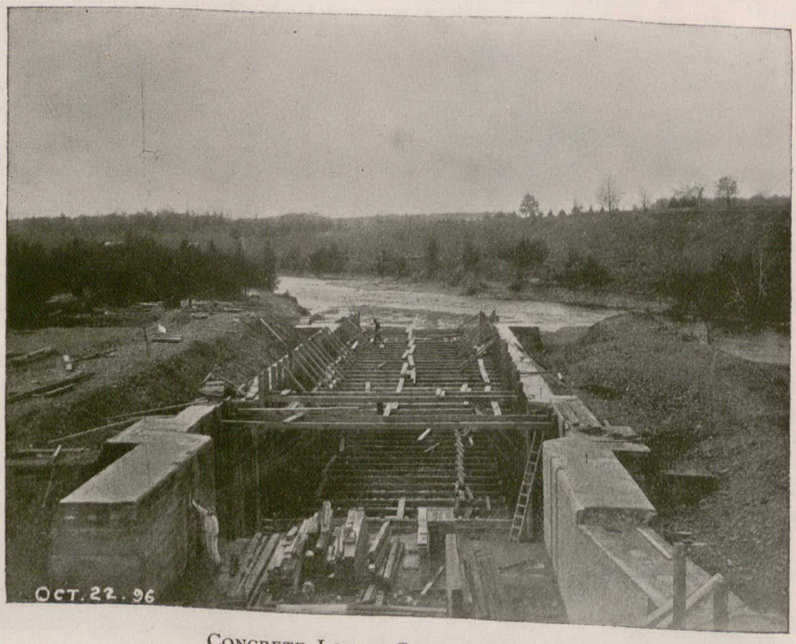
it arrived in Peterborough, and these had to pass the following tests, viz., sifting, specific gravity, and blowing, before the car could be sent to the contractor's siding, where it remained until the three-day test for tensile strength had been made. If this proved up to standard, the car-load could be transferred to the cement-shed erected by the contractor close to the railway siding.

BROKEN STONE.—The specifications called for this to be free from earthy matter and to pass through a two-inch ring. The crusher used on each section was well adapted for the work it had to do. On section No. 1 they used a "Blake" jaw crusher to break the selected stone from the excavated limestone strata. On section No. 2 a "Gates" crusher of coffee-mill type was used, and there the stone were principally hard-heads from the fields, or boulders from the excavation. The jaw crusher on section No. 1, run by steam, crushed about 150 cubic yards per day, while with the machine on section No. 2 electricity was used, and a cubic yard of broken stone was obtained in 3½ minutes.

MOULDS.—The moulds for shaping the face of the lock walls were made by placing braced rectangular frames every five feet apart, and arranged so as to extend across that part of the lock for which they were intended. When they were in place, three-inch planed plank with half-inch lap joints were spiked to the vertical pieces and thus formed the face of the wall. Moulds of unplaned boards, made like very long doors and placed end to end on edge, formed the back of the wall. These moulds, the same height as the proposed steps, were braced from the face of the excavation.

The moulds for the concrete, placed in front of the timber dams, were made in a similar way. In order to avoid sharp edges, mouldings with radii of from two to four inches were placed at all exposed angles less than 120 degrees.




CONCRETE LOCKS, SHOWING MOULDS.

For the bridges, the water-tight embankments, etc., the moulds were formed of scantling and plank placed in the same way as the moulds for the face walls of the lock, but were held in position by braces from the surface of the ground. Nearly all the face walls of bridges were built to a batter; whereas those of the locks were built plumb. In the high level bridge the moulds at the back were held in position by iron rods passing from front to rear of wall.

METHODS OF MAKING CONCRETE.—On section No. 1 the concrete for the locks was mixed by machinery and that for the face of the dams by hand.

The mixing machine consisted of a cubical sheet-iron box revolving on its diagonal axis about six feet above the ground. This box was held up by a framework which also supported a platform above the box, and let into this platform was a hopper for receiving the materials. In the rear of the mixer was a crusher with a carrier leading from it into a large box hoisted on posts, to receive the broken stone. The stone was let out of this box, by a small sliding door, into a car that held one cubic yard of stone. The stone was then taken by car and dumped into a large oak box, holding 1¼ yards, placed near the mixer. The cement which had been deposited on a platform close at hand was dumped in upon the stone. Then the sand and gravel, brought in from the sand pile by another car, was dumped in last and about filled the box. The box was then hoisted and the contents dumped in the hopper. A barrel on the platform of the hopper was kept filled with water by a force-pump at the river bank, and from this barrel a graduated tub was filled to the required height. When everything was ready the door of the cubical box was opened, and, when the slide door of the hopper was shot back, the tub of water was poured in as the materials were falling through in the mixer, which was then closed and revolved. It was found necessary to strike the mixer with mallets to keep the materials from sticking to the sides. After about sixteen or seventeen revolutions, the mixer was stopped and the concrete dropped into a box on a flat car beneath. It was then conveyed to the cableway, hoisted and run into the lock where, for the foundation, it was dumped, spread out in a layer of eight or ten inches and well rammed. For the walls the face was formed of mortar of proportion two to one, and two to five inches in width, as the case required, placed against the face mould, and this mortar was backed up by concrete in eight to ten inch layers, well rammed. Where bolts were built into the concrete, for the purpose of holding the wallings or iron casings, a three to six inch square turn was made on the end imbedded, which gave the bolts an L-shaped appearance; the other end of these bolts had a nut and washer on them. This arrangement was continued throughout, and a three-inch layer of mortar properly smoothed over formed the coping. By this process a cubic yard was manufactured every five minutes. The best ten hours' mixing was 140 cubic yards.

The concrete on section No. 2 was all mixed by hand, and here the proper proportions of cement, sand and gravel were thoroughly mixed together on the platform and spread out. Clean water was now added and the mass well worked with hose. Broken stone was then spread over this and the whole turned over twice. It was then put into barrows, wheeled and dumped into work, where the layers were well rammed, and the face of the wall treated as on section No. 1. The concrete along the face of the dams on section No. 1 was made and put in place in a way similar to that on section No. 2, except where it had to be placed in three or four feet of water, and then the following apparatus was used, viz.: a galvanized sheet-iron tube about one foot in diameter, and long enough to stand, when vertical, about two feet above the water. The upper end of the pipe was funnel-shaped. When the concrete was mixed it was shovelled into the tube, and, when this was full, it was raised about one foot and moved about. This allowed the concrete to slip down and more was added. Thus the concrete was put in without becoming saturated, as after the tube was once filled its contents did not come into contact with the water until it had left the bottom of the tube, when it was in the place intended in the wall. After a few days an examination showed that this concrete was quite satisfactory.

On section No. 1 a portion of the stone was much finer than the size called for, and consequently less gravel was required. After several trials it was found that the following proportions were most suitable, viz.: One part cement, two parts sand, two and one quarter gravel and seven of broken stone. On section No. 2