each particular situation is studied for the one best suited to the conditions. Depth and swiftness of water, length of service, importance of work to be protected, materials at hand, expenditures justified, and variation in river levels are all factors.

The layout and design of construction plant is the most interesting work that the draughtsman will be called upon



GENERAL VIEW OF CAR DUMPING CABLEWAY, CEDARS RAPIDS MFG. & POWER CO.

to do, for on every development of magnitude conditions differ widely. The amount of the plant justified for the work is largely determined by the amount and cost of labor and the amount of work to be done. For the purpose of illustration, let us consider some of the plant designed for the Cedars Rapids Manufacturing & Power Co. on the St. Lawrence River.

This is a low head development with a first installation of nine 10,800 horse power units. The power from the rapids is developed by a wing dam extending up the river for about two miles and not across the river, as it usually



HEAVY MACHINERY STORED ON GROUND—CONCRETE SLABS FOR POWERHOUSE SUPERSTRUCTURE IN BACKGROUND— CEDARS RAPIDS MFG. & POWER CO.

the case. The development is remarkable in that the units are the largest in physical size ever built.

As the site of the work was five miles from the railroad, it was early decided to transport supplies and materials by the Soulange Canal, which bordered the property, rather than build a branch line which would necessitate an expensive drawbridge. Car ferries and tugs were used to bring cars from the railroad ten miles away and transfer them to the company's tracks. Cement, coal and sand were brought in by barges.

As navigation was closed during the cold weather, provision was made for storing materials which would be required during the winter months. A cement storage was built capable of housing 30,000 barrels and equipped with a belt conveyor which could be extended into the hold of the barge. Twelve thousand tons of coal were stored by means of an automatic railway with a ton-a-minute capacity, served by a derrick and clamshell bucket. A temporary wooden crane runaway was built in the open field and one of the powerhouse cranes was installed thereon for handling the heavy hydraulic and electrical machinery. The cars were run under the crane, unloaded and pieces of apparatus skidded out into the field with rollers and tackle, with power furnished by the crane. When the time came for the installation of the machinery the process was reversed.

A rather unusual method was employed to extend the south bank or diverting dam from the mainland to Isle Aux Vaches across the rapids and differed from the hydraulic method sometimes used for building dams. A cableway with two high shore towers, a moving tower on wheels and a central tower to reduce the span was erected. A cradle of sufficient length to hold a train of dump cars was attached to the moving tower and suspended to the 2¼-in. standing lines. At the beginning of operations the moving tower was located next to the shore tower, and as the fill progressed it was moved along until it reached a point where it relieved the centre tower of weight. This tower was then removed and the work progressed until the fill reached the island, a distance of approximately 1,100 ft.

The design of the stone crushing and concrete mixing plant requires careful thought by the designer. He must



DETAIL VIEW OF CRADLE, CAR DUMPING CABLEWAY, CEDARS RAPIDS MFG. & POWER CO.

be familiar with the equipment and be able to fit it into the general scheme of things, so that it will do the maximum amount of work with the least effort on the part of the operators. He must keep in mind that the plant will be required to turn out quantity production and a lack of coordination between its working parts and breakdowns are are serious matters, and a constant source of annoyance and expense.

The following points should be taken into consideration in designing a crusher plant: If the structure is not built on rock, the footings should be so designed as to obviate



STONE-CRUSHING AND CONCRETE-MIXING PLANTS, CEDARS RAPIDS MFG. & POWER CO.