On beginning the work of bridging the opening between Cribs 1 and 2 several points had to receive consideration. As will be seen from Fig. 1, the tailrace from a power house runs just back of the cribwork, and care had to be taken to prevent the wall of this tailrace, which is built of light timber, from giving way and allowing the water to run between Cribs 1 and 2. Also, the top slab would here need to be wider than on the cribs and provision must be made to carry this additional width; the walls of the tailrace could not be interfered with in any way or touched by the new work. It was decided to make the slab at the opening about eight feet wider than on the cribs, and a wall one foot wide, built to the required elevation and a little longer than the opening between the cribs, was built eight feet back of the crib slabs to carry the bridge slab. Very light walls, to prevent material running around the ends of this supporting wall, were built connecting it with the end wall on the cribs.

Across the opening directly between the cribs four 18-inch I-beams were placed to carry the slab and from the rear I-beam pieces of railroad iron a little less than 8 feet long were placed to carry the extra width. These were supported at one end directly on the concrete wall and were attached to the I-beam by a hook over the top of the beam, and securely bolted to the railroad iron web. Expanded metal mesh was used for additional reinforcement between the I-beams and railroad iron. Fig. 3 shows the details of the steel work.

The reason for placing such heavy beams was that this bridge was in more constant use than any other part of the structure and heavy freight is occasionally landed there.

The concrete in this bridge was mixed and placed in the same manner as on the walls on the crib.

Where the new work joins the old masonry a concrete step was placed and a small retaining wall built to hold up a small quantity of earth that was above the level of the completed work.

This old lock masonry has a batter of about one in twenty and the new wall was planned with a plumb face. The connection was made by slightly twisting the forms to conform to the batter, and running to plumb as soon as possible.

The grounds around were graded up where necessary and all unused material removed, leaving all sightly.

This completed the work as planned for the season.

The work was performed under the direction of Mr. C. D. Sargent, superintending engineer of the Ontario-St. Lawrence Canals. The writer did the instrument work, and looked after the details as the work proceeded. The labor was done by the repair staff of the canal, Mr. J. C. Boyd being overseer of this canal.

BUILDING INDUSTRY DURING PAST YEAR.

The building industry throughout Canada for the last year has shown a substantial increase over the very low figures registered for 1915. This is ascribed principally to the increased demands of war industries, but domestic requirements have been responsible for no small part of the increased activity. One important feature of the development of the industrial life of the Dominion is the large number of United States manufacturing concerns which are establishing branches in Canada, partly as the result of a realization of the advantages which are bound to accrue in the ordinary course of events from the industrial expansion which is regarded as inevitable after the war, and also the possibility of trade arrangements which will promote commerce between the allied countries.

EXPERIMENTS ON EARTH PRESSURES.

In a paper read before the Institution of Civil Engineers, Mr. P. M. Crosthwaite gives a short account of Rankine's theory of earth pressure, and the principles and assumption on which it is founded, together with descriptions of former investigations—namely, those of the late Sir George Darwin, and Messrs. Goodrich, Wilson, Bell and Meem. The author concludes that of the experiments made by these investigators to investigate the lateral pressure of earth, those in which model walls were used are of greatest value, but points out that if models are of any size the experimental difficulties are almost insuperable.

The author's experiments, a number of which are described and illustrated in the paper, were made by loading a plunger with known weights and measuring the penetration when the plunger had come to rest after the application of each weight. The materials were enclosed in an open bucket, and their weight was determined.

With those data the value of ϕ, the angle of internal friction, can be obtained from Rankine's well-known formula for the safe depth of foundations—

$$d = \frac{P}{W}\left(\frac{1 - \sin.\ \phi}{1 + \sin.\ \phi}\right)^2$$

when d denotes the penetration, P the pressure in pounds per square foot, and W the weight of the material in pounds per cubic foot. If the formula is true, and the pressures be plotted against the penetrations, the resulting curve is a straight line, and ϕ as calculated from the formula should equal the angle of repose.

With sand, garden earth, and cinders and ashes the resulting curves are straight lines, but it was found that the value of ϕ varied with the state of aggregation of the material—*i.e.*, whether it was lightly poured into the bucket, shaken in, or well pounded in. When the material was deposited in the bucket as lightly as possible the angle of internal friction was the same as the angle of repose, but with more consolidation the angle was much greater.

From these materials the author concludes that Rankine's theory holds, provided the proper angle of internal friction is used and not the angle of repose. If, however, this angle is used it would be necessary to introduce a factor of safety into the formula, for a wall designed without one would be theoretically just strong enough and no more. In Rankine's formula there is no factor of safety, and it is concluded that Rankine saw this, and used the angle of repose as covering the worst conditions that need possibly be provided for. The author's experiments show that, for the materials tested, work designed by Rankine's formula, using the angle of repose, would have a factor of safety of 2½ to 4, and he considers that these are not unreasonable figures for such materials.

The experiments on clay give altogether different results, for instead of the penetration varying at the load, it varies as the square of the load, and the penetration curves are parabolas. Those results, which were altogether unexpected, are completely confirmed by larger experiments carried out by Messrs. Coode, Matthews, Fitzmaurice and Wilson, and by Mr. McAlpine in New York.

The author is unable to give any physical explanation as to why the penetration in clay should vary as the square of the load, but leaves it to the physicists. The law must be capable of some rational explanation, and, if true, it upsets all earth-pressure theories when they are applied to clay; for all accepted theories assume that the angle