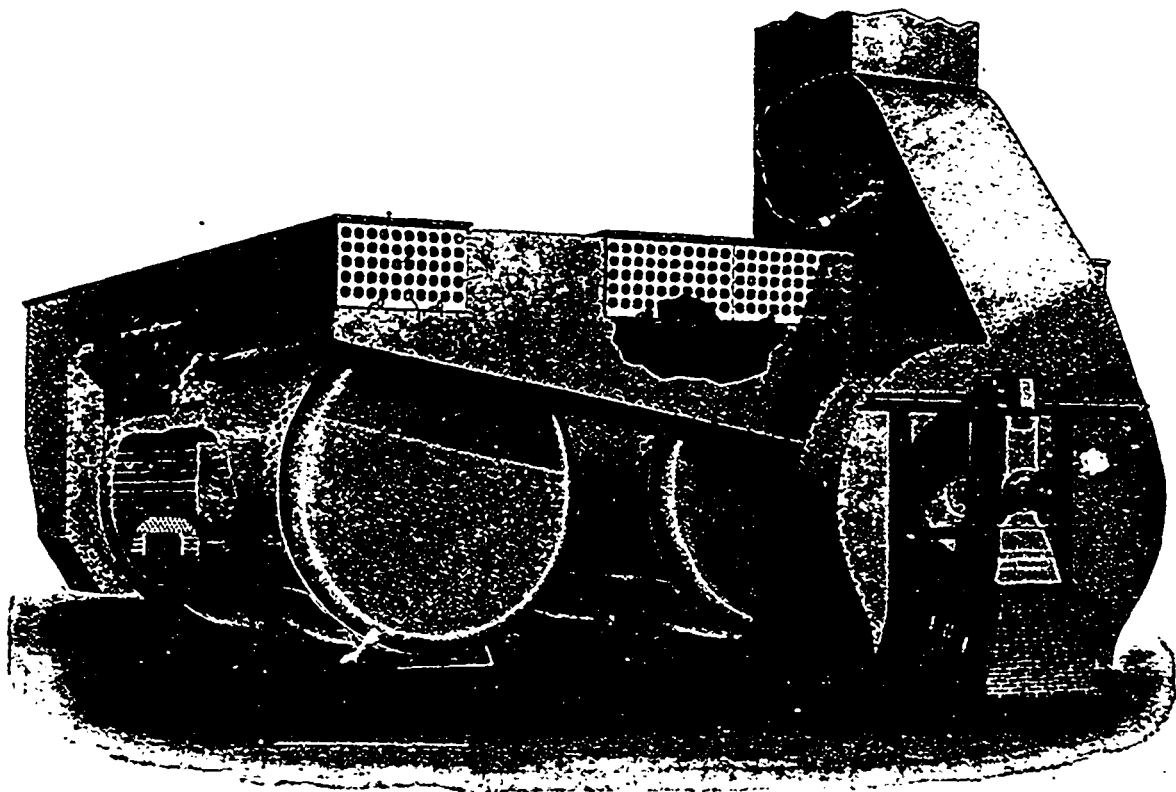


DISCUSSION ON CEMENT.

The recent paper on cement by Cecil B. Smith, of McGill College, Montreal, read before the Canadian Society of Civil Engineers, gave rise to interesting discussions which were continued through three meetings. The following is a summary of the debate:

Mr. Perley (by correspondence) stated that experimenters and men of science had not yet, in spite of all their tests, discovered a real test that could be quickly and accurately carried through by contractors. The latter often suffered from want of time in which to carry out a long system of testing. If a cement were found to be unsound, the best plan to adopt was to return it to the manufacturer with a request to him to find out what was wrong. In Canada, contractors often thought that the imported cements were very superior to the native article. But much of the cement which was prepared in Europe for exportation to Canada and elsewhere was not up to the mark. It was often brought over to serve as ballast for the ship bringing it, and it could not be expected that vessel owners would purchase any, but the cheapest article procurable for such a purpose. Engineers should specify that the cement was to be purchased by weight—so much per cubic foot—and it then should be put up in bags, which were convenient to return. If a series of tests could be designed which would be accurate in result and speedy in action, it would be a very good thing for all concerned.

was doubtful whether an engineer would be warranted in condemning a cement merely on the ground of its specific gravity. The advisability of sand tests might prove doubtful, owing to the constant improvements going on in the manufacture of cements. It was probable that there was a definite relation existing between the neat and sand tests. There was so much difference between sand found in the laboratory and ordinary commercial sand, that much of the importance of the sand test was done away with thereby. Not much importance could be attached to the tension test. All cements should certainly show a certain minimum amount of tensile strength. The longer a cement was allowed to set before being put under pressure, the better, and the longer time it will have in which to become thoroughly established and water-tight. There was one field of investigation which had been left comparatively untouched. There was no doubt that hot cement mixed with hot water should mix, even in freezing weather, but the question was, could they be made to mix properly without the agency of any heat either in the water or in the cement? Some thought that the addition of salt had proved a success in this direction. The difference in prices of cements was entirely due to transportation charges. Canadian cements were often condemned off-hand, and this was no doubt due to their variability, and they would never come into general use until the manufacturers divided their grades properly. In the United States, however, there were several makes of cement



INDUCED DRAFT APPARATUS AT AMERICAN LINE PIER, N.Y.—See page 40.

Mr. Spalding (by correspondence) said there could be no doubt but that sand tests were good, but there was a difficulty connected with the use of them, owing to the great differences existing in the quality of various sands. No short time test could be thoroughly satisfactory: durability was a great element in the quality of a cement, and this of course required weeks to be able to judge satisfactorily. He thought that a direct pressure of about 100 lbs. per square inch should be used. A pressure of 30 or 40 lbs. had been found to give very variable results. Different grades of cements were very variable in their respective actions when mixed with hot water. Mixing with hot water and then letting it be exposed to cold weather, was a very different thing from mixing with cold water and then submitting it to heat. Results of experiments at Cornell University recently showed that the outcome of hot water mixing could not be depended on, as it varied so very greatly.

Mr. J. G. Kerry paid tribute to the careful, painstaking manner in which Mr. Smith had carried on his long series of experiments. The quality most wanted in cements was durability. It was disappointing to find that the blowpipe test was not really so valuable as had been thought. The absolute importance of specific gravity tests was somewhat questionable. It was an indirect test, and it

fully as good as those manufactured in Europe, and Canadians ought to be able to keep up their example.

President T. Monro read the results of some tests on several varieties of cement used on the canal at Coteau Landing, Que. The general results showed that in situations where the water was to be turned on shortly after the laying of the cement, natural cements were not to be relied on.

At the meeting on March 28th the discussion was resumed.

Mr. Irwin made a few remarks on the similarity between the behavior of a solution of certain crystals and that of cement when setting. For instance, Glauber's salt, when in its usual crystalline form, dissolved in hot water easily, but when it was in the form of a powder he observed that it set at the bottom of the glass as a hard mass. This was a side issue, but it perhaps threw light on the behavior of cement when setting under certain conditions. It was not good for cement to be mixed with hot water in cold weather, and perhaps this had something to do with the adjustment of the crystals. The proper setting of cement depended to a large extent on the amount of hydrated silica it contained. The best cement the speaker had ever used was a finely ground Danish cement. Some Canadian cements, which he had tested with hydrochloric acid, had thrown up a quantity of steam and smelt somewhat of sulphuretted hydrogen—a bad sign—whereas the Danish article