TENSILE STRENGTH.

Samples prepared with 25 per cent. of water, and pressed with the fingers into the moulds, when allowed one day in air and six days in water, broke with an average tensile strain of 350 lbs. to the square inch.

HOT TEST.

All the cement used was carefully submitted to the boiling test in thin pots on glass. None of the samples showed any cracks, and but one or two left the glass.

SAND.

The sand used was clean, rather coarse, sharp river sand, very nearly all silica.

Knowing from the success of the hot test that there was no danger to be feared from "blowing," all the brine was made with very hot water. The sand was kept as hot as possible. The stones were not heated, but care was taken to see that no ice was on them.

During the construction of the work the temperature varied, between 39° above to 10° below zero F.

The whole work was carried forward to successful completion, and was and is satisfactory in every respect, no small credit being due to the contractor for the care and skill he showed in pushing on the work under very unfavourable conditions.

Another case where the masonry work was being built under the same specification, and where the contractor was obliged to furnish the salt, it was found that insufficient salt was used, and that as a consequence the outer portion of the mortar bed, about three inches back from the face, in the following spring was of about the consistency of leached ashes, which had to be raked out and replaced with fresh Portland cement mortar; the inner part of the mortar bed was set hard and solid—doubtless the outer portion froze solid, the inner being protected from the severe frost by the overlying stone and at the edge by the parts destroyed.

Another case where natural cement was used in stuccoing a building, having been put on in a coat about one inch thick, failed entirely. In fact, natural cements will not stand frost in the sense herein implied.

During the construction of the Kansas City Bridge,* "the beton, consisting of eight parts limestone, was broken to pass through a three-inch ring, two of sand and three of cement. It is an interesting fact that both masonry and beton were laid in the above works in the severe winter months by the use of hot sand and hot water. At the Quincy Bridge, during the coldest weather, each stone was held over a brazier of charcoal to draw out the frost. The mortar thus used was found the following spring to be as hard and perfect as any on the work."

During the construction of the Chignecto Ship Railway in Nova Scotia, some experiments were tried, which seemed to show a reduction in strength in the samples submitted to the testing machine.† Doubtless the effect of frost on small samples, from the fact that it will penetrate the whole mass, is more serious than in actual works where the effects will be confined to the outer edges of the mortar beds.

In the construction of the works of a lock at the St. Mary's Falls' Canal ‡ in 1877, it was found that Portland cement mortars satisfactorily withstood the effects of frost, but that natural cement mortars were disintegrated to the depth of 3 or 4 inches; in the same locality a Portland cement concrete, which froze solid proved satisfactory.

* Manual for Railroad Engineers, by Geo. L. Vose.
† Proceedings Inst. C. E., Vol. CVII.
‡ Transac. Amer. Soc. C.E., Vol. XVI, pp. 79 et seq.