“Anchoring Bolts into Stone”

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The article begins:

“The *Engineering and Building Record* quotes from a letter to the Troy *Polytechnic* some interesting particulars about the usefulness of various substances for anchoring bolts into stone. It was necessary in the construction of an elevated railway, in a place where the line led over rock, to anchor the foundation by bolts to the ledge, and in view of the exposure and other objectionable qualities of sulphur and lead for this purpose, it was resolved to try whether cement could not be made available….”

This article, which begins on the next page,
is presented on the Stone Quarries and Beyond web site.
http://quarriesandbeyond.org/

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Anchoring Bolts into Stone.

The *Engineering and Building Record* quotes from a letter to the Troy *Polytechnic* some interesting particulars about the usefulness of various substances for anchoring bolts into stone. It was necessary in the construction of an elevated railway, in a place where the line led over rock, to anchor the foundation by bolts to the ledge, and in view of the expense and other objectionable qualities of sulphur and lead for this purpose, it was resolved to try whether cement could not be made available.

To test the question 14 holes were drilled in a ledge of limestone rock, all 42 in. deep, and bolts, some ¾ in. and some 1 in., were set in the holes. Around four of the bolts sulphur was then poured, lead was put in around four more, and Portland cement, mixed neat, around the remaining ones. Two weeks later the bolts were pulled by a powerful lever. Out of those run with sulphur, one was drawn out under a strain of 12,000 lb. With the others the iron yielded before the sulphur gave way. Three of the bolts calked with lead also broke in place, one pulling out; but of those set in cement, one yielded slightly and then broke, while all the others broke in place, showing that Portland cement is not only cheaper for setting iron into stone, as well as less likely to corrode the iron, but is stronger and much more easily applied. This account reminds us, the journal above referred to adds, of a little experience of our own, which has a certain interest.

In the construction of a building where external anchors are used, some of the bolts, which were built through the walls, were sent, by a mistake of the maker, with the ends cut for wood screws, instead of being threaded for a nut. As the work was being hurried, and there was not time to wait for others, they were used, on the assurance of the maker that he could fit nuts to them. After the walls were ready for the anchors, it was found that no machine was made which would tap an iron nut to fit a wood screw, and the manufacturer made nuts of Babbitt metal which were forced on the screw. They were rejected by the architect on account of the softness of the metal, and a bolt, with the nut, was tested at the Watertown Arsenal, on the Emery testing machine, to determine the resistance of the nut. The bolt was pulled in one direction, and the nut in the opposite one, and neither yielded until a force of 5 600 lb. had been applied, when the nut burst, the threads stripped, and the bolt pulled out. The bolt was ¾ in., somewhat deeply cut, so that the resistance of the nut was about three-quarters of the strength of the bolt, and if it had been made thicker, the iron would probably have yielded before the soft Babbitt metal.