HARDENING OF HYDRAULIC CEMENTS.

The reading of a paper on "The Hardening Process of Hydraulic Cements," by Dr. W. Michaelis, Sr., of Berlin, at the annual meeting of the Association of German Portland Cement Manufacturers during the last week of February was one of the most remarkable events in the history of the science of hydraulic cements, says our Chicago contemporary, the Cement and Engineering News. This paper revealed the last secrets of the hardening process of hydraulic mortars, and offered the most manifest proofs and demonstrations for the correctness of the theory that the hardening process of all hydraulic cements is mainly a process of formation of colloids and not a process of crystallization. Dr. Michaelis has stood almost isolated ever since he offered this theory about ten years ago. Most other investigators could not free themselves from the idea that a process of crystallization is the basis of the hardening process. But this isolation has been the same in every previous phase of Dr. Michaelis' classical research work. His theories and explanations have always been bitterly opposed at the time when they were made public, and many years have past in every single case until other investigators were convinced of the correctness of his theories and until the public at large adopted his teachings. Thus, for instance, he found the greatest opposition when he advocated fine grinding about forty years ago, and later, about twenty years ago, the Association of German Portland Cement Manufacturers as a body opposed his demand for an admixture of soluble silica in the form of trass, puzzuolana or slags in order to protect Portland cement from destruction in sea water. To-day the usefulness of such an admixture is universally acknowledged. In every stage of his scientific life Michaelis has been a generation ahead of his contemporaries. Therefore it is no surprise to us to see him give the most lucid explanations of the apparently very complicated hardening process at a time when all other investigators are still busily engaged in a debate about the constitution of Portland cement clinker, a subject of secondary importance, at the best a scientific pastime, but no longer a study from which any advantages have to be expected, especially if the researches refer only to part of the elements in question, if the rest of them are omitted in the research work and if nevertheless conclusions are drawn from such investigations that are afterwards offered to be applied to any possible case of a composition of a clinker.

Through Michaelis' teachings we now know that the composition of the clinker is entirely immaterial to a certain extent, that many different compounds may be contained in the clinker, that some of them are essential, while others may be present or absent, but that no matter what the composition may be within certain limits, the hardening process invariably proceeds the same way and is due to the formation of a gelatinous substance, a colloid, which becomes solid in time and which is composed of calcium hydro-silicates, calcium hydro-aluminates and calcium hydro-ferrites. While this hardening process goes on it is accompanied by a process of crystallization of a small percentage of various compounds, which in the beginning contributes to the solidification of the hardening colloids, but which in time impairs the impermeability of the mortar and thus prepares the way for the ultimate deterioration of all hydraulic cements. The deductions to be drawn from this theory are proved by practical experience. Hydraulic cements being more reliable and more durable the more limited the process of crystallization during their hardening; this means that hydraulic cements low in alumina and calcium oxide are the most preferable, as the surplus of calcium oxide crystalizes in the mortar and becomes the cause of formation of crystals of gypsum and calcium-sulpho-aluminate in the presence of aluminates and sulphates, while the alumina forms unstable crystals of calcium aluminate and in the presence of solutions of sulphates the dreaded calcium sulpho-aluminates.

Iron-ore cement must be regarded as, and has proved to be, an ideal hydraulic cement, because it contains, instead of the aluminates of Portland cement, calcium ferrites, which never crystallize. Moreover, iron-ore cement has the greatest resistance to all chemical reactions that come in question; it is the strongest of all cements and yields the densest mortars on account of its high specific gravity, which is between 3.3 and 3.4.

In the foregoing we have touched only the most salient points of Dr. Michaelis' paper which is before us, but will shortly bring in our columns a complete translation, so that our readers may become familiar with the deductions that form the quintessence of a life study in cement chemistry of a man who took the lead in his science during the second half of the first century of scientific research of hydraulic cements, and who thus continued and completed the work of the great Vicat, who was at the head of the science during the first half century.

PUBLICATIONS.

A copy of a very attractive catalogue recently issued by the Blaw Collapsible Steel Centering Company, of Pittsburg, Pa., has reached this office. It deals with the use of steel center forms for construction of sewers, conduits, culverts, pipe, bridges, etc., and fully explains their collapsible steel center. It is illustrated throughout and contains numerous testimonials from engineers, contractors and construction companies who have used these forms. This catalogue should prove very interesting to engineers, contractors and municipal officers and a copy can be obtained on application to the company.

NOTES.

A. Reeves, contractor, Montreal, has filed papers contesting the demand made upon him to assign.

A meeting of the creditors of J. B. Gauthier, contractor, Montreal, is called for to-day.

The current issue of the Canada Gazette contains notice that the authorized capital of the Dominion Bridge Company, Limited, of Montreal, has been increased from $1,000,000 to $2,000,000.

Operations have been commenced in the erection of the large factory buildings at the head of Christie street, Toronto, for Clarke & Clarke, Limited. The buildings will be one, three and four storeys high and the ground floor plan approximately 175 x 230 feet. A power house will also be erected. These structures will be constructed of concrete, reinforced with the Niagara system, and were designed by Pitt & Robinson, engineers, Toronto and Niagara Falls, Ont.