STONE CAISSONS.

The ordinary "Ransome stone" is composed of particles of sand mixed in some cases with a little ground carbonate of lime, the whole being incorporated into a plastic mass with silicate of soda; and then treated with a solution of chloride of calcium, when a double decomposition takes place, the silieic acid and the oxygen of the silicate of soda combining with the calcium of the chloride of calcium, and thus forming silicate of lime, while the sodium unites with the chlorine of the chloride of calcium, thus forming chloride of sodium. The silicate of lime produced in this way unites the particles of sand, &c., into a hard and perfectly durable mass, while the chloride of sodium remains diffused throughout the block, and has to be removed by washing.

According to a more recent process, Mr. Ransome gets rid of the tedious washing process by making a mixture of certain proportions of ordinary sand, Portland cement, ground carbonate of lime, and some silica readily soluble in caustic soda at ordinary temperatures, such, for instance, as the stone found in the neighbourhood of Farnham and other places; and to these materials are added silicate of soda. The mass thus formed remains plastic a sufficient length of time to allow of its being moulded; but it gradually hardens, and ultimately becomes thoroughly indurated and converted, without any further treatment, into a hard stone capable of resisting heat and cold, perfectly impermeable to moisture, and which, as far as can be judged from the experience hitherto obtained, goes on increasing in hardness, and bids fair to be thoroughly durable.

The chemical actions by which this result is produced are very curious, and appear to be as follows: The Portland cement consists, as is well known, of silicate of alumina and lime, and when the materials are mixed up with the silicate of soda, the latter is decomposed, the silieic acid combining with the lime of the Portland cement, and forming silicate of lime and alumina, while caustic soda is set free. This caustic soda, however, immediately seizes upon the soluble silica which constitutes one of the ingredients, and thus forms a fresh supply of silicate of soda, which is in its turn decomposed by a further quantity of the lime in the Portland cement, and so on. If each decomposition of silicate of soda resulted in the setting free of the whole of the caustic soda, the processes we have mentioned would go on as long as there was any soluble silica present with which the caustic soda could combine, or until there ceased to be any uncombined lime to decompose the silicate of soda so produced, the termination of the action being marked by the presence in the poros of the stone of the excess of caustic soda in the one case, or of silicate of soda in the other. In reality, however, the whole of the caustic soda is not set free each time the silicate of soda is decomposed by the lime, there appearing to be formed a compound silicate of lime and soda, a small portion of the latter being fixed at each decomposition. The result thus is that the caustic soda is gradually all fixed, and none remains to be removed by washing or any other process.

Compared with some of the best natural constructive materials, the strength of Ransome stone of this nature stands thus:

- Granite, resistance to crushing 8000 to 12,000 lb. per square inch.
- Portland stone, 2630 lb. per square inch.
- Bramley Fall, 5120 lb. per square inch.
- The Ransome stone, 8960 lb. per square inch.

Mr. J. W. Butler has recently proposed to employ this stone in the construction of coffer-dams and caissons, and has already carried out its application with success. The materials forming the stone can be moulded in situ into blocks, either solid or cellular, of the required shape and dimensions. The cellular blocks form, however, the special peculiarity of this system. For convenience in sinking them the lower edge of the bottom length would be chamfered, and, when necessary, shod with iron. The horizontal joints would be made preferably with alternate projections and depressions in the sides of the blocks, and the vertical joints are made good with timbers halved into each block. But these joints may be effected in a variety of ways, which need not be specified here.