

"sand tests" in accordance with any standard, as sands of quite different character may each of them equally well fulfil almost any washing or sifting tests that can be applied to them. In the discussion upon the paper, however, the importance of the retention of the sand test was a good deal emphasized notwithstanding its difficulties, particularly as it might often serve to detect the presence of adulterants. The effect upon the tensile strength of the addition to the cement of diluents, such as pure sand, or Kentish rag, might be hardly perceptible until the further addition of sand had increased the total quantity of inert matter to a certain proportion, but after this proportion has been exceeded, the further addition of sand leads to a much more rapid reduction of strength than is shown by the same additions to an unadulterated cement. The addition of any adulterants, such as sand, slag, ragstone, etc., the author condemns most emphatically; he quotes instances showing the danger of the presence of slag in a cement which is to be used in damp situations, and it is also shown how the addition of such adulterants must of necessity lessen the cementitious value of the material which fills the interstitial spaces in a rightly proportioned aggregate. The presence of ragstone can be detected by its effervescence with hydrochloric acid, and by the dark green color of fracture in a briquette, when broken after immersion in water for seven days. A test for the presence of ragstone formulated by Mr. Yardley, analytical chemist, is given as under: "Place on a clean silver coin a thin layer of suspected cement, drop a small quantity of dilute H_2SO_4 on it [$H_2SO_4 + 7H_2O$], then rinse with water. If the cement is genuine, the treatment with acid will slightly affect the color of the silver, but if slag is in

strong proportion, a dark brown stain will be produced on the silver. In the discussion on this paper difference of opinion was expressed as to the relative order in importance of the three principal tests discussed by the author, viz., fineness, soundness and tensile strength, and also with respect to the best practical standard of fineness; a smaller residue upon a coarser sieve than a 5,800 mesh received some advocacy, say $2\frac{1}{2}$ per cent. residue upon a 2,500 mesh—the gauge of the wire also to be duly specified. It was generally agreed that tensile tests, to be truly satisfactory, ought to cover a long period, and ought to reveal a gradual and progressive induration.

The author of the other paper discussed the observed effects upon the time of setting of a cement, produced by the solution in the gauging water of such substances as soda, bicarbonate of soda, sugar, salt, and glycerine, in varying quantities. Soda was found to produce a marked acceleration in the setting, when added to the neat cement in the proportion of 1.44 per cent. The experiments were carried out with two different samples of cement, the chemical analysis of which are not, however, given; in the cases of both the effects were very similar. The time of setting was reduced, in the one case, from 9.5 minutes to half a minute, and in the other case from eight minutes to one minute; complete setting taking place in both cases in one hour and forty-eight minutes. As the quantity of soda was increased above 1.44 per cent., the setting in the case of both cements was retarded, though it was still more rapid than when pure water was used in gauging; all of the other above-mentioned ingredients had a decided effect in retarding the progress of setting. Experiments upon the effect of such additions upon the tensile

strength had, at the date of the paper, only extended over a period of 50 days; they showed a perceptible diminution in strength in the case of the soda briquettes, but a striking parallelism between the curves of induration (plotted to time ordinates), of the pure cement briquettes, and the soda briquettes, respectively. The great value, under some circumstances, of a reliable means of securing rapid setting, was commented upon in the discussion of the paper. The fact indicated by the experiments seem to be that the addition of a small percentage of soda to the gauging water will have a marked effect in the acceleration of the process of the setting of a cement; and, as many cements naturally contain a small quantity of soda, the quantity to be added to produce the best results will probably vary from $1\frac{1}{2}$ to $2\frac{1}{2}$ per cent.

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