## TIME OF SETTING CEMENT.

IT was pointed out by Mr. S. M. Williams, in a paper read before the American Society for Testing Materials, that the factors accountable for the variable results obtained in the time of cement setting make a marked difference in the laboratory results. His paper summed up the results of considerable investigation throughout which the various influences were properly controlled and recognized. The following factors are enumerated as likely to cause errors of considerable magnitude.

1. Variation in the amount of work done on the material may cause a difference of more than two hours in the time of initial setting and cause a normal cement to appear quick setting;

2. Variation in atmospheric moisture or humidity of storage during the setting period may cause the inital time of setting to vary as much as two hours;

3. Variation in atmospheric heat or temperature of storage during the setting period may vary the time of setting as much as 1 or 2 hours.

The determination is also affected, to a less extent, by factors peculiar to the Vicat and Gillmore methods.

Throughout this series of determinations an attempt was made to keep all conditions uniform except the one whose effect was to be noted. In practice, the results obtained on two consecutive days may be affected by several factors which might combine to increase or decrease the range of values. For instance, a cool, damp day may be followed by a warmer day with a high relative humidity. The two factors on the first day both tend to retard the setting of the cement, while the high temperature of the second day, tending to shorten the time of setting, is opposed by the high humidity which reduces the amount of evaporation. To avoid the effects of these variables requires the use of a storage closet whose temperature and humidity can be controlled.

The variation in time of setting as determined by the same observer, thereby eliminating all errors due to personal equation introduced by several observers, is clearly shown, and indicates that neither method will give results consistent enough to justify the reporting of results within the limits of a few minutes.

The other variables, such as formation of the test specimen and manipulation of apparatus, are of smaller importance, compared with those of mixing and curing, but these errors may combine to increase those caused by the above.

The results obtained by varying the amount of work indicate that the test, as made at present, can be relied upon only to identify normal or slow-setting cements. The necessity for vigorous working in order that a normal cement may not be judged quick setting, defeats the object of the test when it is applied to a very quicksetting material, and may cause the set to be broken.

A study of the results makes it evident that neither the Gillmore or Vicat methods can be relied upon to give uniform results unless all factors which influence the rate of hardening are taken into account and controlled, and they further explain why comparative tests in a number of laboratories upon the same material have been found to give most variable, non-dependable results, cement often being adjudged quick-setting in one laboratory and slow-setting in another.

The British Columbia Manufacturers' Association will hold its annual convention in Victoria. September 22 and 23. One of the chief subjects proposed for discussion is "Transportation."

## CHARACTERISTICS OF SAFE DRINKING WATER.*

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CITIES using sewage-polluted water without purification invariably have very high typhoid fever rates. The installation of a filtration plant to purify the polluted water supply almost without exception effects a prompt and remarkable reduction in the typhoid fever rate. This reduction is usually so great that municipal officials are satisfied that their water supply is perfect, when in reality there is still something to be desired. When a city with typhoid fever rates consistently above 100 deaths per 100,000 population has a reduction coincident with the installation of a filtration plant to a rate between 20 and 30, there is good ground for general rejoicing because of the undeniable saving of human lives. Nevertheless, the raw water may be of such a character that an unreasonable burden is imposed on the filtration plant, and under such circumstances, in spite of fair efficiency, the plant delivers an effluent which is unsafe at times.

With the general sanitary conditions which pertain in American cities and a safe public water supply, there is no valid excuse for typhoid rates above 20 deaths per 100,000 population. There is excellent evidence to show that if all the water-borne typhoid were eliminated in northern cities the rate for typhoid fever would be less than 10. As a matter of fact, there is a group of American cities which is fast approaching European cities in the matter of low typhoid fever rates. These are the cities which have gone farthest in making their water supply safe, and while their yearly typhoid fever rates are not always expressed in a single figure, their rates are usually below 12. In these cities with safe water supplies the general sanitary conditions, exclusive of water supply, are not conspicuously better and in some instances are very much worse than those found in cities with polluted water supplies and high typhoid fever rates.

There is a large group of cities in which, following the substitution of a filtered for a polluted public water supply, the rates have been greatly reduced but still remain too high. These cities should not be satisfied with typhoid fever rates of from 15 to 30, but it behooves them to make a searching investigation to determine whether the raw water imposes an unreasonable burden on their filtration plant, or if their plant is efficiently operated and delivering a safe water at all times.

This brings us to the question of what is safe dringing water? In order to say that a drinking water is hygienically safe one must be assured that it contains no pathogenic bacteria. The efficiency of water purification plants varies from day to day and from hour to hour, and an opinion upon the absolute safety of a given water supply can not be rendered unless many bacteriologic analyses, made at short intervals during each 24 hours, show an absence of B. coli. While an absolute dictum is thus most difficult to secure, it is not difficult by daily bacteriologic analysis to determine that a water does or does not give a reasonable index of safety. Instead of attempting to find the germs of typhoid fever, Asiatic cholera, and dysentery in water, we accept the presence of B. coli as an index of pollution with sewage, for the reason that the chances of finding B. coli are very much

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