

ming's method¹ requires that the container must be filled up to a particular volume; Hurd and Letteron's method² requires that a particular length of rod of a specific diameter should be dipped at a particular angle in the gel-forming solution; if Fells and Firth's method³ is employed, it is necessary that the air bubbles should be blown at a particular rate or pressure. If these conditions are changed, different values of the time of setting are obtained. Further, in the methods involving viscosity considerations, the gel-forming system as a whole has to be disturbed several times during measurement, this disturbance being the least in the case of Hurd and Letteron's method. Methods involving the actual measurement of viscosity should give values far from truth because these measurements, by any method, involve continual disturbance of the gel-forming system. This disturbing factor is wholly eliminated if optical properties are employed, but it has been shown that methods depending upon these properties are inapplicable in the case of systems which are either optically void or highly opaque. The authors have devised a method in which the least disturbance is given to the gel-forming system and no arbitrary conditions are prescribed.

When a body is made to vibrate up and down in a liquid, ripples are produced which spread outward along the surface of the liquid, and become feebler, through attenuation, as the circles become larger, and their amplitude is reduced as they progress. The logarithmic decrement of these ripples depends upon the resistance offered by the liquid, the damping effect. In the case of a gel-forming system, the resistance is predominantly offered by the viscosity of the system which increases during setting. This will increase the logarithmic decrement, and will, therefore, decrease the distance travelled by the ripples. The propagation of the ripples will stop when the viscosity becomes very high. Hence, if ripples are produced in a gel-forming system, they will be propagated quite freely in the beginning; in course of time, the distance travelled by them will decrease and after a certain time no ripples will be propagated. This condition would, therefore, indicate that the gel has set.

The actual experimental conditions were realised by means of a ripple projector provided with a stroboscopic arrangement. The gel-forming solution was contained in a watch-glass, and the height of the vibrating fork was so adjusted that the gel-forming system as a whole was not disturbed. It was observed that initially the ripples spread over a large area, but their size diminished as the setting point is approached and the propagation stopped completely when the gel had set. The time taken by the gel-forming system to reach this condition has been taken as the time of setting. The diminution in the extent of the area to which the ripples spread can be seen from the disappearance of the ripples from the far end, and by noting the successive disappearances of the several ripples it is possible to surmise the velocity of gelation of the system,

A NEW METHOD FOR MEASURING THE TIME OF SETTING OF GEL- FORMING SYSTEMS

SEVERAL methods have been suggested for the measurement of the time of setting of gel-forming systems which is the main property characterising a gel. The setting condition has been variously defined such as the approach of a certain value of viscosity or the attainment of a constant value of some optical property. The viscosity methods employ certain criteria involving a number of arbitrary experimental conditions. For instance, Flem-

The values of the time of setting obtained by this method, with both inorganic and organic gels, are correct within 2 to 3 per cent. and are independent of the frequency of the vibrating fork and the size and shape of the vessel containing the gel-forming system. The disturbance imparted to the setting gel is minimum; this makes the present method more accurate and superior to the other methods used so far. A detailed account of this work will be published elsewhere.

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1. Fleming, *Zeit. Physik.*, 1902, **41**, 427. 2. Hurd
and Letteron, *J. Phys. Chem.*, 1932, **36**, 606. 3. Fells
and Firth, *Trans. Farad. Soc.*, 1927, **23**, 623.