probable." These "complex curves" were obtained by Mr. G. H. Cashen of this Station, and the reason advanced for setting them aside does not seem to me at all convincing. I am inclined to regard simplicity as a craving of the human mind rather than a reality of Nature. In any event, Dr. Balls could probably learn a lot about what takes place at the surface of the iron hoops of his cotton bales by employing a method of as critical a nature as that used by Mr. Cashen; 'surface' or 'electrode' capacity must certainly enter in here.

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Heights of Nuclear Potential Barriers

As a result of experimental work in the past few years on the artificial disintegration of light nuclei and the nuclear scattering of α -particles, we now have a means of estimating the heights of the potential walls surrounding these nuclei. I have collected the evidence from a variety of sources which can be summarised as below.

Fig. 1.

(a) *Minimum energy methods*: Here the value of the range of the α -particle of least velocity which will enter the nucleus and cause the emission of either a proton or a quantum of radiation is found. The energy of this particle will correspond to the height of the nuclear barrier.

(b) *Scattering experiments*: The anomalous scattering of α -particles which make close approach to the nucleus gives a measure of the probability of their entry within. The radius of the nucleus for which this scattering is appreciable can be estimated and from this we can deduce the smallest potential for which an observable penetration takes place: this will correspond to the height found by the minimum energy methods.

The heights so found (given in terms of the potential of an α -particle of charge 2) are plotted against atomic number, giving a straight line (Fig. 1).

This therefore suggests the simple rule that the heights of the nuclear barriers of the light elements are proportional to the atomic number.

If this relation is true outside the limits of the elements for which evidence exists, then we must conclude that the protons produced from phosphorus by α -particles from polonium (energy 5.2×10^6 electron volts) and potassium with radium C (energy 7.6×10^6 electron volts) are due to resonance with a

virtual α -particle level, since the α -particle will have insufficient energy to surmount the barrier.

The full details of the calculations will be published shortly.

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E. C. POLLARD.

Dec. 12.

Corrections to the Times of the P Wave in Earthquakes

A REDISCUSSION of about eighty earthquakes from the International Seismological Summary is in progress. Revised epicentres and apparent times of starting have been found, the revised tables of P recently published by one of us being used. The S tables were not used because it was known that the identification of S is less trustworthy than that of P . The new residuals of P show that the correction needed at distances near 30° is somewhat larger than was found before. In East European and North American earthquakes the tables seem accurate to 15° , but need a correction rising to $+1s.$ at 19° . Then there is a sharp bend in the curve, the corrections needed reaching $-5s.$ about 30° . They remain negative to 58° , and then are positive to 70° , the greatest correction being $+2s.$ At greater distances the corrections needed are small.

Japanese earthquakes show a similar behaviour up to 50° , but beyond that distance they are not suited for determining corrections, since an error in the tables has the same effect on the residuals at the European stations as a displacement of the epicentre to the north-west, which cannot be checked on account of the distribution of the near stations. Oceanic earthquakes seem to show no need of corrections near 30° , but the small number and uncertainty of the observations make the probable error of the times large.

Byerly noticed the bend near 20° in the observations of the Montana earthquake, but it remained to be seen how general it was. Miss I. Lehmann has also, we understand from a letter, detected it in an Azores earthquake. Our data would agree with the existence of a discontinuous increase of velocity with depth, but Miss Lehmann's study of original seismograms seems to favour a continuous though rapid transition.

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K. E. BULLEN.

Viscosity Measurements of Liquids by the Oscillating Disc Method

WITH reference to the advantage of this method described by A. van Itterbeck¹, it may be said² that another advantage it has over the capillary stream method lies in the insensitivity of the disc experiments to the presence of dust particles as compared with the sensitivity of the capillary method.

While, however, the disc method has its advantages in experiment, those who have used this method would probably agree that the accurate calculation of the absolute or relative viscosity of a liquid from the logarithmic decrement is not so satisfactory as the calculation from the capillary method.

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Nov. 11.

¹ NATURE, 130, 399, Sept. 10, 1932.

² Fawsitt -Proc. Roy. Soc., A, 80, 290; 1908.