radioactive counts is of integral form, identical in shape with the records of chromatograms obtained from the automatic titration instrument of James and Martin¹.

By injecting a known amount of fatty acid labelled with carbon-14 into the phosphor, the overall efficiency of counting was found to be approximately 30 per cent, which is satisfactory as the photomultiplier 'sees' only about two-thirds of the total volume of phosphor. The background count, including electronic noise, was 3.8 counts/sec.

A full description of the technique and constructional details of an improved apparatus will be published elsewhere.

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Counting Error due to Overlapping Particles in Thermal Precipitator Samples

THE thermal precipitator¹ is widely used as a standard instrument for sampling dust clouds. The dust from a measured volume of air is deposited on glass slides and is afterwards counted under a microscope.

Some particles consist of several smaller ones clumped together and these 'aggregates' are counted as single particles. Other particles are deposited so that they overlap ones already deposited, producing spurious aggregates. These cannot be distinguished from true aggregates and consequently the dust concentration is under-estimated. In the many previous tests of the thermal precipitator the magnitude of this error does not seem to have been investigated.

Fig. 1. Comparison of short- and long-period samples; total number of particles per 20 μ traverse; a, no overlapping; b, fitted curve

Fig. 2. Correction to be added to the count

Two thermal precipitators were placed in a colliery and pairs of samples were taken in which one of the instruments samples for five times as long as the other. A comparison of corresponding mean counts from the two instruments is given in Fig. 1. The short-period counts were grouped and the corresponding long-period means calculated. In the absence of overlapping the long-period counts would be five times the short-period counts, shown by the straight line. In fact they were less, by an amount which increased with the density of the deposit, indicating that a considerable amount of overlapping occurred in the denser samples.

The mean projected area of the particles was 18.6 μ^2 . With finer dusts the effect of overlapping will be smaller.

A curve was fitted to the results using an equation similar to those derived theoretically by other workers². From this curve we can estimate the correction to be added to the number counted to make it equal to the number deposited (Fig. 2).

The results show that with sample densities of 25–50 particles per 20- μ traverse, the true dust concentrations of the coal dust cloud are between 5 and 15 per cent higher than those estimated from the counts. Other workers have recommended densities several times greater than this³. If such densities were in fact used, the overlap error would be very large. The error can be reduced by using very low densities, but the extraneous contamination then becomes an increasingly large error. Consequently it does not seem to be possible in practice to avoid the error introduced by overlapping particles when sampling airborne dust similar to that occurring in this coal mine. The value of the thermal precipitator as a standard reference instrument in coal mines is therefore open to doubt and needs re-investigation against an absolute standard such as a sedimentation cell.

A full report of this work will be published elsewhere.

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