This technique becomes difficult with meshes finer than about 100 British Standard. However, having sealed the edges, even though the working surface may not be rectangular, and consequently estimating the number of apertures becomes laborious; once the number is counted the operation need never be repeated. A photographic enlargement of the mesh is useful here.

For counting the finer particles, electrolytically deposited grids have been used. These have excellent mechanical strength and can be cut easily to produce a standard rectangular working surface. Sealing the edges is not necessary as it is with meshes and this is a decided advantage. However, preliminary results indicate that they are slightly inferior to woven mesh, for often two particles occupied one aperture. The grid is thinner than the correspondingly sized mesh, and its wires are rough and rectangular in section as against smooth and circular ; observation indicates that these factors may have some influence on the adverse effects noted. Nevertheless, a technique for using these grids could probably be developed.

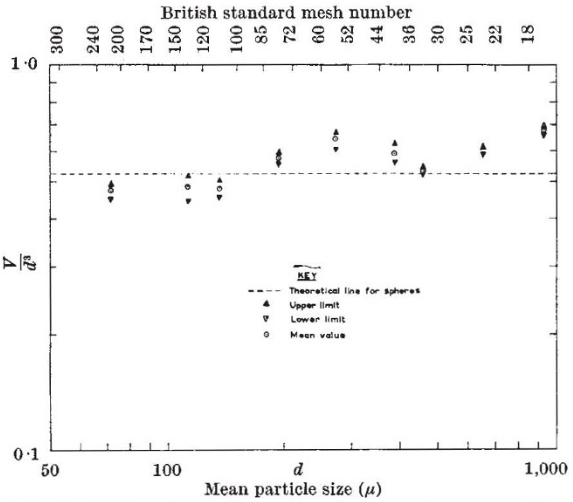

Fig. 3. Relationship between shape factor and mean particle size : coal sample

It is suggested that suitable fine meshes could be specially woven for this purpose. These would contain a standard number of apertures to British Standard or any other specification surrounded by a closely woven edging which would serve both to suitably terminate the working surface and to strengthen the mesh. A large number of these standard aperture count meshes could be woven simultaneously as one piece of cloth, the 'pattern' being (say) 5-cm. squares of working surface separated by 1-cm. wide stripes of close weave. These could be cut and suitably mounted. It should be noted that for 100 British Standard mesh material a 5-cm. square of working surface would contain about 40,000 apertures.

Preliminary results were reported earlier[7,8] where with a particular coal sample an average of $k = 0{\cdot}54$ was obtained. Interesting confirmation of this value based on Heywood's work has since been communicated (Bramley, J., private communication, reproduced in ref. 8).

Some recent measurements on coal samples are illustrated in Fig. 3, which demonstrates a variation in k with particle size. The method of plotting is clearly more revealing to changes in k than the usual logarithmic plot of V against d. Also, if a differently defined measure of particle size is introduced as a ratio with d then a plot by dimensionless groups follows ; this could be useful in correlating shape factor data.

This work is part of a project concerned with the moisture retention properties of fine coal.

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Appendix. A Method for making Standard Aperture Count Meshes

(1) Commence with a suitably sized mesh rectangle which has been cleaned in a grease solvent. A 7·5-cm. square was used here.
(2) Stick a strip of opaque 'Cellotape' on to the mesh so that the outer edge of the tape lies along and covers a wire situated about 1 cm. from the edge of the mesh. Repeat on the reverse side of the mesh for the same wire.
(3) Repeat the operation for the opposite edge of the mesh.
(4) Apply a layer of plastic material to both sides of one uncovered edge and quickly spread evenly on both sides with a spatula. Treat the opposite edge in the same way. An epoxy resin and a proprietary brand of plastic solder have both been used successfully.
(5) When the plastic is dry, but still soft, peel the 'Cellotape' away and a straight clean edge should result. To assist this it is sometimes advantageous to score the plastic gently with a sharp knife.
(6) When the plastic has hardened treat the remaining edges in the same way.

D. HOWITT

Gallium Arsenide as a Semi-insulator

SOME semiconductors have comparatively low resistivity, and this is due to their containing electrically active impurities with energy-levels near a band edge. Others have very high resistivity and this is due to their containing a predominance of impurities with levels far from the band edges, that is, far compared with the thermal energy kT. These latter materials are often referred to as insulators, but since they can carry electronic currents we prefer to introduce the term 'semi-insulator' to describe them. A material such as cadmium sulphide, which by suitable choice of impurity content can be made a semiconductor or a semi-insulator, is of particular interest and much work has been done on cadmium sulphide in the past few years. Gallium arsenide is another substance with the same property, but has the advantage that both n- and p-type material may be readily prepared.