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A Simple and Accurate Method of Deriving the Slope of a Graphed Function

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applying a standard e.m.f. to one segment of the scanner. Since the scanner is driven by a synchronous motor the time can easily be observed from the repetition of the scans on the record.

A typical record is shown in Fig. 2. The whole apparatus, apart from oscillograph, camera and camera drive, is mounted on a standard 19 in. rack, 31 in. high, and requires a power supply of 70 W. at 230 V. and 50 c/s.

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The Use of a Line Focus with Four-Windowed X-ray Diffraction Tubes

In the November 1948 issue of this *Journal*, Unmack and Jensen have illustrated the usefulness in a line focus X-ray tube of the extra two windows for obtaining Debye-Scherrer patterns, if large cameras fitted with slits instead of pin holes are employed. Recently, Taylor (1) has announced the intention of the X-ray Tube Panel of the X-ray Analysis Group to recommend in a forthcoming specification the retention of 4 windows in sealed-off crystallographic tubes of this type.

In these laboratories, a demountable four-windowed vertical tube employing an 8 × 1 mm. line focus has been in operation for the last 15 months. During that time, use has been made of the two windows from which the focus is seen as an elongated rectangle, for obtaining Debye-Scherrer patterns from a 14·32 cm. diameter camera fitted with slits *considerably longer* than are normally employed. Such an arrangement is useful for powder camera work not requiring high precision, and leaves the other two windows free for other work. For example, the following results indicate the applicability of the method:

(*a*) With a collimator consisting of two pinholes, each of ¾ mm. diameter and 50 mm. apart, a pattern from sodium chloride was obtained in 3 hr. (Cu $K\alpha$ radiation, 40 kV. and 15 mA.) when the focal line was viewed at 6° in a fore-shortened direction.

(*b*) With a slit system of the following dimensions: first slit $5\frac{1}{2} \times \frac{1}{2}$ mm., second slit $5\frac{1}{2} \times 1\frac{1}{2}$ mm., distance apart 56 mm., and the camera set up with the slits and specimen axes parallel to the long axis of the tube focus ('sideways-on' position), a photograph of equal density (as judged visually) was obtained in 10 min., other conditions being as in (*a*).

(*c*) The same slit system as in (*b*), but with the camera arranged in the 'end-on' position, as in (*a*), again gave a film of similar density with 10 min. exposure.

(*d*) With the slit system, due to the larger angular divergence of the beam and to the considerable length of specimen irradiated, the recorded diffractions on films (*b*) and (*c*) exhibited appreciable 'umbrella-effect' for values of θ up to approximately 25°. However, the maximum variation in determination of interplanar spacings from all three films was 0·05% in the transmission region and 0·02% in the back reflexion region.

These results confirm that the advantage of increased efficiency obtainable with the line type of focus over the circular focus (2), can be applied to four-windowed crystallographic tubes, whilst still maintaining efficient use of radiation from all four windows.

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A Simple and Accurate Method of Deriving the Slope of a Graphed Function

The following method has been developed to obtain the tangents to a curve accurately and rapidly with no more than a ¼–⅜ in. diameter cylindrical rod of Perspex or glass used as a lens.

The rod is laid roughly tangentially to the curve near to the point P at which the slope is required. It is then rolled over the paper till the image of P appears on the axis of the rod. The rod is twisted in the plane of the paper until the image of the part of the curve near P lies exactly along the axis of the rod. The magnification of the cylindrical lens (× 5 or 6) increases the accuracy with which this can be done. But a further check is obtained if a short pencil stroke is made across the curve at P: this, viewed through the rod, will appear as a line almost exactly normal to the rod axis, however carelessly the stroke is drawn. This line, therefore, gives a secondary criterion for setting the slope of the rod: the image of the stroke must appear to cut the image of the curve at right angles. The rod is then located over the tangent at P, as in Fig. 1.

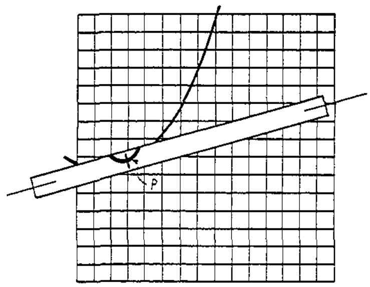

Fig. 1

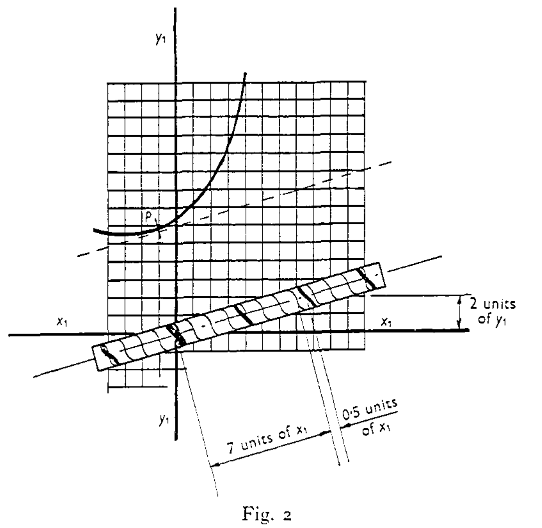

Fig. 2

The slope of the rod can now be measured by rolling it over the paper until it reaches a position where two major reference lines (x_1x_1 and y_1y_1) intersect near one end of the rod as indicated in Fig. 2. This intersection can be viewed through the rod and the rod rolled till the image of the intersection lies on the axis as shown. Other x and y reference lines on the graph-paper appear as indicated in Fig. 2: those to which the rod is nearest in slope (x axis) are the thicker and the more obliquely distorted by the lens. The slope can now be read off directly: in the case illustrated the slope is 2/7·5 the derivation of this being obvious from Fig. 2.

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