1924; Moore & Pauling, 1941). Furthermore, in PbO each lead atom is bonded to four oxygen atoms which form a square to one side of it. This arrangement can also be approximated in lanarkite by giving the sulphate group a plane of symmetry and the following parameters, again referred to the crystallographic axes:

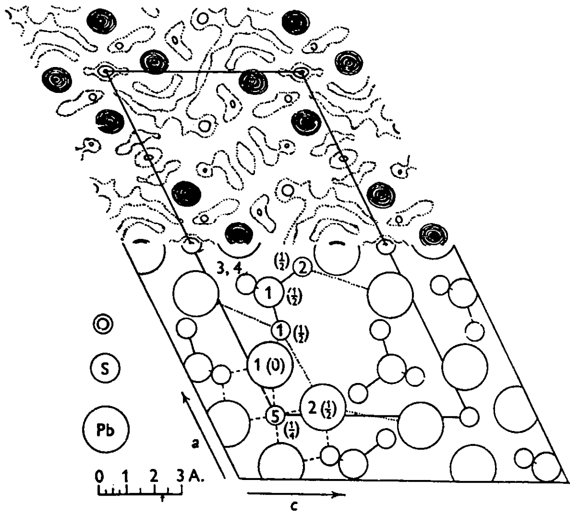

Fig. 1. Electron-density projection along b axis on (010). The unit-cell projection is outlined by solid lines forming a parallelogram. Pb–O bonds are shown by broken lines, van der Waals distances by dotted lines; y co-ordinates of atoms are indicated in brackets in the explanatory diagram.

	x (A.)	y (A.)	z (A.)
S_1	4·97	2·84 ($\frac{1}{2}b$)	1·99
O_1	3·41	2·84	1·72
O_2	5·97	2·84	3·63
O_3	5·28	1·63	1·27
O_4	5·28	4·05	1·27

In this manner, four oxygen atoms (two O_5 atoms at $\pm\frac{1}{4}b$, O_3 and O_4) form approximately a square on one side of each lead atom, at an average distance of 2·3 A. This position of the sulphate group cannot be confirmed from the Fourier map, but it is noteworthy that with this arrangement, a very close network of van der Waals forces exists between O_1, O_2 and the lead atoms. The reliability index, calculated from the usual formula and using these parameters, is less than 0·35 for each zone.

Work is being continued in order to check other possible positions of the sulphate group and to obtain more accurate bond distances.

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Crystal orientation on the Weissenberg goniometer.

By B. Jerslev, *The Royal Danish School of Pharmacy, Universitetsparken 2, Copenhagen Denmark*

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Winchell (1950) has described a modification of the X-ray method given by Bunn (1945) for setting a crystal accurately with a zone axis parallel to the axis of rotation. A somewhat similar technique, though based upon a different theoretical aspect, was used by Arnfelt (1939).

Another modification of Bunn's method, which is considered to be quicker and as accurate, is given here. The crystal is placed as correctly as possible on the goniometer head of a Weissenberg camera. The goniometer head is turned so that the X-ray beam bisects the angle between the two arcs. A narrow strip of film wrapped in black paper is placed around the layer-line screen covering the slit, and a short exposure is made, during which the crystal is oscillated some 10–15° about the above position.

If the plane of the slit in the layer-line screen is assumed to be perpendicular to the axis of rotation and parallel to the X-ray beam, then the shadow of the slit on the film caused by the background blackening may be used as a reference line with respect to the equatorial zone, and with a 57·3 mm. diameter Weissenberg camera the adjustments $\alpha°$ and $\beta°$ of the arcs I and II respectively are given by

$$\alpha° \approx C - D \text{ mm.}, \quad \beta° \approx A - B \text{ mm. (see Fig. 1).}$$

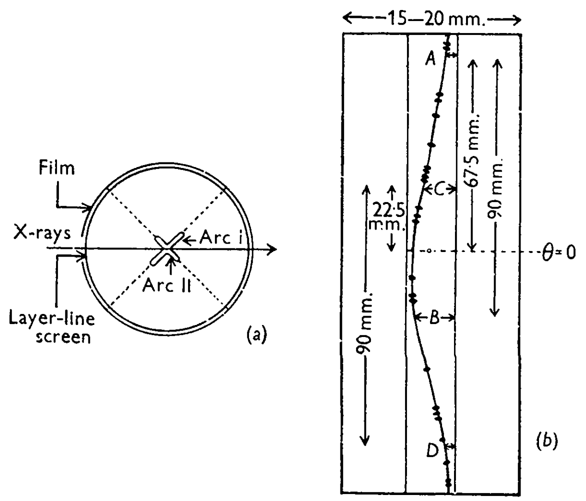

Fig. 1. (*a*) Diagrammatic drawing of the film strip and goniometer head viewed along the axis of rotation of the crystal. (*b*) Film strip flattened out. Horizontal dimensions are expanded as compared with the vertical in the figure. Spots from the equatorial zone are shown.

If the crystal is very badly out of setting the procedure must be repeated a few times because the adjustments found are only approximate, though they generally converge very rapidly towards the correct positions of the arcs.

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Note on Stadler's double-slit Weissenberg technique.

By W. R. Ruston, *Association pour les Études Texturales, 4 rue Montoyer, Brussels, Belgium*

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Stadler (1950) has described a new method of recording the *n*th and zero layers of the reciprocal lattice simultaneously by means of a Weissenberg goniometer with two screen slits.

We have found that the Unicam double-crystal Weissenberg goniometer requires only a minor transformation in order to make it suitable for that method. The layer-line screen of this instrument (Fig. 1 (*a*)) has the form of four half-cylinders B^1, B^2 and T^1, T^2. These are fixed on the two brass rings R^1, R^2 which can be moved along the rotation axis on the two brass cylinders C^1, C^2 to allow the positioning of the layer-line slit. The brass rings have on one end a rim *r* against which, normally, both half-cylinders are pushed. If the top half of the rim of R^1 is removed by milling and the key-hole-type slot of the top half of the layer-line screen T^1 is prolonged in the opposite direction, it becomes possible to position both screen halves T^1 and B^1 independently from one another (Fig. 1 (*b*)). In this way a setting may be obtained where the *n*th layer of the reciprocal lattice is recorded on the bottom half and the zero layer on the top half of the film, or vice versa. Or, if two crystals are used, the zero layers of the standard crystal and the unknown crystal may be recorded simultaneously on the top half of the film, whereas the *n*th layer of the unknown crystal is recorded alone on the bottom half of the film.

Besides the mechanical simplicity of its realization, the method has the advantage that the background fogging is not augmented because both slit halves act as one full slit only.

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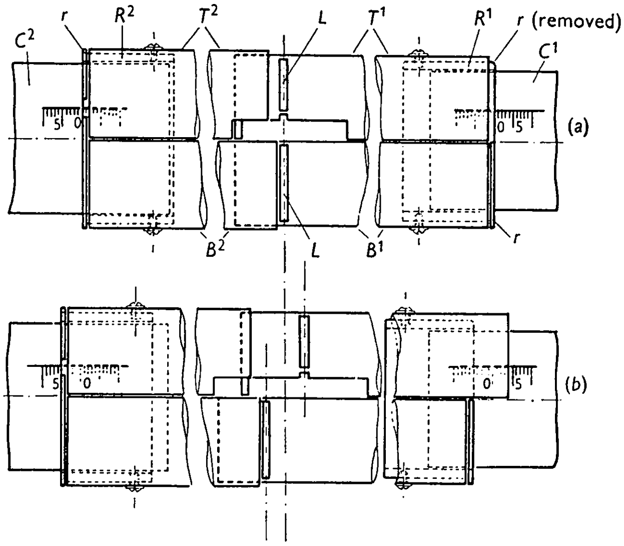

Fig. 1. (*a*) Normal arrangement of screens. (*b*) Arrangement of screens for simultaneously recording two layer lines.

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The space group and optical constants of glucuronolactone.

By F. G. Keihn and A. J. King, *Department of Chemistry, Syracuse University, Syracuse, New York, U.S.A.*

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Interest in glucuronolactone has developed recently because of its experimental application in the treatment of arthritis (Smith & Staveley, 1950). It may be obtained by the slow evaporation of an aqueous solution of glucuronic acid. The latter substance is rather widely distributed in conjugated forms in many animal and plant products.

Pryde & Williams (1931) showed that glucuronic acid has a typical pyranoid ring, and later reported a double-ring structure for the lactone (Pryde & Williams, 1933). It was first believed that the lactone contained a six-membered pyranose and a five-membered lactone ring (*a*), but later work by Reeves (1940) and Smith (1944) on trimethyl-glucurono-lactone indicated that the structure consisted of two five-membered rings (*b*). A study of anhydro sugars by Haworth, Owen & Smith (1941) has shown that structures with two five-membered rings in

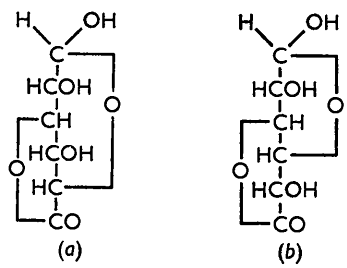

Fig. 1.