How widely the communities, the sciences, the educational institutions of this country are still his debtors is to be found by those who read the list of Sedgwick's "boys," a fine quiver full of crusaders devoted in their various ways to passing on the three gifts which we know he bestowed upon his pupils—"a vision of the subject in hand in its relation to the revolving universe, a rigorously honest method of thinking and working so that the truth may be adhered to and if possible advanced, and an enthusiasm for service which will prove better even than the desire for fame as the compelling motive to make men 'scorn delights and live laboriously.'"

HAVEN EMERSON

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A FOCUSSING X-RAY SPECTROGRAPH FOR LOW TEMPERATURES

FOR the investigation of crystal structure at low temperatures, especially when liquid hydrogen or liquid helium is used, it is essential to make the time of exposure as short as possible. To do this by the ordinary powder method a small camera is used, which naturally decreases the accuracy of measurement. Moreover, certain corrections have to be made to account for the width of the lines (*e.g.*, thickness of the specimen, absorption in the substance, etc.).

It is possible to overcome these difficulties by using the focussing principle by Seeman and Bohlin.[1] By this method the time of exposure is very considerably shortened and the dispersion increased. Since one edge of the lines always remains sharp, none of the above corrections need be made. The essential point of this method is that slit, crystal layer and film are arranged on the circumference of the same circle and a divergent beam illuminates a broad sheet of crystals. Each ray, which fulfills the diffraction equation $n\lambda = 2d \sin \vartheta$ for any particular crystal plane, is then focussed at the same point on the film.

An experimental arrangement using this principle at liquid air and liquid hydrogen temperatures is shown in Fig. 1.

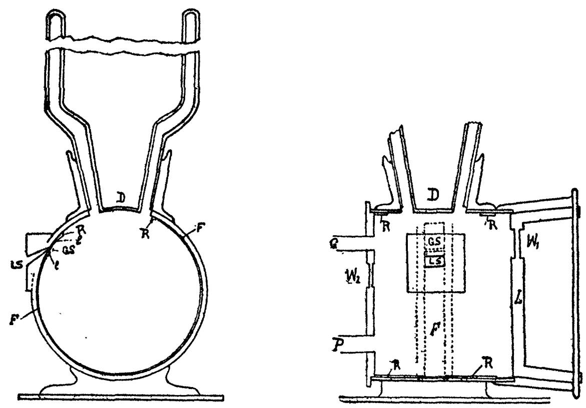

FIG. 1

A divergent beam of X-rays enters through a wedge-shaped lead slit L S in the brass cylinder, which forms the wall of the camera and strikes a crystal layer deposited on the bottom of a Dewar flask (made of Pyrex glass or metal) D, which fits with a ground joint into the camera. The bottom of the Dewar flask D is ground to the same cylindrical curvature as the wall of the camera. The film F is pressed to the wall of the camera by a ring R. The brass ring R, which fits snugly into the brass cylinder of the camera, has a slot 1 cm wide for the exposure of the film. On the same ring a gold slit G S, 0.04 mm wide, with precisely ground edges, is mounted coincident with the inner edge of the lead slit L S. The gold slit G S is placed on the same circumference as the exposed side of the film. Both sides of the gold slit G S are screened with lead (1) to avoid scattering from the slit.

The open end of the camera is closed by a lid L and the lead slit L S is made vacuum tight with aluminium foil, .05 mm thick. The entire camera is evacuated through the tube P, and gas can be admitted through the tube G. The formation of crystals can be controlled by observation through a glass window in the lid W1 and illumination of the crystalline deposit secured through the window W2.

Our experiments have shown that the theoretical expectations are fulfilled. With a Shearer tube (copper or iron target), intense and sharp patterns could be obtained in 300 to 600 milliampere minutes varying with the material investigated and according to the filters with which the film was covered.

Chlorine and bromine have been investigated. The results will be published elsewhere. Investigations of other substances are now being conducted.

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[1] H. Seeman, Ann. d. Physik, 59, 455 (1919); H. Bohlin, *ibid.*, 61, 421 (1920).