A VERTICAL ILLUMINATOR FOR LOW MAGNIFICATION PHOTOGRAPHY OF POLISHED SURFACES

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The writer finds it desirable in many instances to photograph polished surfaces in their entirety rather than be restricted to a limited field provided by the reflecting microscope. This is particularly true where textural gradations cover a rather large area. To render detail effectively, vertical illumination is necessary in photographing polished sections at natural size, or with low magnification. For this purpose the author has designed a simple illuminator.

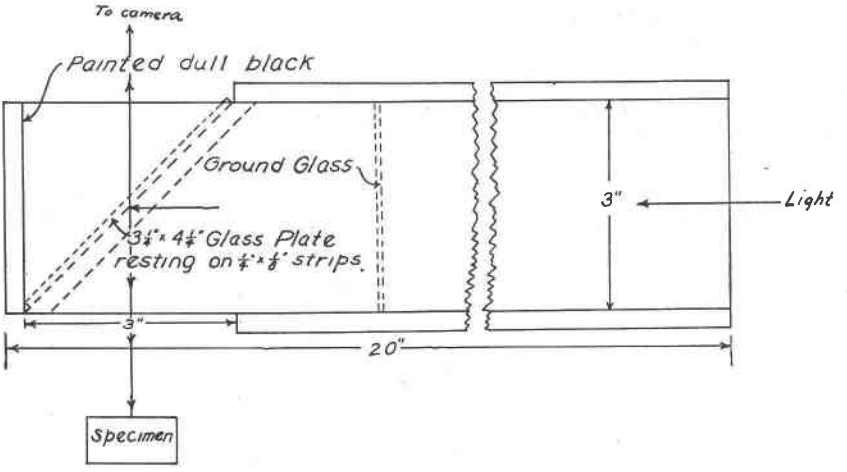

FIG. 1. Elevation of vertical illuminator.

The illuminator consists of a wooden tube 20 inches long, 3 inches high, and $3\frac{1}{4}$ inches wide, inside dimensions, closed at one end. At the closed end a space of 3 inches is left open on top and bottom. A glass plate is placed at an angle of 45° across the opening. The light coming from the open end of the tube is partially reflected and partially refracted. The reflected portion is directed vertically downward and is in turn reflected up the system by the specimen. Part of this reflected light strikes the lower side of the inclined glass plate and is reflected out through the wooden box, a small part is absorbed by the plate and the balance continues up through the camera.

The end of the tube is painted a dull black so as to absorb all the light refracted by the plate in its first reflection. Otherwise this light will re-

flect up the axis of the camera and cause a fog or haze on the film. The glass plate must be scrupulously clean to prevent hazing of the image.

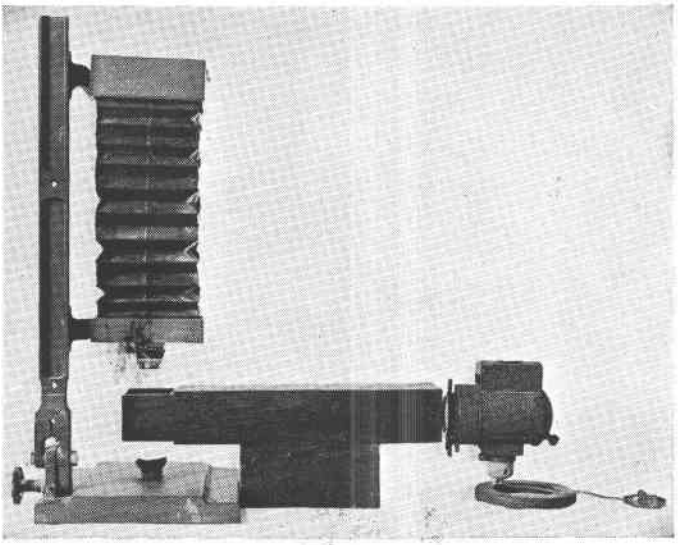

FIG. 2. Illuminator set up with camera, lighting equipment, and specimen.

The light source is a Spencer Microscope Lamp (No. 370) equipped with a projection bulb and a daylight diffusing screen which is mounted on the lamp and swings in or out in front of the bulb. A ground glass plate about 2 inches from the reflecting plate equalizes the illumination.

The camera has ground glass focusing equipment and a long extension bellows. The image can be projected on the ground glass to give an approximate focus and to outline the image as it will appear on the plate. For a final focus a transparent glass and a large focusing lens is necessary.[1]

The camera lens used by the writer is a 12 cm. Leitz photographic lens. A shorter focal length is not recommended. A longer focal length would probably be more satisfactory, for in that case for a given magnification the lens would be farther from the specimen. The cone of light from the specimen would be narrower and the light received would be more nearly vertical.

[1] Short, M. N., Microscopic Determination of the Ore Minerals: *U. S. Geol. Survey, Bull.* **825,** 20 (1931).

FIG. 3. Disseminated grains of pyrite and chalcopyrite in schist. Magnification 2×. Oblique illumination will not bring out the disseminated grains, but by the use of vertical illumination the grains clearly stand out and their distribution over a rather large area is revealed.

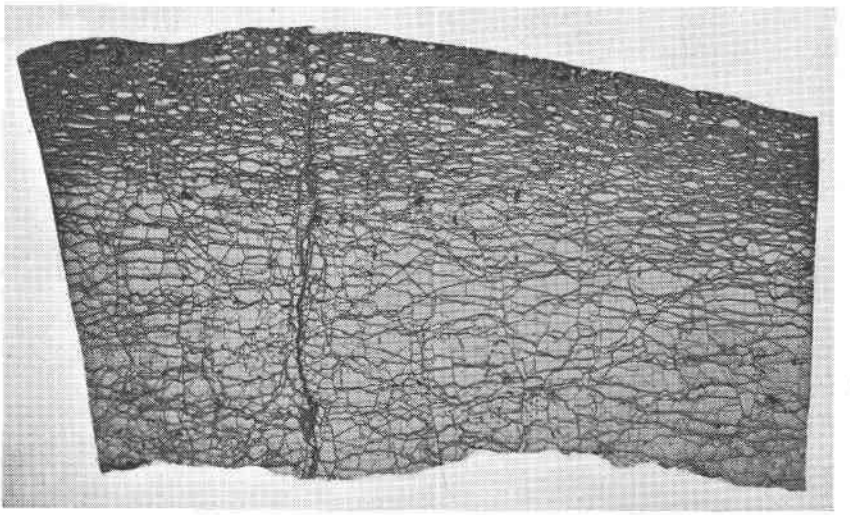

FIG. 4. Polished section of pyrite showing progressive replacement by chalcocite. Magnification 2×. This photograph illustrates a textural gradation which could not be fully illustrated by the limited field of the microscope.

A small stop on the camera lens increases the sharpness of the image. A stop of U. S. 24 is satisfactory as it gives a sufficient depth of focus for sharp images and exposure times are not excessive. Because the exposures are time exposures, the camera must be mounted on a firm foundation. Exposures vary with the specimen and it may be desirable to make a test strip for each photograph.

This illuminator was designed for mounted polished sections, but larger polished surfaces could be photographed by a correspondingly larger illuminator.