THE AMERICAN MINERALOGIST, VOL. 47, JULY-AUGUST, 1962

THE SPINDLE STAGE: A MODIFICATION UTILIZING A HYPODERMIC SYRINGE

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ABSTRACT

A new spindle stage is described built around a hypodermic syringe. Advantages of the simple design include rigidity coupled with smoothness of rotation.

INTRODUCTION

The use of the spindle stage is now well established in mineralogical practice. The diverse designs described, together with a general account of their operation, have been summarized by Wilcox (1959). A new form of stage is described hereunder which is simple in its construction yet robust, convenient to use, and capable of yielding results of acceptable accuracy.

GENERAL DESCRIPTION

A mounted stage is shown in Fig. 1. It consists of three assemblies. There is firstly the hypodermic syringe to which the measuring pointer and protractor are attached with the aid of rubber tubes. Secondly, there is the glass cell, in which the immersion liquid is held; several cells may be prepared for each stage. The cell is an independent unit which can be removed completely from the stage; it has a channel sawn into one side for introduction of the needle-mounted grain. Thirdly, there is a wooden base plate on which the syringe is held, and to which the glass cell is clamped by the ordinary microscope clips; the base plate is screwed onto the rotating stage of the microscope.

A dismantled stage can be seen in Fig. 2. The syringe assembly is held on the base-plate by the rivetted strip of plastic tubing; whereas the entire syringe can be moved forcibly—during initial assembly and for purposes of centering—it remains stable while the plunger is rotated.

Apart from the addition of rubber tubing for holding the measuring devices, the only modification of the syringe which is necessary is that the tip of the plunger be sawn off; a small amount of cork is stuffed into the hollow thereby exposed. The needle on which the mineral grain is to be mounted will be stuck, pointed end first, into this cork. The mineral may therefore be rotated by turning the plunger head while the syringe housing is clamped to its base.

When mounted in this manner the grain will be about one centimeter above the height at which a rock-slice would normally lie on the microscope stage. For this reason it may not be possible to exploit the full numerical aperture of the high power objective for the examination of

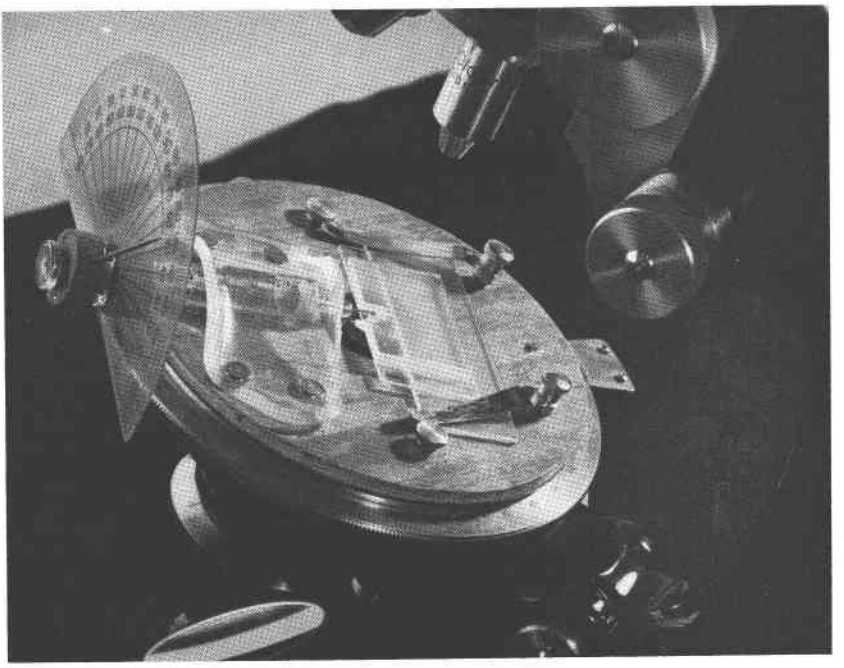

FIG. 1. The mounted spindle stage. The microscope has been fitted with a universal stage objective (Zeiss UD 20) for conoscopic observations.

interference figures unless some adaptation is made to the microscope substage. On some microscopes it is sufficient to remove the upper stop-screw from the condenser rack, thereby enabling elevation of the condenser lens. Alternatively an accessory lens may be inserted between the needle and condenser: the simplest such arrangement is replacement of the standard condenser by one designed for conoscopic work with the universal stage.

METHOD OF USE

Before use, a few drops of glycerine are inserted within the syringe to act as a lubricant: the movement thereafter will be at once firm yet delicate.

A broken-off needle is used for mounting the grain; any available needle will serve, such as a domestic or hypodermic type, as long as it is thin enough to pass through the tip of the syringe. Irregularities left on the broken needle tip should be ground off, for they will render cementing the grain difficult. Dental wax, as recommended by Rawlins and Hawksley (1934) was the first glue tried by the author, and as it has proved

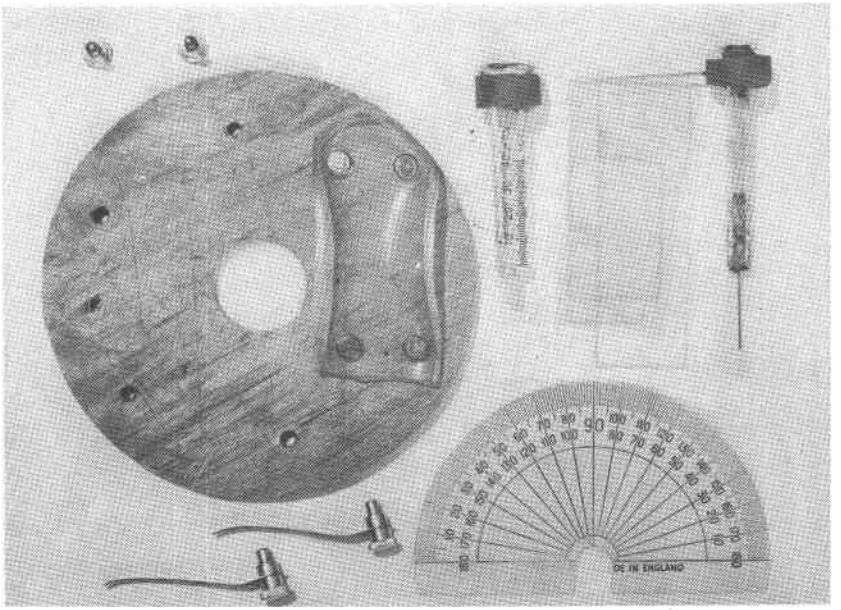

FIG. 2. The spindle stage dismantled. The plastic strip (3 mm thick) is rivetted to the plywood base plate (5 mm thick). The tube around the syringe housing is to clamp the protractor in place.

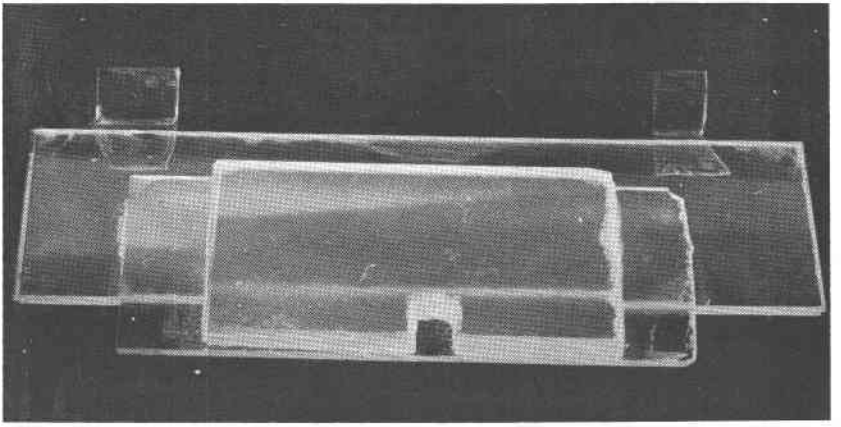

FIG. 3. The glass cell (without liquid or cover-slip). Constructed solely of microscope slides glued by dental wax. There are no optimal dimensions for the channel: a larger opening facilitates manipulation but requires more liquid.

satisfactory none of the other recipes to be found in the literature have been tried. The needle needs be but slightly warmed before touching it to the strip of wax; the blob of wax which forms immediately around the needle tip will remain sufficiently soft during several seconds for the attachment of a grain.

After the grain has been mounted on the needle the latter has to be attached to the plunger. With the plunger in position, the mounted needle is lifted with forceps and the sharp end passed through the opening of the syringe and pressed firmly into the cork which is within the plunger shaft.

Ensuring that the needle is emplaced firmly, the grain is centered, while observing it through the microscope, by manipulating the syringe bodily within its plastic clamp (Fig. 1); this is a simple and rapid procedure. The plastic tube will retain the syringe in its new position.

Having mounted and centered the grain, a cell is filled with the selected liquid and covered with a cover slip. The cell is then placed on the stage and brought up carefully until the grain is enveloped. Once in place, the cell is clamped with one or both of the stage clips. Optical observations of the grain may now be begun.

Liquids are changed after removing the cell and brushing it in a small bath of acetone. The cell is charged with the new liquid, a cover slip put on, and returned to the stage as before.

Advantages of the Design

Mechanical performance of the stage is good. Movement of the spindle is free yet amenable to precise control, and the grain may be rotated a full 360 degrees. The removability of the glass cell facilitates its washing, although further cells may be held ready for immediate interchange without pausing to wash the first one. As several needles may be kept to hand, a series of pre-mounted grains may be speedily examined. Measured grains may be stored in their original orientation, or perhaps transferred to a mounting on an *x*-ray machine.

Acknowledgment

The author wishes to thank his dentist, Dr. M. Wiener, for kindly providing the wax.

References

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Wilcox, Ray E. (1959), Use of spindle stage for determining refractive indices of crystal fragments. *Am. Mineral.*, **44**, 1272–1293.

Manuscript received, November 25, 1961.