

As the instrument is small, some difficulty was experienced in obtaining a lightweight, flexible shaft. After a number of unsuccessful attempts, a suitable shaft was constructed and is described as follows: The shaft-housing is a 24" length of nickel-plated, curtain rod, coil-spring having an outside diameter of  $3/16$ " and an inside diameter of  $1/8$ ". One fourth inch rubber tubing forms the outer covering of the drive assembly. The cable, or actual driving part of the shaft, was obtained by unwinding the two outer layers of the flexible cable-drive of a discarded hair clipper. A  $3/32$ " cable which fitted freely into the housing thus was obtained. One end of the assembled drive was then anchored to the motor shaft by brass fittings, while the other end was fitted into a hand-piece and drive attachment for the chuck.

The chuck (Fig. 2) is a split jaw type and screws onto the drive fittings at the free end of the flexible shaft. By changing the jaws of the chuck, either needles or dental burs may be used.

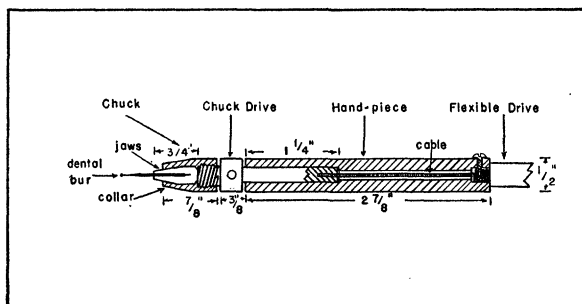


FIG. 2. Chuck and hand-piece. Section showing detail of chuck construction, chuck drive assembly and method of anchoring flexible drive.

Ordinarily, dental excavating burs are used for drill bits; however, sewing needles or abrasive dental points may be substituted as the need arises. The cutting tool which can be used most satisfactorily for any given test is dependent not only on the size and hardness of the mineral particle but also on the skill of the operator. The smallest standard dental bur is 800 microns or 0.8 millimeter in diameter, and as the cutting heads of the burs are spherical, the smallest, serviceable cutting area is 50-70 microns. Unless extremely small areas are being studied, standard excavating dental burs make the most efficient cutting tool. For very hard metallic minerals or hard gangue minerals, abrasive dental points may be required. The smallest, standard abrasive points are from 2-3 millimeters in diameter and must be dressed or worked down to usable size. The dental burs and abrasive points used were manufactured by the S. S. White Dental Mfg. Co., Philadelphia, Pa., and are listed in their general catalogue for 1943 on pages 63, 64 and 66.

Care must be taken to avoid injury to the objective lens of the microscope while the micro-drill is being used. If abrasive dental points are being used as cutting tools, extreme caution must be exercised. The short-mounted Bausch and Lomb 16-millimeter, Spencer 18-millimeter or Leitz No. 3 objectives, all have sufficient working distance between the lens and specimen; objective lenses of higher magnification focus too closely to the specimen for easy manipulation of the cutting tool.

Although the drill was developed originally for use on the harder minerals, it is also useful on the softer ones. Usually, one brief touch of the cutting tool to the surface of a soft mineral will produce an abundance of powder for microchemical tests. The harder minerals require slightly more pressure and time for a quantity of cuttings to accumulate.

The ore minerals are, on the whole, quite heavy, thus the cuttings pile up near the bit and can be readily collected and transferred to a glass slide. The transfer may be accomplished by the method recommended by Short<sup>2</sup> or they may be brushed from the specimen onto the glass slide with a small, soft brush.

The instrument, with suitable points, can be used for the index-marking of thin sections, hand specimens or metal objects.

The experimental micro-drill works well, but the present design has some minor defects. The writer, in cooperation with Mr. Roy Kayler, Machine Shop Foreman, General Maintenance Shops of the University of Idaho, is working on an improved design. The new model will have ball-bearing joints and a smaller and improved chuck.

WARREN R. WAGNER

DEPARTMENT OF GEOLOGY,  
UNIVERSITY OF IDAHO,  
MOSCOW

<sup>2</sup> N. M. Short, *U.S.G.S. Bulletin* No. 914, 2nd ed., pp. 176-177, 1940.

## BOOKS RECEIVED

- BUCKY, PAUL C. *The Precentral Motor Cortex*. Illustrated. Pp. xiv + 605. University of Illinois Press. \$4.50, paper bound; \$5.50, cloth bound. 1944.
- GRAHAM, HERBERT and ERIK G. MOBERG. *Chemical Results of the Last Cruise of the Carnegie*. Illustrated. Pp. vii + 58. Carnegie Institution of Washington Publication 562. \$1.00, paper cover; \$1.25, cloth binding. 1944.
- Marihuana Problems*. By the Mayor's Committee on Marihuana, New York City. Illustrated. Pp. xii + 220. Jaques Cattell Press. \$2.50. 1944.
- OSBORN, CHASE S. and STELLANOVA OSBORN. *Hiawatha with Its Original Indian Legends*. Illustrated. Pp. vii + 255. Jaques Cattell Press. \$2.50. 1944.
- SVERDRUP, H. U. and OTHERS. *Observations and Results in Physical Oceanography*. Illustrated. Pp. vii + 156. Carnegie Institution of Washington Publication 545. 1944.
- SEMAT, HENRY. *Fundamentals of Physics*. Illustrated. Pp. xii + 593. Farrar and Rinehart, Inc. \$4.00. 1945.