NOTE ON THE MEASUREMENT OF THE DENSITY OF MINERALS.[1]

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The object of this note is to call attention to the advantages of the "flat-top" pycnometer[2] for the accurate measurement of the density of minerals and other granular or powdered solids. This pycnometer was used and described several years ago by Dr. John Johnston and the present writer,[3] and has since been used by a number of investigators, all of whom report favorably concerning its convenience and accuracy. It has recently been placed on the market.

This pycnometer differs from the older form in having the usual conical joint between stopper and bottle replaced by a plane joint, *i.e.*, the lower plane surface of the stopper rests on the upper plane surface of the pycnometer. The frequent source of error in the older form,—the insertion of the stopper to different depths in the two weighings for each determination,—is thereby effectually done away with. This form of the joint, moreover, allows it to be easily cleaned, and, when the surfaces are properly ground, no grease or other lubricant is required. A further advantage lies in the fact that the loss in weight on standing (due to the evaporation of liquid) is negligible.

For accurate measurements with powdered material it is necessary to evacuate before adding the liquid. This is readily accomplished by attaching a water-aspirator to a special stopper exactly like the ordinary stopper except for a small axial hole. The liquid is then, by a suitable device, allowed to cover the material before air is admitted.[4]

[1] [The striking variations shown in the different authors' data on the density (or specific gravity) of even the most simple and definite minerals show that something must be wrong with our methods of determination. With the idea of aiding in the attainment of greater accuracy, the Editor has requested Dr. Adams to prepare this article; and has encouraged the Empire Laboratory Supply Co. of N. Y. to manufacture the apparatus described. It is now on the market; see advertising pages.]

[2] Also spelled "pyknometer"; the usage of *Chemical Abstracts* is followed here.

[3] John Johnston and L. H. Adams, *J. Am. Chem. Soc.* **34**, 566, 1912.

[4] *Cf.* A. L. Day and E. T. Allen, *Carnegie Institution of Washington Publ.* No. **31**, p. 55; W. F. Hillebrand, *U. S. Geol. Survey Bull.* **700**, p. 55.

A certain amount of care must be exercised in placing the stopper on the pycnometer. The latter having been filled to overflowing with water (or other suitable liquid) is grasped at the neck by the thumb and finger of the left hand, and with the other hand the stopper is pushed on firmly with a sliding motion. Unless the temperature rises (in which case no bottle of this general type is satisfactory), the stopper sticks to the bottle and is not easily dislodged. The weight of the pycnometer filled with liquid can be determined to within 0.1 mg., which implies an accuracy of about 0.0001 in the density of an ordinary mineral. The convenience as well as the accuracy of this pycnometer is likely to appeal to any one who is engaged in determining densities.

NEW MINERAL SPECIES DESCRIBED DURING 1916–1920. EDGAR T. WHERRY, *Washington, D. C.*—About sixty mineral species have been described as new during the period from 1916 to 1919 (and early 1920), inclusive, and published in this magazine, either in the original or in abstracts. It seems worth while to present a classification of these, more or less according to Dana's System of Mineralogy (Ed. 6), so that their relations to previously known minerals or groups will be brough' out.

The primary subdivisions, or "families," as they may perhaps be called, are as follows:

A. Native elements, including isomorphous mixtures of elements.
B. Sulfides, selenides, arsenides, etc., and sulfo-salts.
C. Halides, including oxyhalides and hydroxyhalides.
D. Oxides, including double oxides and hydroxides.
E. Carbonates, oxalates, organic compounds; also borates.
F. Sulfates, molybdates, etc.
G. Phosphates, arsenates, vanadates, etc.
H. Columbates, tantalates, titanates, etc.
I. Silicates of all kinds.

The first four of these families are essentially as in Dana; in E, however, types of compounds are introudced which Dana scatters in various places. It seems logical to place with the carbonates all other carbon compounds, just as all sorts of silicates are grouped together; and borates, which resemble carbonates far more than they do the uranates, with which Dana groups them, also fit in well here.

The order of the last four families is exactly reversed from that of Dana, the idea being that it is well to take up compounds in the order of increasing complexity, which brings sulfates early and silicates late. Titanates are placed with columbates because of the striking isomorphism these two types of compounds show.