low-temperature laboratory of the Physico-Technical Institute of the Academy of Sciences of the U.S.S.R. to study the effect of homogeneous compression on the anisotropy of the magnetic properties of crystals at low temperatures. Some results of such investigations, made on crystals of bismuth and zinc, have been published previously (references 10 and 11).

This paper is devoted to the description of a method for investigating the effect of homogeneous compression on the anisotropy of the magnetic properties of crystals, to the discussion of the results of investigations concerning the de Haas — van Alphen effect on zinc crystals under homogeneous compression, and also to the comparison of the experimental data with the theory of the phenomenon. Furthermore, some new information is given on the de Haas — van Alphen effect in unconstrained zinc crystals.

2. METHOD AND APPARATUS

The method of investigation consisted of measuring the torque acting on a small anisotropic crystal placed inside a massive but magnetically isotropic high pressure bomb, suspended by means of a thin elastic thread in a homogeneous magnetic field. The homogeneous compression of the crystal was brought about by the "ice method," i.e., by freezing water inside the bomb.[10]

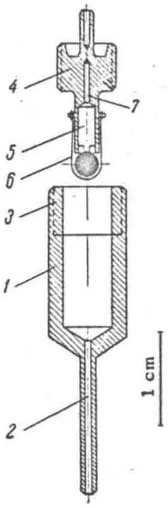

FIG. 1. Pressure bomb for investigation of the magnetic anisotropy of homogeneously compressed crystals.

A diagram of one of the most convenient high-pressure bombs is shown in Fig. 1. The bomb, made of pure beryllium bronze,* consists of the body 1 with capillary 2 and thread 3 into which bronze stopper 4 with crystal holder 5 can be screwed. The crystal holder consists of a thin-walled copper tube (copper tube and stopper are made in one piece) with four perpendicular lugs and with side windows. The cavity 7 in the stopper serves to center the crystal in the crystal holder.

The crystal is initially oriented on the platform of a goniometer and a thin quartz stick is attached to it (in the direction coinciding with the axis of suspension in the apparatus). The sample is then transferred to the crystal holder in such a way that the quartz stick fits into the cavity 7, and wire harness 6 is firmly secured to the lugs. After mounting the crystal, the quartz stick can be detached. The error in the orientation of the crystal axes relative to the axis of suspension of the bomb does not exceed 1°.

The stopper 4 is screwed into the body 1 of the bomb while covered with pure molten indium, which makes the thread gas tight after hardening. This avoids the use of gaskets and enables the bomb and the stopper to be subjected to a sufficiently strong acid etch after the machining is completed, in order to remove ferromagnetic impurities.

After the bomb has been mounted in the apparatus, it is evacuated and filled with water through the capillary 2. The bomb is cooled from the capillary side, and the ice plug which forms in the capillary then securely contains the pressure developing inside the bomb. The ice inside the bomb is thawed from above, from the side of stopper 4; if it were thawed from below, the movement of the ice would upset the suspension of the crystal holder. When the whole suspension system rotates in the magnetic field, a light spot is displaced on a scale; the displacement is measured on a traveling microscope.

The experiments were carried out at pressures of $p \sim 1700$ kg/cm^2 in a magnetic field $H \leq$ 20,000 Oe over the temperature range from 1.6 to 4.2°K.

3. THE SAMPLES

Zinc supplied by the firm Hilger (spectroscopically pure) served as starting material for the preparation of the crystals. Five zinc crystals: Zn-1, Zn-2, Zn-3, Zn-4 and Zn-7, were prepared and investigated; they differed in the method of preparation and the growth rate. Crystals Zn-2, Zn-3, and Zin-4, spherical in shape, were prepared by the method of Obreimov — Shubnikov in quartz tubes at a growth rate of 10, 15 and 50 mm/hr respectively. The crystal Zn-1 was prepared by the same method from Hilger zinc that had been

*We wish to take this opportunity to thank I. Bolgov for casting the bronze from copper and beryllium with a high degree of purity.