~300 Oe.) It must be pointed out that in certain cases [4, 5] magnetic sublattice inversion is not a phase transition of the first kind, and is spread over a field-strength region of the same order as that observed experimentally. An investigation of the mechanisms considered in [4, 5] is of independent interest. The methods we have used to attain exact angular alignment make it hopeful that such an investigation will be completed soon. The transition width found in the present study cannot be unambiguously interpreted, due to the masking effect of the demagnetizing fields of the specimen. The experimental conditions did not permit this to have the shape of an ellipsoid, so the demagnetizing fields in the specimen were nonuniform with a strength estimated at ~400 Oe, which fully explains the observed transition region width.

A relatively small transition width may be quite sensitive toward the state of a crystal. In our experiments the effects of structure defects on transition widths were not investigated. From the reproducibility of the results and the absence of any traces of block structure under the polarizing microscope as on x-ray photographs, it may be expected that their contribution would have been negligible. When pressure was applied the transition width increased, doubling at $p \sim 2.5$ katm. We suggest that this broadening was due to deviation of the pressure axis direction away from the ordering axis by ±5° and to pressure nonuniformity in the bulk of the specimen.

4. EXPERIMENTAL RESULTS

Figure 2 shows the differential susceptibilities χ_d of both specimens plotted against the magnetic field strength, with a uniaxial pressure of 2.5 katm applied to one specimen. The absolute value of the critical field for a free specimen (first χ_d splash) at 4.2°K was 91.7 ± 1 kOe, according to our measurements. The critical field of the compressed specimen, determined from the position of the second splash, was displaced by 700 Oe. The error in the relative scales of the magnetic field on the oscillogram is estimated at 5%.

Imposition of uniaxial pressure on a specimen leads not only to a shift in H_c but also to a broadening of the transition. This makes measuring the shift more difficult, particularly at low pressures, when the individual splashes are poorly resolved. By stabilizing the supply circuits to the apparatus it was later possible to get quite good reproducibility in the position of the χ_d maximum on the scale (not poorer than 50 Oe), which allowed the free-specimen peak to be distinguished. This made it possible to determine the H_c shift for lower pressures.

Figure 3 is a graph of the relationship $\Delta H_c(p)$. Within experimental error limits it can be described as a straight line of slope $(1/H_c)(dH_c/dp) = 2.9 \cdot 10^{-12}$ cm²/dyn.

These results were reproduced with three specimens, and the relationship quoted refers to a specimen in the shape of a cylinder ($D = 0.76$ mm, $l = 1.2$ mm).

5. DISCUSSION

Returning to the problem expressed at the beginning of the article, we will consider the individual mechanisms contributing to the measured values of $H_c(p)$. These include: 1) classical magnetostriction; 2) change in the anisotropy constant with pressure; and 3) the sought-for quantity $d\chi_\perp/dp$. The first two contributions can be calculated, and the last one found by experiment. Classical magnetostriction is a phenomenon in which a magnetic substance in an external field is subject to forces causing its elongation along the magnetic field direction and its compression perpendicular to this direction. With the specimen form factor taken into account, evaluations in [6] give $\Delta U_c = 0.24 \cdot 10^{-5}$ and hence $[(1/H_c)(dH_c/dp)]_\perp = 0.27 \cdot 10^{-12}$ cm²/dyn. Possible inaccuracies in determining the specimen's effective form factor are not of particular importance in view of the small size of the contribution.

The anisotropy energy of the crystals considered is almost entirely of magnetic-dipole origin [7], with the anisotropic part of the magnetic dipole field equal to

$$\mathbf{H}_a = \sum_i \frac{3(\boldsymbol{\mu}\mathbf{r})\,\mathbf{r}}{r_i^5}, \tag{2}$$

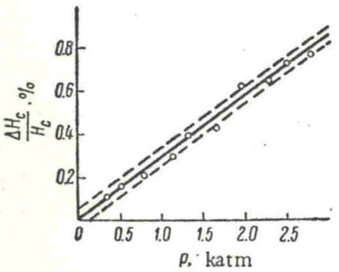

Fig. 3. Relative changes in the critical field values of a MnF_2 speciment plotted against uniaxial pressure applied along the four-fold axis. The broken lines enclose the average scatter values of the experimental points.