Determining η^2 from the condition that the thermodynamic potential be a minimum when $T < T'_c$, and inserting this into the expression for Φ, we obtain the potential of the low-temperature phase, namely

$$\Phi = \Phi_0(T) - (A^2/2B)(T-T_c)^2 - (\alpha_1 + aA/B)(T-T_c)(\sigma_{xx}+\sigma_{yy}) + (\alpha_3 + bA/B)(T-T_c)\sigma_{zz} -$$
$$- {}^1/_2(s_{11} + a^2/B)(\sigma_{xx}^2 + \sigma_{yy}^2 + 2\sigma_{xy}^2) - {}^1/_2(s_{33}+b^2/B)\sigma_{zz}^2 - {}^1/_2 s_{44}(\sigma_{xz}^2+\sigma_{yz}^2) - (s_{12}+a^2/B)(\sigma_{xx}\sigma_{yy} - \sigma_{xy}^2) -$$
$$- (s_{13} + ab/B)(\sigma_{xx}+\sigma_{yy})\sigma_{zz} - s_{14}[(\sigma_{xx}-\sigma_{yy})\sigma_{zz} - 2\sigma_{zx}\sigma_{xy}],$$

from which we can immediately determine the discontinuities in the elastic coefficients at the transition point,

$$\Delta s_{11} = \Delta s_{12} = a^2/B, \quad \Delta s_{33} = b^2/B, \quad \Delta s_{13} = ab/B, \quad \Delta s_{14} = \Delta s_{44} = 0,$$

and the discontinuities in the coefficients of thermal expansion

$$\Delta\alpha_1 = aA/B, \quad \Delta\alpha_3 = bA/B.$$

Although the coefficients s_{14} and s_{44} have no discontinuities at the transition point, they have a break at this point when considered as functions of the temperature. The magnitude of this break can be found if we include terms proportional to the product of η^2 and quadratic combinations of the strain tensor components in the series expansion of the thermodynamic potential.

According to the measurements of Austin and Pierce,[6] in the temperature region we are here concerned with $\alpha_1 \sim 0.1\alpha_3$. It is reasonable to assume that the discontinuities $\Delta\alpha_1$ and $\Delta\alpha_3$ are in at least the same ratio, so that $a \lesssim 0.1b$. Then for the discontinuities in the elastic coefficients, we obtain

$$\Delta s_{11} = \Delta s_{12} \leqslant 0{,}01\,\Delta s_{33}, \quad \Delta s_{13} \leqslant 0{,}1\,\Delta s_{33},$$

which would seem to be in agreement with the results of Kornfel'd and Chudinov.

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A MEASUREMENT OF THE DEPTH OF PENETRATION OF A MAGNETIC FIELD INTO MERCURY FILMS

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MEASUREMENTS of the critical temperature and critical magnetic field were performed for mercury films whose thickness varied from 3.7 × 10^{-6} to 95 × 10^{-6} cm so as to determine the depth of penetration.

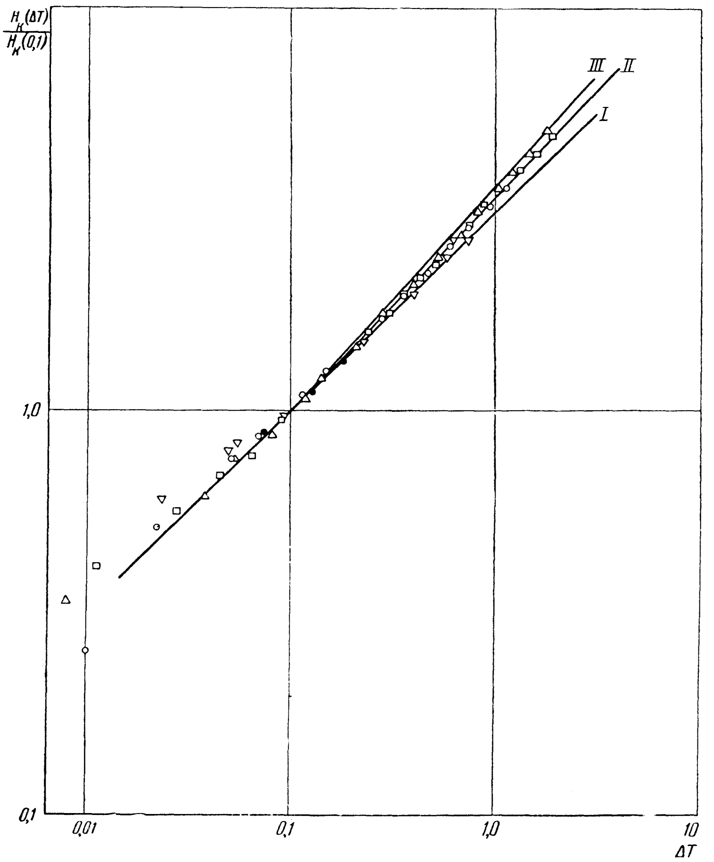
The first attempts to measure this depth of penetration were those of Appleyard, Brostow, H. London, and Misener[1] in films, Shoenberg[2] in colloidal samples, Desirant and Shoenberg[3] in thin wires, and Laurmann and Shoenberg[4] in a bulk sample. Recently the depth of penetration was measured by Whitehead[5] in colloidal mercury, and Prozorova* in thin films at a frequency of 9400 Mc.

Method and author	$10^6\,\delta_0$ (cm)
Thin films[1,8]	6.15*
Thin wires[3]	7.6
Bulk sample[4]	3.8** 4.5***
Thin films (present work)	5.3 ± 0.4
Thin films (Prozorova[1])	5.5 ± 0.5

*According to Ginzburg $\delta_T = 6.6 \times 10^{-6}$ cm at 2.5° K.

**Magnetic field parallel to the crystal axis.

***Magnetic field perpendicular to the crystal axis.



The film thicknesses for the various points (in 10^{-6} cm) are ○ — 3.7, △ — 4.5, □ — 8.3, ▽ — 21, ● — 31. The solid line is calculated from the formula $\delta = \delta_0 [1 - T/T_k)^n]^{-1/2}$, with the following values of n. (I) n = 3, (II) n = 4, (III) n = 5.

The relatively high vapor tension of mercury made it possible to obtain films up to a micron thick at temperatures of liquid helium, without using a heater of more than 0.4 w.

The films were obtained by the Shal'nikov-Zavaritskii method[6] of condensation on the plane polished surface of a container with platinum leads soldered through it. To obtain a more homogeneous film, the sides of the container were covered by a screen. An evaporated drop of mercury was placed in a thin-walled glass tube about 10 mm long with an opening about 1.5 mm, on which was wound a platinum wire half embedded in the glass for better thermal contact.

Before the start of condensation, the apparatus was evacuated with a diffusion pump, and its upper part was treated in an oven at a temperature of about 300° C for three hours. The lower part of the apparatus containing the vaporizer and mercury was placed in liquid nitrogen. The unsoldered apparatus was then mounted within a helium-filled Dewar flask. Condensation of the film continued from 15 min to 1 hr. and its thickness was calculated from the weight of the evaporated mercury. The inhomogeneity of the film thickness from the side of the container to the center was no greater than 0.3%.

The resistance of the film was measured by an ordinary potentiometer circuit, and in the case of the thickest films it was measured directly in terms of galvanometer deflection. First the temperature dependence of the film resistance was measured, and then at several temperatures the transition curves from the superconducting to the normal state was measured as the external magnetic field strength, parallel to the plane of the film, was increased. The properties of the films were measured both immediately after condensation and after annealing to the temperature of liquid nitrogen.

On the basis of the R(H) curves obtained, we found the critical magnetic field strength H_k of the film (at which $R = R_N/2$) as a function of $T = T_k - T$. The films satisfied the law $H_k \sim (\Delta T)^{1/2}$ in a completely satisfactory way, with the thickest films indicating a characteristic break in these curves, on one side of which the above law remains valid.

Using the Ginzburg-Landau formula[7] $H_k/H_{km} = 2\sqrt{6}\,\delta/d$, one can obtain the depth of penetration $\delta(T)$ from the experimental results.

It is seen from the figure that the temperature dependence of δ is not in contradiction to

$$\delta(T) = \delta_0 [1 - (1 - T/T_k)^4]^{-1/2}.$$

The table gives values of δ_0 as obtained by various authors.

In conclusion I express my sincere gratitude to Professor A. I. Shal'nikov for directing the work and constant attention, and to N. V. Zavaritskii for participating in discussions of the results.

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*Reported at All-Union Conference on Low-Temperature Physics, Leningrad, 1956.

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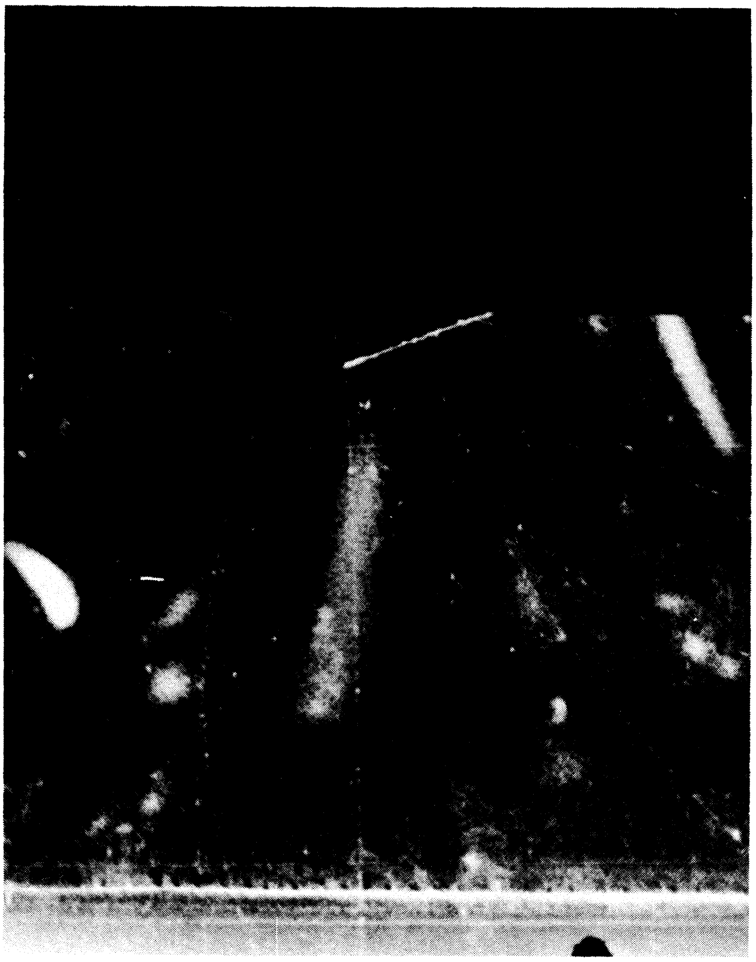

For the article by Mandzhavidze, N. N. Roinishivili and G. E. Chikovani entitled "Anomalous Decay of a Charged Particle Observed in a Cloud Chamber."

ANOMALOUS DECAY OF A CHARGED PARTICLE OBSERVED IN A CLOUD CHAMBER

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THE unusual event whose photograph is shown in the figure was recorded among the decays of charged hyperons and K-particles observed in a cloud chamber at the El'brus Laboratory.

A slow particle with an ionization multiplicity factor greater than twenty enters the chamber through the front window and decays emitting at an angle of 95° a positive particle with momentum 352^{+94}_{-61} Mev/c and close to minimum ionization. The transverse component of the secondary particle momentum is 351 Mev/c, which is much larger than the maximum momentum of the decay products in the rest system for all known decay schemes of hyperons and K-mesons.

The anomalously large momentum of the secondary particle is hard to explain in terms of experimental error. It is true that the track passes close to a small vapor cloud, but this does not interfere with the