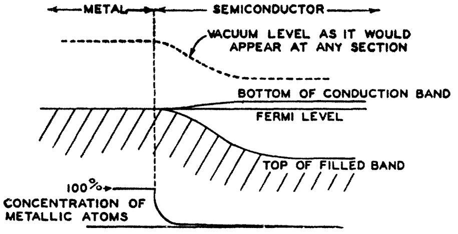

FIG. 2. Proposed energy level diagram at a contact.

the forbidden band shrinks out of existence and the Fermi level occupies the same position as in a metal, as is illustrated in Fig. 2. Since there is no thin barrier layer at such a metal-semiconductor transition, no rectification should be expected. According to Fig. 2, if some energy gap exists at the semiconductor surface, a rectifying barrier would be formed at the contact (vertical dashed line); the rectification should then depend on the barrier height.

Thus, a soldered contact to a semiconductor forms a smooth transition between a metal and the semiconductor. The energy gap in the latter may be shrunk in such a fashion that there is no barrier layer, so that rectification cannot take place.

I wish to thank Drs. D. O. North and A. Rose for their discussions and comments.

[1] H. B. Law, RCA Laboratories Division (unpublished).

Atomic Heat of Indium at Liquid Helium Temperatures

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THE atomic heat of indium has been measured in the normal and the superconducting states. For the superconducting state the data extend from 2.3°K through the transition, 3.368°K. The data obtained with the sample in a magnetic field of 250 gauss, sufficient to suppress superconductivity, extend from 1.7°K to 4.3°K. Figure 1 presents the unsmoothed data of two single experimental runs.

There exist no calorimetric data for comparison. However, Daunt, Horseman, and Mendelssohn[1] and Misener[2] have calculated values of ΔC, the difference between the atomic heat in the superconducting state and that in the normal state, and γ, the coefficient of the electronic specific heat term, from critical magnetic field measurements. Preliminary analysis of our calorimetric data gives $\gamma=4.0\times10^{-4}$ cal./mole/deg.[2] as compared to 3.5×10^{-4} found by Daunt *et al.* and 3.6×10^{-4} by Misener.

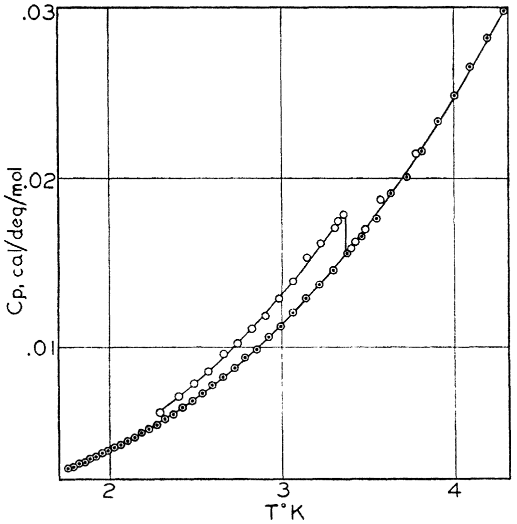

FIG. 1. Atomic heat of normal and superconducting indium. ⊙: Specimen in an applied magnetic field of 250 gauss. ○: No applied magnetic field.

Owing to experimental difficulties during the run with no magnetic field present, the data in the superconducting state are not so conclusive as is desirable. Tentative values of ΔC were calculated, however, and found to be slightly higher than those obtained by either Daunt *et al.* or Misener. These data also indicate a temperature dependence for the specific heat of the superconducting electrons more nearly proportional to T^3 than to T^4 as reported by Misener.

Additional data and a complete analysis will be reported in a forthcoming article.

[1] Daunt, Horseman, and Mendelssohn, Phil. Mag. **27**, 754 (1939).
[2] A. D. Misener, Proc. Roy. Soc. **174**, 262 (1940).

The Thermoelectromotive Force of Tin at the Superconducting-Normal Junction

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MEASUREMENTS recently published by Steele[1] of the thermoelectromotive forces existing in tin at the superconducting-normal junction were in strong disagreement with the values previously published by Keesom and Matthijs.[2] Steele's technique of measurement employing a uniform magnetic field and a single superconducting-normal junction differed in several respects from the method of Keesom in which a magnetic field made sharply non-uniform by a shield of superconducting lead provided two superconducting-normal junctions at different temperatures.

Since the Keesom method would appear to allow a more direct determination of the temperature of the superconducting-normal junctions, it was felt desirable to repeat this experiment in an attempt to resolve the conflicting results. We therefore constructed an apparatus consisting of a single loop of spectroscopically pure tin wire mounted so that half the loop passed through the core of a hollow lead cylinder 25 cm long.

The apparatus was mounted vertically in a uniform longitudinal magnetic field supplied by a liquid-nitrogen-cooled solenoid. The liquid helium bath was adjusted so that about half of the lead shield was immersed.

To assure the needed temperature gradient, a heater and carbon thermometer were attached to the tin inside the lead shield at a point about 5 cm from its upper end.

Copper wires were attached to the ends of the tin loop and were brought out of the flask to a Perkin-Elmer amplifier which served to measure the voltages. Both copper-tin junctions were outside of the lead shield and were placed in close proximity in the liquid helium bath to minimize any thermoelectromotive forces from this source.

By supplying power to the heater, the upper end of the tin loop was raised to a temperature above the normal transition point, 3.72°K, the lower end of the loop being at the temperature of the bath. In the absence of a magnetic field there then existed a superconducting-normal junction in each branch of the tin loop, both junctions being at 3.72°K. The application of a magnetic field of about 300 gauss destroyed the superconductivity of those parts of the tin wire which were not shielded. Under these conditions, a hot superconducting-normal junction (3.72°K) was located in the field-free region inside the shield, and a cold superconducting-normal junction, at the temperature of the bath, occurred near where the tin wire emerged from the lower end of the shield. The temperature of this cold junction was determined