Physics. — Measurements of the latent heat of tin in passing from the superconductive to the non-superconductive state at constant temperature. By W. H. KEESOM and P. H. VAN LAER. (Abstract of Communication No. 248c from the Kamerlingh Onnes Laboratory at Leiden).

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As a continuation of former preliminary experiments, we measured the latent heat of tin, when passing from the superconductive to the non-superconductive state, by increasing the external field at constant temperature. Measurements were made at the temperatures 2.971, 2.362, 2.303, 1.835, 1.239. We used a massive block of tin, which again had the shape of a rotation ellipsoid, axis of rotation 17.5 cm, short axis 3.5 cm.

After the block had been cooled in a zero magnetic field, and the calorimeter box exhausted, a magnetic field was set up and gradually increased. When the first cooling of the block was observed, a constant heating current was switched on and the external field adjusted so as to keep the temperature as constant as possible.

The current was kept flowing until the moment that the heating by the current could no longer be compensated by increasing the external field. The energy applied in this way immediately gives the latent heat for the transition region linearly with the external field. which tells strongly that the state at constant field and temperature is reversible.

The disturbance of the superconductivity of the block of tin, as far as it is indicated by caloric effects, occurred at the same critical fields which are characteristic of resistance and induction phenomena.

The transition proceeded very continuously and for the larger part of the transition region linearly with the external field, which tells strongly for the assumption of a sort of intermediate state, whatever this may be.


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In previous calorimetric experiments we observed that the transition from the superconductive to the non-superconductive state in the case of tin,

if effected by heating, a constant magnetic field being applied, takes place with a relaxation of several seconds (ordinarily about 30). If the transition was realised by increasing the external magnetic field, no such relaxation was observed. The measurements were carried out on a block of tin of the shape of a rotation ellipsoid provided with two cores for heating and temperature measuring. To be sure that the time-effects could not be accounted for by the complex internal structure of the first block, we repeated the experiments with a massive block of the same dimensions. The temperature records during a calorimetric experiment in all respects showed the same feature, from which we conclude that the relaxation phenomenon, mentioned above, must be characteristic of the transition process itself.

In the penetration of the magnetic field a retardation occurred of the order of tens of minutes. An analogous retardation often was observed by other experimenters in measurements of the change in induction. The penetration of the internal magnetic field and probably also the change of induction succeeds the transition so far as it is attended by a calorie effect.

We compared our results with those of other experimenters and concluded that several relaxation and hysteresis phenomena of a different kind are to be distinguished.


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Instrumente S und R. Die Beobachtungen wurden alle auf R reduziert: die Reduktion R—S beträgt ~0.16. Spektrum M 1—4e (HA 79). Gesamtzahl der Beobachtungen 585 (von 2417082 bis 2428219). Es wurden wieder, wie in allen früheren Mitteilungen, die in zwei Instrumenten angestellten Schätzungen nur einmal gezählt. Sieben stark abweichende Schätzungen wurden verworfen, sieben stark abweichende Schätzungen (2417225, 7770, 2423238, 2436, 3637, 5806 und 6321), in der Figur 1 eingeklammert, wurden verworfen, und so blieben 578 Beobachtungen für die Diskussion übrig. Der Stern ist von Mitte Februar bis Mitte Juli nicht beobachtbar, und die Lichtkurve (s. Fig. 1) zeigt Lücken, welche den Kurvenzug des öfteren unsicher machen.

Die Tabelle 1 gibt eine Uebersicht der benutzten Vergleichsterne.
