Physics. — "*On the measurement of very low temperatures.* XXII. *The thermo-element gold-silver at liquid hydrogen temperatures.*" By H. KAMERLINGH ONNES and J. CLAY. (Communication N°. 107*b* from the physical laboratory at Leiden).

(Communicated in the meeting of May 30, 1908).

The thermo-element gold-silver of which, when one of the limbs is kept at 0°, the electromotive force at ordinary temperature is about zero, shows at lower temperatures a more and more rapid increase of electromotive force [1]).

A calibration with the hydrogen thermometer has shown that at the temperatures which can be reached with liquid and solid hydrogen the increase of the electromotive force of this thermo-element per degree becomes large enough to render it suitable for temperature determinations in the area under consideration, while at the temperatures far below the melting point of hydrogen (for the determination of which the helium thermometer must be used for the calibration instead of the hydrogen thermometer) the sensibility of the instrument will be greater still.

The following table may serve to make this clear.

TABLE I. Calibration of the thermo-element gold-silver at hydrogen temperatures.

Temperature read on the hydrogen thermom.	Electromotive force in millivolts.	
	gold-silver	(constantin-steel)
(—216.01°)	(0.11972)	
(—217.416)		(6.8310)
—252.86	0.24742	
—252.93		(7.1315)
—255.34	0.26304	
—258.61	0.28912	
—259.24		(7.4585)

[1]) Comp. the measurements of J. CLAY in his thesis for the doctorate and in Comm. no. 107*d* from the Physical Laboratory at Leiden.

The third column contains the determinations about the element constantin-steel of Table VI in Comm. N°. 95^a (Sept. '06). Owing to the great lessening of the increase of the electromotive force per degree this element is unfit for the accurate measurement of the lowest temperatures [1]).

We shall soon publish a calibration of the thermo-element gold-silver with the helium thermometer at low temperatures.

Physics. — "*On the change of the resistance of pure metals at very low temperatures and the influence exerted on it by small amounts of admixtures.* II. By H. KAMERLINGH ONNES and J. CLAY. Communication N°. 107^c from the physical laboratory at Leiden.

(Communicated in the meeting of May 30, 1908).

§ 7. *Supplementary notes to Comm. N°. 99^c* (Sept. '07). We add to it with regard to [2]):

Gold. A formula of the form D has been derived for Au_V. The drawing thinner of gold wire has the same influence as we remarked in the comparison of the thin wire Pt_d with Pt_I in Comm. N°. 99^b (Sept. '07) which influence was ascribed to impurities. With two gold wires it was possible by means of analysis to show the difference in composition called forth by drawing.

Mercury. The values given in Comm. N°. 99 are represented (except at 0°) by the quadratic formula.

$$W_t = 22\,.\,3605\,(1 + 0.00358\,t - 0.06588\,t^2)$$

which for $-197°.87$ gives $O - C = +0.0106$ so that we are led to think that the temperature has not been observed quite accurately enough. Of the metals investigated it seems that mercury is best suited for the measurement of temperatures below the meltingpoint of hydrogen.

Lead. For lead two formulae were derived of the form A' and B' (A and B each time with omission of the term $c\left(\frac{t}{100}\right)^3$), according

[1]) Also the element german silver-platinum investigated by DEWAR (Proc. Roy. Soc. ser. A, vol. 76 p. 316 sqq. 1905) is unfit for this purpose because of the same fault.

[2]) Observations, formulae and other details are given in J. CLAY's thesis for the doctorate, and in Comm. N°. 107^e for the sections 7 and 8, in Comm. N°. 107^d for § 9.