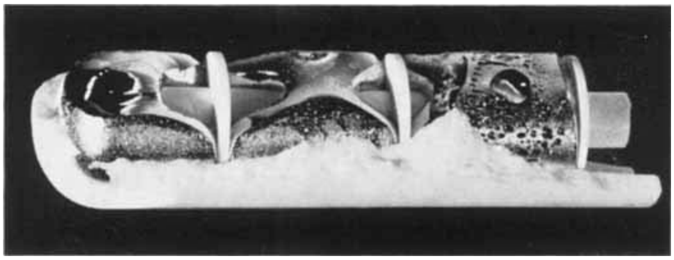

Fig. 8 An ingot of platinum after melting. Neither the alumina crucible nor black-body were damaged during heating or cooling from room temperature to the melting point. The crucible was broken after the measurement so that the melted platinum could be examined

The Freezing Point of Platinum

It became apparent during the course of this work that a temperature of 1772°C (IPTS-68) for the freezing point of platinum would not be consistent with the results of measurements made in the two black-bodies from the gold point upwards. The e.m.f./temperature curve thus obtained showed that the temperature at which the platinum arm of the thermocouple melted was some 4 deg C below 1772°C. A similar result was obtained from platinum wire-point measurements made at NRC. That the freezing point of platinum was lower than the previously accepted value was subsequently confirmed at NPL by measurements made with the photoelectric pyrometer using substantial ingots of pure platinum (4). Three series of measurements were made, two ingots being supplied by Engelhard (U.K.) and one by Johnson Matthey. There was no significant difference found between the results from the three ingots, nor between the melts and the freezes. The final value for the freezing point of platinum was found to be 1767.6±0.3°C (IPTS-68).

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Much of the impetus behind this work, together with invaluable advice and encouragement during its execution, came from the late C. R. Barber of NPL.

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Iron-Rhodium Resistance Thermometers

Cryogenic engineering is becoming much more important as work with liquid gases and on the applications of superconductivity increases. Special thermometers are needed at these very low temperatures because although platinum resistance thermometers are satisfactory for use down to 20 K they cannot be used below 10 K.

The use of 0.5 atomic per cent iron-rhodium alloy as a resistance thermometer material at very low temperatures was proposed by Professor B. R. Coles of Imperial College, London in 1964 (*Phys. Lett.*, 1964, **8**, (4), 243–244). Tests have since shown that it is suitable for use between 0.35 and 40 K. It is now available from Johnson Matthey Metals in the form of wire 0.13 mm diameter in either a hard-worked or an annealed condition.

The rate of increase of resistance of the wire varies somewhat over the range of temperature from 0.35 up to 40 K. Calibration is therefore necessary and this should take place in the position in which the instrument is to be used.

Strong magnetic fields occur in work on superconduction but the iron-rhodium alloy remains virtually unaffected so that the change in resistance per deg K is small and predictable. At temperatures in the liquid helium range a one per cent change in the resistance is produced by a field of 10 kOe. The change in resistance per deg K is not altered by work-hardening. Accuracy of ± 10^{-3}deg K in the range is possible with 20 cm of 0.13 mm diameter wire used with conventional potentiometric measuring equipment.