of hydrogen in an electric furnace, but at the maximum temperature of 1700° C. there was no sign of fusion. Rods of both electrolytic and thermit chromium were therefore prepared and heated by passing a current through them *in vacuo*.

A small hole drilled in the side of the rod enabled the true (black body) temperature of the axis of the rod, as well as the brightness temperature of the surface, to be determined (cf. Pirani and Alterthum, *Z. Elektrochem.*, **29**, 5; 1923) by means of a disappearing filament pyrometer calibrated at the melting points of tungsten, molybdenum, platinum, and iron. The difference between these two temperatures at 1600°-1700° C. was found to be 160° C. A number of determinations of surface brightness at fusion gave a value of 1760° C., giving a value of 1920° C. for the melting point of chromium. The experimental errors all tend to make this a low value. More accurate determinations will be made when larger rods of chromium are available.

C. J. Smithells.
S. V. Williams.

Research Laboratories of the
General Electric Co., Ltd.,
Wembley.

March Rainfall of North-West India and Agra Upper Winds in December–January.

The strength of upper winds in India promises to be a useful agent for long-range forecasting in this country. About 1926, Mr. J. H. Field (then Director-General of Indian Observatories) found some important relationships between Agra upper winds in September–October and subsequent winter precipitation over north-west India. Further investigations to forecast March rainfall, which I found to be very important for growth of wheat in the Punjab, revealed a correlation coefficient of − 0·82 between the departures from normal of westerly upper winds in a layer 3 km. to 7 km. over Agra during the second fortnight of December and first fortnight of January and the departures from normal of subsequent rainfall in March over the plains of north-west India. North-west India is taken to consist of the Punjab, the North-West Frontier Province, Sind, Rajputana, and Gujarat. The figures for calculated and actual departures of rainfall over this area are given in the accompanying table and are exhibited graphically in Fig. 1. The upper air data are available for 15 years.

March Rainfall over Northwest India	Yearly departures from normal Normal rainfall = 0·45"														
	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929
Actual	+1·0	-0·3	0	+0·8	-0·1	+0·1	-0·4	-0·4	-0·1	-0·2	-0·4	+0·9	-0·2	-0·1	-0·4
Calculated from Agra upper winds in Dec-Jan.	+0·9	0	+0·2	+0·3	-0·1	+0·1	-0·4	-0·4	-0·2	-0·4	-0·5	+0·4	-0·1	+0·4	-0·1

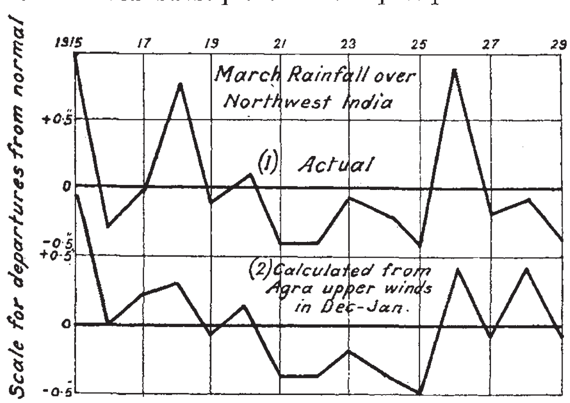

Fig. 1.

M. V. Unakar.

Meteorological Office,
Poona, 5,
Aug. 21.

Science and Engineering.

In his very interesting presidential address to Section G (Engineering) of the British Association, portions of which appear in Nature of Sept. 14, Prof. F. C. Lea attributes to J. V. Poncelet the enunciation of " the guiding principles underlying the design of vanes receiving moving fluids ".

I think Prof. Lea will find that it was L. N. M. Carnot (the father of Sadi Carnot) who, in 1787, first laid down the basic rules that water engine efficiency must depend upon the fluid entering without impact, and leaving without energy. General Poncelet published a memoir on water wheels in 1826, and claimed that the design of his wheel satisfied Carnot's conditions. The Poncelet wheel could scarcely be called a turbine, however. In 1827, Fourneyron constructed a machine which, in addition to being a commercially useful reaction water turbine, also went a long way towards meeting Carnot's requirements. Having regard to the date of Fourneyron's pioneering work, and the extraordinarily high efficiency of 87 per cent reached by his first turbine, one cannot help feeling that his name should at least be bracketed with that of Poncelet when tracing the beginnings of turbine development.

Hugh P. Vowles.

20 Ridgway Place,
Wimbledon, London, S.W.19.

Band Spectra of the Oxides of Praseodymium, Neodymium, and Samarium.

By a special arrangement of the oxyhydrogen flame, by which the dissociation of the oxides into metal and oxygen is retarded, I have been able to volatilise completely the oxides of praseodymium, neodymium, and samarium, and to photograph their emission spectra between λ8000 and λ2400.

The oxide of praseodymium shows a band spectrum extending from the extreme visible red to the violet; the most intense groups of bands are at λλ6475, 6282, 6022, 5765, 5692, 5597, 5352.

The oxide of neodymium shows groups of bands between the extreme visible red and about λ6000; the most intense group of which is at λ6580.

The oxide of samarium shows a very complicated band spectrum between λ7000 and about λ5800; the most intense group of which is at λ6506.

No bands in the ultra-violet region have been found as yet. These spectra are very likely to be attributed, at least in part, to diatomic molecules.

Giorgio Piccardi.

Istituto di Chimica generale
della R. Università,
Via Gino Capponi 3, Firenze (Italia),
Sept. 12.