connected with the appearance of a molecular field at a well-defined temperature, which, in analogy to ferromagnetic bodies, we shall call the Curie point.

It is characteristic that, in accordance with Landau's theory, the Curie point 23.5° is higher than the value of $\theta = 20.4^\circ$ found by Woltjer and Wiersma by extrapolating the law of Curie-Weiss.

The specific heat curve below the Curie point is not completely smooth; a hump is clearly discernible. We are at present not in a position to decide whether this hump is due to the properties of ferrous chloride or to some secondary fact, such as impurities or the presence of helium adsorbed on the powder in the calorimeter.

It is interesting to note that preliminary measurements of the specific heats of NiCl_2 between 20° and 80° K. ($\theta = 67^\circ$) do not point to the existence of any marked anomaly. At present we are engaged in measuring the specific heat of CrCl_3 , in which the results obtained with FeCl_2 would lead us to expect an anomalous behaviour.

O. N. TRAPEZNIKOWA.
L. W. SHUBNIKOW.

Ukrainian Physico-Technical Institute,
Kharkov. July 6.

¹ Woltjer, *Leiden Comm.*, 173b. Woltjer and Wiersma, *Leiden Comm.*, 201a.

² L. Landau, *Sov. Phys.*, 4, 675; 1933.

Ionospheric Investigations

IN a recent letter¹, Mr. R. Naismith gave a brief description of equipment used for ionospheric investigations by the Radio Research Board as a part of the Polar Year programme. The equipment described made it possible to record the relation between the radio frequency of the pulse signals used and the virtual height reached by them in the ionosphere. Records of this type give a measure of the maximum density of ionisation.

Fig. 1.

Similar equipment was developed at the U.S. National Bureau of Standards^{2,3} in 1932, and records extending from April 1933 to date are at hand. Of particular interest are the records obtained at night showing the critical penetration frequencies for the ordinary and extraordinary rays in the *F* region. Fig. 1 shows records obtained at 0500 and 0600 E.S.T. on December 22, 1933. Each record gives the virtual height for the band 2500–4400 kc/s. The frequency is changed at a uniform rate of 200 kc/s. per minute, thus requiring $9\frac{1}{2}$ minutes to pass through the band. Although accurate deter-

mination of the actual separation between critical frequencies will await a more nearly simultaneous determination of the two values, the separation is very nearly 800 kc/s. when the ordinary ray critical frequency is at 2500 kc/s.

The greater portion of the critical frequencies obtained at night in this band were for the extraordinary ray. The diagram in Fig. 2 has been plotted from monthly averages of this critical frequency and represents about 1,900 hourly determinations of the

Fig. 2.

type shown in Fig. 1. Calculations from these curves indicate that the two minima in December occurring at 2200 and 0600 represent respectively ionisation densities approximately 1.14 and 2.05 times as great as the minimum value at 0400 in June. The maximum in December at 0430 represents a density 2.65 times as great as the June minimum. The maxima in November and January are slightly higher than that in December.

Work is in progress on the replacement of the preliminary equipment by permanent equipment which will record over a frequency range from 500 to about 12,000 kc/s. The apparatus is arranged to cover this range in four bands. In order to maintain the receiving set accurately in tune with the transmitter, the latter is provided with two oscillators, one variable and the other fixed. The fixed oscillator is set at a value equal to the intermediate frequency of the superheterodyne receiving set. The output from the antenna is either the sum or the difference frequency depending on which band is being used. The variable oscillator of the transmitter serves also as the oscillator for the receiving set. Thus only the detector of the receiving set is required to be tuned, and this tuning is not critical.

Department of Commerce, T. R. GILLILAND.
Bureau of Standards,
Washington.
June 12.

¹ R. Naismith, *NATURE*, 133, 66, Jan. 13, 1934.

² Gilliland, *Bureau of Standards Journal of Research*, 11, 561–566, Oct. 1933. *Proc. I.R.E.*, 22, No. 2, 236, Feb. 1934.

³ *NATURE*, 133, 57, Jan. 13, 1934.