observed; it is clear from all results however that there is a transition of some kind at 79°C ±0.5°.

The problem is now being attacked by more refined methods, since the preliminary exploration has given consistently positive results.

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[1] Band and Li, *Longitudinal Thermoelectric Effect (3) Aluminium* Proc. Phys. Soc. appearing shortly.
[2] Band, *Longitudinal Thermoelectric Effect (4) Aluminium continued*, Proc. Phys. Soc. appearing shortly.
[3] Feng and Band, *Longitudinal Thermoelectric Effect (1) Copper*, Proc. Phys. Soc. **46**, 515 (1934).

Elastic Scattering of Fast Electrons in Mercury and Agreement with Mott's Theory

Jordan[1] has reported good agreement between Mott's theory and the experimentally measured angular distribution of elastically scattered electrons for 2000 volts in mercury in the angle range 0° to 42°. He was unable to go to angles greater than 48°, because he could not measure the small scattered current accurately at large angles and high voltages. Agreement at such a voltage in mercury is not to be expected, since Mott[2] made approximations which are equivalent to assuming that the classical "distance of closest approach," b, of the electron to the nucleus is small compared to the de Broglie wave-length (λ) of the electron. For 2000 volts in mercury, $b=0.57$A, and $\lambda=0.27$A. According to Morse's criterion,[3] which is that the minimum energy for which Mott's equations are accurate is of the order $50Z^2$ (Z is the atomic number), we should not expect good agreement much below 320,000 volts in mercury.

In preliminary experiments, using an apparatus developed to record the angular distribution of scattered electrons photographically, we have found a distinct maximum near 112° at 2000 volts in mercury. Since Mott's theory gives a monotonic curve, we can conclude that there is not good agreement over the whole angular range for 2000 volt electrons in mercury.

A horizontal beam of fast electrons was shot through a vertical molecular beam of mercury. The electrons scattered in a horizontal plane pass through slots in three semicylindrical concentric shields. A retarding potential on the second shield stops all the inelastically scattered electrons, while a high potential on the third shield accelerates the elastically scattered electrons to the film, which is in the form of a semicircular strip. The angular distribution of elastically scattered electrons is thus recorded as the linear distribution of blackening along the strip of film. The decrease in scattered intensity as the incident electron energy is increased, is overcome by increasing the acceleration to the film, which in effect increases its sensitivity.[4] The position of maxima observed at 800 volts in mercury showed good agreement with those observed by Arnot[5] and Jordan and Brode.[6] With increasing electron energy, these maxima moved in to smaller angles, till at 2000 volts only one peak, at 112°, was clearly resolved.

This research is admittedly incomplete because of the transfer of the author to another institution. The investigation was suggested by Professor A. L. Hughes.

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[1] E. B. Jordan, Phys. Rev. **45**, 47 (1934).
[2] N. F. Mott, Proc. Roy. Soc. **A127**, 658 (1930).
[3] A. L. Hughes and J. H. McMillen, Phys. Rev. **43**, 875 (1933).
[4] B. von Borries and M. Knoll, Phys. Zeits. **35**, 229 (1934).
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[6] E. B. Jordan and R. B. Brode, Phys. Rev. **43**, 112 (1933).

Note on New Bands of the Ionized Nitrogen Molecule

It has been found possible by employing a slit-form cathode to operate a discharge in pure nitrogen so as to develop the $^2\Sigma \rightarrow {}^2\Sigma$ bands of N_2^+ with considerable intensity and great freedom from the troublesome overlapping of spectra of the neutral nitrogen molecule. Measurements on the best plates have enabled the assignment of some 400 new lines to be made including the (2–2), (3–4), (5–7), (6–8), (0–3), (1–4) and (2–5) bands. The locations of the origins have been obtained graphically from the frequencies of the early R and P lines and are given in Table I together with the wave-lengths of the heads.

TABLE I.

Band	Head (A)	Origin (cm⁻¹)	Band	Head (A)	Origin (cm⁻¹)
(2–2)	λ3857.9	25939.8	(6–8)	λ4466.6	22406.5
(3–4)*	λ4168.0–0.4	24013.8	(0–3)	λ5228.0	19139.7
(3–5)*	λ4554.4–0.2	21971.1	(1–4)	λ5148.8	19434.7
(5–7)	λ4486.2	22305.4	(2–5)	λ5076.5	19710.4

* Double headed due to rotational perturbation.

In addition it has been possible to follow the (3–5) band to the origin and with the help of the data on the (3–4) band to determine with considerable certainty that the $v'=3$ levels are perturbed at only two points (and not three as inferred by Coster and Brons).[1] Densitometer records made from both first and second order plates of these bands indicate pretty definitely that the lines showing the *greater* perturbation (centering at $K'=9$) must originate on $T_1'(K+\frac{1}{2})$ levels while those showing the *smaller* perturbation (centering between $K'=6$ and 7) must originate on the $T_2'(K-\frac{1}{2})$ levels. This reverses the assignment made by Coster and Brons from a study of the (3–5) band alone. It must be borne in mind, however, that these authors were not able, because of the many impurity lines present on their plates, to follow each branch to the origin and admitted that their relative intensity data did not lead unambiguously to their assignment.

The rotational constants and the observed origins are in close agreement with the results predicted by other observers.[1, 2]

A more extended account of the experimental arrangements and the numerical results is appearing in a current number of the *Proceedings of the American Academy of Arts and Sciences.*

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October 26, 1934.

[1] Coster and Brons, Zeits. f. Physik **73**, 747 (1932).
[2] Parker, Phys. Rev. **44**, 914 (1934).