transition curves of showers and bursts, has provided fairly strong evidence that there must be a very few energetic rays at sea-level, which have the full radiation loss of electrons, even in heavy elements. It follows that the great majority of the rays, for which the energy loss certainly varies rapidly with energy, are probably not normal electrons. We therefore agree with the view of Neddermeyer and Anderson that it is likely that there are two types of particles present, though the difference in behaviour only exists for energies over 2×10^8 e-volts.

The experimental work described in this paper was carried out mainly to investigate the discrepancy mentioned above between the two sets of experimental results. It will be shown that our former conclusion, that nearly all the rays with energy under 2×10^8 e-volts are absorbed like radiating electrons, has been fully confirmed. Further, the assumption of the previous paper that the penetrating rays actually become absorbable like normal electrons, when their energy falls much below about 2×10^8 e-volts, is also shown to be correct.

These further results, together with the implications of the cascade theory, lead therefore to the conclusion that the cosmic-ray beam at sea-level consists of a few fully radiating electrons, together with a large number of particles, which are very penetrating when energetic, but which apparently become indistinguishable from radiating electrons when their energy falls much below 2×10^8 e-volts.

2. The mean energy loss as a function of energy

Measurements have been made of the energy loss of cosmic rays in the following plates:

	t	$l = t/\lambda_0$
Lead	0·33 cm.	0·82
Lead	1·0 cm.	2·50
Gold	2·0 cm.	8·5

The thicknesses (t) are given also in terms of the fundamental units λ_0 of the cascade theory, which are 0·40 cm. Pb and 0·24 cm. Au (Bhabha and Heitler 1937). The magnetic field used was either 3330 or 10,000 gauss.

In order to compare the results with the theory of the radiation loss, it is convenient to subtract from the measured energy loss $(E_1 - E_2)$, the energy E_i estimated to be lost in ionization and excitation. From Table II of the paper by Bethe and Heitler (1934), this can be estimated as approximately 15×10^6 e-volts per cm. Pb, for energies from fifty to a few hundred million