Using a cleavage surface of rock salt crystal instead of the glass surface, a fine pattern of rectangular cracks is obtained (Fig. 1). Other crystals give different but characteristic patterns, though not always coinciding with the usual cleavage cracks. The breadth of the zone of cracks increases with the capacity of the spark circuit. The relationship between the density of cracks and the capacity and the potential difference is not simple. The appearance of the cracks is probably due to the electrostatic stress acting as a superficial tension along the spark track. It seems that the present phenomena may be utilised for measuring the steepness of the potential gradient along the spark track.

Details of the results of experiments will be published later in the *Scientific Papers* of our Institute.

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Character of Atmospheric Ionisation.

IN recent months an apparatus has been set up at Kew Observatory for investigating atmospheric ionisation. A continuous record is taken of the ionisation currents to the central electrodes of three cylindrical condensers, through which air is aspirated. The outer cylinders of the condensers are maintained at three different voltages, which are automatically reversed in sign every five minutes, so that positive and negative ions are alternately collected by the central electrodes. The ionisation currents are recorded photographically on bromide paper by light reflected from the mirrors of three Dolezalek electrometers. The mouths of the condensers project through the wall of a hut and are 10 cm. apart from each other. The mean height above the ground, a grass lawn, is 1·5 metres.

A quite unexpected phenomenon has been observed on the photographic traces. So far as can be seen, the ionisation current consists of a succession of pulses which occur simultaneously on all three current records. The magnitude of the effect varies with atmospheric conditions and from one pulse to the next. About twenty such pulses are recorded by the electrometers in each four minutes of charging up; that is, the frequency is five per minute on the average. In fine weather conditions, each electrode collects about 10^8 ions in four minutes, so that each pulse contains on the average about 5×10^6 ions. Further, a proportionality exists between the pulses on the three instruments; a large 'kick' on one electrometer is accompanied simultaneously by large 'kicks' on the other two.

The Dolezalek electrometers are not critically damped, so it is impossible at the present stage to make accurate measurements of the succession of electrometer 'kicks' which constitute for the most part the current traces. It is intended to utilise a Lindemann electrometer, which is practically dead beat, for obtaining more exact information on the nature and magnitude of the pulses.

The results can only be interpreted as evidence that the ionisation in the bottom layer of the atmosphere is by no means uniformly diffused. Parcels of relatively highly ionised air are present which are of such a size that when one condenser receives a charge-pulse so do the other two. It is not possible to give the number of ions comprising a parcel; one can only point out that the fraction which each condenser collects may be from 10^6 to 10^7 ions. For comparison, we note that an α-particle produces about 2×10^5 pairs of ions in its path through air at atmospheric pressure; each parcel of ions in the atmosphere probably contains about a thousand times this number.

The phenomenon is yet to be explained, but one feels that the picture it has suggested of ions in parcels distributed more or less regularly through the atmosphere must modify considerably our ideas in atmospheric electricity.

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Polish on Metals.

SIR GEORGE BEILBY [1] attributed the polish on metals to the covering over of the surface by a layer of amorphous metal resulting from rubbing, which causes the metal to flow and then harden as a supercooled liquid. Prof. G. P. Thomson's high-speed electron beam camera [2] was used to investigate this.

Small blocks of copper and silver were etched and pictures taken which showed diffraction rings corresponding to the spacings in the cubic lattice of each metal. The copper block was rubbed successively on emery papers No. 00, No. 000, and No. 0000, with benzene as a lubricant to prevent the abrasive from being forced into the metal. At this degree of polish the diffraction rings were diffuse but of the same atomic spacings. As crystals normally give sharp diffraction patterns, the rubbing must have decreased the original size of the crystals, which reduced their resolving power and so caused the rings to broaden.

After polishing with light magnesium oxide and water, the mirror-like surface gave only two broad diffraction rings in place of the previous diffraction rings. The spacings of the copper atoms were now different from those in the crystal structure. The copper atoms must have been flowed into a random arrangement different from their orderly positions in the cubic lattice. But the atoms can approach each other only to a finite distance which will predominate, so that this new semi-orderly arrangement will be favourable for electron diffraction interference.

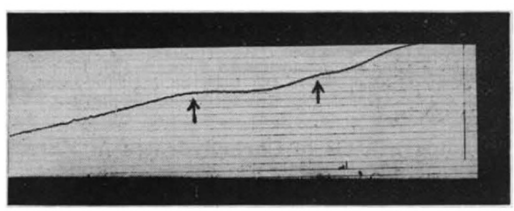

FIG. 1.

The intensity of the diffracted electrons I depends on the factor ψ, the amount that a single copper atom diffracts as the angle of incidence varies, and on the factor x, a function of the distance between the copper atoms, the angle of incidence, and the wave-length of the electrons. $I = 2\psi^2(1 + \sin x/x)$. A microphotometer record of the two broad rings from polished copper is shown in Fig. 1.

NEAREST DISTANCE OF APPROACH OF ATOMS.

	Calculated from diffraction expts.	In normal crystal (X-rays).
Copper . .	$2{\cdot}585 \times 10^{-8}$ cm.	$2{\cdot}54 \times 10^{-8}$ cm.
Silver . .	$2{\cdot}718 \times 10^{-8}$	$2{\cdot}876 \times 10^{-8}$
Iron . .	$2{\cdot}667 \times 10^{-8}$	$2{\cdot}78 \times 10^{-8}$

These broad rings also appeared from a stainless steel mirror classed above as iron, and from silver and