

which it is cut. It may be defined shortly as the projection on the plane of the section of the line bounding the area of destructive shear. This line will be in advance of the face of the tool by a distance



FIG. 3.

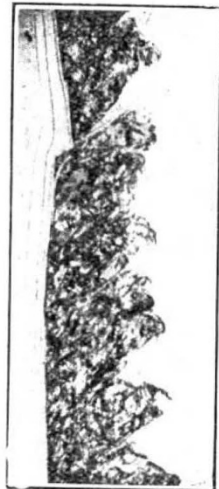


FIG. 4.

FIG. 3.—Shaving from a block of paraffin. At the temperature at which the cut took place, the paraffin behaves much like a sample of cast iron.

FIG. 4.—Longitudinal section of a similar shaving. The paraffin shaving was embedded in soap, sectioned in a microtome, and mounted in castor oil.

proportional to the thickness of the cut at the point under consideration (see Fig. 5).

The shaving is always shorter than the length of the cut from which it was taken, and if α and β are respectively the angles which the principal plane of cleavage and the face of the tool make with the normal to the surface of the cut, it is easy to see that the ratio of the lengths is $\cos \alpha / \sin (\alpha + \beta)$.

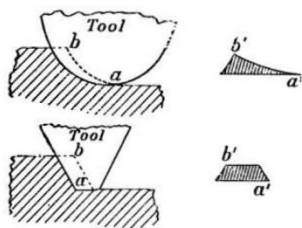


FIG. 5.—Relation between the cross-section of the cut, ab , and that of the shaving produced, $a'b'$.

impossible without it. Glass cutting with steel tools also requires a lubricant, for which purpose turpentine or petroleum are generally chosen.

I remember, in a correspondence with Sir G. G. Stokes on this subject, mentioning that even the presence of turpentine vapour had a noticeable effect. There can, I think, be little doubt that films of lubricant (of molecular thickness it may be) pass not only over the active part of the tool, but also penetrate along the planes of cleavage in the shaving itself.

A. MALLOCK.

9 Baring Crescent, Exeter.

One Possible Cause for Atmospheric Electric Phenomena: A Reply.

IF Sir Oliver Lodge will turn up his copy of NATURE for January 21, 1904 (Vol. 69, p. 270), he will find that I made there the identical suggestion for the origin of the earth's negative charge which he makes in NATURE of October 14, p. 512. The explanation

is, however, unsatisfactory for a number of reasons, the chief of which may be stated shortly as follows:

To maintain the current from the earth into the atmosphere, it would be necessary for 2000 negative electrons to be shot into each square centimetre of the earth's surface every second. But beta rays ionise the air through which they pass, and according to recent theoretical work it appears that beta rays, no matter what their velocity may be, produce more than 40 pairs of ions along each centimetre of their path in air at atmospheric pressure. Thus in each cubic centimetre of air near the earth's surface 80,000 pairs of ions would be produced per second. But we know from actual measurements extending from the equator to the polar regions that only 4 or 5 are so produced and all these can be accounted for by known radiations.

Sir Oliver suggests that "the beta particles would be magnetically inveigled towards the poles, where they might descend with down currents." This suggestion has been made previously, and it is easy to show that it offers no way out of the difficulty although the demonstration is too long to be given here.

G. C. SIMPSON.

October 17.

The Green Ray at Sunset and Sunrise.

IN NATURE of October 14, p. 513, Prof. Alfred Porter maintains that there are two distinct phenomena which go under the name of the green flash, and that the one most usually seen is an after image in an eye fatigued by the red light of the sun. I have seen the green ray many times in this country and in the tropics, and the phenomenon as I have seen it is always exactly the same; I am quite convinced in my own mind that it is not due to eye fatigue, for the appearance at sunrise is precisely the same as that at sunset; I have seen it a number of times at sunrise, and the first time I ever saw it was at sunrise when I was not looking out for it. I have, moreover, examined the setting sun with binoculars and with a telescope; when the sun has very nearly set, but before the appearance of the green ray proper, the upper edge has a very irregular shape owing to refraction effects, sometimes resembling flames; the tops of these "flames" gradually become bright green and the colour spreads downwards till the whole of the minute remaining part of the disc becomes green. To any one who has examined the green ray with a telescope at sunset, and has seen it with the naked eye at sunrise, it seems inconceivable that it can be due to eye fatigue.

C. J. P. CAVE.

Stoner Hill, Petersfield,

October 21.

As the green segment continues to be debated, permit me to put a few facts on record. I have often in Egypt watched the sunrise light descending the western hills, and when the edge of the shadow reached me, turned to view the sun. The first appearance of the sun is a blue segment, changing to green, and then to white. This is exactly the converse of the colours of the sunset segment; as the rising light cannot be due to an after-image, no more is the setting light. Moreover I have never seen the green light shift about, as an after-image does, by movement of the eye; it is always exactly on the segment.

Further, I often have protracted the sunset blue by walking up a slope, and so keeping it in view, on and off, as long as I go upward. The least distance