

the blackness of the escaping smoke. The supply of electricity of sufficiently high potential is, however, a difficulty for the present.

### 3. The Remarkable Sunsets. By Mr John Aitken.

The very remarkable and beautiful sunsets which have been so frequent of late, in which the sky has been lit up with a wondrous wealth of colouring, and with a splendour more than earthly, has given rise to much interest and speculation as to the cause of the brilliant colouring. According to one explanation, the effect is produced by the light becoming coloured in its passage through the atmosphere by an excess of water vapour, or other absorbing medium, at present in the air. The other explanation is, that the effects are the result of a superabundance of atmospheric dust, probably due to the late eruptions of *Krakatoa* and other volcanic mountains.

There seems to be a possibility of determining by observations which of these theories is the more probable. In all the descriptions of the sunsets the point which is most generally remarked on is the immense wealth of the various shades and tints of red. Now, if dust is the cause of these glowing sunset colours, then there must be somewhere a display of the colours complementary to the reds; because the dust acts, not by the selective absorption, and destruction of the colours, but by a selective dispersion of them. The very small particles of dust in the atmosphere stop the direct course of the rays and reflect them in all directions; but the dust particles are so very small, especially in the upper regions, that they are only capable of stopping, and reflecting, or scattering the rays of the blue end of the spectrum, while the red rays pass on unchecked. There therefore ought to be somewhere in the sky a display of the colours of the blue end of the spectrum. From the observations I have been able to make since this suggestion presented itself, I find that the display of blue and green colours is quite as prominent a feature of the late sunsets as the reds.

Overhead the display of blue is fuller than I have ever seen it before; and as the sun passes below the horizon, and the lower stratum of air with its larger particles, which reflect white light,

cease to be illuminated, the depth and fulness of the blue increases in a very marked degree. While the sky is deep blue overhead it will be observed that lower down the blue changes to blue-green, and in some cases to green, the wonderful greenness sometimes seen in a clear space in the sky being occasionally intensified by contrast with a rose-coloured cloud or haze alongside of it.

These considerations seem to point to dust as the cause of the glowing colours of our late sunsets, as none of the colours are destroyed, but are simply sifted out and assorted, and the sunset colours seem to be produced in the following way: When we look into the clear blue sky overhead, we see the light selectively reflected from the small particles capable of scattering only the colours of short wave-lengths, and we see only blue. If in the evening we gradually lower our gaze, and look into the clear sky in any direction not towards the sun, we will then see that the blue gradually changes to blue-green, and sometimes even to green, and lower down it passes into white or rose-colour near the horizon, according to the circumstances. This green would seem to be produced in the following way: Suppose we are looking northwards, then the light which enters our atmosphere from the west has, before it arrives at the part of the sky into which we are looking, had much of its blue thrown out by reflection, and is therefore deficient in blue light; and the particles at that elevation are not large enough to reflect the red, so only green is reflected by the sky, and the red passes on. When we look overhead, we also look through this green stratum, so to speak, but the green is overpowered by the greater brilliancy of the blue. And, further, when looking upwards at only a slight angle, we see the light reflected from a far greater amount of the green stratum than when looking through it towards the zenith.

The fine particles of dust having thus scattered the blue and the green rays, only the red rays are allowed to pass on, and we see them reflected on the clouds far to the east of us, as well as to the south and north. Some of the most beautiful and delicate rose tints are formed by the air cooling and depositing its moisture on the dust, increasing the size of the particles till they are able to stop and reflect the rays of the red end of the spectrum, when the haze glows with a strange aurora-like light.

Another peculiar feature of these sunsets is the very remarkable amount of after-glow which has sometimes been observed. So brilliant is this after-light that to many it has seemed as if the light had returned and increased in brilliancy. This impression is, however, only subjective. If we watch the moon, it will be seen to become more and more brilliant, as the colour phenomena change, which would not be the case if the after-glow increased the light. The apparent increase seems to be due to the sensitiveness of the eye becoming restored, after being fatigued by the bright light of day, and part of the apparent increased brightness is due to the increased sensitiveness of the eye, and part is due to the illumination becoming coloured. These remarks are, of course, altogether apart from the wonderful increase of twilight lately enjoyed, which has lengthened the day by nearly an hour, and refer only to the apparent increase and return of the light.

The increased amount of red light which fell on the earth at and after sunset produced some very remarkable changes in the appearance of surrounding objects, causing all red or reddish-coloured objects to glow with a strange brightness, and destroyed the relation of the colours of the different objects to which we are accustomed. Dead beech leaves, for instance, which under ordinary conditions of light are not conspicuous, shone out brightly. But perhaps the most remarkable effect was observed when looking down on a town. Most of the houses were bathed in a uniform grey light; but all the tiled roofs shone out brilliantly, and looked very much as if they had just been painted with vermilion.