

as to what exactly the terms used mean, impedes progress. New and convenient terms are needed for expressing the quantities themselves and a general agreement as to the conditions under which the terms should apply.

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#### Ball Lightning.

PROF. R. W. WOOD'S letter in NATURE of Nov. 8, p. 723, is a valuable contribution to our knowledge of this type of lightning. His reference to increasing our knowledge by touching the globe perhaps calls for a word of warning. I think that touching the globe would certainly cause a very severe burn and might possibly also kill the experimenter. Many years ago I saw two globes of lightning. They were reddish yellow in colour and appeared to be rotating. One of them struck a building and burst with a loud report, causing the inhabitants to open the windows and look out to see what had happened, but as there was no trace of anything they looked bewildered. The other drifted away.

Prof. Wood quotes an eye-witness who said that the flashes struck in the water, coming nearer and nearer like advancing shell-fire. This reminds me of a typical case published in the *Phil. Trans.* for 1781, p. 42. It is related how the tenant of a large three-story house facing the sea at Eastbourne was standing and looking through the window at an ominous black cloud. He saw several balls of fire drop successively out of the cloud into the sea. Suddenly he was thrown violently backwards by what he described as a flash of fire. Many people outside the house at that instant saw something which in form and flame they all agreed was like an immense 'sky rocket' strike the house. The tenant's clothes were torn, and pieces of metal he had about him were melted. Every pane of glass in the room was completely smashed. On the ground floor the coachman and a footman were killed, and on the top floor a lady and her maid were rendered insensible. All the bell wires in the house were deflagrated.

I have an impression that globular lightning makes a slight noise as it drifts about. It has been compared to the purring of a cat.

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DURING April 1906, a small storm occurred near Piccadilly Circus. There was one ordinary flash; then some little while later, there was an instantaneous globular flash some distance above the roofs of the buildings. The sound was like that of a shell bursting. I did not see any movement of the globe, although it happened to have been looking in the right direction before it appeared.

H. SOUTHORN.

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#### Crystal Structure of the $\beta$ -Phase of Aluminium-Bronze.

In the *Memoirs* of the Ryojun College of Engineering, 2, p. 205; 1929, and 3, p. 87; 1930, I have confirmed that the eutectoid transformation of aluminium-bronze consists of a stepped change:  $\alpha + \delta \rightleftharpoons \beta' \rightleftharpoons \beta$ , and just as it is impossible to suppress, by water-quenching, the change of austenite into martensite in steel, so also it is impossible to suppress completely the change of the  $\beta$ -phase into the  $\beta'$ -phase in aluminium bronze.

In order to determine the crystal structure of the  $\beta$ -phase, it is therefore necessary either to take a powder photogram at high temperature or to retard the change,  $\beta \rightarrow \beta'$ , on quenching, adding a third

element which passes into the solid solution of the  $\beta$ -phase. The latter method was successfully employed by Elis Persson, who suggested that the said phase should have a body centred cubic super-lattice. Extrapolating from the lattice constants of the ternary  $\beta$ -phase of copper-aluminium-manganese alloys, he gave  $5.833 \pm 0.005$  A. for the parameter of the binary  $\beta$ -phase, which contains 12.5 per cent of aluminium (cf. *Zeitschrift für Physik*, 57, p. 115; 1929).

Recently, by constructing a high temperature camera, I have succeeded in taking a powder photogram of a fine rod of the binary alloy, containing 12.5 per cent of aluminium, at about 650° C., and determined that it belongs to a body centred cubic super-lattice, the parameter of which was found to be 5.887 A. at this temperature.

On the photogram obtained from the same alloy quenched from 850° C. in water, the spectral lines belonging to the  $\beta$ -phase appeared very weakly, while the intense lines were found to correspond to a hexagonal lattice, which may be regarded as of the  $\beta'$ -phase. The following lattice constants were obtained for these two phases:

$\beta'$ -phase:  $a = 11.13$  A.,  $c = 6.342$  A.,  $c/a = 0.5698$ .

$\beta$ -phase:  $a = 5.835$  A.

Details of the work will be published in the *Memoirs* of Ryojun College of Engineering.

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#### Cage for the Study of Sheep Ticks.

WHILE carrying out work on the life-history of *Malophagus ovinus*, the sheep ked, difficulty was experienced in obtaining an effective cage which could be erected on sheep in the open.

Cages were tried by which pressure of the walls on the body of the sheep was depended upon to provide a close enough fit to confine keds. These were untrustworthy. However, a structure was devised, such that it could be sewn to the skin and lie loosely in the wool, thus preserving normal environmental conditions as closely as possible. This was made by sewing together the short edges of a rectangular piece of muslin 12 in. by 8 in. On one end of the cylinder thus formed the selvage had been retained, so as to afford a suitable hold for the horsehair with which it was attached to the sheep.

Sterilised horse-tail hair was used, enough being collected at one time to provide for several cages, and stored in five per cent phenol.

Preparatory to attaching the cage, wool was clipped away, at the selected site, in the form of a circular track two inches wide leaving a clump of wool about three inches in diameter in the centre.

The cylinder of muslin fitted over the central clump of wool and was hemmed to the skin by means of a double thread of hair. A local anæsthetic (cocaine) was used in attaching one cage, but it was found that if stitching be carried out expeditiously no undue discomfort is caused to the sheep. The wool requires to be washed thoroughly with water to remove cocaine, otherwise death may result to keds.

Closing of the cage was effected simply by drawing the outer edge of the cylinder, bag fashion, and tying with tape. To examine contained keds, the muslin is rolled back in the same manner as a stocking would.

It was found that attachment of such a cage in the region of the hind ribs, half-way down the side, ensured its being covered by the fleece and affording sufficient protection, at the same time providing conditions favourable to the ked.

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