is reduced by exhausting the value of the source. A low temperature reduces the value of the injury current by checking the process upon which it depends. Both extremes, then, reduce the value of the current, but by quite different means. This being so, there will be a mean temperature around which these two effects are balanced; at which the value of the source decreases less rapidly than at the higher temperature, and the value of the diffusion process is greater than at the lower temperature, at which, therefore, the injury E.M.F. is best maintained. This consideration led to the systematic study of the injury current at different steady temperatures, and the sought-for point of best maintained E.M.F. was found to lie between 14° and 19° C.

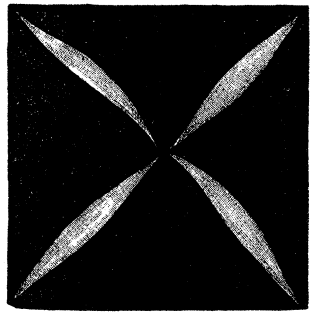
In the experiments hitherto considered, we have dealt with *current*, no allowance being made for changes of resistance brought about by altered temperature. The error, in some cases, was of no great moment, in others, those, namely, where a lowering of temperature gave an increased injury current; a correction for altered resistance would but have accentuated the point it was sought to establish. But there are instances in which the error might be serious—and it seemed, therefore, desirable throughout the inquiry to supplement the photographic records by a series of observations, in which measurements of potential by compensation should be taken at frequent intervals. Such measurements have been undertaken by us, and completely confirm the statements made above.

"On the Formation of Definite Figures by the Deposition of Dust." By W. J. Russell, Ph.D., F.R.S. Received January 29,—Read February 19, 1903.

(Abstract.)

The author shows that when a plate of glass or other material is slightly warmed and allowed to cool for 6 or 7 minutes in a dust-laden atmosphere, a clear and definite figure is formed on the plate. The figure is determined by the form of the plate on which it is deposited. If a square plate is used then a simple cross is formed, a ray of deposit proceeds from each corner of the plate to the centre. If the plate be triangular, a ray again proceeds from each corner; and with an octangular plate an eight-rayed star is formed. In every case the number and position of the angles of the plate determine the form of the figure. The dust generally used was that produced by burning magnesium ribbon, but any fine dust acts in the same way and produces the same figures.

With regard to the plate on which the figure is deposited, its composition is not of importance except as a back ground for the dust. A glass plate for many reasons is best, but the figures form with equal



certainty and sharpness on one of copper, or mercury, or ebonite, or India-rubber, or card-board, &c. In order to heat the plate it may be passed several times over the flame of a lamp, warming it as uniformly as possible, and, if it be a glass plate, until the moisture condensed on the under side has disappeared; or the plate may be heated by laying it on a copper plate heated to about 120°C. for 30 minutes, or it may simply be warmed in an air or water bath. The plate is best supported on three pieces of wire about $1\frac{1}{2}$ inches long, and a receiver filled with the dust, inverted over it and allowed to remain there for 6 or 7 minutes.

In order to obtain symmetrical figures the plate on which they are deposited must be perfectly horizontal, and as they are very sensitive to heat, there must be no unequal heating either of the plate or the surrounding atmosphere while the deposition is taking place.

As long as the plate and the surrounding atmosphere are nearly of the same temperature only very imperfect figures form, but as the temperature rises a more and more nearly perfect figure appears. If the plate be above 17°, indications of pictures are produced when the plate is at a slightly lower temperature than the surrounding atmosphere, but when the difference is 6° or more, these indications cease altogether. Very good pictures are produced by having the plate at 12° or more degrees above the dust-laden air, and even when the plate is 100° or 120° above the air, distinct but thin pictures are produced. The effect of a slight heat below the plate, while the deposit is taking place, is shown to thicken the figure, and distort it in a curious manner and is illustrated by photographs. Also the effect of radiant heat on these figures is shown by the action of a Bunsen burner at distances of 12 and 26 inches, and of other sources of heat at considerable distances from the plate. Some singular and complicated effects are

produced by placing a source of heat above the plate instead of below it. A large number of experiments are also recorded and illustrated showing the effect which different bodies in the immediate neighbourhood of the plate have on the figures which are formed. Taking only one case, that of a pin. When it is placed in contact and at right angles to the plate a definite deposit is produced, and this varies as the pin is moved further and further away, and as it is placed either on a level with plate, or above or below it. Even when the pin is 6 mm. below the level of the plate, and 2 mm. away from it, a distinct effect is produced. Again, these dust currents may be influenced in a remarkable way by suspending glasses of different sizes, and at different heights above the plate on which the figures are depositing, and photographs of the figures produced are given. The effects produced by obstructions of different sizes laid on different parts of the plate are also shown.

It was also found that a current of dust drawn through a tube will form a characteristic figure on a plate, which need not be warmed, as it passes over it.

If the magnesia dust be allowed to settle on a surface of water, about the temperature of 17° C. or, on water containing a very small amount of alcohol or glycerine, the deposit which forms on the surface breaks up, by the powder sinking, into a figure of cellular form.

Magnesia dust, which was generally used, undergoes some strange changes. When first deposited it is removed by the slightest touch, but if the plate be kept for a week or fortnight it may then be softly brushed over without damage to the figure. Another change which this powder undergoes is shown by collecting it immediately it forms, and examining it under a microscope, when it will be found to consist of irregular shaped and separate particles, but if the collection of the dust be made a few minutes after its formation, it is then seen that the particles are strung together, forming small and irregular fibres. In the various figures that have been produced the magnesia seems to have assumed this form.