dynamic cooling of a column of air ascending over the land by day; the great range of temperature and extreme susceptibility to frost, to excessive radiation of heat from the ground through unusually clear sky produced by dynamic warming, and evaporation of cloud, in the column descending over the land by night.

The winds and weather of the upper Lake Region are usually under the control of passing cyclones but statistical analysis of wind records affords a verification of the foregoing hypothesis by showing the existence of a diurnally reversing component of the wind.

ANOMALOUS TEMPERATURE EFFECTS UPON MAGNETIZED STEEL.[1]

BY N. H. WILLIAMS.

SMITH and Guild, in experimenting with short steel rods of high carbon content, found that, upon heating the specimens, the magnetism was reversed in the neighborhood of 200° C. Their explanation ascribed the reversal to the difference in action of the self-demagnetizing field of the magnet upon the iron and the carbide components of the steel.

The present paper deals with experiments which suggest an entirely different explanation.

It is found that the reversal is dependent upon the method of magnetizing the rod and that it can be prevented entirely by preventing an oscillatory discharge through the magnetizing coil.

THE POSITIVE POTENTIAL IN THE PHOTO-ELECTRIC EFFECT.[1]

BY W. H. KADESCH.

TWO main sources of error have been especially troublesome in work on the positive potential. These are due, first, to the relatively short range of frequencies to which the easily manageable metals are sensitive, and secondly, to the effect of ageing of surfaces, and of photo-electric fatigue. The use of the strongly electropositive metals as electrodes in this research made it possible, not only to illuminate with light of greater wave-length than has hitherto been used but also to expose a new surface with the greatest readiness whenever desired.

Cylindrical electrodes of sodium and potassium were fixed to the rim of a wheel which could be rotated by means of an electro-magnet, the shaft of the wheel carrying a soft iron armature. In the plane of the wheel, and at opposite ends of a diameter, were placed a Faraday cylinder, and an auger-like knife operated by means of a second electro-magnet. To make an observation the electrode was turned first toward the knife, by means of which a slice of any desired thickness was taken off, then toward the Faraday cylinder, in position to receive the illumination. The source light was a spark about 2 mm. in length between iron terminals. The analyzing device was a quartz spectrometer.

[1] Abstract of a paper presented at the Chicago meeting of the Physical Society.

The Faraday cylinder was joined to one pair of quadrants of an electrometer, while the electrode was given any desired potential by means of potentiometer scheme. The positive potential corresponding to any wave-length was determined, either by giving the electrode a potential just sufficient to prevent the escape of electrons, or by varying the potential applied and then plotting curves with this, and the corresponding photo-electric current, as coördinates. In the former method fresh surfaces were frequently cut, especially when the balancing potential was approached. In the latter, for each potential applied the current given by surfaces of different age was determined, a fresh one being cut for each exposure. The current for zero age was then found by extrapolation. This precaution was found to be unnecessary, however, since the slope of the age-current curves fell to zero at the balancing potential.

The range of wave-lengths employed was that from 2155 to 3970 A.U. Longer waves could not be used, with the quartz arrangement, because of the small dispersion. The positive potential was found to vary directly as the frequency of the light. This relation is expressed by the equation,

$$V = kn - V_0.$$

The value of k found for sodium was 3.87, that for potassium 3.83. The true value is somewhat higher, every source of error tending to reduce the value given by experiment.

THE THEORY OF PHOTO-ELECTRIC AND PHOTO-CHEMICAL ACTION.[1]

BY O. W. RICHARDSON.

IN this paper it is shown that the following equations are valid for all substances at all temperatures:

$$\int_{\nu_0}^{\infty} \frac{F(\nu\nu_0)h\nu^3}{e^{\frac{h\nu}{RT}}-1}\left\{\varphi(\nu) - \frac{h\nu e^{\frac{h\nu}{RT}}}{e^{\frac{h\nu}{RT}}-1} - RT^2\frac{\partial \log F(\nu\nu_0)}{\partial T}\right\}d\nu = 0, \qquad (10)$$

$$\int_{\nu_0}^{\infty} \frac{F(\nu\nu_0)h\nu^3 d\nu}{e^{\frac{h\nu}{RT}}-1} = A_1 T^{\frac{1}{2}} e^{\int^T \frac{\omega}{RT^2}dT} = \Phi(T)e^{-\frac{h\nu_0}{RT}}, \qquad (16)$$

$$\int_{\nu_0}^{\infty} \frac{h\nu^3}{e^{\frac{h\nu}{RT}}-1}\left\{\frac{F(\nu\nu_0)}{RT}\left(\frac{\partial w}{\partial \nu_0}\right)_T + \frac{\partial F(\nu\nu_0)}{\partial \nu_0}\right\}d\nu = 0, \qquad (17)$$

$$\int_{\nu_0}^{\infty} \frac{\nu^3 T_\nu F(\nu\nu_0)}{e^{\frac{h\nu}{RT}}-1}h d\nu = 2RT\Phi(T)e^{-\frac{h\nu_0}{RT}}, \qquad (27)$$

where the notation is the same as in Phil. Mag., Vol. 24, p. 570 (1912), except that T is written for temperature instead of θ, $F(\nu\nu_0)$ is written for $\epsilon F(\nu)$, $\varphi(\nu)$ is the energy abstracted from the radiation by an atom which is liberated under the excitation of radiation of frequency ν and $\Phi(T)$ may be regarded as defined by the right-hand one of the two equations (16). ν_0 is the value of ν at which $F(\nu\nu_0)$ becomes zero.

[1] Abstract of a paper presented at the Chicago meeting of the Physical Society, November 29, 1913.