Proceedings of the Iowa Academy of Science

Volume 31 | Annual Issue | Article 131

1924

A Simple Method of Determining Horizontal Intensity of the Earth's Magnetic Field

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saw one day in July, 1923, that was reflected on her wet sidewalk following an afternoon shower.

Another occurrence was a halo of prismatic colors surrounding the sun nearly overhead at 10 o'clock in the morning of July 6, 1922. It was witnessed by H. O. Walsted, Earl Arsers and Clark Kugler of this city.

The most beautiful illusion, though, was reported to me by Mrs. Charles Sweney, who saw one morning about 9 o'clock, June 16, 1921, the image of her little granddaughter, Esther Sweney, playing in a beam of sunlight that shone between two houses, fully twelve feet above the ground. Mrs. Sweney was sitting in an automobile across the street facing north towards her son's home, when suddenly she saw the form of her little granddaughter playing in the sunbeam that shone even with the second story windows. She had hardly time to realize the situation before the vision vanished as the little girl came running into view from the north side of the house.

OSAGE, IOWA.

A SIMPLE METHOD OF DETERMINING HORIZONTAL INTENSITY OF THE EARTH'S MAGNETIC FIELD

E. P. T. TYNDALL

This method of determining the horizontal intensity of the earth's magnetic field depends on well known principles, which, however, do not seem to have been applied in exactly this fashion before. A magnet is suspended in a horizontal plane and allowed to vibrate under the joint influence of the earth's field and a known controlling field in the same direction and in either the same or opposite sense. The controlling field is that of two similar circular coils placed a distance apart equal to the radius (arrangement of Gaugain and Helmholtz). The magnet is placed midway between the coils of their axis. Its period is observed for several values of the known field, H_1. If H_0 is the horizontal component of the earth's field, P the period, M the magnetic moment of the magnet and I its moment of inertia, then, neglecting torsion of suspension and damping,

$$4\pi^2/P^2 = H_0M/I + H_1M/I$$

The curve plotted with values of $4\pi^2/P^2$ as ordinates and values of H_1 as abscissas is a straight line of slope M/I and (negative) intercept on x axis equal to H_0. This was checked by experiment.

The method is simple, rapid and accurate. The controlling field is uniform over a large space so that an exceedingly small magnet is not needed and its adjustment in position is not critical. No deflections have to be measured.

The effect of torsion in the suspending system and damping is discussed.

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APRIL, 1924.

THE M ABSORPTION LIMITS OF THE TUNGSTEN X-RAY SPECTRUM

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(ABSTRACT)

The x-ray spectrum of tungsten has been investigated from 7 to 3 Angstrom Units, using a metal x-ray tube and a vacuum spectrometer.

The voltage on the tube was about three thousand volts and the power input about one kilowatt. The tube did not exhibit any space charge effects. It is thought that this was due to the presence of mercury vapor from the diffusion pump. A serious disadvantage of the mercury vapor was that the tungsten filaments sputtered readily. A 25 mil tungsten filament had to be replaced about every twenty hours. An important benefit from this sputtering was that the water-cooled copper target soon became coated with a thin layer of tungsten. This was of value in obtaining the tungsten emission spectrum. Due to the high atomic weight of tungsten it was an ideal source of continuous radiation for absorption spectra. It was necessary to remove water vapor from the x-ray tube with phosphorus pentoxide.

The x-ray was separated from the spectrometer by a thin collodion window which contained just enough lamp black to keep the light from the filament from fogging the photographic plate in the spectrometer. To obtain the absorption spectrum of tungsten in this region, an additional collodion window was used which contained a small quantity of the yellow oxide of tungsten, finely powdered.

The exposures were about 6 hours for remission spectra and 100 hours for absorption spectra.

In the emission spectrum of tungsten the strong lines α, β and γ were found to have a fine structure as noted by Hjalmar.[1] The

[1] Zeit. für Physik 15, p. 65, 1923.