

the frequency of the atom and the number of free electrons are not the same functions of the magnetic field at different temperatures and tensions this form of explanation might give a reason for the variation of the thermoelectromotive force and for the influence of tension on it.

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POSITIVE RAY ANALYSIS OF LITHIUM AND ZINC.

By A. J. DEMPSTER.

POSITIVELY charged atoms are formed by vaporizing the metal in an electrically heated capsule, and bombarding the vapor with electrons from a hot cathode. After falling through a definite potential the particles are deflected through 180° by a magnetic field, the semicircular path being smaller for the lighter than for the heavier. The different atoms are observed by means of their charge. Two components were observed in the case of lithium with atomic weights 6 and 7. The proportion of the two components was found to vary in different experiments. Preliminary experiments with zinc have given three strong components two units apart in atomic weight, and one weaker component one on the heavy side of the strong group and separated also by two units of atomic weight.

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A CONVENIENT CONTACTOR FOR SMALL CURRENTS.

By FREDERICK J. SCHLINK.

ORDINARY drawing ink applied in the form of lines with a ruling pen will form an electrical path of sufficient conductivity to be used in connection with the oscillograph for recording the instants at which the lines pass by a brush or wiper. As it is frequently necessary to determine electrically the rate of translation or rotation of some moving part, the possibility of providing for the electrical contacts required by simply drawing lines on a strip of paper gummed to the moving part, affords great convenience, in comparison with the trouble and expense of constructing the usual composite commutator for the purpose. Moreover, the ink and paper contacting device will often be of negligible mass and inertia in relation to the part whose motion is under investigation. The lines may be connected to a common return circuit by drawing transversely across them a wide band of the same material, which in turn may be connected to a metallic return path through wire, metallic foil, or similar connection.

The contact pressures required will be extremely minute, and as the ink and paper are sensibly in the same plane, difficulty from bouncing of the brush will not be encountered unless the velocities are very high indeed. It is found that the drawing ink will carry a considerable amount of graphite in suspension; addition of this will increase the conductivity markedly, especially if the ink after drying be burnished and compacted to a glossy condition by the use of a smooth metallic tool.

It is found that in practice, if every fifth or tenth line is emphasized by being drawn somewhat wider than the others, the effect will be recorded in the oscillogram by the greater amplitude corresponding to the higher conductivity of the wider line. In exceptional cases, where, in order to obtain a high precision or "definition" of the contact, a very narrow line must be used, of correspondingly low conductivity, a d.c. amplifier introduced into the circuit will enable sufficient amplitudes to be obtained in the usual G.E. oscillograph.

There seems to be a fair possibility of obtaining a space-time curve direct by the use of a brush passing along, instead of transversely to such an ink line, in which case resistance would be cut in or out proportionally to the relative displacements of the brush and the line, but opportunity has not been available to try out this method. Undoubtedly a variable resistance of this character would not be constant in its value; this would not, however, be a matter of serious moment if the method were required only for occasional use, as a preparatory calibration could readily be made.

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THE DIELECTRIC CONSTANT OF MICA.

By J. R. WEEKS, JR.

IN looking for an average value of the dielectric constant of mica, the writer was impressed with the wide variations, 2.5 to 10, found by different investigators. It seemed likely that at least a part of this large variation might be due to air pockets or films between the various laminæ, especially since most of these low values were found on rather thick sheets. The high values, on the other hand, might be due to conducting films between the laminæ increasing the effective area of the electrodes.

Accordingly the dielectric constant of 12 different grades of mica was determined, using a shielded capacity and conductance bridge to measure the capacity of a condenser formed by two mercury electrodes and the sheet of mica. These 12 grades included some of those for which other investigators found abnormally high or low values.

It was found that:

1. When air films in the interior of the sample of mica were eliminated by splitting it along its natural lines of cleavage into thin sheets, in no case was the dielectric constant less than 6.4.
2. Where air films were plainly visible, the dielectric constant was low (2.9 to 4.8).
3. The most probable cause of very low values as found by some investigators is the existence of air films between the laminæ. These air films are in most cases very hard to see without carefully examining the edges of the sheets.
4. Stained sheets did not show a dielectric constant enough higher than the average value of 8.1 to determine the effect of stains in mica upon the dielectric constant.