reasons there might exist a causal relation between small dimensions and high threshold value, and that supraconductivity might persist to a higher field strength in sufficiently fine wires than in the massive metal at the same temperature. This assumption is supported by results obtained in Toronto[3] on supraconductive films deposited on another metal. Owing to the possibility, however, that in this case the phenomena may have been influenced by the formation of an alloy at the boundary of the two metals, definite proof cannot be obtained by these experiments.

Conductivity experiments on fine lead wires in a longitudinal magnetic field at 4·2° K. have now been carried out. The specimens were made by the Taylor process from pure lead (99·999 per cent) and annealed. The largest diameter at which a change of threshold value (that is, the field strength at which the first resistance appears) was found is 14·2 μ. From this size downwards, however, the threshold value

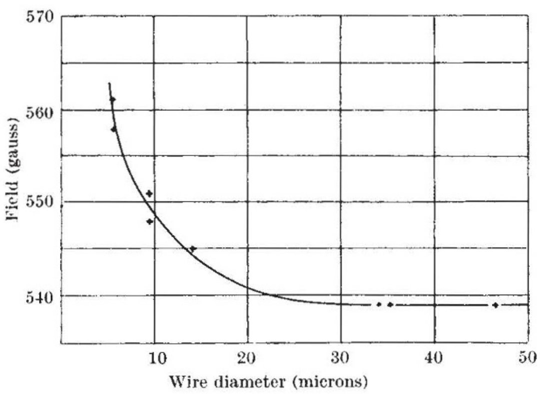

Fig. 1.

THRESHOLD FIELDS OF FINE LEAD WIRES AT 4·21° *K*.

increased with decreasing diameter of the wire as can be seen from Fig. 1. In the smallest wire (5·6 μ) the threshold field exceeded the normal value by 4·08 per cent. Hysteresis phenomena were observed at the return to the supraconductive state.

This result shows that the depth to which a magnetic field penetrates a supraconductor at the surface cannot be neglected as soon as the size of the supraconductor becomes of the order of 5×10^{-4} cm., thus indicating a depth of penetration of the order of 10^{-5} to 10^{-6} cm. In connexion with the calculations of H. London[4], this would mean that the number of supraconduction electrons is of the order of Avogadro's number. However, more experiments, especially on the free energy of supraconductors, have to be carried out before definite conclusions concerning this last point can be drawn.

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[1] Mendelssohn, *Proc. Roy. Soc.*, A, **152**, 34 (1935).

[2] Mendelssohn and Moore, *Phil. Mag.* (7), **21**, 532 (1936). Mendelssohn, Moore and Pontius, "Reports of the Seventh International Congress of Refrigeration", **1**, 431, 1937.

[3] Misener, *Canad. J. Research*, **14**, 25 (1936). Misener, Grayson Smith and Wilhelm, *Trans. Roy. Soc. Canada* (3), **29**, 13 (1935).

[4] London, H., *Proc. Roy. Soc.*, A, **152**, 650 (1935).

Sedimentation Equilibrium in the Simplest Air-driven Tops

IT has been highly desirable to develop a simple device everywhere available for accurately measuring sedimentation equilibrium of particles of all sizes from the smallest molecules in solution to the largest colloids or filter-passing organisms. We have used one method of limited scope throughout the past year for measuring the molecular weight of sucrose within 5 per cent in a one-piece hollow air-driven rotor[1].

We have more recently perfected for universal use a rotor consisting of two pieces of steel and a rubber sac in which is laid a pile of 100 ordinary annular washers of coin silver containing 10 per cent copper, and each 0·003 in. thick. The washers are alternately wide and narrow, the outside diameter being the same in all cases. They are held pressed together so that the liquid between the wide washers is immobilized in annular layers, 0·003 in. thick and several millimetres deep. Sedimentation equilibrium is set up in this immobilized liquid in any desired centrifugal field up to a few hundred times gravity.

However, the immobilized liquid is inaccessible. The simple device for studying it is to have a thin layer of excess liquid completely mobile and convecting, lining the cylindrical space within the pile of washers. This liquid is necessarily identical in composition with the most dilute portion of the sedimented liquid. Knowing the speed, the composition of the liquid originally put into the rotor, and the dimensions of the latter and of the washers therein, it is only necessary after the rotor is stopped to withdraw a sample of the supernatant mobile liquid for analysis in order to determine the molecular weight of any molecules or particles of uniform size. Sucrose has given a molecular weight 331 and 339 instead of the theoretical 342. Full details are being published elsewhere.

Another variant in design permits sampling of the liquid in contact with the outside radius of the immobilized liquid as well, to test whether the molecules of particles are all of one size.

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[1] See McBain, NATURE, **135**, 831 (1935); and McBain and Stuewer, *Kolloid-Z.*, **74**, 10 (1936); a specimen of the latest model was deposited with Prof. Dr. Wolfgang Östwald, Kolloidchemische Gesellschaft, Leipzig, in July 1936.

Automatic Plotting of Electron Trajectories

AN apparatus developed independently in this laboratory plots trajectories of charged particles in potential fields entirely automatically. A similar scheme has recently been reported by Gabor[1], but the apparatus described below has certain differences and perhaps advantages.

The basic principle of both systems is the same; namely, the plotting of a trajectory by adjusting the radius of curvature at each point of the path to the value $2V/E_n$, where V is proportional to the total kinetic energy of the particle and E_n to the force acting normal to the path.

In the apparatus here, both these quantities are measured by an electrode unit consisting of two