factor (plotted above). The slight shift in the upper energy limit is within the uncertainty caused by the extrapolation. It is to be noted that the arbitrariness involved in fitting C_{2T} or C_{2V} to experimental data is such that one can fit Kurie plots with curvatures ranging from concave to convex, as for example, RaE and Cl.[36] The arbitrariness is removed if the matrix elements involved can be evaluated. According to Greuling's[6] method of estimation, the ratio $|A_{ij}|^2:|T_{ij}|^2$ should be $5(\gamma_5)^2/9\rho^2$. With $(\gamma_5)^2$ having a value probably between 0.01 and 0.1, this ratio then is somewhere between 30 and 300, whereas the value used to fit the Cl^{36} spectrum is 18.

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Cross Sections for Ion-Atom Collisions in He, Ne, and A

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A METHOD has been developed by one of us which permits accurate measurement of the drift velocity v_d of a positive ion as it moves through a gas under the influence of a constant electric field E. We wish to discuss, in the following, the results of these measurements for the ions He^+, Ne^+, and A^+ in their respective parent gases.

Theory predicts that v_d should depend only on the gas temperature and on the combination E/N, N being the gas number density. When $v_d \gg$ thermal velocity, theory predicts further that v_d should depend only on E/N. This prediction is confirmed by experiment. A log-log plot showing v_d *versus* E/N for neon is shown in Fig. 1. Similar plots for helium and argon have been obtained.

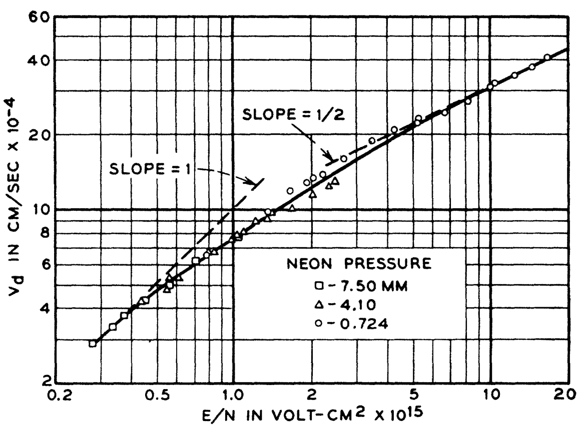

FIG. 1. Drift velocity of Ne^+ in neon as a function of the ratio of electric field strength to gas number density.

It may be noted that at low E/N, v_d approaches proportionality to E/N, while at high E/N, v_d varies directly as $(E/N)^{\frac{1}{2}}$. Dimensional arguments permit us to conclude from this last result that λ, the mean free path for ion-atom collisions, has become approximately constant. Examination of the interaction forces indicates that the law of scattering is isotropic to a good approximation. Isotropy and a constant mean free path uniquely characterize the hard sphere model of kinetic theory. This model is, therefore, applicable to the motion of He^+, Ne^+, and A^+ in the parent gases, provided we limit ourselves to the "high field" range.

The problem of ionic motion in high fields has been solved by one of us for the hard sphere model and yields for the drift velocity $v_d = 1.147(a\lambda)^{\frac{1}{2}}$. Here a stands for the acceleration imposed by the field upon the ion. We can apply this formula to the high field measurements discussed above and obtain from them a value of λ and hence the collision cross section σ_i, which is listed in the first column of Table I. The viscosity cross section σ_a for the gas atoms

TABLE I. Cross sections and mobilities.

	$\sigma_i \times 10^{16}$ cm^2	$\sigma_a \times 10^{16}$ cm^2	$\mu_L\left(\frac{\text{cm}^2}{\text{volt-sec}}\right)$	$\mu_0\left(\frac{\text{cm}^2}{\text{volt-sec}}\right)$
He	54.3	14.9	13.4	10.8[a]
Ne	65.2	21.0	4.85	4.4
A	134	41.7	1.67	1.63

[a] The value computed by Massey and Mohr (reference 1) is 11.

is given in the second column for comparison. In all cases, σ_i is larger than σ_a, as expected. We should point out that it is improper to reduce σ_i by standard methods to yield an "ionic radius." Massey and Mohr[1] have shown that the collision of He^+ with a helium atom has anomalous resonance features that make σ_i abnormally large. Our experiment shows that a similar situation must prevail for neon and argon.

It is interesting to substitute the hard sphere cross sections σ_i, together with known values of the dielectric constants for the gases, in the classical Langevin mobility formula and thereby obtain predicted values for the low field mobility (defined as v_d/E) of the ions He^+, Ne^+, and A^+ in their respective parent gases. This value, μ_L, is given in the third column of the table for standard gas density, while the fourth column shows a low field value, μ_0, obtained by extrapolation of our measurements to zero field. The rough agreement between them leads us to the conclusion that the Langevin treatment of ion mobilities is more satisfactory for these cases than has been supposed.

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Electromagnetic Relaxation in Superconductors

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LONDON'S macroscopic electrodynamic theory of superconductivity[1] has been generalized by von Laue[2] in a series of papers. Steady-state solutions of the fundamental equations have been obtained by F. and H. London and by von Laue for various simply shaped superconductors. Schubert[3] has solved the time-dependent equations for the cases where the specimen is an infinite half-space or an infinite slab with parallel faces. This note is concerned with the solution of the time-dependent equations for an infinite circular cylinder. The basic equations of the theory will be found in Schubert's paper.

Let us consider first the transition of a long cylinder from the normal to the superconducting state in a constant magnetic field maintained by external sources. The characteristic parameter, λ, of the London theory will be assumed to be a function of the time which varies from an infinite value at all temperatures above the transition point to an arbitrary finite value λ_0 at the final temperature. If one neglects the small displacement current, one obtains the following equation for the magnetic field inside the specimen:

$$(\partial^2 H/\partial r^2) + (\partial H/r\partial r) - (\sigma\partial H/c^2\partial t) - H/c^2\lambda(t) = 0. \qquad (1)$$

Cylindrical coordinates have been chosen. The ohmic conductivity σ is assumed the same in both normal and superconducting states.