LETTERS TO THE EDITORS

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Names of Electrical Units

WHILE the use of the metre-kilogram-second-coulomb system of units is rapidly becoming more widespread, that of the E.M.U. system is almost non-existent, except in elementary courses and old-fashioned text-books. In purely electrostatic problems, on the other hand, the general use of the E.S.U. system is likely to continue. The lack of distinctive names for the units in this system is a drawback in several respects, of which I will only mention the difficulty of checking dimensions. To remedy this defect a practice has arisen of using names such as 'statcoulombs', 'statvolts' and other equally cacophonous terms. This nomenclature has already been criticized in a recent review of a text-book (*Proc. Phys. Soc.*, **53**, 624; 1941), but no alternative has been proposed. I therefore wish to propose a terminology which should be acceptable to all English-speaking people.

I suggest that the charge which repels a similar charge at a distance of one centimetre with a force of one dyne be called a *franklin*, in honour of Benjamin Franklin, the pioneer of static electricity.

There is no need for any other new names. The accompanying table gives the units of the most important electrostatic quantities in centimetre-gram-second-franklin (C.G.S.F.) units and in metre-kilogram-second-coulomb (M.K.S.C.) units. It seems unlikely that one should want to use the C.G.S.F. system for magnetic measurements, but it can be so used; the unit of H would be franklin/sec. cm. and that of B would be erg cm. sec./franklin.

At the same time, to avoid ambiguity, I suggest that, whatever units be used, the ratio D/E should always be called the *permittivity*, a nomenclature already widely used in the United States, and that *dielectric constant* should denote the ratio of permittivity of medium to that of empty space and should thus be a number independent of the units used. This suggestion is incorporated in the table.

One further point. An increasing number of physicists, though still a minority in Great Britain, prefer to use the rational system. I want to point out that this need not involve a change of units, but merely a change in the definition of D, so that at the surface of a charged conductor, $D = \sigma$ instead of $D = 4\pi\sigma$, and the electrostatic energy density becomes $\frac{1}{2}ED$ instead of $ED/8\pi$. Rationalization thus leaves E unaltered, but reduces D by a factor $1/4\pi$, and this statement is true whether E, D be both measured in C.G.S.F. units or both in M.K.S.C. units.

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Term	C.G.S.F. unit (E.S.U.)	M.K.S.C. unit
Charge	franklin	coulomb
Surface density of charge, σ	franklin/cm.^{2}	coulomb/m.^{2}
Displacement, D	franklin/cm.^{2}	coulomb/m.^{2}
Current	franklin/sec.	coulomb/sec. = amp.
Current density	franklin/sec.cm.^{2}	amp./m.^{2}
Energy	erg	joule
Energy density	erg/cm^3.	joule/m^3.
Potential	erg/franklin	joule/coulomb = volt
Field, E	dyne/franklin	volt/m.
Permittivity, D/E	franklin^2/erg cm.	coulomb/volt m. = sec./ohm m.
Value of permittivity of empty space	$1 \frac{\text{franklin}^2}{\text{erg cm.}}$	$\frac{1}{9 \times 10^9} \frac{\text{sec.}}{\text{ohm m.}}$

THE international procedure which in normal times can be adopted for agreement or otherwise to suggested changes in the nomenclature of fundamental units cannot function at the present time, but it is hoped that Dr. Guggenheim's suggestion, which can be brought to the notice of those it concerns through the columns of NATURE, will find the favour it seems to deserve, and will prevent the 'stat-coulomb' becoming an established term, which has neither the merit of euphony nor symmetry in the systematic naming of the electrical units.

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Refractive Indexes of Gases at High Radio Frequencies

SINCE atmospheric refraction plays an important part in the bending of ultra-short radio waves round the surface of the earth, an adequate study of the propagation of these waves requires a knowledge of the refractive indexes of gases at very high frequencies. It was thought desirable to test the assumption, made in all previous theoretical work, that the values of these indexes were the same as their values at lower frequencies. When this work was begun, no figures were available for the refractive index of any gas at a frequency higher than about 4 Mc./sec. Since then, however, a result for water vapour at 42 Mc./sec. has been published by Tregigda[1].

A standing wave method has been used in this work, the standing waves being produced in a gas-tight concentric tube Lecher circuit, by bringing it into resonance with a highly stable crystal-controlled oscillator to which it was loosely coupled. The apparatus was so constructed that the changes in the length of these standing waves as the pressure or composition of the gas inside was varied could be determined with some precision, the refractive index of a gas for a wave of given frequency being equal to the ratio of the length of the wave in a vacuum to the length in the gas. The concentric tube form of Lecher system is very suitable here, as the gas under investigation can be placed in the space between