Letters TO THE EDITOR

Quantisation of energy

Dear Sir—The present theoretical approaches to the propagation of electromagnetic energy may be broadly classified into two main types: wave theory and energy-quantisation theory. When the material medium involved acts solely as a boundary to the energy, wave theory is essential. When the electromagnetic energy is affected by the atomic structure of the material, wave theory is still essential to explain lattice scattering, but the quantisation of energy is postulated to explain photoelectric effects, the Compton effect and the law of heat radiation. If it is assumed that atomic particles are basically simple, it is obviously correct to introduce this complication into electromagnetic theory. If, however, it is assumed that atomic particles are complicated, then it would seem more logical to keep to simple wave theory and to look for the complications in atomic particles that might explain the effects.

If one associates some form of spin precession velocity, $\varepsilon/N$, where $N$ is the fine structure constant, about a radius equal to the electron radius, with any electron travelling at a velocity $\nu$, then the precession frequency is $f = m\varepsilon/N$ and the wavelength is $\lambda f$, the de Broglie wavelength.

If, conversely, an electromagnetic wave is directed onto some material, there will be interaction with those electrons whose velocity is equal to $h\nu/mc$. The Doppler frequency change* is then given by:

$$ f' = f \left(1 - \frac{\nu}{c}\right) $$

$$ = f \left(1 - \frac{\nu}{\lambda f}\right) $$

where $f_c$ is the Compton frequency. Hence:

$$ \lambda' = \frac{\lambda}{1 - \frac{\nu}{c}} $$

$$ \simeq \lambda + \lambda_c \text{ for } \lambda \gg \lambda_c $$

For radation of this energy back along the axis, the same Doppler effect will occur, and then $\lambda' = \lambda + 2\lambda_c$. This is the Compton formula for energy received back along the axis. The Compton effect has previously been considered unintelligible on a wave-theory approach and a complete justification for the concept of energy quantisation.

A similar argument may be applied to black-body-radiation theory, to give a reduced energy distribution at high frequencies without assuming energy quantisation. The proposed interaction of any electromagnetic energy with only those electrons having a velocity appropriate to the frequency would also explain the photoelectric effect.

It appears that the concept of energy quantisation may not be fundamental to the understanding of electromagnetic-energy flow but merely a convenient concept to allow for material boundary conditions. If this model is correct, all atomic particles have a much more detailed structure than has previously been supposed.—Yours faithfully,

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Electricity from waste

Dear Sir—I have been interested in the letters that have appeared in recent issues of the Journal giving various instances of early installations where refuse was burnt for the generation of electricity, thus contesting the statement in the foreword to the March 1963 Journal, p. 107, that "although many local authorities have disposed of refuse in incinerators, the heat produced has not been utilised for electricity generation". The following claims have so far been made: Bootle (1933), Glasgow (1923) and Prahran-Melbourne (1908). May I also join in the fray?

As far back as 1893 the Vestry of St. Leonard (the predecessors of the Metropolitan Borough of Shoreditch) received a report from their consulting electrical engineer, Mr. E. Manville, in which he recommended "the utilisation of the heat generated by dust destructors for raising steam for running an electric central station, and heating baths and washhouses proposed to be erected on an adjoining site". His scheme was adopted, and on the 28th June 1897 the combined electricity generating station and refuse-destructor works at Coronet Street were opened by Lord Kelvin. This was considered at the time an important development, as hitherto the combination of electricity generation with refuse destruction had only been attempted on an experimental scale, which was instanced by the fact that the Vestry's first chief electrical engineer, Mr. C. Newton Russell, presented a descriptive note and dispositions to the Institution of Civil Engineers, which can be found in the proceedings of that body.

Quantiation of energy

L. M. Stephenson, B.Sc.(Eng.), Graduate

Electricity from waste

R. H. Rawll, Member

Electrical tariff structures

Dr. H. D. Einhorn

Why 'Associate'? *

L. A. W. Davis, P.Eng., Associate Member

The present state of the supply industry

P. L. Alger, Member

There is an interesting sequel to the above historical facts. When I was borough electrical engineer and manager at Shoreditch during the coal crisis in February 1947, I ran up again two of the 250kW Bellis generating sets at Coronet Streets which had been installed in 1898, using steam obtained from the refuse destructor (which was still fulfilling its other original function of providing heat to the adjoining Pitfield Street public baths) and supplied electrical energy to the d.c. network during that critical period. The only snag was that the accountants of the Central Electricity Board had no provision in their established procedure to give me credit for these units that I had supplied and that had not come officially from the 'selected' generating station of Shoreditch at Whiston Road, and this difficulty had not been resolved when the industry was nationalised in 1948. —Yours faithfully,

R. H. RAWLL
London Electricity Board
Northern District
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9th October 1963

Electrical tariff structures

Dear Sir—Mr. McAuley's letter on tariffs (September 1963) makes a few valuable suggestions: the desirability of simplicity, the undesirability of hiding price increases, and the undesirability of discriminating against consumer groups, e.g. against small consumers by block tariffs. Some arguments in his letter go too far, however, or miss the point:

That vacant premises pay a charge for the privilege of remaining connected is economically sound, as plant must be available to meet any possible demand at any time. We must pay for availability, and rent on premises not used must also be paid.

The two-part tariff is simple enough to be understood by large consumers and fulfills various functions. It offers a convenient method of allowing for power factor and encourages power-factor control; it allows for individual load factors and fosters peak-load control, although at the expense of diversity.

Diversity could best be allowed for by