between these two values. This method of tuning a valve set to the resonant frequency of a neighbouring circuit is a modification of Austin's well-known 'double click' method. Both methods are described in Moullin's "Radio Frequency Measurements," pp. 14 and 136. In an experiment on a nickel rod a metre long and 2·54 cm. diameter, the critical points on the condenser scale were separated by an interval of a four thousandth part of the whole capacity. On clamping the bar by means of heavy lead weights these irregularities disappear. Clamping the bar corresponds to breaking the connexions in the neighbouring circuit.

Such experiments need not be confined to bars of one material; nickel or iron could be suitably attached to bars of other materials. Nor need the oscillations be wholly longitudinal; for example, a conventionally shaped tuning fork could be thrown into resonant vibration by subjecting the junction of the prongs to a vibrating magnetic field in the plane of the fork and at right angles to the prongs.

The field producing magneto-striction may be due to a current carried by the magneto-strictive body. Thus when a current traverses a wire of nickel its circumference shrinks and the whole wire will therefore tend to increase in length. Thus Beatson heard a sound produced by an intermittent current flowing in an iron or steel wire (Beatson, *Elect. Mag.*, April 1846). This reference is taken from a remarkably interesting paper by Honda and Shimizu (*Phil. Mag.*, vol. 4, Series Six, p. 645) entitled "Note on the Vibration of Ferromagnetic Wires placed in a Varying Magnetizing Field," and published twenty-five years ago. In their paper the earlier work is reviewed and an account is also given of their own experiments on the subject carried out with such resources as were then available for experimenters. Magneto-strictive oscillations are so readily produced that it may well transpire that materials which when tested by static methods do not exhibit the effect will, when subjected to properly tuned fields, be found to possess it. For example, some variety of invar may be sufficiently magneto-strictive to oscillate in a tuned field; so that in addition to obvious important technical applications such as the provision of sources of oscillations and frequency standards, this method may be of scientific value.

A paper on some parts of this very wide and fascinating subject is in preparation.

J. H. VINCENT.

L.C.C. Technical Institute,
Paddington, London, Nov. 30.

Standardisation of Telephone Apparatus.

IN the article on my paper on telephone apparatus standardisation in NATURE of Nov. 26, the writer states that it is not easy to understand what telephone engineers mean by a transmission unit, and I agree that if reference only is made to the short statement included in my paper this is certainly true. I may, perhaps, therefore be allowed to supplement this statement by the following remarks:

Until recently the telephone engineer expressed losses and gains in transmission efficiency in two ways, namely: (1) in terms of the product of attenuation constant and length, βl; (2) in terms of a standard cable having certain definite line constants.

The objection to (1) is that it is strictly applicable only to a homogeneous telephone line of infinite length, and that such lines do not occur in telephone practice, and that, furthermore, the product of attenuation and length is meaningless when applied to a piece of telephone apparatus.

The objection to (2) is that it is arbitrary, and is dependent on the frequency transmitted.

βl, however, is equivalent to $\log_e \frac{i_1}{i_2}$ or $\log_e \frac{v_1}{v_2}$ or $\frac{1}{2}\log_e \frac{p_1}{p_2}$, where i_1, i_2, v_1, v_2 and p_1, p_2 are input and output currents, voltages, or powers respectively.

In this form the conception of a product of attenuation and length has disappeared, and hence the application to non-homogeneous and short lines and to apparatus generally is logical. So far this is the argument for the use of the unit termed the 'népper,' which is equivalent to $\frac{1}{2}\log_e \frac{p_1}{p_2} = 1$.

The advocates of the unit termed the 'bel,' that is, $\log_{10} \frac{p_1}{p_2} = 1$, claim that in this form the relationship between the numerical values of the units and the actual input and output power ratios is much simpler to memorise and more convenient for use by working telephone engineers than when natural logarithmic values of ratios are used, and that as the infinite homogeneous line, on which the unit βl is based, is an abstract conception, there is no advantage in retaining this conception in the form of the natural logarithm of a ratio.

In conclusion, it may also be pointed out that transmission values based on the direct ratios of input and output powers could be used to express transmission efficiency, if it were not for the large range of numerical values required, and the fact that a number of individual transmission values would require multiplying together to obtain the overall value, instead of adding as in the case of the logarithms of the ratios.

The controversy between the protagonists of the two different systems formed the subject of a number of articles appearing in the *Electrician* and elsewhere some time ago.

B. S. COHEN.

I HAVE read with great interest Mr. Cohen's letter, but regret that I still have only the haziest notions of what the various kinds of transmission units are, about which there is so much controversy. I thought at first they were the 'telephone traffic units,' but as these depend on the calls in a specified period of time (see B.E.S.A. glossary No. 9932) it could not refer to them. Mathematical engineers like Dr. Fleming call β the wave-length constant and α the attenuation constant. Apparently a distortionless circuit is considered. I assume that a 'homogeneous' circuit is the same as what Heaviside called a distortionless circuit. Until clear, mathematical definitions of the 'transmission units' are given, it seems a waste of time to discuss them at international or other meetings.

THE WRITER OF THE ARTICLE.

John W. Draper's Position in Science.

IN NATURE of Sept. 24 the interesting Calendar of Discovery and Invention states that the first astronomical photographs were made in 1840 by John W. Draper, using daguerreotype plates; also that Draper's last great photographic achievement was a record of the nebula in Orion, made on Sept. 30, 1880, and that attempts at improving on this first effort were cut short by Draper's death. Here, at New York University, where Draper was a member of the faculty during the productive years of his life, we were gratified to see this appreciative note about him. In the interest of accuracy, however, it should be stated that the photographs of the great nebula in Orion were