and he gives us a number of curious illustrations, one of which, however, may judiciously have been omitted in a book which claims to be popular.

The Propagation of Electric Currents in Telephone and Telegraph Conductors. By Prof. J. A. Fleming. Third edition, revised and extended. Pp. xiv+370. (London: Constable and Co., Ltd., 1919.) Price 21*s.* net.

IN preparing a new edition of his well-known study of the propagation of telegraph and telephone currents, Prof. Fleming has taken the opportunity of bringing it in line with both the latest theoretical and the latest practical work in this field. The subject presents a very fine example of mathematical investigation leading to results of far-reaching practical utility, and the author conducts his reader along a logically continuous path from the point where he introduces him in the first chapter to hyperbolic functions of complex angles, to the page near the end where he pauses to show him a picture of a telephone cable with loading coils being laid across the Channel. Telegraph and telephone engineers owe a great debt of gratitude to Prof. Fleming for the way he has, at first in his lectures and then in the volume now before us, brought together so much valuable work in this complicated subject, to which he himself has been no mean contributor. Perhaps the most valuable feature of the treatment is the way in which he has simplified, so far as possible, the mathematical results of the original investigators, while at the same time facilitating the building of the bridge from the other end by providing the material to extend the student's mathematical resources in the required direction.

Half-past Twelve: Dinner Hour Studies for the Odd Half-Hours. By George W. Gough. Pp. vi+77. (London: Sells, Ltd., n.d.) Price 1*s.*

THERE is abundant evidence that much of the present-day industrial unrest arises from the ready acceptance of fallacious economic ideas by many of those engaged in industry. The need for sound teaching in the first principles of economics of a character within the ready understanding of working men and women, and of all who help to form public opinion, is acute, and Mr. Gough has rendered a valuable service in helping to satisfy this need.

This inexpensive little book is an attempt to correct wrong economic ideas and a limited perspective by providing a series of talks on familiar economic topics such as production, capital, profits, wages, the mechanism of exchange, and the principles of taxation. The author deals with these in a brief but extremely lucid manner, and his conclusions, while significantly orthodox, are arrived at without bias or prejudice. His illustrations are most apt, and will effectively secure the interest of his readers. It is to be hoped that this publication will be widely read not only by industrial workers and students, but also by the public generally. A. P. M. F.

Letters to the Editor.

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The Separation of the Isotopes of Chlorine.

PROF. SODDY (June 24) and Mr. Core (July 8) have in their comments on my letter in NATURE of June 17 raised several points of interest. The former asks that all the assumptions from which the equation

$$[Cl'_2][Cl_2]=[ClCl']^2$$

was deduced may be given. The assumptions are:

(1) The differences between the vapour pressures of the three varieties of chlorine are negligibly small.

(2) The vapours are almost perfect gases.

(3) The three varieties of gaseous chlorine are separable by semi-permeable membranes or other means, or the equivalent assumption that the thermodynamic potential of a mixture of the three varieties is the sum of the thermodynamic potentials of the constituents.

(4) The work required to convert reversibly 1 mol. of solid Cl'_2 and 1 mol. of solid Cl_2 into 2 mols. of solid $ClCl'$ is negligible.

The three last assumptions lead us to the formula

$$o=\log_e K+\log_e \frac{\{ClCl'\}^2}{\{Cl_2\}\{Cl'_2\}}$$

where the bracket $\{\}$ indicates concentration of saturated vapour. Whence with the aid of assumption (1) we deduce that $K=1$.

Assumption (4) follows from Nernst's heat theorem if it be postulated that the energy of the change considered is almost zero. It would appear, therefore, that if isotopes are inseparable by processes similar to that described in my first letter, one of the assumptions made is not valid.

Prof. Soddy asks whether there is any step in my argument to prevent its being applied to prove the possibility of the separation of arbitrarily selected atoms from a group of completely identical molecules by chemical means; for, if there is not, then it follows, as a *reductio ad absurdum*, that the equilibrium equation

$$[Cl'_2][Cl_2]=[ClCl']^2$$

is wrong, and it is unnecessary to test its validity by experiment. Concerning this query I am in doubt whether it would be generally admitted that assumption (3) could be made in such a case as that contemplated by Prof. Soddy, and therefore I think it is desirable that the question of the validity of the equation should be submitted to the test of experiment—so far as it is possible to do this.

Mr. Core assumes that the isotopes of chlorine are inseparable by chemical means, but does not agree with my conclusion that if such is the case Nernst's heat theorem will be difficult to defend. He admits that at finite temperatures the difference in entropies of the solid reactants and resultants is $R\log_e 4$, but he argues that it may become zero at zero temperature owing to the effects of the differences in properties of the three solids being more pronounced at exceedingly low temperatures. But even if it be admitted that in the case of chlorine the difference between the entropies of the reactants and resultants can be nothing at zero temperature and $R\log_e 4$ at finite temperatures, it has still to be explained how the same rise in the difference of entropies from zero to the constant value $R\log_e 4$ could occur for a change of the same type in the case