of the conductor, being the same for resistances of metal wire, graphite, thin metallic films, films of drawing ink, and strong or weak electrolytes. It does, however, depend on temperature and is proportional to the absolute temperature of the resistance. This dependence on temperature demonstrates that the component of the noise which is proportional to $R$ comes from the conductor and not from the vacuum tube.

A similar phenomenon appears to have been observed and correctly interpreted in connexion with a *current sensitive* instrument, the string galvanometer (W. Einthoven, W. F. Einthoven, W. van der Horst, and H. Hirschfeld, *Physica*, 5, 358-360, No. 11/12, 1925). What is being measured in these cases is the effect upon the measuring device of continual shock excitation resulting from the random interchange of thermal energy and energy of electric potential or current in the conductor. Since the effect is the same for different conductors, it is evidently not dependent on the specific mechanism of conduction.

The amount and character of the observed noise depend upon the frequency-characteristic of the amplifier, as would be expected from experience with the small-shot effect. The apparent input power originating in the resistance is of the order $10^{-18}$ watt at room temperature. The corresponding output power is proportional to the area under the graph of *power amplification—frequency*, at least in the range of audio frequencies. The magnitude of the 'initial noise,' when the quietest tubes are used without input resistance, is about the same as that produced by a resistance of 5000 ohms at room temperature in the input circuit. For the technique of amplification, therefore, the effect means that the limit to the smallness of voltage which can be usefully amplified is often set, not by the vacuum tube, but by the very matter of which electrical circuits are built.

J. B. JOHNSON.

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New York, N.Y., Nov. 17.

### Oxygen = 17. Oϕ.

I KNOW that I am very ignorant, but old and unrepentant as I am I still live to learn from young people and watch their doings with delight, tho' maybe they are sometimes a little 'previous.' The argument behind Messrs. Harkins and Shadduck's letter (NATURE, December 18, p. 875) is doubtless irreproachable and unanswerable. Probably, therefore, I am more than stupid in being surprised at "the atom (presumably oxygen of mass 17) which is synthesised." Suppose, however, that a poor errant molecule of fair hydrone were the stricken 'atom,' it might well be 'electrolysed' and give OH = 17 + H = 1. Who will say me hay and make it clear that this cannot be? Uesanian orders are sometimes tall and the propinquity of the Wheat Pit may well have influenced the Chicago laboratory, just as Cambridge, being an apanage of Newmarket, is given over to racing competitions and so demoralises the whole of our educational system.

I know full well, that it is wrong for a poor worm of a chemist to turn and put a common or garden interpretation upon the work of august and fashionable physicists: that they should be regarded as kings who can do no wrong. I have, however, preserved from my youth the memory of a king who wore no clothes and myself still work a little in the garden with not too much regard for weather. NATURE, too, disturbs my belief in things. In it, Dr. Jeans—who, being senior secretary of the Royal Society, a mathematician and a man who sees stars, must know everything—has recently assured us that the elements short of uranium are infinitely stable, even at the super-satanic temperature of 12,500,000 million degrees. If so, is a mere missile of mass 4 with a range of 6 cm. likely to knock spots off them? Cannot we rather picture the nitrogen molecule, in itself a hard nut to crack, as contemptuously asking, whenever hit by an α-particle: 'Who are you shoving of?' and moving on its way, naked and unashamed, uncaressed by the particle—this latter, attended as it is from its birth by the faithful electron, as then wickedly compassing the prostitution of fair hydrone?

My faith in the immaculate judgment of the 'Physicals' would be greater if they would curb their imagination by learning just a little chemistry and would seek to tell me what happens when I rub my stylo upon my coat sleeve: a fundamental question to which I can get no answer. The α-particle may be doing as the moving stylo does. When I read the heroics in NATURE of December 18, I am only too conscious of the greatness of the 'Electronicals': still, men with the unlimited speculative power they possess might sometimes deign to deal with matters which affect ordinary mortals and with the common objects of the laboratory floor.

HENRY E. ARMSTRONG.

### Temperature Coefficient of γ-Ray Absorption.

RECENT improvements in design and technique for a gold-leaf electrometer, details of which will be published shortly, have made it possible to apply the instrument with success to the problem of a possible temperature coefficient of γ-ray absorption. Preliminary measurements with lead as absorber, over a temperature range of about 250° C., indicate that when due allowance has been made for the expansion of the lead, there occurs an increase in the absorption coefficient of approximately 0·2 per cent. per hundred degrees rise of temperature. That the effect is dependent on temperature, or indeed on any incidental at all, is somewhat of a surprise; and considerable interest is added by the recent account by H. S. Read (*Phys. Rev.*, 27, p. 373, 1926) of an effect of temperature on X-ray absorption, in which he records, for lead and the five other metals examined, a temperature increase in the coefficient of the same magnitude as here reported. Further investigation is contemplated.

L. BASTINGS.

The University, Durham,
Dec. 3.

### The Supposed Law of Flame Speeds.

WITH reference to Prof. Bone's letter in NATURE of Dec. 11, p. 837, it is evident that the speed generalisation advanced by Prof. R. V. Wheeler and Dr. W. Payman must break down when one of the combustible gases in a complex mixture interferes with the burning of another. This has been shown to occur for carbon monoxide–hydrogen–air mixtures by Dr. Payman (*J.C.S.*, 115, 1454, 1919). In this case the speed of burning of carbon monoxide is much increased in the presence of hydrogen. The reverse effect occurs when mixtures of carbon disulphide not too far removed from the limit are mixed with certain other combustibles (*J.C.S.*, 121, 2561, 1922). By mixing suitable carbon disulphide–air and (say) ether–air mixtures having the same speed of flame, mixtures can be obtained which refuse to propagate flame.

A. G. WHITE.

45 Caledonia Road,
Saltcoats, Dec. 20.