

to actuaries who have practical experience of them that the writer of the article may have thought it too obvious for reference. It is, however, an important aspect of the problem of providing pensions which ought not to be overlooked.

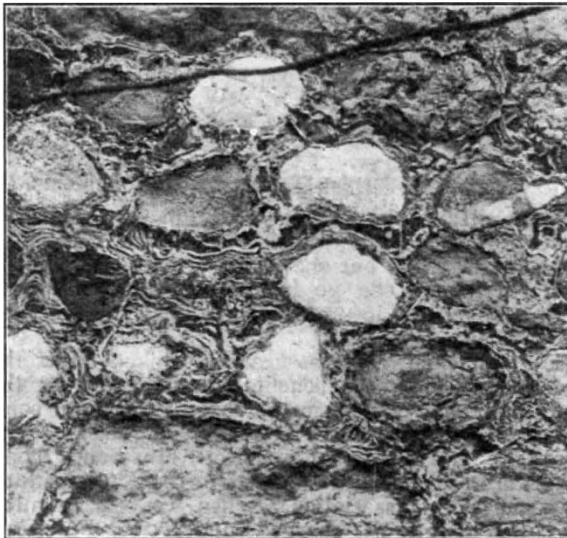
W. PALIN ELDERTON.

Mansion House Street, E.C.2, July 4.

[THE insurance companies selected by the council of the Federated Superannuation System are not all mutual companies, and, in consequence, there are shareholders and dividends to be taken into account. Apart from this, even among mutual companies such matters as directors' fees, palatial buildings, and highly paid officials are not unknown, not to speak of expenses, often heavy, of advertising. If Mr. Elderton wishes to maintain the position that insurance companies are purely philanthropic institutions, we fear he has taken on an impossible task.—ED.]

Cup and Ring Markings.

MAY I query Mr. Carus-Wilson's opinions in his letter in NATURE of June 23 (p. 523)? I have, alas! seen only one case (at Ilkley) of these markings, but have long been interested in the peculiar weathering of mortar which is common on the north side of old buildings near the sea. My view is that it is quite distinct from the cup and rings. The change in mortar is, I suspect, one of adsorptive precipitation, so well explained by Mr. S. C. Bradford in NATURE of March 23, 1916, and elsewhere.



After saturation by rain, when drying takes place the lime forms into parallel lines with intermediate spaces, and those sand-grains which are thus robbed of their cement are speedily removed by the wind. The accompanying photograph (Fig. 1) is of an old stable wall built of local sandstones and limestones at the Military Arms Inn, The Nothe, Weymouth, and was taken in 1904. The scale is 1/10. I presume the cracks, etc., in old oil paintings are also quite unlike either of the above.

GEORGE ABBOTT.

June 26.

A New Acoustical Phenomenon.

WITH regard to Dr. Erskine-Murray's observation of the behaviour of aeroplane sounds (NATURE, June 16, p. 490), attention may be directed to the
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fact that any combination of confused noises will behave in the same manner, such, for example, as the noise of rustling leaves, escaping steam, a shower of rain on trees or tin roofs, or of a distant train in motion. If one stoops towards the road or approaches a reflecting wall while any of these noises are going on, the pitch of the sound rises, and when one is in the act of standing up, or of withdrawing from the wall, it descends. The grating of carriage-wheels on the road, or rather the noises reflected downwards from the body of the carriage, have a like effect when the observer is standing perfectly still. In this case, however, for some reason not clear to the writer, careful listening shows that the pitch falls as the vehicle nears the observer, and rises as it recedes from him. If the sound is a single continuous note, such as that of a whistle blown by a bicyclist riding past the observer, beats are heard as the whistle advances and also as it recedes, these being due to interference between the direct sound-waves and those reflected from the road. The occurrence of beats in such circumstances is perhaps not generally recognised.

F. M. WEST.

11 Downshire Square, Reading, July 12.

Magnetism and Atomic Structure.

ON the cubical atom theory developed by Lewis and Langmuir it appears that the molecules of CO_2 and N_2O have almost identical electron configurations. A. O. Rankine has shown from viscosity data that each electron system is equivalent to that of three adjoining neon atoms in line. The writer is not aware that attention has been directed to the fact that the specific susceptibilities of gaseous CO_2 and N_2O are -0.423×10^{-6} and -0.429×10^{-6} (Také Soné, Science Reports, Tôhoku, vol. viii., p. 162, 1919, and Proc. Phys. and Math. Soc. Japan, vol. ii., p. 84, 1920) and their molecular susceptibilities -18.6×10^{-6} and -18.8×10^{-6} respectively.

The electron systems of the two molecules are apparently identical, but the net positive charges on the atomic nuclei are 8-6-8 for CO_2 and 7-8-7 for N_2O . If, therefore, atomic nuclei possess rotations and are a source of magnetic moment, it must be assumed that the redistribution of the positive charges in the manner indicated involves no change of angular momentum.

A. E. OXLEY.

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July 14.

An Algebraical Identity.

WITH reference to the letters in NATURE of June 9 and July 7 by Dr. G. B. Mathews, Dr. H. C. Pocklington, and the Rev. J. Cullen on the polynomials $Y(x)$, $Z(x)$ satisfying the identity

$$Y(x)^2 - (-)^{(p-1)/2} Z(x)^2 = 4(x^p - 1)/(x - 1),$$

may I point out that $Y(x)$, $Z(x)$ are tabulated as far as $p=101$ in Dr. Hermann Teege's inaugural dissertation, "Ueber die $\frac{1}{2}(p-1)$ gliedrigen Gaussischen Perioden" (Kiel, Peters, 1900)? Connected with these polynomials there is a further point which, so far as I am aware, has not yet been settled. When $x=1$ and $p \equiv 1 \pmod{4}$, $Y(x)=py$, $Z(x)=z$, and $py^2 - z^2 = 4$.

I have verified from Dr. Teege's results that (y, z) is the primitive solution of $pu^2 - v^2 = 4$, and consequently $\frac{1}{2}(z+y\sqrt{p})$ the primitive unit of the quadratic field $[\sqrt{p}]$ as far as $p=101$; but the question whether this unit is always primitive needs further investigation.

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