CORRESPONDENCE.

LIMITED PAYMENT LIFE POLICIES.
SPECIAL RESERVES FOR PROFITS AND EXPENSES.

To the Editors of the Journal of the Institute of Actuaries.

SIRS,—Mr. Todhunter's Hypothetical Office Premium Formula, given in his recent paper (*J. I. A.*, vol. xlix, p. 264) on the above subject, produces reserves equal to the net premium reserve for the sum assured plus the net premium reserve for a pure endowment equal to the amount of the special additional reserve required at the end of the premium period by the usual method. From the Table in the paper (p. 265), it will be seen that the full reserve in the illustration there given is 69·86 at the end of 20 years. The single premium at age 50, $O^{M(5)}$ $2\frac{1}{2}$ per-cent, is 61·49, and therefore, 8·37 is the amount of the pure endowment. The increase in reserve arising by valuing these pure endowments as endowment assurances would, perhaps, not be considered important in practice. If the premiums under limited payment policies are valued by the Z-method it might be found convenient to make a correction for the special reserve by, at the same time, scheduling an amount to be valued as an endowment assurance, which amount could be suitably adjusted to take account of any inadequacy in the limited payment premiums.

In the following table are given reserves calculated on this principle in comparison with the figures given in Column (6) of Mr. Todhunter's Table. There is also added, as a matter of interest, the reserves obtained by valuing 8·37 as a pure endowment on the experience basis $O^{(M)}$ 4 per-cent.

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Limited Payment Policy Values.

n	By Hypothetical Office Premium Method (Mr. Todhunter)	Net Premium Reserve $+8{\cdot}37_nV_{30:\overline{20}\rceil}$ ($O^{M(5)}$ $2\frac{1}{2}\%$)	Net Premium Reserve ($O^{M(5)}$ $2\frac{1}{2}\%$) $+8\,37_nV_{30\ \frac{1}{20}\rceil}$ ($O^{[M]}$ 4%)
0	0·00	0·00	0·00
5	14·00	14·08	13·81
10	30·02	30·16	29·73
15	48·44	48·57	48·19
20	69 86	69·86	69·86

The difference in reserve would be greater in some cases than shown above, but if thought material a higher rate of interest might be adopted. Investigation would possibly show that the average age obtained for the valuation of the premiums, or a simple modification thereof, would be applicable to the endowment assurances. The method would perhaps be considered applicable to single premium policies, the usual extra reserve at the end of a fixed term of years being valued as an endowment assurance; or a portion only of the special reserve could be provided in this manner, the balance being provided for in the usual way.

Apparently it would be necessary to reschedule a correction factor at the end of the premium period, (in the case of single premiums at the end of the fixed term agreed upon), but possibly some convenient device could be found to overcome this. If not, there would be some compensation in the fact that a considerable proportion of policies cease before the end of the premium period, thus materially reducing the work.

Yours faithfully,

A. D. WATSON.

Insurance Department,
Ottawa,
9 *October* 1915.

[A practical method of valuation (for $n<t$), suggested by the foregoing letter, would be to take the net premium value and add n/t-ths of the additional loading reserve required at the end of the payment term. An alternative method—suggested by the writer of the letter with the object of reducing the valuation-strain in the early years incidental to taking n/t-ths of the additional loading reserve—would be to add to the net premium reserve the accumulated sinking fund for the additional loading reserve, *i.e.*, to take ${}_nV_{\bar{t}\rceil}$-ths of that reserve instead of n/t-ths. Either of these modifications would answer the purpose of the hypothetical office premium method, that purpose being merely to avoid the inconvenience of the ordinary method of valuation—consistently

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with making a fully adequate reserve—by distributing over the payment term the valuation-loss due to the commutation of the whole-life premium at a rate of interest higher than the valuation-rate. The first mentioned method, which has the advantage of being very simple in application, would give the following reserves for $n=5$, 10 and 15 in the case dealt with in the letter :—14·54 ; 30·82; 49·11.—Eds. *J.I.A.*]

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