

CORRESPONDENCE.

LIFE - CONTINGENCY PROBLEMS.

To the Editor of the Assurance Magazine.

SIR,—As it is not uncommon to find inserted in Mathematical Journals occasional problems upon which such readers as are fond of analysis may exercise their skill, it has occurred to the writer that this characteristic may, also, in a mathematical sense, come within the scope of the *Assurance Magazine*. The three following Life-Contingency problems are accordingly offered in the hope that other actuaries may be induced to add to the list; for independently of the novelty which such problems in themselves may be expected to comprehend, they may also occasionally become the bases of various useful transformations of the ordinary formulæ, when treated by methods of solution varying with the ideas of different calculators. If it be further remembered that the precedent has already been offered by Simpson, in his “Select Exercises,” so well known and appreciated by the profession, it may be reasonably presumed that actuarial readers, at least, will not think such forms foreign to the purpose of an *Assurance Magazine* :—

Annuities. The formulæ for adjusting the value of a Life Annuity, when it becomes payable by n instalments in the year, appears to have not hitherto been deduced in connection with the *column system*. It is required to effect this, and to thereby show the exact nature of the assumption upon which the usual approximation is really founded.

Assurances. It is required to be shown, that the value of a policy has always a certain relation to the *compound interest* of the sum assured, considered as a loan.

Probabilities. The limits of “probability” being zero and unity, it is required to be shown that any “definite integral,” involving those limits, necessarily represents an *average* value; and that the recognised assumption by writers on probability, that the average result is also the most probable, is therefore virtually implied in the methods of definite integration, by which alone the results involved can be properly estimated.

E. J. F.

ON MEDICAL FEES PAID BY LIFE ASSURANCE COMPANIES.

To the Editor of the Assurance Magazine.

SIR,—The following information as to the working of the system of paying medical referees, may be interesting to some of your practical readers, who are still undergoing the harassments connected with that vexed question.

One thousand proposals having been made to an office within a certain time, the number of cases in which the Directors were enabled to decide without applying to the referee, (either because the life was obviously bad, or because he had been very recently assured under another Policy, or because he had no medical attendant)	was	276
The number of cases in which the Referee happened also to be the Company's Examiner, and in which no separate fee was paid.....	was	47
The number of cases in which the Referee was paid half a guinea, (the amount proposed to be assured being under £500)	was	328
The number of cases in which the Referee was paid a guinea	was	349
		1,000

And the total cost of the system amounted to 2.15 per cent. upon the first year's premium upon the new policies granted during the period.

I am, Sir,
Your faithful servant,
M. C. I. A.

ON THE PROPER MODE OF ESTIMATING THE VALUE OF PERMANENT AND TERMINABLE ANNUITIES.

To the Editor of the Assurance Magazine.

SIR,—In valuing permanent or terminable annuities, much must depend on the object and purpose of investment, and as to how far the realisation of the capital on the revenue desired from it, is of principal importance. Where immediate realisation is or may be required, the price that will be brought is of course the sole consideration; where, on the other hand, the revenue to be derived from the investment is the entire object, the price, paradoxical as it may seem, is little or no criterion of the value at which it should be estimated.

Thus, if the object in view be to secure in perpetuity an obligation for an annuity of £30, and this has been secured for £800, it will be of no consequence that the selling price of the fund rises to £1000; it is still put equal to the obligation, and if it be estimated at more, a corresponding value must be attached to the obligation. In short, whether the value of the fund rises or falls, it is of no moment to the obligant; there can be neither profit nor loss *quoad* the transaction. This is plain enough. It may be more strikingly illustrated as follows:—Suppose an investment has been made in the 3 per cent. Consols to secure an annuity of £100 in perpetuity, and that the investment had been made when the price of the Consols was £75, or for £2,500. If the funds should rise to par, and at the same time be reduced a quarter per cent., there would be an apparent gain of £333 6s. 8d., while in reality, there would be a loss of £333 6s. 8d.; at least, that sum would require to be further invested to maintain the annuity required.

The business of a Life Assurance Office partakes much less of that character where immediate realisation should be contemplated, than most companies, and rises very closely to the position we have just illustrated by figures, depending on the whole, for the general fulfilment of its contracts, most materially, if not principally, upon the revenue to be derived from its capital. While this is the case with reference to the whole general capital, the remark applies with more force to that portion consisting of permanent investment which we have at present in view, except for the sake of making a profit in such investments, which is not to be presumed to be the intention with which they are made; it can very rarely be expected that any necessity will arise for disturbing them prior to a time removed at such a distance as to make the present value of the capital then to be realised, very small, compared with that of the revenue to be derived in the meantime.

Calculating at 4 per cent. on an investment made at that rate, and to continue for 40 years, the value of the capital to be received at the end of that period,