years, and that it should be the part of your *Magazine* to maintain soundly conservative doctrines in life assurance. I crave your pardon for troubling you with these remarks, not having the honour of belonging to the Institute which your *Journal* represents with so much ability; but I believe you do not consider that qualification essential to correspondence with you.

I am, Sir,

Your obedient servant,

EDWARD W. BRABROOK, F.S.A.

27, *Regent Street,*
October, 1862.

P.S.—I add one line, to congratulate Mr. Younger and the Institute on his election as a Fellow; though we happen to differ on this occasion, a long acquaintance with him has led me to hold him and his merits in very high regard.

E. W. B.

ON MR. SAMUEL YOUNGER'S PLAN FOR THE ASSURANCE OF INVALID LIVES.

To the Editor of the Assurance Magazine.

SIR,—Will you allow me space for a few remarks on Mr. Younger's paper, in your last Number, on the assurance of diseased lives, as I think that gentleman rather needlessly complicates a comparatively simple matter.

A person desirous of making a specific annual payment or investment for the assurance of his life, has, obviously, various alternatives to choose from. He may assure the same sum over the whole period of life—a larger sum for but a part of his life—or a sum increasing by a certain ratio, as in most ordinary "Bonus" assurances. He may stipulate that the risk of the Office shall only commence a fixed number of years hence, as in a printed table now before me; or, as in the case detailed by Mr. Younger, it may be an understanding that the risk of the Office shall be for one (smaller) sum during an earlier period of the assurance, and for a larger sum thereafter—the *fixed* terms being, the amount of premium to be paid, the larger sum for which the Office is to be responsible, and the period when the larger risk is to commence; the *variable* term being the amount of risk during the earlier period. Of course, such a system can be carried out only within certain limits, and the amount of the smaller risk is obtained by the simple equation—

$$S=\frac{AM_x-\pi N_{x-1}}{M_x-M_{x+n}},$$

where S is the smaller amount required, π the premium agreed to be paid, reduced by its proportion of Office loading or commission, A the larger assurance agreed on, and n the number of years for which the risk of it is deferred.

By this we may work out the first example given by Mr. Younger, where $x=35$ (the *assumed* age of the diseased life), $n=34$, $A=100$, and $\pi=1{\cdot}7554$, the net annual premium by the Carlisle 4 per cent. table for a life assurance of £100, at age of 30. This premium is perfectly arbitrary, and any other might have been taken for illustration—the result gives £82·4536 for the smaller sum to be assured, or £17·5464 less than the £100 to be finally covered. Mr. Younger proposes to deduct only £6. 12*s.*

The method has lately been made applicable to the assurance of diseased lives; the benefit being calculated at the increased age of the assured assumed by the Office, and the premium payable being that applicable to his real age. Certainly, more has been made of it than is warrantable, as it has been asserted to be a means of correction of any erroneous estimate of the deterioration of the life, although that estimate is strictly adhered to in the equation.

Mr. Younger now, however, proposes to deal in another way with the latter problem. Reasoning, from an assumed tendency of the medical officer to overrate a special risk, and from other causes, he thinks to correct the error by making his computation at the real age of the assured, deducting from the benefit, during the earlier period of the assurance, such an amount as is represented by the extra premium arbitrarily imposed by the exigencies of the case. The propriety of this view is, to say the least, very doubtful; but without stopping to discuss it, you will see that, assuming the extra premium payable for the whole of life, the deduction is to be calculated from the expression—

$$\frac{\pi N_{x-1}}{M_x - M_{x+n}},$$

π being the extra premium imposed; and dealing with Mr. Younger's first example, where $x=30$, $n=34$, and $\pi=\cdot35833$, the result gives the equivalent short assurance (by Carlisle 4 per cent.) to be £28·9808.

I am not very sure, however, of Mr. Younger's meaning, when he "suggests that the extra premium proposed to be charged should be left unpaid until the expiration of the period termed the expectation of life;" but assuming that his proposal is, to require payment from the assured, not for the whole of life, as recommended by his medical adviser, but for that term only during which the deduction from the sum assured is to be in force, and which he fixes at the tabular "Expectation," then, abiding by his first example, and the Carlisle 4 per cent. data, the present value of the 34 years' assurance, which he is to deduct from the benefit under the policy in question, is—

$$\frac{6\cdot6\,(M_{30}-M_{64})}{D_{30}}=1\cdot45684,$$

while the present value of but the first 34 payments of the premium, which he is to forego in respect of this risk, is—

$$\frac{\cdot358333\,(N_{29}-N_{63})}{D_{30}}=5\cdot89234,$$

or upwards of four times the first amount.

Such a discrepancy invites an inquiry into Mr. Younger's investigation, but I confess my inability to follow his reasoning. Assuming the truth of his own expression (1), as a correct estimate of the present value of the annuity forborne, he should, surely, have equated it, not with an assurance payable at death, but with one payable should the life fall within *e* years, the early period he deals with; but I must leave it to himself, or any other of your contributors who will kindly give us some farther information on the point.

I am, Sir,

Your most obedient servant,

H. AMBROSE SMITH.

Aberdeen, 24th November, 1862.

ON MR. YOUNGER'S SCHEME FOR THE ASSURANCE OF DETERIORATED LIVES.

To the Editor of the Assurance Magazine.

SIR,—My attention has been directed to Mr. Younger's paper in your last Number (p. 268), on a scheme for the assurance of diseased and deteriorated lives, and I shall be glad to be allowed to make a few remarks on it.

The usual mode of dealing with deteriorated lives is to treat them as if so many years older than their actual age, the effect being the imposition of an additional amount of premium, which may or may not be commuted into a reversionary deduction. Mr. Younger is dissatisfied with this mode of treatment, and he propounds a scheme of his own, with a view to obviate his objections to that at present in use.

Mr. Younger's main position is, that the decision of "the medical officer [which regulates the number of years to be added to the age of the life, and, consequently, the amount of the extra premium], if incorrect, is far more likely to be in favour of the Company than otherwise"; and upon this, as a foundation, he erects his superstructure. Retaining the extra premium, imposed in accordance with the medical report, he proposes:—

1. That this premium shall be payable, not during the whole of the after-lifetime, but only during a portion of it.

2. That it shall not be payable even during the term in question, unless the assured die during the said term. And,

3. Commuting the premium thus curtailed and rendered contingent into a *whole-life* reversionary deduction, he proposes, finally, to restrict the duration of this deduction to the term already referred to.

Add to all this that Mr. Younger, in his valuations and commutation, uses the *real*, and not the *increased* age, and it will be strongly surmised that the concessions enumerated are vastly more than sufficient to meet a presumed *likelihood* that the medical report, *if incorrect*, errs in favour of the Office.

Let us examine a particular case. I take at random the first given by Mr. Younger—a life of 30, which is estimated by the medical officer as deteriorated to the extent of five years, and on which, accordingly, an additional premium of 7*s*. 2*d*.$=\cdot 358333$ per cent. is imposed. The present value of this premium (Carlisle 4 per cent.), as at age 35, is 6·1065. Mr. Younger, for this premium, substitutes a reversionary deduction of £6. 12*s*.$=6\cdot 600$, during the first 34 years—the present value of which is 1·7086. If, with Mr. Younger, we use the real age, the values come out 6·3970 and 1·4568 respectively, exhibiting a still greater disparity. The