

would give results troublesome to calculate: higher powers than the first of a small quantity are continually being rejected in mathematical approximations, and its propriety in these problems is proved by our knowledge of the insignificant amount of the error in a sufficient number of cases to warrant an induction to all other cases.

A few words regarding Mr. Saug's tables. It is evident that I believe him to have used the proper expression for the interest of £1 in half a year; but I think, as there were differences of opinion as to what is the proper expression, he should have stated which he had employed: also, that his tables would have been more useful and much more used, if the value of assurances involved in them had been found as payable at the end of the year in which death occurs.

WILLIAM ORCHARD.

THE RESULTS TO BE LOOKED FOR ON TOSSING A DYNAMICALLY TRUE COIN.

To the Editor of the Assurance Magazine.

SIR,—Will you allow me, as a reader of the *Assurance Magazine*, to offer one or two observations with reference to the subject of a paragraph, "on tossing a dynamically true coin," which appeared in the July number of that periodical?

I would remark, in the first place, that it does not appear to me that the terms of the hypothesis are inconsistent. We must, I think, allow it to be theoretically possible that a dynamically true coin, when tossed, *may* turn up head a hundred times successively, although on the other hand it must be admitted that the hypothesis is purely casuistical, and supposes a coincidence of conditions, the probability of the occurrence of which is so small that there is a moral certainty that such coincidence will never actually obtain.

The argument adduced to prove that if a dynamically true coin has been tossed and has turned up head a hundred times successively, the probability of the next throw is in favour of tail, appears to me to be fallacious *ab initio*; for it is an untenable assumption that "in any given number of trials with such a coin, it is probable that the number of heads turned up will equal the number of tails." If *two* trials, for example, are to be made, it is clearly as likely that there will be either two heads or two tails, as that there will be an equal number of heads and tails; and therefore that in this, the most favourable case, there are no odds in favour of the latter result.

The origin of this assumption was probably a hasty deduction from the evidently true proposition, that if a dynamically true coin be tossed a certain number of times, the probability that there will be a given numerical excess of heads over tails is equal to the probability that there will be the same excess of tails over heads. This is true, however small the excess, and therefore when it is zero. The proposition, in this its limit form, has been hastily taken to be—"it is probable that there will be an equal number of heads and tails"; whereas it really is—"it is as probable that there will be the same number of heads and tails, as that there will be the same number of tails and heads." To apply a Johnsonian phrase, this is a conclusion wherein nothing is concluded.

It does not therefore ensue that any reason has been adduced for doubting the accuracy of your statement, that, the coin "being true, one result might be looked for at any time just as much as the other"; but if any one has any impression in favour of the opposite opinion, let me recommend him, before embracing it, to view the question in another light. A hundred and one dynamically true coins are fairly tossed, and then one of them is covered. The others, when examined, are all found to have head uppermost. Is not the hidden coin as likely to have head as tail uppermost?

I am, Sir,

Your obedient Servant,

Royal Military Asylum,
Chelsea, August 24th, 1853.

W. J. REYNOLDS, B.A.

THE CHANCES OF PREMATURE DEATH AMONG SELECT LIVES.

To the Editor of the Assurance Magazine.

SIR,—As I presume the paper last read at the Institute, in which my name was somewhat frequently referred to, will be inserted in your present Number, perhaps you will allow me to make some comments upon that paper, in order that such readers as were not present at the Institute, may not imagine, that I thereupon became a convert to Mr. Spens' views.

If I understand that gentleman's notions correctly, he seeks to maintain, that for a single year's insurance, the value of selection neutralizes all distinction of age from 21 to 45, and that the *true* premium per cent. for each age alike, is about 10s. 8d., which is the money value of 0.55, when discounted for a year at 3 per cent. I further understand Mr. Spens to maintain that all other ideas are essentially "fabulous," and more especially those set forth in what he is pleased to call my "elaborate treatise 'On the Chances of Premature Death, and the Value of Selection among Assured Lives.'" Mr. Spens, indeed, does not demur to the correctness of the conclusions, as deduced by me; for he expressly says, "*I have not one word to say against these results being correctly deduced from the data on which they are founded; but it is my argument, that they are the correct deductions, reasoning from the data, assuming them to be correct data.*" Is it then, an unfair presumption to consider, that data collected and arranged, under the joint superintendence and responsibility of ten well known actuaries, may at least have some claim for correctness and consideration? It was, indeed, the obvious justness of this claim that induced me to undertake the laborious task referred to.

True it is, that the experience so collected, was of necessity the experience of policies, and therefore not necessarily that of lives; but it had already been tolerably well ascertained, that in moderately large numbers, as a matter of ratio the number of increased deaths, when reckoned by policies, was sufficiently balanced by that of the increased number of policy survivances, when reckoned on the same principle. As an instance of this: Mr. Griffith Davies' well known Table of the Equitable Experience was founded on Mr. William Morgan's statement of policies (*Essay on Rise and Progress*), not upon Mr. Arthur Morgan's experience of Equitable lives; and yet the two tables did not so materially differ as to render Mr. Davies' table