THE AMERICAN EXPERIENCE TABLE OF MORTALITY.

(S. A. Joffe before the Actuarial Society of America).

It is now more than forty years since the American Experience Table of Mortality was introduced as a legal standard by the New York State Insurance Department, and many a page has been devoted to the study of this table. But notwithstanding all efforts, very little is known regarding its construction, and as late as May, 1908, Mr. D. P. Fackler, the esteemed ex-president of the Actuarial Society of America, concluded his paper on "The Genesis of the American Experience Table" as follows: "At the beginning of this paper I stated my fears that I could not give you much information regarding the Genesis of the American Table, and now, in closing, I am afraid you will all be disappointed, though I have done my best to furnish the information desired. It is greatly to be regretted that Mr. Homans never published any account of the method employed by him in preparing the table."

It is but natural that in an attempt to solve the puzzle of the American Experience Table, which was constructed by an actuary of the Mutual Life Insurance Company of New York from the mortality experience of that company, one should turn to the study of the early mortality tables and premium rates used by the Mutual. While endeavoring to trace step by step the known results to their respective sources, I was gradually brought in my historical research to the investigation of the premium rates charged by a certain American insurance company in 1823, which were computed by its actuary, a well-known mathematician.

MASSACHUSETTS HOSPITAL LIFE INSURANCE COMPANY.

A pamphlet of this company under the title "Proposals," dated August 18th, 1823, contains a table of annual premiums for one-year term, seven-year term and ordinary life, ages 14 to 60, inclusive. The premiums were computed by its actuary, Nathaniel Bowditch, the celebrated translator of Laplace's Mécanique Céleste. I find by experiment that the net premiums were calculated by the Northampton Table of Mortality, assuming 3 per cent. interest, and that the loading is 10 per cent. of the net premiums for the respective plans.

NEW YORK LIFE INSURANCE AND TRUST COMPANY.

The table of premium rates published in a pamphlet of this company under the title, "Rates and Proposals," dated 1830, is a reprint of the premium rates of the Massachusetts Hospital Life Insurance Company, and is accompanied by a statement that the rates were adopted with the permission of the latter company. Having subsequently decided to reduce its premium rates, the New York Life Insurance and Trust Company employed Dr. Anderson, Professor of Mathematics in Columbia College, New York, to compute the new rates.

The pamphlet, "In Chancery.——In the matter of the New York Life Insurance and Trust Company.—Order, Answer and Report," dated April, 1832, contains annual premiums for ages 14 to 60. I find on investigation that the premiums for ages 14 to 55 are calculated by the Carlisle Table of Mortality, assuming 4 per cent. interest, with a loading of 35 per cent. For ages 56 to 60 the figures are copied from their pamphlet of 1830, or, in other words, the premiums for these ages are Bowditch's figures, by the Northampton Table of Mortality, assuming 3 per cent. interest, with a loading of 10 per cent.

THE MUTUAL LIFE INSURANCE COMPANY OF NEW YORK.

In the first annual report of this company, which was for its second year, published in 1845, the table of premiums contains annual premiums for one-year term, seven-year term, and ordinary life, ages 14 to 67, inclusive. The rates for ages 14 to 60 are exact copies of the figures appearing in the pamphlet of the New York Life Insurance and Trust Company published in 1832. For ages 61 to 67 the premiums for ordinary life for $100 insurance have the following differences:—

Age.	Cents.
61	25
62	30
63	30
64	30
65	40
66	40
67	50

It is evident from this table that the rates for these last ages were not constructed scientifically but were extrapolated by using artificial differences in round figures.

These first premium rates of the Mutual were kept in force for ten years until February, 1853, but two years previous to that date Professor Charles Gill, the company's first actuary, who appeared to occupy that position from October, 1849, to October, 1855, had recommended to "the Trustees to confine their assurance business, so far as the issuing of new policies is concerned, to lives below the age of 56." This quotation is taken from the "Actuary's Report to the Board of Trustees of the Mutual Life Insurance Company of New York, exhibiting the experience of the company during the first eight years of its operations . . . ." presented by Gill in February, 1851.

His recommendation is based on several considerations, which he concludes as follows: "I have before had occasion to mention that the rates of assurance of this company above the age of 55, are too small when compared with the rates below that age; for instance, the rate of 67 is 9.45 per cent., while, calculated on the same principles as the rates for ages below 55, it should be 10.32 per cent." From this it appears that Gill did not know the history of the formation of the first premium rates of the Mutual, and did not suspect that the rates for ages 56 to 60 were actually computed by the Northampton, not by the Carlisle Table.

MUTUAL'S ADOPTION OF NEW RATES.

In February, 1853, the Mutual adopted new rates which were computed by Gill from a new mortality table constructed by him. The following is the description in Gill's own words of the manner in which his table was formed. This description is contained in a manuscript folio volume, entitled "Assurance Premiums" recently unearthed in the archives of the Mutual:—

"A curve was described whose co-ordinates were the number of years of age, from 10 to the extremity of life, and the number $\left(\frac{1}{1-p^x}\right)$ out of which one will die between that and the succeeding age according to the Carlisle Table of Mortality; this was repeated on the same paper for several other life