

REVIEWS

Reports of the Unemployment Insurance Statutory Committee on the Financial Condition of the Unemployment Fund. (First General Report, as at 31 Dec. 1934. Pp. 22. 1935. 4d. Second General Report, as at 31 May 1935. Pp. 22. 1935. 4d. Third General Report, as at 31 Dec. 1935. Pp. 39. 1936. 9d. Fourth General and First Agricultural Reports, as at 31 Dec. 1936. Pp. 44. 1937. 9d. Fifth General and Second Agricultural Reports, as at 31 Dec. 1937. Pp. 66. 1938. 1s. 0d. Sixth General and Third Agricultural Reports, as at 31 Dec. 1938. Pp. 40. 1939. 9d. H.M. Stationery Office.)

THESE reports furnish a history of unemployment insurance in Great Britain from the time when the Unemployment Insurance Statutory Committee was set up in 1934. (See Chapter v of the *Final Report of the Royal Commission on Unemployment Insurance*, Cmd. 4185, 1932; Mr H. M. Trouncker's Address on Unemployment Insurance to the Institute on 27 March 1933 and the subsequent discussion, *J.I.A.* Vol. LXIV, p. 107; and sections 56-60 of the Unemployment Insurance Act, 1935, which replaced sections 17-19 of the Unemployment Act, 1934.)

A separate account is kept in respect of the scheme for the agricultural industry, which was established in 1936 on the recommendation of the Statutory Committee. The principal reports of the Committee are of course those dealing with the General Account, and in what follows these are the reports referred to, except where a report on the Agricultural Account is specified.

It is the duty of the Statutory Committee to advise the Minister of Labour on the unemployment *insurance* scheme. The separate scheme of unemployment *assistance* allowances, provided by the State, subject to a means test, mainly for those unemployed whose rights to insurance benefit have become exhausted, is not within the province of the Committee.

The Committee entered on their task under the provisions of the Unemployment Act, 1934. By that Act some increases were made in the benefits, and the debt which had been mainly incurred during the severe depression of 1930-33 was funded at the figure at which it stood on 30 June 1934, namely £105,780,000, to be repaid out of the Unemployment Fund by halfyearly payments of £2,500,000 each, covering principal and interest, with a final payment in 1971.

For three and a half years after the appointment of the Committee, employment in this country passed through a comparatively favourable phase, and the income of the Unemployment Fund exceeded its outgo

(including the service of the funded debt) to such an extent that it was possible not only to build up a reserve for future emergencies but also from time to time to declare substantial disposable surpluses. The Committee's recommendations as to how these surpluses should be used have, almost in their entirety, been supported by the Minister of Labour and approved by Parliament.

Under their second report, the benefit for each dependent child was increased from 2s. to 3s. a week; under their third report, the contributions of each party (insured, employers and State) were reduced by 1d. per week; under their fourth report, the waiting time in respect of which no benefit is paid was reduced from six to three days, and the number of "additional days" in respect of which benefit can be drawn in a year was increased; and under their fifth report, the number of "additional days" was further increased, and the benefit for an adult dependant was increased from 9s. to 10s. a week.

As would be anticipated from the monthly returns published by the Ministry of Labour during 1938, this series of reports with disposable surpluses has for the time being come to an end, and, while it is satisfactory that in their report as at 31 December 1938 the Committee are able to state that the prospective liabilities and resources of the Fund may be regarded as substantially balancing, there is on this occasion no disposable surplus.

The Committee are required by statute to give public notice of their intention to make a report and to consider any representations thereupon made to them by interested persons. In their first report the Committee said that they attached the greatest possible importance to this requirement, that they desired to honour it in the spirit as well as in the letter, and that they believed that this meant giving to those interested in the insurance scheme, whether as contributors or beneficiaries, not merely the formal right of making representations, but full information as to the working of the scheme. In pursuance of these aims, representatives of the insured and their employers have been given full opportunities of submitting their views to the Committee, and in their series of reports the Committee have set out fully and frankly both the facts and the considerations which they have had before them.

Actuaries are likely to be especially interested in the information published by the Committee as to the basis of the reserve which they consider it advisable to keep for future emergencies.

There is no specific mention of any such reserve in the Acts of 1934 and 1935. Under those Acts, the principal statutory duty of the Committee is to report to the Minister of Labour on the financial condition of the Fund as at each 31 December, and at such other times as they think fit, and if in the opinion of the Committee the Fund is, or is likely to become, and is likely to continue to be, insufficient to discharge its liabilities, or is, and is likely to continue to be, more than reasonably

sufficient to discharge its liabilities, to make recommendations for the revision of the contributions or the benefits or both. With commendable caution the Committee have insisted, from their first report onwards, that "the accumulation in advance of a balance sufficient to cover the losses of a normal trade depression is the first condition of saying that the Unemployment Fund is, and is likely to continue to be, sufficient to discharge its liabilities".

To decide what the amount of such a reserve should be involves some forecast of future unemployment. The Committee recognize that this is a matter of extreme difficulty. They have not hesitated to change their basis when a more suitable one has become available.

In their first two *General Reports* the standard provisionally adopted by the Committee was a reserve equal to one-half of the estimated amount which the Fund would lose if it had to face a depression equal to the greatest yet known, that of 1930-33. The reserve was put at only one-half of that estimated loss, because the Committee considered it extremely unlikely that the next depression would be as severe as that of 1930-33.

In preparing their third and subsequent reports, the Committee have had the benefit of the advice of the Committee on Economic Information as to the average rate of unemployment which it would be reasonable to assume over the period of the next trade cycle. As is well known, the Chairman of the Statutory Committee on Unemployment Insurance, Sir William Beveridge, has made a special study of the phenomenon known as the trade cycle, and in an address to the Economics Section of the British Association in 1938 he maintained that the trade cycle appeared to be deeply rooted in our economic institutions (see report in *The Times* of 23 August 1938 and also a paper by Sir William Beveridge on "Unemployment in the Trade Cycle" in *The Economic Journal* for March 1939).

In 1935 the average rate of unemployment in Great Britain was 15.3% of the number insured, and the rate was falling. In December 1935 the Committee on Economic Information considered that the most reasonable working hypothesis would be the assumption of an average rate of unemployment of from 16.25 to 16.75% over the period of the next complete trade cycle. The Statutory Committee on Unemployment Insurance decided to work on an assumed average rate of 16.75% over the 8 years 1936-43. They translated this into a varying annual rate, with a minimum of 14.5% in 1936, and then increasing.

This basis has been maintained in the last four reports.

The rates of unemployment actually experienced during the last three years have been well below this forecast, but the position in 1938 was greatly affected by a very marked rise in a factor which had been steady during the three preceding years, namely, the proportion of unemployment ranking for insurance benefit.

The following table shows the expected and actual yearly averages:

Year	Rate of unemployment (% of number insured)		Proportion of unemployment ranking for insurance benefit (%)	
	Expected	Actual	Expected	Actual
1935	—	15·3	—	47·2
1936	14·5	12·9	46·0	46·2
1937	15·0	10·7	46·5	48·4
1938	15·5	12·6	47·0	59·2

The "expected" figures in the above table were prepared by the Committee at the beginning of 1936, and do not allow for the extensions in the period of benefit which were made on the recommendation of the Committee out of disposable surpluses as at 31 December 1936 and 1937. The "actual" figures allow for these extensions.

The Committee do not say to what extent in their opinion the increase in the proportion ranking for benefit is due to these extensions, but in their reports recommending the extensions they gave estimates of their cost, and judging from those estimates it seems unlikely that the extensions would have increased the proportion of unemployment ranking for benefit by more than one-quarter of the increase which actually took place between 1936 and 1938.

Most of the increase must, it seems, be due to another cause, the existence of which has been indicated by the Committee from their first report onwards, though they do not appear to have anticipated that its effect in 1938 would be as great as it proved to be. As the Committee have explained, when a period of industrial activity is followed by a depression and the rate of unemployment rises, the additional unemployed are mainly people qualified for insurance benefit, so that the proportion of the total unemployment that ranks for benefit also rises. At some later stage the proportion will tend to fall, for even if the depression continues men will gradually exhaust their insurance rights and pass from insurance benefit to assistance allowances.

It must be recognized that at present the Committee have very little statistical material on which to base their forecasts, and the above table shows that, even with the help of the best expert opinion available, there may be serious divergencies between the expected and actual figures, as witness the great difference in favour of the Fund between the expected and actual rates of unemployment in 1937, and the great difference against the Fund between the expected and actual proportion of unemployment ranking for insurance benefit in 1938.

The figures emphasize the need for a substantial reserve, but at the same time indicate that any meticulous attempt at forecasting would be out of place.

This appears to be the feeling of the Committee, for their *General Report* as at 31 December 1938 is laconic compared with its predecessors. While it recommends holding a reserve on the same basis as before, it offers no forecast for any individual future year, but simply states that in the opinion of the Committee "the prospective liabilities and resources of the Unemployment Fund in respect of its General Account may be regarded as substantially balancing".

The income of the General Account for the year 1938 was about £65,000,000 and the outgo £62,000,000. The resources of the Fund, on General Account, apart from its future income, amounted at 31 December 1938 to about £40,000,000 in short-term British Government securities, together with the right to re-borrow the greater part of £23,000,000 on a long-term basis if required in the near future. The latter sum consists of £20,000,000 recently applied in repayment of debt in excess of the compulsory debt charge, and a further £3,000,000 which the Committee recommend should be so applied, both subject to the rights as to re-borrowing which were given, on the Committee's recommendation, under the Unemployment Insurance Act, 1938.

Of the total of £63,000,000 which has been accumulated out of the excess of income over expenditure since the Committee was appointed in 1934, about £40,000,000 represents the reserve for the less favourable years of the current trade cycle on the basis of the Committee's forecast, and the balance represents realized surpluses intended to support for eight years the increased benefits recommended by the Committee.

The Committee's forecast, made early in 1936, assumed an average rate of unemployment of 16.75% over the eight years 1936-43, with an average of 48% ranking for insurance benefit. Perhaps in the light of the further experience since 1935 they would now regard their reserve as corresponding to a rather lower average rate of unemployment with a higher proportion ranking for benefit, but the amount of the reserve appears reasonable.

As regards the scheme of unemployment insurance for the agricultural industry, this was brought into operation, in pursuance of a special report made by the Statutory Committee (Cmd. 4786 of 1935), by the Unemployment Insurance (Agriculture) Act, 1936. The rates of contribution and benefit were lower than those under the general scheme, and it was arranged that a separate account should be kept.

Both the rate of unemployment and the proportion ranking for insurance benefit have been much lower than under the general scheme, and the second and third *Agricultural Reports* have each recommended reductions in the rates of contribution and increases in the benefits.

Unemployment in agriculture is highly seasonal, so that large fluctuations in the rate of unemployment occur at short intervals. The concurrence of an increase in the proportion of unemployment ranking for insurance benefit with a rise in the rate of unemployment, mentioned

above in connexion with the general scheme, is very marked in the agricultural scheme, as shown in the following figures:

Month	Rate of unemployment in agriculture (% of number insured)	Proportion of unemployment ranking for benefit (%)
January 1937	5·6	62·9
July 1937	2·5	26·6
January 1938	8·1	63·1
July 1938	3·9	38·8
December 1938	8·0	61·1

On the average, the proportion of unemployment ranking for benefit under the agricultural scheme is low, and the Committee express the hope that before their next report is due it will have been possible by means of enquiries made through the Ministry of Labour, or otherwise, to throw light on this problem. They consider that the covering of a larger proportion of the total unemployment than at present should be regarded as one of the essential purposes of the agricultural insurance scheme. In this way they strike the same note in their latest report as in their first: that they are concerned not only with the solvency of the Fund but also with the maintenance of the social service of unemployment insurance.

The Committee's reports include particulars of several investigations which have a bearing on their task. In particular, reference may be made to the discussions in the *Fifth General Report* and the *Third Agricultural Report* as to how rates of wages compare with the rates of benefit. The discussion in the *Fifth General Report* is based on an investigation by sample made by the Ministry of Labour in respect of the persons applying for benefit on 30 August 1937. The investigation showed that there is an unsatisfactory relation between rates of benefit and wages, in so far as appreciable numbers of men and women were shown to be better off unemployed than employed, especially men with large family responsibilities. On this account it was not without hesitation and not unanimously that the Committee on this occasion decided to use part of the disposable surplus to increase the incomes of some of the unemployed.

In the general scheme there is no maximum limit of weekly benefit, but in the agricultural scheme there was originally a maximum limit of 30s. a week. The increases in benefits recommended in the *Third Agricultural Report* include an increase of 1s. a week for an adult man and 2s. a week for an adult dependant, making a total increase of 3s. a week for each adult married man. If the maximum limit had remained unaltered at 30s. a week its operation would have been much extended;

to avoid this, the Committee recommended that the limit should also be increased by 3s. a week to 33s.; but they give the results of an enquiry by the Ministry of Labour into rates of wages in agriculture, and they point out that in many counties the increased limit is very high in relation to current wages.

There is undoubtedly a conflict between the lowest current rates of wages, both in agriculture and in industry generally, and the current rates of benefit, especially in the case of men with large family responsibilities—in such cases the lowest rates of wages appear to be still very low in relation to any tolerable standard of human needs.

The Committee deserve the gratitude of the community both for their far-reaching conception of their task and for the great pains they are evidently taking to carry it out. In a few years they have built up a most valuable tradition of an impartial body outside the political arena determined to administer the unemployment insurance scheme in the best interests of all concerned, and their efforts constitute by far the best attempt which has yet been made to discover how far a scheme of unemployment insurance is practicable in this country in present conditions.

H. B.

Report of the Unemployment Assistance Board for 1938.

[Pp. 198. 1939. 3s. H.M. Stationery Office.]

EVERYONE who wishes to understand the provision being made for the maintenance of the unemployed in this country should read the reports of the Unemployment Assistance Board as well as those of the Unemployment Insurance Statutory Committee. As the unemployment assistance allowances are provided wholly by the State, no question of maintaining the solvency of a Fund arises in respect of them. They involve problems of quite a different character, for, whereas insurance benefits are definite in amount, the assistance allowances vary according to the needs and means of the individual applicants, and, although they are now based on a standard set out in Regulations approved by Parliament, the Board's officers still have certain discretionary powers which they exercise in the light of the general views of the Board, with the help of many Advisory Committees throughout the country.

The Board and their officers, and the local Advisory Committees, are concerned not only with the maintenance of their applicants, but with their welfare generally and especially with their employability.

Knowledge of the nature and magnitude of the problems involved is obtained by a number of statistical surveys (the results of which for 1938 are included in the Report), supplemented by many interviews with applicants by the Board's officers and members of the Advisory Committees.

In 1938 the Board have been specially concerned with the duration of unemployment. Their applicants belong to that section of the unemployed whose lack of work has been most severe, either on account of a prolonged spell of unemployment or a large amount of intermittent unemployment.

The familiar monthly return published by the Ministry of Labour in respect of the whole of the unemployed provides an analysis on the basis of the length of the current spell of unemployment. This is useful for some purposes, but it cannot be taken as indicating the extent of an applicant's unemployment in recent years, for a single recent spell of employment of four days or more might move an applicant from the longer spells shown in the Table to the shortest.

A special investigation by sample has therefore been made of the applicants for unemployment assistance allowances, to ascertain the number in each age-group who have been unemployed for various periods during the last three years. The following summary of the results of the two investigations indicates how necessary it was to make the second investigation, if a proper statistical statement of the extent of recent unemployment among the applicants was to be obtained.

*Number of applicants for unemployment assistance allowances
analysed according to duration of employment*

(1) Length of spell of unemployment current on 14 Nov. 1938 in respect of applicants for whom allowances had been authorized					
Less than 3 months	3 months but less than 6 months	6 months but less than 12 months	12 months or more	Total	
156,133	55,201	88,714	248,280	548,328	
(2) Total employment during the three years ending Oct. 1938 (covering about 92 % of applicants, complete records being unobtainable in the remaining cases)					
2 years or more	1 year but less than 2 years	6 months but less than 1 year	Under 6 months	None	Total
19,140	62,060	76,310	187,270	173,990	518,770

During 1938 the Board have given special consideration to the case of the younger men among the applicants. There are about 100,000 aged 30 or under, of whom about 50,000 have had either no employment at all during the last three years or less than six months' employment during that period. The total number of men aged 30 or under who follow insurable occupations is about 4,700,000, so that the proportion among the Board's applicants is small, but the problem is unquestionably one requiring serious attention and effort.

It is cheering to read that many of the applicants have kept themselves fit and have remained alert and undiscouraged, but the Board report that there is a residuum (which they indicate may be as much as from 25% to 30% of these applicants) "who have settled down to a life on allowances and are in need of the discipline of work and a normal and ordered life if they are to be shaken out of their apathy". The Board recommend that serious consideration should be given to the question of making allowances in such cases conditional on the acceptance of some form of training.

Beyond this there is the urgent necessity to provide opportunities of work for those who have kept themselves fit, as well as for those who are brought back into working condition by a course of training. After prolonged unemployment it is difficult for anyone to obtain and keep employment. The Board feel that exceptional steps should be taken to give these young men a fresh start. They point out that a great volume of work is now being done wholly or mainly at the Government's expense, and recommend that special steps should be taken to ensure that a proportion of the men with whose welfare the Board are concerned should be given an opportunity of employment that otherwise might never come to them.

The present large number of applicants for allowances is a legacy from past industrial depressions. It should be a persistent national aim to reduce it to the lowest possible limit by return to normal employment. From 1935 to 1937, while employment as a whole was increasing, substantial reductions were made; in 1938 the number has remained almost stationary. It should, however, be remembered that in the autumn of 1937 there was a substantial increase in the rate of unemployment, lasting until the spring of 1939, and without being complacent we may recognize some ground for hope of future improvement in the fact that the number of applicants for allowances was, on the whole, so little affected by that increase.

The following figures have been extracted from the Gazette published monthly by the Ministry of Labour.

Date	Total No. of Insured Unemployed*	No. of claims admitted for Insurance Benefit	No. of applications authorized for Assistance Allowances†
13 Sept. 1937	1,288,878	592,038	546,201
13 Dec. 1937	1,630,944	896,019	555,927
14 March 1938	1,711,518	994,659	549,315
13 June 1938	1,773,124	1,073,755	530,763
12 Sept. 1938	1,756,231	1,042,115	531,677
12 Dec. 1938	1,801,277	1,076,387	553,596
13 March 1939	1,698,922	976,692	552,779

* Ages 16-64, excluding special schemes.

† Excluding allowances in supplementation of insurance benefit.

H. B.

Report of the Departmental Committee on Compensation for Card-Room Workers.

[Pp. 32. 1939. 6d. H.M. Stationery Office.]

THIS is a notable example of collaboration between Friendly Society officials, physicians and an actuary in search of an equitable solution of a dispute in the cotton industry.

The operatives and their employers had agreed that up to 1920 there had been an excess of dust in the card-rooms, and that this had resulted in an excess of respiratory disease among the workers. About 1920 the conditions as to dust in the card-rooms were much improved, but there was disagreement as to whether this had removed the liability to an excess of respiratory disease.

The question was considered by a previous Departmental Committee which reported in 1932. That Committee came to the conclusion that the sickness statistics then available did not afford any evidence that modern conditions were producing any abnormal amount of respiratory disease, but the statistical survey made for that Committee had been criticized on the ground that the comparison which it made was not with the general population living in the same locality but only with a control group selected from within the cotton industry.

A new investigation was made for the present Committee by Mr P. N. Harvey, the Deputy Government Actuary (who was himself one of the members of the Committee), with the assistance of the Ministry of Health and the officials of certain Approved Societies.

This investigation compared the sickness experience during the years 1935 and 1936 of male members of the Approved Society known as The Amalgamated Association of Card, Blowing and Ring Room Operatives (A.S. 1265) with that during the same period of men included in two control groups. Control "A" was of a geographical character, and consisted of random samples taken from the Lancashire membership of the Prudential Approved Society and the National Amalgamated Approved Society. Control "B" was of an industrial character, and consisted of similar samples taken from two Approved Societies recruiting their members from the spinning and weaving sections of the cotton industry.

The report includes a memorandum by Mr Harvey giving details of this investigation.

It showed that, while there were certain dissimilarities between the sickness experience of the two controls, the broad characteristics of the A.S. 1265 experience were the same, whichever control was used for comparison; and that the experience of those members of A.S. 1265 who were not employed in the card-room, or in the cotton and blowing rooms, was not very different from that of the controls.

As regards card-room workers, at ages under 30 they experienced less sickness, both respiratory and from other causes, than the controls; at ages 30-44 there was a substantial respiratory excess which was more than offset by a very light experience of other sickness; while at ages 45 and over there was a very heavy respiratory excess which resulted in a high total rate of sickness from all causes.

As regards workers in the cotton and blowing rooms, whereas the tendency has always hitherto been to regard the card-room as the worst area of the cotton mill so far as dust and its effects upon the health of the workers are concerned, the investigation showed that the respiratory experience among workers in the cotton and blowing rooms was similar, at ages 45 and over, to the card-room experience, and, at younger ages, was heavier than the card-room experience or either control. The number of workers in the cotton and blowing rooms was much smaller than in the card-room.

The high rate of respiratory sickness among card-room workers at ages 45 and over appears to be associated with the fact that most of the workers in question had been employed in the card-room for some years prior to the introduction of measures for reducing the dust. Those measures appear to have reduced the liability to excess respiratory sickness, but not to have removed it entirely.

The high rate of respiratory sickness among workers in the cotton and blowing rooms appears to indicate the need for improvements in their working conditions, corresponding to the improvements which have been made in the card-room.

The Committee came to the conclusion that, in addition to the problem presented by those workers who have already become permanently incapacitated by respiratory disease, there is a continuing problem, although one of a magnitude which is diminishing.

Their next step was to take evidence from medical men familiar with the conditions of health and employment of workers engaged in the dusty processes of the cotton industry, and from experts appointed by the Royal College of Physicians, as to whether cases of respiratory disease occurring among such workers are capable of recognition as being due to the conditions of their employment, and they came to the conclusion that a properly constituted Medical Board would, *in the case of an applicant of about 20 years' employment history*, be able, after considering all the evidence, clinical and historical, to decide not only whether the applicant was incapacitated by respiratory disease but also whether that disease was occupational in origin.

The term "byssinosis" is already in use among medical men to denote respiratory disease among cotton workers due to exposure to dust.

The Committee recommend that byssinosis should be recognized as an industrial disease to be dealt with under the Workmen's Compensa-

tion Act in a manner analogous to silicosis. They recommend that male workers who

- (a) have been employed in the cotton, blowing, and/or card-room for not less than 20 years,
- (b) at the time of application are engaged in that employment or have left it not more than 12 months previously, and
- (c) claim to be suffering from byssinosis and to be totally incapacitated thereby,

should be entitled to have their history and condition reviewed by a Medical Board, to be specially appointed for the purpose, whose duty would be to certify whether they were or were not satisfied that the applicant was suffering from byssinosis and was totally incapacitated; and that a workman should, on obtaining an affirmative certificate, be entitled to claim compensation as if the disease were a personal injury by accident arising out of and in the course of his employment.

There remain the cases of men employed in the past who have left the industry, disabled by occupational respiratory disease. The Committee recommend that these cases also should be reviewed by the special Medical Board, provided the applicant was employed for not less than 20 years in one or other of the specified rooms, and that if the Medical Board are satisfied that the applicant is suffering from byssinosis and is totally incapacitated he should be granted an allowance, the cost of the allowances in these cases to be raised by means of a levy on all employers employing workmen in the processes concerned.

H. B.

Tables of Addition and Subtraction Logarithms with Six Decimals. By Dr B. COHN.

[Pp. viii + 63. Scientific Computing Service Ltd., London.]

THE existence of addition and subtraction logarithms is apparently not very widely known even among some of those who perform a considerable amount of computing and who should, therefore, from time to time have to make the calculations for which these tables are designed. The object of addition and subtraction logarithms is to obtain the logarithm of the sum or difference of two numbers directly from the logarithms of those numbers. The addition logarithm is, for example, the quantity to be added to the logarithm of the larger of the two numbers to obtain the logarithm of their sum, the argument being the difference between the logarithms of the two numbers. It will thus be seen that the function is a kind of Gaussian logarithm, namely: $\log(1 + 1/x)$ with the argument $\log x$. The subtraction logarithm is the quantity to be subtracted from the logarithm of the larger of the two numbers to obtain the logarithm of their difference, the argument being again the difference between the logarithms. In this case the function tabulated against $\log x$ is $\text{colog}(1 - 1/x)$.

The use of addition and subtraction logarithm tables thus entails a subtraction, an entry in the tables and an addition (or subtraction) instead of two entries in an anti-logarithm table, an addition (or subtraction) and an entry in a logarithm table, and while the saving might appear slight the advantages would be apparent if a large amount of work involving these operations had to be performed.

Dr Cohn's tables are very well arranged and the present edition has been excellently reproduced by a photographic process. W. A. F.

Tables for calculating, by Machine, Logarithms to 13 places of Decimals.
By FRÉDÉRIC DEPREZ.

[Pp. xvi + 166. Scientific Computing Service Limited, 1939. Price 26s.]

THIS book has the merit of compactness, and with the aid of a calculating machine may be used instead of more extensive logarithm tables. The operations of multiplication and division take the place of the process of interpolation usually required with other logarithm tables.

The four main tables are tables of anti-logarithms. The first table gives to 14 figures the numbers the mantissae of whose logarithms consist of 4 figures (·0001, ·0002, . . . up to ·9999); the next three tables give to 14 figures the numbers where the mantissae consist of 3 figures preceded by 4, 7 and 10 0's respectively. To find the number corresponding to a given logarithm, it is necessary to split the logarithm into the sum of four separate logarithms, to determine the four anti-logarithms from the tables, and to multiply them together; three multiplications being required. The converse process of finding the logarithm of a given number involves three divisions and two multiplications. Best use can be made of the tables only if a calculating machine is available which will give the products of 14-figure factors in a single operation. Failing this, it is shown in the Introduction how the factors may be broken up, the product being put in the form $(a+b)(c+d)$.

Two further tables give logarithms of $(1+i)$ to 16 places for values of $(1+i)$ from 1·0005 to 1·1000 at intervals of ·0005, and also values of $(1+i)$ to 13 places corresponding to values of the logarithm from ·00001 to ·03350 at intervals of ·00001. These tables are for use in connexion with calculations involving compound interest.

Commentaries on the Insurance Act (Act No. IV of 1938). By TARADAS DUTT, M.A., B.L., Advocate, High Court, Calcutta.

[Pp. xx + 203. S. C. Sarkar and Sons Ltd., College Square, Calcutta, 1938.]

THE author of this book has previously written on the problems arising in the transaction of life assurance in India. His book, *Law and Practice of Life Assurance and Provident Insurance in India*, published in 1933, was reviewed in *J.I.A.* Vol. LXV, p. 112.

In a prefatory note to his latest book the author states that his object has been to explain Insurance Law in India as changed by the new Insurance Act when this comes into operation. The Act is printed in full, and explanatory notes in different type accompany each section which the author thinks requires comment or explanation. The general arrangement is admirably clear and such as to facilitate reference.

The more purely legal sections of the Act are particularly well treated, and his notes on Sections 38 and 39 dealing with assignments and nominations of life policies are valuable. Especially interesting are his opinions on some points on which various views have been expressed. The author makes the comment that the production of the actual deed of assignment, provided it contains the information required to be given in a notice according to Indian law, would be valid notice to the Company, but another authority in India has expressed a contrary view. Support for the latter view is given by the provision of the Amending Act which makes it necessary to deliver to the insurer a notice in writing of an assignment together with the relative deed or a certified copy thereof. This provision of the Amending Act also clears up the doubt under the original Act, discussed by the author, as to whether a Company has the right to call for production of the original deed of which notice is received.

The author draws attention to the wording of subsection (3) of Section 38 and states that "notice is made to regulate the priority not only as regards recognition by the Company but also 'as between persons interested in the policy'"; and proceeds to point out the difference from the wording of the British Act of 1867. He does not discuss in this connexion the effect of subsection (2) "the transfer or assignment shall be complete and effectual upon the execution of such endorsement or instrument duly attested but shall not be operative as against an insurer . . . until a notice in writing of the transfer or assignment has been delivered . . ."; nor of the wording of subsection (5).

As regards nominations the author takes the view that the wording of subsection (1) of Section 39 gives the assignee of a life policy the right to nominate. Other opinion has been expressed to the contrary; but the doubt has been settled by the inclusion in the Amending Act of a provision restricting the right to the life assured.

Insurers whose country of origin is outside India are of course affected by Section 62 and Section 3 subsection (3) dealing with discrimination. It would have been useful to have had the author's comments on these sections; but he gives no assistance on the difficult questions arising thereon.

Those concerned in the practical questions arising in the application of the Act to insurers in India will be disappointed to find no notes or comments on the very important schedules to the Act. These raise a great number of points of complexity in their practical application. The

author no doubt regarded discussion of these as outside the scope of the book but some critical comment on their interpretation would have very greatly increased its value to those compelled to prepare and furnish returns in accordance with the Act.

Everyone affected by the application of the 1938 Act will welcome this well-produced book as an informative survey of the Act from the legal point of view and a most valuable work of reference. It is hoped that the author will place us further in his debt by preparing a new edition incorporating the changes made by the Amending Act.

R. W. S.

Statistical Testing of Business-Cycle Theories. I. A Method and its Application to Investment Activity. By J. TINBERGEN.

[Pp. 164. League of Nations Economic Intelligence Service. Allen and Unwin. 1939. Price 3s. 6d.]

THIS is the first of a series of studies which have as object the statistical analysis of various aetiological theories concerning trade cycles. It provides the explanation of the statistical methods to be employed in the subsequent volumes of the series.

The "econometric business cycle research" is here effected by means of multiple correlation analysis which is rather inadequately summarized in the first chapter and the appendix. Chapters III, IV and V, respectively, detail the application of this method to investment activity (represented by iron and steel consumption), dwelling-house construction by private firms, and net investment in railway rolling-stock. About forty pre-war years are considered in respect of the United Kingdom, the U.S.A., Germany and France, and the post-war years are added for the two former countries. Investment activity, for example, is "explained" by means of multiple regression equations involving various combinations of (1) profits earned, (2) price of capital goods, (3) interest rates, (4) profit margins, (5) production of consumer's goods, and (6) rate of increase in general price level. Only the first of these turns out to be of supreme importance although a number are statistically significant. As a result of the analysis in Chapter IV it is suggested that the causes of the building boom in this country after 1933 were the fall in interest rates and building costs, and the rise in real income.

As an alternative to testing the regression coefficients for significance in the usual manner, in some cases sub-periods are taken and the calculations are repeated to determine if the corresponding coefficients are of the "same order of magnitude". This is said to save labour but suffers from the disadvantage that the judgment of significance is only removed a stage farther on, for we must decide what differences between the pairs of coefficients are significant. It would seem that R. A. Fisher's method of finding the multiple regression coefficients (see e.g. Rider, *Statistical Methods* (1939), pp. 38-41 and 95-96) with its subsequent

facilitation of the calculation of their standard errors, would not require so very much more work.

The book is primarily for economists although the statistical method employed may well find actuarial applications. The reasoning throughout is fairly clear but some of the arguments demand a relatively advanced knowledge of economic theory.

H. L. S.

Mathematical Theory of Graduation. By ROBERT HENDERSON.

[Pp. 126. Actuarial Studies No. 4, The Actuarial Society of America, New York.]

THIS book first appeared in 1919 under the title *Graduation of Mortality and Other Tables*, but has been revised and, in part, rewritten in view of subsequent developments. Such revision must always be a thankless task and it must be confessed that, as so often happens, the author seems to have concentrated on detail and avoided any major recasting of the earlier book. In this connexion it is interesting to note that the references to *J.I.A.* in the Bibliography go back to Vol. XIII, while the most recent is Vol. XLIX.

After dealing with the general principles of graduation the author describes in successive chapters the Graphic Method, Interpolation Methods, Difference-Equation Methods, Summation Formulae, and Graduation by Mathematical Formulae and finally compares the results brought out for an illustrative experience given in the first chapter, viz. the data for the $O^F(50)$ table, the female table corresponding to the O^M but excluding the first *fifty* years of assurance. As the biggest number of deaths at any age is only 26, graduation of this illustrative experience is a formidable task but after explaining each method the author applies it and the results brought out represent a remarkable achievement. Such an irregular series based on scanty data is suited to a graphic method, but some of the others, particularly a summation method, require great care and judgment. The results produced would satisfy all but the most exacting critic and the device by which the end values are obtained for the summation method is the author's own idea. A 27-term formula was used (Kenchington's).

A chapter of particular interest to British Actuaries is that dealing with Difference-Equation methods which do not appear to have been discussed here and were not included in the earlier edition of this book. They are described in Whittaker and Robinson's *Calculus of Observations* but have been developed in connexion with mortality statistics by the author who has read at least two papers on the subject. In its simplest form the method is briefly as follows: From the rough series (U''_x) a series of U'_x is formed, each U'_x being interpolated from U'_{x-2} , U'_{x-1} and U''_{x+a} the last value being taken from the rough series (a is a constant).

The graduated values U_x are then found, each U_x being interpolated from U_{x+2} , U_{x+1} and U'_{x-a} . The two initial values of U'_x and U_x are determined somewhat arbitrarily, but the method introduces only a fourth difference error which can be reduced to any desired extent by a suitable choice of the constant a . The results of the illustrative graduation showed smoothness surpassed only by the Makeham graduation as well as very close adherence to the data.

Another point which will intrigue readers in this country is the care taken over some features which we usually regard as relatively unimportant and the somewhat sketchy treatment or the complete exclusion of others which are of current interest to us. For instance, about half the text (as distinct from tables) on the Graphic Method is a quotation from Sprague's paper dealing with the detection of points of inflexion which were formerly regarded as inadmissible, while recent British experiences suggest that such a change of curvature is a definite feature between ages 20 and 30.

Again it has been the practice in this country in applying King's method to make the interpolation curves pass through the graduated quinquennial pivotal values, thus producing a certain amount of waviness while the author uses Jenkins' formula which produces greater smoothness but does not exactly reproduce the pivotal values.

In dealing with summation formulae no mention is made either of wave-cutting properties or of the very elegant practical devices described by G. J. Lidstone and D. C. Fraser in *J.I.A.* Vol. LXVII.

Generally speaking the author is happiest when dealing with the theoretical rather than the practical aspects of graduation (the change of title of the book is interesting in this connexion) and one of the best chapters is the one dealing with Frequency Distributions. In about twenty pages the author deals with grouped frequencies and Sheppard's adjustments (two very interesting proofs of which are given), the calculation of moments from successive summations, the theory and properties of the various Pearsonian frequency curves and numerical examples of how they can be fitted to statistical data. As in some other sections, this very condensed exposition is rather heavy reading and makes considerable demands on a student's mathematical equipment but no essential steps are omitted and every page repays very close study.

The author's fondness for theoretical aspects occasionally betrays him, however, into displaying a certain lack of perspective which is particularly noticeable in the section on Makeham graduations. It is usually felt that a reasonably good approximation to $\log c$ is sufficient and that the theoretically exact value does not necessarily produce the best graduation. The author, however, starts by assuming that $m_x = \mu_{x+\frac{1}{2}}$ (an unnecessary approximation which introduces a small systematic error), and explains briefly how the constants A and B can be found by the method of moments if c is known. He then gives three different

methods of finding c , two of which involve the fitting of a skew frequency curve and a binomial distribution respectively to the exposed to risk and the properties of Gamma functions are brought in! Again Wittstein's rather fanciful attempt to fit a single curve to q_x from birth to the extreme of life is described, but the very interesting curves given in Mr Perks' paper in *J.I.A.* Vol. LXIII are not mentioned although they seem to have considerable possibilities.

To sum up, it may be said that the book cannot be regarded as a complete text-book on graduation (no such claim is made for it in the title) but it is a very scholarly and interesting treatise on the mathematical theory.

H. T.

Probability, Statistics and Truth. By RICHARD VON MISES, Professor at the University of Istanbul.

[Pp. 323 + xvi. London: William Hodge and Company, 1939. Price 12s. 6d. net.]

A WORK on Probability by Professor Richard von Mises has already been reviewed in the *Journal* (Vol. LXIII, p. 522), and since no fresh developments in his views appear to be expressed in the present book, it may not seem to require anything more than a brief notice. The new work, however, merits rather more, partly because it is printed in English, having been very well translated, and partly because it eschews all but the most elementary mathematics. What the book loses therefore in precision it gains in ease of reading, placing at the disposal of those who cannot read German a comprehensive survey of the subject of probability from the author's standpoint that should prove useful as an introduction for those who wish to take the subject up as a post-graduate study. Professor von Mises is expert in his subject and makes numerous references to the works of other writers whose points of view he states clearly and concisely, whether he accepts and supports them or dissents from and criticises them. The references are conveniently collected at the end of the book, where they form a useful bibliography.

The greater part of the book is devoted to the exposition of ideas that are familiar to students of probability. There is, however, a chapter on Statistical Physics that is welcome because it gives an account of the probability basis of Modern Physics, including the Quantum Theory and Heisenberg's Principle of Indeterminism, that falls between the popular descriptions given in books meant for the public and the highly mathematical and technical original works of Dirac, Eddington, and others. The actuarial student who becomes sufficiently interested to pursue the subject in the original works of the physicists will find, we think, that there is much to learn on this side of the subject not without profitable use in his own vocation.

The chief claim of the book for consideration, however, lies in the fact that it is throughout wholeheartedly based on the "relative frequency" definition of probability. Professor von Mises' admitted prototype is Venn, but he claims to have built up a mathematical theory that Venn did not reach. He bases probability on (a) Observed relative frequencies, (b) Assumed limits to which these lead, and (c) Randomness as defined by him (arbitrary place selection). He seems to have no doubt that observed frequencies will tend to limits; it is not so clear how the limiting value is to be obtained in practice, and when he deals with mortality rates, where our own experience scarcely seems to support that belief, he passes over the whole subject of graduation as "certain corrections with which we do not need to be bothered". Moreover, when we read the following:

"Three black balls and three white balls are placed in an urn. We draw two balls consecutively without putting the first ball back before drawing the second one. The two balls are then placed back, and the whole procedure is repeated. The two collectives considered are: that composed of all the first draws, i.e. draws made from an urn containing six balls. If the distribution of probabilities is homogeneous, then the probability of a white ball in this collective is $\frac{1}{2}$, . . ." we cannot resist the feeling that the probability of $\frac{1}{2}$ was not found by drawing balls from the urn in question, or from similar urns, but is our old friend the ratio of the number of favourable ways to the total number of ways. At any rate, it is marvellously like it, and the "homogeneous probabilities" very like the "equally likely ways".

In fact, the collective, of whose relative frequency the probability is the mathematical limit, is an ideal series that is substituted for the observations, and necessarily so, since one can only calculate a limit from a mathematical function whose variable can be indefinitely increased or decreased at pleasure. Thus the collective is based on the probability, rather than the probability on the collective.

It seems that Professor von Mises' quarrel is not with the practice of those who employ probabilities but with the wording of the definition. Having somehow obtained a probability, we must set up an imaginary collective for which this probability holds, and we may then legitimately employ the theorems and formulae that have been produced by earlier mathematicians on the basis of the old erroneous definition. Since then the *a priori* definition produces a fraction (let us not call it a probability), that has been found in the case of simple repetitive chance events such as throwing dice, tossing pennies and drawing balls from urns, to be very close to the necessarily limited results of experiments in those pastimes, may we not still use that method to obtain the fraction which, after we have imagined our unlimited collective, becomes for that collective a probability; and is not the *a priori* definition then merely a case of justifiable prolepsis?

R. D. A.

Guide to Current Official Statistics.

[Pp. 404. 1939. 1s. H.M. Stationery Office.]

Vol. xvii of this well-known and useful guide has recently been published, providing a systematic survey of the statistics appearing in all official publications of the United Kingdom issued in 1938. H. B.