PROCEEDINGS
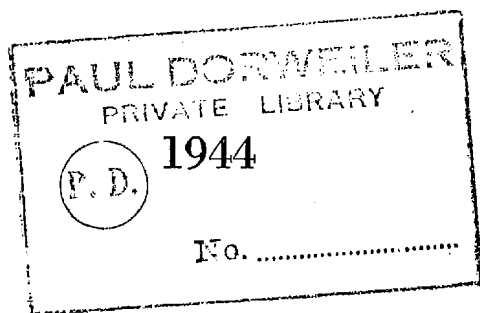
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NOTICE

"Come into the place, young man, that is of right your own; for you are destined to be an ornament to philosophy. Yours are these possessions; yours these books; yours these discourses."—*Epictetus*.

PROCEEDINGS

November 1, 1944

POSTWAR PLANNING FOR THE CASUALTY ACTUARY
PRESIDENTIAL COMMENTS BY HAROLD J. GINSBURGH

The year 1944 marks the 30th anniversary of our Society's founding. It had its beginning in a time which saw the onset of what came to be a world-wide conflict, terrible in its course and in its aftermath. The Society's 30th year falls in what we fervently hope is the later phase of a second gigantic war. These two wars are like boundaries between eras. The toll we have paid and are paying for passage is truly terrible. But already signs of the beginning of the end are multiplying; and having learned the lesson taught by the last quarter century, men are thinking and planning for what lies beyond this boundary set by war. In our own sphere, limited in scope but tied in with the larger world of political, social and economic organization, it may not be amiss to consider some of the conditions which exist and the problems which they pose, in order that we may plan for the orderly seeking of solutions to those problems.

More than ever before there is a political awareness of the business of casualty insurance. The U. S. Supreme Court decision arising out of the South Eastern Underwriters' Association case has overturned the theories and practices of three-quarters of a century, and by designating insurance as commerce has established federal control over it. Whatever Congress may do in legislation which withholds the federal power in favor of continuation and extension of the states' regulatory processes, any future Congress may undo. In any event, there is the practical certainty of a great increase in the area of rate regulation by the states. Much attention in this connection has been focused on the Sherman and Clayton Acts, but there is the likeli-hood that the Federal Trade Commission Act and the Robinson-Patman Act will also be part of our environment.

Another facet of the political force acting upon casualty insurance is perhaps more specifically directed against what may be called the social insurance phases of the casualty field. Proponents of state insurance for workmen's compensation are as active as ever, but the new element in the picture is the increasing political activity of those who advocate govern-mental administration of all forms of social insurance — non-occupational

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accident and sickness, hospitalization and medical, as well as workmen's compensation—as a part of an over-all plan of social security set up, guaranteed and administered by government.

The significance of these political developments for us in our sphere of activity is that, more than ever, what we do must stand the tests of public scrutiny and public acceptance as to reasonableness and factual background. And this is the situation at a time when we as the technicians and designers of casualty insurance ratemaking have to a large degree lost the use of our basic factual material, the detailed statistics of experience. Because of the limitations which the war placed on the labor and mechanical resources available to the insurance business, the recording and collecting of casualty insurance statistics suitable for ratemaking have had to be suspended in the majority of lines for several years past.

The problem thus created must be considered not only in the light of the political conditions mentioned, but also against the background of some of the social and economic conditions of our present environment engendered by the war. There have been large geographical shifts of population, the permanence of which is problematical. The age distribution of the population may be different from what it otherwise would have been. There will be an increase in the proportion of disabled persons, induced by the wounds of war and of war industry. How will changes in the density and character of the population of a given area affect the validity of prewar data bearing on many of the hazards which we seek to measure?

In industry the use of new materials and the development of new processes and new products have been greatly accelerated. Production has been accelerated in some directions, retarded in others. The ordinary channels of trade have been diverted, constricted, or dammed up. We have been and are in a war economy, with all the dislocations which such a situation implies and with all the difficulties to face of reconversion to a normal economic organization.

Taking into account these political, social and economic factors which bear upon the problem, casualty actuaries must be planning for their part of the task of taking the casualty business through the reconversion period in a manner which will maintain the strength of the carriers and retain the confidence and good will of the public. It will be their job to find the materials for and to build a sound factual base for classifications, rates and rating plans in lines in which the underwriting practices of the past have already been changed or obviously must be modified. Detailed statistics of prewar experience will have to be evaluated. The usefulness of such limited aggregate data as is currently available must be determined. The structure of statistical plans previously used must be scrutinized for applicability under conditions of both the immediate and more distant future. Steps must be taken

for the resumption of the keeping of detailed statistics at the earliest practicable time. Such resumption might itself be in a transitional form. Ratemaking techniques should be sought which might reduce the lag between the occurrence of experience and its use in rates. A time classification other than the traditional policy year or calendar year could well be looked into for establishing the incidence of loss in relation to exposure.

An outstanding example in specific form of the general problem which has been outlined is in the automobile liability field. The very substantial war emergency rate reductions which followed upon tire and gasoline rationing were more than justified by the ensuing experience. However, accident frequency apparently has again started to rise. While bodily injury rates are on the average still adequate, the rise in accident frequency, coupled with the difficulty and increased cost of repairs, has begun to create an unfavorable underwriting situation for property damage. Variation in the incidence of this trend between underwriting territories is difficult to determine in the absence of detailed data; but apart from its immediate practical effect the trend accentuates the problem to be encountered with the elimination of rationing, whether this be gradual or sudden.

Even a partial lifting of rationing restrictions is likely to have an immediate and appreciable effect on current experience. How shall rates be adjusted to meet the changed degree of hazard? What use can be made of the experience of the immediate prewar years? If the use of motor vehicles is unrestricted, this experience will probably be the best basis for action immediately available, but what of such factors as the decrease in number of vehicles, the deterioration of vehicles and roads, the changes in degree of traffic density due to shifts in population, the rise in the general price level, and many others? Whatever be the judgment and data employed in the establishment of new underwriting classifications and rates for automobile liability insurance when the change from the present basis must be made, justification to the underwriters and before the public for maintaining or modifying these classifications and rates must come as soon as reasonably possible from the facts of experience under them. It is therefore important that plans be made now for the earliest practicable resumption of statistical reporting in forms useful for rate-making—the practicability being determined largely by availability of personnel and equipment. Moreover, since the so-called "earned factor" method of employing uncompleted policy year experience seems hardly trustworthy for at least the early years of the postwar period, some thought should be given to other methods of making recent experience available for use with as little lag as possible. In this connection, the suggested accident year method for relating losses to exposures described by Mr. Joseph Linder in his paper in Volume XVII of the *Proceedings* merits consideration.

The miscellaneous liability coverages, other than automobile, constitute another field in which there is need to develop facts of experience under changed conditions and to employ these as a factual base for rates satisfactory to the underwriters and justifiable to the public. The development of comprehensive coverages and "package" policies has tended to break down the boundaries between the traditional lines of liability insurance, for which in the past experience statistics have been separately maintained and rates separately made. Thus it will be necessary not only to attempt to pick up where we left off with respect to the old separate lines of liability insurance, but also to determine to what extent prewar or other experience can be used and what type of recorded data will be required in the future for ratemaking under the concept of "comprehensive" or "package" liability coverage. Furthermore, as the boundaries between the areas covered by the separate parts of the existing liability rating structure tend to break down and disappear under the influence of the time, we must co-operate with the underwriters in seeking some common denominator or measure of exposure for the various types of hazards included in the broadened field of integrated coverage, to establish as a basis of premium in a soundly conceived ratemaking structure satisfactory to the public and to the carriers.

In citing two fields of casualty insurance to give specific examples of tasks to be faced in the near future, there is no intention to imply that these are the only types of problems to be solved by the casualty actuary in the immediate and subsequent postwar periods. It is not so much a question of what the business of casualty insurance might wish to do if left to itself, or the manner in which it might wish to do it. For, obviously, with more state regulatory laws and with the Federal authority newly in the picture, insurance prices and practices will be subject to governmental supervision and control to a much greater extent than before the war. Considering on the one hand such factors as the disruption of past orderly processes of accumulation of data, the tremendous changes in many conditions affecting hazard or premium which came with the war and the equally great changes which will come in the reconversion from war to peace, and considering on the other hand the necessity of meeting statutory standards in many areas where formerly freedom of action was the rule, the situation appears to be one that will call urgently for the application of the actuarial technique. In performing his function during the coming period of adjustment and readjustment the casualty actuary will not find his path an easy one; but the goal of a sound rate structure providing adequate income for the carriers and fair in the eyes of the public must and, we believe, will be reached.

POSSIBLE VALUES FOR RETROSPECTIVE RATING PLANS

BY

F. S. PERRYMAN

This paper is in a sense complementary to the paper "An Actuarial Analysis of Retrospective Rating," by Thomas O. Carlson, P.C.A.S., XXVIII, p. 283: it is less abstractly mathematical and gives arithmetical examples.

The notation is basically the same as that given in Carlson's paper: however, in this paper all dollar values (except P) will be in terms (ratios) of P, the standard premium, e.g.: if G, the maximum premium, is 125% of the standard premium P \$10,000, G in Carlson's notation means the maximum premium \$12,500 while in mine it means the maximum premium ratio 1.25. In both notations, however, P means \$10,000.

We shall find it convenient to use the following additional symbols:

(i) $Lo = L + Lp$, where L is any loss ratio, e.g.:

$$H'o = H' + H'p, G'o = G' + G'p$$

(ii) $'L = K$ where $K' = L$, e.g. if E is the expected loss ratio and $X = B + CE$ then $X' = E$ and we will write $'E = X$. Thus $'G = G, 'H = H$.

The symbols* required for this paper are listed below for convenience of reference:

P = standard premium

C = loss conversion factor

Γ = maximum value of C

B = basic premium ratio

H = minimum premium ratio

G = maximum premium ratio

H' = allowable loss ratio in the minimum premium

G' = allowable loss ratio in the maximum premium

R = final retrospective premium ratio (to P)

Rv = average retrospective premium ratio (to P)

E = expected loss ratio

$'E$ = final retrospective premium ratio (to P) if actual loss ratio is E

K, X are constants

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* See Note 1 of Appendix III, with particular reference to the meaning of the symbols B and C.

If L is any loss ratio (for a premium size P)

$Lx =$ ratio to total losses of losses in excess of L
    (for the premium size P)

$Lp =$ ratio to P of losses in excess of L
    (for the premium size P)

$\qquad = ELx$

$Lo = L + Lp$

The Retrospective Plans dealt with in this paper (as in Carlson's) will be linear, i.e. of the type in which the final premium R depends linearly on the loss ratio L actually experienced (subject, however, to a maximum G and a minimum H) i.e.

$$R = B + CL \text{ but } R \nless H \text{ and } \ngtr G$$

C will always be positive and $B \leqslant H \leqslant G$. L of course is also positive.

The average retrospective premium, Rv, or in other words the expected value of R, is easily seen to be

$$Rv = H + C\,(H'p - G'p)$$

for in every case the minimum H is payable and in addition C times the losses in excess of a loss ratio of H' and not in excess of a loss ratio of G' (see also Carlson's paper).

For the purpose of this paper, which is to study the possible variations in the retrospective rating values, the question is "Given Rv what are the possible retrospective rating values (i.e. C, B, H, G, etc.)?" and it doesn't matter at all how Rv has been determined so long as we know its value for any value of P. Thus in this paper we are not directly concerned with Rv except that it is assumed to be a definite function of P. However, we have in mind that Rv is determined in practice by giving effect to certain reductions in the expense loadings of the standard premium: these reductions are usually made in the acquisition, general administration and payroll audit items in such a way as to reduce these loadings as the premium size increases: this is generally termed an expense gradation by size of risk. Usually in retrospective plans a small portion of the reductions in loadings is kept back to provide for contingencies. Some further remarks on this subject will be found in Appendix III where the actual data of an example are given. For our present purpose, however, all we require to know is that

$$H + C\,(H'p - G'p) = Rv, \text{ a determinate function of } P$$

In the original construction and presentation of the (Compensation) Retrospective Plan the loss conversion factor C was computed as the ratio of losses loaded for claim expense and taxes to losses and used at that value, so that in the original plan there was "full" reimbursement (to the carrier)

of losses and related expenses. In these original plans, therefore, C was fixed (or practically so—actually the computed value was usually rounded to an even percentage and the difference carried to B). The introduction later of the concept of credibility or partial reimbursement or the idea of letting C be variable (for example a function of the size of risk) gave greater flexibility and a wider range of practical plans, and a broader view of the real structure of retrospective rating. To take one instance, the explanation of the modus operandi of the original retrospective rating plan was considerably complicated by the necessity of explaining the calculation of the loss conversion factor and then the rationale of the basic factor which "contained" the remaining expenses: (an additional, and from our point of view irrelevant, complexity arose out of the assumed need of balancing out, by including an extra item in the basic premium for the excess or deficiency caused by rounding the loss conversion factor to say the nearest whole percent). Under the newer concept, of C being allowed to vary, C can be any positive value subject to a practical limit discussed below, and all we are concerned with is that our rating values shall satisfy

$$H + C\ (H'p - G'p) = \text{the given value of } Rv$$

without having to decide which part of the premium comes from C (or rather $C - 1$) and which from B: thus actually if C is less than unity then from the older point of view some of the losses are provided for in B and only some by C, but from the newer point of view it is not necessary to go into that question.

A varying "credibility" C thus can be used as a key providing much more flexible formulas and easier construction of retrospective plans. Let us consider it for a minute or two. Theoretically or arithmetically it could take any positive value (I suppose it could even be negative) but for practical reasons its range must be restricted. If it were considerably in excess of unity, say three, the insured would pay a premium that would increase, within the limits of the minimum and maximum premium, three times as fast as the losses and he would save money by paying losses himself. Insureds would be entitled to and would take a very low premium when losses were light and would be charged a very high premium for heavy losses but would be able to, and tempted to, find ways of avoiding at least some part of the high charge. Such an "option against the carrier" is unsound and thus the value of C must be restricted so that the increase in premium for increase in losses is justifiable. Two limitations have been used (i) a limit of unity as in the premium return plan: this is of course quite safe and (ii) a limit of unity plus the loading for claim expenses and taxes, the reason being that these can quite reasonably be regarded as "belonging" to the losses: this is the usual basis of C and limits it to a value of about 1.20 in Compensation

insurance: such a value is reasonably "safe" but nevertheless there is still some temptation for an insured to pay some minor losses without reporting them and thereby save about 20% of them: it is obvious that the arguments, sometimes put forward, that in C (usually called the loss conversion factor) should be included also loadings for acquisition cost and other expense elements, will not hold water. The values of C in use at present are already high enough.

My personal view is that unity is the limit to be preferred but in view of the widespread plans with higher limits, we will deal with an upper limit, which we will call $\ulcorner$, equal approximately to unity increased by loadings for claim expenses and taxes.

This paper was originally drafted a year or two ago when interest was being manifested in the more flexible plans that a variable C renders possible. Unfortunately, from many points of view (including that set out above), the original retrospective plan with a fixed loss conversion factor proved to be so strongly entrenched that immediate practical interest in variable credibility plans has vanished: the new Compensation plans brought out last year retain the old concept of loss conversion factor. The only example of a varying credibility plan in general use is the Premium Return Plan in Utah.

Nevertheless in this, a professional, paper we will cover the whole field including the possibility of partial credibility, i.e., a C between 0 and $\ulcorner$.

The basic formulas are our fundamental equation

$$Rv = H + C\ (H'p - G'p)$$

and the relations

$$H = R + CH'$$
$$G = B + CG'$$

from these we readily obtain

$$Rv = B + C\ (H'o - G'p)$$
$$Rv = G + C\ (H'o - G'o)$$

These are our basic formulas which we find it convenient to write in the form

$$H = B + CH' \tag{1}$$
$$G = B + CG' \tag{2}$$
$$B = Rv - C\ (H'o - G'p) \tag{3}$$
$$H = Rv - C\ (H'p - G'p) \tag{4}$$
$$G = Rv + C\ (G'o - H'o) \tag{5}$$

Note that in the last three the terms in brackets are all essentially positive: for as $H' < G'$, then $H'o \geqslant H'p > G'p$ and $G'o > H'o$. Note also that (as it should be) $B \leqslant H \leqslant Rv \leqslant G$.

Of these five equations only three are independent; e.g., from the first three the last two can be derived.

We have thus six variables, C, B, H, G, H' and G' for each value of P and three independent relations, and we wish to investigate the interrelationship of these six variables, e.g., possible sets of consistent values and possible and practical plans that can be made from such possible values.

Note that when we state we have six variables we assume (i) that the values of Rv have been set for every value of P, i.e., Rv is a known function of P: (ii) that a table of excess pure premium rates has been settled on, so that $H'p$, $H'o$ are "known functions" of H' (and $G'p$, $G'o$ of G') or in other words that for every value of P we can determine $H'p$ (or $H'o$) for every H' and vice versa, and the same for the functions of G'.

We could proceed by constructing a series of exhibits or tables showing for each of a series of selected values of P the various possible typical combinations of the variables. This would produce a very voluminous and unwieldy set of exhibits where we could not "see the wood for the trees," unless we are careful to go about the job very systematically. I learned this by experience. At one time I had such a set of tables constructed and found them very difficult to analyze. So I set about devising methods of selection and classification.

However, let us suppose for the moment that we have a complete list of the possible combinations of the values of the quantities P, C, B, H, G, H' and G'. We know that for any fixed value of P only three of the remaining six quantities are independent, there being three independent relations connecting them.

If we assume another relation between the quantities B, H, G, H', G' we would have left only two independent variables for each value of P and could chart on a two dimensional graph or diagram the remaining possibilities for that value of P. For the additional relation to be assumed we could take any equation involving C, B, H, G, H' and G': the simplest type of such equation would be to put the value of one of the quantities equal to a constant. Then we could put $G = 1$ say and make a series of charts for a selected set of values of P: then if we wanted we could do the same for $G = 1.2$, $G = 1.4$, etc.

In this way as we shall see we can get considerable insight into the range of possibilities of retrospective plans. By making different assumptions, e.g., first $G = 1$, $G = 1.2$, etc., and then say $H = .25$, $H = .5$, and so on, we can study successively what we will call different "aspects" of possible plans and see what sort of results follow.

Let us suppose then we first take the "aspect" $G = 1$ (perhaps intending later to make charts for other values of G or because we are, or think we will be, interested only in plans with $G = 1$).

Now, for a given value of P, we are left with C, B, H, H' and G' and three independent relationships of these and can graph the possibilities in terms of any two of these quantities. Suppose we decide to use G' and H' (which choice has the advantage of showing the effective range in terms of loss experience) then each separate pair of values for G' and H' gives definite values for C, B and H. We can therefore make a graph where the x y coordinates are G' and H' and show on it the loci of C for different values (say .5, 1 and $\sqcap$) and the loci of H for say .25, .5, etc., and the loci of B for say 0, .25, etc.

Before proceeding it is necessary to remember that while we can in general use any two of our "variables" C, B, H, G, H' and G' as our independent variables for our charts, we can use any particular pair only if the additional relationship assumed does not (i) fix one of the pair—for example obviously if we assume $G = 1$ we cannot use G as a coordinate of the graphs, or (ii) give us a definite equation connecting the pair, e.g., if the relationship were $H + G = $ constant we could not use H and G (but we could use say H and B). In other words each of the two coordinates must be a variable and the two must be mutually independent. Usually it will be quite clear which quantities cannot be used as coordinates but occasionally the "aspect" being examined will involve an implied equation between two of the quantities: thus if $H' = 0$, it is obvious that H' cannot be used; but in addition the $H' = 0$ leads to $H = B$: again, if L is a given loss ratio the "aspect" $'L = $ constant leads to $B + LC = $ constant and therefore the pair B and C cannot be used in this instance.

Of the quantities C, B, H, G, H' and G' the pairs G and H, G' and H', and B and C seem to be logical combinations. I will usually choose G' and H' for the reason stated above: however, in investigating relationships such as $H' = 0$ (equivalent to $B = H$, the "no specified minimum" plan) this pair cannot of course be used: I find B and C suitable for this case.

Before going on let us review the proposed procedure: we started with *seven* variable quantities, namely the standard premium P and the six ratios C, B, H, G, H' and G', with three independent equations connecting them: this is equivalent to four independent variables in terms of which the other three can be expressed (this assumes that Rv is a determinate function of P, and $H'p$, $H'o$ are determinate functions of P, H', and $G'p$, $G'o$ of P, G'): we reduce the four independent variables to two by (i) using a selected series of values of P and making our calculations separately for each such value and (ii) by assuming another relationship between the other six quantities, giving a particular "aspect." We can then draw for each value of P a graph of the "aspect" using as coordinates any pair of remaining independent varying quantities, indicating on it the graph for the other varying quantities.

We have so far assumed that we have a complete list of possible combina-

tions; that is to say that for a given P we can determine by inspection the value of all of C, B, H, G, H' and G' from the values of any three of them. Theoretically we have such a list, since from our equations (1)-(5) we can calculate the other three from the values of any three (see Appendix II), but as a practical matter of course we don't have such a list. What we are going to do now is to construct a restricted list that we can use for rapidly examining different "aspects." This will prove much more satisfactory than having to stop and calculate values for each different aspect we want to look at.

The first thing is to consider and restrict the field, that is the arithmetical range of the variables.

Consider the possibilities for a particular fixed value of P. Of C, B, H, G, H' and G' any three can be taken as the independent variables: let us take C, H' and G' and consider these as coordinates in ordinary three dimensional space. Any set of values for C, H' and G' give a point in space, and any point in space gives a set of values. All possible points form a solid some of the boundaries of which reach to infinity. We want to confine our "points" to a region or volume of space that will give reasonable and practical values. First H', G' must both be positive and G' cannot be less than H'. Also C must be positive and less than Γ (in accordance with our discussion above). In addition we should put some upper limits on H' and G' since values of say 2 or 3 for such quantities are scarcely practical. For the purpose of this paper I took $H' = .60$ and $G' = 1.20$ as upper limits. These limits confine the "points" to a finite volume: but some of the points in it may have values of G between Rv and 1 and some of the points may have values of B less than zero: now while it is not impossible to have practical plans with $B < 0$ or $G < 1$, such plans would look rather bizarre and accordingly I find it desirable to make the additional limitations that $B \geqslant 0$ and $G \geqslant 1$ (these conditions have a further advantage: they establish a lower limit for C). Accordingly the limits are:

$$H' \geqslant 0 \text{ and } \leqslant .60 \qquad G' \leqslant 1.20 \qquad C \leqslant \Gamma$$
$$B \geqslant 0 \qquad G \geqslant 1$$

and our points are confined to a finite volume—a polyhedron with faces (not necessarily flat) expressed by the limits. In passing it may be noted that these limits prevent G from being too large and it is not necessary to adopt a formal upper limit for G.

The next step is to find the "vertex" points of this polyhedron: these are the points where three of the limit conditions hold. The simplest way is to try all the possible combinations of these three at a time (there are sixteen such) and rule out those which produce answers violating another of the limitations. (We could determine the possible cases from theoretical considerations but it is quicker to try the sixteen possible cases.)

We will illustrate this process by giving it for a particular case, the one on

which are based all the examples and graphs given in this paper. This is, briefly, a compensation retrospective plan for a "40%" state, with the expense gradation underlying the A, B and C retrospective plans introduced in 1943. Values are given for $P = 5,000$, $25,000$ and $100,000$: these three premium sizes give a comprehensive view of the range of retrospectively rated risks.

Details of the expense gradation, contingency loading and excess pure premium table used are given in Appendix III and details of the working out of the tables are given in Appendix IV with the complete tables.

It is found, in this instance, that for each of the three values of P, there are six vertex points, namely the intersections of the "plane" $H' = 0$ and the "plane" $H' = .6$ with the "line" $(C = \Gamma, G = 1)$ the "line" $(C = \Gamma, G' = 1.2)$ and the "line" $(G = 1, G' = 1.2)$, namely

Table of Vertex Points

C	B	H	G	H'	G'
		$P = 5,000$			
1.162**	.643	.643	1.**	.0**	.307
1.162**	.198	.895	1.**	.6**	.690
1.162**	.100	.797	1.494	.6**	1.2**
1.162**	.366	.366	1.760	.0**	1.2**
.105	.875	.875	1.**	.0**	1.2**
.153	.821	.910	1.**	.6**	1.2**
		$P = 25,000$			
1.162**	.355	.355	1.**	.0**	.555
1.162**	.102	.799	1.**	.6**	.773
1.162**	.031	.728	1.425	.6**	1.2**
1.162**	.194	.194	1.589	.0**	1.2**
.214	.743	.743	1.**	.0**	1.2**
.277	.676	.838	1.**	.6**	1.2**
		$P = 100,000$			
1.162**	.217	.217	1.**	.0**	.674
1.162**	.099	.796	1.**	.6**	.776
1.162**	.069	.766	1.464	.6**	1.2**
1.162**	.160	.160	1.555	.0**	1.2**
.239	.712	.712	1.**	.0**	1.2**
.276	.678	.839	1.**	.6**	1.2**

where the double asterisk denotes one of the limiting conditions. Note that the limit $B = 0$ does not come into play. 1.162 is of course the value of Γ.

Looking at these points we see that the minimum and maximum values of the quantities are

	$P = 5,000$		$P = 25,000$		$P = 100,000$	
	Min.	*Max.*	*Min.*	*Max.*	*Min.*	*Max.*
C	.105	1.162	.214	1.162	.239	1.162
B	.100	.875	.031	.743	.069	.712
H	.366	.910	.194	.838	.160	.839
G	1.000	1.760	1.000	1.589	1.000	1.555
H'	.0	.6	.0	.6	.0	.6
G'	.307	1.2	.555	1.2	.674	1.2

and we note that the following "selected values" will cover the range of values:

C	.167,	.333,	.500,	.667,	.833, 1.000, 1.162	
B	.1,	.303,	.5,	.7		
H	.303,	.5,	.7,	.9		
G	1.0,	1.2,	1.4,	1.6		
H'	.0,	.2,	.4,	.6		
G'	.4,	.6,	.8,	1.0,	1.2	

(*Note*: The value .303 was taken for B and H instead of .3 because $B = .303$ satisfies the condition $'E = 1$ for $C = \Gamma$: in other words for $C = \Gamma$, $B = .303$ gives points for which the final retrospective premium is the standard when the actual loss ratio equals the expected.)

So what we do is to make a table of all possible points for which the values of C, B, etc., are such that (a) all are within our limitations and (b) three of them are selected values. The details of how we do this and complete tables for the three values of P are given in Appendix IV.

Now we have our restricted list and can use it to examine very quickly various "aspects" of the possibilities. Thus we can take $C = 1.162$ or $C = 1$, etc.

or $B = $ .1   or .303, etc.
or $H = $ .303 or .50, etc.
or $G = 1$ or 1.20 or 1.40, etc.

and pick out the values belonging to this "aspect." These values can be graphed, separately, for each value of P, using any independent pair of the other variables as plotting coordinates. As mentioned above, I usually use H' and G' when available. On the diagrams we can then show the loci for the various selected values of the remaining three quantities and other information of interest. The examples given below will make this clear.

If we want to study some "aspect" which is not given by our table (e.g. $'E = 1$) we will have to make some additional calculations (see Appendix IV) but often it will be sufficient to interpolate in the main table.

It was my intention to give diagrams for the "aspects"

  (i) $C = \Gamma$ (the usual retrospective plan)
 (ii) $G = 1$ (the "no penalty" plan)
(iii) $B = .303$ (a constant basic)
 (iv) $H = .5$ (a constant minimum)
  (v) $H' = 0$ (the "no specified minimum" plan)
 (vi) $'E = 1$ (a plan where an actual loss ratio equal to the expected produces the standard premium)

For all these, except (v), the independent or plotting coordinates taken were to be G' and H'; for (v) they were to be B and C.

It was my intention to give eighteen diagrams (each of the above six assumptions for each of the three values of P) showing the lines for various values of C, B, G, H, etc., as applicable; also to show the loci for $'E = 1$ and $'E = Rv$ and the areas where $'E < Rv$, $'E > Rv$ and < 1, and $'E > 1$ (i.e. the areas where the expected loss ratio produce a final retrospective premium less than Rv, between Rv and 1, and greater than 1): but owing to limitations of time (my time to draw the diagrams) and cost (the cost of reproducing the diagrams) I am giving the diagrams only for the first "aspect," that is $C = \Gamma$ (the present "standard" plan).

These diagrams are accordingly given: they are mostly self-explanatory so that only a brief description of them, as follows, is required:

For the assumption or aspect $C = \Gamma = 1.162$ it is clear (from the list of "vertex" points) that the points all fall in the area bounded by $H' = 0$, $H' = .6$, $G' = 1.2$ and $G = 1$. Plotted as functions of H' and G' three of these boundary lines are straight lines and the fourth ($G = 1$) is curved. The boundaries meet at four intersections. Taking as an example the diagram for $P = 25,000$, these points are $H', G' = (0, .555)$ $(0, 1.2)$ $(.6, 1.2)$ and $(.6, .773)$. The minimum and maximum values of B are .031 and .355 and the lines for $B = .1$, $B = .303$ are shown. The minimum and maximum values of H are .194 and .799 and the lines for $H = .303$, $H = .5$ and $H = .7$ are shown. The minimum and maximum values of G are 1 and 1.589 and the lines for $G = 1$, $G = 1.20$ and $G = 1.40$ are shown. All the values for these come from the table. The lines $B = .1$, $B = .303$ are the same as $'E = .797$ and $'E = 1$ respectively, since $C = 1.162$. In addition there is shown the locus for $'E = Rv$: additional values were calculated for this, which is equivalent (for $C = 1.162$) to $B = .170$. The areas are shaded to show where $'E$ is less than Rv, where $'E$ is between Rv and unity and where $'E$ is greater than unity. The diagrams for $P = 5,000$ and $P = 100,000$ were similarly constructed. (On the $P = 100,000$ diagram there is no locus for $'E = 1$ because in this instance $'E$ is always less than one.)

Now just what does such a diagram indicate? Take for example that for $P = 25,000$. It shows the possible values (within our chosen limits) for $P = 25,000$, $C = 1.162$, $Rv = .8668$. Any point on the diagram (not outside the area) signifies as follows: take for instance $H' = .262$, $G' = 1.036$. For this $G = 1.4$, $H = .5$ and B is between .1 and .303 (actually .196 on reference to the table in the appendix, or $B = G - 1.162\,G'$ gives the value): $'E$ is between Rv or .867 and 1 (actually $B + 1.162\,E$ gives .893). This means the set of values $C = 1.162$, $B = .196$, $H = .5$, $G = 1.4$, $H' = .262$, $G' = 1.036$ satisfies the basic equations or in other words, with our assumptions as to excess pure premium tables and gradation of expenses and contingency loading, $C = 1.162$, $B = .176$, $H = .5$, $G = 1.4$ are possible retrospective rating values and with these the minimum is reached at a loss ratio (H') of .262 and the maximum at (G') 1.036: an actual loss ratio equal to the expected of .6 gives a retrospective premium of .893.

The diagram, however, has more value than this: it gives us a birdseye view of the possibilities under the "aspect" $C = 1.162$. If, for instance, we want G to be less than 1.4, we are confined to the area below the line $G = 1.4$. If we want $'E$ to be less than Rv we must take values from the right-hand shaded part of the area. It also shows at a glance impossible combinations: thus, if we want $H = .5$ or less, we cannot have $'E$ less than Rv.

Of course to fix definite values (for $P = 25,000$) for use in a plan we need two more conditions, e.g. $G = 1.2$, $H = .7$ gives the point $H' = .476$, $G' = .906$, and $H' = 0$, $G = 1.4$ gives the point $H' = 0$, $G' = 1.021$.

By studying these diagrams for the various values of P and others based on other "aspects" we can see what kinds of retrospective plans we can construct. (Regarding the actual construction of plans see the remarks made later on.) Similar charts for various other aspects can readily be made from the given tables: I regret I could not give more of them here: the procedure for drawing them is the same as for those for $C = \lceil\; \rceil$. Thus the first step for a diagram for $P = 25,000$ showing the possibilities for $H' = .5$ is to pick out the boundaries and their intersections. The table at once shows the boundaries to be

$$H' = 0, \ G' = 1.2, \ C = 1.162, \text{ and } G = 1$$

and the intersections to be

C	B	H	G	H'	G'
1.162**	.354	.5*	1**	.125	.556
1.162**	.175	.5*	1.570	.280	1.2**
.760	.5*	.5*	1**	.0**	.660
.634	.5*	.5*	1.261	.0**	1.2**

The diagram is to be completed as before.

The analysis of possible combinations is of course only the first part of the complete work of analyzing retrospective rating and constructing retrospective rating plans. The second part is the actual construction of plans and necessitates still further selection or, using the language employed above, the making of still more assumptions, i.e. the imposing of further restrictions. Thus we may decide we are interested in plans with $C = \Gamma$ (as we seem to be at present) and want to construct plans (with $C = \Gamma$) with the further condition $G = 1$ ("no penalty"). This reduces our independent variables (including P) to two, namely P, B, H, G' and H', with three relations say (6), (7) and (10), in which $C = 1.162$ and $G = 1$. We can thus construct a (single) diagram giving all the possibilities for all values of P. We can use as plotting coordinates any two *independent* values (not e.g. B and G' for $B + CG' = 1$). It is logical to use P as one and as the other either B or H or G' or H' according to the features of the plan in which we are most interested. It was my intention to give some examples of this second part of the problem but this will have to be postponed to a later paper: there are many practical points to be considered including the problem of keeping the values in proper relation for compensation insurance in different states and possibly as between different lines of insurance. Thus, therefore, considerations of time and space make it impossible to tackle this task now. In the meanwhile, however, I wanted to put before the other members of our profession the results I had obtained and which I have explained in this paper.

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APPENDIX I

SOLUTION OF THE BASIC EQUATIONS

In order to make the arithmetical calculations we must be in a position to determine all the variables C, B, H, G, G' and H' given either any three of them or any three independent relations between them. The first is the most usual problem that arises and can be systematically solved as follows (it is assumed that Rv is known and that we have tables of Lp and Lo).

We have the five equations

$$H = B + C\,H' \tag{1}$$
$$G = B + C\,G' \tag{2}$$
$$B = Rv - C\,(H'o - G'p) \tag{3}$$
$$H = Rv - C\,(H'p - G'p)\ . \tag{4}$$
$$G = Rv + C\,(G'o - H'o) \tag{5}$$

I. Given C and any two others:

    (i) Given C and B, G

        From equation (2) we find G' and then from (3) we find H' and then from (1) we find H.

    (ii) Given C and B, H

        From (1) we get H' and from (3) we get G' and from (2) we get G.

    (iii) Given C and H, G

        $G' - H' = (G - H)/C$: then by trial we find values of G', H' differing by this amount and satisfying (5).
        Then B comes from (1).

    (iv) Given C and B, G'

        From (3) we get H' and from (1) and (2) we get H, G.

    (v) Given C and B, H'

        From (3) we get G' and from (1) and (2) we get H, G.

    (vi) Given C and G, G'

        From (5) we get H' and from (2) we get B, and then from (1) we get H.

    (vii) Given C and H, H'

        From (4) we get G' and from (1) we get B, and then from (2) we get G.

    (viii) Given C and G, H'

        From (5) we get G' and then B from (2) and then H from (1).

    (ix) Given C and H, G'

        From (4) we get H' and then B from (1) and then G from (2).

    (x) Given C and G', H'

        (3) gives us B and (1) and (2) give H and G.

II. If C is not one of the given quantities:

    (xi) Given B, G, H

        Trial values of C give values of $G' = (G - B)/C$ and $H' = (H - B)/C$ to satisfy (4).

    (xii) Given B, G, G'

        We get C from (2) and then H' and H as in (i).

    (xiii) Given B, H, H'

        We get C from (1) and then G' and G as in (ii).

(xiv) Given B, G, H'

Eliminate C from (2) and (5) and find G' by trial and then C (or trial values of C give G' from (2) to satisfy (5)). Then H from (1).

(xv) Given B, H, G'

Eliminate C from (1) and (4) and find H' by trial and then C (or trial values of C give H' from (1) to satisfy (4)). Then G from (2).

(xvi) Given H, G, G'

Eliminate C from (4) and (5) and find H' by trial and then C (or trial values of C give H' from (4) to satisfy (5)). Then B from (1) or (2).

(xvii) Given H, G, H'

Eliminate C from (4) and (5) and find G' by trial and then C (or trial values of C give G' from (4) to satisfy (5)). Then B from (1) or (2).

(xviii) Given B, G', H'

Get C from (3) and then H, G from (1) and (2).

(xix) Given H, G', H'

Get C from (4) and then B, G from (1) and (2).

(xx) Given G, G', H'

Get C from (5) and then B, H from (1) and (2).

If we are given some relation or relations between the quantities we must solve the equations in the easiest manner. For instance, if we are given that $'E$ is equal to a given value X (which is equivalent to $X = B + C E$) and are given in addition

(a) the value of C (or B) we get B (or C) immediately from $X = B + C E$ and proceed as above.

(b) the values of G', H', or $G G'$, or $H H'$, we can get C immediately from $X - C E = Rv - C (H'o - G'p)$ or $G - C G' = X - C E$, or $H - C H' = X - C E$, respectively: and then proceed as above.

(c) the values of G, H', we use trial values of C to get G' from $G = Rv + C (G'o - H'o)$ to satisfy $X - C E = Rv - C (H'o - G'p)$ and so on: similarly, if given H, G'.

(d) the values of G, H, we use trial values of B which give values of C and thus values of G' from $C G' = G - B$ and H' from $C H' = H - B$ to satisfy $G - Rv = C (G'o - H'o)$.

APPENDIX II

CONVERSION OF EXCESS PURE PREMIUM TABLE FROM
ONE EXPECTED LOSS RATIO TO ANOTHER

If we have a table of "excess pure premium ratios" showing some or all of Lx^*, Lp, Lo for loss ratios L and such table was constructed on the assumption of an expected loss ratio of E, then if we wish to use the table for a different expected loss ratio say $\overline{E}$ we proceed as follows:

(i) we make the assumption that the excess pure premium ratio for a loss ratio L, if the expected loss ratio is E, is obtained by entering the E table with a loss ratio of L multiplied by $E/\overline{E}$, i.e.

$$Lx = \text{the tabular value of } \left(\frac{LE}{\overline{E}}\right) x$$

(ii) Put $\dfrac{E}{\overline{E}} = k$ and put $\overline{L} = k\,L$ and write "tab. val." for "the tabular value of"

Then $Lx = \text{tab. val. } \overline{L}x$
$Lp = \overline{E}\,Lx = (\text{tab. val. } \overline{L}p)/k$
$Lo = L + Lp = (\text{tab. val. } \overline{L}o)/k$

(iii) Now if we put $\overline{C} = \dfrac{C}{k}$ and $\overline{H}' = k\,H'$, $\overline{G}' = k\,G'$ our working equations become

$H = B + \overline{C}\,\overline{H}' \qquad G = B + \overline{C}\,\overline{G}'$
$B = Rv - \overline{C}\,((\text{tab. val. } \overline{H}'o) - (\text{tab. val. } \overline{G}'p))$
$H = Rv - \overline{C}\,((\text{tab. val. } \overline{H}'p) - (\text{tab. val. } \overline{G}'p))$
$G = Rv + \overline{C}\,((\text{tab. val. } \overline{G}'o) - (\text{tab. val. } \overline{H}'o))$

so that all we have to do is

(iv) Convert C to $\overline{C}$ by *dividing* by k. Convert H', G', and all loss ratios to $\overline{H}'$, $\overline{G}'$, etc., by *multiplying* by k. Work out whatever problem we are concerned with in terms of B, G, H, $\overline{G}'$, $\overline{H}'$ and $\overline{C}$ and then reconvert $\overline{C}$ to C by *multiplying* by k and reconvert $\overline{H}'$, $\overline{G}'$ and all loss ratios to H', G', etc. by *dividing* by k.

(v) The conversion and reconversion of C, H', G', etc., can be done by inspection by a simple "conversion table" if the difference between E and $\overline{E}$ is small, as it is usually. For example, I used this method in my calculations and had to convert from a loss ratio of .598 (the expected loss ratio in the excess pure premium table) to .600 (the expected loss ratio assumed in my examples). I worked to three decimals both in loss ratios and credibilities (loss conversion factors), e.g. $H' = .398$, $C = 1.165$ and accordingly the difference be-

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* We do not need Lx for calculations according to the methods of this paper.

tween .600 and .598 was 2 "points". So I constructed a table which gives the ranges of values for which the difference between X and kX is less than ½ point, greater than ½ point but less than 1½ points and so on; and then for the first range we take the difference as 0 points, for the second as 1 point, and so on.

The complete table (up to the largest value, 1.2, I need) follows:

Loss Ratio $(E = .600)$ LCF $(E = .598)$		Loss Ratio $(E = .598)$ LCF $(E = .600)$
.000		.000
	$-0+$	
.150		.150
	$-1+$	
.450		.449
	$-2+$	
.750		.748
	$-3+$	
1.050		1.047
	$-4+$	
1.350		1.346

(Note: In critical cases descend.)

This is used as follows: (i) Given $H' = .398$, what is $\overline{H'}$? In the left-hand column headed "Loss Ratio $(E = .600)$" .398 is between .150 and .450 and we find the direction -1 meaning to subtract 1 point. So $\overline{H'} = .397$. (ii) Given $\overline{G'} = 1.047$, what is G'? In the right-hand column we find 1.047 and bearing in mind the note "In critical cases descend" we take the direction $+4$ and so $G' = 1.051$. (iii) If $C = 1.162$, what is $\overline{C}$? In the *right*-hand column (headed "LCF $(E = .600)$") we find the direction $+4$ so $\overline{C} = 1.166$.

In making the calculations for the examples in Appendix IV we have to convert from .598 to .600—that is why I gave this particular conversion table.

APPENDIX III

DESCRIPTION OF THE ARITHMETICAL EXAMPLE

All the numerical examples and calculations in this paper are based on the following underlying data, namely

(i) Compensation insurance.

(ii) The excess pure premium table (based on unlimited losses) constructed on New York experience in 1941*. This is keyed to a loss ratio of .598.

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* See "Risk Distributions Underlying Insurance Charges in the Retrospective Rating Plan," by Nels M. Valerius—P.C.A.S. XXIX, p. 96. The table is given on pp. 111-117.

(iii) A so-called "40%" state with the following make-up of the standard premium dollar:

Losses	.600
Loss Expense	.080
Inspection	.025
General Administration and Payroll Audit	.095
Acquisition	.175
Taxes	.025
	1.000

(Note: I could have saved some of the arithmetical work by assuming a hypothetical state with an expected loss ratio of .598, the same as in the excess pure premium table. The reason I did not is that I made some of the calculations for a 60% expected loss ratio state a year or two ago, using the unlimited New York excess pure premium table (then the latest available) and it was easier to finish the arithmetical work on this basis rather than recalculate all the values I already had. Also, the "40% state" is usually selected for illustration purposes. Anyhow the conversion from one expected loss ratio to another is not so burdensome particularly if the difference in expected loss ratios is small. For the method used see Appendix I).

(iv) There is an expense gradation equal to savings in acquisition of 5 points in acquisition from 1000 to 5000 of standard premium and of 10 points from 5,000 to 100000, and savings in General Administration and Payroll Audit expense of 5.4 points on all standard premium over 1000. This is the expense gradation underlying the new retrospective plans introduced in 1943.

(v) A flat contingency loading of .01 is included. My examples will thus be for a "40% state" with the expense gradation and contingency loading underlying the new retrospective plans introduced in 1943.

Thus the net reduction on account of the gradation and contingency loading, expressed as usual as a ratio of the standard premium P, is for $5000 \leqslant P \leqslant 100000$ (the range covered by my examples)

$$\frac{1}{.975} \left(\frac{.154 \ (P - 5000) + 416}{P} - .01 \right)$$

and this equals $1 - Rv$.

Accordingly $Rv = .8523 + \dfrac{363}{P}$.

We will be interested only in the values of Rv for $P = 5000$, 25000 and 100000, for which $Rv = .9249$, .8668 and .8559 respectively.

The value of Γ is $\dfrac{.600 + .080}{.600} \ \dfrac{1}{.975} = 1.162$.

Note 1: In this paper I have used throughout the older terminology and

notation wherein the tax loading is incorporated in all the factors: the new A, B, C Plans, however, (and the Comprehensive Rating Plan for War Projects) have a separate "tax multiplier". Care must be taken in all cases to see just what the effect of this is on the values of the retrospective rating factors and on the notation.

The difference between the terminology used in this paper and in the A, B, C Plans is that if the tax multiplier in the A, B, C Plans is called $1 + T$, then in the notation of this paper

(a) the basic premium ratio in the A, B, C Plans is $\dfrac{B}{1+T}$

(b) the loss conversion factor in the A, B, C Plans is $\dfrac{C}{1+T}$

so that to apply the formulas of this paper the basic premium ratio and the loss conversion factors of the A, B, C Plans must be multiplied by the tax multiplier.

Note 2: Contingency loadings can be incorporated in several ways: (a) flat, say 1% of the standard premium, i.e. $= .01$ (remember this means $.01\,P$); or (b) a percentage say $1\frac{1}{2}\%$ of the retrospectively variable part of the formula, i.e. $.015\,(R - H)$; or (c) a percentage say $2\frac{1}{2}\%$ of C, i.e. $.025\,C\,(= .025\,CP)$: and so on, including of course a combination of one or more of these methods.

Thus if for a certain standard premium size P there is to be allowed a savings of 10% (of P) on account of the gradation of the expense loading the retrospective formulas will be as follows according to the three examples given above of contingency loadings:—

(a) flat contingency loading of 1%

$$Rv = 1 - .10 + .01 = .91$$
$$.91 = H + C\,(Hp - Gp)$$

(b) contingency loading of $1\frac{1}{2}\%$ of the retrospectively variable part of the final premium.

$$Rv = 1 = .10 + .015\,(Rv - H)$$
$$Rv = \frac{.9 - .015\,H}{.985} = H + C\,(Hp - Gp)$$
$$\text{or } .9 = H + .985\,C\,(Hp - Gp)$$

(c) contingency loading of $2\frac{1}{2}\%$ of C

$$Rv = 1 - .10 + .025\,C$$
$$.9 = H + C\,(Hp - Gp - .025)$$

The example given in this Appendix has a contingency loading of type (a), i.e. flat.

APPENDIX IV

CALCULATION OF TABLE POINTS

To calculate the table of values for possible combinations of select values of the quantities C, B, H, G, H', G' for a given value of P, I proceeded as follows:

(i) I constructed a table of Lp, Lo for each value of P (we do not need Lx). This shows Lp and Lo for each 1% of loss ratio from 0 to 120%. I found it convenient to work with C, B, H', G to three decimals (e.g. $C = .895, G = 1.181, H' = .592$) and found that in these circumstances it was advisable to have Lp and Lo to four decimals, so that proper interpolations could be made. Excerpts from the table for $P = 25000$ are given.

STANDARD PREMIUM 25,000

L	Lp	Lo	L	Lp	Lo	L	Lp	Lo
.00	.5980	.5980	.40	.2422	.6422	.80	.0748	.8748
.01	.5878	.5978	.41	.2356	.6456	.81	.0724	.8824
.	.	.	.	.	.	.	.	.
.39	.2494	.6394	.79	.0771	.8671	1.19	.0215	1.2115
.40	.2422	.6422	.80	.0748	.8748	1.20	.0209	1.2209

(ii) It must be remembered that we are working with an expected loss ratio of 60%, whereas the table was keyed to a 59.8% loss ratio. It is accordingly necessary to convert all loss ratios and values of C in accordance with the conversion table in Appendix II and then reconvert at the end when the calculations have been made. We want to construct tables for $P = 5000, 25000$ and 100000 for which $Rv = .9249, .8668$ and $.8559$ respectively. What we want to do is to find all possible combinations of selected values of any three of C, B, H, G, H' and G' and the values of the other three quantities for these possible combinations, all subject to the limiting conditions that

$$C \geqslant 1.162, \ B \geqslant 0, \ G \geqslant 1, \ H' \geqslant 0 \text{ and } \leqslant .60, \ G' \leqslant 1.20$$

Remember that given values of any 3 of the 6 quantities we can calculate the values of the other three, but of course the calculated values may be impossible or may be outside the limits we have set. In fact, our problem is solely to determine possible combinations. To put it another way, we want to find all possible "points" (C, B, H, G, H', G') in which *three* of the quantities each has one of the

selected values given in the paper and repeated below and in which *all* of the quantities are within the limits just set forth, e.g. the point $(C = 1.162, B = .20, H = .60, G = 1.217, H' = .581, G' = .717)$ if it exists—that is, if the values satisfy our fundamental equations, is a value we are trying to find because in it we have $C = 1.162$, $B = .20, H = .60$, which are selected values, and the other three quantities, G, H' and G', are within the limits set: on the other hand the "point" $(C = 1, B = 0, H = .828, G = 1, H' = .828, G' = 1.021)$ even if it "exists" is not a point we are looking for because H' is greater than the limit .60: also the "point" $(C = 1, B = 0, H' = .528, G = 1.010, H' = .528, G' = 1.010)$ even if it "exists" is not a point we are interested in finding for there are not in it three quantities with selected values.

(iii) The first thing to do is to find the most extreme cases (which I call "vertex" points). These are those "points" for which hold three of the limiting equations

$$C = 1.162, B = 0, G = 1, H' = 0, H' = .6, G' = 1.2$$

The simplest way is to try all possible combinations of these three at a time, ruling out those which produce answers violating another of the limitations (or we can determine the possible cases by a theoretical investigation but it is simpler to try the sixteen possible cases). We find that with the data we are using the following six "points" exist for all three of our values of P:

C	B	H	G	H'	G'
1.162			1	0	
1.162			1	.6	
1.162				.6	1.2
1.162				0	1.2
			1	0	1.2
			1	.6	1.2

The limiting condition $B = 0$ does not come into play, B being positive for all points otherwise possible. We then finally choose the selected values as explained in the paper where it will be recalled we determined on the following (including the limiting values)

C	.167	.333	.500	.667	.833	1.000	1.162
B	.1		.303		.5	.7	
H	.303		.5		.7	.9	
G	1.0		1.2		1.4	1.6	
†H'	0		.2		.4	.6	
†G'	.4		.6		.8	1.0	1.2

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† Note, however, as explained below, that in the tables printed we have omitted the points determined by the non-limiting values of H' and G'.

(iv) The rest of the work is purely arithmetical: we will give details for $P = 25000$.

We set out the table of six vertex points in full, putting a double asterisk against the three limiting values in each set:

$P = 25000$ — Vertex Points

C	B	H	G	H'	G'
1.162**	.355	.355	1**	0**	.555
1.162**	.102	.799	1**	.6**	.773
1.162**	.031	.728	1.425	.6**	1.2**
1.162**	.194	.194	1.589	0**	1.2**
.214	.743	.743	1**	0**	1.2**
.277	.676	.838	1**	.6**	1.2**

We now set out the table of "edge points" namely those combinations for which two of the limiting conditions hold. We do this by taking all combinations of two limiting values and each of these pairs we find in either two or more of the sets of vertex points: e.g. for $C = 1.162$, $G = 1$ we find this combination in the first two vertex points above: going from one of these points to the other we see that B varies from .102 to .355 (passing through the selected value .303) H varies from .355 to .799 (through .5 and .7) H' varies from 0 to .6 (through .2 and .4) and G' varies from .555 to .773 (through .6). So we get the edge points

$C = 1.162$**	$G = 1$**	$B = .303$
$C = 1.162$**	$G = 1$**	$H = .5$
	etc.	

We set these out in the table of edge points and for each point calculate the values of the other quantities: we mark the "limiting" values (e.g. $C = 1.162$, $B = 1$) with a double asterisk as before, and the other selected value (e.g. $B = .303$) with a single asterisk. We do this for all the possible pairs of limit values. The table of edge points follows:

$P = 25000$ — Edge Points

C	B	H	G	H'	G'
1.162**	.303*	.686	1**	.330	.6*
1.162**	.354	.5*	1**	.125	.556
1.162**	.293	.7*	1**	.350	.608
1.162**	.342	.574	1**	.2*	.568
1.162**	.268	.733	1**	.4*	.630
1.162**	.303*	.303*	1.090	0**	.677

etc. (See table at end of Appendix)

We now examine the table of edge points to determine the "face points", namely those for which *one* of the limiting conditions hold. We do this in a manner similar to that by which we got the edge points from the vertex points: we take all possible combinations of one limiting value (with a double asterisk) and a non-limiting value (with one asterisk); if such a combination occurs in the edge point table it occurs twice. Thus the combination $C = 1.166**$, $B = .1*$ occurs twice—once with $H = .797$, $G = 1.006$, $H' = .6**$, $G' = .780$, and again with $H = .674$, $G = 1.495$, $H' = .494$, $G'=1.2**$ and so gives face points with $H=.7*$ and $G=1.2*$ and $G = 1.4*$ and $G' = .8*$ and $G' = 1.0*$. Note that each "face point" will be found twice by this method and should not be duplicated in our table: thus $C = 1.162**$, $B = .1*$, $H = .7*$ arises not only as above but also from the two occurrences of $C = 1.162**$, $H = .7*$ in the edge points. We thus construct the table of "face points"

$P = 25000$ — Face Points

C	B	H	G	H'	G'
1.162**	.1*	.7*	1.132	.517	1.061
1.162**	.1*	.728	1.2*	.541	.946
1.162**	.1*	.689	1.4*	.507	1.119
1.162**	.1*	.787	1.029	.561	.8*

etc.

Now for the final step: from the table of face points we get, in a similar manner, the "interior points", namely those for which none of the limiting conditions hold. We take all combinations of two non-limiting values (i.e. with one asterisk): if one such occurs once in the table of face points it appears twice and from the two occurrences we determine interior points. We thus construct the following table of interior points, taking care to put each point in only once (they will occur three times):

$P = 25000$ — Interior Points

C	B	H	G	H'	G'
1.*	.303*	.5*	1.285	.197	.982
1.*	.303*	.7*	1.087	.398	.785
1.*	.303*	.598	1.2*	.295	.896

etc.

The tables for $P = 5000$, $P = 25000$, $P = 100000$, given at the end of the Appendix, give the values of all the points found as above except that (to save space) I have omitted those where one, or two, of the selected values fixing the point are $H' = .2$ or $.4$, or $G' = .4$, $.6$, $.8$ or 1.0. This cuts almost in half the number of points to be tabulated and yet does not take away a great deal from the usefulness of the tables, since in most cases H' and G' will be used as plotting coordinates.

If we need additional values, such as say for $'E = a$ constant, we can either calculate the additional values by combining the new condition with the limiting values and so on or can often get close enough values by interpolating in the tables already calculated.

We give the values for $C = \ulcorner$, $'E = Rv$. Note that for this $B = Rv - \ulcorner E$, a fixed value: also $H'o - G'p = E$.

<div align="center">

Table for $C = \ulcorner$ $'E = Rv$

$P = 5000$

</div>

C	B	H	G	H'	G'
1.162**	.228	.894	1**	.573	.664
1.162**	.228	.712	1.623	.416	1.2**
1.162**	.228	.820	1.2*	.510	.837
1.162**	.228	.762	1.4*	.460	1.008
1.162**	.228	.717	1.6*	.420	1.181

<div align="center">

$P = 25000$

</div>

1.162**	.170	.786	1.**	.530	.715
1.162**	.170	.524	1.565	.305	1.2**
1.162**	.170	.7*	1.159	.457	.851
1.162**	.170	.680	1.2*	.438	.886
1.162**	.170	.586	1.4*	.358	1.059

<div align="center">

$P = 100000$

</div>

1.162**	.159	.748	1.**	.507	.724
1.162**	.159	.389	1.554	.198	1.200**
1.162**	.159	.5*	1.068	.468	.783
1.162**	.159	.7*	1.381	.293	1.052
1.162**	.159	.623	1.2*	.399	.896
1.162**	.159	.466	1.4*	.264	1.068

TABLE OF POINTS

$P = 5{,}000$

$Rv = .9249$

VERTEX POINTS

C	B	H	G	H'	G'
1.162**	.643	.643	1.**	.0**	.307
1.162**	.198	.895	1.**	.6**	.690
1.162**	.100	.797	1.494	.6**	1.2**
1.162**	.366	.366	1.760	.0**	1.2**
.105	.875	.875	1.**	.0**	1.2**
.153	.821	.910	1.**	.6**	1.2**

EDGE POINTS

C	B	H	G	H'	G'
1.162**	.303*	.882	1.**	.499	.600
1.162**	.5*	.845	1.**	.297	.430
1.162**	.640	.7*	1.**	.052	.310
1.162**	.5*	.5*	1.172	.0**	.578
1.162**	.488	.488	1.2*	.0**	.613
1.162**	.423	.423	1.4*	.0**	.841
1.162**	.386	.386	1.6*	.0**	1.044
1.162**	.146	.843	1.2*	.6**	.907
1.162**	.113	.810	1.4*	.6**	1.108
1.162**	.1*	.797	1.494	.6**	1.200
1.162**	.1*	.797	1.494	.600	1.2**
1.162**	.303*	.627	1.698	.279	1.2**
1.162**	.352	.5*	1.747	.127	1.2**
1.162**	.240	.7*	1.635	.396	1.2**
1.162**	.205	.730	1.6*	.452	1.2**
1.*	.670	.670	1.**	.0**	.330
.833*	.699	.699	1.**	.0**	.361
.667*	.728	.728	1.**	.0**	.407
.5*	.789	.789	1.**	.0**	.421
.333*	.801	.801	1.**	.0**	.598
.167*	.851	.851	1.**	.0**	.889
.828	.7*	.7*	1.**	.0**	.362
1.*	.297	.897	1.**	.6**	.703
.833*	.398	.898	1.**	.6**	.723
.667*	.498	.898	1.**	.6**	.753
.5*	.599	.899	1.**	.6**	.802
.333*	.702	.902	1.**	.6**	.894
.167*	.807	.907	1.**	.6**	1.154
.990	.303*	.897	1.**	.6**	.704
.664	.5*	.898	1.**	.6**	.754
.337	.7*	.902	1.**	.6**	.891
.483	.610	.9*	1.**	.6**	.807
.122	.854	.9*	1.**	.375	1.2**
1.*	.443	.443	1.643	.0**	1.2**
.833*	.523	.523	1.523	.0**	1.2**
.667*	.603	.603	1.403	.0**	1.2**
.5*	.683	.683	1.283	.0**	1.2**
.333*	.764	.764	1.164	.0**	1.2**
.167*	.841	.841	1.042	.0**	1.2**
.881	.5*	.5*	1.556	.0**	1.2**
.466	.7*	.7*	1.259	.0**	1.2**
.384	.740	.740	1.2*	.0**	1.2**
.662	.605	.605	1.4*	.0**	1.2**
.941	.471	.471	1.6*	.0**	1.2**
1.*	.215	.815	1.415	.6**	1.2**
.833*	.334	.834	1.334	.6**	1.2**
.667*	.452	.852	1.252	.6**	1.2**
.5*	.570	.870	1.170	.6**	1.2**
.333*	.688	.888	1.088	.6**	1.2**

EDGE POINTS (Cont'd.)

C	B	H	G	H'	G'
.167*	.806	.900	1.006	.6**	1.2**
1.162	.1*	.797	1.494	.6**	1.2**
.876	.303*	.829	1.354	.6**	1.2**
.599	.5*	.859	1.218	.6**	1.2**
.317	.7*	.890	1.080	.6**	1.2**
.226	.764	.9*	1.036	.6**	1.2**
.561	.526	.863	1.2*	.6**	1.2**
.970	.237	.816	1.4*	.6**	1.2**

FACE POINTS

C	B	H	G	H'	G'
1.162**	.303*	.7*	1.443	.341	.981
1.162**	.303*	.787	1.2*	.416	.772
1.162**	.303*	.712	1.4*	.352	.944
1.162**	.303*	.654	1.6*	.302	1.116
1.162**	.5*	.7*	1.106	.173	.522
1.162**	.487	.5*	1.2*	.011	.613
1.162**	.420	.5*	1.4*	.069	.844
1.162**	.376	.5*	1.6*	.106	1.053
1.162**	.422	.7*	1.2*	.239	.669
1.162**	.319	.7*	1.4*	.328	.930
1.162**	.250	.7*	1.6*	.387	1.162
1.*	.303*	.896	1.**	.593	.697
1.*	.5*	.857	1.**	.357	.499
1.*	.669	.7*	1.**	.031	.331
.833*	.5*	.877	1.**	.453	.600
.833*	.699	.7*	1.**	.001	.361
.667*	.5*	.897	1.**	.596	.750
.667*	.7*	.821	1.**	.182	.449
.5*	.7*	.868	1.**	.335	.600
.333*	.712	.9*	1.**	.565	.863
.167*	.827	.9*	1.**	.432	1.033
.350	.7*	.9*	1.**	.571	.856
1.*	.5*	.5*	1.307	.0**	.807
1.*	.533	.533	1.2*	.0**	.667
1.*	.479	.479	1.4*	.0**	.921
1.*	.448	.448	1.6*	.0**	1.153
.833*	.583	.583	1.2*	.0**	.740
.833*	.540	.540	1.4*	.0**	1.032
.667*	.7*	.7*	1.034	.0**	.502
.667*	.637	.637	1.2*	.0**	.845
.667*	.604	.604	1.4*	.0**	1.194
.5*	.7*	.7*	1.172	.0**	.944
.5*	.695	.695	1.2*	.0**	1.008
1.116	.5*	.5*	1.2*	.0**	.627
.942	.5*	.5*	1.4*	.0**	.955
.487	.7*	.7*	1.2*	.0**	1.025
1.*	.247	.847	1.2*	.6**	.953
1.*	.217	.817	1.4*	.6**	1.183
.833*	.352	.852	1.2*	.6**	1.017
.667*	.459	.859	1.2*	.6**	1.112
.333*	.7*	.900	1.012	.6**	.933
.333*	.700	.9*	1.012	.6**	.933
.911	.303*	.850	1.2*	.6**	.984
.602	.5*	.861	1.2*	.6**	1.163
.333	.7*	.9*	1.012	.6**	.933
1.*	.303*	.759	1.502	.457	1.2**
1.*	.441	.5*	1.640	.059	1.2**

TABLE OF POINTS
P = 5,000—(Cont'd.)
Rv = .9249

FACE POINTS (Cont'd.)

C	B	H	G	H'	G'	C	B	H	G	H'	G'
1.*	.365	.7*	1.565	.335	1.2**	.167*	.817	.9*	1.018	.494	1.2**
1.*	.400	.647	1.6*	.247	1.2**	1.081	.303*	.7*	1.601	.367	1.2**
.833*	.5*	.667	1.501	.200	1.2**	.914	.303*	.812	1.4*	.356	1.2**
.833*	.484	.7*	1.484	.259	1.2**	1.080	.303*	.699	1.6*	.366	1.2**
.833*	.400	.765	1.4*	.438	1.2**	.810	.5*	.7*	1.472	.247	1.2**
.667*	.5*	.817	1.300	.476	1.2**	.750	.5*	.762	1.4*	.349	1.2**
.667*	.587	.7*	1.387	.170	1.2**	.417	.7*	.821	1.2*	.290	1.2**
.667*	.600	.662	1.4*	.092	1.2**	.772	.476	.5*	1.6*	.031	1.2**
.5*	.683	.7*	1.284	.033	1.2**	.687	.575	.7*	1.4*	.182	1.2**
.5*	.400	.654	1.2*	.508	1.2**	1.082	.301	.7*	1.6*	.368	1.2**
.333*	.7*	.883	1.100	.549	1.2**						

INTERIOR POINTS   **INTERIOR POINTS (Cont'd.)**

C	B	H	G	H'	G'	C	B	H	G	H'	G'
1.*	.303*	.832	1.2*	.529	.897	.833*	.5*	.705	1.4*	.246	1.081
1.*	.303*	.782	1.4*	.480	1.098	.833*	.563	.7*	1.2*	.165	.765
1.*	.5*	.7*	1.188	.200	.688	.833*	.503	.7*	1.4*	.238	1.078
1.*	.5*	.690	1.2*	.190	.700	.667*	.5*	.844	1.2*	.516	1.050
1.*	.479	.5*	1.4*	.021	.921	.667*	.611	.7*	1.2*	.103	.853
1.*	.446	.5*	1.6*	.054	1.155	.5*	.695	.7*	1.2*	.009	1.008
1.*	.492	.7*	1.2*	.208	.708	1.082	.303*	.7*	1.2*	.368	1.199
1.*	.414	.7*	1.4*	.286	.986	.984	.5*	.7*	1.2*	.203	.712
.833*	.5*	.7*	1.413	.240	1.096	.838	.5*	.7*	1.4*	.239	1.075
.833*	.5*	.783	1.2*	.339	.840						

P = 25,000
Rv = .8668

VERTEX POINTS   **EDGE POINTS (Cont'd.)**

C	B	H	G	H'	G'	C	B	H	G	H'	G'
1.162**	.355	.355	1.**	.0**	.555	1.*	.203	.803	1.**	.6**	.798
1.162**	.102	.799	1.**	.6**	.773	.833*	.307	.807	1.**	.6**	.833
1.162**	.031	.728	1.425	.6**	1.2**	.667*	.411	.811	1.**	.6**	.883
1.162**	.194	.194	1.589	.0**	1.2**	.5*	.519	.819	1.**	.6**	.962
.214	.743	.743	1.**	.0**	1.2**	.333*	.630	.830	1.**	.6**	1.113
.277	.676	.838	1.**	.6**	1.2**	.841	.303*	.806	1.**	.6**	.830
						.523	.5*	.814	1.**	.6**	.948
						.250	.7*	.827	1.**	.508	1.2**

EDGE POINTS

C	B	H	G	H'	G'	C	B	H	G	H'	G'
1.162**	.303*	.686	1.**	.330	.600	1.*	.288	.288	1.488	.0**	1.2**
1.162**	.354	.5*	1.**	.125	.556	.833*	.384	.384	1.384	.0**	1.2**
1.162**	.293	.7*	1.**	.350	.608	.667*	.481	.481	1.281	.0**	1.2**
1.162**	.303*	.303*	1.090	.0**	.677	.5*	.577	.577	1.178	.0**	1.2**
1.162**	.251	.251	1.2*	.0**	.815	.333*	.675	.675	1.074	.0**	1.2**
1.162**	.213	.213	1.4*	.0**	1.021	.973	.303*	.303*	1.470	.0**	1.2**
1.162**	.1*	.797	1.006	.6**	.780	.634	.5*	.5*	1.261	.0**	1.2**
1.162**	.054	.751	1.2*	.6**	.986	.288	.7*	.7*	1.045	.0**	1.2**
1.162**	.032	.730	1.4*	.6**	1.177	.536	.556	.556	1.2*	.0**	1.2**
1.162**	.1*	.674	1.495	.494	1.2**	.858	.370	.370	1.4*	.0**	1.2**
1.162**	.193	.303*	1.588	.094	1.2**	1.*	.147	.747	1.347	.6**	1.2**
1.162**	.175	.5*	1.570	.280	1.2**	.833*	.267	.767	1.267	.6**	1.2**
1.162**	.069	.7*	1.464	.543	1.2**	.667*	.387	.787	1.187	.6**	1.2**
1.*	.411	.411	1.**	.0**	.589	.5*	.507	.807	1.107	.6**	1.2**
.833*	.473	.473	1.**	.0**	.632	.333*	.623	.823	1.023	.6**	1.2**
.667*	.538	.538	1.**	.0**	.693	1.065	.1*	.739	1.379	.6**	1.2**
.5*	.606	.606	1.**	.0**	.788	.783	.303*	.773	1.243	.6**	1.2**
.333*	.694	.694	1.**	.0**	.918	.510	.5*	.806	1.112	.6**	1.2**
.760	.5*	.5*	1.**	.0**	.660	.694	.368	.784	1.2*	.6**	1.2**
.297	.7*	.7*	1.**	.0**	1.009	1.109	.069	.734	1.4*	.6**	1.2**

TABLE OF POINTS
$P = 25,000—(Cont'd.)$

$Rv = .8668$

C	B	H	G	H'	G'	C	B	H	G	H'	G'
		FACE POINTS						FACE POINTS (Cont'd.)			
1.162**	.1*	.7*	1.332	.517	1.061	.833*	.303*	.741	1.303	.526	1.2**
1.162**	.1*	.728	1.2*	.541	.946	.833*	.385	.5*	1.385	.138	1.2**
1.162**	.1*	.689	1.4*	.507	1.119	.833*	.351	.7*	1.351	.420	1.2**
1.162**	.303*	.5*	1.068	.170	.658	.667*	.480	.5*	1.280	.029	1.2**
1.162**	.241	.303*	1.2*	.043	.825	.667*	.459	.7*	1.259	.362	1.2**
1.162**	.212	.303*	1.4*	.078	1.019	.667*	.400	.778	1.2*	.567	1.2**
1.162**	.240	.5*	1.2*	.224	.826	.5*	.571	.7*	1.171	.258	1.2**
1.162**	.196	.5*	1.4*	.262	1.036	.333*	.674	.7*	1.074	.077	1.2**
1.162**	.147	.7*	1.2*	.476	.906	1.128	.1*	.7*	1.454	.532	1.2**
1.162**	.084	.7*	1.4*	.531	1.133	1.083	.1*	.728	1.4*	.580	1.2**
1.*	.303*	.771	1.**	.469	.697	.963	.303*	.5*	1.459	.205	1.2**
1.*	.412	.5*	1.**	.088	.589	.880	.303*	.7*	1.359	.452	1.2**
1.*	.369	.7*	1.**	.331	.631	.914	.303*	.650	1.4*	.379	1.2**
.833*	.474	.5*	1.**	.032	.632	.606	.5*	.7*	1.228	.330	1.2**
.833*	.447	.7*	1.**	.304	.664	.583	.5*	.743	1.2*	.418	1.2**
.667*	.5*	.756	1.**	.383	.750	.860	.368	.5*	1.4*	.154	1.2**
.667*	.448	.488	1.2*	.0**	1.068	.555	.534	.7*	1.2*	.300	1.2**
.5*	.603	.7*	1.**	.195	.795	.981	.222	.7*	1.4*	.487	1.2**
.333*	.682	.7*	1.**	.054	.956			INTERIOR POINTS			
1.142	.303*	.7*	1.**	.348	.610	1.*	.303*	.5*	1.285	.197	.982
.718	.5*	.7*	1.**	.252	.696	1.*	.303*	.7*	1.087	.397	.785
1.*	.303*	.303*	1.336	.0**	1.033	1.*	.303*	.598	1.2*	.295	.896
1.*	.326	.326	1.2*	.0**	.874	1.*	.296	.303*	1.4*	.007	1.105
1.*	.296	.296	1.4*	.0**	1.105	1.*	.322	.5*	1.2*	.178	.878
.833*	.405	.405	1.2*	.0**	.954	1.*	.288	.5*	1.4*	.213	1.113
.667*	.5*	.5*	1.119	.0**	.929	1.*	.254	.7*	1.2*	.445	.946
.667*	.448	.488	1.2*	.0**	1.068	1.*	.208	.7*	1.4*	.492	1.192
1.051	.303*	.303*	1.2*	.0**	.853	.833*	.303*	.756	1.2*	.544	1.076
.986	.303*	.303*	1.4*	.0**	1.113	.833*	.404	.5*	1.2*	.115	.955
.643	.5*	.5*	1.2*	.0**	1.089	.833*	.361	.7*	1.2*	.407	1.007
1.*	.162	.762	1.2*	.6**	1.038	.667*	.5*	.7*	1.075	.300	.863
.833*	.303*	.803	1.013	.6**	.852	.667*	.488	.5*	1.2*	.019	1.069
.833*	.273	.773	1.2*	.6**	1.133	.667*	.465	.7*	1.2*	.326	1.103
1.093	.1*	.756	1.2*	.6**	1.007	1.143	.1*	.7*	1.4*	.524	1.137
.790	.303*	.777	1.2*	.6**	1.137	1.036	.303*	.5*	1.2*	.191	.866
1.*	.288	.303*	1.488	.015	1.2**	.968	.303*	.5*	1.4*	.202	1.126
1.*	.278	.5*	1.478	.222	1.2**	.924	.303*	.7*	1.2*	.427	.971
1.*	.208	.7*	1.408	.493	1.2**	.611	.5*	.7*	1.2*	.328	1.146
1.*	.200	.707	1.4*	.507	1.2**						

TABLE OF POINTS
$P = 100,000$

$Rv = .8559$

C	B	H	G	H'	G'	C	B	H	G	H'	G'
		VERTEX POINTS						EDGE POINTS			
1.162**	.217	.217	1.**	.0**	.674	1.162**	.1*	.796	1.**	.599	.775
1.162**	.099	.796	1.**	.6**	.776	1.162**	.215	.303*	1.**	.075	.675
1.162**	.069	.766	1.464	.6**	1.2**	1.162**	.213	.5*	1.**	.247	.677
1.162**	.160	.160	1.555	.0**	1.2**	1.162**	.183	.7*	1.**	.448	.703
.239	.712	.712	1.**	.0**	1.2**	1.162**	.175	.175	1.2*	.0**	.882
.276	.678	.839	1.**	.6**	1.2**	1.162**	.166	.166	1.4*	.0**	1.066

TABLE OF POINTS
$P = 100,000$ (*Cont'd.*)

$Rv = .8559$

C	B	H	G	H'	G'	C	B	H	G	H'	G'
EDGE POINTS (*Cont'd.*)						FACE POINTS (*Cont'd.*)					
1.162**	.076	.773	1.2*	.6**	.967	.667*	.470	.5*	1.**	.044	.794
1.162**	.070	.767	1.4*	.6**	1.145	.667*	.466	.7*	1.**	.351	.801
1.162**	.1*	.733	1.495	.545	1.2**	.5*	.561	.7*	1.**	.277	.877
1.162**	.161	.303*	1.556	.122	1.2**	.333*	.642	.7*	1.**	.174	1.075
1.162**	.156	.5*	1.551	.296	1.2**	.989	.303*	.5*	1.**	.200	.705
1.162**	.119	.7*	1.514	.500	1.2**	.956	.303*	.7*	1.**	.415	.729
1.*	.298	.298	1.**	.0**	.702	.486	.5*	.7*	1.**	.329	.824
.833*	.384	.384	1.**	.0**	.739	1.*	.266	.266	1.2*	.0**	.934
.667*	.471	.471	1.**	.0**	.793	1.*	.258	.258	1.4*	.0**	1.143
.5*	.563	.563	1.**	.0**	.873	.833*	.361	.361	1.2*	.0**	1.007
.333*	.658	.658	1.**	.0**	1.028	.667*	.464	.464	1.2*	.0**	1.114
.991	.303*	.303*	1.**	.0**	.703	.953	.303*	.303*	1.2*	.0**	.941
.615	.5*	.5*	1.**	.0**	.813	.924	.303*	.303*	1.4*	.0**	1.187
.261	.7*	.7*	1.**	.0**	1.151	.594	.5*	.5*	1.2*	.0**	1.178
1.*	.201	.801	1.**	.6**	.800	1.*	.183	.783	1.2*	.6**	1.017
.833*	.307	.807	1.**	.6**	.832	.833*	.303*	.803	1.032	.6**	.875
.667*	.413	.813	1.**	.6**	.881	.833*	.293	.793	1.2*	.6**	1.089
.5*	.521	.821	1.**	.6**	.958	.667*	.405	.805	1.2*	.6**	1.193
.333*	.631	.831	1.**	.6**	1.109	1.127	.1*	.776	1.2*	.6**	1.089
1.161	.1*	.797	1.**	.6**	.777	1.117	.1*	.770	1.4*	.6**	1.164
.839	.303*	.806	1.**	.6**	.831	.819	.303*	.794	1.2*	.6**	1.096
.532	.5*	.819	1.**	.6**	.939	1.*	.258	.303*	1.457	.045	1.2**
.250	.7*	.796	1.**	.386	1.2**	1.*	.255	.5*	1.455	.245	1.2**
1.*	.257	.257	1.457	.0**	1.2**	1.*	.231	.7*	1.430	.470	1.2**
.833*	.357	.357	1.357	.0**	1.2**	1.*	.200	.756	1.4*	.556	1.2**
.667*	.457	.457	1.257	.0**	1.2**	.833*	.303*	.780	1.303	.573	1.2**
.5*	.557	.557	1.157	.0**	1.2**	.833*	.356	.5*	1.356	.173	1.2**
.333*	.657	.657	1.057	.0**	1.2**	.833*	.342	.7*	1.342	.430	1.2**
.923	.303*	.303*	1.411	.0**	1.2**	.667*	.457	.5*	1.257	.065	1.2**
.594	.5*	.5*	1.213	.0**	1.2**	.667*	.450	.7*	1.250	.376	1.2**
.260	.7*	.7*	1.012	.0**	1.2**	.5*	.554	.7*	1.155	.291	1.2**
.579	.506	.506	1.2*	.0**	1.2**	.333*	.656	.7*	1.056	.130	1.2**
.906	.312	.312	1.4*	.0**	1.2**	.921	.303*	.5*	1.408	.214	1.2**
1.*	.179	.779	1.379	.6**	1.2**	.892	.303*	.7*	1.373	.466	1.2**
.833*	.292	.792	1.292	.6**	1.2**	.914	.303*	.596	1.4*	.320	1.2**
.667*	.404	.804	1.204	.6**	1.2**	.587	.5*	.7*	1.204	.341	1.2**
.5*	.518	.818	1.118	.6**	1.2**	.583	.5*	.725	1.2*	.386	1.2**
.333*	.630	.830	1.030	.6**	1.2**	.907	.312	.5*	1.4*	.208	1.2**
1.116	.1*	.770	1.440	.6**	1.2**	.579	.505	.7*	1.2*	.336	1.2**
.816	.303*	.793	1.283	.6**	1.2**	.942	.270	.7*	1.4*	.457	1.2**
.525	.5*	.815	1.131	.6**	1.2**	INTERIOR POINTS					
.660	.408	.804	1.2*	.6**	1.2**	1.*	.266	.303*	1.2*	.037	.934
1.043	.150	.775	1.4*	.6**	1.2**	1.*	.258	.303*	1.4*	.045	1.143
FACE POINTS						1.*	.264	.5*	1.2*	.236	.936
1.162**	.1*	.752	1.2*	.561	.946	1.*	.256	.5*	1.4*	.245	1.145
1.162**	.1*	.737	1.4*	.548	1.119	1.*	.240	.7*	1.2*	.460	.960
1.162**	.175	.303*	1.2*	.110	.882	1.*	.232	.7*	1.4*	.469	1.169
1.162**	.128	.303*	1.4*	.151	1.065	.833*	.303*	.783	1.2*	.576	1.077
1.162**	.170	.5*	1.2*	.284	.886	.833*	.361	.5*	1.2*	.168	1.007
1.162**	.158	.5*	1.4*	.294	1.069	.833*	.346	.7*	1.2*	.425	1.025
1.162**	.137	.7*	1.2*	.485	.915	.667*	.457	.5*	1.2*	.064	1.114
1.162**	.120	.7*	1.4*	.499	1.111	.667*	.451	.7*	1.2*	.374	1.124
1.*	.297	.303*	1.**	.006	.704	.930	.303*	.5*	1.2*	.212	.964
1.*	.286	.5*	1.**	.214	.715	.920	.303*	.5*	1.4*	.215	1.193
1.*	.267	.7*	1.**	.434	.734	.900	.303*	.7*	1.2*	.442	1.191
.833*	.384	.5*	1.**	.139	.739	.588	.5*	.7*	1.2*	.340	.996
.833*	.372	.7*	1.**	.394	.754						

RETROSPECTIVE RATING PLAN RATIOS FOR

$P = 5{,}000 \quad C = \Gamma = 1.162 \quad Rv = .9249$

RETROSPECTIVE RATING PLAN RATIOS FOR
$$P = 25{,}000 \quad C = \Gamma = 1.162 \quad Rv = .8668$$

RETROSPECTIVE RATING PLAN RATIOS FOR

$$P = 100,000 \quad C = \sqcap = 1.162 \quad Rv = .8559$$
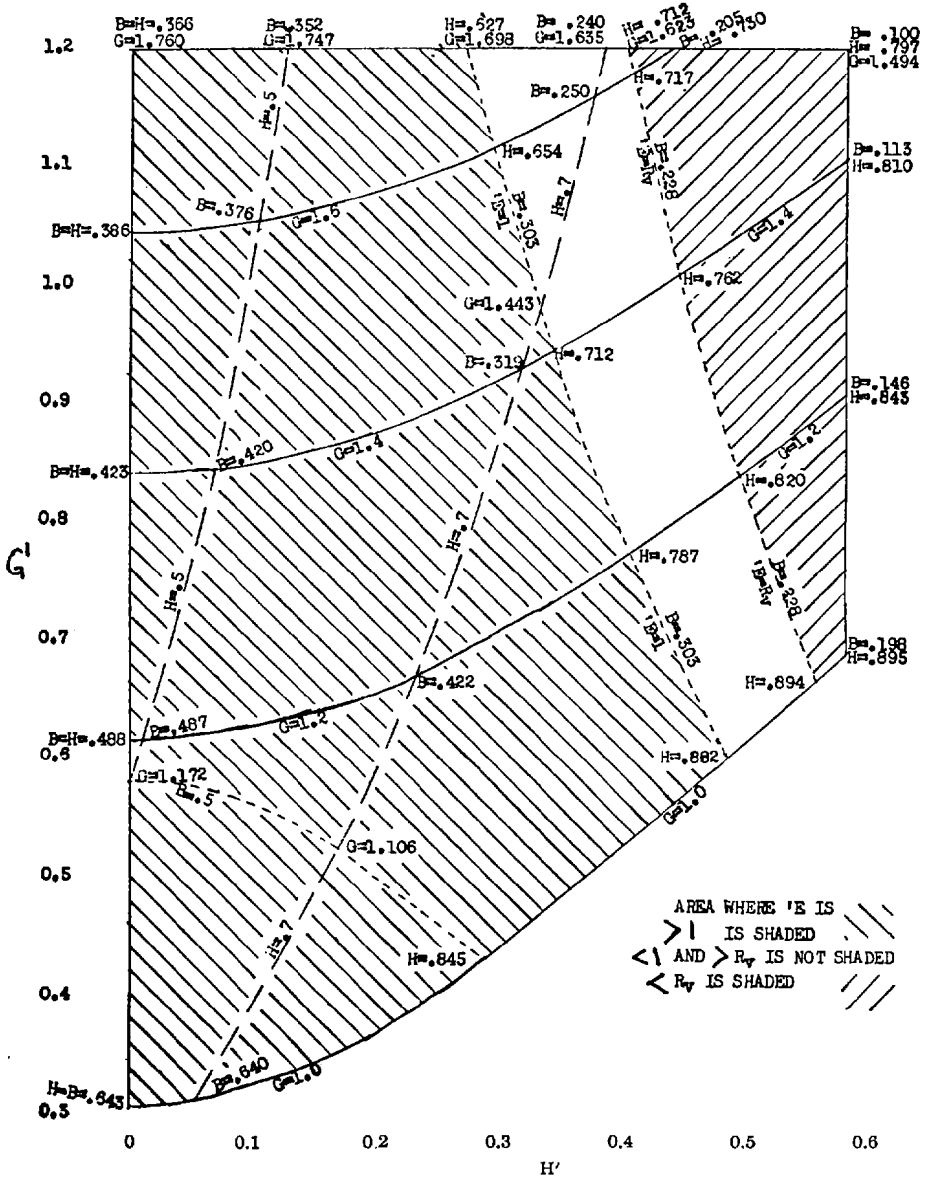
REVIEWS OF PUBLICATIONS
CLARENCE A, KULP, BOOK REVIEW EDITOR

Basics of Supervision. H. W. Heinrich. Alfred M. Best and Company, Inc., New York, 1944. Pp. xi, 180.

The author of this book is the well-known pioneer in the field of safety education and the author of one of the basic texts in the field of safety engineering.

For many years safety has been included in most courses in production supervision given to foremen in industry but this subject is only one of many included in this book; for the first time an effort is made to discuss the problems of supervision in such a manner as to emphasize particularly the supervisor's relation to industrial accident prevention.

The book is divided into two Parts. Part I is entitled *Basic Instruction* and deals primarily with the fundamentals of supervision although even these are discussed in part in the light of their relation to safety. There are 122 pages in this Part. Part II is entitled *Advanced Instruction* and is devoted almost exclusively to a discussion of safety. Although this section is written for the supervisor it could be studied with profit by the experienced safety engineer. There are 53 pages in this Part. Every chapter is followed by a brief review and a series of *Suggested Questions.*

The key position of the foreman in relation to production and safety has long been recognized. The objective of this book is to present the "basics" of supervision in such a manner that the foreman will be able to learn the few fundamentals quickly and at the time time learn to apply them to his daily tasks, both to secure production and to reduce accidents.

Any book of this size which deals both with supervision and safety must of necessity confine itself to fundamentals. The author has shown good judgment in selecting the important parts of both subjects.

This book is written in clear and concise language and can be used successfully both for self-study and for group discussion purposes. Considering the purpose of the book the only feature which could be improved considerably is the suggested questions which appear at the end of every chapter. These questions generally require memorization of the text rather than the application of the textual material to specific situations.

This work can be highly recommended to companies that have not had any formal supervisory courses or whose supervisory courses have lacked the proper emphasis on accident prevention.

*V. S. KARABASZ.

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* Guest reviewer.

Fire Losses and Fire Risks. Herbert A. Simon, Ronald W. Shephard and
　Frederick W. Sharp. University of California Press, Berkeley, 1943.
　Pp. x, 65.

This is one of a number of studies prepared by the Bureau of Public
Administration of the University of California to discover and improve
methods for evaluating administrative agencies in terms of the services
produced by their activities. The final test of a fire department's operating
effectiveness is the city's fire loss. The use of this test makes it necessary
to set up some standard as to how large the fire loss ought to be. Only by a
study of *what there is to burn* is it possible to apply a standard to *what is
burning* in order to determine whether losses are high or low.

The subjects of this study are the fire losses and the underlying values
in the cities of Oakland and Berkeley for the period 1935 to 1940. A very
detailed and complete discussion brings out the practical usefulness of such
a study in evaluating the efficiency of a fire department. It shows that the
maintenance of a continuous study of this type would be a practical matter
and a very worthwhile project for most cities.

The method used consists of comparing company exposure expressed in
dollar losses, classified by type of construction and occupancy, with fire
dollar losses similarly classified. When enough data have been collected
along these lines it is a simple matter to calculate the expected fire losses
in a community from an inventory of property in the community. The rela-
tion of actual to expected fire losses then gives a measure of the efficiency
of the local fire fighting forces.

Of particular interest is a special study of the frequency of fires in
dwelling units. The incidence of interior fires is found to be approximately
proportional to the number of dwelling units in the building. The geo-
graphical variations in the fire rate for dwelling units appear to be largely
accounted for by the average age of the structure. What physical and social
conditions are the real cause of excessive fires in old structures is not
entirely clear.

Throughout the study proper emphasis is placed on the statistical reli-
ability of the results and a summary of the statistical methods used is
included.

If tabulations of fire exposures and fire losses along the lines suggested
in this study were available for large cities throughout the country they
would not only be of great assistance in the administration of fire depart-
ments but would also be very useful in checking the level of insurance rates
between cities. Any encouragement which could be given to cities to set up
such studies on a continuous basis would be very worthwhile.

F. E. SATTERTHWAITE.

The History of Acquisition Cost in New York. Francis R. Stoddard. Privately published, New York, 1944. Pamphlet. Pp. 60.

This pamphlet, written by the Hon. Francis R. Stoddard, former Insurance Superintendent of New York, traces the history of acquisition cost in New York, particularly by quoting decisions of the State Insurance Department in connection with acquisition cost rulings.

The pamphlet traces the procedures followed by the various Superintendents in New York as they performed their duties of protecting the interests of the citizens of New York, in the application of expense control. The history starts with the formation of the New York Fire Insurance Exchange in 1899 and the attempt of the companies to control acquisition costs by voluntary agreement. This problem is traced through its various ramifications to the present.

The pamphlet is very much worthwhile and affords a record of acquisition cost regulation which should be in every company's possession.

W. J. CONSTABLE.

Hospital Malpractice Insurance. Gerhard Hartman. University of Chicago Press, Chicago, 1943. Pamphlet, Pp. 72.

Although the pamphlet does not mention just what is Mr. Hartman's work, it is apparent to any insurance man that it was not written by someone in the insurance industry. The booklet gives a comprehensive picture of hospital malpractice insurance when read from the layman's angle. However the manuscript definitely does not belong in the insurance Hall of Fame.

In outline the pamphlet tells the entire story of hospital malpractice insurance, including its background, the need for coverage, the manner in which this need is satisfied and a chapter on rates and rate-making.

His philosophizing however on insurance aspects is so general in many instances that he could be talking about any line of insurance. In discussing the advantages of hospital insurance his fourth point reads as follows: "Where the loss ratio to insurance cost over a period has proved to be low, it might prove economical to attempt group self-insurance, assuming that there is not likely to be any marked changes in the loss ratio in the future." This of course is so platitudinous that it is meaningless.

Mr. Hartman throughout seems to think that malpractice premium cost is very high and implies that self-insurance would reduce a premium probably averaging $200. Yet in his section on claims he shows a case where suit was for $75,000.

The pamphlet has many merits despite its shallowness as a technical insurance treatise. Mr. Hartman has rather conclusively proved that hos-

pitals approved by the American College of Surgeons are much better risks than unapproved hospitals and that they should be treated differently in malpractice insurance. His chapter on rates and rate-making is constructive and his case history examples are effective.

In summary, this book, which is one of the few written documents in malpractice insurance, is very readable and should be of interest to all those in both the hospital and insurance fields. It has many tables and other information of value. Nevertheless, it does not fulfill the requirements of a clear-cut, concise insurance analysis of hospital malpractice insurance.

ARMAND SOMMER.

Industrial Life Insurance. Malvin E. Davis. McGraw-Hill, New York City, 1944. Pp. xii, 399.

Governmental discussion in Great Britain and in the United States has been critically directed against the limitations and deficiencies of the small level premium individual life insurance contracts called "industrial." Each successive discussion tends to repeat the criticism previously developed. Even the appraisals by Sir William Beveridge seem to me seriously inadequate, and in the quotation of certain statistical relationships, to be misleading, if not inaccurate.

Mr. Davis' book is the first really comprehensive treatment of the subject in the United States. It is peculiarly welcome because of its comprehensiveness and general reliability. The reader must be alert to note which of 4 levels is being discussed at any point: (a) the experience of the Metropolitan Life Insurance Company alone, (b) the experience of 3 life insurance companies, the Metropolitan, the Prudential and the John Hancock, (c) the situation of 31 of the larger industrial insurance companies, (d) the situation in industrial insurance as a whole. The author is careful in his statements but the reader must recognize that net cost comparisons and statements concerning available services may not exactly apply to the smaller companies which have been given relatively little attention.

Mr. Davis shows that industrial insurance is individual life insurance on the level premium basis. It involves not merely benefits for funeral expenses but a contingent savings element, particularly valuable during the depression years. He shows that industrial, even as ordinary insurance, involves the 3 factors of mortality, interest and expense. He goes to some pains to show that industrial insurance follows the long-standing traditions of ordinary insurance but that these traditions have been adapted for the practical service of those receiving smaller incomes. He indicates that for most of the

clients buying industrial insurance a quarterly, a semi-annual or an annual premium does not fit the weekly pay interval. Those in the group insurance and salary savings fields will be apt to contend that their form of protection is still better adapted to the periodic pay-check, since contributions toward group premiums and all salary savings premiums are collected at the source, with even less inconvenience to the employee and his family.

The industrial business is estimated to insure 50 million persons under 90 million policies. Since most of the readers of the book do not own industrial insurance, they will learn a great deal from its discussion about industrial insurance operation. Thus among other things they may learn that:

1. Rates are determined for age next birthday rather than age nearest birthday, since the mortality table on which the rates are based has been prepared on that basis.

2. One large company, dividing total premiums among policies terminated by death, maturity, cash surrender and lapse, shows only .3 per cent of premiums on policies which lapse with neither a cash settlement nor extended insurance benefits.

3. In one company about one-third of the new policyholders are electing monthly rather than weekly premium payments, although they expect the service of home collection in either case. Forty-four percent of the business in force is currently on the monthly premium basis, a part of the group having elected monthly premium payments initially, the other part having changed from weekly to monthly payments at the company offices, with a 10 percent reduction in premium cost.

4. The larger the proportion of salary allotted to life insurance, the more persistent is the policyholder in maintaining his insurance in force.

5. As a result of the level premium mechanism, interest on investments has been nearly enough to meet the expenses of operation. (A rather important point in considering the question of expenses.)

6. The use of agents in industrial insurance has produced a large volume of protection. This is in contrast to relatively small volume under plans dispensing with agents: Wisconsin State Insurance, Massachusetts, New York and Connecticut savings-bank insurance, British Post Office insurance.

7. One company pays its dividends by waiving a number of weekly premium payments, another translates dividends into additional paid-up benefits.

The structure of the book is evident from the table of contents. Part I comprises a chapter of introduction and general summary under the title

of *Life Insurance for Families of Modest Means.* The successive Parts are as follows:

Part II—The Industrial Policy Contract
Part III—How Industrial Life Insurance is Transacted
Part IV—The Cost of Industrial Life Insurance
Part V—The Actuarial Basis of Industrial Life Insurance
Part VI—The Effectiveness of Industrial Life Insurance

The appendices cover a variety of major and minor points of interest.

Even as I feel that this book is an extremely valuable reference work and helps to correct certain misapprehensions about industrial insurance, I feel also that its over-emphasis on the low income of the American working man is too much in the tone of our depression pessimism and too little in the tone of our post-war programs for "full employment." The author is in danger of making too good a case for the economic failures of American business and industry. Yet on the evidence of the steady transfer from weekly to monthly premium payment and of the wide purchase of both ordinary and group insurance by industrial policyholders it seems clear that the relative importance of industrial insurance is shrinking and that of ordinary and group is increasing. I should say that Mr. Davis has rationalized the value of industrial insurance in servicing low income purses in the past rather than analyzed adequately the need for it in the immediate future.

As an indication of the current attitude toward the amount of insurance protection the federal old-age and survivors insurance program recently developed in the United States can be examined. Under this program monthly installments are provided to the orphaned children and the widowed mother of these children when the deceased insured worker has been a full-fledged member of the plan. This protection may range from a relatively small amount up to amounts in excess of $10,000. The average protection of such persons probably is at least $2,500. Since this social insurance is regarded as a floor of protection which individual and group insurances supplement, the industrial policy seems proportionally very small. Also millions of men now in the armed services are carrying life insurance averaging more than $9,000, a large proportion from the wage earners or potential wage earners in industry, commerce and agriculture.

Mr. Davis has outlined the remarkable improvement which has taken place in mortality rates particularly at the lower ages during the period of industrial insurance development in the United States. This mortality improvement for ages 1 to 17 inclusive indicates that a pure net annual premium not in excess of $2 per $1,000 provides one-year term insurance for the entire child population. At many ages, particularly among the girls, the pure net premium would be below $1.

One large ordinary company not carrying industrial insurance has suggested that children constitute a dependent category whose period of dependency is rather temporary and that term insurance might more suitably deal with this need than ordinary. When a father buys ordinary insurance on his own life he could round out family protection by using term insurance for the children. A company not writing the industrial line also suggests the protection of dependents by group coverage. Premiums are paid by the employer and the working member of the family through payroll deduction.

The 3 forms of insurance, ordinary, industrial and group, are so markedly different in their whole organizational structure that it has to be recognized (a) that the 3 methods of protection will reflect distinct methods of expense allocation; (b) that small policies on a term basis in ordinary will involve a considerable expense load; (c) that dependents' insurance under group will involve a per capita expense representing a high percentage of a pure premium as low as $2; (d) insuring the child through group insurance subjects the protection to interruption when the father changes employment; (e) term insurance whether under ordinary or under group alike has no growing cash balance which industrial insurance provides under its level premium basis.

Whether ordinary and group will make large inroads on the industrial insurance business—particularly should the high wages of the present be drastically readjusted in the early post-war years—remains problematic. In any event industrial insurance under level premium long-term contracts involves responsibilities for carrying forward the commitments of those contracts. It is more important that changes should develop through an evolutionary rather than through a too revolutionary approach and that vested rights should be appreciated in the changes in practice now developing.

W. R. WILLIAMSON.

Practical Fire and Casualty Insurance. J. Edward Hedges. The National Underwriter Company, Cincinnati, 1943. Pp. x, 278.

This book was prepared primarily as a study manual for insurance agents, especially those preparing for the Indiana agents' qualification examinations. Its origin accounts for its elements of strength and weakness. For this limited purpose the book should prove satisfactory. In fact, in mimeographed form prior to publication, it appears to have been used effectively. But when it is found that the book is intended also for broader, more ambitious purposes, doubts arise as to its contribution to the fund of insurance literature.

The author states that he has used the material as a text in college classes

and also as a basis for preparation of candidates for the Chartered Property Casualty Underwriter (C.P.C.U.) examinations of the American Institute for Property and Liability Underwriters. For these purposes the book seems to possess overwhelming handicaps.

It is difficult in fact for this reviewer to conceive of a single treatise which would be useful to the rank and file of applicants preparing for state qualification examinations and which would at the same time measure up to the standards of a college text. The author seems to recognize this difficulty. He points out some of the limitations of his book as a college text by stating on page v that "In scope the book is not as comprehensive as the customary college text-book on insurance, nor is it as detailed as the specialized treatises dealing with one or another of the branches of functions of the business." Nevertheless on the same page he expresses the hope "that it may prove useful also as a text for college courses in fire and casualty insurance."

One of the principal shortcomings of the book as a text is its factual descriptive character. It includes very little in the way of insurance principles. In the first chapter, within only 16 pages of text, the principles of insurance are presumed to be covered. Not only are various aspects of risk discussed but, to mention not all but only a representative selection, the law of large numbers, the functions of insurance, insurable interest, moral hazards, valued policies, deductible clauses, reinsurance, standard policies, coinsurance, insurance law, rates, prevention and social aspects of insurance. In such a short space it is difficult to see how the treatment could be other than much too superficial for text use in a college course.

Likewise, beyond the first chapter the book contains very little of an analytical nature. Types of carriers and the agency system are described but not evaluated in a chapter of less than 15 pages. The standard fire contract, using the 1886 New York form as a basis and including brief interpretations of some of its provisions, is described in a chapter of 30 pages. Subsequent chapters, varying from 20 to 30 pages, are entitled *Extended Cover and Collateral Fire Lines, Consequential Loss* (including use and occupancy insurance), *General Liability and Workmen's Compensation, Inland Marine Insurance, Automobile Insurance, Miscellaneous Casualty Lines,* and *Surety Bonds.* Perforce the treatment of each topic is inadequate for a college course.

In the discussion of the fire insurance contract it is unfortunate that the author chooses to center his discussion around the 1886 New York standard form. The reason of course is easy to understand. The contract most used in Indiana at the time the material was prepared was the 1886 New York form. But before the book was published the 1943 New York standard form had appeared and was being adopted in state after state. The book is dated December 1943. By April 1, 1944 the 1943 New York standard form was

to be used even in Indiana. Unfortunately too the author sees fit to devote less than a page to the changes introduced by the new form. As a result, the book today on this subject has very limited usefulness as a text in fire insurance at the college course level or elsewhere.

Also the book has not been written or edited with sufficient care to qualify it as a college text. There are many references to principles or contract provisions to which the reader has not theretofore been introduced and with which he may be unfamiliar. For example on page 51 reference is made to short rates on cancellation of a fire insurance policy by the insured but nowhere before or after are short rates described. Nor are reasons sought or given for the difference in refund when the insurer rather than the insured cancels. Likewise on page 62 a clause referred to as the "waiver clause" (actually the waiver of inventory clause in the coinsurance clause) is discussed without any explanation of its nature at a prior or subsequent point. To a reader without knowledge acquired elsewhere such paragraphs defy comprehension. Clarity is sacrificed for the sake of brevity.

The author must also be charged with loose and misleading statements. On pages 9 and 10, a mathematical illustration of the necessity for coinsurance, taken from the New York Merit (*sic*) Committee report, is presented. In it the tacit assumption is made by the author that the only properties covered by insurance are those which suffer a fire loss. The distribution of losses per 100 fires is presented. A cost of insurance then is calculated for each of the hundred properties without regard to the number of properties exposed to risk and insured, but on which no losses have occurred. Also on page 45 the statement is made that the 1886 New York fire form contains a provision which renders the entire policy void if the interest of the insured in the property is not correctly stated. The author adds: "(The 1918 New York form contains no such provision.)" It is true that this precise provision does not appear in the 1918 form and that no similar provision appears at the same point in the 1918 form but the implication that an incorrect statement of the insured's interest in the property does not void the 1918 form is decidedly misleading. Similarly on page 53, discussing the protection of the mortgagee's interest in property, the statement is made that "All of these methods are defective in that acts of the mortgagor or his failure to pay the premium may void or terminate the coverage." Among the methods referred to, and for which the statement is incorrect, is the method of the mortgagee carrying separate insurance. On page 195, discussing burglary and theft lines, "The writing of the open stock coverage differs from the writing of the residence form only in that a different classification system applies." And on page 212, discussing accident and health contracts, "The life insurance contract with disability benefits is, of course, non-cancellable but disability is only a small part of

the contract. Such policies, incidentally, provide the *only* example of *life indemnity*, that is, benefits payable for life." (Italics are the author's.)

In some places too the author has succumbed to the temptation to quote difficult policy provisions in detail and avoid clarifying explanation. This is particularly noticeable in the chapter on automobile insurance, especially pages 178-180, where the major portion of the text is direct quotation.

The book is completely undocumented. One searches in vain for a foot-note. At the close of each chapter the author presents a number of *Suggestions for Further Reading*. Most of the suggestions refer to standard works.

The book has one feature of value to those preparing for examinations, whether agents' qualification examinations or those of a college course. A number of questions and some very good practical problems are provided at the end of each chapter. In fact the problems frequently are too difficult for those who would rely on the accompanying text alone, but they should be helpful to test the extent of the student's ability to apply information to practical situations.

*C. M. KAHLER.

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* Guest reviewer.

Risks We Face. An Introduction to Property Insurance. Laurence J. Acker-
    man and Ralph W. Bugli. Prentice-Hall, Inc., New York, 1944. Pp.
    viii, 120.

The extent to which insurance should enter into the curricula of secondary schools is a moot question. If it is to be taught, there is a need for an ele-mentary simplified treatise which the authors of *Risks We Face* seek to satisfy. It is evident both from the statement of the authors in the *Introduction* and from the list of those to whom specific credit is given on pages iv and v that this is their principal purpose. Collateral purposes which such a book might reasonably be expected to serve in introducing property insur-ance to those who need nontechnical understanding are expressed by the authors, but the book nevertheless must be reviewed as a text for secondary school students.

It is indeed a difficult undertaking to prepare a book for lay readers and secondary school students about such a technical field as property insurance. Certainly such a book must avoid technical details and must be written in the simplest terms. The authors have done an excellent job in this respect. Details have been avoided. Clarity of expression has been attained without use of technical terminology. For the reader who wishes to learn the mean-ing of some of the most frequently used technical terms a glossary of 50 terms is appended. The selection, except for the inclusion of such terms as *expense ratio* and several already fully described in the text, is very good. The definitions with but few exceptions are quite satisfactory.

In the choice of topics to include and those to exclude the authors have shown considerable care. Several choices however are difficult to understand. The book begins with a discussion of perils and methods of meeting risk. It continues with a presentation of the origin of insurance and its development during the early years of our colonial and national life in America. The principal types of insurance carriers are then reviewed. To the selection of topics thus far, little objection can be raised. But in the next chapter, *The Insurance Contract,* the question of insurable interest and the matter of coinsurance consume over half of the 10 allotted pages. As a result topics of importance even to the lay reader are omitted. Among such topics are the meaning of fire as the term is used in the contract, excluded perils and the significance of such exclusions, conditions which suspend or restrict the coverage and the fundamental basis of loss settlements. All of these topics seem to this reviewer to be essential to give the reader, as the authors put it, "a general understanding of the property insurance institution."

The book continues with a presentation of the functions of agents and brokers, the scope of property insurance protection and the operation of a property insurance company. It seems that a somewhat more logical development would be to discuss the different coverages within the field of property insurance immediately following the discussion of the fire insurance contract and then to link the agency system and insurance company operation, if the latter topic is to be covered at all. As the book now stands, a copy of an agent's daily report and a brief description of home office underwriting, including reinsurance, are included. The necessity for more than passing mention of these topics is not evident, whereas the omission of any discussion, however brief, of a few of the fundamental principles of agency law, seems unwarranted. The secondary school student and the lay reader undoubtedly will be much more vitally concerned with this latter topic than with a number of those which are covered.

The book concludes with a treatment of fire prevention, a discussion of how property insurance serves the nation and a presentation of opportunities for careers in property insurance.

Several extremely difficult concepts have been developed rather briefly and most lucidly. A case in point is the description of coinsurance appearing on pages 42 to 46. Here the discussion is the clearest which this reviewer has observed in any text. On the other hand some topics have been oversimplified and errors have crept in. For example the New York conflagration of 1835 is discussed in considerable detail. The impression is left with the reader that the insurance companies generally weathered the storm and policyholders went unscathed. The authors conclude on page 25: "The New York fire of 1835 was, in many ways, a dramatic test of the strength and sta-

bility of the young American fire insurance business." A test of strength and stability it was—but according to all the historians a test which most companies operating in New York failed to meet. In fact this conflagration pointed out one of the serious deficiencies in the line along which insurance then was developing. Because of adverse tax legislation in several states, New York included, it was almost prohibitive for foreign companies to operate in these states. The business of each company was local in nature and the spread of risk necessary to sound stable operation was lacking. The conflagration in 1835 was disastrous but it brought to light the unwisdom of such legislation when 23 out of 26 companies failed. This legislation was abandoned and unearned premium reserve legislation and state supervision developed as a substitute.

The discussion of how fire insurance rates are determined (p. 71) is so brief and generalized that its value is rather questionable. Perhaps one should not infer from it that rates are determined with statistical exactness and precise equity but the inference is difficult to resist. Along the same line of thought on p. 76 a chart appears in which the trend of fire insurance cost from 1913 to 1943 is compared with living costs over the same period. The trend of fire insurance cost is shown to be downward almost without interruption, whereas the cost of living is shown to have risen sharply during World War I and to have remained high, though declining, until the end of the period when it began to rise sharply again. The implication, reenforced by a pictograph, is that fire insurance costs have resisted the upward pull of living costs. But there is no reason for any appreciable increase in insurance costs when prices rise since insurance costs are quoted in terms of rates per $100 of insurance. A doubling of values would require no change in rate but only the application of the original rate to the larger amount of insurance which would be carried at the new value level. It is true that rates have been reduced due to improved construction, protection and prevention, but a comparison of the change with price changes in general is of dubious import.

Another chart which presents a similar difficulty appears on page 72. The chart shows the distribution of the average premium paid for $100 of protection in 1942. The average premium was 61 cents, of which 35.7 cents went to pay losses, 12.5 cents to pay for the agent's services, 3.7 cents for field supervision, 3.6 cents for company salaries, 2.9 cents for public services and miscellaneous expenses and 2.3 cents for taxes, leaving approximately ¼ cent as underwriting profit for the companies. Ordinarily such distributions are shown per dollar of premium income so that direct comparisons can be made. Here the reader must keep in mind the base of 61 cents and, for example, calculate that 12.5 cents for agent's services represents an average in excess of 20 per cent of the rate.

It is unfortunate that a book of this type should be limited to property insurance. If insurance is to be taught as part of a course in secondary schools, life and casualty lines of insurance should be included as well. The probable reason for the limited scope of this book is that it is sponsored by the National Board of Fire Underwriters which of course centers its interest in fire insurance and allied lines. This sponsorship however creates an even more serious question since the National Board is an organization of capital stock fire insurance companies. Have the authors been able to avoid bias in their treatment? The question unfortunately cannot be answered positively in the affirmative. It is the reviewer's belief that the bias is unconscious but nevertheless it is present. For example, on page 22 appears the statement: "Finally came the capital stock companies *whose additional financial strength, in the form of capital funds plus growing reserves,* permitted them to keep pace with the demands of a rapidly expanding nation." (Italics are the reviewer's.) And on page 50, with reference to the agency system supported by the stock companies, "the property owner . . . is obviously buying not only a policy but a complete insurance service, *including the expert help of the local agent . . .*" (Italics are the reviewer's.) A similar statement appears on page 56. And on page 61: "For maximum security, each property owner should cooperate with a qualified insurance agent or broker in analyzing the perils to which his property is exposed and the insurance coverages that will furnish necessary safeguards against financial loss."

The book contains a number of eye-catching graphs and illustrations which are geared to the level of the average reader and portray excellently the ideas which the authors seek to convey. At the end of each chapter projects are suggested by which some of the principal matters under discussion may be expanded, tested or proved. In addition several problems are appended to each chapter and suggestions are made for further reading. Except that some of the suggestions, such as Barbour's *Agents Key to Fire Insurance* and Dean's *Analytic System for the Measurement of Relative Fire Hazards,* are beyond the capacity of lay readers and perhaps even some secondary school teachers, these supplementary materials are valuable additions to the work.

*C. M. KAHLER.

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* Guest reviewer.

Voluntary Medical Insurance in the United States: Major Trends and Current Problems. Helen Hershfield Avnet. Medical Administration Service, Inc., New York, 1943. Pp. 104.

This rather comprehensive digest of present and past plans furnishes a splendid background and reference for the appraisal of a rapidly developing form of insurance.

The author made her study at the request of Group Health Cooperative, Inc., of New York, one of New York's medical cooperatives which so far have achieved little growth. Her study was made for the purpose of collecting and analyzing factual material about medical insurance plans now in operation and of evaluating from this data trends and tendencies which might be helpful in directing the development of future plans.

Her factual report contains an historical outline of medical insurance; excellent descriptions and appraisals of many representative plans classified under various kinds of sponsorship, administration and control, including types of service and benefits; and an analysis of plans in operation in New York City.

The reader will obtain good snapshots of medical plans he has heard and read much about—the Ross-Loos Clinic of Los Angeles, the Kaiser Permanente Foundations of Washington and California and the Michigan Medical Service, a statewide plan sponsored by the Michigan State Medical Society with an enrollment greater than all other plans combined but having experienced more difficulties than most others.

Interspersed is the author's comment and opinion on many significant factors which have affected the development of medical insurance. She discusses the possible influence of labor unions, the relationship of Blue Cross Hospitalization plans, individual versus family coverage, eligibility factors such as income limits and minimum percentage requirements for groups, probable enrollment saturation points in certain areas (surprisingly low in many urban centers), administrative problems, methods of reimbursing the insured, methods of operation, comprehensiveness of coverage, and rates.

The casualty actuary will find an ample but bewildering array of rates for perusal. Because of the newness and experimental character of medical insurance, rates vary considerably. In some instances experience, even of short duration, has necessitated radical adjustment of rates or coverage.

Miss Avnet has made a fine contribution to the further expansion of medical insurance.

HAROLD R. GORDON.

Injury and Death under Workmen's Compensation Laws (Horovitz on Workmen's Compensation). Samuel B. Horovitz, LL.B. Wright and Potter Printing Company, Boston, 1944. Pp. xxxii, 486.

This is a hornbook on workmen's compensation laws written by a member of the Boston Bar Association who for 20 years has been active as a practicing "plaintiff's" attorney before Industrial Accident Boards and Commissions. Published late in 1944, it has already "sold" approximately 4,000 copies and has excited considerable comment. The book is a concise work

covering exactly 400 pages of text and notes. It is written in a simple style, in clear everyday language, which makes it understandable even to members of the general public unschooled in the law for whose benefit the book is evidently largely written. The scope of the author's treatment is sufficiently broad to embrace the essentials of the more important subdivisions of a highly complex branch of the law. It includes a survey of the following highlights: personal injury arising out of and in the course of the employment, employer and employee relationship, notice and claim, average weekly wages, incapacity, judicial review, dependency benefits, serious and willful misconduct, and common law suits. On the whole the author's scope with regard to the highlights of workmen's compensation law mentioned above is adequate. Mr. Horovitz has thoughtfully furnished the reader with a detailed index and liberal footnote citations, which together provide the means for easy reference to a starting point in the reader's search for the legal answer to a compensation problem.

Because *Injury and Death Under Workmen's Compensation Laws* is a hornbook, a general word of caution ought to be said with regard to its use by the general public. The user, particularly the layman, must recognize that the compression of a complex legal subject into a book of 400 pages must of necessity result in a sketchy digest. The author's treatment with regard to scope and detail must of necessity be limited. *Horovitz on Workmen's Compensation* is not the beginning and the end of workmen's compensation law as it exists today in more than 50 jurisdictions. Care must also be exercised by the reader to avoid the common pitfall of accepting a citation purporting to represent the law as it exists in one jurisdiction as the prevailing law in all other jurisdictions. The cases cited should be read in their entirety and a search made for other cases which may distinguish or qualify the principle of law indicated in the citation.

Because it was largely written for the general public the book must be criticized for the manner in which the subject matter is presented. First of all the author's approach is distinctly biased in favor of the employee as against the employer. The author himself recognizes his shortcomings and attempts to explain it in his preface. On page viii he writes: "to make the subject matter intelligible the author has admittedly taken sides on controversial questions." A study of his book will show that Mr. Horovitz goes beyond taking sides in the interest of clarity and better understanding. It is not without significance that in 400 pages Mr. Horovitz only once gives his open approbation to something which disadvantageously affects the financial interest of employees; that is, with regard to the assessment of costs on a prevailing party on appeals, for all practical purposes a very insignificant matter in workmen's compensation, and of very doubtful value to an employer who prevails on appeal. A perusal of his book will reveal that

Mr. Horovitz is not a neutral; he further excuses his lack of neutrality by stating in his preface: "True neutrality in Workmen's Compensation is a myth." I would not have Mr. Horovitz alter his personal convictions against his will but I submit that even a belligerent, when he undertakes to write "a legal book" for the general public untrained in law, owes an obligation to the public which will presumably look to the book for information and guidance. That obligation is to divorce his personal prejudice from his treatment of the subject to the extent of avoiding the occasion of creating erroneous impressions in the minds of lay readers. The author has all too frequently failed in this regard. At times the lay reader could get the impression that every decision resulting in a denial of, and every legal bar to, a workmen's compensation award are unsound as a matter of law, are unreasonable as a matter of logic or are necessarily unfair as a final result. Of course Mr. Horovitz did not deliberately intend to create such impressions. The result is probably due to 25 years of militant experience as an attorney for employees exclusively but the result is none the less regrettable.

In still another respect *Injury and Death Under Workmen's Compensation Laws* must be found wanting. In proposing changes in the law the author frequently fails to clearly set forth cogent reasons to support his argument. To give one example, take his argument that a workman who works on land but who occasionally in the course of his duties goes aboard ship and there sustains an injury should not be considered, for purposes of compensation benefits, as coming within the scope of the Federal Longshoremen's and Harbor Workers' Act but should receive his benefits under the Jones Act, which by its express terms, and the clear intent of Congress, applies only to seamen and members of crews. Other than to indicate somewhere in his book that compensation benefits under the Jones Act are greater Mr. Horovitz offers no reason to support this contention, but leaves the reader to speculate how the argument can be defended in law or logic. He who criticizes the existing law and proposes radical changes in the fabric of that law should give logical reasons in support of his contentions and thus enable the reader (particularly if the reader is a layman) fairly and intelligently to determine whether the offered proposition ought to be accepted or rejected.

Mr. Horovitz has further failed to set out the historical reasons why the law denies workmen's compensation benefits to certain groups of individuals. For example he shows considerable impatience with the rule that dependents of an employee who commits suicide cannot recover benefits for an industrial injury. Mr. Horovitz says that rule is irrational and the product of bigotry. This rule is not the brain-child of "railroad favoring judges" as the author implies, but a cardinal principle of public policy, as old as legal tradition itself, that the law will not extend its helping hand to aid a wrongdoer. The law has recognized this principle from time immemorial as a deterrent

to individuals from committing the social and moral crime of self-destruction. Take the policy of the law which denies dependency compensation benefits, except under certain conditions, to illegitimate children of a deceased employee. Here again social policy requires, and not without reason, a deterrent for individuals to avoid those illicit relationships which undermine the family and society. Mr. Horovitz argues that the protection of workmen's compensation laws should be extended to all inmates of prisons and penitentiaries despite the fact that these individuals by their crimes against society have placed themselves beyond the protection of the law.

Mr. Horovitz' treatment of those phases of workmen's compensation which relate to the problems of constitutionality leaves much to be desired. The historical background is not clearly supplied. The reader who is unschooled in the law could conclude that many constitutional questions were first raised when compensation acts began to appear. He could conclude for example that the defense of lack of State authority to regulate certain matters of interstate commerce first came into being when employers engaged in interstate industrial activities disputed the right of employees to recover compensation benefits under State workmen's compensation acts. Historically authority to regulate certain matters of interstate commerce is a right granted by the Constitution of the United States solely to the federal government. States have no authority under the Constitution to regulate in these matters. This is true whether the State attempts to regulate interstate commerce in the field of taxation, labor law or any other sphere of governmental regulation, workmen's compensation included. Historically also the defense of lack of State authority has been raised since the very inception of the United States Constitution. It has and will continue to be raised as long as we continue to be governed under the Constitution. We criticize for the same reason Mr. Horovitz' treatment of the subject of workmen's compensation as it relates to admiralty and maritime matters, extra-territoriality, and federal territory.

Lastly, it must be noted that nowhere in his book does Mr. Horovitz clearly define the fundamental principle of workmen's compensation acts. The basic theory of workmen's compensation is to place the burden of industrial disease and injury on the employer rather than on the individual employee or on society. The diseases and injuries for which the employee is to be compensated are those sustained by the employee in his employment and by reason of his employment. Because the reader is not given a clear definition of the basic theory of compensation and because of the author's partisan approach to many compensation problems, I imagine it would be difficult for an employee to understand why injuries and diseases not causally related to, and not sustained in the course of, an employee's work do not create a legal obligation on his employer to pay him compensation under

the law. The fundamental purpose of compensation acts—to put the cost of industrial injuries and diseases on industry—must be achieved under the Constitution and the laws of the land, by means of legal process, and through a fair and just administration of adequate workmen's compensation laws with due regard for the legal rights of *both* employer and employee. Those who would have it otherwise would have us stop governing ourselves under a government of laws and be governed instead by a government of men.

In summary, insofar as the work purports to be a hornbook, that is, a brief digest furnishing a general outline and providing an easy starting point in the reader's search for the legal answer to a problem in workmen's compensation, the book is deserving of commendation. It embraces the more important highlights in the field as completely and adequately as 400 pages of text permit. The book deserves to be criticized for bias and prejudice. Bearing in mind the natural limitations of a hornbook, and discounting the author's bias, *Injury and Death Under Workmen's Compensation Laws* is a worthwhile book and its use may be recommended.

*C. W. AKSTENS.

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* Guest reviewer.

STATISTICAL NOTES

BURGLARY INSURANCE STATISTICS

F. S. GARRISON

So far as I can learn, there has been only one paper on Burglary insurance statistics presented to the Society since it was organized in 1914. That was at the meeting on October 22, 1915 when I read an article on this subject. I have been interested in this line of insurance long enough to remember how sorely handicapped the companies were because of the lack of reliable statistics or, for that matter, any statistics whatever. Early in 1911 an organization called the Burglary Insurance Underwriters' Association attempted to establish a statistical plan for the purpose of combining the experience of all stock companies. Prior to that time very few of the companies kept the business segregated so as to show the experience under the various forms of policies.

While attempts were made from time to time to establish some plan for furnishing reliable statistics on this line of insurance, it was not until early in 1914 when a small committee, of which I was a member, working with Dr. Rubinow, who was then President of the Society, adopted the card system, whereby each company member of the Association, which did not have a Statistical Department (and there were several such) furnished the Association with a typewritten or handwritten card for each policy issued and canceled, and another card for losses. The items of information shown on these cards included the company number, year of business, month and year charged, form of policy, endorsements, policy or other identifying number, amount of insurance, class of risk, territory, state, city, premium, and term in months. The "loss" card showed the same information plus the claim number, amount of loss, cause of loss, kind of property lost, ownership, and month and year loss occurred. The three year business was kept separate from the one year business and the entire plan was arranged on a policy year basis. The typewritten or handwritten cards were transcribed to punched cards in the Association Offices. The punched cards were then sent to an outside agency which did the assorting and tabulating work and furnished the Association with the results.

Those companies which had Actuarial or Statistical Departments furnished completed Master cards periodically or at least once a year, showing the total of the companies' business and losses segregated into the various items of information mentioned. This arrangement continued until 1921 when the work was transferred to the Statistical Department of the National Bureau, subject to guidance by that Bureau's Statistical Committee, all the members of which were members of the Casualty Actuarial Society. In 1923 the Burglary Insurance Underwriters' Association was disbanded and its activi-

ties taken over by the National Bureau, which had organized a Burglary Insurance Department on November 1, 1923. The original Statistical Plan has been continued down to and including the compilation for the policy year 1941 without making any change in the fundamentals of the original plan but with some condensation and refinements which resulted in somewhat less detailed work without weakening the value of the plan in any respect.

The recent curtailment of the plan due to a shortage of personnel is beginning to emphasize the value of the information previously furnished. It seems to be human nature to fail to appreciate the value of some conveniences until they are suddenly interrupted or discontinued. This was the case in September of 1938 and again in September of 1944, when the hurricane disrupted a great part of the lighting, refrigerating, telephone and radio services throughout the northeastern part of the United States. This is also true when water supply is shut off even temporarily in a small section of a city, resulting in complaints from the people living in the section affected, even though they are deprived of the use of water for only two or three hours. Many of the Casualty insurance companies which for many years have been accustomed to being furnished with a set of statistics and actuarial data from the Actuarial and Statistical Department of the National Bureau may not have fully appreciated their value until the Statistical Plan was so curtailed that they could no longer obtain information as to several items which was formerly furnished.

It is difficult to select the most important item of Burglary statistical information that has been furnished by the National Bureau. To me, possibly the most valuable item was the experience by state and city. In the article which I prepared in 1915 I stated that "the segregation of the experience as to location by state, territory and city is important because it is well known that burglaries occur more frequently in some cities than in others." For example, in the Residence line there are twelve territories and all states and cities in each territory take the same rate. There are twenty-nine states in Territory IV, which include states as far apart as Maine and Nevada. In addition, some of the larger cities are classified separately. The Residence statistics show the experience in each city in the United States having a population of 100,000 or more. There are also similar but fewer territorial classifications for the Commercial and other Burglary and "All Risk" policy forms.

While the statistics also show the experience by states for all Burglary policy forms combined, they have not been used to any great extent except to show the total Burglary insurance premiums and losses in each state. Probably the experience by policy form is equally as important as the experience by state and city, whether it is used on a countrywide basis or a state and city basis. In actual practice the two items usually have been combined,

together with other less essential but important items of information in considering results for each year.

In the year 1914 the total net Burglary insurance premiums written by all stock companies in the United States amounted to $4,225,594. The loss ratio was 38%. During the year 1943 the premiums written amounted to $37,057,995 with a loss ratio of 20.6%. I mention these figures principally because prior to 1915 there was some doubt in the minds of some insurance men as to the advisability of going to the expense of maintaining a more or less elaborate statistical plan for what many looked upon as a minor line of insurance.

At the meeting of October 22, 1915, Dr. Rubinow stated that "One or two papers on other lines of Casualty insurance have been presented, others are in active preparation. Personal Accident and Health, Burglary Insurance and other lines need as much scientific light, have as much to gain in the future, as insurance of workmen's compensation. Even towards pure theory, towards the application of higher mathematics to casualty problems our Society has not remained indifferent. Both the profound mathematician and the practical underwriter are being equally benefitted by our work."

The value of statistical information is not limited to the making of rates. The Burglary insurance statistics have been presented in such detail that they also indicated what types of risks should be avoided, or the type of physical protection necessary, such as burglar alarm systems and watchmen. An analysis of losses by cause has also enabled the companies to include coverage on certain types of losses that were formerly excluded. Practically all of the so-called Burglary forms have been broadened many times during the last 20 years and now many of the more important forms for Commercial risks are not limited to losses caused through stealing of one kind or another; but in so far as money, securities and valuable papers are concerned, they cover against fire, windstorm, disappearance and other insurable hazards.

The new Residence and Outside Theft policy is another illustration of the important part that statistics have played in giving the public more insurance protection for the same money.

In the Mercantile or Commercial business the classification experience is shown according to the type of business which the Assured conducts, segregated by state and city. There is only one policy form, which, however, may be amended by endorsement to include theft in addition to burglary for an additional premium, but this endorsement is used only occasionally. There are over 200 classifications for this class of business and about 30 separate classifications for Mercantile Safe Burglary insurance, the experience for which is segregated by type of safe or vault and is again subdivided as between money and securities in one class and jewelry, furs and other types of merchandise in the other.

Valuable information as to the type of property stolen is also shown. This has proved particularly valuable in the Residence insurance business and has enabled the companies to insure such property as jewelry, sterling silverware and furs at one rate and all other types of household property at a lower rate. The lowest rate is for articles that are separately described and insured specifically.

Under Residence policies the statistics also show the experience separately by size of policy, arranged in nine groups. This information has been invaluable because of the graded rates charged for this form of coverage. The figures prove conclusively that graded rates are fully justified.

The experience is also shown separately for each company under each form of policy, which enables individual companies to compare their experience with that of all the companies combined and also with each other.

Like many other lines, Burglary insurance is seriously affected by changes in general conditions and even styles of attire. For example, many years ago when ladies wore ostrich plumes in their hats, there was a great demand for such merchandise, with the result that losses on ostrich plumes were substantial and of frequent occurrence. When the fashions changed it was rather difficult to find ostrich plumes anywhere except on an ostrich.

Prohibition had two diametrically opposite effects on Burglary insurance losses. When the Prohibition Law took effect, many Residence Burglary policyholders had stocks of wines and liquors in their residences which were lawfully owned and had been legally acquired and were therefore covered by the policy. Naturally, such stocks were tempting targets for burglars and thieves, with the result that the companies found it necessary within a short time to limit the coverage on such stocks to 20% of the face amount of the policy. Later, however, bootlegging became such a profitable industry that many underworld characters transferred their affections from the burglary business to the illicit liquor business because they found it more profitable.

Judging by what happened after World War I and in fact after most major wars, there is likely to be a severe crime wave after the present war. This possibility must be taken into consideration in determining rates for the future.

In my opinion the growth and profit in the Burglary insurance business during the last 25 years would not and could not have been so satisfactory had it not been for the vital and accurate array of statistics maintained by the Statistical Department of the National Bureau of Casualty and Surety Underwriters, which Department has always operated on the principles and plans prepared by company men who were members of the Casualty Actuarial Society and in close touch with the workings of the Society in other Casualty lines. The information thus furnished has been of inestimable value to the Underwriting Departments of the various companies.

DESCRIPTION OF THE PROFESSION OF ACTUARIAL SCIENCE

Occupational Summary

Actuarial science is concerned with statistical, mathematical, or financial calculations dealing with the probability of future losses or contingencies involved in insurance plans (*e.g.*, insurance against loss of life, disability, unemployment, hospital expenses, etc.). It includes elements such as the evaluating of risks, the calculating of premiums, and the determination of other matters involved in the financial operation of an insurance business.

The actuary is employed for the most part by insurance companies, or by firms or government departments concerned with insurance or pension plans. While his duties vary with the type of insurance or organization, in general, he determines whether the basis of conducting the business is sound, both theoretically and practically, and whether permanent financial stability is being maintained. He is often concerned with the development of contract provisions or general insurance plans and the calculation of appropriate premium rates. It is his duty under participating contracts to design scales for the distribution of dividends to policyholders, and, in addition, to determine the proper basis for valuing the business of an insurance organization. He may also be called upon to work out various accounting procedures required by such valuation.

Essentially, the actuary is a technically trained businessman. Not the least of his duties is to explain complicated matters in insurance to other businessmen and to policyholders, in language simple enough to be understood.

Major Branches

The actuary generally specializes according to (A) class of insurance or (B) by type of organization.

A. I. **Life Insurance**—The actuary is concerned with problems of personal insurance such as life insurance, annuities, and pensions. Special types of insurance considered here are Ordinary, Industrial, Group (including accident and sickness, accidental death and dismemberment, hospital and surgical expenses). Group annuities is a special field concerned with providing pensions for members of specific groups.

II. **Fire, Marine, and other Property Indemnity**—This branch covers property risks resulting from fire, marine disaster, automobile collision, burglary, loss of livestock, or crop, wind, rain, hail, and water damage, etc.

EDITOR'S NOTE: The description of the profession of actuarial science by the War Manpower Commission has been included in this number of the *Proceedings* because it was thought to be of interest to the members of this Society.

III. Casualty Insurance — The actuary is primarily concerned with problems of insurance on hazards arising out of the legal liability of an insured for the safety and well-being of others. In addition to fields of Workmen's Compensation Insurance, Public and Employer's Liability Insurance, Automobile Bodily Injury and Property Damage Insurance, and other liability fields, Casualty Insurance extends to Accident and Health Insurance.

B. I. State Insurance Department Work—The actuary is primarily concerned with supervising the valuation of companies doing business in the state and seeing that legal requirements are complied with. In some states an actuary is employed in connection with State Workmen's Compensation Insurance, Unemployment Insurance or Savings Insurance Programs.

II. Federal Insurance Department Work — The actuary in this field performs general work covering primarily life insurance and annuity benefits and extending to various other fields involving special benefits and payments. Work in this area differs from commercial insurance work in that the actuary operates within the confines of a particular Federal act or other specific legislation. National Service Life insurance and the Pension Plan Review in the Bureau of Internal Revenue are important fields for Governmental actuarial service.

III. Fraternal Organizations and Individual Associations—These are groups formed for the primary purpose of providing members with certain benefits, generally life insurance or sickness benefits. In this area, also, specialization of work results from the necessity of complying with certain kinds of legislation. The proper functioning of such organizations requires the advice of an actuary on either a full or part time basis.

Functional Activities

Actuaries may engage in one or more of the following functions, in addition to the activities mentioned above.

1. Calculation of rates and values, development of mortality tables, life tables, commutation columns, morbidity tables, etc.
2. Valuation—involves preparing liability statements and responsibility for their accuracy.
3. Determination of dividend scales.
4. Compilation of mortality, morbidity, lapse and other records.
5. Research and Analysis—rate structures, equity of dividend scales, financial status of company, etc.
6. Development of contract provisions—concerned with preparation of fair, accurate and attractive policy terms.
7. Underwriting—concerned with study of type of risk and setting of appropriate case rates.
8. Reinsurance—involves the assumption of risk from other companies.
9. Public Relations—furthering of sound company policy through correspondence, addresses, review of press releases, etc.
10. Consulting—analysis of self-insured plans or recommending insurance programs for private industry or associations.

Related Professional Fields

The field of actuarial science is related to the broader field of insurance and there are several divisions of this field in which the actuary must possess some general knowledge although the specialization is left to others. These related fields are:

> Insurance accounting
> Insurance underwriting (medical analyses)
> Insurance law
> Claim administration
> Agency supervision
> Investment

Professional Affiliations

Membership in the Actuarial Society of America, the American Institute of Actuaries, or the Casualty Actuarial Society or in other similar societies is usually indicative of professional standing. Such membership is generally acquired by passing a series of examinations presented by such organizations.

Educational Qualifications

A bachelor's degree with a major in mathematics is highly desirable, as well as a broad collegiate training in which the more important subjects are English composition, economics, banking and finance, accounting and statistics. A thorough knowledge of mathematics through calculus, including a good basic course in algebra is fundamental.

Sources of Employment

Actuaries find employment for the most part in insurance companies. They are also employed by State Insurance Departments, by the Federal Government, and in private industry. Some are employed in independent firms of consulting actuaries or are self-employed as "consultants."

OBITUARY
EARL OGLEBAY DUNLAP
1878 - 1944

Earl O. Dunlap, who retired in 1943 as third vice-president of the Metropolitan Life Insurance Company, died at his home in East Orange, New Jersey, on July 5, 1944.

Mr. Dunlap was born November 25, 1878, at Coon Island, Washington County, Pennsylvania. In 1903, after several years of commercial experience, he entered the employ of the Pittsburgh Life and Trust Company shortly after its organization. During the succeeding fourteen years he was appointed assistant secretary and subsequently the actuary of the Company.

When Mr. Dunlap became associated in August 1917 with the Metropolitan Life Insurance Company he was given charge of the business assumed by that company from the Pittsburgh Life. His administration of that business proved most successful, and the unique reinsurance arrangements through which the business was conducted received widespread favorable recognition. All the policy obligations of the Pittsburgh Life were discharged in full, liens wiped out, and some dividends paid.

In 1923 Mr. Dunlap was appointed assistant secretary, and in 1927 he became an assistant actuary and was placed in charge of the actuarial work in connection with the company's Group insurance business. A keen student of group insurance, Mr. Dunlap made many important contributions to the development of that branch of the business. He was chairman of the Group Association from 1936 to 1937. He was frequently consulted on various questions relative to Group insurance and had been a frequent speaker and has written much on various Group subjects. In 1939 Mr. Dunlap was appointed third vice-president of the Metropolitan Life and was given charge of the accounting and auditing division.

Mr. Dunlap became a Fellow of the Casualty Actuarial Society on May 19, 1915 and attended many of its meetings. He became a Fellow of the American Institute of Actuaries in 1911, was a member of its Board of Governors from 1912 to 1918, and contributed various papers to the Record. He was vice-president of the Institute of Internal Auditors in 1942, and a director in 1943. He was also a member of the Controllers Institute of America.

His generous spirit to help others will be long remembered by those privileged to know him. He will be missed by the elder generation of actuaries as one of their confreres who did much constructive work during the last generation.

OBITUARY
BENEDICT DEVINE FLYNN
1880 - 1944

Benedict Devine Flynn, a charter member and former president of the Society, died on August 22, 1944, in Hartford, Connecticut, the city of his birth, at the age of sixty-four years.

Mr. Flynn commenced his career with The Travelers Insurance Company as a part-time employee while attending Hartford Public High School. After graduation he entered the life actuarial department of The Travelers in 1898, where he worked for three years and then left to enter Trinity College but was induced to return to the Company before completing his college course. The honorary degree of Master of Arts was later conferred upon him by Trinity College.

During his early years in the insurance business, casualty insurance was in a formative stage and committees representing the various companies were in frequent conference as to how to solve their many problems. It was in this committee work, in which Mr.Flynn was actively engaged, that the idea of the formation of a casualty actuarial society originated and later bore fruit. He was one of the original vice presidents of the Society, serving in this capacity in 1914 and 1915 and again in 1918. In 1919 he was elected president. He contributed several papers and discussions and took a prominent part in the work of various committees of this Society. He was also a Fellow of the Actuarial Society of America, serving on the Council for several years. His papers and discussions of other papers, appearing in the publications of both Societies, illustrate the unusually wide scope of his interests.

Mr. Flynn's advancement in The Travelers was both rapid and continuous. In April 1907, he was made assistant actuary of the life department. In 1911 he became casualty actuary. He advanced to assistant secretary in 1914 and to secretary in 1922. In 1930 he became secretary and actuary and in September of that year he was made vice-president and actuary. In 1941 he was elected to the board of directors.

For many years Mr. Flynn was chairman of the Hartford City Pension Committee, a member of the Connecticut State Employees Retirement Commission and a member of the board of directors of the Travelers Bank and Trust Company.

He possessed a natural aptitude for mathematics but he was not dominated by figures. His keen, incisive mind cut through all extraneous matter and bared the fundamentals of problems. He asserted a strong insistence upon the application of sound actuarial principles in the development of

casualty insurance rates and did much to impress the influence of the actuarial viewpoint upon the casualty business as a whole. He was also an advocate of the same sound principles in the development of group life insurance and group pensions.

Mr. Flynn's friendliness was infectious and his gracious manner endeared him to his friends and made a profound impression on all who came in contact with him. He had an innate courtesy and a willingness to listen to another's point of view. If his opinion happened to differ, he possessed a natural ability to disagree with one in such a quiet and courteous manner that after a first meeting with him you left him feeling that he had added you to his list of friends even if you had not gained the objective for which you called upon him. His passing is a distinct loss to the insurance business and the actuarial profession.

OBITUARY
CLARENCE WHITMAN HOBBS

1878 - 1944

Through the death of Clarence Whitman Hobbs, this Society and the insurance world in general lost a beloved and outstanding personality. His death, on July 20, 1944, came after a long illness which followed an intestinal operation in January. After the operation he was unable to be at his desk except for a few short visits but he nevertheless maintained an active interest in his work, and as late as April 15th prepared a long and detailed report to the Insurance Commissioners on the Workmen's Compensation Expense Loading.

Clarence Hobbs was born at Woodfords, Maine, on October 1, 1878. He was educated in the Lynn, Massachusetts, public schools, the Classical High School in Worcester, Massachusetts, and was graduated from Harvard University, Class of 1902. He received the degree of LL.B. from Harvard Law School in 1904, and was admitted to the Massachusetts bar in August of that year, and to the New York bar in 1925. He served as a member of the Massachusetts House of Representatives during 1910, 1911 and 1912, and of the Massachusetts Senate from 1913 to 1919 inclusive. In September 1919 he was appointed Commissioner of Insurance by Governor Coolidge, which position he held until the Spring of 1923 when he was selected by the National Association of Insurance Commissioners as its first Special Representative in the National Council on Compensation Insurance. He served continuously in this capacity until his death.

Mr. Hobbs was elected a Fellow of this Society on May 23, 1924 and, from November 1933 until he died, he filled the post of Editor. As Editor and as a Member of the Council, as well as a frequent contributor of papers,

he was a prodigious worker. Many of his papers have been reprinted from the Proceedings and are generally used by the insurance carriers for reference purposes. As Editor, in addition to the detailed work of handling "copy," he did much to improve the clarity and literary standards of the papers submitted.

As Special Representative of the National Association of Insurance Commissioners, he filled a difficult and exacting role. He acted as chairman of most of the National Council's Committees and as such was charged with the duty of resolving questions that had come to an impasse as the result of tie votes. In such cases, his decisions were made only after exhaustive investigation and study of the facts and no one could ever doubt the honesty of conviction behind his opinions. He was in a position to watch over all the National Council's activities and his periodic reports to the Insurance Commissioners provided them—and all others interested—with exhaustive and easily understood factual information on the activities of the National Council and the pertinent problems of the Workmen's Compensation business.

Mr. Hobbs was not only an excellent writer but he loved to write. He had the faculty of putting the most complex and confusing technical subjects into writing in such simple and logical fashion that his works are masterpieces in their field. He published several books, the best known being "Workmen's Compensation Insurance" which is probably the most exhaustive treatise on the subject ever written. His writings also include such papers as "State Regulation of Insurance Rates," "The Attitude of the Courts in Construing the Compensation Acts," "Federal Jurisdiction and the Compensation Acts," etc., many of which were reprinted from papers originally presented to this Society, and which represent detailed research into highly technical fields. Such works are of incalculable value.

Clarence Hobbs was a great reader and student with an unusual ability to acquire and to retain information. His store of knowledge was profound. If one asked him any question on any subject—history, science, economics, or the classics—the answer was at his tongue's end. And so, from his uncanny ability to uncover all available information on the subjects of his research; from his inherent fund of basic knowledge; from his sound, well balanced thinking; and from his genius for putting his material into writing, he became a foremost authority in Workmen's Compensation matters. But with all the erudition and technical knowledge with which he wrote and conversed there was never one iota of ostentation.

He was a kindly man, always unbegrudgingly willing to counsel and advise —a genial personality, with a keen sense of humor that gave vent in merry laughter, jokes or witty verse. His friends, the insurance world and this Society have suffered an inestimable loss.

OBITUARY
KARL NEWHALL
1896 - 1944

Karl Newhall, an Associate of the Casualty Actuarial Society, died at his home in West Hartford, Connecticut, on October 24, 1944.

Mr. Newhall was born in Chester, New Hampshire, on November 13, 1896. His studies were interrupted when on May 17, 1917 he joined the Army where he served as a private first class attached to a base hospital. After service in both the United States and France he was discharged on May 17, 1919 and returned to Boston University where he completed his A.B. degree in 1921. For three years he taught mathematics at the Snider School in North Carolina and in 1924 became associated with The Travelers Insurance Company in the Actuarial Department. He was transferred to the Group Department where he was actively engaged in assisting the field force in the sale of group annuity contracts. In 1935 he was made Group Annuity Underwriter in the Group Department which position he held at the time of his death. In 1928, he became an Associate of the Casualty Actuarial Society.

In a quiet unassuming manner he won the friendship, not only of his fellow employees in the home office of The Travelers, but of the many company employees throughout the United States. As time went on his services were in greater demand and he gave of his time and energy unstintingly. His death at the early age of 47 was a severe loss to his company and to the Society.

OBITUARY
ARTHUR E. THOMPSON
1887 - 1944

Arthur E. Thompson, consulting statistician of the Eagle, Globe, and Royal Indemnity Companies, died at his home in Maplewood, New Jersey, on January 17, 1944.

Mr. Thompson was born in Valatie, N. Y., on January 24, 1887 and obtained his school education in Newark, N. J. The early part of Mr. Thompson's business career was spent in the Statistical Departments of the Fidelity and Casualty Company of New York and the American Insurance Company in Newark, N. J. In 1916 he became statistician of the Royal Indemnity Company, which he left in 1928 in order to accept a similar position with the Globe Indemnity Company. When the latter moved its offices

in the late summer of 1931 from Newark to New York, he became also statistician of the Eagle and Royal Indemnity Companies, in which capacity he represented the companies on various statistical and actuarial committees.

He was not only one of the founders of the Association of Casualty and Surety Accountants and Statisticians, but was an Associate of this Society and a member of the American Statistical Association.

In his capacity as a statistician, he developed a genius for statistical work and gave liberally of his time to the development of statistical plans for nearly all casualty lines. The quality that endeared him most to his associates was his complete unselfishness and his willingness to subordinate his own needs when there was a call for help from another. He will continue to live in the memory of casualty insurance people both as a constructive pioneer and as a lovable human being.

CASUALTY ACTUARIAL SOCIETY

NOVEMBER 1, 1944

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*Terms expire at the annual meeting in November 1945.
†Terms expire at the annual meeting in November of the year given.

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REPORT BY THE COUNCIL AS TO 1944 MEETING AND BUSINESS

No annual meeting of the Society was held in November 1944, due to war conditions.

The present members of the Council and the present officers remain in office for one'year until the annual meeting in November 1945.

Charles W. Crouse and Dunbar R. Uhthoff had passed the 1944 Examinations and been admitted as Associates.

The death had been reported since the last annual meeting of three Fellows, Earl O. Dunlap, Benedict D. Flynn and Clarence W. Hobbs, and two Associates, Karl Newhall and Arthur E. Thompson. Obituary notices appear in this number of the *Proceedings*.

James S. Elston prepared the Third Index to Volumes XXI to XXX of the *Proceedings*, thus adding a third to the two very useful index volumes he previously compiled covering all of the earliest volumes.

The report of the Secretary-Treasurer (Richard Fondiller) which had been audited by the Auditing Committee (Dudley M. Pruitt, Chairman) follows:

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CASUALTY ACTUARIAL SOCIETY

ANNUAL REPORT ON FINANCES

Cash Receipts and Disbursements from October 1, 1943 to September 30, 1944

INCOME
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On Deposit October 1, 1943 in Marine Midland Trust Company		$ 590.21
Members' Dues	$2,295.00	
Sales of *Proceedings*	1,144.00	
Examination Fees	285.00	
Luncheons and Dinners	231.00	
Michelbacher Fund	119.00	
Fondiller Prize	100.00	
Sale of Hobbs' Reprint	68.00	
Miscellaneous	21.16	4,263.16
Total		$4,853.37

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DISBURSEMENTS
</div>

Printing and Stationery	$3,342.05
Postage, Telegraph, Express, etc.	102.58
Secretarial Work	420.00
Examination Fee Refunds	34.26
Examination Expense	401.78
Luncheon and Dinners	250.27
Insurance	12.10
Miscellaneous	64.83
Total	$4,627.87
On deposit September 30, 1944 in Marine Midland Trust Company	225.50
Total	$4,853.37

RECONCILIATION

Cash in Bank—September 30, 1943		$ 590.21
Income	$4,263.16	
Disbursements	4,627.87	
Excess of Disbursements over Income		364.71
Cash in Bank—September 30, 1944		$ 225.50
Bonds Owned September 30, 1944		3,750.00*
Total Assets September 30, 1944		$3,975.50

* Michelbacher Fund of $1,563.36 invested in above bonds.

The Examination Committee (Arthur E. Cleary, Chairman) submitted the following report:

1944 EXAMINATIONS—SUCCESSFUL CANDIDATES

The following is a list of those who passed the examinations held by the Society on April 12 and 13, 1944:

ASSOCIATESHIP EXAMINATIONS

PART I: DOUGLAS H. BOND   RICHARD B. BURSTEIN
           ALLEN MAYERSON

PART II: RICHARD B. BURSTEIN   ALLEN MAYERSON
           MARGARET A. TREVARTHEN

PART III: FREDERIC ACKERSON   OLAN T. MCMILLAN
           DAVID J. COHEN   ROBERT C. MORROW
           GEOFFREY CROFTS   ROBERT C. PERRY
           CHARLES W. CROUSE   MARGARET A. TREVARTHEN
           JOHN B. MASIOWSKI

PART IV: WENDELL W. COOKE   MATTHEW RODERMUND
           GEOFFREY CROFTS   OLIVER F. SIEGMUND
           JOHN B. MASIOWSKI   MARGARET A. TREVARTHEN
           ROBERT C. MORROW   ELIA VERGANO

PART V: FRANK R. REILLY, JR.   D. R. UHTHOFF
           MATTHEW RODERMUND   EDWARD C. ROONEY

The Council elected Emma C. Maycrink as Editor and re-elected Thomas O. Carlson as Librarian.

1945 EXAMINATIONS OF THE SOCIETY
APRIL 4 AND 5, 1945

EXAMINATION COMMITTEE

ARTHUR E. CLEARY - - - - GENERAL CHAIRMAN

IN CHARGE OF	IN CHARGE OF
ASSOCIATESHIP EXAMINATIONS	FELLOWSHIP EXAMINATIONS
PARTS I TO IV	AND ASSOCIATESHIP EXAMINATION PART V
GEORGE B. ELLIOTT, CHAIRMAN	JOHN A. MILLS, CHAIRMAN
ROGER A. JOHNSON, JR.	RUSSELL P. GODDARD
ERNEST T. BERKELEY	NELS M. VALERIUS

EXAMINATION FOR ENROLLMENT AS ASSOCIATE

PART I

1. (a) Solve the equation $x^3 - 13 x^2 + 15 x + 189 = 0$, given that two of the roots differ by 2.

   (b) Solve the equations:
   $$x + 2 y - z = 11$$
   $$x^2 - 4 y^2 + z^2 = 37$$
   $$xz = 24$$

2. (a) The number of terms in an arithmetic progression is even. The sum of the odd terms is 24, of the even terms 30, and the last term exceeds the first by $10\frac{1}{2}$. Find number of terms and the first three terms.

   (b) Find the greatest term in the expansion of $(x + 2 y)^{45}$, when $x = 3$ and $y = 4$.

3. (a) A workman whose weekly salary is less than \$50.00 cashes his check at a bank, and the teller carelessly transposes the dollars and cents items, giving him too much money. After spending \$3.20, the workman then has left exactly twice the amount he should have received originally. What was the amount of his check?

   (b) Brass is an alloy of copper and zinc; bronze is an alloy containing 80% of copper, 4% of zinc and 16% of tin. A fused mass of brass and bronze is found to contain 74% of copper, 16% of zinc and 10% of tin. Find the ratio of copper to zinc in the composition of brass.

4. (a) There are p points in a plane, no three of which are in the same straight line with the exception of q points which are all in the same straight line. Find the number of straight lines that result from joining all the points.

   (b) If of $p + q + r$ things, p be alike, q alike and the rest different, what is the total number of combinations?

   (c) In a certain insurance company there are 10 different positions vacant, of which 4 must be held by men and 3 by women; the other 3 may be held by either men or women. If 15 men and 6 women file applications, in how many ways can the positions be filled? (Do not perform the final multiplications.)

Note: The following values will be useful in solving problems 5 to 8 inclusive. The answers to problems marked with an asterisk (*) may be stated in the form of an expression in which all numerical values are entered but not multiplied.

$s_{\overline{6}\rvert}$ (at 5%) = 6.80191		$a_{\overline{6}\rvert}$ (at 6%) = 4.91732	
$s_{\overline{10}\rvert}$ (at 5%) = 12.57789		$a_{\overline{12}\rvert}$ (at 2½%) = 10.25776	
$j_{(12)}$ (at 4%) = .03928		$a_{\overline{12}\rvert}$ (at 6%) = 8.38384	
$j_{(12)}$ (at 6%) = .05841		$a_{\overline{22}\rvert}$ (at 2½%) = 16.76541	
$a_{\overline{2}\rvert}$ (at 2½%) = 1.92742		$a_{\overline{40}\rvert}$ (at 1½%) = 29.91585	
$a_{\overline{6}\rvert}$ (at 3%) = 5.41719		$a_{\overline{40}\rvert}$ (at 2%) = 27.35548	
$a_{\overline{6}\rvert}$ (at 4%) = 5.24214		$\dfrac{1}{a_{\overline{4}\rvert}}$ (at 4%) = .27549	

5. (a) Derive a formula in terms of d for the present value of a perpetuity due of 1 per annum payable quarterly.

   (b) In his will a church member leaves $500.00 for painting the church and sufficient funds to provide a like amount every four years. If money is worth 4%, what was the total amount of the bequest?

6. (a) A $5,000 bond with dividends at 6% payable semi-annually on outstanding face is to run for five years and then be redeemed by yearly instalments of $1,000, the last instalment to be paid ten years after the date of valuation. What is the purchase price to yield the investor 5% convertible semi-annually?

   (b) A 4¾% bond for $1,000, dividends payable semi-annually, is redeemable at par May 25, 1948. Find the purchase price May 25, 1945, to yield 6% payable semi-annually, and prepare a schedule to show the accumulation of discount.

7. * A man buys a house for $12,500, making a down payment of $2,500 and arranging for a mortgage for the balance to be paid over a period of 12 years with monthly payments at the end of each month, money being worth 6% effective. At the beginning of the seventh year the mortgage is revised to reflect a change in the interest rate to 4% effective. What is the amount of the monthly payment in the latter six years of the mortgage period?

8. (a) An annuity of $1,000, payable in semi-annual instalments for 20 years is purchased for $14,500. What rate of interest was realized by the purchaser?

   (b) *A machine has an original value of $2,000. Its depreciation is to be covered by a sinking fund at 5% under the conditions that the scrap value at the end of ten years will be $200. What wearing value remains at the end of six years?

PART II

1. (a) A tapestry seven feet in height is hung on a wall so that its lower edge is nine feet above an observer's eye. At what distance from the wall should he stand so that the vertical angle subtended in his eye by the tapestry is a maximum?

   (b) The adiabatic law for the expansion of air is $PV^{1.4} = C$. If at a given time the volume is observed to be 10 cu. ft. and the pressure is 50 lb. per square inch, at what rate is the pressure changing if the volume is decreasing 1 cu. ft. per second?

2. Find the right circular cone of greatest volume that can be inscribed in a given sphere.

   Note: The volume of a right circular cone is $\frac{\pi}{3}$ times the square of the radius of the base times the altitude.

3. (a) Find the area bounded by $9x^4 - y^2 = x^6$.

   (b) The plane surface of a spherical segment of one base is a circle of radius 8 inches, and the greatest thickness of the segment is 4 inches. Find the volume by integration.

4. Integrate (a) $\displaystyle\int_0^1 \frac{x^3\, dx}{(x^2 + 1)^2}$

       (b) $\displaystyle\int_0^1 \frac{x^3\, dx}{(x + 1)^4}$

       (c) $\displaystyle\int \frac{dx}{(a^2 - x^2)^{3/2}}$

5. (a) Given the following table:

Age	44	45	46	47
a_x at $4\frac{1}{2}\%$	13.40	13.16	12.93	12.68

       Find to two decimal places, the age corresponding to an annuity of 13.00, by the method of finite differences.

   (b) Express $4\,x^3 - 3\,x^2 + 9\,x - 1$ and its differences in factorial notation.

6. (a) Given $u_0 = 10$, $u_1 = 8$, $u_4 = 26$, $u_5 = 60$

       (a) Find u_2 by divided differences, and

       (b) Find the form of the function by La Grange's formula to check your answer.

   (b) Given the following values of the function u_x at quinquennial points:

$$u_{75} = 2459,\ u_{80} = 2018,\ u_{85} = 1180,\ u_{90} = 402$$

       Find u_x for unit intervals from 75 to 80.

7. Identify the following formula and from it derive Sterling's Formula:

$$u_x = u_0 + x\,\Delta\,u_0 + x_2\,\Delta^2 u_{-1} + (x + 1)_3\,\Delta^3\,u_{-1} + (x + 1)_4\,\Delta^4\,u_{-2}$$

8. Sum to n terms $2 \cdot 4 \cdot 8 \cdot 14 + 4 \cdot 6 \cdot 10 \cdot 16 + 6 \cdot 8 \cdot 12 \cdot 18 + \cdots\cdots$ by the method of finite differences.

PART III

1. If in a series of N_1 observations, the arithmetic mean is M_1, and in a second series of N_2 observations the arithmetic mean is M_2, derive a formula for the arithmetic mean of the entire group of $N = N_1 + N_2$ observations in terms of N, N_1, M_1, N_2 and M_2. Use this formula to find the mean age of death from tuberculosis, from the data given in the following table:

Deaths from Tuberculosis by Ages

Age at Death	Number Dying	Age at Death	Number Dying
0 — 4	1,356	30 — 34	8,776
5 — 9	537	35 — 44	15,456
10 — 14	1,278	45 — 54	11,060
15 — 19	6,300	55 — 64	7,455
20 — 24	10,911	65 — 74	4,788
25 — 29	10,349	75 — 84	1,866

2. (a) From the following data, calculate the standard deviation:

Class Interval	Frequency
0 — 9.9	1
10 — 19.9	1
20 — 29.9	3
30 — 39.9	6
40 — 49.9	42
50 — 59.9	18
60 — 69.9	7
70 — 79.9	5
80 — 89.9	3
90 — 99.9	2
Total	88

(b) Given the average cost of eggs by month for a period of ten years, outline two methods of eliminating seasonal fluctuation.

3. (a) Using $\sqrt{p_o\,p_i}$ as the base prices, the simple arithmetic mean of relatives for the base year and for the given year are respectively given by

$$A_o = \frac{1}{N} \sum \frac{p_o}{\sqrt{p_o\,p_i}} \text{ and } A_i = \frac{1}{N} \sum \frac{p_i}{\sqrt{p_o\,p_i}}$$

Show that the index $I = A_i/A_o$ fulfills the time reversal test.

(b) Given the following data, find $_oP_i$ by the weighted aggregative method, using base period quantities as weights, where the base year is 1921.

Production and Price of Grains in the United States
1921 and 1925

Grain	Price (cents)		Production (millions of bushels)	
	1921	1925	1921	1925
Corn	40	70	3000	2900
Wheat	90	140	800	700
Oats	30	40	1000	1500
Rye	70	80	60	50
Barley	40	60	150	200
Buckwheat	80	90	10	10
Rice	90	150	40	30

4. (a) Show that S_y^2 and r_{xy}^2 may be expressed in the following forms:

$$S_y^2 = \frac{\Sigma Y^2 - m \Sigma XY - b \Sigma Y}{n} \text{ and } r_{xy}^2 =$$

$$\frac{b \Sigma Y + m \Sigma XY - nM^2y}{\Sigma Y^2 - nM^2y}$$

   (b) A distribution of 150 people in normal condition gave an average pulse rate of 79.68 ± 0.15 beats per minute, but after being administered a certain drug they showed an average pulse rate of 81.12 ± 0.20 beats per minute. Is it probable that the increase in the pulse rate was due to the drug or is the increase simply a result of variation due to sampling?

5. (a) The following transactions took place in a wholesale concern:

Sales for cash	$20,000
Sales returns	600
Cash received from customers	30,000
Purchase returns	400
Purchases for cash	12,000
Cash paid out to creditors	25,000
Wages paid	2,000
Purchases on account	30,000
Sales returns	900
Sales on account	35,000
Delivery expense paid	800
In-freight and cartage paid	1,000

Record these transactions, debit and credit, in ledger "T" accounts.

   (b) Show the adjusting entries (debit and credit) necessary to prepare the books for taking a trial balance.

Inventory, Jan. 1	$ 4,000
Inventory, Dec. 31	5,000
Purchases	25,000
Bad Debts	350
Depreciation—Furn. & Fix.	45

6. The net sales of Stanley Bennett for the year 1944 were $75,600. Out of each dollar received from net sales, the amount of 60 cents was paid for the cost of merchandise sold, 8 cents for salesmen's salaries, 4 cents for delivery expense, 3 cents for advertising, 1 cent for depreciation of delivery equipment, 2 cents for office salaries, ½ cent for office ex-

penses, 0.6 cents for telephone and telegraph, 0.3 cents for stationery and printing, 3 cents for rent, 1.6 cents for insurance, 2 cents for interest, ½ cent for bad debts, and 3 cents for sales discounts. The equivalent of 3 cents of each sales dollar was earned through purchase discount and 1½ cents from interest income. The inventory at the end of the period was one-fourth of the cost of goods sold and was less than the beginning inventory by $1,500. Prepare a statement of profit and loss for the year.

7. From the following account balances of the X Corporation, prepare a trial balance and balance sheet, showing each item under its proper heading of Current Assets, Fixed Assets, Current Liabilities, Fixed Liabilities and Proprietorship. What is the amount of working capital of this business?

X CORPORATION

Account Balances

Cash	$ 5,000.00
Capital	20,000.00
Land and buildings	6,000.00
Accrued expenses	500.00
Accounts receivable	10,000.00
Supplies	500.00
Reserve for depreciation on building	250.00
Merchandise	10,000.00
Reserve for doubtful accounts	500.00
Furniture and fixtures	700.00
Accounts payable	2,500.00
Profit	5,400.00
Reserve for depreciation on furniture	50.00
Mortgage payable	3,000.00

8. Mr. X, with an established business of his own, is persuaded by two friends, Mr. Y and Mr. Z, to form the XYZ Corporation with an authorized capitalization of $100,000 under which he subscribes for stock in an amount equal to his interest in the individual proprietorship and each of the other two subscribes for equal amounts of the remaining stock at par. The corporation purchases the assets and assumes the liabilities of the individual proprietorship, paying with stock as indicated. Mr. Y and Mr. Z pay their subscriptions in cash.

The balance sheet of the individual proprietorship is as follows:

BALANCE SHEET OF MR. X

Cash	$ 8,000	Accounts Payable ..	$30,000
Accounts Receivable.	60,000	Mortgage Payable ..	40,000
Merchandise	20,000	Mr. X Capital......	68,000
Plant	50,000		
	$138,000		$138,000

Show the opening entries for the new corporation, close the books of the individual proprietorship and make explanatory comments on each entry.

PART IV

1. (a) The reserved seats in a certain section of a concert hall are numbered consecutively from 1 to 100. A man buys five consecutively numbered tickets for one concert and eight consecutively numbered tickets for another. Find the chance that there will be no number common to both sets of tickets.

   (b) A certain sum of money is to be given to the one of three persons, A, B or C, who first throws 10 with three dice. If they throw in the order named until the event happens, find their respective chances.

2. (a) A and B play for a prize. A is to throw a die first and wins if he throws a 6. If he fails, B throws and wins if he throws either 6 or 5. If he fails, A throws again and wins if he throws 6, 5 or 4, and so on. Find each player's chance of winning.

   (b) The chance of one event happening is the square of the the chance of a second event, but the odds against the first are the cube of the odds against the second. Find the chance of each.

3. (a) Out of a bag containing 12 balls, 5 are drawn and replaced, and afterward 6 are drawn. Find the chance that exactly 3 balls were common to the two drawings.

   (b) What is the chance that a hand of five cards contains:
     i) exactly two like cards of different suits?
     ii) at least two like cards of different suits?

4. A and B each have eight pennies. Each tosses his set of pennies. Find to three places of decimals the chance that the number of heads obtained by A exceeds the number obtained by B by at least three.

Note: The following values will be useful in solving problems 5 to 8 inclusive.

$$a_{\overline{10}|} = 8.6 \qquad\qquad N_{50} = 181664$$
$$D_{50} = 12499 \qquad\qquad N_{55} = 124876$$
$$M_{50} = 6355 \qquad\qquad N_{60} = 81106$$

5. (a) Show that
$$\frac{e_x \cdot e_{x+1} \cdot e_{x+2} \cdots e_{x+n-1}}{(1+e_{x+1})(1+e_{x+2})(1+e_{x+3})\cdots(1+e_{x+n})} = {}_np_x$$

   (b) Prove that
$$a_x = \sum_{n=1}^{\omega-x+1} (a_{\overline{n}|} \cdot {}_{n-1}|q_x)$$

6. (a) A certain life insurance policy matures when the policy-holder is of age 50 and gives him an option of $10,000 in cash or a sequence of equal payments at the beginning of each year for ten years and as long thereafter as he may live. If he dies during the first ten years the payments are to be continued to his heirs until a total of ten have been made. Find the annual payment under the optional plan.

   (b) The so-called "modified" life policy provides for the payment of $1,000 in event of the death of the insured now aged 50. The premiums payable for the first five years are exactly one-half of the ultimate premium payable for life thereafter. Compute the ultimate net premium.

7. (a) Express in terms of commutation symbols the seventh terminal reserve for a $5,000 ten year term policy issued at age 30, using the prospective method.

   (b) Describe briefly the full preliminary term method of modifying premiums and reserves. In connection with what type of policy is it generally permitted and why?

8. (a) Give the Davies and De Morgan definitions for the commutation symbol D_{xy} and prove that if $x = y$, the two definitions coincide.

   (b) Explain what the following expressions mean:
   (1) $500 (A_x \, a_{\overline{m}|} + {}_mE_y \cdot a_x|_{y+m})$
   (2) $|_nA_{\overline{xy}}$, and express in terms of commutation symbols
   (3) ${}_nE_y + {}_nE_z - {}_nE_{yz} - {}_nE_{xz} - {}_nE_{xy} + {}_nE_{xyz}$.

PART V

1. (a) What are the deposit premium requirements for interim audit policies of Workmen's Compensation Insurance written in (1) Massachusetts, (2) New York, and (3) the majority of remaining states?

   (b) Why are the states arranged into three groups for occupational disease coverage in the Workmen's Compensation Manual?

2. (a) Does the standard specified car automobile policy cover the private non-ownership liability of the named insured without extra charge? Explain.

   (b) Does automobile medical payment coverage apply to the operation of any automobile not specifically described in the named insured's policy? Explain.

3. (a) Distinguish between a boiler explosion and a furnace explosion.

   (b) Can the coverage of a blanket fidelity bond or a bankers blanket bond be cancelled with respect to the acts of one individual employee without cancelling the bond as a whole? Explain.

4. (a) An insured has residence theft coverage in the amount of $1,000 under Division 2 of his policy, and in addition, $150 applies specifically to a ring under Division 3. The actual value of the ring is $400, and it is stolen while not on the premises. To what amount is the insured entitled under his policy?

   (b) What purpose is served by the Elective Indemnity provision of an accident policy?

5. (a) Under what conditions does an insurance carrier pay for bodily injuries under a boiler and machinery insurance policy in the event persons are injured as a result of the explosion of an insured boiler?

   (b) What objectives, criteria and practical considerations should be kept in mind in the making of rates?

6. (a) What cost elements are included in the "pure premium" under (1) Automobile Insurance, (2) Workmen's Compensation Insurance, and (3) Boiler and Machinery Insurance?

(b) Outline the rate making procedure normally followed in determining the bodily injury and property damage rates for a private passenger car.

7. (a) About a year and a half ago, overtime payrolls were excluded from the compensation premium base. Discuss the propriety of this step in relation to the usual criteria for the determination of an acceptable exposure medium.

(b) In what important respects does Surety rate making differ from Workmen's Compensation rate making?

8. (a) How were national pure premiums determined under Workmen's Compensation Insurance and what purpose were they intended to serve?

(b) Under Workmen's Compensation Insurance it has been found that large risks as a class usually develop a better loss experience than small risks as a class. Describe and discuss several features of rate making which are designed to recognize this difference in the loss experience.

EXAMINATION FOR ADMISSION AS FELLOW

PART I

1. (a) Discuss the advantages and disadvantages of common stocks as an investment for a multiple line casualty company.

(b) Outline the major provisions of the New York Insurance Law governing the investments of casualty insurance companies.

2. (a) Describe three types of price advances which may underlie inflation.

(b) Which of these types is most devastating in its consequences?

3. (a) Discuss three methods for the control of credit.

(b) What are the tests of a good investment?

4. (a) Define first preferred stock, second preferred stock, redeemable preferred stock, convertible preferred stock, participating preferred stock and common stock.

   (b) Give and briefly explain the important steps in the exam-
       ination procedure of casualty insurance companies by
       insurance departments.

5. (a) Discuss the control exercised by the state through its
       licensing power.

   (b) Discuss briefly the nature and function of law.

6. (a) What third party remedies are available to employees
       under Workmen's Compensation Acts?

   (b) Why are insurance policies subject to a large degree
       of public regulation through statute and administrative
       supervision?

7. (a) Give the grounds and methods for cancellation of insur-
       ance contracts.

   (b) Discuss the Southeastern Underwriters case and its im-
       portance to the insurance business and policyholders.

8. (a) Discuss the various ways of meeting risk.

   (b) Distinguish between static and dynamic losses.

PART II

1. (a) Define the daily, monthly, and annual pro rata method of
       determining unearned premium reserves and give their
       relative merits from a financial statement viewpoint.

   (b) Outline a method for determining reserves against a re-
       currence of an unfavorable loss ratio during "bad times"
       on bonding lines.

2. (a) How are unearned premium reserves usually determined
       on bonds written for an indefinite term and how is the
       unearned premium liability usually terminated on such
       bonds?

   (b) Describe a logical procedure for determining a casualty
       insurance carrier's liability for unpaid, unallocated loss
       expenses and give your reasons for advocating the proce-
       dure you recommend.

3. (a) An insurance carrier's stocks had a market value in excess of cost at the beginning of the statement year, and the stocks increased in market value by $1,000,000 during the year. The carrier lost $500,000 from underwriting and earned $500,000 from its investments, exclusive of the $1,000,000 appreciation in market value. What good reason or reasons are there for the carrier not taking full credit for the $1,000,000 appreciation in market value in its surplus account?

(b) Given the following information, which has been taken from Schedule "P", Part I, of a casualty insurance carrier, develop the total minimum reserve for unpaid liability losses:

Policy Year	Amount of Earned Liability Premiums	Liability Loss and Loss Expense Payments	Total Estimated Reserve for Liability Losses Case Basis
Prior to 1942	$30,000,000	$18,000,000	$ 200,000
1942	4,000,000	2,000,000	500,000
1943	5,000,000	1,800,000	1,300,000
1944	3,000,000	500,000	1,000,000
Grand Total	$42,000,000	$22,300,000	$3,000,000

4. (a) What effect can the widespread adoption of expense gradation be expected to have on Workmen's Compensation Schedule "P" and what might be done towards minimizing this effect?

(b) Discuss the function and place of a statistical department in a multiple line casualty insurance company.

5. (a) What factors besides reported surplus must be considered in judging the strength and permanence of a casualty insurance company?

(b) Discuss the problem of accurately allocating Workmen's Compensation expenses by state and give a practical method that can be followed in meeting requests for such information.

6. (a) What information is required under Schedule "E" of the annual statement blank of the National Association of Insurance Commissioners for casualty insurance companies, and what purpose does it serve?

(b) What information is required under Schedules "G" and "H" of the annual statement blank of the National Association of Insurance Commissioners, and what purpose do these schedules serve?

7. (a) Comprehensive or "package" policies fitted to the require-
        ments of each business are increasing in popularity. What
        new statistical problems can be expected from this devel-
        opment and what are possible solutions to them?

    (b) Given the following information taken from the records
        of a casualty insurance company, prepare income and
        disbursement pages of the annual statement blank of
        the National Association of Insurance Commissioners.
        Arrange the items in the order in which they appear in
        the annual statement blank but use the number in lieu
        of the descriptions in order to conserve time.

1.	Net Premiums written	$10,000,000
2.	Interest, dividends and rents received	200,000
3.	Gross profit on sale of ledger assets	100,000
4.	Gross increase by adjustment in book value of ledger assets (including $10,000 accrual of bond discounts)	20,000
5.	Paid for losses	5,000,000
6.	Paid for investigation and adjustment of claims	800,000
7.	Underwriting expenses paid (excluding ⅛ of 1% of mean invested assets)	3,000,000
8.	Investment expenses paid	20,000
9.	Dividends to stockholders	100,000
10.	Gross loss on sale of ledger assets	50,000
11.	Gross decrease by adjustment in book value of ledger assets (including $10,000 for bond amortization)	20,000
12.	Real Estate	500,000
13.	Bonds	8,000,000
14.	Stocks	2,000,000
15.	Cash	3,000,000
16.	Premiums in course of collection less than 90 days due	1,000,000
17.	Premiums in course of collection more than 90 days due	100,000
18.	Interest and rent accrued 12/31/44	20,000
19.	Market value of stocks over book value 12/31/44	100,000
20.	Reserve for losses 12/31/44	6,000,000
21.	Reserve for investigation and adjustment of claims 12/31/44	100,000
22.	Reserve for unearned premiums 12/31/44	4,000,000
23.	Underwriting expenses unpaid 12/31/44	500,000
24.	Capital 12/31/44	1,000,000
25.	Surplus 12/31/44	3,020,000
26.	Unearned premiums 12/31/43	3,500,000
27.	Unpaid losses 12/31/43	5,500,000
28.	Unpaid loss expenses 12/31/43	80,000
29.	Unpaid underwriting expenses 12/31/43	450,000
30.	Premiums in course of collection over 90 days due 12/31/43	90,000
31.	Interest and rents accrued 12/31/43	20,000
32.	⅛ of 1% of mean invested assets	10,000
33.	Book value of stocks over market value 12/31/43	20,000
34.	Capital 12/31/43	1,000,000
35.	Surplus 12/31/43	2,660,000
36.	Ledger assets (as per balance) 12/31/43	13,280,000

8. (a) Make use of the information given under question 7 (b) to prepare the asset and liability pages following the form of the annual statement blank of the National Association of Insurance Commissioners. Again use numbers in lieu of the descriptions in order to conserve time.

(b) Make use of the information given under question 7 (b) to prepare the underwriting and investment exhibit following the form of the annual statement blank of the National Association of Insurance Commissioners. Again use numbers in lieu of the descriptions in order to conserve time.

PART III

1. (a) Describe the principal features of Retrospective Rating Plans A, B and C.

(b) Under what conditions can an insured "pay twice" for his bad experience in a given year as a result of the operation of the prospective experience rating plan and the new Workmen's Compensation rating program?

2. (a) What new, troublesome variable is introduced when the retrospective rating principle is applied to automobile insurance and by what methods could this variable be brought under reasonable control?

(b) What are the objections to using war experience in determining postwar experience rating credits and debits?

3. (a) Describe the principal features of the new Pennsylvania Retrospective Rating Program effective on risks written on and after June 30, 1944.

(b) Distinguish between social insurance and social assistance and give what are said to be the advantages of the former over the latter.

4. (a) What changes in the present United States Social Security Program would you think advantageous to the country as a whole? Give your reasons.

(b) How can the insurance carriers fill part of the gap (accident & health) in the existing Social Security Plan on an economical and an efficient basis?

5. (a) Discuss the relative merits of basing Federal Income taxes of casualty insurance companies on (a) case basis reserves or (b) statutory reserves.

   (b) Describe the principal features of what you would consider the "ideal" pension plan (from the standpoint of employer and employee) for a casualty insurance company, giving your reasons.

6. (a) Discuss the relative merits of a pay-as-you-go plan as against a reserve plan under Social Security.

   (b) Discuss the relative merits of a financial responsibility law, such as that of New York, and a compulsory automobile insurance law, such as that of Massachusetts.

7. (a) What are the principles of the "ideal" rating bill that is recommended by the insurance companies to the various states for passage as a result of the decision that insurance is commerce?

   (b) Do you favor retention of the present division of insurance classes between life, fire, and casualty carriers or some other division? Give your reasons.

8. (a) Fluctuations in the loss ratio between good and bad times have been a serious problem in the past. Discuss this problem, taking into consideration current Federal Tax Laws and give possible partial or total solutions to it.

   (b) Assigned automobile risks have developed higher loss ratios on the average than other automobile risks. Do you favor or oppose surcharges on assigned risks? Give your reasons.

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CASUALTY

ACTUARIAL SOCIETY

ORGANIZED 1914

1945 YEAR BOOK

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(Addendum to Volume XXXI of the *Proceedings*)

Corrected to February 1, 1945   **No. 24**

FOREWORD

The Casualty Actuarial Society was organized November 7, 1914 as the Casualty Actuarial and Statistical Society of America, with 97 charter members of the grade of Fellow. The present title was adopted on May 14, 1921. The object of the Society is the promotion of actuarial and statistical science as applied to the problems of casualty and social insurance by means of personal intercourse, the presentation and discussion of appropriate papers, the collection of a library and such other means as may be found desirable.

Prior to 1914 little technical study was given to the actuarial and underwriting problems of most of the branches of casualty insurance. The organization of the Society was brought about through the suggestion of Dr. I. M. Rubinow, who became the first president. The problems surrounding workmen's compensation were at that time the most urgent, and consequently many of the members played a leading part in the development of the scientific basis upon which workmen's compensation insurance now rests.

The members of the Society have also presented original papers to the *Proceedings* upon the scientific formulation of standards for the computation of both rates and reserves in accident and health insurance, liability, burglary, and the various automobile coverages. The presidential addresses constitute a valuable record of the current problems facing the casualty insurance business. Other papers in the *Proceedings* deal with acquisition costs, pension funds, legal decisions, investments, claims, reinsurance, accounting, statutory requirements, loss reserves, statistics, and the examination of casualty companies. The Committee on Compensation and Liability Loss Reserves submitted a report which has been printed in *Proceedings* No. 35 and No. 36. The Committee on Remarriage Table submitted a report including tables, printed in *Proceedings* No. 40. The Special Committee on Bases of Exposure submitted a report which is printed in *Proceedings* No. 43. The "Recommendations for Study" appear in *Proceedings* No. 54 and are in effect for the 1945 and 1946 examinations.

The lower grade of membership in the Society is that of Associate. Examinations have been held every year since organization; they are held on the first Wednesday and following Thursday in April, in various cities in the United States and Canada. The membership of the Society consists of actuaries, statisticians, and executives who are connected with the principal casualty companies and organizations in the United States and Canada. The Society has a total membership of 278, consisting of 155 Fellows and 123 Associates.

The annual meeting of the Society is held in New York in November and the semi-annual meeting is held in May. The Society has decided to discontinue its May meeting for the duration. The annual meeting was not held in November, 1944, by reason of the national emergency in transportation and the terms of the officers and members of the Council were extended for one year.

The Society issues a publication entitled the *Proceedings* which contains original papers presented at the meetings. The *Proceedings* also contain discussions of papers, reviews of books and current notes. This Year Book is published annually and "Recommendations for Study" is a pamphlet which outlines the course of study to be followed in connection with the examinations for admission. These two booklets may be obtained free upon application to the Secretary-Treasurer, 90 John Street, New York 7, N. Y.

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> EMMA C. MAYCRINK (*ex-officio*)

COMMITTEE ON PROGRAM
> HAROLD J. GINSBURGH, CHAIRMAN (*ex-officio*)
> ALBERT Z. SKELDING
> CHARLES J. HAUGH
> JAMES M. CAHILL
> GREGORY C. KELLY
> RICHARD FONDILLER (*ex-officio*)

COMMITTEE ON PUBLICATIONS
> HAROLD J. GINSBURGH, CHAIRMAN (*ex-officio*)
> RICHARD FONDILLER
> EMMA C. MAYCRINK
> THOMAS O. CARLSON

5

SPECIAL COMMITTEES

COMMITTEE ON MORTALITY FOR DISABLED LIVES

PAUL DORWEILER (CHAIRMAN)
RALPH M. MARSHALL
MARK KORMES
HARMON T. BARBER
JOHN W. CARLETON
CHARLES M. GRAHAM
RICHARD M. PENNOCK

COMMITTEE ON SOCIAL INSURANCE

FRANCIS S. PERRYMAN (CHAIRMAN)
HARMON T. BARBER
JAMES M. CAHILL
HAROLD J. GINSBURGH
CLARENCE A. KULP
WILLIAM R. WILLIAMSON
JARVIS FARLEY

MEMBERSHIP OF THE SOCIETY, NOVEMBER 1, 1944

FELLOWS

Those marked (†) were Charter Members at date of organization, November 7, 1914.

Those marked (*) have been admitted as Fellows upon examination by the Society.

Admitted	
*Nov. 21, 1930	AINLEY, JOHN W., The Travelers Insurance Company, 700 Main Street, Hartford 3, Conn.
*Nov. 13, 1931	AULT, GILBERT E., Actuary, Church Pension Fund and Church Life Insurance Corporation, 20 Exchange Place, New York 5, N. Y.
May 23, 1924	BAILEY, WILLIAM B., Economist, The Travelers Insurance Company, 700 Main Street, Hartford 3, Conn.
*Nov. 20, 1924	BARBER, HARMON T., Assistant Actuary, Casualty Department, The Travelers Insurance Co., 700 Main Street, Hartford 3, Conn.
*Nov. 20, 1942	BART, ROBERT D., West Bend Aluminum Co., West Bend, Wis.
*Nov. 18, 1932	BARTER, JOHN L., Vice-President, Hartford Accident & Indemnity Co., Hartford 5, Conn.
*Nov. 13, 1931	BATHO, ELGIN R., Assistant Actuary, Equitable Life Insurance Company of Canada, Waterloo, Ontario, Canada.
†	BENJAMIN, ROLAND, Treasurer, Fidelity & Deposit Company of Maryland and American Bonding Company, Baltimore 3, Md.
*Nov. 22, 1934	BERKELEY, ERNEST T., Superintendent, Actuarial Department, Employers Liability Assurance Corporation, Boston 9, Mass.
†	BLACK, S. BRUCE, President, Liberty Mutual Insurance Company, 175 Berkeley Street, Boston 16, Mass.
Apr. 20, 1917	BLANCHARD, RALPH H., Professor of Insurance, School of Business, Columbia University, New York 26, N. Y.
†	BREIBY, WILLIAM, Vice-President, Pacific Mutual Life Insurance Company, Los Angeles 14, Cal.
*Nov. 18, 1927	BROWN, F. STUART, Statistician, Indemnity Insurance Co. of North America, 1600 Arch St., Philadelphia 3, Pa.
Oct. 22, 1915	BROWN, HERBERT D., (Retired), Glenora, Yates County, New York.
†	BUCK, GEORGE B., Consulting Actuary for Pension Funds, 150 Nassau Street, New York 7, N. Y.

FELLOWS

Admitted	
Apr. 20, 1917	BURHOP, WILLIAM H., Executive Vice-President, Employers Mutual Liability Insurance Company, Wausau, Wis.
*Nov. 23, 1928	BURLING, WILLIAM H., Assistant Actuary, The Travelers Insurance Company, 700 Main Street, Hartford 3, Conn.
*Nov. 19, 1929	CAHILL, JAMES M., Asst. Sec'y, National Bureau of Casualty & Surety Underwriters, 60 John Street, New York 7, N. Y.
*Nov. 18, 1932	CAMERON, FREELAND R., Actuary, American Surety Company, 100 Broadway, New York 5, N. Y.
†	CAMMACK, EDMUND E., Vice-President and Actuary, Aetna Life Insurance Company, Hartford 15, Conn.
*Nov. 17, 1938	CARLETON, JOHN W., Liberty Mutual Insurance Company, 175 Berkeley Street, Boston 16, Mass.
*Nov. 21, 1930	CARLSON, THOMAS O., Actuary, National Bureau of Casualty & Surety Underwriters, 60 John Street, New York 7, N. Y.
†	CARPENTER, RAYMOND V., (Retired), 66 Park Avenue, New York 16, N. Y.
Mar. 20, 1941	CARVER, HARRY C., Professor of Mathematics, University of Michigan, Ann Arbor, Michigan.
*Nov. 13, 1936	CLEARY, ARTHUR E., Actuary, Massachusetts Insurance Department, 100 Nashua Street, Boston 14, Mass.
*Nov. 15, 1918	COATES, BARRETT N., Coates and Herfurth, Consulting Actuaries, 660 Market Street, San Francisco 4, Calif.
*Nov. 17, 1922	COATES, CLARENCE S., Assistant Secretary, Lumbermens Mutual Casualty Company, Mutual Insurance Bldg., Chicago 40, Ill.
Oct. 27, 1916	COGSWELL, EDMUND S., First Deputy Commissioner of Insurance, 100 Nashua Street, Boston 14, Mass.
Feb. 19, 1915	COLLINS, HENRY, Manager and Attorney, Ocean Accident & Guarantee Corporation and President, Columbia Casualty Company, 1 Park Avenue, New York 16, N. Y.
*Nov. 23, 1928	COMSTOCK, W. PHILLIPS, Statistician, London Guarantee & Accident Company, 55 Fifth Avenue, New York 3, N. Y.
*Nov. 22, 1934	CONSTABLE, WILLIAM J., Secretary, Lumbermens Mutual Casualty Company, 342 Madison Avenue New York 17, N. Y.
*Nov. 22, 1934	COOK, EDWIN A., Assistant Secretary, Interboro Mutual Indemnity Insurance Company, 270 Madison Avenue, New York 16, N. Y.
†	COPELAND, JOHN A., Consulting Actuary, Candler Building, Atlanta, Ga.
*Nov. 18, 1925	CORCORAN, WILLIAM M., Consulting Actuary, Wolfe, Corcoran & Linder, 116 John Street, New York 7, N. Y.
*Nov. 19, 1926	CRANE, HOWARD G., Treasurer, General Reinsurance Corporation, 90 John Street, New York 7, N. Y.
*Nov. 18, 1932	DAVIES, E. ALFRED, Asst. to Treasurer, Liberty Mutual Insurance Company, 175 Berkeley Street, Boston 16, Mass.
*Nov. 18, 1927	DAVIS, EVELYN M., Woodward, Ryan, Sharp & Davis, Consulting Actuaries, 41 Park Row, New York 7, N. Y.

FELLOWS

DEARTH, ELMER H., (Retired), 1409 Clark St., Des Moines, Iowa.

† DEKAY, ECKFORD C., President, DeKay & Company, 84 William Street, New York 7, N. Y.

*Nov. 17, 1920 | DORWEILER, PAUL, Actuary, Aetna Casualty & Surety Company, Hartford 15, Conn.

*Nov. 24, 1933 | EDWARDS, JOHN, Casualty Actuary, Ontario Insurance Department, 91 Arundel Avenue, Toronto 6, Ontario, Canada.

*Nov. 15, 1940 | ELLIOTT, GEORGE B., Compensation Actuary, Pennsylvania Insurance Department, 938 Public Ledger Bldg., Philadelphia 6, Pa.

*Nov. 17, 1922 | ELSTON, JAMES S., Assistant Actuary, Life Department, The Travelers Insurance Co., 700 Main Street, Hartford 3, Conn.

*Nov. 15, 1935 | EPPINK, WALTER T., Vice-President, Merchants Mutual Casualty Co., Casualty Insurance Building, Buffalo 5, New York.

† FACKLER, EDWARD B., Consulting Actuary, Fackler & Company, 8 West 40th Street, New York 18, N. Y.

† FALLOW, EVERETT S., Actuary, Accident Department, The Travelers Insurance Co., 700 Main Street, Hartford 3, Conn.

*Nov. 15, 1940 | FARLEY, JARVIS, Actuary and Asst. Treasurer, Massachusetts Indemnity Co., 632 Beacon Street, Boston 15, Mass.

† FARRER, HENRY, Insurance Company of North America, 99 John Street, New York 7, N. Y.

*Nov. 15, 1935 | FITZHUGH, GILBERT W., Assistant Actuary, Metropolitan Life Insurance Co., 1 Madison Avenue, New York 10, N. Y.

Feb. 19, 1915 | FONDILLER, RICHARD, Woodward and Fondiller, Consulting Actuaries, 90 John Street, New York 7, N. Y.

*Nov. 22, 1934 | FULLER, GARDNER V., Lumbermens Mutual Casualty Co., Compensation & Liability Dept., 260 Tremont St., Boston 16, Mass.

† FRANKLIN, CHARLES H., (Retired), 5157 Latimer Place, Seattle 5, Washington.

*Nov. 18, 1927 | FREDRICKSON, CARL H., Actuary, Canadian Underwriters Association, 55 York Street, Toronto, Canada.

† FURZE, HARRY, (Retired), 42 Douglas Road, Glen Ridge, N. J.

Feb. 19, 1915 | GARRISON, FRED S., Secretary, The Travelers Indemnity Co., 700 Main Street, Hartford 3, Conn.

*Nov. 20, 1924 | GINSBURGH, HAROLD J., Vice-President, American Mutual Liability Insurance Co., 142 Berkeley Street, Boston 16, Mass.

*Nov. 21, 1930 | GLENN, J. BRYAN, 5214 First Street, N. W., Washington 11, D. C.

*Nov. 13, 1931 | GODDARD, RUSSELL P., American Mutual Liability Insurance Company, 142 Berkeley Street, Boston 16, Mass.

FELLOWS

Admitted	
†	GOODWIN, EDWARD S., 750 Main Street, Hartford 3, Conn.
*Nov. 19, 1926	GRAHAM, CHARLES M., Associate Actuary, State Insurance Fund, 625 Madison Avenue, New York 22, N. Y.
Oct. 22, 1915	GRAHAM, THOMPSON B., Fourth Vice President, Metropolitan Life Insurance Co., 1 Madison Avenue, New York 10, N. Y.
†	GRAHAM, WILLIAM J., Vice-President, Equitable Life Assurance Society, 393 Seventh Avenue, New York 1, N. Y.
†	GREENE, WINFIELD W., Vice-President, General Reinsurance Corporation, 90 John Street, New York 7, N. Y.
†	HAMMOND, H. PIERSON, Actuary, Life Department, The Travelers Insurance Co., 700 Main St., Hartford 3, Conn.
Oct. 27, 1916	HARDY, EDWARD R., Secretary-Treasurer, Insurance Institute of America, Inc., 80 John Street, New York 7, N. Y.
Oct. 22, 1915	HATCH, LEONARD W., (Retired), 425 Pelham Manor Road, Pelham Manor, New York.
*Nov. 19, 1926	HAUGH, CHARLES J., Secretary, Compensation and Liability Dept., The Travelers Insurance Co., Hartford 3, Conn.
Oct. 22, 1915	HODGKINS, LEMUEL G., (Retired), 5 Whitman Road, Worcester 5, Mass.
†	HOFFMAN, FREDERICK L., Consulting Statistician, 1978 Sunset Boulevard, San Diego 3, California.
Oct. 22, 1915	HOLLAND, CHARLES H., Suite 2001, 165 Broadway, New York 6, N. Y.
*Nov. 22, 1934	HOOKER, RUSSELL O., Actuary, Connecticut Insurance Department, Hartford 2, Conn.
Nov. 18, 1932	HUEBNER, SOLOMON S., Professor of Insurance, University of Pennsylvania, Philadelphia 4, Pa.
†	HUGHES, CHARLES, (Retired), 285 Smith St., Freeport, N. Y.
Nov. 19, 1929	HULL, ROBERT S., Unemployment Compensation Division, Social Security Board, Washington, D. C.
†	HUNTER, ARTHUR, (Retired), 124 Lloyd Road, Montclair, N. J.
Feb. 25, 1916	JACKSON, CHARLES W., Consulting Actuary, Woodward and Fondiller, 90 John Street, New York 7, N. Y.
*Nov. 19, 1929	JACKSON, HENRY H., Vice President & Actuary, National Life Insurance Co., Montpelier, Vt.
*Nov. 14, 1941	JOHNSON, ROGER A., JR., Acting Actuary, Compensation Insurance Rating Board, 125 Park Avenue, New York 17, N. Y.
*Nov. 16, 1939	JONES, HAROLD M., Liberty Mutual Insurance Company, 175 Berkeley Street, Boston 16, Mass.
*Nov. 17, 1938	KARDONSKY, ELSIE, 66 Corbin Place, Brooklyn, 29, N. Y.
Nov. 17, 1938	KELLY, GREGORY C., General Manager, Pennsylvania Compensation Rating & Inspection Bureau, 938 Public Ledger Bldg., Philadelphia 6, Pa.
*Nov. 19, 1926	KELTON, WILLIAM H., Assistant Actuary, Life Department, The Travelers Insurance Co., 700 Main Street, Hartford 3, Conn.
*Nov. 21, 1919	KIRKPATRICK, A. LOOMIS, Insurance Editor, Chicago Journal of Commerce, 12 East Grand Avenue, Chicago 11, Ill.
*Nov. 14, 1941	KOLODITZKY, MORRIS, State Insurance Fund, 625 Madison Avenue, New York 22, N. Y.
*Nov. 24, 1933	KORMES, MARK, Consulting Actuary, 341 Madison Avenue, New York 17, N. Y.

FELLOWS

Admitted	
Nov. 23, 1928	KULP, CLARENCE A., Professor of Insurance, University of Pennsylvania, Logan Hall, 36th Street and Woodland Avenue, Philadelphia 4, Pa.
Nov. 13, 1931	LA MONT, STEWART M., (Retired), 305 Sheldon Avenue, New Rochelle, New York.
*Nov. 24, 1933	LANGE, JOHN R., Chief Actuary, Wisconsin Insurance Department, State House, Madison 3, Wis.
†	LEAL, JAMES R., Vice-President and Secretary, Interstate Life and Accident Co., Interstate Building, 540 McCallie Avenue, Chattanooga 3, Tenn.
†	LESLIE, WILLIAM, General Manager, National Bureau of Casualty & Surety Underwriters, 60 John Street, New York 7, N. Y.
*Nov. 20, 1924	LINDER, JOSEPH, Consulting Actuary, Wolfe, Corcoran & Linder, 116 John Street, New York 7, N. Y.
*Nov. 13, 1936	LYONS, DANIEL J., Assistant Actuary, Guardian Life Insurance Co., 50 Union Square, New York 3, N. Y.
†	MAGOUN, WILLIAM N., (Retired), 33 Fearing Road, Hingham, Mass.
*Nov. 23, 1928	MARSHALL, RALPH M., Assistant Actuary, National Council on Compensation Insurance 45 East 17th Street, New York 3, N. Y.
*Nov. 18, 1927	MASTERSON, Norton E., Vice-President and Actuary, Hardware Mutual Casualty Co., Stevens Point, Wis.
*Nov. 19, 1926	MATTHEWS, ARTHUR N., Asst. Actuary, Casualty Department, The Travelers Insurance Co., 700 Main Street, Hartford 3, Conn.
May 19, 1915	MAYCRINK, EMMA C., Secretary-Treasurer, Association of New York State Mutual Casualty Companies, 60 East 42nd Street, New York 17, N. Y.
*Nov. 16, 1923	McCLURG, D. RALPH, Secretary and Treasurer, National Equity Life Insurance Co., Little Rock, Ark.
*Nov. 15, 1935	McCONNELL, MATTHEW H., JR., Underwriter, Employers Mutual Liability Ins. Co., 12 S. 12th Street, Philadelphia 7, Pa.
May 23, 1919	McDOUGALD, ALFRED. Ellerslie, Beddington Gardens, Wallington Surrey, England.
*Oct. 31, 1917	McMANUS, ROBERT J., Statistician, Casualty Department, The Travelers Insurance Co., 700 Main Street, Hartford 3, Conn.
†	MICHELBACHER, GUSTAV F., Vice-President and Secretary, Great American Indemnity Co., 1 Liberty Street, New York 5, N. Y.
*Nov. 17, 1938	MILLER, JOHN H., Vice President and Actuary, Monarch Life Insurance Company, Springfield, Mass.
†	MILLIGAN, SAMUEL, Vice-President, Metropolitan Life Insurance Co., 1 Madison Avenue, New York 10, N. Y.
*Nov. 18, 1937	MILLS, JOHN A., Vice President, Lumbermens Mutual Casualty Co., and American Motorists Insurance Co., Mutual Insurance Bldg., Chicago 40, Ill.
*Nov. 18, 1921	MONTGOMERY, VICTOR, President, Pacific Employers Insurance Co., 1033 So. Hope Street, Los Angeles 15, Calif.
Nov. 19, 1926	MOONEY, WILLIAM L., (Retired), 4 Pleasant Street, West Hartford 8, Conn.

FELLOWS

Admitted	
†	MOORE, GEORGE D., Comptroller, Aero Insurance Underwriters, 111 John St., New York 7, N. Y.
†	MOWBRAY, ALBERT H., Consulting Actuary, 806 San Luis Road, Berkeley 7, Calif.
*Nov. 17, 1920	MUELLER, LOUIS H., President, Associated Insurance Fund, 332 Pine Street, San Francisco 4, Calif.
†	MULLANEY, FRANK R., Vice-President and Secretary, American Mutual Liability Insurance Co., and American Policy-holders' Insurance Co., and Vice-President, Allied American Mutual Fire Insurance Co., 142 Berkeley Street, Boston 16, Mass.
May 28, 1920	MURPHY, RAY D., Vice-President and Actuary, Equitable Life Assurance Society, 393 Seventh Avenue, New York 1, N. Y.
*Nov. 15, 1935	OBERHAUS, THOMAS M., Assistant Actuary, Woodward and Fondiller, Consulting Actuaries, 90 John Street, New York 7, N. Y.
†	OLIFIERS, EDWARD, Consulting Actuary, Caixa Postal 8 Perto-polis, Rio, Brazil.
†	ORR, ROBERT K., 226 S. Logan Street, Lansing, Mich.
*Nov. 21, 1919	OUTWATER, OLIVE E., Actuary, Benefit Association of Railway Employees, 901 Montrose Avenue, Chicago 13, Ill.
*Nov. 18, 1921	PERKINS, SANFORD B., Secretary, The Travelers Insurance Co., 700 Main Street, Hartford 3, Conn.
*Nov. 21, 1930	PERRYMAN, FRANCIS S., Secretary and Actuary, Royal Indemnity Co., and Eagle Indemnity Co., 150 William Street, New York 7, N. Y.
*Nov. 14, 1941	PETERS, STEFAN, Assistant Actuary, Compensation Insurance Rating Board, 125 Park Avenue, New York 17, N. Y.
Nov. 19, 1926	PHILLIPS, JESSE S., Chairman of Board, Great American Indemnity Co., 1 Liberty Street, New York 5, N. Y.
*Nov. 24, 1933	PICKETT, SAMUEL C., Assistant Actuary, Connecticut Insurance Department, Hartford 2, Conn.
*Nov. 17, 1922	PINNEY, SYDNEY D., 290 Wolcott Hill Road, Wethersfield 9, Conn.
*Nov. 13, 1931	PRUITT, DUDLEY M., Actuary, General Accident Fire & Life Assurance Corp., Fourth & Walnut Sts., Philadelphia 5, Pa.
May 23, 1919	RICHARDSON, FREDERICK, Deputy Chairman of the Board, General Accident Fire and Life Assurance Corporation, Perth, Scotland.
*Nov. 19, 1926	RICHTER, OTTO C., Asst. Chief Statistician, American Telephone & Telegraph Co., 195 Broadway, New York 7, N. Y.
May 24, 1921	RIEGEL, ROBERT, Professor of Statistics and Insurance, University of Buffalo, Buffalo, New York.
*Nov. 16, 1939	ROBBINS, RAINARD B., Vice-President, Teachers Insurance and Annuity Association, 522 Fifth Avenue, New York 18, N. Y.

FELLOWS

Admitted	
*Nov. 16, 1923	ROEBER, WILLIAM F., General Manager, National Council on Compensation Insurance, 45 East 17th Street, New York 3, N. Y.
*Nov. 17, 1943	ROSS, SAMUEL M., Asst. Actuary, National Bureau of Casualty and Surety Underwriters, 60 John Street, New York 7, N. Y.
*Nov. 20, 1942	SATTERTHWAITE, FRANKLIN E., Group Division, Aetna Life Ins. Co., Hartford 15, Conn.
†	SCHEITLIN, EMIL, Treasurer, Globe Indemnity Co., 150 William Street, New York 7, N. Y.
*Nov. 18, 1937	SHAPIRO, GEORGE I., First Vice President and General Manager, Public Service Mutual Insurance Co., 342 Madison Avenue, New York 17, N. Y.
*Nov. 13, 1931	SILVERMAN, DAVID, c/o Wolfe, Corcoran & Linder, 116 John Street, New York 7, N. Y.
*Nov. 24, 1933	SINNOTT, ROBERT V., Assistant Secretary, Hartford Accident and Indemnity Company, 690 Asylum Avenue, Hartford 5, Conn.
*Nov. 19, 1929	SKELDING, ALBERT Z., Actuary, National Council on Compensation Insurance, 45 East 17th Street, New York 3, N. Y.
*Nov. 19, 1929	SKILLINGS, E. SHAW, Actuary, Allstate Insurance Co., 20 North Wacker Drive, Chicago 6, Ill.
*Nov. 18, 1932	SMICK, JACK J., National Council on Compensation Insurance, 45 East 17th Street, New York 3, N. Y.
*Nov. 15, 1940	SMITH, SEYMOUR E., Casualty Department, The Travelers Insurance Co., Hartford 3, Conn.
*Nov. 24, 1933	ST. JOHN, JOHN B., Associate Actuary, Towers, Perrin, Foster & Crosby, Inc., 12 South 12th Street, Philadelphia 7, Pa.
Nov. 18, 1927	STONE, EDWARD C., U. S. General Manager and Attorney, Employers' Liability Assurance Corporation, Limited, and President, American Employers' Insurance Company, 110 Milk Street, Boston 9, Mass.
Oct. 22, 1915	STRONG, WILLIAM RICHARD, No. 4 "Sheringham," Cotham Road, Kew, Victoria, Australia.
*Nov. 17, 1920	TARBELL, THOMAS F., Actuary, Casualty Department, The Travelers Insurance Co., 700 Main Street, Hartford 3, Conn.
†	THOMPSON, JOHN S., Vice-President and Mathematician, Mutual Benefit Life Insurance Co., 300 Broadway, Newark 4, N. J.
†	TRAIN, JOHN L., President and General Manager, Utica Mutual Insurance Co., 185 Genesee Street, Utica 1, New York.
Nov. 17, 1922	TRAVERSI, ANTONIO T., Consulting Actuary and Accountant, Bank of Adelaide Chambers, Margaret St., Sydney, Australia.
*Nov. 23, 1928	VALERIUS, NELS M., Aetna Casualty and Surety Co., Hartford 15, Conn.
*Nov. 21, 1919	VAN TUYL, HIRAM O., Supt., Accounts Department, London Guarantee & Accident Co., 55 Fifth Avenue, New York, 3 N.Y.
*Nov. 17, 1920	WAITE, ALAN W., Assistant Secretary, Aetna Casualty and Surety Co., Hartford 15, Conn.
*Nov. 15, 1935	WAITE, HARRY V., Statistician, The Travelers Fire Insurance Co., 700 Main Street, Hartford 3, Conn.

FELLOWS

Admitted	
*Nov. 18, 1925	WARREN, LLOYD A. H., Professor of Actuarial Science, University of Manitoba, 64 Niagara Street, Winnipeg, Manitoba, Canada.
*Nov. 15, 1935	WILLIAMS, HARRY V., Assistant Secretary, Hartford Accident and Indemnity Co., Hartford 5, Conn.
Nov. 14, 1941	WILLIAMSON, WILLIAM R., Actuarial Consultant, Social Security Board, Washington 25, D. C.
*Nov. 13, 1931	WITTICK, HERBERT E., Secretary, Pilot Insurance Co., 199 Bay Street, Toronto, Canada.
†	WOLFE, LEE J., Consulting Actuary, Wolfe, Corcoran & Linder, 116 John Street, New York 7, N. Y.
May 24, 1921	WOOD, ARTHUR B., President and Managing Director, Sun Life Assurance Company of Canada, Montreal, Canada.

ASSOCIATES

Those marked (*) have been enrolled as Associates upon examination by the Society.

Numerals indicate Associateship Part V and Fellowship examination parts credited.

Admitted	
May 23, 1924	ACKER, MILTON, Manager, Compensation and Liability Department, National Bureau of Casualty and Surety Underwriters, 60 John Street, New York 7, N. Y.
*Nov. 15, 1918	ACKERMAN, SAUL B., Professor of Insurance, New York University, 90 Trinity Place, New York 6, N. Y.
*Nov. 16, 1939	AIN, SAMUEL N., Office of George B. Buck, Consulting Actuary, 150 Nassau Street, New York 7, N. Y.
Apr. 5, 1928	ALLEN, AUSTIN F., President and General Manager, Texas Employers Insurance Association and Employers Casualty Co., Dallas 1, Texas.
Nov. 15, 1918	ANKERS, ROBERT E., Secretary and Treasurer, Continental Life Insurance Co., Investment Building, Washington 5, D. C.
*Nov. 21, 1930	ARCHIBALD, A. EDWARD, Vice President and Actuary, Volunteer State Life Insurance Company, Chattanooga 1, Tenn. (V, I.)
*Nov. 16, 1939	BAILEY, ARTHUR L., Statistician, American Mutual Alliance, 60 E. 42nd Street, New York 17, N. Y.
*Nov. 24, 1933	BARRON, JAMES C., Asst. Treasurer, General Reinsurance Corporation, 90 John Street, New York 7, N. Y. (V, I, III.)
*Nov. 23, 1928	BATEMAN, ARTHUR E., Liberty Mutual Insurance Company, 175 Berkeley Street, Boston 16, Mass. (V, I.)
*Nov. 15, 1940	BATHO, BRUCE, Actuary, Country Life Insurance Company, 608 So. Dearborn St., Chicago 5, Ill.
*Nov. 18, 1925	BITTEL, W. HAROLD, Actuary, Department of Banking and Insurance, Trenton 7, New Jersey.
Nov. 17, 1920	BLACK, NELLAS C., Manager, Statistical Department, Maryland Casualty Co., Baltimore 3, Md.
*Nov. 15, 1940	BLACKHALL, JOHN M., Monarch Life Insurance Co., Springfield, Mass.
*Nov. 22, 1934	BOMSE, EDWARD L., National Bureau of Casualty & Surety Underwriters, 60 John Street, New York 7, N. Y.
*Nov. 23, 1928	BOWER, PERRY S., Great West Life Assurance Company, Winnipeg, Manitoba, Canada.
*Nov. 15, 1918	BRUNNQUELL, HELMUTH G., Assistant Actuary, The Northwestern Mutual Life Insurance Co., Milwaukee 2, Wis.
*Oct. 22, 1915	BUFFLER, LOUIS, Director, Underwriting Department, State Insurance Fund, 625 Madison Avenue, New York 22, N. Y.
*Nov. 20, 1924	BUGBEE, JAMES M., Asst. Manager, Automobile Department, Maryland Casualty Co., Baltimore 3, Md.
Mar. 31, 1920	BURT, MARGARET A., Office of George B. Buck, Consulting Actuary, 150 Nassau Street, New York 7, N. Y.
Nov. 17, 1922	CAVANAUGH, LEO D., President, Federal Life Insurance Co., 168 N. Michigan Avenue, Chicago 1, Ill.

ASSOCIATES

Admitted	
*Nov. 18, 1927	CHEN, S. T., Actuary, China United Assurance Society, 104 Bubbling Well Road, Shanghai, China.
*Nov. 18, 1927	CONROD, STUART F., Actuary, Loyal Protective Life Insurance Co., 19 Deerfield Street, Boston 15, Mass.
*Nov. 24, 1933	CRAWFORD, WILLIAM H., Secretary, Fireman's Insurance Co. of Newark, N. J. & Affiliated Fire & Casualty Co's Pacific Dept., 220 Bush Street, San Francisco 4, Cal. (V, I.)
*Nov. 18, 1932	CRIMMINS, JOSEPH B., Metropolitan Life Insurance Co., 1 Madison Avenue, New York 10, N. Y. (V, I.)
*Nov. 1, 1944	CROUSE, CHARLES W., Manufacturers Casualty Insurance Co., 16th Street and Pennsylvania Blvd., Philadelphia 3, Pa.
*Nov. 18, 1925	DAVIS, MALVIN E., Associate Actuary, Metropolitan Life Insurance Co., 1 Madison Avenue, New York 10, N. Y.
*Nov. 24, 1933	DAVIS, REGINALD S., Comptroller-Actuary, State Compensation Insurance Fund, San Francisco 2, Calif. (V, I.)
*Nov. 14, 1941	DOWLING, WILLIAM F., Asst. Treasurer, Lumber Mutual Casualty Co., 41 E. 42nd Street, New York 17, N. Y.
May 25, 1923	ECONOMIDY, HARILAUS E., 2402 Boulevard, Galveston, Texas.
June 5, 1925	EGER, FRANK A., Secretary, Indemnity Insurance Co. of North America, 1600 Arch Street, Philadelphia 3, Pa.
*Nov. 16, 1923	FITZ, L. LEROY, Group Department, John Hancock Mutual Life Insurance Company, Boston, Mass. (V, I.)
*Nov. 18, 1927	FITZGERALD, AMOS H., Assistant Actuary, The Prudential Insurance Company of America, Newark 1, N. J. (V, I.)
*Nov. 16, 1923	FLEMING, FRANK A., Actuary, American Mutual Alliance, 60 East 42nd Street, New York 17, N. Y.
Nov. 20, 1924	FROBERG, JOHN, Manager, California Inspection Rating Bureau, 500 Sansome Street, San Francisco 11, Calif.
*Nov. 13, 1936	FRUECHTEMEYER, FRED J., Liberty Mutual Insurance Co., 175 Berkeley Street, Boston 16, Mass. (V, I.)
*Nov. 19, 1929	FURNIVALL, MAURICE L., Assistant Actuary, Accident Department, The Travelers Insurance Co., 700 Main Street, Hartford 3, Conn. (V, I.)
*Nov. 18, 1932	GETMAN, RICHARD A., Life Actuarial Department, The Travelers Insurance Co., 700 Main Street, Hartford 3, Conn. (V, I.)
*Nov. 17, 1922	GIBSON, JOSEPH P., JR., Vice President, Excess Insurance Company of America, 99 John Street, New York 7, N. Y.
*Nov. 16, 1923	GILDEA, JAMES F., The Travelers Insurance Co., 700 Main Street, Hartford 3, Conn.
Nov. 19, 1929	GORDON, HAROLD R., Managing Director, Health & Accident Underwriters Conference, 176 West Adams Street, Chicago 3, Ill.
*Nov. 18, 1927	GREEN, WALTER C., Consulting Actuary, 211 West Wacker Drive, Chicago 6, Ill.
*Nov. 15, 1940	GROSSMAN, ELI A., 26 California Street, Mount Vernon, New York.
*Nov. 15, 1935	GUERTIN, ALFRED N., Actuary, American Life Convention, 230 N. Michigan Ave., Chicago 1, Ill. (V, I.)

ASSOCIATES

Admitted	
*Nov. 16, 1939	HAGEN, OLAF E., Metropolitan Life Insurance Company, 1 Madison Avenue, New York 10, N. Y.
*Nov. 18, 1921	HAGGARD, ROBERT E., Superintendent, Permanent Disability Rating Department, Industrial Accident Commission, State Building, San Francisco, Calif.
*Nov. 17 1922	HALL, HARTWELL L., Associate Actuary, Connecticut Insurance Department, Hartford 2, Conn.
*Nov. 13, 1936	HAM, HUGH P., Automobile Manager & Asst. Secretary, British America Assurance Co., 22 Wellington St. E., Toronto Ontario, Canada. (V, I.)
Mar. 24, 1932	HARRIS, SCOTT, Vice-President, Joseph Froggatt & Co., 74 Trinity Place, New York 6, N. Y.
*Mar. 25, 1924	HART, WARD VAN BUREN, Assistant Actuary, Connecticut General Life Insurance Co., Hartford 2, Conn. (V, I.)
Nov. 21, 1919	HAYDON, GEORGE F., General Manager, Wisconsin Compensation Rating & Inspection Bureau, 715 N. Van Buren Street, Milwaukee 2, Wis.
Nov. 17, 1927	HIPP, GRADY H., Executive Vice-President, Liberty Life Insurance Co., Greenville, S. C.
Nov. 19, 1929	JACOBS, CARL N., President, Hardware Mutual Casualty Co., Stevens Point, Wis.
*Nov. 18, 1921	JENSEN, EDWARD S., Supt., Group Department, Occidental Life Insurance Co., Los Angeles 55, Calif. (II, III.)
Nov. 21, 1930	JONES, H. LLOYD, Deputy General Attorney, of Phoenix-London Group, Vice-President, Phoenix Indemnity Company, and Deputy United States Manager, London Accident & Guarantee Co., 55 Fifth Avenue, New York 3, N. Y.
*Nov. 21, 1919	JONES, LORING D., (Retired) 64 Raymond Ave., Rockville Centre, Long Island, N. Y.
*Nov. 15, 1940	KELLY, ROBERT G., 2127 California St., Washington 8, D. C.
*Nov. 17, 1922	KIRK, CARL L., Assistant U. S. Manager, Zurich General Accident & Liability Insurance Co., 135 South LaSalle Street, Chicago 3, Ill.
*Nov. 15, 1935	KITZROW, ERWIN W., Vice-President, Hardware Mutual Casualty Co., Stevens Point, Wis. (V, I.)
*Nov. 16, 1939	KNOWLES, FREDERICK, 5724 Mountain Sights Ave., N. D. G., Montreal, Canada.
*Nov. 18, 1937	LASSOW, WILLIAM, 185 206th St., Bronx 58, New York. (V.)
*Nov. 17, 1938	LIEBLEIN, JULIUS, 2710-29th, Street, S. E., Washington 20, D. C.
*Nov. 13, 1931	MacKEEN, HAROLD E., The Travelers Insurance Co., 700 Main Street, Hartford 3, Conn. (V, I.)
Mar. 24, 1932	MAGRATH, JOSEPH J., Executive Assistant, Chubb & Sons, 90 John Street, New York 7, N. Y.
*Nov. 18, 1925	MALMUTH, JACOB, Examiner, New York Insurance Department, 61 Broadway, New York 6, N. Y.
Mar. 24, 1927	MARSH, CHARLES V. R., Comptroller and Assistant Treasurer, Fidelity & Deposit Co. and American Bonding Co., Baltimore 3, Md.
*Nov. 13, 1936	MAYER, WILLIAM H., JR., Actuarial Department, Metropolitan Life Insurance Co., 1 Madison Avenue, New York 10, N. Y.
*Nov. 17, 1922	McIVER, ROSSWELL A., Actuary, Washington National Insurance Co., 610 Church Street, Evanston, Ill.

Admitted	

*Nov. 17, 1922   MICHENER, SAMUEL M., Actuary, Columbus Mutual Life Insurance Co., 303 East Broad Street, Columbus 15, Ohio. (V, I.)

*Nov. 13, 1931   MILLER, HENRY C., Comptroller, State Compensation Insurance Fund, 450 McAllister Street, San Francisco 2, Calif. (V, I.)

*Nov. 19, 1926   MILNE, JOHN L., Actuary, Presbyterian Ministers' Fund for Life Insurance, 1805 Walnut Street, Philadelphia 3, Pa.

*Nov. 18, 1937   MINOR, EDUARD H., Accident and Health Department, Metropolitan Life Insurance Company, 1 Madison Avenue, New York 10, N. Y.

Nov. 17, 1922   MONTGOMERY, JOHN C., Secretary and Assistant Treasurer, Bankers Indemnity Insurance Co., 15 Washington Street, Newark 2, N. J.

May 25, 1923   MOORE, JOSEPH P., President, North American Accident Insurance Co., 455 Craig Street, W., Montreal, Canada.

*Nov. 21, 1919   MOTHERSILL, ROLLAND V., President, Anchor Casualty Co., Anchor Insurance Building, 2700 University Avenue, St. Paul 4, Minn. (II, III.)

*Nov. 18, 1937   MYERS, ROBERT J., Senior Actuarial Mathematician, Social Security Board, Washington 25, D. C.

*Nov. 19, 1929   MULLER, FRITZ, Director, Agrippina Life Insurance Stock Co., Berlin, W. 30 Mackensenstr. 16, Germany.

*Nov. 15, 1935   NELSON, S. TYLER, Utica Mutual Insurance Co., 185 Genesee Street, Utica 1, New York.

*Oct. 27, 1916   NEWELL, WILLIAM, Secretary, Assigned Risk Pool, 60 John Street, New York 7, N. Y. (V, I.)

*Nov. 18, 1925   NICHOLSON, EARL H., Actuary, Joseph Froggatt & Co., 74 Trinity Place, New York 6, N. Y.

May 23, 1919   OTTO, WALTER E., President, Michigan Mutual Liability Co., 163 Madison Avenue, Detroit 26, Mich.

*Nov. 19, 1926   OVERHOLSER, DONALD M., Office of George B. Buck, Consulting Actuary, 150 Nassau Street, New York 7, N. Y.

Nov. 20, 1924   PENNOCK, RICHARD M., Actuary, Pennsylvania Manufacturers' Association Casualty Insurance Co., Finance Building, Philadelphia 2, Pa.

Nov. 19, 1929   PHILLIPS, JOHN H., Vice-President and Actuary, Employers' Mutual Liability Insurance Co., Wausau, Wis.

*Nov. 17, 1920   PIKE, MORRIS, Associate Actuary, John Hancock Mutual Life Insurance Co., Boston, Mass.

*Nov. 23, 1928   PIPER, KENNETH B., Actuary, Provident Life and Accident Insurance Co., Chattanooga 2, Tenn. (V, I.)

*Nov. 18, 1927   POISSANT, WILLIAM A., The Travelers Insurance Co., 700 Main Street, Hartford 3, Conn.

*Nov. 17, 1922   POORMAN, WILLIAM F., Vice-President and Actuary, Central Life Assurance Society, Fifth and Grand Avenues, Des Moines 6, Iowa. (V, I.)

*Nov. 13, 1936   POTOFSKY, SYLVIA, State Insurance Fund, 625 Madison Avenue, New York 22, N. Y. (V.)

ASSOCIATES

Admitted	
Nov. 17, 1922	POWELL, JOHN M., President, Loyal Protective Life Insurance Co., 19 Deerfield Street, Boston 15, Mass. (V, I.)
*Nov. 15, 1918	RAYWID, JOSEPH, President, Joseph Raywid & Co., Inc., 92 William Street, New York 7, N. Y.
Nov. 19, 1932	RICHARDSON, HARRY F., Secretary-Treasurer, National Council on Compensation Insurance, 45 East 17th Street, New York 3, N. Y.
*Nov. 18, 1932	ROBERTS, JAMES A., Life Actuarial Department, The Travelers Insurance Co., 700 Main Street, Hartford 3, Conn. (V, I.)
*Nov. 15, 1940	ROSENBERG, NORMAN, Actuary, Public Service Mutual Insurance Co., 342 Madison Avenue, New York 17, N. Y. (I.)
*Nov. 18, 1927	SARASON, HARRY M., Associate Actuary, General American Life Insurance Co., 1501 Locust Street, St. Louis 3, Mo.
Nov. 16, 1923	SAWYER, ARTHUR, Globe Indemnity Co., 150 William Street, New York 7, N. Y.
*Nov. 20, 1930	SEVILLA, EXEQUIEL S., Actuary, National Life Insurance Co., P. O. Box 2856, Manila, Philippine Islands.
*Nov. 20, 1924	SHEPPARD, NORRIS E., Professor of Mathematics, University of Toronto, Toronto, Canada. (V, I.)
Nov. 15, 1918	SIBLEY, JOHN L., Assistant Secretary, United States Casualty Co., 60 John Street, New York 7, N. Y.
*Nov. 18, 1921	SMITH, ARTHUR G., Assistant General Manager, Compensation Insurance Rating Board, Pershing Square Bldg., 125 Park Avenue, New York 17, N. Y.
*Nov. 19, 1926	SOMERVILLE, WILLIAM F., Secretary, St. Paul Mercury Indemnity Co., St. Paul 2, Minn. (V, I.)
*Nov. 18, 1925	SOMMER, ARMAND, Supt. of Agencies, Continental Casualty Co., 910 So. Michigan Avenue, Chicago 5, Ill.
*Nov. 15, 1918	SPENCER, HAROLD S., Statistician, Aetna Casualty and Surety Co., Hartford 15, Conn.
Nov. 20, 1924	STELLWAGEN, HERBERT P., Executive Vice-President, Indemnity Insurance Company of North America, 1600 Arch Street, Philadelphia 3, Pa.
*Nov. 16, 1923	STOKE, KENDRICK, Actuary, Michigan Mutual Liability Company, 163 Madison Avenue, Detroit 26, Mich.
*Nov. 21, 1930	SULLIVAN, WALTER F., Asst. Actuary, State Compensation Insurance Fund, 450 McAllister Street, San Francisco 2, Calif. (V, I.)
*Nov. 21, 1919	TRENCH, FREDERICK H., Manager, Underwriting Department, Utica Mutual Insurance Co., 185 Genesee Street, Utica 1, N. Y. (V, I.)
*Nov. 20, 1924	UHL, M. ELIZABETH, National Bureau of Casualty & Surety Underwriters, 60 John Street, New York 7, N. Y. (V, I.)
*Nov. 1, 1944	UHTHOFF, DUNBAR R., Lumber Mutual Casualty Insurance Co., 41 E. 42nd Street, New York 17, N. Y.
May 23, 1919	WARREN, CHARLES S., Secretary, Massachusetts Automobile Rating and Accident Prevention Bureau, 89 Broad Street, Boston 10, Mass.
Nov. 18, 1925	WASHBURN, JAMES H., Actuary, 1501 Gale Lane, Nashville 4, Tenn.

ASSOCIATES

Admitted	
*Nov. 18, 1932	WEINSTEIN, MAX S., Actuary, New York State Employees' Retirement System, 256 Washington Ave., Albany 1, N. Y.
*Nov. 18, 1921	WELCH, EUGENE R., Associated Indemnity Corporation, 332 Pine Street, San Francisco 4, Calif. (Deceased Jan. 17, 1945)
*Nov. 18, 1925	WELLMAN, ALEXANDER C., Vice-President Protective Life Insurance Co., Birmingham, Ala.
*Nov. 21, 1930	WELLS, WALTER I., Supervisor of Applications, Massachusetts Protective Association, Worcester 2, Mass. (V, I.)
Mar. 21, 1929	WHEELER, CHARLES A., Chief Examiner of Casualty Companies, New York Insurance Department, 61 Broadway, New York 6, N. Y.
*Nov. 18, 1927	WHITBREAD, FRANK G., Associate Actuary, Great West Life Assurance Co., Winnipeg, Manitoba, Canada.
*Nov. 16, 1939	WITTLAKE, J. CLARKE, Actuarial Department, Business Men's Assurance Company, Kansas City 10, Mo.
*Oct. 22, 1915	WOOD, DONALD M., Childs & Wood, General Agents, Royal Indemnity Company, 175 W. Jackson Blvd., Chicago 4, Ill.
*Nov. 18, 1937	WOOD, DONALD M., JR., Childs & Wood, 175 West Jackson Blvd., Chicago 4, Ill.
*Nov. 18, 1927	WOOD, MILTON J., Assistant Actuary, Life Actuarial Department, The Travelers Insurance Co., 700 Main Street, Hartford 3, Conn.
*Oct. 22, 1915	WOODMAN, CHARLES E., Assistant Manager, Ocean Accident & Guarantee Corporation and Comptroller, Columbia Casualty Co., 1 Park Avenue, New York 16, N. Y.
*Nov. 22, 1934	WOODWARD, BARBARA H., Hughes, Hubbard & Ewing, 1 Wall Street, New York 5, N. Y.
*Nov. 18, 1925	WOOLERY, JAMES M., Actuary, Union Labor Life Insurance Co., 570 Lexington Ave., New York 22, N. Y.

SCHEDULE OF MEMBERSHIP, NOVEMBER 1, 1944

	Fellows	Associates	Total
Membership, November 17, 1943..........	159	123	282
Additions:			
By election............................	..		..
By reinstatement.......................	..		..
By examination........................	..	2	2
	159	125	284
Deductions:			
By death..............................	3	2	5
By withdrawal.........................	1	..	1
By transfer from Associate to Fellow.....	..	..	..
Membership, November 1, 1944...........	155	123	278

OFFICERS OF THE SOCIETY
Since Date of Organization

Elected	President	Vice-Presidents	
1914–1915	*I. M. Rubinow	A. H. Mowbray	*B. D. Flynn
1916–1917	*J. D. Craig	*J. H. Woodward	*H. E. Ryan
1918	*J. H. Woodward	*B. D. Flynn	G. D. Moore
1919	*B. D. Flynn	G. D. Moore	W. Leslie
1920	A. H. Mowbray	W. Leslie	*L. S. Senior
1921	A. H. Mowbray	*L. S. Senior	*H. E. Ryan
1922	*H. E. Ryan	G. F. Michelbacher	E. E. Cammack
1923	W. Leslie	G. F. Michelbacher	E. E. Cammack
1924–1925	G. F. Michelbacher	S. B. Perkins	R. H. Blanchard
1926–1927	S. B. Perkins	G. D. Moore	T. F. Tarbell
1928–1929	G. D. Moore	S. D. Pinney	P. Dorweiler
1930–1931	T. F. Tarbell	*R. A. Wheeler	W. W. Greene
1932–1933	P. Dorweiler	W. F. Roeber	*L. S. Senior
1934–1935	W. W. Greene	R. H. Blanchard	C. J. Haugh
1936–1937	*L. S. Senior	S. D. Pinney	F. S. Perryman
1938–1939	F. S. Perryman	H. T. Barber	W. J. Constable
1940	S. D. Pinney	H. J. Ginsburgh	J. M. Cahill
1941	R. H. Blanchard	H. J. Ginsburgh	J. M. Cahill
1942	R. H. Blanchard	Albert Z. Skelding	Charles J. Haugh
1943–1944	H. J. Ginsburgh	Albert Z. Skelding	Charles J. Haugh

Secretary-Treasurer
1914–1917......*C. E. Scattergood
1918–1944............R. Fondiller

Editor†	Librarian†
1914..............W. W. Greene	1914.............W. W. Greene
1915–1917.........R. Fondiller	1915...............R. Fondiller
1918.......... W. W. Greene	1916–1921.........L. I. Dublin
1919–1921....G. F. Michelbacher	1922–1924.........E. R. Hardy
1922–1923........O. E. Outwater	1925–1937............W. Breiby
1924–1932......R. J. McManus	1937–1944........T. O. Carlson
1933–1943........*C. W. Hobbs	
1944............E. C. Maycrink	

*Deceased.
†The offices of Editor and Librarian were not separated until 1916.

FELLOWS WHO HAVE DIED

The (†) denotes original membership at date of organization, November 7, 1914

Admitted		Died
May 24, 1921	Edward J. Bond	Nov. 12, 1941
May 19, 1915	Thomas Bradshaw	Nov. 10, 1939
June 5, 1925	William Brosmith	Aug. 22, 1937
†	William A. Budlong	June 4, 1934
Nov. 18, 1932	Charles H. Burhans	June 15, 1942
Feb. 19, 1915	F. Highlands Burns	Mar. 30, 1935
Feb. 19, 1915	Gordon Case	Feb. 4, 1920
†	Charles T. Conway	July 23, 1921
†	Walter G. Cowles	May 30, 1942
†	James D. Craig	May 27, 1940
†	James McIntosh Craig	Jan. 20, 1922
May 26, 1916	Frederick S. Crum	Sept. 2, 1921
†	Alfred Burnett Dawson	June 21, 1931
†	Miles Menander Dawson	Mar. 27, 1942
May 19, 1915	Samuel Deutschberger	Jan. 18, 1929
†	Ezekiel Hinton Downey	July 9, 1922
May 19, 1915	Earl O. Dunlap	July 5, 1944
†	David Parks Fackler	Oct. 30, 1924
Feb. 19, 1915	Claude W. Fellows	July 15, 1938
†	Benedict D. Flynn	Aug. 22, 1944
†	Charles S. Forbes	Oct. 2, 1943
May 26, 1916	Lee K. Frankel	July 25, 1931
Feb. 25, 1916	Joseph Froggatt	Sept. 28, 1940
†	Theodore E. Gaty	Aug. 22, 1925
May 19, 1915	James W. Glover	July 15, 1941
Oct. 22, 1915	George Graham	Apr. 15, 1937
May 25, 1923	William A. Granville	Feb. 4, 1943
†	William H. Gould	Oct. 28, 1936
†	Robert Cowen Lees Hamilton	Nov. 15, 1941
Nov. 21, 1919	Robert Henderson	Feb. 16, 1942
†	Robert J. Hillas	May 17, 1940
Nov. 15, 1918	Frank Webster Hinsdale	Mar. 18, 1932
May 23, 1924	Clarence W. Hobbs	July 21, 1944
Nov. 19, 1926	Charles E. Hodges	Jan. 22, 1937
Nov. 21, 1919	Carl Hookstadt	Mar. 10, 1924
†	Burritt A. Hunt	Sept. 3, 1943
Nov. 28, 1921	William Anderson Hutcheson	Nov. 19, 1942
May 19, 1915	William C. Johnson	Oct. 7, 1943
Nov. 23, 1928	F. Robertson Jones	Dec. 26, 1941
Nov. 18, 1921	Thomas P. Kearney	Feb. 11, 1928
Oct. 22, 1915	Virgil Morrison Kime	Oct. 15, 1918
†	Edwin W. Kopf	Aug. 3, 1933
Feb. 17, 1915	John M. Laird	June 20, 1942
Feb. 19, 1915	Abb Landis	Dec. 9, 1937
Nov. 17, 1922	Arnette Roy Lawrence	Dec. 1, 1942
Nov. 18, 1921	James Fulton Little	Aug. 11, 1938
Nov. 23, 1928	Edward C. Lunt	Jan. 13, 1941
Feb. 19, 1915	Harry Lubin	Dec. 20, 1920
Feb. 15, 1915	Franklin B. Mead	Nov. 29, 1933

FELLOWS WHO HAVE DIED—Continued

Admitted		Died
Apr. 20, 1917	Marcus Meltzer	Mar. 27, 1931
†	David W. Miller	Jan. 18, 1936
†	James F. Mitchell	Feb. 9, 1941
†	Henry Moir	June 8, 1937
Feb. 19, 1915	William J. Montgomery	Aug. 20, 1915
May 19, 1915	Edward Bontecou Morris	Dec. 19, 1929
†	Lewis A. Nicholas	Apr. 21, 1940
†	Stanley L. Otis	Oct. 12, 1937
Nov. 13, 1926	Bertrand A. Page	July 30, 1941
Nov. 15, 1918	William Thomas Perry	Oct. 25, 1940
†	Edward B. Phelps	July 24, 1915
†	Charles Grant Reiter	July 30, 1937
†	Charles H. Remington	Mar. 21, 1938
†	Isaac M. Rubinow	Sept. 1, 1936
†	Harwood Eldridge Ryan	Nov. 2, 1930
†	Arthur F. Saxton	Feb. 26, 1927
†	Leon S. Senior	Feb. 3, 1940
Apr. 20, 1917	Charles Gordon Smith	June 22, 1938
Feb. 19, 1915	John T. Stone	May 9, 1920
Feb. 25, 1916	Wendell Menville Strong	Mar. 30, 1942
†	Robert J. Sullivan	July 19, 1934
Nov. 22, 1934	Walter H. Thompson	May 25, 1935
Nov. 18, 1921	Guido Toja	Feb. 28, 1933
May 23, 1919	Archibald A. Welch	May 8, 1935
Nov. 19, 1926	Roy A. Wheeler	Aug. 26, 1932
†	Albert W. Whitney	July 27, 1943
†	S. Herbert Wolfe	Dec. 31, 1927
†	Joseph H. Woodward	May 15, 1928
†	William Young	Oct. 23, 1927

ASSOCIATES WHO HAVE DIED

Admitted		Died
Oct. 22, 1915	Don A. Baxter	Feb. 10, 1920
Nov. 22, 1934	John J. Gately	Nov. 3, 1943
Nov. 20, 1924	Leslie LeVant Hall	Mar. 8, 1931
Oct. 31, 1917	Edward T. Jackson	May 8, 1939
Nov. 23, 1928	Karl Newhall	Oct. 24, 1944
Nov. 18, 1927	Alexander A. Speers	June 25, 1941
Mar. 23, 1921	Arthur E. Thompson	Jan. 17, 1944
Nov. 21, 1919	Walter G. Voogt	May 8, 1937
Nov. 17, 1920	James J. Watson	Feb. 23, 1937
Nov. 15, 1918	Albert Edward Wilkinson	June 11, 1930

CONSTITUTION
(As Amended November 15, 1940)

ARTICLE I.—*Name.*

This organization shall be called the CASUALTY ACTUARIAL SOCIETY.

ARTICLE II.—*Object.*

The object of the Society shall be the promotion of actuarial and statistical science as applied to the problems of casualty and social insurance by means of personal intercourse, the presentation and discussion of appropriate papers, the collection of a library and such other means as may be found desirable.

The Society shall take no partisan attitude, by resolution or otherwise, upon any question relating to casualty or social insurance.

ARTICLE III.—*Membership.*

The membership of the Society shall be composed of two classes, Fellows and Associates. Fellows only shall be eligible to office or have the right to vote.

The Fellows of the Society shall be the present Fellows and those who may be duly admitted to Fellowship as hereinafter provided. The Associates shall be the present Associates and those who may be duly admitted to Associateship as hereinafter provided.

Any person may, upon nomination to the Council by two Fellows of the Society and approval by the Council of such nomination with not more than one negative vote, become enrolled as an Associate of the Society, provided that he shall pass such examination as the Council may prescribe. Such examination may be waived in the case of a candidate who for a period of not less than two years has been in responsible charge of the Statistical or Actuarial Department of a casualty insurance organization or has had such other practical experience in casualty or social insurance as, in the opinion of the Council, renders him qualified for Associateship.

Any person who shall have qualified for Associateship may become a Fellow on passing such final examination as the Council may prescribe. Otherwise, no one shall be admitted as a Fellow unless recommended by a duly called meeting of the Council, with not more than three negative votes, followed by a three-fourths ballot of the Fellows present and voting at a meeting of the Society.

ARTICLE IV.—*Officers and Council.*

The officers of the Society shall be a President, two Vice-Presidents, a Secretary-Treasurer, an Editor, and a Librarian. The Council shall be composed of the active officers, nine other Fellows and, during the four years following the expiration of their terms of office, the ex-Presidents and ex-Vice-Presidents. The Council shall fill vacancies occasioned by death or resignation of any officer or other member of the Council, such appointees to serve until the next annual meeting of the Society.

CONSTITUTION

ARTICLE V.—*Election of Officers and Council.*

The President, Vice-Presidents, and the Secretary-Treasurer shall be elected by a majority ballot at the annual meeting for the term of one year and three members of the Council shall, in a similar manner, be annually elected to serve for three years. The President and Vice-Presidents shall not be eligible for the same office for more than two consecutive years nor shall any retiring member of the Council be eligible for re-election at the same meeting.

The Editor and the Librarian shall be elected annually by the Council at the Council meeting preceding the annual meeting of the Society. They shall be subject to confirmation by majority ballot of the Society at the annual meeting.

The terms of the officers shall begin at the close of the meeting at which they are elected except that the retiring Editor shall retain the powers and duties of office so long as may be necessary to complete the then current issue of *Proceedings*.

ARTICLE VI.—*Duties of Officers and Council.*

The duties of the officers shall be such as usually appertain to their respective offices or may be specified in the by-laws. The duties of the Council shall be to pass upon candidates for membership, to decide upon papers offered for reading at the meetings, to supervise the examination of candidates and prescribe fees therefor, to call meetings, and, in general, through the appointment of committees and otherwise, to manage the affairs of the Society.

ARTICLE VII.—*Meetings.*

There shall be an annual meeting of the Society on such date in the month of November as may be fixed by the Council in each year, but other meetings may be called by the Council from time to time and shall be called by the President at any time upon the written request of ten Fellows. At least two weeks' notice of all meetings shall be given by the Secretary.

ARTICLE VIII.—*Quorum.*

Seven members of the Council shall constitute a quorum. Twenty Fellows of the Society shall constitute a quorum.

ARTICLE IX.—*Expulsion or Suspension of Members.*

Except for non-payment of dues no member of the Society shall be expelled or suspended save upon action by the Council with not more than three negative votes followed by a three-fourths ballot of the Fellows present and voting at a meeting of the Society.

ARTICLE X.—*Amendments.*

This constitution may be amended by an affirmative vote of two-thirds of the Fellows present at any meeting held at least one month after notice of such proposed amendment shall have been sent to each Fellow by the Secretary.

BY-LAWS

(As Amended November 13, 1936)

ARTICLE I.—*Order of Business.*

At a meeting of the Society the following order of business shall be observed unless the Society votes otherwise for the time being:

1. Calling of the roll.

2. Address or remarks by the President.

3. Minutes of the last meeting.

4. Report by the Council on business transacted by it since the last meeting of the Society.

5. New membership.

6. Reports of officers and committees.

7. Election of officers and Council (at annual meetings only).

8. Unfinished business.

9. New business.

10. Reading of papers.

11. Discussion of papers.

ARTICLE II.—*Council Meetings.*

Meetings of the Council shall be called whenever the President or three members of the Council so request, but not without sending notice to each member of the Council seven or more days before the time appointed. Such notice shall state the objects intended to be brought before the meeting, and should other matter be passed upon, any member of the Council shall have the right to re-open the question at the next meeting.

ARTICLE III.—*Duties of Officers.*

The President, or, in his absence, one of the Vice-Presidents, shall preside at meetings of the Society and of the Council. At the Society meetings the presiding officer shall vote only in case of a tie, but at the Council meetings he may vote in all cases.

The Secretary-Treasurer shall keep a full and accurate record of the proceedings at the meetings of the Society and of the Council, send out calls for the said meetings, and, with the approval of the President and Council, carry on the correspondence of the Society. Subject to the direction of the Council, he shall have immediate charge of the office and archives of the Society.

The Secretary-Treasurer shall also send out calls for annual dues and acknowledge receipt of same; pay all bills approved by the President for expenditures authorized by the Council of the Society; keep a detailed account of all receipts and expenditures, and present an abstract of the same at the annual meetings, after it has been audited by a committee of the Council.

The Editor shall, under the general supervision of the Council, have charge of all matters connected with editing and printing the Society's publications. The *Proceedings* shall contain only the proceedings of the meetings, original papers or reviews written by members, discussions on said papers and other matter expressly authorized by the Council.

The Librarian shall, under the general supervision of the Council, have charge of the books, pamphlets, manuscripts and other literary or scientific material collected by the Society.

ARTICLE IV.—*Dues.*

The dues shall be ten dollars for Fellows payable upon entrance and at each annual meeting thereafter, except in the case of Fellows not residing in the United States, Canada, or Mexico, who shall pay five dollars at the time stated. The dues shall be five dollars for Associates payable upon entrance and each annual meeting thereafter until five such payments in all shall have been made; beginning with the sixth annual meeting after the admission of an Associate as such the dues of any Associate heretofore or hereafter admitted shall be the same as those of a Fellow. The payment of dues will be waived in the case of Fellows or Associates who have attained the age of seventy years or who, having been members for a period of at least twenty years, shall have attained the age of sixty-five years.

It shall be the duty of the Secretary-Treasurer to notify by mail any Fellow or Associate whose dues may be six months in arrears, and to accompany such notice by a copy of this article. If such Fellow or Associate shall fail to pay his dues within three months from the date of mailing such notice, his name shall be stricken from the rolls, and he shall thereupon cease to be a Fellow or Associate of the Society. He may, however, be reinstated by vote of the Council, and upon payment of arrears of dues.

ARTICLE V.—*Designation by Initials.*

Fellows of the Society are authorized to append to their names the initials F. C. A. S.; and Associates are authorized to append to their names the initials A. C. A. S.

ARTICLE VI.—*Amendments.*

These by-laws may be amended by an affirmative vote of two-thirds of the Fellows present at any meeting held at least one month after notice of the proposed amendment shall have been sent to each Fellow by the Secretary.

SYLLABUS OF EXAMINATIONS
Effective 1941 and thereafter

ASSOCIATESHIP

Part	Sections	Subjects
I	1	Algebra.
	2	Compound Interest and Annuities Certain.
II	3	Differential and Integral Calculus.
	4	Calculus of Finite Differences.
III	5	Descriptive and Analytical Statistics.
	6	Elements of Accounting, Including Corporate Accounting.
IV	7	Probabilities.
	8	Life Contingencies, Life Annuities and Life Assurances.
V	9	Policy Forms and Underwriting Practice in Casualty Insurance.
	10	Casualty Insurance Rate Making Procedure.

FELLOWSHIP

Part	Sections	Subjects
I	11	Investments of Insurance Companies.
	12	Insurance Law and Legislation.
	13	Insurance Economics.
II	14	Determination of Premium, Loss and Expense Reserves.
	15	Advanced Problems in Casualty Insurance Statistics.
	16	Advanced Problems in Casualty Insurance Accounting.
III	17	Individual Risk Rating.
	18	Social Insurance.
	19	Advanced Problems in the Underwriting and Administration of Casualty Insurance.

RULES REGARDING EXAMINATIONS FOR ADMISSION TO THE SOCIETY

1. Dates of Examination.

Examinations will be held on the first Wednesday and following Thursday during the month of April in each year, except that if such dates are in the week preceding Easter, the examinations will be held on the second Wednesday and following Thursday of April. The examinations will be held in such cities as will be convenient for three or more candidates.

2. Filing of Application.

Application for admission to examination should be made on the Society's blank form, which may be obtained from the Secretary-Treasurer. No applications will be considered unless received before the fifteenth day of January preceding the dates of examination. Applications should definitely state for what parts the candidate will appear.

3. Fees.

The examination fee is $2.00 for each part, with a minimum of $5.00 for each year in which the candidate presents himself; thus for one or two parts, $5.00, for three parts, $6.00, etc. Examination fees are payable to the order of the Society and must be received by the Secretary-Treasurer before the fifteenth day of January preceding the dates of examination.

4. Associateship and Fellowship Examinations.

(a) The examination for Associateship consists of five parts and that for Fellowship consists of three parts. A candidate may take any one or more of the five parts of the Associateship Examination. No candidate will be permitted to present himself for

any part of the Fellowship Examination unless he has previously passed, or shall concurrently present himself for and submit papers for, all parts of the Associateship Examination and all preceding parts of the Fellowship Examination. Subject to the foregoing requirement, the candidate will be given credit for any part or parts of either examination which he may pass.

(b) A candidate who has passed Associateship Parts I-IV prior to 1941, but who has not been enrolled as an Associate because of lack of the experience qualifications required by the examination rules effective prior to 1941, will be enrolled as an Associate upon passing Part V. Such a candidate may also take Fellowship Examination Parts I-III in the same year as Associateship Part V, subject to the provisions of paragraph (a) above.

(c) An Associate who has passed no part of the Fellowship Examination under the Syllabus effective prior to 1941 is required, in order to qualify for admission as a Fellow, to pass Associateship Examination Part V and Fellowship Examination Parts I-III.

5. Alternative to Passing of Fellowship Parts II and III.

As an alternative to the passing of Parts II and III of the Fellowship Examination, a candidate may elect to present an original thesis on an approved subject relating to casualty or social insurance. Such thesis must show evidence of ability for original research and the solution of advanced problems in casualty insurance comparable with that required to pass Parts II and III of the Fellowship Examination, and shall not consist solely of data of an historical nature. Candidates electing this alternative should communicate with the Secretary-Treasurer and obtain through him approval by the Examination Committee of the subject of the thesis. In communicating with the Secretary-Treasurer, the candidate should state, in addition to the subject of the thesis, the main divisions of the subject and general method of treatment, the approximate number of words and the approximate proportion to be devoted to data of an historical nature. All theses must be in the hands of the Secretary-Treasurer before the first Wednesday in April of the year in which they are to be considered. Where Part I of the Fellowship Examination is not taken

during the same year, no examination fee will be required in connection with the presentation of a thesis. All theses submitted are, if accepted, to be the property of the Society and may, with the approval of the Council, be printed in the *Proceedings*.

6. Waiver of Examinations for Associate.

The examinations for Associate will be waived under Article III of the Constitution only in case of those candidates who meet the following qualifications and requirements:

(a) The candidate shall be at least thirty-five years of age.

(b) The candidate shall have had at least ten years' experience in casualty actuarial or statistical work or in a phase of casualty insurance which requires a working knowledge of actuarial or statistical procedure or in the teaching of casualty insurance principles in colleges or universities. Experience limited exclusively to the field of accident and health insurance shall not be admissible.

(c) For the two years preceding date of application, the candidate shall have been in responsible charge of the actuarial or statistical department of a casualty insurance organization or of an important division of such department or shall have occupied an executive position in connection with the phase of casualty work in which he is engaged, or, if engaged in teaching, shall have attained the status of a professor.

(d) The candidate shall have submitted a thesis approved by the Examination Committee. Such thesis must show evidence of original research and knowledge of casualty insurance and shall not consist solely of data of an historical nature. Candidates electing this alternative should communicate with the Secretary-Treasurer and obtain through him approval by the Examination Committee of the subject of the thesis. In communicating with the Secretary-Treasurer, the candidate should state, in addition to the subject of the thesis, the main divisions of the subject and general method of treatment, the approximate number of words and the approximate proportion to be devoted to data of an historical nature.

RECOMMENDATIONS FOR STUDY

To assist students in preparation for the examinations, Recommendations For Study have been prepared. This lists the texts, readings and technical material which must be mastered by the candidates. Textbooks are loaned to registered students by the Society. By "registered students" is meant candidates who have signified their willingness to take the examinations by the payment of their examination fees.

LIBRARY

The Society's library contains all of the references listed in the Recommendations for Study with the exception of certain periodicals and publications subject to periodical revision. It also contains numerous other works on casualty actuarial matters. Registered students may have access to the library by receiving from the Society's Secretary the necessary credentials. Books may be withdrawn from the library for a period of two weeks upon payment of a small service fee and necessary postage.

The library is in the immediate charge of Miss Mabel B. Swerig, Librarian of the Insurance Society of New York, 107 William Street, New York 7, N. Y.