SCHEDULED EXPERIENCE RATING.

BY

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It will be obvious to the members of this Society that no adequate test of the theory herein advanced could be made from the data available in the records of any one company. Hence the writer cannot say positively that it will be found in practice an improvement on that now followed or that it will be found workable at all. Yet it would seem to be the duty of members of this Society to bring before it for discussion and criticisms such studies, when made in the hope that if found apparently practicable a method of test will be found. It is in this spirit that the following study is presented.

Present methods of compensation rate-making have been subjected to criticism at two points of their progress. The methods of determining manual or base rates have been several times directly criticized as employing too much subjective judgment and as being too inflexible to meet changing conditions such as the rise and fall of accident frequency with changes in industrial activity. The method of modifying classification rates through rating schedules has by implication been subjected to equal criticism through criticism of the similar fire-rating schedules, as resting entirely on personal judgment for their values and as inconsistent and inharmonious with classification rates made from experience.

Personal judgment has entered into the making of manual rates through the insufficiency of experience data to furnish dependable pure premiums for the several classifications. It has been suggested that the number of classifications is too large and that this results from a wrong principle of classification. This is a question for further consideration and discussion. The practical field men and executives seem to feel the present basis needful. The disturbing effect upon classification experience limited in volume, of one or more serious or fatal accidents, is also a cause for the use of judgment in modifying statistical indications.

Little time need be taken for a discussion of present methods of

modifying statistical indications in determining manual rates—a process of association with cut and fill leveling according to the combined judgment if not the whim or prejudice of the rate making committee checked back by a comparison of actual and projected losses. Massachusetts and New York Insurance Departments are now calling for a separate return in Schedule Z of fatal accidents in the hope that such data may be helpful in the effort to spread the cost of this type of accident, especially when it is not characteristic of the industry. While such data will undoubtedly be useful in such work, it of itself furnishes no rule for its use, which must still be governed by subjective judgment so called.

We can hardly get away from the criticism of inflexibility for some time to come, our rates must be made for the future from the data of the past with all the limitations thereby imposed of waiting for payroll audits and maturing of experience and of even then working with data more or less vitiated by the necessity of including estimates of deferred liability on serious cases. The suggestions herein put forth are not intended or expected, except incidentally, to meet this criticism.

Turning to implied criticisms, our present rating schedules largely follow in form those in use for fire insurance rating. These fire-rating schedules were developed for application to a base rate made solely upon personal judgment for an arbitrary type of risk having no necessary relation to any found in practice. The values assigned to the individual schedule items were also purely personal judgment values, though in fairness it must be said that the judgments were of men of broad experience with large opportunity for observation. The base rate for the arbitrary type from which the schedule departures are taken is made in the same way. To this extent the system is consistent. But it is now proposed to try to base fire insurance rates on pure premiums derived from classified statistical experience records and a fire underwriter of no less standing than Mr. E. G. Richards, U. S. manager of the North British and Mercantile Insurance Company and lately president of the National Board of Fire Underwriters has pointed out the inconsistency of attempting to combine individual rate modification according to schedules of this type with classification base rates so made. In the "Experience Grading and Rating Schedule" he proposes a new system, which has suggested to the writer the present study.

Our present workmen's compensation rating schedules were doubtless inspired by the existing fire schedules which seem to have been taken as a model. The values are likewise judgment values applied directly to the rate. They do not specify any definite standard underlying the base rate which, however, is assumed to be an average risk. This further complicates matters, for the average rarely, if ever, exists in actual life. It is purely a mental concept, a composite photograph of what has come into the range of observation. A statistical average is perhaps not too hard to deal with, since by analysis we can determine its composition but where the average has not been determined from actual statistics the problem becomes exceedingly complex, since each individual has his own impression based upon recollection of conditions he has observed. Hence have arisen the conflicts of opinion over the propriety of credits for certain conditions in place of charges for the lack of them.

As progress is made in safety work the average is presumably raised and the experience pure premium ought to reflect this. Hence by change of the base line the schedule values will be thrown out of line and conditions now covered by credits should probably be required, their absence calling for charges.

It would seem there is an irreconcilable conflict between our present system of manual rate determination and our present schedule system of individual rate modification.

For these faults in our present methods what are the remedies? It is obvious that much of the direct criticism can be met if a way can be found to broaden the range of our observation so as to give us a larger exposure basis of rate-making. It is hard to see how the criticisms of our rate modification plans can be met except by a radical change in system.

Obviously an increased exposure would be obtained if our rate-making data were based upon a longer term of observation. This, however, is open to serious objection for several reasons, among the most important of which are:

1. Increasing cost due to more complete report of the compensation benefits.
2. Changes in costs resulting from changes in business conditions (not in all respects an objection).

3. Changes in legal terms and administrative methods having important effects upon costs but difficult to measure with precision.

An increased exposure would also result if data from a larger area were brought into requisition. To this proposal also serious objections may be raised. Among the conditions adversely affecting such a proposal are:

1. Difference in legal conditions in different states necessitating the use of differential multipliers, the accuracy of which may easily be called in question.
2. Differences in local administrative methods which cannot be measured satisfactorily by a differential.
3. Differences in local conditions due to differences in the type of working population.
4. Local differences in methods of conducting similar operations due to climatic or other differences in condition.

It has been attempted to secure a larger rate-making base by combining classifications in groups by analogy of hazard and the use of multipliers where necessary. The amount of gain possible in this way is quite limited and discussions which have taken place here and elsewhere have raised serious questions which need not be reviewed here.

Study along the line of Mr. Richards' suggestions in regard to fire-rating has led the writer to a further suggestion which seems to have considerable possibilities of usefulness. For lack of a better term we will refer to it as analyzed combination in groups.

Various analyses of the pure premium formula $\pi = L/P$ have been presented. The analysis

$$\Pi = \frac{L}{P} = \frac{l_1 + l_2 + \cdots + l_w}{P} = \frac{l_1}{P} + \frac{l_2}{P} + \cdots \frac{l_w}{P}$$

is simple and obvious, the losses being divided into elements according to the point of view of the study. It is proposed to approach the problem from the point of view of hazard or accident cause. The analysis indicated above may be carried as far as desired. For present purposes it is sufficient to stop after analyzing to one of a few simple groups of causes, for which analysis sufficient data

is usually available in the first accident report without further investigation. The following is suggested as a tentative set of groups:

1. Power generation including boilers, engines, etc.
2. Power transmission covering to the belt of the individual machine.
3. Working machinery.
4. Hand and portable tools.
5. Conditions of building, stairs, floors, etc.
6. Elevators.
7. Electric hazard.

If this or a similar set of groups were used and an analysis made as indicated above we would find our pure premium break down into a number of parts, each representing, if the exposure were sufficient, the pure premium for coverage of accidents only from the corresponding group of causes. Of course if insurance were to be actually written in this way we would need to find some other basis of premium than the entire payroll of the plant. It is not so written and division of payroll along such lines is impracticable, so that we must use the entire payroll for the denominator of the fraction and in so doing the analysis is not for present purposes vitiated.

The writer has not been able to make such an analysis and he doubts the value of it unless made on a broad basis but it seems highly probable that with studies based upon sufficiently broad exposure it will be found that the sectional pure premium for certain hazards, say elevators for example, will be found substantially the same for a wide range of classifications which as a whole could not possibly be combined.

If this be so it would violate no principle of equity to determine this part of the pure premium for each classification from the combined data of such enlarged group. Offhand, it is hard to see why there would be need of further subdivision for determining the elevator hazard section of the workmen's compensation pure premium than for determining pure premium for elevator public liability coverage.

Such determination of sections of the pure premium from the broadest possible basis of combined classifications would of itself tend to distribute the weight of fatal and serious accidents not

fundamentally characteristic of the classification, thus meeting one criticism of the present method, the one which has led the insurance departments to call for segregated returns of fatal accidents. To the writer, such a method would seem to be more rational than to study and attempt more or less equitably to adjust the fatal accident cost shown by such special returns.

The use, if practicable, of enlarged groups for determining sectional pure premiums has also a further and greater advantage in permitting of subdivision and analysis along new lines leading to a readjustment of our schedule rating plans to make them more consistent with our system of determining pure premiums from experience.

We have already pointed out some of the disadvantages of trying to frame schedules for use in comparison with an average as the base. Others have pointed out the greater simplicity of making a schedule upon either an ideal standard, the departures being wholly charges, or the worst possible risk as the base, all departures being credits. Either of these bases might be used as the starting point if the purpose were merely to arrange all risks in order of merit, that is if the schedule were merely a grading schedule. Much of the dispute among engineers and underwriters in making schedules has arisen either over the question whether a given condition was better or worse than the average, or whether a condition required by the law of some state should carry a credit, or some similar question arising out of the fact that the schedule was a rating schedule. There seems to be little difficulty in reaching agreements that certain conditions are better than others and even agreeing how much better. Therefore the construction of a grading schedule would seem to be a much simpler task, especially if it were confined to a particular section or type of hazard, when it is not necessary to inquire whether for example a certain improvement in the power generation hazard were less or more valuable than a certain other improvement in the working machine hazard.

Let it be assumed then that it is possible to constitute a large group of classifications for which the elevator hazard, for example, is substantially the same and for which a very large payroll exposure can therefore be observed. Let it be further assumed that a grading schedule for the elevator hazard had been worked out and all the risks in the group had been classified according to grade in ten (or a lesser number) grade classes. Let it be finally as-

sumed that payrolls and losses due to elevator hazards have been correspondingly tabulated. We would have, combining all the data, an average pure premium for the elevator hazard which we may call X; we would also have, taking the data for each class separately, a series of class pure premiums for the elevator hazard which we may call X_1, X_2, X_3, etc. If we take the quotients X_1/X, X_2/X, etc., we will find the percentage which the cost in each class bears to the average cost represented in the manual rate. From these the amount of charge or credit to be given risks which the grading schedules place in the several respective grades may be readily determined. These credits or charges will be subject to revision when additional data is available as and when basic manual rates are revised.

It is believed that for all of the sectional pure premiums except those dealing with the characteristic working machinery of the several classifications, enlarged groupings will be possible, giving sufficient payroll exposure to permit of this kind of study. Further, the segregation of the other elements would leave only a part of the premium, which it would seem must be determined by the experience of the classification itself or of analogous classifications. Hence an error in association by analogy would have less weight than where the entire premium was so determined and we would feel more free to make such combinations, thus getting larger payroll exposures here. Finally, study of the percentages for the several grades for working machine hazard in those classifications where ample data did exist would doubtless show very approximately what should be the proper credit and charge for the several grades.

The statistical work involved will not be very difficult and is well adapted to the use of perforated cards. It will, of course, be necessary to record on the exposure card the grade in the several hazard sections received by the risk in question and on the accident card the hazard section in which the cause of the accident falls and the grade received in that section by the risk reporting the accident. The tabulations required have probably been sufficiently indicated above. There are appended to this paper, cards adapted from those now used by many of the companies which it is believed would suffice for the purpose, assuming exposure cards are not made until audit has been completed.

Enough has probably been said above to indicate fairly clearly

how rates would be made according to this theory but perhaps it may serve to clarify and fix the idea to briefly recapitulate the several steps.

1. For suitably associated large groups of classifications the several sectional average pure premiums are to be determined. (Note: The groups may and probably should vary for the several hazard fields or sections.)

2. For the same groups the percentage credits and charges for the several grades are to be determined.

3. The manual classification pure premium will be found by adding the several sectional or partial pure premiums found for the corresponding hazard field for the group in which it was placed.

4. The individual risk is to be graded according to the schedules for the several hazard fields and the credit or charge as a percentage of the manual rate will be found by adding together algebraically credits or charges on each hazard field (these being the proper percentages of the corresponding pure premium) and finding the ratio of this sum to the manual classification pure premium.

There remains to be considered the management or so-called moral or, as it seems more appropriately termed, "morale" hazard. It will be readily seen that this item cannot enter additively into the synthesis either of the manual or the individual rate. On first consideration, however, it would seem entirely proper to formulate a grading schedule for this element also and combine the entire experience in large groups of accident cost from all causes. Then do the same for the several management hazard grades and so determine the percentage of credit or charge to be applied to the manual rate. The writer could find no fault with this proposal if he felt there were probably no correlation between physical condition and management or morale hazard. On the contrary, however, it seems reasonable to believe there is a close correlation. This greatly complicates the matter though it is fair to say that this complication arises from the same reason with all plans of schedule rating.

It would seem that a study of the extent and nature of this correlation should be made before attempting to modify rates on account of this element. Some indication of the nature and degree of correlation would appear to be given if risks were graded for morale and the average grading on physical condition determined for each grade on morale. It might be that the proper multiplier

on this account would be indicated by comparing the total actual losses for the risks in a given morale rank with the total projected losses assuming the average physical rating.

It may be noted in closing the presentation of the foregoing theory that under it the vexatious problem of whether application of the schedule will raise or lower rates and how much will not present itself. Manual rates so constructed automatically work out to reproduce the experience upon which they were made and the individual adjustments will automatically balance.

It will be evident that it will not be possible immediately to put into effect in its entirety a system of grading and rating such as the above. A period of transition is necessary during which data is being collected on which to work, particularly for determining the charges or credits to correspond to grading results. If broken into hazard sections the present rating schedules may serve as the basis of grading schedules and it seems not improbable that the results of their application would grade risks into ranks not very different from those into which they would fall under the operation of schedules constructed solely for grading. If this be so we might at once proceed upon the statistical work, maintaining the present schedule rating plans until the grading credits have been worked out.

It may be objected that a system of rating such as is worked out herein would be less acceptable in the field because the broker or agent would be less able to advise the insured in regard to improvements in his plant and the effect of changes on rates. It should be noted that when the plan was put into operation grading schedules would be published as would the credit for each grade. An inspection of the plant would show present grades and a study of deficiencies noted and their weight in the schedule would show how the grade could be improved and the credit thereby gained. The broker or agent would thus be no worse placed than at present.

It is not hoped that the above theory will be found entirely free from practical objection nor that it can be adopted in its entirety as above set forth. It is hoped that it may lead to further study and perhaps statistical work looking to the development of a consistent system of manual and individual rate making. In closing, indebtedness must again be acknowledged to Mr. E. G. Richards through his book "The Experience Grading and Rating Schedule" for suggestion of the central idea above presented, without however

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EXPOSURE CARD.

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0	0 0 0 0 0 0	0 0	0	0 0 0 0	0 0	M	0	0 0 0 / 0 0	0	0 0 0	0 0	0 0	0 / 0 0 0 / 0	0 0 / 0 0 0 0 / 0 0	0
1	1 1 1 1 1 1	1 1	1	1 1 1 1	1 1	1	1	1 1 1 / 1 1	1	1 1 1	1 1	1 1	1 / 1 1 1 / 1	1 1 / 1 1 1 1 / 1 1	1
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ACCIDENT CARD.

in any way disclaiming responsibility for the form and manner in which it has been presented for application to workmen's compensation insurance rate making.

It has been the aim to modify the present cards in general use as little as possible. The accident card may be greatly simplified if it is not desired to use it for other purposes as now designed. It is probable that the "Cause of Injury" Code may be so developed that the first column can be used to designate the hazard field to which the accident is to be assigned. It then only becomes necessary to provide for recording the grading in regard to that field, which is done by using the at present unused portion of the first field, and for the morale grading, which is done by using the last column on the card. The "x" or "y" of this column may be used as the counter if it cannot otherwise be provided for.

NOTE.

Since the above was prepared and transmitted to the Society the writer has learned from Mr. Richards that he is now engaged in preparing a revised edition of his Experience Grading and Rating Schedule. It would, therefore, seem that if casualty insurance is to derive the greatest benefit from his studies and suggestions we should not close our consideration of the subject until this becomes available.

In this connection it may not be inappropriate to point out that the student of one field of economic science who sees in the practical suggestions of a student of a kindred field the enunciation of principles which may help solve his own problems, is in a somewhat delicate position. Loyalty to his own work would seem to compel him to direct attention to such principles and suggestions and to try to suitably adapt them to the special needs of his own field. In so doing, however, fairness demands that due credit be given to him who first gave them out. Yet unskillfull attempts at adaptation may prove an impediment to the clear understanding and appreciation of the value of the original suggestions and thus develop unwarranted opposition to their adoption in their own field. The writer would deeply regret his action in presenting his paper at this time if such results should follow in the present instance. Having this in mind he strongly urges all whose interest may have been aroused by the foregoing to familiarize themselves with Mr. Richards' work itself and form their judgment of its value on its individual merits.