A 1940 VIEW OF NON-CANCELLABLE DISABILITY INSURANCE

BY

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Non-cancellable disability insurance, despite an arduous past, is being written today with apparent success by a small number of companies. In the past the insurance has often been associated with unlimited life-time coverage, either as separate non-can[1] policies or as disability income provisions in life insurance policies. Such association is not necessary. Very little non-can is now written on a life indemnity basis—none on an unlimited life indemnity basis. Almost all of the new policies issued today place a limit to the period of coverage varying from eight or ten years to little over a year. Such limitation of the disability term is important as a symbol of the greater attention being paid to the intangible aspects of non-can underwriting.

With the benefit of hindsight we know now that there is no single disability experience standard. There are subtle, intangible elements in the conduct of non-can, and variations in the treatment thereof can make the difference between a safe or a disastrous experience. The general aim of this paper is to present a basis for an understanding of these intangibles. There is no practical value in a discussion of the mathematical aspects of the non-can actuary's functions unless it is based upon such an understanding. Considerable attention will therefore be devoted to the three major hazards of insurance—moral, physical and legal—as they affect general non-can underwriting practices.

Background

The distinctive feature of a non-can policy is the surrender by the company of any active right to terminate the policy during the

[1] This common abbreviation is used throughout the paper in order to avoid cumbrous repetition of the term "non-cancellable disability insurance."

major part of the policyholder's productive lifetime. There are several types of non-can policies of which life indemnity was one extreme. The common prejudice against anything labeled "non-can" springs largely from the experience with life indemnity, which without significant exception has caused every black mark in the record. It is still possible to obtain life indemnity in connection with the life insurance policies of a few companies, and there are non-can policies setting no limit to the period of indemnity so long as the insured is strictly confined withindoors. Most policies, however, have the limit mentioned above, and a waiting period varying from a few days up to three months is almost universal.

Non-can, and its cousin the life insurance disability clause, were born of the public's need for a permanent form of protection against loss of income. The average family is founded economically upon the earning capacity of the paterfamilias. There are three insurable hazards which threaten to destroy that earning capacity—death, old age, and disability. All three hazards involve life contingencies, and there was a strong logic behind the attempt by the life companies to expand their function to include insurance against all three. The casualty companies also had a certain logic in their adoption of non-can. They had long written restricted cancellable health and accident coverage, and the discontent created by restrictions and by the necessary and proper exercise of the right of cancellation led many underwriters to dream of a policy which would cover all bona fide disabilities—one which would not create the dissatisfaction which results from cancelling the policy just when the insured most urgently needs the protection. The obvious need for such a policy, and the strong desire of the companies to fill that need, set the stage for the headlong rush into the field which followed the breaking of the ice in 1915. The errors which competition injected into early underwriting practices are just as understandable as they were unfortunate. Two important lessons have been drawn from that early experience—that the very real need for broad, permanent disability income insurance creates a fertile field for the coverage which can meet that need; and that the field is crisscrossed by moral hazards which must be solved in order to underwrite the insurance successfully.

The Need for Non-Can

The need for disability insurance has its roots in the importance of earned income to the average individual in our economic order. There are material necessities with which every family and individual must be provided in order to sustain life. The quality of food, shelter and clothing which each individual will consider to be his necessary minimum will vary with the individual's background, economic experience, and moral stamina; yet the requirement exists for everyone and must be paid for in some way, even if berries, a cave, and a set of fig leaves would satisfy the respective needs. They may be paid for by one's own current efforts, by savings or inherited property, or by assistance from other people or from a government agency. The individual who wants to avoid such assistance and has limited savings or inheritance must rely on his current capacity to earn. If his earning capacity be impaired, outside assistance is his only alternative unless that earning capacity has been insured.

This qualitative aspect of the need for disability insurance, although simple and elementary, is subject to variations. In some cases income stops the instant the earner is forced to leave his work. In such cases the need is for immediate commencement of benefit payments. Sometimes a salary may continue for a few weeks or even months in spite of disability. In such cases there may be need for immediate hospitalization or medical insurance, but there is no need for immediate disability insurance as such. Here the need is for insurance with a waiting period matched to the period of salary continuation. These are the extremes of the inception of the insurance, with all gradations between. Different waiting periods make it possible to fit the insurance closely to this aspect of individual needs.

Once the loss of income becomes actual, it continues until recovery reestablishes the capacity to work, or until death transfers the burden to the life insurance field, or until the disability becomes so fused with superannuation that the line is difficult to draw. To what extent can today's limited policies meet the need created by such continuing loss of income? The old-time unrestricted life-indemnity policy intended to provide a substitute income as long as total disability lasted, but the modern policies have no such intention. A two-year policy buys no bread in the

third year of disability, and even a ten-year policy fails to provide an income throughout a disability which outlasts the decade.

Adequacy of Limited Non-Can Policies

In spite of the apparently drastic limitations the modern policies do not fall seriously short of affording full protection against the fundamental hazard. In the first place, long-term[2] protection at modern rates is not cheap, and possible applicants for complete protection form an extremely small proportion of all prospects. Most prospects, being unable or unwilling to purchase complete coverage if it were available, must necessarily adapt their coverage to their means. From this practical viewpoint the broadest part of the field is fully served by policies providing no more than two years of coverage. Since these prospective assureds make no use of the facilities available for longer-term coverage, the lack of unlimited coverage can be no hardship to them.

Another large group of prospects is actively interested in the coverage out to eight or ten years. This group is made up in part of those who have already covered the shorter-term hazard and can afford protection against the longer disabilities, and in large part of those whose financial position permits them to disregard the first few weeks of disability and thereby concentrate their premiums on longer coverage with a greater waiting period. According to the Conference Modification of Class (3) Experience a two year policy covers almost two-thirds of disability, and less than one-fifth of all disability lies beyond the scope of a policy paying for 100 months. If it were possible to get a table which expressed true physical and mental disability, eliminating all malingering and superannuation, it would show that there is only a very small proportion of true total disability which cannot be covered by the policies available. That small part attracts and encourages pseudo-disabilities and retirement claims to such an extent as to make the underwriting thereof on any adequate scale

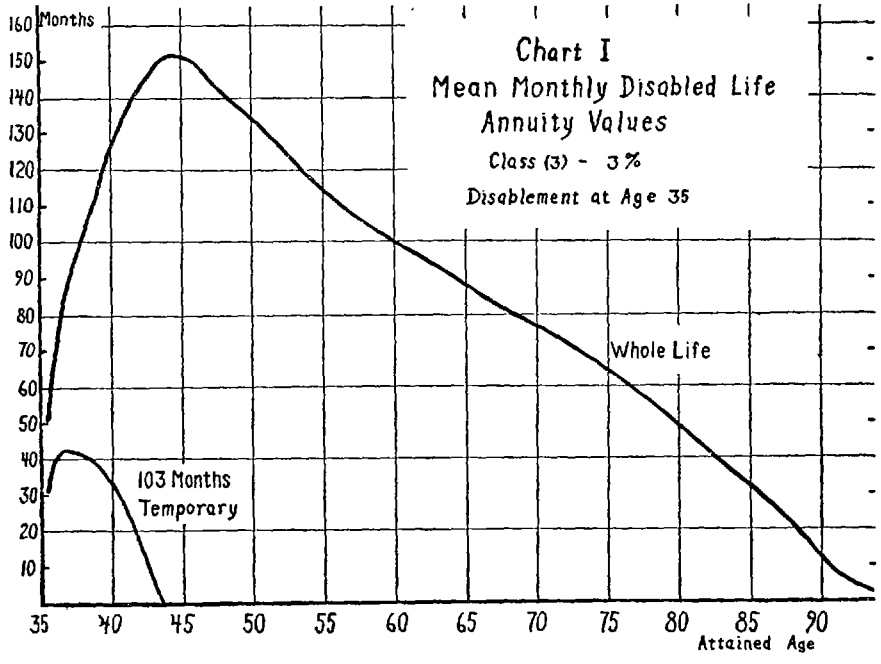
[2] The word "term" has two applications in non-can insurance, and both are used in this paper. One is the period during which the policy may be kept in force, and the other is the period of disability to which the payment of indemnity is limited. The phrase "long-term" as used here refers to the limit of indemnity. In general the application will be apparent from the context.

apparently impossible, but the protection which can be secured covers by far the greatest part of the field and is a real contribution to the fundamental social need.

Effect of the Limit on the Moral Hazard

The indemnity limit was characterized above as a symbol of the attention given to the moral hazard by the companies now writing non-can. That limit is one of the important factors making possible the underwriting of non-can insurance. One of the most serious moral hazard aspects encountered under life indemnity policies was the temptation to retire permanently to live on the proceeds of the policy. According to Class (3) the average number disabled for more than one year is between two and three out of every thousand life-years exposed. The average Class (3) select life annuity value at the end of the first year of disability is equal to about six years of indemnity, so a significant change in that frequency is obviously a serious matter. The frequency can be drastically altered by a few claimants whose lack of moral stamina is such that they find it more difficult to recover than to adjust their scale of living to the income from their disability insurance. The certainty that the insurance income will stop after a very definite period, regardless of their ability to demonstrate to others the seriousness of their ailments, is a potent factor in convincing many such claimants of the desirability of reestablishing their earning power before it is too late. A ten-year policy might seem at first thought to be almost as hard to underwrite successfully as life indemnity, but a ten-year annuity is vastly different from a life annuity in the eyes of a man who is uncertain whether to give up or to attempt a comeback. A claim limited to one hundred months is entirely paid and all liability thereunder is terminated before the average Class (3) select reserve on a life indemnity claim has stopped growing. Chart I, comparing the mean disabled life annuity values under a one hundred months' policy (with 90 day exclusion period) and a life indemnity policy for lives disabled at age 35, gives an indication of the salutary effect which even a long limit can exercise. The average Class (3) select annuity at the end of the first year under a one hundred month policy is equal to only a little more than three years'

indemnity and is already close to its maximum value. The limit—even a long limit—prevents underwriting errors from accumulating in the form of permanent claims with extremely high reserves. Therein lay a major weakness of life indemnity; and, conversely, there lies a major strength of modern limited-term non-can.



The limitation on the indemnity serves also to draw a broad distinction between disability and superannuation. That distinction is hard to draw for a life indemnity claim, and as a result the disability policy was made to bear the cost of many a claim which was really a regular old age annuity. A part of the unfortunate experience under life indemnity coverage was caused by providing protection against both the old-age hazard and the disability hazard, all for the premium and reserve calculated for disability only. Taking advantage of hindsight it can be said that results would have been better if the policies had made outright provision to cover both hazards, or if the stage had been better set to exclude or reduce the old-age hazard. Today's limited long-term policies adopt the second alternative.

Such longer-term policies must still be more carefully underwritten than the short-term coverage. Limitation to a relatively short period is a greater safeguard against the moral hazard than limitation to a longer period. Even cutting the annuity off at eight or ten years is not positive protection against retiring on the policy. A prospective pseudo-invalid may find that such insurance would provide a very nice temporary supplement to his other financial arrangements for retirement. The underwriter of long-term non-can is much more concerned with this problem than the underwriter of short-term coverage. Another factor, too, relieves the underwriter of short-term non-can from some of the pressure on his long-term associate. The expected cost of disability under any policy is a function of the frequency of claims and the cost per claim. Short-term policies, because of their short waiting periods, expect a high frequency and a low average claim. Long-term policies generally carry a waiting period of one to three months and expect a frequency which may be less than one-tenth of that on a short policy, but with an initial value of the claim annuity which may be more than ten times greater. A rate of underwriting error which could pass almost unnoticed when the expected frequency is 250 per thousand could be a very serious matter if the expected frequency is 25 per thousand. The underwriter of the latter risk must exercise tremendous care and apply most stringent standards of insurability. For that reason this paper tends to be more concerned with the long-term coverage and its underwriting safeguards.

Underwriting the Moral Hazard

The qualitative aspect of the need for disability insurance has already been touched upon. The underwriter is more directly concerned with the quantitative aspect—how much insurance is needed and may safely be granted? It is an axiom of disability insurance that the insured must be a co-insurer of the risk. The income from insurance must not approach the income to be earned on the job or there will be incentive to malinger, or at least lack of incentive to recover. Beyond this, the answer lies in the level of income which the applicant has established. Disability insurance should be large enough to afford necessities, but

only under carefully guarded conditions should it ever be a factor in providing the insured with luxuries. Where earned income is the only means of support, a small income will allow few luxuries and a substantial percentage of the income may be insured. Where income is larger, the percent thereof needed for necessities—and consequently the percent insurable—is smaller. Moreover, where the established income is large the line of "necessities" can be drawn at a lower level after a spell of disability. A man who would spurn a $4,000 income while he is active may prefer a $3,000 income rather than attempt a recovery if disability has sapped his morale. Such depreciation of the risk has a vital bearing on the upper limit of the need for disability insurance. Where there is other income, from savings or inheritance for example, which does not depend on current earning ability, that income could be used to provide necessities in event of disability. Withdrawals from principal can be used in like manner. The existence of such alternative means of support obviously reduces the need for disability insurance, and where such alternative means are substantial, the need for insurance does not exist at all.

In translating this reasoning to specific standards the 1921 Committee of the Personal Bureau recommended[3] for life indemnity non-can that the amount of indemnity provided by all insurance should not exceed sixty percent of earned income, and that in any event such indemnity should not exceed $500 per month. For limited long-term policies this has been modified by companies today to permit up to seventy-five percent of established earned income, subject to the maximum of $500 monthly. Emphasis should be laid on the phrase "established earned income". No applicant is acceptable who has not an established and reasonably steady source of earned income, and care should be taken to avoid basing participation on a temporarily high level of income.

A special case is presented by the professional man whose gross income from his practice depends on his active attention thereto, but whose net income is reduced by the cost of maintaining his

[3] "Revised Joint Report of the Committees Known Respectively as the Underwriting and the Actuarial Committees on Non-Cancellable Disability Insurance", submitted to the Bureau of Personal Accident and Health Underwriters, June, 1921. Page 11.

office. He has a legitimate need of insurance to support his office during disability, but if disability should become protracted, he could give up the office and thereby increase his net income from insurance. The case illustrates a situation in which a distinction may well be drawn between the underwriting of long-term and short-term coverage. Short-term participation may properly be based on gross earned income, but it would be a mistake to base long-term participation on anything but established net earnings.

A company can control its own policy of participation and limits, but once a non-can policy is issued there is nothing to prevent another company with less conservative standards from issuing additional insurance which violates those limits. Standard Provision 17 relieves this problem for cancellable policies; if the company is notified of other insurance it may cancel if it wishes, and if it is not notified the insurance may be prorated. A non-can company has no redress if it is notified of other insurance after the risk has attached. The policyholder who obtains other insurance with a questionable motive is most likely to protect himself by giving notice thereof, so it follows that Standard Provision 17 has small significance in a non-can policy.

Of more importance is the so-called "average-earnings clause", which provides, in the event of overinsurance, for the reduction of the policy's indemnity in accordance with the proportion by which insurance exceeds the average earnings of the insured over some previous period, generally two years. Such a provision is not new, but for competitive reasons it is seldom used in short-term policies where the retirement hazard is not great. The recent New York Code incorporated the average earnings clause as an optional standard provision for non-can policies.[4] Only Massachusetts among the more populous states denies its legality (although not its propriety). The provision is the only feasable form of protection against overinsurance resulting from decreased earnings, but observance of uniform and conservative standards of participation by the individual companies is far more effective in preventing deliberate overinsurance.

The underwriter depends heavily on knowledge of other companies' experience with an applicant. If another company has had bad experience, such as repeated claims, serious malingering

[4] § 164 (5).

or unreasonable attitude in adjusting a claim, there is little reason to expect that the applicant would be a good risk on a non-can policy.

The underwriter will also want to know, besides the general economic situation of the insured and his established earned income, any special hazard which may be connected with his occupation; whether his history contains anything revealing an unusual hazard, such as financial stress, tendency to avoid just obligations, unfortunate domestic situation, or personal habits leading to increased individual hazard, to name a few examples. Anything which indicates a tendency to be unreasonable or unbusinesslike in case of a claim indicates an undesirable policyholder. It is customary to obtain an inspection report on every applicant for long-term insurance, and on every short-term applicant for more than a nominal amount of insurance. Particular attention must be paid by the inspector to earned income and to other income, and the underwriter of long-term especially will often find that a close watch is needed to keep the inspecting agency constantly careful of these items. Extreme, almost fanatical attention to this phase of underwriting is a *sine qua non* of successful underwriting of long-term non-can. Henry Jackson was once moved to suggest that disability insurance can easily become "a benefit the enjoyment of which does not necessarily conflict very seriously with the desires of the insured".[5] Any benefit so describable is doomed in advance. The purpose of non-can is to provide a sure income when disability impairs earning power, but the underwriter must bend every resource of training and instinct to avoid accepting a policy which at any time during its entire term could invade that area where the insured, considering everything, finds it no more to his advantage to recover than to prolong his dependence on insurance.

These remarks on the underwriter's treatment of the moral hazard are intended to be provocative rather than exhaustive. The history of non-can has surely shown the necessity of strict observance of stringent standards, applied by executives who know the ground and how to walk upon it. The conduct of each separate department is the task of an expert, and acute awareness of the problems of other departments is essential to adequate

[5] XVII P.C.A.S. 298.

administration of each expert's own department. It is the function of this paper not to attempt the detailed delineation of the entire terrain but to follow each separate road only as far as may be necessary to show its relationship to the others. This discussion is an index map of the fields in the territory; the drawing of a large-scale detailed map of each field is the expert's task.

Underwriting the Physical Hazard

The physical hazard must be underwritten as searchingly as the moral hazard. Both long and short-term policies require strict standards of insurability, and a medical examination has an importance at least as great to the non-can underwriter as to the life insurance underwriter. So far as can be discovered, every risk must start on a reasonably equal basis. It is philanthropy, not insurance, to accept risks which have already started along the road to a serious claim. Long-term insurance especially calls for the services of skilled medical examiners who have an interest in the success of the company. A life insurance examination is not adequate to the needs of the non-can company's Medical Director; for disability and mortality, while related risks, are not identical and the hazards are not always measured by the same yardstick. A competent disability examiner, for example, can occasionally discover and impart to the Home Office some aspect about the applicant which bears more on the moral hazard than the physical, and in which the life company would have not the slightest interest. Frequent examinations for a non-can company develop familiarity with the aspects peculiar to disability underwriting, as well as giving the examiner a financial interest in doing a good job. A small but reasonably busy list of examiners will enable the Medical Director to develop relationships which will add immensely to the value of the examinations.

It must be recognized that even under ideal conditions a medical examination has its limitations in evaluating the physical hazard. Considering the number of clinics devoting their full time and their resources of special training and equipment, with the entire cooperation of their clients, to problems of diagnosis and preventive medicine, it would be foolish to expect perfection from a brief inspection of a subject not always fully cooperative.

The value of the able examiner lies in his appraisal of the personality and appearance of the applicant, and in his assistance in obtaining family history, personal medical experience, and further checks on other insurance, as much as in his report on blood pressure, urinalysis, and other physical aspects. Duplicating questions in the Declarations to the Medical Examiner, which generally form a part of the application for the policy, can be used to check the answers to important questions in the application proper. The atmosphere of a physical examination is often more conducive to careful answers than the circumstances surrounding the taking of the main application. A medical examination may also be valuable for its psychological effect in discouraging outright the application of poor risks.

A large amount of short-term non-can is written non-medically. This practice has two chief justifications, both arising from the fact that the non-medical insurance is issued only where relatively small benefits are involved. A low earned income leaves little margin above necessities, and insurance within proper limits leaves even less margin. There is small incentive to malinger under such circumstances, and experience on small policies is recognized as being better than on larger policies. Furthermore, the standard cost of a full medical examination is a large percentage of the premium for a small policy. The savings from waiving the medical together with the recognized lower disability cost of the small policy provide a margin which can offset the possible increase in frequency resulting from non-medical underwriting. Where doubt exists as to some physical aspect the companies often call for a medical examination even on small applications.

The actual evaluation of the physical risk is the job of the Medical Director and is not a subject for detailed analysis here. In doing that job he has the advantage of experience gained in the not-too-distant past. Tuberculosis has been one of the greatest causes of disability losses in the past. It now seems possible that strict attention to family history, in connection with age and weight of the applicant, may have increased the underwriter's efficiency in avoiding this hazard. Insanity and the field of psychoses and neuroses in general have caused and still cause many disability losses. It is not impossible that in this field also greater attention to family history and to economic and personal

history, together with a more conservative view toward abnormal blood pressures, may reduce the frequency of claims.

Substandard Risks

Selective underwriting automatically implies denial of insurance to some individuals, and the use of such phrases as "strict observance of conservative standards" suggests that such individuals may be numerous. That is particularly true of longer-term coverage. The very underwriting feasibility of such coverage depends on the acceptance so far as possible only of risks free from actual or incipient impairment. What, then, of the numerous prospects who are not acceptable as standard risks? They have greater need of insurance than standard risks, and where need exists both social and business considerations draw attention.

It has already been remarked that short-term insurance puts a relatively smaller penalty on an underwriting error because of the greater frequency and lower average claim cost. Borderline cases of certain types can be viewed somewhat more sympathetically when short-term insurance is applied for. A part of the substandard problem can be handled by offering short-term insurance to certain types of risks not acceptable on the long-term basis applied for. Moreover, where it is possible to exclude a definite and separable hazard, it is common practice among companies to issue a policy from which that hazard is excluded by rider, provided the other aspects of the risk appear sound. Hernia and sacro-iliac strain are frequent subjects of rider. Less frequently accepted are risks from which any abnormality of the gastro-intestinal tract, of the genito-urinary tract, or of the cardio-vascular system, for example, are excluded. Such exclusions are not entirely satisfactory to either party. The insured has limited coverage only, although it is surely better than no coverage at all; and the company's claim adjuster may find the line between accepted and excepted risk exceedingly hard to draw. Nevertheless, where the moral hazard is reasonable and the physical aspect clean in other respects, short-term insurance so restricted may be socially desirable as well as financially possible.

British companies have accepted some types of impairments without exclusion but at an increased premium. If enough cases

are offered to provide an adequate spread—and if the actuary can find an acceptable experience assumption—this practice would create a field analogous to substandard life insurance. For the present, however, and until the experience basis for standard risks is better established, it is probable that American companies will be extremely wary about entering the substandard field. With some exceptions the substandard risk in this country apparently must wait until the companies develop a greater degree of confidence.

Besides the problem of substandard risks there is another type of problem presented by the necessity for strict underwriting standards; namely, the responsibility of applying those standards uniformly. There can be no consideration more important than sound underwriting if a non-can company is to avoid difficulties. The setting up of standards does not always insure their being applied. The human mind, if not carefully watched, is peculiarly open to self-deception. There is little to be gained from kidding oneself—especially since the averages are not so easily kidded. Failure to recognize and to deal realistically with departures from standards can have unfortunate results.

Relation of Agency and Underwriting Departments

Even more subtle is the danger of rationalizing "valid exceptions" to the standard ideal. Such rationalizing is especially possible when the underwriter is subordinate—in practice, if not in position—to the agency organization. When short-term coverage is at risk—that is, when expected disability takes the form of high frequency and low average cost—there is a theoretical argument in favor of "making an exception" of an occasional near-borderline case in order to iron out an agency difficulty. The theoretical argument, however, runs up against the practical difficulty that the making of exceptions, like other habits, can easily become master of the situation. In the long-term field, with its low frequency and high average cost, it is an unusual agency difficulty which is worth inviting a claim that may run into thousands of dollars. The independence of the underwriting department—its complete freedom from all agency pressure—is a condition of success in the long-term field, and will prevent many headaches even if a company engages in the short-term field alone.

The nature and training of the agency organization can have a great effect on the company's success in underwriting both physical and moral hazards. To survive, a company must have a reasonable volume of good business. The agency force determines both the quality and the quantity of business submitted for home office underwriting. Poor risks will be ready applicants under any agency system, but good risks in general must be sold. A well-trained, aggressive sales organization will produce applications from good risks as well as poor; a weaker type of agent will get as many applications from poor risks, but will not sell as many good risks. The same underwriting standards may be applied to both groups of applications, but there is more chance of error in underwriting a group of predominantly poor risks, as well as greater temptation to accept borderline cases. Agents who understand the intangible aspects of non-can underwriting may do some underwriting of their own before risks are submitted to the company, but such underwriting by agents cannot always be relied upon. Training in underwriting is valuable, but training in selling is fully as important if the home office underwriter is to see many applications from desirable risks. If there were two companies alike in all other respects except agency organization, the company with a full-time force of good salesmen would unquestionably have the better experience. A force of good salesmen working only part time for the company would produce better business than a full-time force of weak salesmen. The business from a group of part-time order-takers alone might conceivably lead to the destruction of a company, because of underwriting errors, inadequate volume, or more probably both.

Legal Hazard

The moral and physical hazards do not complete the score—there is still the legal hazard. No discussion of life company disability insurance fails to dwell on the enlargement of the contract by the courts as one cause of the adverse experience. "Total disability", a phrase originally intended to confine the benefits of the policy to bona fide cases of necessary loss of income on account of disability, came to mean any physical or mental inconvenience to the insured in his relationship with his usual source of earned

income. The word "permanent" in a disability clause acquired a meaning quite different from its meaning anywhere else. There is no intent here to discuss this history, or even to suggest that the courts in general overstepped the limits of social advantage. The example will serve simply as a reminder of the importance of the legal hazard, and of the fact that the process of judicial modification of the policy has not stopped.

A phase of the legal hazard arises in efforts to fit the policy to the facts in individual cases. The court and the parties may all agree on the definition of total disability, for example, as used in a particular policy, when the issue lies in the determination of whether the facts in the case fit that definition. In its effort to avoid a denial of recovery to the policyholder the court may stretch the facts, or it may distort the definition. If the former occurs, the one case may be lost without any adverse bearing on other cases; but in the latter event, new law has been made, and the definition of total disability may have been extended for the future.

The most satisfactory defense against the legal hazard is to keep as free as possible from all litigation. The ingrained desire of the courts to avoid finding against the policyholder is well recognized, and if not abused leads to proper principles for court guidance. One such principle is the established rule that an ambiguous provision in the contract is to be construed strictly against the maker. That rule puts the drafter of an insurance policy on his mettle to make the policy conform to real economic and social needs and to use phraseology which is clear and consistent with those needs. Even crystal-clear phraseology will not prevent judicial straining of terms if the policy is not consistent with sound social and economic values. A policy of insurance may best be regarded, not as an ironclad contract, but rather as a general memorandum of the intent of the parties. If that intent is reasonable, if the provisions are fair, if the actuary has set rates which allow the claim administration to be reasonably generous, then a company's chances of successfully defending suits are surely enhanced; but in such circumstances virtue will reward itself and there will be fewer suits to defend. Under these conditions most of the remaining litigation will arise from such causes as misrepresentation in obtaining the policy, gross malingering,

or just pure cussedness. These causes are individual rather than general. They can never be eliminated, but an able application of strict underwriting principles can do much to cut them off at the source by avoiding the acceptance of applicants who give indication of being other than reasonable in the event of claim.

Claim Administration

The preceding paragraph commended generosity in claim administration. Proper public relations and good business practice both demand fair treatment of policyholders, but even such virtues as fairness and generosity can be abused, and in every large group there will be a few who will take any selfish advantage possible. It is on account of these few, rather than the honest many, that insurance companies must be so concerned with "defenses". It is probably unavoidable, though unfortunate, that the public is less aware of the customary amicable relationships than it is of the use of these defenses against the small minority of questionable or unscrupulous claimants. Almost every honest citizen will readily accept from the claim adjuster just a little bit more than he might strictly be entitled to receive. That extra little bit is a part of the price of good policyholder relations and must be included as a part of the premium to be paid for the insurance. The company should be in a position, however, to resist any attempt to swell the extra little bit into more significant proportions; otherwise the honest majority will be forced, by the extra premium made necessary, to subsidize the inequitable claims of the minority. Such subsidy is either charity or graft, depending on the intent and attitude of the claimant. It most certainly is not a proper part of insurance. Hence the attention devoted to the exceptional dishonest or questionable case by the claim administrators as well as by the public is unfortunately out of all proportion to the number of such cases.

Most questionable disability claims fall into one of two categories: either an unquestioned disability involving doubt as to whether the policy covers, or a condition which would be covered except for a possibility that the claimant is not truly disabled. Each category has its typical defenses, both legal and tactical. This division applies to all types of disability insurance, cancell-

able and non-can, long-term and short. The nature of the defense, however, may vary considerably according to the nature of the policy coverage. The full analysis and detailed presentation of these defenses is, as suggested earlier, the task of the expert in the field of claim administration. It is not out of order, however, to touch upon a few of the aspects particularly applicable to non-can.

Claims in the second category—questionable disability—present an extremely serious problem under policies providing life indemnity for sickness disability, because of the retirement hazard. When the policy is limited, the retirement hazard is severely checked, and the more ordinary degrees of malingering become of greater relative importance. Under a short-term cancellable policy, if normal tactics fail to shake a malingerer, the company can afford to let a claim run its course and then cancel to prevent a repetition. Recourse to cancellation is denied under a non-can policy, and if the term is long, the company cannot afford to be satisfied with ordinary efforts to prevent malingering. One device occasionally used is the provision in the policy that benefits will be reduced if the insured, while still totally disabled, is not confined withindoors. This device creates a strong financial deterrent to malingering, but since the effect of real total disability on earned income is independent of the confining nature thereof, some companies hesitate to draw the distinction. Another policy device, more effective with short-term policies than with long, is the aggregate limit upon indemnities. When benefits have been paid for a period the remaining limit is reduced accordingly and the fixed premium is at a higher rate. The effect is negligible on a long-term aggregate, but may be significant where the limit is short. To some extent the proportionately higher cost of the reduced limit reflects a depreciation of the quality of the risk, and the higher rate of premium is an automatic correction. The correction is haphazard, however, and falls alike on the just and the unjust, the standard risk and the malingerer, and for that reason (among others) some companies set the limit, not as an aggregate, but rather as a limit to the period of indemnity for each individual disability.

The most effective weapon against long-term malingering, aside from the friendly and resourceful adjuster, may be a physician

who understands the nature and purpose of disability insurance. Standard Provision 8 gives the company the right and opportunity to examine the person of the insured when and so often as it may reasonably require during the pendency of a claim. If a physician or specialist retained by the company is satisfied that whatever condition may exist does not constitute total disability within the meaning of the policy, regardless of how desirable a long vacation may be to the policyholder, it not infrequently happens that the professional relationship between the specialist and the insured's own physician makes it possible to discuss constructively the real nature of the insurance. An admission by the insured's own physician that disability is not total generally leads to the insured's modifying his claim to indemnity for partial disability. Provision for partial disability is generally omitted from short-term policies as creating so much additional cost as to make the premium disproportionate. In long-term policies, however, a provision for a limited period of partial is a desirable means of effecting an amicable transition from total disability indemnity to recovery. Properly handled, it will often reduce the amount of indemnity otherwise payable while at the same time cementing good feeling between the policyholder and the company.

In the long run the best safeguard against malingering is the personal contact between the company's representative and the insured and his physician. If the physician continues to state that indemnity should be paid, there generally isn't much the company can or should do about it but pay. Even where the good faith of the physician's statement is dubious the courts in general offer no practical relief. It is this consideration which leads companies to rely on the policy limit for prevention of retirement, to underwrite severely to reduce the moral hazard, to rely heavily on the personal touch in claim administration, and to resign themselves to pay for any malingering which creeps through those guards. The same considerations and reliance on the same factors have also led companies to relax the policy definition of total disability, on the ground that there is no use scaring a prospect by an apparently restrictive definition that can't be enforced anyway, and wouldn't be enforced if it could be. The older policies defined total disability as inability to engage in any occupation for wage or profit. This definition led to fears

that ability to sell shoestrings on a street corner would disqualify the insured from benefits. This "shoestring" objection has never been justified, but the definition remained, with "any occupation" interpreted as meaning any occupation reasonably consonant with the insured's training and background. Culminating the trend of earlier court decisions, total disability is now rather generally defined as inability to engage in the insured's regular occupation. It is quite generally so interpreted even when not so defined. Only in the longest-term coverage does any other definition appear. Even there the insured's own occupation is the criterion for all but the most protracted disability. For such disabilities the test is still whether an occupation in which the insured may engage is one which he might be expected to enter, giving due consideration to his background and experience.

Defense of Origin

Into the other category fall the cases where the existence of disability is unquestioned, but where the disability is not covered by the policy. Policy provisions excluding certain types of disability are not common. Unrestricted coverage is socially desirable, and competition reinforces the desire to provide insurance as free from restrictions as may be consistent with sound underwriting. One type of restriction, however, is both necessary and desirable; namely, the restriction of coverage to disability which has its origin after the date of the policy. Earlier reference has been made to the impropriety of asking a company to insure an individual who already has a head-start toward a costly claim. When the policy is issued all risks should be, if not on an equal footing, at least up to a certain standard of insurability. It is a major part of the underwriter's job to weed out those applicants who fail to meet that standard, but the best underwriter is human and his tools are fallible. It is proper, therefore, that he be supported by a policy provision excluding any disability which has its origin prior to the policy date. Only by such an exclusion can a company avoid saddling honest policyholders with the extra cost of unwarranted claims from dishonest or careless policyholders, which for long-term policies especially could be a serious burden. Abuse of the exclusion is prevented by the necessity of

showing clearly the causal relationship of the pre-existing condition to the subsequent disability.

This defense of origin, so-called—that is, defense based on proof that the origin of disability antedated the policy—is alternative as well as supplementary to the defense involving rescission of the policy. Policy rescission is an uncertain procedure at best, and is automatically limited if the policy contains an incontestable clause. The defense of origin gives the company another and stronger string to its bow. The policy is not disturbed under this alternative procedure; on the contrary, a provision of the policy is relied upon in defense of the claim. The New York Court of Appeals found in *Metropolitan Life Insurance Company vs. Conway,* 252 N. Y. 449, 169 N. E. 642 (1930), that a provision in a life insurance policy excluding death from certain causes (and specifically excluding death having its origin in a condition existing prior to the date of the policy) was not in conflict with the incontestable clause. In *Apter vs. Home Life Insurance Company,* 194 N. E. 846 (1935), the same court applied the principle and specifically allowed the defense where the company was being sued for disability benefits. The policy provided a benefit, in effect, for "disease originating after the date on which this agreement becomes effective". The court said, "The parties have stipulated that fraud by the assured will not vitiate the policies after lapse of one year. That stipulation is not open to the construction that fraud of the assured will result in the imposition upon the insurance company of a liability extending beyond the terms of its policy."

The recent New York Insurance Code, §155 (2), denies the right to use the origin clause in life insurance policies, but there is strong and compelling support for the origin defense as a part of non-can policies. A disability can be kept under cover until the policy becomes incontestable. Only the origin clause can prevent a miscarriage of justice under such circumstances. For every case where a pre-existing condition results in death there are many cases where the result would be disability of varying degrees of severity. This greater frequency puts a correspondingly greater and more subtle burden on the underwriting staff, and particularly on the medical examiner. Courts have referred sometimes to the fact that companies have had the opportunity

through their medical examiners to make a thorough inspection of the applicant's physical condition. This opportunity is greatly overvalued. The practice of preparing impaired risks to pass physical examinations is notorious. The examiner who is trying, usually without cooperation and on occasion with downright opposition, to discover possible impairments where he has no special reason to suspect that impairment exists has no chance of anything like a perfect score. His examination must be cursory at best, because of unavoidable lack of time and equipment to make a thorough clinical diagnosis. Since the examiner is so inevitably unable to discover all the existing conditions which may lead to subsequent disability, it is proper for the company to have the policy exclusion as a secondary defense.

Furthermore, there can be only one claim under a life insurance policy—the death claim. That one claim is the sole purpose of the life policy, and when it is made the policy automatically matures to the benefit of persons other than the insured. The exercise of the defense of origin under a life policy has exactly the same effect on the beneficiary as rescission of the policy. Benefits under a disability policy, however, are payable to the insured himself, and are not by any means limited to a single claim. The disability for which indemnity is denied by the origin clause may be followed by others for which indemnity would properly be payable. The fundamental purpose of the policy is, therefore, not denied to the disadvantage of third parties. A non-can policy may be an instrument of gain to the insured himself. The moral hazard in general is so great in the non-can field that the company needs this additional means of excluding from its exposure those cases where the insured event is already in process of happening.

Incontestable Clause

The weakness of the right to contest a policy has already been suggested. The chances of a successful action to rescind after two or three years are very small indeed on a policy issued after a medical examination, however inadequate in fact the examination may be. The chance of successful rescission is somewhat greater if the policy was underwritten non-medically. Since many short-term policies are issued without medical examination the

New York Code does not require an incontestable clause to be included in policies imposing an indemnity limit of not more than two years. Longer-term non-can policies, quite generally underwritten with medical examination, are required in New York to contain an incontestable clause, and after the initial contestable period, reliance is placed on the origin clause alone to exclude liability for disabilities involving a pre-existing condition.

An incontestable clause in a disability policy, paradoxically, may sometimes enhance the company's chance of a successful rescission action during the initial contestable period. The impending incontestability of the policy has the effect of threatening to deny to the company the right to defend a possible suit on the grounds that the policy was obtained by material misrepresentation. In most jurisdictions the possible lack of an adequate remedy at law opens the door of equity to the company, which can ask to have the merits of the case decided when memories are fresher and when prejudices are less apt to be aroused than in a later defense to a suit by the policyholder. In equity, before a judge alone, the company may sometimes receive fairer treatment than before a jury at law. With the defense of origin available, some non-can executives welcome an incontestable clause, not only because of the value of assuring the policyholder that he cannot later be deprived of his policy on account of an inadvertent misstatement in his application, but also because it actually improves in some cases the prospects of defeating improper attempts to obtain insurance by misrepresentation.

The foregoing discussion is based upon the law in New York State under the Conway case. This interpretation cannot be relied upon universally. In some jurisdictions the rescission act is accomplished differently, and is available for any type of policy which has not become incontestable by its terms. In some other jurisdictions the courts have decided, in effect, that the incontestability of a life insurance policy prevents the company from defending a claim for any reason not specifically saved in the incontestable clause itself. Applied to an incontestable disability policy, this interpretation would mean that a company could not rely upon any exception in the policy (including the origin clause) unless the exception were incorporated into the incontestable clause. The result of such an extreme interpretation might be

either a very awkwardly drafted policy or else a blank check to the policyholder. It does not appear that this question has ever been presented in such jurisdictions on a disability policy, and the decision might be different. Because of the danger, however, non-can policies are not made completely incontestable. The phrase "incontestable as to any statements made in the application" provides incontestability as broadly effective as the general clause under the interpretation of the Conway case, and by the limiting words it is hoped that the extreme position referred to above may be avoided in states which do not follow the New York rule.

Activity in Claim Supervision

Fortunately, in spite of the attention devoted to rescission, defense of origin, and other methods of resisting claims, there are relatively few cases where such methods need be applied. Most claims involve no disagreement between company and policyholder, and are settled in normal routine to the satisfaction of both parties. With few exceptions the claim adjuster's task involves friendly routine calls which serve the two functions of creating service contacts with the disabled policyholder and of reducing possible malingering. The former function is obvious; the effect of the latter can be emphasized by a reference to the Conference Modification of Class (3) Experience. Two-thirds of those disabled more than six days recover before they have been disabled one month; three-quarters of those disabled one month or more recover by the end of the third month; and of those whose disability lasts over three months about four-fifths have recovered by the end of the first year—all according to Conference Table age 45. If each of these temporarily disabled policyholders were to malinger for a single week beyond a reasonable recovery date, the resulting increased claim cost would be a significant addition to the cost assumed. If a substantial minority were to extend their claims for a few weeks, the company's loss ratio would suffer sadly—hence the importance of reasonably frequent check-up visits to reduce malingering during the early period of disability. Almost every honest citizen's conscience will allow him to extend his recuperation a trifle when the company is helping to finance it. This much must be assumed as an integral part of the cost of

insurance, and it is to a company's advantage for the disabled policyholder not to invite a setback by too early activity. It is not fair to the honest policyholder, however, to assume that very many recuperations are to be exaggerated very much. Careful application by the underwriter of the principle of coinsurance will serve as a general check on such malingering, but the specific check of the claim adjuster is needed to prevent the wholesale petty malingering which can so drastically alter the average cost when a rapid recovery rate is expected. Careful watch in the early stages of a claim, moreover, may forestall later developments which would make the claim more costly than it ought to be.

After the early disability months the picture changes tremendously. Still referring to Conference Table age 45, 72% of those still disabled at 12 months remain so at 2 years; only 20% recover in the third disability year, only 13% in the fourth year, and in the tenth year less than 5%. Even if every recovery after the second year were postponed a month or more, the effect on the average cost would be relatively minor compared to the effect of a few days added to each of the more numerous shorter claims. The longer claims need service, and the realization that the company is watching will help to reduce major malingering. Intensive activity among longer claims, however, for the purpose of reducing petty malingering could easily cost more than the saving in benefits.

Advance Settlements

Two related problems occasionally confront the administrator of long-term claims—rehabilitation, and the buying up of a claim or policy. Cooperation with the claimant to encourage him to attempt a comeback may be very effective if he is assured that his effort to work will not impair his insurance income for a reasonable test period. Sometimes a claimant who is physically able but mentally whipped could be restored to activity if he had the capital to reenter an economic field in which he is experienced—storekeeping, for example. A reasonable advance on the policy can sometimes serve the double function of restoring the man's self-confidence and of saving an expensive protracted claim by reestablishing the policyholder's earning power.

Nearly related to this type of advance is the buying up of a

policy in order to substitute a known loss for an indefinite claim liability. The large reserves required on long-term claims increase the temptation to make such a substitution, particularly if the claimant is willing to settle for a sum which is smaller than the reserve. There is a subtle danger in the practice, namely, that the reserve held on a claim in conformity with a recognized valuation standard will be confused with the individual value of that claim. A tabular reserve is an estimated average value, too high in some cases and much too low in others. Which case is high and which case is low cannot be told individually, but over the whole the salvage from the overvalued cases must be available to make good the deficiency on the others. The claimant who will settle most readily is generally the one who has the best expectation of speedy recovery. The adjuster who settles very far in advance with many such claimants may find it necessary to draw on the company's surplus before the remaining claims are fully paid. For that reason any policy of settling claims by large advance payments should receive the gravest study and analysis.

Disability Experience

In one sense, everything written above has been introductory to the ever-present problem of rates and reserves. Whatever the merit of the pages above, they should at least have pointed once again the costly lesson that the moral hazard, and to a lesser extent the legal hazard, are responsible for a very real part of the cost of non-cancellable disability insurance. Two companies could write exactly similar policies at the same premium rates; but if one management were conservative and the other not, the experiences would be vastly different.

The premium structure of non-can insurance cannot be considered apart from the underwriting foundation. The Non-Cancellable Reserves Committee of the Health and Accident Underwriter's Conference gave recognition to this when it gave specific warning in its 1939 report[6] that net premiums derived from its tables were not to be considered a proper basis for the computa-

[6] "Report of Non-Cancellable Reserves Committee," published by the Health and Accident Underwriters' Conference, May, 1939. This report was restricted to active life reserves. A subsequent report in May, 1940, considered reserves on disabled lives.

tion of gross premiums. There can be no single standard experience upon which to base premiums for each and every sort of policy. Disability is a subjective hazard—if a man claims to have a pain it is effectually impossible to prove him wrong. It is conceivable that the incidence of actual physical disability might conform to a reasonably uniform table, but actual physical disability is not the event insured. The companies must pay benefits for disability which is effectively claimed. There is an extra cost to this risk equal to the sum of dishonest claims plus claims, often honestly made, where an actual condition is made to assume proportions it properly should not have. This extra element measures the moral and legal hazards, and the actuary must have some yardstick before he can estimate premiums. He must know the standards and the personalities which will govern the acceptance of risks and the administration of claims; and in following his company's experience he must be familiar with the current practices and the extent to which the company actually adheres to its professed standards. These factors are subject to wide variations. The company which is most conservative in all respects will enjoy the least costly claim experience. A company not reasonably conservative in most respects may be wholly unable to stay in the field.

Reserves for active lives may not vary as greatly as premiums. Since these reserves depend, not on the absolute level of the term premiums, but rather on the relation of the annual term premiums one with another, it follows that a very high level premium may actually develop reserves no higher—or even lower—than a smaller level premium. This is true of short-term coverage with a short waiting period compared with long-term coverage with a long waiting period. The level premium for the former might be considerably higher, but because the term premium curve slopes less, the reserves are lower. It might also be the case where two companies issued similar non-can policies, but one—Company A—paid less underwriting attention than Company B to the tuberculosis risk, for example. Company A would probably have higher claim costs at younger ages, but as the body of policyholders grew older, the claim costs of the two companies would grow more nearly alike. Company A's experience would develop the higher level premiums of the two, but the same experience, with costs

higher in early years than Company B, would develop lower policy reserves. Similarly a restrictive provision in a policy, lowering the premium, might actually require higher reserves if the restriction had greater effect at the younger ages. If the reduction were the same at all ages, not percentage-wise but absolutely, the reserves would be the same as for the unrestricted policy.

If the assumption could be made that differences in underwriting and in policy restrictions, assuming similar periods of coverage, effected a constant modification of the term premiums, then it would be possible to develop a table which could be used to value active life reserves, even though the net premiums derived therefrom would not reflect actual losses. Experience is not available to prove or disprove the validity of such an assumption, but empirical reasoning can go far to justify it. Physical underwriting soon wears off, and its effect on reserves need not be considered if ultimate premiums are assumed. Arguments can be set up for both higher and lower reserves as the result of common policy restrictions, and since experience is lacking, it seems reasonable to make the assumption, when seeking a minimum reserve standard, that opposite effects on reserves cancel each other. Similarly for the effect of the moral hazard; if underwriting is unsuccessful it is doubtful if any level of premiums or reserves would suffice to prevent disaster, but the disaster would probably result from insufficient premiums rather than from insufficient reserves. With reasonable underwriting, it could be argued that cases of questionable origin in early years and of questionable merit in later years would effect a roughly constant addition to the cost of purely physical disability. The Conference Committee, seeking a basis for recommending a minimum reserve standard, made these assumptions, and for that purpose the assumptions are justified.

A minimum reserve basis should be studied carefully before accepting it as the basis upon which a company's continued solvency will depend. A conservative company would naturally adopt a standard which would reserve the unearned premiums until they are needed. With conservative underwriting the Conference recommendations may actually prove redundant for some policies. The Conference basis is not a feeble reserve standard, and even where it may prove inadequate the minimum reserves should be enough to enable the diligent company to work out of

the situation, provided proper steps are taken as soon as the inadequacy is known. Inadequacy of premium can be a much more serious matter than a small inadequacy of reserves, and if premiums are adequate it may be possible by economies to wipe out a reserve deficiency.

Net Premiums

The mechanics of calculating net premiums and reserves for non-can policies has been presented in detail in the publications of the Actuarial Society of America[7], and Mr. Craig has presented a paper on the subject to our own Society[8] in addition to Mr. Cammack's important paper[9]. Various premium formulae have been developed from the fundamental principle of determining an annuity-due whose value shall equal the present value (as of the issue date) of expected liability under the policy. Four such formulae are reproduced below. Number (1)[10] is the true formula for an annual premium to provide an unlimited benefit of $1.00 yearly (payable monthly) for disability incurred prior to age y, assuming a mortality table which separates active and disabled lives and defining r_x as the probability that an active life now age x will become disabled prior to attaining age $x+1$:

$$(1) \qquad \frac{\sum_{z=x}^{z=y-1} v^{\frac{1}{2}} \cdot D_z^{aa} \cdot r_z \cdot a_{[z+\frac{1}{2}]}^{(12)}}{N_x^{aa} - N_y^{aa}}$$

Number (2) is the same formula assuming mixed life table and functions:

$$(2) \qquad \frac{\sum_{z=x}^{z=y-1} v^{\frac{1}{2}} \cdot D_z \cdot r_z \cdot a_{[z+\frac{1}{2}]}^{(12)}}{N_x - N_y}$$

Number (3)[11] uses the traditional symbols adapted by Mr. Craig in his paper, modified to give the same benefit:

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[7] Especially Actuarial Studies No. 5 (Second Edition).

[8] XVII P.C.A.S. 51.

[9] VII P.C.A.S. 267.

[10] See Actuarial Studies No. 5, p. 165, and XXX T.A.S.A. 410 for discussion of Numbers (1) and (2).

[11] XVII P.C.A.S. 58 ff. The formula assumes a three month waiting period.

$$(3) \qquad \frac{K_x^{3/12\,/\,all} - K_y^{3/12\,/\,all}}{N_x - N_y}$$

where $K_x^{3/12\,/\,all} = \sum_{z=x}^{z=\omega} H_z^{3/12\,/\,all}$

$$H_z^{3/12\,/\,all} = H_z^{3/12\,/\,9/12} + H_z^{1/1} + H_z^{2/1} + \cdots\cdots \text{to end of table}$$

$$H_z^{n/1} = v^{z+n+\frac{1}{2}} \cdot l_{z+n+\frac{1}{2}} \cdot s_z^{n/1}$$

and $s_z^{n/1}$ = sickness incurred at age z suffered during the one year period immediately following the first n years of sickness, expressed as the amount of such sickness for each life-year exposed during the year from age $z+n$ to $z+n+1$.

In applying Formula (3) to such American tables as Cammack's, Class (3) or the Conference Modification[12], special note must be taken of the form of $H_z^{n/1}$. In the form of these tables which gives the amount of disability for various periods by age of disablement, the symbol $s_{(z)}^{n/1}$ means the amount of sickness incurred at age z and suffered during the one year period immediately following the first n years of sickness, expressed as the amount of such sickness for each life-year exposed during the year from age z to $z+1$. For the American tables, therefore, $H_z^{n/1}$ becomes

$$v^{z+n+\frac{1}{2}} \cdot l_{z+\frac{1}{2}} \cdot s_{(z)}^{n/1}$$

and

$$\begin{aligned}(A)\ H_z^{3/12\,/\,all} &= v^{z+\frac{1}{2}} \cdot l_{z+\frac{1}{2}} \cdot s_{(z)}^{3/12\,/\,9/12} + v^{z+\frac{3}{2}} \cdot l_{z+\frac{1}{2}} \cdot s_{(z)}^{1/1} \\ &\qquad + v^{z+\frac{5}{2}} \cdot l_{z+\frac{1}{2}} \cdot s_{(z)}^{2/1} + \cdots\cdots \text{etc.} \\ &= v^z \cdot l_{z+\frac{1}{2}} \left[v^{\frac{1}{2}} \cdot s_{(z)}^{3/12\,/\,9/12} + v^{\frac{3}{2}} \cdot s_{(z)}^{1/1} + \cdots\cdots \text{etc.} \right] \\ &= v^z \cdot l_z \cdot \frac{l_{z+\frac{1}{2}}}{l_z} \cdot [\cdots\cdots\cdots] \\ &= D_z \cdot {}_{\frac{1}{2}}p_x \cdot [\cdots\cdots\cdots]\end{aligned}$$

Formula (4) is fundamentally the same as that used by the Conference Committee, based on Formula (3)

[12] 1939 Report, *supra*.

(4) $$\frac{K_x - K_y}{N_x - N_y}$$

where $$K_x = \sum_{z=x}^{z=\omega} H_z$$

$$H_z = S_z \cdot D_z = S_z \cdot l_z \cdot v^z$$

and $S_z =$ the net one year term premium for the benefit. Note the distinction between $s_{(z)}$, which is an amount of sickness, and S_z which is a net one year term premium. Formula (4), for the sake of simplicity, omits from the upper right hand corner of the commutation symbols the designations which indicate the waiting period and the limit of indemnity. The designations will be the same throughout any one calculation and can be understood from the table heading.

The formulae are fundamentally similar. Numbers (1) and (2) are the same formula, adapted for use with active and mixed life tables respectively. Form (2) is used here to compare with the others. Each formula shows the net level premium for a life indemnity policy with a three month waiting period. This benefit is used here for simplicity—the modification to provide for other indemnity periods is made in the term premiums when necessary.

The differences among the last three formulae lie in certain of the commutation devices used and in the net one year term premium. The present value at the beginning of the year of the term premium as used in Formula (2) is

(5) $$v^{1/2} \cdot r_z \cdot a^{(12)}_{[z+1/4]}$$

Using in Formula (3) the second form of $H_z^{3/12/all}$ shown at (A) p. 47 the term premium's present value at the beginning of the year is

(6) $$_{1/4}p_z \cdot [v^{1/2} \cdot s_{(z)}^{3/12\,/\,9/12} + v^{3/2} \cdot s_{(z)}^{1/1} + \cdots\cdots \text{etc.}]$$

In Formula (4) the term premium appears directly as S_x. Using S_z to replace the other forms of the term premium, each formula reduces to the same expression:

$$\frac{\sum_{z=x}^{z=y-1} D_z \cdot S_z}{N_x - N_y}$$

In the development of the commutation columns used to evaluate this expression

$$K_x^{3/12\,/\,all} - K_y^{3/12\,/\,all}$$

is the equivalent of ${}^{\omega}_{y}M^{r}_{x}$ and $H_x^{3/12\,/\,all}$ is the equivalent of ${}^{\omega}C^{r}_{x}$.[13]

Form (5) and its basic Formula (2) were designed for use with the disability income clause of life insurance policies. The benefit was unlimited during disability—i.e., life indemnity—and in the calculation $a^{(12)}_{[z+\frac{1}{2}]}$ was developed by an approximation from the value of $a^{(12)}_{(z)}$. The benefit commenced immediately upon recognition of its total and presumably permanent nature, and the disabled life tables were drawn up on that basis. A change in the presumptive period involved an adjustment to the annuity values. The formula as stated is not convenient for use with varying exclusion periods. For such use the annuity may be restated as

$$k|_m a^{(12)}_{[z+\frac{1}{2}]}$$

where k is the exclusion period after the inception of disablement, and m is the indemnity limit. The term premium assumes the general form

$$(5A) \qquad v^{\frac{1}{2}} \cdot r_z \cdot {}_k|_m a^{(12)}_{[z+\frac{1}{2}]}$$

With the same limit the term premium in (6) assumes the general form

$$(6A) \quad {}_{\frac{1}{2}}p_z \cdot [v^{\frac{1}{2}} \cdot s^{k/1-k}_{(z)} + v^{\frac{3}{2}} \cdot s^{1/1}_{(z)} + \cdots + v^{n-\frac{1}{2}} \cdot s^{n-1/1}_{(z)} + \cdots \cdots + v^{\frac{k+m+c}{2}} \cdot s^{c/(k+m-c)}_{(z)}]$$

where k and m have the same meaning as above, and c is the greatest whole number of years in $k + m$. Form (6A) requires a table which gives the amount of sickness during stated periods rather than one giving the number of lives disabled at stated intervals. The latter type table is used in developing the disabled life annuity factor in form (5A). The two expressions are very similar, but are not identical. The annuity makes no provision for the present value of indemnity accruing after the last full monthly payment and before termination. The amount of such indemnity may be assumed to equal one-half of one monthly pay-

[13] See Actuarial Studies No. 5, p. 158.

ment for each termination prior to the expiration of the indemnity limit, and the present value would necessarily be less than half of one month's indemnity.

In actual calculations the author has used still a third term premium

$$(7) \qquad S_x^{3/12\,/\,all} = s_{(x)}^{3/12\,/\,9/12} + v \cdot s_{(x)}^{1/1} + v^2 \cdot s_{(x)}^{2/1} + \cdots \text{etc.}$$

or in general terms for the limited indemnity

$$(7A) \qquad S_{(x)}^{k/m} = s_{(x)}^{k/1-k} + v \cdot s_{(x)}^{1/1} + \cdots + v^{n-1} \cdot s_{(x)}^{n-1/1} + \cdots$$
$$\cdots + v^{\frac{k+m+c-1}{2}} \cdot s_{(x)}^{c/(k+m-c)}$$

where k, m, and c have the same meaning as above. The discount factor in the last term can be made equal to v^{c-1} without introducing any discernible error. Formula (7A) is easily recognized as Formula (6A) divided by ${}_{\frac{1}{2}}p_x \cdot v^{\frac{1}{2}}$, which varies from 0.983 at age 20 to 0.972 at age 60, using American Men mortality and 3% interest. That is, the Formula (7A) is 1.7% higher at age 20 and 2.9% higher at age 60. It is, therefore, slightly more conservative for both premiums and reserves, although slightly less accurate, and the greater ease of application makes its use preferable in the author's opinion. At the present stage of development of disability experience there is nothing lost by using approximate methods if they are conservative.[14] Even assuming a greater refinement of experience we would be justified in using a more convenient though slightly less exact formula, provided the relationship to the more exact formula is understood. It is important to know the degree and direction of any error of approximation in order to avoid reliance upon margins which may not actually be present. Table I compares net one year term premiums developed by Formulae (5A), (6A) and (7A), and adds for good measure the undiscounted amount of disability.

[14] Note that the measurement of the disability term in the Class (3) table commences with the date of disability, which is the date disability was approved and which is (with some exceptions) 90 days after the date of disablement—the date on which the insured actually became disabled. Formulae used for non-can assume date of disablement, and thus the Class (3) tables are arbitrarily shifted one-quarter of a year away from age 0. The error thus introduced is more technical than real, because of the large element of judgment used in graduating the Class (3) experience. The error and the judgment element are mentioned here as examples of conditions which make too great refinement a travesty on accuracy.

TABLE I

Net One Year Term Premiums — $1.00 Monthly, Payable for 100 Months

3 Months' Waiting Period; Conference Modification of Class (3)— 3% Interest

Age	Formula (5A)	Formula (5A) Adjusted*	Formula (6A)	Formula (7A)	Undiscounted Amount of Disability
20	0.0749	0.0789	0.0780	0.0793	0.0838
30	.0933	.0978	.0980	.0997	.1067
40	.1278	.1336	.1330	.1354	.1456
50	.2327	.2415	.2385	.2435	.2634
60	.4621	.4769	.4704	.4839	.5245

* Adjusted by adding ½ month's disability (undiscounted) for each disabled life recovering prior to expiry of the indemnity limit.

$$\text{Correction} = \frac{1}{2 \cdot l_x} \cdot [l'_{(x)+3/12} - l'_{(x)+\frac{1}{12}}]$$

The net level premium Formula (4) has the advantage over the other formulae of involving fewer and simpler symbols and commutation columns. The Formula is repeated for convenience:

$$(4) \qquad \frac{K_x - K_y}{N_x - N_y}.$$

If ${}_yK_x = K_x - K_y$ and ${}_yN_x = N_x - N_y$

the formula becomes simply

$$(4A) \qquad \frac{{}_yK_x}{{}_yN_x}$$

where

$${}_yK_x = \sum_{z=x}^{z=y-1} H_z.$$

The values of H_x are readily determined by multiplying each D_x by the corresponding S_x. The ${}_yK_x$ column is created directly by accumulating the values of H_x from the bottom upward. Division by the respective values of ${}_yN_x$ then gives the level premiums $[PS]_x$.

Care must be exercised in assigning the value of y. If the insurance terminates at exact age 60, for example, then $y = 60$, and 59 is the last age included in ${}_{60}K_x$ and ${}_{60}N_x$. If the policy phraseology is such that the company is exposed to the risk during

a part or all of the year beginning with age 60, then y is equal to $60\frac{1}{2}$ or 61, not to 60.

Waiver of Premium

If the policy provides for the waiving of its premium an additional question is presented. Formula (1) assumes that only active lives will be exposed to risk, and that only active lives will pay premiums. Waiver is automatically provided by those assumptions. By using a mixed life table the other three formulae assume that disabled lives are also exposed (an error which increases the premium) but that disabled lives pay premiums. Mr. Phillips showed[15] that for the life disability income clause—90 day presumptive—the errors practically offset each other, and that the mixed life Formula (2) is very slightly more conservative for a benefit which includes the waiver. This result will obtain, however, only when the term premium is derived from a table based on an exposure to active lives alone. If the experience table is based on an exposure to mixed lives, the first overstatement is eliminated from the mixed life formula and either a premium must be collected from disabled lives or else the error must be corrected. A simple correction is made by assuming that the level premium for the waiver will be proportionate to the level premium for a benefit subject to the same indemnity limit after the waiting period required for the waiver.[16] The level premium of such a benefit need not be separately calculated but may be approximated from the premium for the income benefit. The error involved in such an approximation, if carefully made, will be insignificant in the final total premium. Using the net level premium $[PS]_x$ for an income benefit of \$1.00 yearly the net level premium for waiving will be

$$[PS]_x \cdot [PS]'_x \tag{8}$$

where $[PS]'_x$ is the adjusted premium for the waiver. The premium given by (8) must itself be waived, at a cost of

$$[PS]_x \cdot [PS]'_x \cdot [PS]'_x, \text{ and so on.}$$

[15] XXX T.A.S.A. 410.

[16] The refinements of this assumption as they pertain to life insurance disability clauses are discussed at Actuarial Studies No. 5, p. 159, and at XXX T.A.S.A. 406-8.

The total cost of the premium waiver is thus the sum of an infinite geometric series

$$ar + ar^2 + ar^3 + \cdots\cdots$$

where $a = [PS]_x$ and $r = [PS]'_x$.

The total premium for income and waiver benefits is

$$a + ar + ar^2 + ar^3 + \cdots\cdots.$$

The sum is equal to

$$(9) \qquad \frac{a}{1-r} = \frac{[PS]_x}{1-[PS]'_x}.$$

This formula can be easily modified to fit benefits expressed in terms other than $1.00 yearly.

Active Life Reserves

Like the net annual premium calculations, the methods of non-can active life reserve valuation are closely analogous to life insurance methods. Prospectively the reserve at the end of the n^{th} policy year is equal to the present value of future benefits minus the present value of future premiums, or

$$(10) \qquad {}_nV_x = \frac{{}_yK_{x+n}}{D_{x+n}} - \frac{{}_yN_{x+n}}{D_{x+n}} \cdot \frac{{}_yK_x}{{}_yN_x},$$

This formula may be applied directly, or it may be modified to

$$(11) \qquad {}_nV_x = \frac{{}_yN_{x+n}}{D_{x+n}} \cdot \left[\frac{{}_yK_{x+n}}{{}_yN_{n+n}} - \frac{{}_yK_x}{{}_yN_x}\right]$$

which may be expressed as

$$(12) \qquad {}_nV_x = a_{x+n}\{[PS]_{x+n} - [PS]_x\}.$$

Formula (10) is the form which Mr. Craig uses[17], and is followed by the Conference Committee in its report of May, 1939[18]. Formula (11) has the advantage of eliminating one operation in practice—it substitutes the finding of $\{[PS]_{x+n} - [PS]_x\}$ for the calculation of

$$\frac{{}_yK_{x+n}}{D_{x+n}}$$

and the subtraction of $a_{x+n} \cdot [PS]_x$ from the values thereof.

[17] XVII P.C.A.S. 68.
[18] Pp. 18, 20.

In actual practice an accumulation method has advantages in being both simple and substantially self-checking. The premium $[PS]_x$ is collected from l_x lives at the inception of the risk. The present value at the beginning of the year of the first year's cost of insuring l_x lives is $l_x \cdot S_x$. The difference $l_x \cdot [PS]_x - l_x \cdot S_x$ accumulated for one year $(1+i)$ gives the total amount held at the end of the first year on all policies. The average terminal reserve per policy is therefore

$$(13A) \qquad {}_1V_x = \{[PS]_x - S_x\} \cdot \frac{l_x}{l_{x+1}} \cdot (1+i).$$

At the beginning of the second year the new premiums $l_{x+1} \cdot [PS]_x$ are added to $l_{x+1} \cdot {}_1V_x$, the present value of the year's claims are deducted $(l_{x+1} \cdot S_{x+1})$ and the balance accumulated at interest, so that the average value per policy is then

$$(13B) \qquad {}_2V_x = \{{}_1V_x + [PS]_x - S_{x+1}\} \cdot \frac{l_{x+1}}{l_{x+2}} \cdot (1+i).$$

In general

$$(13C) \qquad {}_{n+1}V_x = \{{}_nV_x + [PS]_x - S_{x+n}\} \cdot \frac{l_{x+n}}{l_{x+n+1}} \cdot (1+i)$$

or setting

$$u_x = \frac{l_x}{l_{x+1}} \cdot (1+i) = \frac{D_x}{D_{x+1}}$$

$$(13) \qquad {}_{n+1}V_x = \{{}_nV_x + [PS]_x - S_{x+n}\} \cdot u_{x+n}.$$

This formula is simple to work, each value leading directly into the next, and it is virtually self-checking: ${}_{y-x}V_x$ can equal 0 only if there is no error or if there are precisely compensating errors.

Theoretically the total unearned premium on non-can policies would be the mean reserve based upon the formula

$$(14) \qquad \tfrac{1}{2}\{{}_{n-1}V_x + [PS]_x + {}_nV_x\}.$$

If the premium is payable other than annually the formula could be modified accordingly. In practice this formula is not used by non-can companies, which make their annual reports on the Casualty and Miscellaneous Edition of the Convention Blank. In 1922, in order to meet the accounting convenience of the casualty companies who were currently active in the non-can field, the unearned premium was divided between line 25 (pro-rata unearned premium, as held on the usual type of casualty policy for which the premium is paid for the entire policy term) and line 25½ (the additional unearned premium on account of the non-can feature). The most usual practice is to enter in line 25 the pro-rata unearned portion of the current premium, calculating separately the amount of the accumulated unearned portions of past premium payments to be entered in line 25½. On the assumption that the policies were issued evenly throughout each year the line 25½ unearned premium is the mid-terminal reserve, computed by the application of valuation factors derived from the formula

$$\text{(14A)} \qquad \tfrac{1}{2}\{{}_{n-1}V_x + {}_nV_x\}.$$

This formula does not need to be corrected if premiums are paid other than annually, since the accounting for the current premium is done on line 25.

The level premiums, and consequently the reserves, will vary somewhat according to assumptions of interest and mortality. Tests were made to see what the differences would be, assuming identical term premiums, on a policy to provide 100 months of indemnity after a 3 months' waiting period. Table II shows that the effect of a lower interest assumption is relatively small. Table III shows that premiums and reserves based on American Experience are only slightly different from those based on American Men (Ultimate) mortality, and reserves are actually higher in some cases. The explanation lies primarily in the fact that the mortality and interest enter both numerator and denominator of the level premium formula, thus tending to offset each other. The Tables also indicate roughly the extent of the modification of Class (3) by the Conference Table, for Table II is based on the Conference Table and Table III is based on Class (3).

TABLE II

Comparison of Net Level Premiums and of Terminal Reserves for Different Interest Assumptions, Using Same Mortality

$1.00 Monthly for 100 Months after a 3 Month Waiting Period—Term Policy to Age 60 (inclusive)

Col. 1	Col. 2	Col. 3	Col. 4
		Net Level Premiums	
Age	Net One-Year Term Premiums	A.M.(5)—2½%	A.M.(5)—3½%
20	0.084	0.162	0.153
25	.098	.179	.171
30	.107	.200	.192
35	.119	.228	.221
40	.146	.264	.258
45	.191	.309	.305
50	.263	.365	.363
55	.364	.434	.433
60	.524	.524	.524

Col. 5	Col. 6	Col. 7	Col. 8	Col. 9
	Terminal Reserves			
	Age 35		Age 45	
Policy Year	A.M.(5)—2½%	A.M.(5)—3½%	A.M.(5)—2½%	A.M.(5)—3½%
1	0.112	0.105	0.122	0.119
2	.222	.210	.235	.229
3	.331	.315	.338	.331
4	.438	.418	.430	.423
5	.543	.519	.510	.503
10	1.004	.977	.673	.675
15	1.248	1.236	.215	.219
20	1.111	1.119		
25	.297	.304		

Col. 2—Undiscounted amount of disability from Conference Modification of Class (3)

Cols. 3, 4, 6-9—Calculated from Col. 2 with A.M.(5) Mortality, same formulae, *differing only in interest assumption.*

TABLE III

Comparison of Net Level Premiums and Terminal Reserves for Different Mortality Assumptions, Using Same Interest

$1.00 Monthly for 100 Months after a 3 Month Waiting Period—Term Policy to Age 60 (inclusive)

Col. 1	Col. 2	Col. 3	Col. 4
		Net Level Premiums	
Age	Net One-Year Term Premiums	Am. Ex.—2½%	A.M.(5)—2½%
20	0.081	0.148	0.151
25	.094	.164	.167
30	.100	.183	.186
35	.111	.209	.211
40	.133	.243	.244
45	.175	.286	.287
50	.242	.340	.341
55	.339	.408	.408
60	.494	.494	.494

Col. 5	Col. 6	Col. 7	Col. 8	Col. 9
	Terminal Reserves			
	Age 35		Age 45	
Policy Year	Am. Ex.—2½%	A.M.(5)—2½%	Am. Ex.—2½%	A.M.(5)—2½%
1	0.102	0.103	0.115	0.115
2	.203	.206	.222	.223
3	.303	.307	.320	.320
4	.403	.407	.408	.408
5	.500	.505	.485	.485
10	.941	.941	.651	.648
15	1.183	1.177	.207	.206
20	1.067	1.059		
25	.285	.283		

Col. 2—Undiscounted amount of disability from Class (3)

Cols. 3, 4, 6-9—Calculated from Col. 2 with 2½% interest, same formulae, differing only in mortality assumption.

Unlevel Premiums and Benefits

Some non-can policies provide that the premium shall be increased at a given age and the benefits reduced at a later age. One purpose of such provisions is to reduce the active life reserve below the level premium standard by increasing the present value of future premiums and by reducing the present value of future benefits. Formula (4) can be modified for such policies, as follows:

$$(15) \qquad \frac{{}_uK_x + A \cdot {}_yK_u}{{}_uN_x + B \cdot {}_yN_v}$$

where $u =$ age at which benefits are reduced,
$A =$ ratio of reduced benefits to original,
$v =$ age at which premium increases,
$B =$ ratio of increased premiums to original,
$x < v$; $x < u$; and in practice $v < u$.

At certain ages and durations this formula will lead to negative reserves, which means that if actual experience follows the expected the company will pay out excess benefits in the hope of collecting excess premiums later. If B is a high ratio, or A very low, such negative reserves may present an acute problem. For that reason care must be taken in assigning the values of A and B. Some conservative actuaries value such policies as if they were three separate contracts, one to age v

$$(16) \qquad [PS]^a_x = \frac{{}_vK_x}{{}_vN_x}, \qquad (x < v)$$

the second from age v to age u

$$(17) \qquad [PS]^b_x = \frac{{}_uK_x}{B \cdot {}_uN_x}, \qquad (v \leqslant x < u)$$

and the third above age u

$$(18) \qquad [PS]^c_x = \frac{A \cdot {}_yK_x}{B \cdot {}_yN_x}, \qquad (u \leqslant x < y).$$

The unlevel premium and benefit plan has also the result of reducing the annual premium for the earlier years of the policy, and of reducing the difference between the annual premiums graded by age at issue. It is characteristic of short-term coverages that the term premiums form a much flatter curve than for long-term coverages. An unlevel premium plan applied to a short-term policy may have the result that the age 49 annual premium is only slightly higher than the age 20 annual premium. Such a result would enable the company to charge a single flat gross premium for all issue ages from 20 to 49, and that is most often done for short-term policies. For long-term policies, however, the annual differences are such as to require the gross premium schedule to be graded, like life insurance, according to age at issue.

Disabled Life Reserves

From a formal viewpoint the reserve on a disabled life is to be valued as an annuity payable monthly during disability, subject to appropriate policy limits. The symbol $a^{t(12)}_{(x)+t/12}$ stands for the value, at the end of the t^{th} month of disability, of a life annuity with first payment due in one month and subsequent payments due monthly during disability, for a life disabled at age x. The symbol $a^{t(12)}_{(x)+t/12:\overline{k+m-t/12}|}$ is the corresponding value of a temporary annuity limited to m years after a waiting period of k. If the annuities are computed from disabled life mortality tables they will include the last full payment to each disabled life, but will not include any fractional part of a month's indemnity accruing between such payment and recovery or death. A correction could be made by assuming that each recovery contributes one-half of a month's additional disability, and by valuing those contributions. The present value of such contributions must always be less than one-half the value of one month's indemnity; substantially less as the remaining term of the annuity becomes shorter. One-half of one month's indemnity is approximately 1% of the value during the early years of a 103 months temporary annuity on a life disabled at age 40. The annuity (omitting the correction) can be computed by developing regular commutation columns, monthly; as

$$D^{t}_{(x)+t/12} = l^{t}_{(x)+t/12} \cdot v^{x+t/12} \tag{19}$$

$$N^{t(12)}_{(x)+t/12} = \sum_{n=0}^{n=12(\omega-x)-t} D^{t}_{(x)+\frac{t+n}{12}} \tag{20}$$

$$_{(x)+k+m+1/12}N^{t(12)}_{(x)+t/12} = N^{t(12)}_{(x)+t/12} - N^{t(12)}_{(x)+k+m+1/12} \tag{21}$$

whence

$$12 \cdot a^{t(12)}_{(x)+t/12} = \frac{N^{t(12)}_{(x)+\frac{t+1}{12}}}{D^{t}_{(x)+t/12}} \tag{22}$$

and

$$12 \cdot a^{t(12)}_{(x)+t/12:\overline{k+m-t/12}|} = \frac{{}_{(x)+k+m+1/12}N^{t(12)}_{(x)+\frac{t+1}{12}}}{D^{t}_{(x)+t/12}}. \tag{22A}$$

The correction for the accrual after the last payment before termination can be estimated approximately by the formula

$$(23) \qquad 12 \cdot \Delta_{(x)+t/12:\overline{k+m-t/12}|} = \frac{l^{(1)}_{(x)+t/12} - l^{(1)}_{(x)+k+m}}{24 \cdot l^{(1)}_{(x)+t/12}} .$$

This formula is conservative to the extent of the interest assumption which is disregarded. Values calculated with this correction for an annuity of 100 months after a 3 month waiting period are shown in Column (1) of Table IV.

TABLE IV

Value of $1.00 Monthly Select Temporary Annuity
103 Month Term—Class (3)—3%
Age 40 at Disability

n	Col. 1 Formulae (22A) and (23) Adjusted True Monthly Annuity	Col. 2 Formula (24) Approximate Monthly Annuity Based on Amount of Sickness	Col. 3 Formula (27) Approximate Monthly Annuity Adjusted from Annual	Col. 4 Formula (26) Annual Annuity
1	40.3	40.9	40.9	45.4
2	44.5	45.2	44.8	48.5
3	44.3	44.9	44.5	47.5
4	41.2	41.8	41.4	43.7
5	35.4	35.9	35.6	37.3
6	27.4	27.8	27.6	28.7
7	17.7	17.9	17.8	18.4
8	6.8	6.9	6.9	7.0

The annuities can also be valued along lines similar to Formula (7A) on page 50 above, using amounts of sickness rather than separate payments of indemnity. This method requires disability tables showing both $s^{n/1}_{(x)}$ and $l^{(1)}_{(x)+n}$. It is rather cumbersome to apply in any way other than annually at anniversary dates. Such annual values are shown for comparison in column (2) of Table IV. They include all indemnity expected to accrue in the future without necessity for considering any correction on account of the part-month accruing immediately before termination. The formula is

$$(24) \qquad a^{(12)}_{(x)+n:\overline{\frac{103}{12}-n}|} = \frac{\sum_{t=0}^{t=\frac{103}{12}-n} v^{n+t} \cdot s^{(n+t)/1}_{(x)}}{v^n \cdot l^{(1)}_{(x)+n}} .$$

In applying the formula the amount of sickness in the last year is not for a full year, but for only a part thereof. That correction should be understood in interpreting $s^{8/1}_{(x)}$, which is really $s^{8/7/12}_{(x)}$. The excess of the values of Column (2) over those of Column (1) is due to the arbitrary differences in the treatments of the interest assumption.

With unlimited life indemnity the monthly annuities can be approximately derived from annual annuities by the relationship

$$a^{t(12)}_x = a^t_x + 13/24. \tag{25}$$

This formula is not directly applicable to the select temporary annuities which characterize non-can today. The values of

$$12 \cdot a^t_{(x)+n:\overline{\frac{103}{12}-n}|} \tag{26}$$

given in Column 4 of Table IV demonstrate that the adjustment to the monthly annuity is not a constant. A close approximation can be made, however, by the following formula

$$a^{t(12)}_{(x)+n:\overline{m+k-n}|} = a^t_{(x)+n:\overline{m+k+6/12-n}|} - \tfrac{1}{2}. \tag{27}$$

Values computed by this formula are shown in Column (3) of Table IV. In applying the formula the payment at the beginning of the final year was adjusted to the appropriate part of the full year.

Formula (24) or (27) can be used to calculate values at anniversary dates, and intermediate monthly values can be interpolated if desired. Assuming valuation on the average at the middle of a disability month, the mean monthly annuity for the t^{th} month would be the mean of the annuity at the beginning of the t^{th} month (next payment due at the end of the month) and the annuity-due at the end of the t^{th} month (payment due immediately): or

$$\tfrac{1}{2} \cdot \left\{ a^{t(12)}_{(x)+\frac{t-1}{12}} + a^{t(12)}_{(x)+\frac{t}{12}} \right\}. \tag{28}$$

Formula (28) values the full payment due at the end of the t^{th} month; that is, it includes both the accrual up to the average valuation date since the payment at the end of the $(t-1)^{th}$ month and the amount which will accrue after such date and

before the next payment. Any other accrued and unpaid indemnity must be valued separately.

Very few companies have exposure enough to base long-term annuity calculations upon their own experience. Most companies must adopt some experience not their own. The Conference Committee recommended Class (3), as extended in its report, as a basis for valuing claims which have lasted one year or longer from the date of disablement[19]. Non-can policies are offered and bought as a type of insurance complete in itself, rather than as a clause supplementary to another type of insurance. This fact, combined with the more active claim supervision shown by non-can companies, leads to the expectation of more claims presented under a non-can policy—even with identical waiting period—followed by more rapid termination for the first few months. After the sifting out of the more numerous but less costly short claims, the termination rates and the relative frequencies of the two types should approach each other. Such early divergency followed by later convergence was noticed in the experiences analyzed as Classes (1), (2) and (3), and a marked difference even from Class (3) has been noted in the first disability year experience on long-term, long-waiting period non-can policies. The differences were recognized in the Committee's modification of Class (3) to fit more nearly the special non-can needs.

The foregoing discussion applies to the valuation of long-term non-can claims, but it holds only academic interest in connection with short-term claims. There are better ways of valuing short-term claims than computing formal annuity values. With short-term policies the frequency of claims is much greater because of the usual shorter waiting periods. The maximum loss is much lower, and the values by age vary but little. Under these conditions there is no need to go through formal calculations of the sort outlined above. The Conference Committee, for example, recommended for claims of less than a year's duration that reserves be set aside in such manner as the company's calculations justify[20]. This standard allows for the application of average claim values. One method is to observe the average run-off of such claims outstanding at December 31 of each year, and to derive

[19] 1940 Report, *supra.*
[20] 1940 Report, *supra.*

therefrom an average with which to value such claims outstanding at a subsequent December 31. This method works reasonably well if the policies exposed are fairly uniform in size and nature, and so long as no epidemic strikes shortly before the valuation date. If the policies exposed vary in size a more reliable valuation can be obtained by computing the average as a given period rather than as a given amount. An epidemic generally creates a large number of claims of short average duration. The regular average applied to a claim list which includes a large number of epidemic claims will generally result in a substantial overvaluation. Contrariwise, if the valuation follows a short period of exceedingly good health throughout the country, the list will contain a greater-than-average proportion of longer, more serious claims. The regular average would undervalue such a list. The most satisfactory course is to prepare a separate average for each of a number of durations. Claims incurred in December and still outstanding at the end of the year may be valued at x weeks of indemnity; those incurred in November at y weeks; and so on as the company's experience may indicate. The number of weeks of indemnity used as the factor may not be the actual period which the average claim is expected to run. Other benefits—hospital, surgical, etc.—may be included in the liability, and some measure of accrued but unpaid benefits will necessarily be present. The factor may be developed simply as the number of weeks for which the indemnity would be equal to the actual liability for such benefits together with the regular loss of time indemnity.

Two observations may be made on that general method. The first is the warning—scarcely necessary—that the average size of all claims settled by a company is not a satisfactory average to apply to claims outstanding at a given time. The outstanding list is very much more heavily weighted with the more serious claims, which remain longest on the book. The most numerous claims are the shortest and least costly, which have a big effect on the general average but which are settled so quickly that relatively few of them are outstanding at any time. The second observation is that an average of claims outstanding at December 31 is not necessarily applicable to claims outstanding at some other time. Short-term disability claims have a definitely seasonal cast; claims incurred in December may have an altogether different average from

claims incurred in June. Valuation averages developed for one date should be tested before assuming that they will be satisfactory at another date.

The Conference Committee made a suggestion with regard to checking the claim reserves actually set up. Schedule O lumps together all claims which were outstanding at the end of the previous year, thus obscuring the effect of a possible inadequate or redundant valuation basis for older long-term claims. The Committee's suggestion was a modification of Schedule P—Part 5, wherein each year a new valuation of outstanding liability is added to actual payments to date, subdivided by the calendar years in which the claims were incurred, and the result compared with previous similar totals. In this way a trend may become apparent, indicating either inadequate or redundant reserves. One method would be to start with the first year's reserves for claims incurred in the year 1940, for example. At the end of 1941 add payments made in 1941 on claims incurred in 1940 to the current reserves for such claims still outstanding, and compare the result with the first reserve at the end of 1940. At the end of 1942 add payments made in 1941 and 1942 to current reserves, all for claims incurred in 1940, and compare the result with the previous two years' estimates—and so on, until the 1940 claims are all settled; and similarly for each calendar year's claims. A variation of this method is to include all payments made in 1940 on claims incurred in 1940, not just payments made after the 1940 year-end valuation. Each successive year's sum is thus an estimate of the total losses incurred in 1940, and may be compared with earned premiums to get developed loss ratios for each calendar year separately. If a trend is present it will show up in either variant of the method. The Conference Committee warned, "It should be noted that a period of several years may be required to reach reliable conclusions as to whether the reserves set up have been too large or too small. The longer the period of time during which benefits are payable under a policy, the greater is the fluctuation in remaining reserves likely to be from year to year. The outstanding claim liability may also be influenced by such factors as the average period since issuance of the policies exposed, and the current phase of the economic and morbidity cycles. A favorable run-off of reserves should not, therefore, be considered

as justifying, without thorough study and analysis, a possible relaxation of the application of the recommended standard."[21]

Valuation Basis

Active life reserves are the nucleus of the accounting device which permits a company to charge a level premium for a risk with an unlevel cost. The excess or unearned portion of the level premium in early policy years is set aside and reserved until needed to supplement the level premium when it becomes insufficient to meet the increased cost in later policy years. The reserve is a liability of the company, and the basis on which the liability is to be valued is important. The relative merits of net premium valuation and gross premium valuation have caused much discussion in life insurance circles, and the same general principles apply to the valuation of the reserve on non-can policies.

The insurance policy is a contract which the company is obligated to fulfill *in toto*. The total cost of fulfilling the contract is composed of benefits to policyholders plus the cost of administering the insurance. The net premium covers benefits alone, and the gross premium is loaded to cover all costs. No company can pay the net claim costs and ignore its other expenses, and the actual total liability under the policies would seem to be most closely estimated by the gross premium reserve, which is equal to the excess of the present value of all future costs over the present value of future gross premiums. In practice policy reserves are calculated as equal to the excess of the present value of future claim liability over the present value of future net premiums. Such net premium valuation is a heritage from the established life insurance practice in this country, and its general use makes it imperative to understand its meaning and its implications. Benefit payments to policyholders are, of course, the most important part of the non-can policy liability and the part which increases most significantly with the passing policy years. Net

[21] 1940 Report, *supra*. This is a timely point to acknowledge the profit which the author derived from the discussions of the Conference Committee, and to state that while many of the thoughts expressed herein should properly be credited to other members, the paper is not to be considered a statement of the Committee's beliefs. The faults are the author's alone.

premium valuation focuses attention on this aspect, but failure to recognize the incidence of other costs could conceivably result in embarrassment to a company.

If all expenses other than benefit payments were the same each year, the loading on current premiums would pay all current expenses. With such level incidence of expenses, gross premium valuation and net level premium valuation would be identical. But expenses are not level for non-can policies. The expenses for which the net premium must be loaded are, broadly, acquisition cost (including here all agency expense), underwriting cost, premium taxes, claim administration expense, and general home office expense. Each of these could be a complete subject in itself, but for brevity's sake certain assumptions may be permitted in this discussion. Non-can acquisition cost is characterized by a high first-year commission and lower renewal commissions. Underwriting costs, including the fees for medical examinations and inspections, are all incurred before the policy is issued. Premium taxes are approximately level, subject only to increases by state governments in the rates of taxation. The general home office expense of an established company may be presumed to be level. The cost of claim administration is roughly proportionate to the claim payments themselves, and consequently increases as policies grow older. Of the five broad components, therefore, premium taxes and general home office expenses can be set aside here as being level and thus not affecting the relationship between gross and net premium valuation. First year commissions and underwriting expenses cause a high incidence of cost in the first policy year; subsequent year commissions may be level or decreasing, according to the individual agency plan; and claim administration expense shows an increasing trend. These three factors, therefore, affect the relationship in various and opposite degrees.

Under a gross premium valuation, and from a realistic business viewpoint, provision must be made to pay the increased claim adjustment costs of later policy years. In actual practice various expedients are usually available to make the total year by year renewal expenses come within a level loading, so that the general pattern of the non-can expense load can be assumed to be a high first year cost followed by level renewal costs. This pattern creates differences which exist between the valuation bases. If net

premium valuation is applied on a full level premium basis, the company must set up at the end of the first year the same reserve which it would set up if the expense load were level throughout. To finance the extra first year cost in addition to setting up that reserve the company must draw on surplus funds. Such a drain upon surplus is an unnecessary burden upon a growing company. That the burden is unnecessary follows from the nature of the gross premium, which is determined as an annuity-due whose value is equal to the present value of all costs. Assume, for example, that total first year costs just equal the gross premium. At the end of the year the present value of future gross premiums is still equal to the present value of all future costs. Under these circumstances no reserve is necessary to assure the company's solvency. The full net level premium reserve is an extra safety margin, and is therefore conservative, but conservatism can be carried to a destructive extreme. Mr. Shepherd said recently, "It is particularly worthy of note that there seems to be no record of a company which has established itself in the United States on the net level premium reserve basis when its business has been confined strictly to non-participating ordinary life insurance."[22] This statement would also apply to non-can, which in this respect differs only in degree from non-participating ordinary life insurance.

Gross premium valuation recognizes that in practice a company which cannot make provision to pay expenses is as truly insolvent as a company which cannot provide for its net insurance liability. It further recognizes that every premium paid is a gross premium. A company does not collect a premium to meet net claim costs without collecting the expense loading at the same time. Benefit payments represent a sort of preferred obligation, it is true, but the expense load is an obligation which is just as binding for all practical purposes, and every dollar of the gross premium is just as valuable as every other dollar. In recognizing these facts, gross premium valuation is more realistic than net level premium valuation. It is not without its own weakness, however. The arguments in its favor are strongest when first year expenses do not exceed the gross premium. When the initial expenses are so large as to require actual cash outlay over and above the premium

[22] XXVIII R.A.I.A. 231 (1939).

received, the gross premium basis develops a negative reserve. Theoretically a negative reserve is an asset, but it is an asset of uncertain value. It counts absolutely on the collection of subsequent premiums, and an over-heavy lapse would impair its value. In practice negative reserves from any cause are disregarded, thus offsetting the weakness to some extent, and incidentally making it necessary to finance new business from surplus, even on a gross premium basis.

There is no intention here of arguing for or against the adoption of the gross basis. This discussion is simply a background to show the logic behind the general use of the full preliminary term basis in valuing non-can policies. Gross premium valuation is on its strongest ground when the first year reserve is not negative; that is, when the first year premium equals or exceeds the total assumed cost. When premiums just equal costs in the first year, and the expense load in subsequent years is level, the gross premium basis develops reserves identical with those on the one-year full preliminary term basis[23]. The full preliminary term basis is a net premium valuation which does not impose the burden of a first year level premium reserve and which avoids the possible early negative reserve of the gross premium basis. The one year full preliminary term basis considers that in the first year the policy is a one year term contract, so that the entire first year premium is available to pay first year claims and expenses. Thus there is no unearned premium at the end of the year. Any excess of costs over premium is paid from surplus, thereby avoiding negative reserves. Starting with the second policy year the expense load is assumed to be level. On the assumption that the policy was issued at the beginning of the second policy year, with the premium based on the age at that date, all differences between the valuation plans disappear. With the first year eliminated, the net level premium basis, the gross premium basis, and the full preliminary term basis all develop the same reserves. The full preliminary term plan is thus a sound and acceptable compromise, and is firmly established as a satisfactory basis for determining the unearned premium under non-can policies.

There is no need to consider a modified preliminary term basis

[23] This is not true if the policy provides an increase in the gross premium at some age. The comparison would then depend upon the increase.

for non-can. The policies are term contracts of pure insurance, with no investment element. There is nothing comparable to the endowment insurance which makes a modified preliminary term basis preferable for life insurance valuation. The select and ultimate valuation basis also need not be considered here, partly because if there is any select period at all it is very short, and partly because the basis is subject in less degree to the same criticism which is made of the net level plan.

Gross Premiums

In calculating the gross premiums at which his company will guarantee the insurance for a long span of years the actuary must have reasonable assurance that his basic assumptions will be conservative. A slight inadequacy in premium may cause no more serious hardship than retrenchment in expenses, but a larger inadequacy can bring financial disaster, and has done so more than once. With conservative underwriting short-term non-can has been written successfully with net premiums at a level approximately equal to 125% of the Conference Table. With extremely conservative underwriting it is possible that the experience of long-term non-can may be no greater than 125% of the Conference Table, but for safety's sake net premiums are customarily figured today on a higher modification. The premiums must make provisions for a possible adverse future trend of disability. In recent years the cost of disability has been showing an improved trend, but the improvement may be temporary or may be only an apparent improvement due to better economic conditions. It has long been held that the advance of medical science has bettered mortality at the expense of disability experience. Comparison of the successive Manchester Unity investigations supports this contention. On the other hand, medical science has practically eliminated many serious acute and epidemic diseases, and has made progress on checking degenerative conditions. It is not at all inconceivable that many types of degenerative conditions will some day be brought under control. The recent favorable trend may even be a reflection of that campaign. If so, net premiums figured on the assumption of an unfavorable trend will prove to be more than conservative. It

would certainly not be conservative today, however, to base net premiums on the assumption that the recent trend will continue.

The net premiums must be loaded for the cost of conducting the insurance, and for this purpose the full preliminary term basis has become firmly established in the non-can field. In finding the gross premium to be charged for issue age x on the full preliminary term basis the net premium at age $x + 1$ is loaded for renewal costs, which will vary among companies but which for long-term policies will probably be something like 20% for agency (including the renewals' share of supervision cost), 12 to 14% for administration, 3% for taxes, and 5% for claim adjustment (subject to increase, possibly financed from a reducing agency cost); or a total of 40-42% of gross, plus provision for profit. This premium should be compared with the sum of first year costs, which for long-term coverage will include underwriting expenses (including the expense of rejected applications) of 15 to 20%, agency expense (including cost of development) of around 60%, taxes, general home office administration, and claim administration of about 20%; or a total of very nearly 100% before considering the one year term claim cost, which may be lower for long-term policies than for short-term. When the total exceeds the computed premium, the premium must obviously be increased according to some plan of amortizing the excess. Unless the excess is taken care of all at once—that is, unless the gross premium is increased by the full amount of the excess—there will be an initial investment to be financed from surplus. This investment increases the necessity of careful planning for the financing of new business, and of designing the amortization plan conservatively in order to assure that the investment will be returned.

The actual loading has been applied sometimes as a given percentage of the gross premium and sometimes as a flat loading plus a percentage. Commissions and taxes, and possibly claim adjustment expense, depend directly on the amount of the premium, so that a percentage loading is dictated for them. The net premium on a policy issued at age 50 may be as much as twice the net premium on a policy issued at age 25, but the costs of home office supervision and of underwriting are apt to be much the same whatever the age of the policyholder. A flat loading for these items, therefore, seems to be fairer and sounder. Otherwise

the man who applied at an older age is made to subsidize the younger applicants, and any reduction in the average issue age would have the effect of reducing income from loading, possibly to an inadequate level. The percentages in the preceding paragraph are intended merely to suggest the relative importance of the various broad items of expense. The loading would vary among companies, depending on such factors as volume of premiums, type of agency organization and type of policy. A small premium volume, for example, does not allow economies in organization which could reduce general home office and claim administration costs. The cost of the agency organization may itself depend on the type of policy. The market for long-term non-can, for example, is smaller than for short-term. The effort per sale is greater and the number of sales is lower. An agency force selling only long-term policies would require a larger unit return than a force to which the broader market is open. The underwriting of short-term non-can may be less costly because it is at least partly nonmedical. On the other hand, the difference between the net level premium at age $x+1$ and the net one year term premium at age x is less for short-term policies than for long-term so that claims consume a larger part of the first year premium. The result may be an even higher initial investment for short-term non-can than for long term. Such individual variations should be studied and understood in applying any plan of loading the premium.

Nonforfeiture

The unlevel acquisition cost of non-can which occasions the initial investment is made possible only by the long term of the contract, which may be as much as forty or forty-five years. A protracted contract of this sort is found only in the branches of insurance involving life contingencies, and the non-can company has some problems in common with life insurance companies. One such problem is that involving forfeiture of the active life reserve, which is closely analogous to the reserve on a term policy of life insurance; for a non-can policy is precisely a term policy to age 60 or 65, as the case may be. The non-forfeiture provisions of life insurance policies were imposed by legislative action to

prevent loss to policyholders of the substantial equities which arise from the investment element inherent in most life insurance plans. Endowment plans of insurance, of which the whole-life plan is a special type, require the certain payment of a known sum, and consequently the reserves grow very considerably larger than under plans of term insurance where the payment is not certain and where the honest policyholder has no investment purpose in taking out the insurance. Both the investment and the pure protection plans, however, develop at least a small reserve, because an increasing cost is insured at a level premium. The policyholder has an equity in the reserve which can always be realized by exercising his right to continue the policy throughout its entire term. This is as true of disability insurance as of life insurance. That is the only interest the policyholder has in the reserve so long as the policy is in force. The problem of nonforfeiture values arises only when the insurance is terminated prior to the end of the specified term.

Nonforfeiture provisions are based on the premise that an individual should not be required to forfeit upon lapse any equity which he may then have in the reserve. That premise is generally accepted as sound, and problems arise only in determining the amount of such equity and the manner and extent of the recognition thereof. Properly speaking there is no "reserve" set against an individual policy. Insurance is not an individual function, but is a sharing of risk among a number of individuals. Premium and reserve accounting against an individual risk is simply placing a bet based on mathematical probability. Only with the distribution of the risk over a reasonable number of individuals does the law of averages turn the bet into an insurance operation. Such distribution prevents the reserve from having any individual nature. Speaking in broad terms, the reserve is the aggregate amount by which the present value of future premiums to be collected from the entire group of individuals is inadequate to balance the present value of the future costs under all the contracts in the group. The aggregate reserve is calculated by the use of average factors, and for policies actively in force it is customary to speak of the policy value as being equal to the proportionate share of the aggregate reserve. This custom is not objectionable if the limitations are understood. The only

practical impropriety in the custom is the confusion created in the lay mind when the subject changes from active policies to lapsed policies.

It has been generally recognized in life insurance circles[24] that the amount of the policyholder's equity in the reserve at the moment of lapse is not necessarily equal to the proportionate share of the reserve at the moment before lapse. An active policy carries its share of net cost and overhead expense and contributes to the spread of risk which transforms the operation from wagering to insurance. Premature termination of such sharing impairs the position of the remaining participants. The cost of such impairment should be borne by the lapsing policyholder rather than by those remaining. The extent of the impairment is impossible to determine closely for disability insurance, at least at the present stage of its actuarial development, because the experience to be expected on disability insurance is not thoroughly established, and because the nature of the moral hazard creates a very significant extension of the anti-selection inherent in lapsation, the degree of which cannot be accurately measured. The amount by which the company and its remaining policyholders are damaged by lapses can only be crudely estimated; and so small is the reserve on even long-term disability policies, compared to most life insurance plans, that a conservative estimate of the damage very nearly, if not entirely, wipes out any equity of the lapsing policyholder. A very small nonforfeiture value may be worse than none at all, partly because of the bother and expense of accounting for small sums and largely because the very smallness thereof may cause dissatisfaction. A Scottish actuary[25], explaining why surrender values are not given on disability insurance by his company, said, "If the Company has made a point of advertising the Surrender Value in its prospectuses, the Policyholder makes as much as possible of the dissatisfaction. Too frequently he compares with the premiums paid the Surrender Value offered for the Continuous Disability Policy and the Surrender Value which has been quoted to him for a Policy taken out under the Endowment Assurance Plan in some Life Office, and

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[24] For example, "Report of the Committee to Study the Need for a New Mortality Table and Related Topics," Chapter VI.

[25] W. A. Robertson, XIV T.F.A. 66.

it is difficult to make it clear to him that there can be no comparison as between the two contracts." If the time comes when the effect of lapse can be more accurately evaluated it is conceivable, though improbable, that a small nonforfeiture value may be established on long-term high-reserve disability policies issued thereafter. Such nonforfeiture value, if it should arise, would undoubtedly be expressed as some type of extended term insurance. A cash value would be unfortunate, for it would needlessly accentuate the financial strain normally suffered by disability companies in periods of economic depression, and would create extra incentive to lapse a policy whose sole purpose is protection. It would introduce a banking or investment element utterly foreign to the nature of the insurance. In the short-term low-reserve field no true nonforfeiture provision is probable even if present difficulties should be cleared away, and unless that time comes there is no proper place even in long-term policies for any such provision.

Investment

At one time the presence of relatively high reserves created the possibility of excess interest earnings. The disposition of excess interest is no problem today, particularly to a company valuing at 3½% and paying federal income taxes on its entire coupon income to boot. The chief concern in investing the assets held against non-can reserves is to be sure that the principal remains intact. Portions of premiums collected today may not be used for 10, 20 or even 30 years from now. The liability is expressed in dollars so that possible change in the purchasing power of money is not a major problem in investing the assets held against the reserves. It is more important to conserve the principal than to earn a big return thereon. A possible inadequacy of net yield may be a simpler problem to meet than an inadequacy of principal, and high yield does not commonly go hand in hand with safety.

Adjustments to the Statutory Underwriting Exhibit

The Underwriting Exhibit of the Casualty and Miscellaneous Blank makes no provision for interest earned on account of

reserves, although the reserve calculations assume such interest. The entire amount of assumed interest in active life reserves is actually taken out of premiums by the statutory formula, so that "premiums earned" is understated by that amount. Similarly "losses incurred" is overstated by the amount of interest assumed in disabled life reserves. The statutory underwriting results for non-can, therefore, must be corrected for the interest assumption before a true picture of operations can be determined.

An adjustment must also be made for underwriting expenses if the volume of non-can being written has not become stabilized. The expenses of a growing non-can company cannot be compared with the level expenses of a general casualty company, or even with the stabilized expenses of a mature non-can company. As already stated, non-can policies have a high first year expense load and a lower load in subsequent years. A growing company perforce has a higher percentage of first year business than a mature company, so expenses are correspondingly higher than for a company whose business has leveled off. The resulting high statutory expense ratio is not abnormal, nor is it undesirable provided the growth is not too rapid. The effect of the unlevel expense load must be recognized, however, in laying plans and in analysing the incidence of costs.

The Future of Non-Can

Only time holds the answer to the question, "What will be the future of the non-can business?" There is a wide need for the types of insurance offered by non-can companies. Men familiar with non-can believe that if the moral hazard is controlled the need can be largely satisfied. Control of the moral hazard lies in the company and its underwriting attitudes. For that reason non-can will probably be written by companies with no other lines or whose other lines are kept completely subordinate, for only such companies will be in a position to give whole-hearted attention to the non-can operations or to undertake the requisite control of agency underwriting. If a company has the necessary degree of self-control to keep the moral hazard in line, the dangers of the business will be found not so much in loss experience as in acts bearing directly on the business by men unfamiliar with its

requirements. Legislatures and insurance departments cannot make non-can, but they can break it. As in any other field, failure to understand principles can lead to unfortunate misconceptions. Such misconceptions have more than once caused government officials to make moves which were not in the best interest of either the business or the public. The future of non-can lies not only in the companies themselves but also in the hands of those who have the power to make or to refrain from making unintentionally destructive legislation or rulings.

Conclusion

To guide and coordinate the efforts of the various departments is the job of management. Each department must pull its weight and must respect the spheres of the others. Weakness in just one department alone may prevent the successful conduct of the business, and the same can be said of interference by one department in the conduct of another. Agency management, claim administration, underwriting and investment are all fields for experts. This paper has not attempted to treat those fields from the experts' viewpoints. It has tried to discuss from the management viewpoint the relationship of the fields with one another, and to show wherein each contributes to the success of the whole.

The right arm of management is the actuary, and the non-can actuary must understand the problems and the inter-relationships of the departmental experts. Mathematical formulae and theories are not nearly enough. Human nature permeates the non-can field and human nature cannot be forced into the shape of a theoretical formula. Non-can must have a sound actuarial foundation, but that foundation must be realistic and independent in its recognition of human nature, and it must be thorough in its coordination of the best efforts of those engaged in the business. Upon such a foundation, honestly laid, can be erected a structure which may lack something of mathematical exactness but which promises to be both sound and socially desirable.