Liability Loss Reserves.

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The unstable condition of liability insurance and the lack of experience and precedent in workmen's compensation insurance are quite naturally matters of deep concern, not only to those engaged in the branch of the insurance business, but also to the government officers entrusted with the duty of supervision. Side by side with efforts to keep the cost of insurance down, and thus prevent excessive waste, efforts must be made to keep the insurance organizations solvent, and thus protect the interests of the assured and the injured workmen. The new state organizations for supervision of insurance rates, are more frequently called upon to keep premiums up against the onslaught of ruinous competition, than to keep them down against the efforts of rate-making combinations.

The establishment of solvency of an insurance company, and especially of a casualty company is not a simple matter, with millions of advance receipts and millions of deferred obligations, many of which are altogether unknown, and others uncertain. The supreme test of solvency is in the reserves, and primarily the reserves for outstanding losses. Many different methods of ascertaining the loss reserves of casualty companies have been tried within the last decade. It is not necessary to go here into a description of these methods, for this has recently been done in the extremely interesting pamphlet* of Mr. Frank E. Law, Vice-President of the Fidelity & Casualty Company, who is particularly qualified to discuss this important problem because of his own activity in the shaping of the laws as they stand in the statute books of many states at present. The significant situation at present is the gradually growing feeling that the loss reserves as computed by the method established only a few years ago, and at present required in the majority of states, are often insufficient. This was officially announced a few years ago by Hon. W. T. Emmet, then the New York State Superintendent of Insurance, as follows:

*"A Review of Liability and Workmen's Compensation Loss Reserve Legislation."

"There can be no question of the inadequacy of the reserves produced by the new liability loss reserve law, nor of the desirability of so amending it that it will produce reserves entirely adequate for the purposes intended."* In view of this statement, new legislation on the subject of liability and compensation loss reserves may reasonably be expected. The whole subject must, therefore, be considered anew in the light of recent experiences, and the time is propitious for suggestions as to a proper basis for the more exact computations of the loss reserve.

The first step in the inquiry is to ascertain how successful or unsuccessful is the present law in accomplishing its purpose. While this is not a simple matter, and one may not be absolutely sure of his results, certain conclusions the writer has arrived at seem to be fairly justified.

How are we to judge of the adequacy or inadequacy of the legal reserve? The law says: you are to make certain prescribed and complicated computations and to put away as a reserve the figure arrived at. How is anyone to know that that sum is sufficient for the purposes intended?

Evidently one method is to compare the figure so obtained with the sum of individual estimates on losses outstanding which are kept by nearly all large casualty companies for their own use, mainly as a check upon the work of the adjusters. In the cases of some companies such a comparison is made. The results of the comparison differ, however. The company may find that the sum of its individual estimates is greater than the legal reserve demanded, and as a result it may put aside the difference as a voluntary reserve.

Another company may have an entirely different experience. Thus Mr. Law finishes his interesting study with the following statement:

"In the case of the Fidelity & Casualty Company the reserve by the method of loss ratios with suit test at December 31, 1912, was $1,486,449.96 while by the method of individual estimate it was $1,099,688, a difference of $386,781.96. This is significant."

It is difficult, however, to appraise the real significance of this comparison until more is known of the accuracy of the individual

*Statement made before the National Convention of Insurance Commissioners at Spokane, Washington, July, 1912. (See Frank E. Law's pamphlet, p. 30.)

estimates. Evidently, positive and definite information cannot be had until all the cases for which individual estimates had been made have been disposed of, which may take many years.

In discussing the necessity for revision of the loss reserve law, only the adequacy of the reserves is usually considered. As the loss reserve laws came primarily in response to a demand for a better guarantee of solvency, the efforts were directed only towards increasing the reserves. Thus, for instance, Mr. Law says: "The law has produced results of value. The companies in general are carrying higher reserves than before its passage, and by so much the policyholders are in a safe position." Nevertheless, it is obvious that excessively high reserves are equally undesirable. Reserves are used not only for purposes of determining solvency, but also for the computation of the underwriting results. The business being one of advance receipts and deferred liabilities, it is impossible to determine the underwriting result, or to be more explicit, the profit and loss, without reserves. An undervaluation of outstanding liabilities will show a fictitious underwriting profit, and cause perhaps an unjustifiable optimism, which in its effect upon dividends and rates may work untold harm to the business. But an overvaluation of the outstanding losses, by unduly reducing the underwriting profit, must also have its effects. If it should occur in all companies, it would have its effect upon the rates, for the companies must necessarily try to adjust premiums to the losses, and thus increase the cost of insurance.

The reserve law in force at present is known as the method of loss ratios with suit test. This reserve law is based upon the following assumptions:

1. That for each company there is a fairly definite loss ratio, based upon its methods of underwriting.

2. That while it may differ very much between one company and the other, for each other it remains fairly permanent.

This being so it is but necessary to determine for each company what its ultimate loss ratio is, and having ascertained that, reserve for each year's business as much as has not yet been paid out.

As it takes about seven years for all the liability losses of any one year's underwriting to mature, the loss ratio of the company must be determined from the experience of several years back. The law requires the experience of a five years' period five years back.

Thus for the 1914 reserve the five year period, 1905–1909, must be taken as a basis. The loss ratio for that period having been ascertained, it is applied to each one of the five years following, namely, 1910–1914. The probable loss is computed from the earned premiums on each year's policies, by applying to it the theoretical loss ratio, and by subtracting from the probable loss the payments already made, the remainder is to be set aside as a reserve. That is the method of "loss ratio." In addition there is a "suit test" for the first three of the five years. It is assumed that most claims developed from policies issued more than two years ago have become suits; and from past experience it is further assumed that the average cost of settling a suit is to be about $750. If the remainder computed by the loss ratio method does not prove sufficient to provide $750 for each suit outstanding, a sufficient amount must be set aside to equal this $750 per suit. If the remainder is excessive it must nevertheless be set aside as a whole. In other words of the two amounts separately computed (remainder, or difference between probable loss and loss already sustained, and $750 per suit) the larger must be set aside for the three years 1910–1912. This suit test is not applied to the last two years' business, since many claims have not yet developed into suits and the average cost of recent suits is smaller.

Finally, if any suits are still outstanding on policies issued from five to ten years ago, $750 per suit is set aside as a reserve, and if there are any suits over ten years old, $1,000 per suit.

This being the law, the reserve in each of the preceding ten years' business may be analyzed. It may be impossible to ascertain on December 31, 1914, whether the reserve of December 31, 1913, on 1913 business is sufficient, but for the old years there should be no such difficulty.

Taking the experience of nine large casualty companies as disclosed in their 1913 and 1914 financial statements, the following comparisons have been made:

1. For suits outstanding on policies issued earlier than 1905, a reserve of $1,000 per suit is required. Thirty-seven suits were outstanding on December 31, 1913, for policies issued in 1903 and 1904. By December, 1914, the number of suits outstanding in the same companies was 19, showing that 18 suits were closed. What payments were necessary to effect this?

Total payments on policies issued in 1903 and 1904 for nine large casualty companies:

By December 31, 1913	12,621,375
By December 31, 1914	12,674,628
Payments made in 1914	53,253

This places the average cost of a suit of 1903 and 1904 as $2,958—nearly $3,000 or three times larger than the legal reserve provided for by law.

2. Taking the five years 1905–1909 the total payments in the policies issued during those years by December 31, 1913, amounted to $54,296,687. By December 31, 1914, the payments on the same years' account had increased to $54,979,801. In other words during 1914 $683,114 was paid in losses on policies written from 1905 to 1909 inclusive (Table I).

TABLE I.

Years of Issue.	Total Payments by Dec. 31, 1913.	Total Payments by Dec. 31, 1914.	Payments During 1914.
1905	8,950,546	9,002,199	51,653
1906	10,534,125	10,570,989	36,864
1907	10,442,211	10,531,799	89,588
1908	10,368,605	10,568,984	200,379
1909	14,001,200	14,305,830	304,630
	54,296,687	54,979,801	683,114

For these five years' business 1,021 suits were outstanding on December 31, 1913. By December 31, 1914, there remained on the same years' business 527 suits outstanding. It is reasonable to assume that no (or very few) new suits were created in 1914 on policies written from five to ten years earlier. It follows, therefore, that 494 suits were settled. These cost $683,114 or over $1,400 per suit—nearly 85 per cent. more than the reserve required by law (Table II).

TABLE II.

Suits Outstanding Dec. 31, 1913.	Suits Outstanding Dec. 31, 1914.	Number of Suits Closed.	Average Cost per Suit Closed.
36	15	21	$2,460
94	54	40	922
139	71	68	1,316
281	143	138	1,452
471	244	227	1,342
1,021	527	494	1,382

The analysis establishes that the requirement of an average amount of $750 in suits outstanding policies over five years old is inadequate, since the average cost is so very much higher.

The test of the reserves on the recent years is more difficult. In these recent years new suits are created, even new claims arise, and on the other hand a good many additional premiums arise, as some of the policies run over the period. For the years 1910–1913, therefore, the comparison must be made by a somewhat different method (Table III).

TABLE III.

	Years of Issue.			
	1910.	1911.	1912.	1913.
Payments up to Dec., 1914...	16,946,680	16,223,328	18,127,816	14,481,591
Payments up to Dec., 1913...	16,017,848	14,581,749	14,140,677	5,014,215
Payments made in 1914	928,832	1,641,579	3,987,139	9,467,376
Reserve of Dec. 31, 1914.....	462,800	1,036,555	2,556,883	4,366,441
Total.....	1,391,632	2,678,134	6,544,022	13,833,817
Reserve of Dec. 31, 1913.....	916,676	1,929,120	4,640,315	3,462,211
Difference.....	474,966	749,014	1,803,707	10,371,606
Additional premiums earned	70,656	86,058	1,354.596	8,826,541

In regard to each one of the four years the same condition prevails: The payments made during 1914 added to the reserve at the end of the year exceed the reserve at the beginning of the year by very substantial amounts.

As against this apparent loss the item of additional earned premiums must be taken into consideration as shown in the last line of the table. This item is most important in the last year's issue. Naturally almost all policies written in 1913 were in force at the close of 1913 and part of their premium unearned.

But the evidence furnished by this table is not conclusive. It is impossible to state with certainty that the reserves as on December 31, 1913, were inadequate, because the reserves at the close of the following year may be overestimated. Moreover, in regard to the last year in the table, the final results depend largely upon what happened in 1914, and not in 1913, while it is obvious that the reserves of 1913 must be judged only by what happened prior to the close of that year. In a slighter degree that is true even of the results for 1912.

Therefore, to check up our conclusions, a more detailed analysis of the results by separate years of issue becomes necessary.

1910. The reserve as per December 31, 1913, amounting to $916,676 was intended to provide for 1,211 suits. There may have been some other claims not yet maturing into suits, but their number could not be very great. The reserve amounted therefore to $757 on an average. By December 31, 1914, the number of suits outstanding was reduced to 608; showing a closing of 603 suits. The payments on these amounted to $916,676 or $1,520 per suit. Table III indicates a deficit of $474,966 on that year. That is as far as the developments of one year indicate. If we are to assume that the remaining 608 will also cost about $1,500 per case (and the cost of outstanding suits is not improving with age) then the reserve on December 31, 1913, should have been some $1,816,500 and the actual amount was only a little over 50 per cent. of that amount. The additional premium earnings represented scarcely 8 per cent. of the deficit, and after commissions have been deducted perhaps only 6 per cent.

1911. The situation is somewhat similar though perhaps less striking. Disregarding claims not suits, the average reserve per suit on December 31, 1913, was (1,929,120 : 1,976 =) $976 and would therefore appear ample. On December 31, 1914, the reserve per case was (1,036,555 : 984 =) $1,053 or only slightly higher. The number of suits closed was 992 or about one half. Other claims, not suits, must have been settled and altogether not over one half the liability was disposed of. This cost $1,641,579, which equalled 82 per cent. of the total reserve. Evidently the reserve as on December 31, 1913, was altogether insufficient, and probably the amount set aside on December 31, 1914, is still below the mark.

1912 and 1913. For the last two years there are so many claims in addition to suits that without knowing the actual figures an analysis of suit statistics alone is insufficient as a test. So many claims on policies of these years' issue may have turned into suits during 1914, that it is impossible to ascertain how many suits were closed. Yet the following facts are significant:

The reserve on policies of 1912 at December 31, 1913, amounted to $4,640,315. Yet the payments in 1914 alone amounted to $3,987,139 or almost equalled the reserves. It is true that an additional income from earned premiums of $1,354,596 was available, so that the loss payments minus this income (with adjustment for commissions, etc.) were about $3,000,000. The question as to

whether the reserves on December 31, 1913, were sufficient or not depends upon the reserves on the same year's business at December 31, 1914, being excessive or not. After the close of 1914 the additional premium income to be expected is slight. There were outstanding on December 31, 1914, on policies of 1912, compensation claims to the amount of $574,587 according to individual estimates of cases. This left as reserve for liability claims only $1,972,296 which was to cover the liability on 2,156 suits, providing on an average about $915 per suit. Since we found that the suits of 1911 year's issue closed in 1914 cost on an average $1,053, and that the suits become more expensive as they grow older, it is quite evident that a reserve of $915 per suit will surely not be excessive in 1915. Thus the inadequacy of the reserves as on December, 1913, is established.

As to the reserve for the current year's policies, it is somewhat difficult to judge. But at any rate it is significant that taking the experience of any year's issue, the loss ratio constantly rises from year to year. We have taken the year 1911, and computed the combined loss ratio of ten casualty companies. In computing the loss ratio only the earned premiums were considered and the legal loss reserve was added to the loss payments and loss expense.

The results indicate that the loss ratio in the policies issued in 1913 was:

On December 31, 1911	44.5
On December 31, 1912	56.3
On December 31, 1913	58.8
On December 31, 1914	61.3

This rising loss ratio can only be explained by the insufficiency of reserves and the increase in the loss ratio being greatest in the second year, seems to prove that the reserves on the last year's business are most inadequate.

It has thus been established that on the whole the loss reserves are insufficient and that neither the average reserve of $750 per suit, nor the assumed loss ratio are supported by actual conditions. But this does not complete the indictment against the present reserve law. In the statistical computations given above the totals for ten of the largest companies were used, and averages derived from such totals. It would be obviously improper to draw attention here to individual companies. But it is quite evident that the

purpose of reserve laws is not to make reserves sufficient on an average, but individually for each company, since the solvency of one company does not help in case of insolvency of the other.

Now the reserves of each company are based upon two factors, (1) a uniform suit reserve of $750 and (2) a variable loss ratio for old companies, and a uniform ratio of 50–55 per cent. (in 1914—53 per cent.) for companies less than ten years old.

Let us subject both these factors to some test of actual results. Five hundred and thirteen suits on issues of 1903–1909 were closed by ten companies in 1914. The cost of these was $706,367 or $1,377 per suit. But for individual companies the average cost per suit fluctuated between $627 and $2,706 as follows:

Company.	Outstanding Suits Closed in 1914.	Average Cost.
1	18	$ 627
2	74	689
3	67	1,156
4	128	1,383
5	59	1,415
6	35	1,497
7	23	1,824
8	52	1,843
9	52	1,965
10	5	2,706

This seems to furnish fairly strong evidence that one average for all companies is misleading.

The long and short of this is that the reserve computed on the basis of a uniform loss ratio is likely to be accidental—either accidentally small, or accidentally large. As the loss ratio is admittedly inaccurate, more dependence is placed upon the suit test. But it is very easy to point out a number of reasons why a uniform average allowance per suit is not satisfactory.

1. The method is altogether inapplicable to compensation business, and this is already recognized, the financial statements requiring individual estimates on outstanding compensation cases.

2. It is a well-known fact that while legally a liability policy indemnifies only against judgments, most claims are never permitted to go to suit, but are settled in advance. The number of suits does not at all represent the full liability of a company.

3. The proportion of claims going to suit is not uniform for all companies. Usually companies have very different experiences in

that respect. Some are known to prefer early settlements, and attorneys may delay entering suits in the hope of affecting an amicable settlement. Others are known to resist payments stubbornly, and in their experience suits accumulate even on the slightest claims.

If then neither the method of an arbitrary average per suit nor that of assumed loss ratio seem to give satisfactory results, the indications are that it may be better to accept some method of valuation of the actual claims outstanding, as is done for all other branches of casualty insurance.

It is admitted that this method may be used in regard to compensation claims. The law in regard to a compensation claim is specific. Granted that all factors in connection with an accident are known, the amount of benefits and of the present value of future payments permits of a fairly accurate computation. The application of actuarial principles may give proper consideration to the effect of mortality, or remarriage, to compound interest, and make for still higher accuracy. Errors of course are possible, but with an increased experience they should not be great. The individual errors should cancel themselves to a large extent, and in large volume of business the total estimate should not be very far from the true cost.*

In liability cases the accurate estimating of the final cost presents greater difficulties. But it is not impossible. In fact ability to estimate accurately is a necessary requirement of an adjuster, not only because without such estimating a company is entirely at sea as to underwriting results, but because an adjuster really cannot make satisfactory adjustments unless he can fairly accurately estimate the probable cost of cases.

And for this reason: theoretically a liability policy is an indemnity policy. The casualty company undertakes to indemnify the assured for judgments against him arising out of personal injury liability suits. Practically, however, it is well known that a casualty company which should refuse to assume any liability until the time when the judgment should be rendered would go bankrupt in a very few years. The vast majority of claims must be settled

* There seems to be an almost unanimous agreement that this should be done on older compensation cases. The question at issue is whether it can be done for recent cases, where information is neither complete and final, and therefore actuarial valuation either more difficult or altogether impossible.

in advance of the trial or even law suit, and in accomplishing this the adjuster must not be in the dark as to the probable cost of the case. The bargaining is not always between an expert adjuster and an inexperienced injured. More frequently it is between two expert lawyers. If the adjuster should persistently overestimate the probable cost of claims, this would undoubtedly tend to extravagance in settlements. If the tendency should be systematically to underestimate, the adjuster will find himself in the position where he cannot effect the settlement at all, and the number of suits will increase, thus eventually resulting in higher losses.

Assuming then, that every large casualty company must have a system of individual estimates of its outstanding liabilities and an organization of persons capable of making such estimates, why cannot the total sum of such estimates be used to determine the loss reserve?

Of course, some obvious objections may be raised. Granted claim officers who are able to make good accurate estimates, and granted a management willing to present the actual state of affairs, without any intention to misrepresent them, the method of individual estimates may work. But either of these conditions or both of them may be absent. The estimates (and the total loss reserve dependent upon them) may be erroneous, and again they may be wilfully wrong.

This is so evident that unless the writer had a remedy for it, he would have refrained from making any of this argument. If a check upon individual estimates were impossible, the method would be worthless.

But as a matter of fact a check is possible, and does not appear too difficult. By means of this check of accuracy, a method may be devised to control almost automatically the accuracy of the true loss reserve as computed by the company.

This is the essence of the constructive suggestion offered here.

First as to the check. In the present blank, schedule O demands this check for all other lines except liability. The omission of liability and compensation in this table is, in my opinion, a very serious error. The table requires information as to estimates made on cases outstanding at the beginning of the year, and payments made on such cases during the year. If compiled accurately—and that of course is subject to audit of the state's authorities—it will show whether the previous year's reserves were sufficient, excessive,

or approximately correct. A similar statement can be compiled for the liability and compensation estimates, is in fact compiled in some companies to test the accuracy of the estimates. Thus a method exists for checking up the accuracy of the liability reserves.

Such a check will demonstrate whether any tendency exists to minimize or exaggerate the loss reserves. Suppose it demonstrated that the losses were 10 per cent. higher than the reserves provided for. It may be established therefore that the company's rate of underestimating was 10 per cent. and therefore, its estimated reserves should be increased by 10 per cent. If the tendency is in the other direction then the reserves derived from individual estimates would be decreased. In this way an automatic formula would correct the estimates of the insurance company, and in addition there could be a stimulus for the making of fairer estimates.

In applying this method, another difficulty may be met: all outstanding liability cases are not settled within one year, so that the check upon the reserve of one year will not be complete by the expiration of the next year.

Assuming, for instance, that 1,000 cases were outstanding on December 31, 1913, and of these 750 were closed during the year 1914, and 250 remained outstanding on December 31, 1914, how can a proper check of the reserve of 1913 be made? The results are known only as far as the closed cases are concerned. But it would evidently be improper to have the coefficient of accuracy on such cases only, because the tendency is always for the early settlement of easy cases, where a saving can be effected against the original estimate, while on the more serious cases settlement may be postponed for a long time. If based upon the closed cases only, the results of the test might appear too favorable, and therefore, in the case of the open claims the estimates on these, after thorough review, must be included.

In other words, the reserve would be equal to the estimates made by the company (R^n_n standing for the reserve on December 31, of the year on cases outstanding on that date) multiplied by a factor

$$\frac{P^n_{n-1} + R^n_{n-1}}{R^{n-1}_{n-1}} \cdot$$

(proportion of payments made in the year n on cases outstanding at the end of year $(n-1)$ (P^n_{n-1}) plus estimated reserve at the end

of year n on cases still outstanding from the year $n-1$, to the estimates outstanding at the end of the preceding year).*

The necessity of including estimates on old reserve cases introduces an additional complication. These cases belong to the old reserve. Being over a year old, they have usually developed so that their expected cost may be better estimated than the year before. But if a conscious effect at underestimating them should be made this not only would reduce the new reserve, but also minimize the error of the preceding year's reserve.

It is possible to meet this difficulty by taking into consideration the check not only upon the last year's reserves, but also that of the preceding year, in other words, by getting the advantage of two years' experience. In two years such a large proportion of the outstanding cases is settled that the results are almost final and will not be subject to very much change. Besides the comparison of results of the two preceding reserves will produce an additional automatic check.

Let us assume for instance that at the close of 1913 a company with a tendency for underestimating shows a reserve of $500,000, while as a matter of fact the outstanding liabilities would be nearer to $750,000. By the end of 1914 some 70 per cent. of the claims are settled by a payment of $400,000, and the remaining 30 per cent. with an original estimate of $150,000 may appear to be worth $350,000. If the estimate made at the end of 1914 is adequate, then the results of 1913 reserves by the end of December, 1914, will appear as $\frac{\$400,000 + \$350,000}{500,000} = 1.50$. In other words the results of the reserve of 1913 will indicate that the original estimates of the Company should be increased by 50 per cent. As a matter of fact the Company will not of itself indicate the full amount of the underestimating of the preceding year. It is possible that the outstanding cases of the 1913 reserve will be valued on December, 1912, as say, $200,000 and the formula will be

$$\frac{400,000 + 200,000}{500,000} = 1.20,$$

* The writer has no apology to offer for the awkward symbols, except that there is as yet no accepted set of casualty insurance symbols. The appointment of a Committee on Terms, Definitions and Symbols by this Society promises that in the near future the situation will be remedied and there will be no necessity of inventing new symbols for every paper.

and the correction will be 20 per cent., which may be insufficient. In another year most of the cases of 1913 will be settled. By December, 1915, the results of the underestimating of 1913 may appear to have been 40 per cent. and of the underestimating of 1914 20 per cent. This should indicate the correction of the 1915 estimates by $\frac{40+20}{20}=30$ per cent.

The evident result of such a system would be that the knowledge that results of estimating on outstanding claims are subject to frequent checks will make the work estimates very much more careful. Insofar as some companies should persist in systematically underestimating, the formula will necessitate an automatic loading. The only way of avoiding the loading of the outstanding liability, as a punishment for past underestimating, will be to make an effort at more liberal estimating of outstanding liability. The formula then briefly is this:

The reserve at the end of the year is equal to the total of estimates on outstanding cases multiplied by a factor, equal to one half the sum of the following two quantities:

1. Payments on cases outstanding a year before (P^{n}_{n-1}) plus estimates on open cases outstanding since a year before (R^{n}_{n-1}) divided by reserve set aside a year before (R^{n-1}_{n-1}), i. e.,

$$\frac{P^{n}_{n-1}+R^{n}_{n-1}}{R^{n-1}_{n-1}}.$$

2. Payments during two years on cases outstanding since two years ago ($P^{n-1}_{n-2}+P^{n}_{n-2}$) plus estimates on cases outstanding since two years ago (R^{n}_{n-2}) divided by reserve of two years ago (R^{n-2}_{n-2}), i. e.,

$$\frac{P^{n-1}_{n-1}+P^{n}_{n-2}+R^{n}_{n-2}}{R^{n-2}_{n-2}}.$$

The mean of the two ratios may be applied to the sum of the total estimates. The result may not be absolutely correct; but it will have the effect of counteracting any tendency to error in either direction. If the Company's claim department is inclined to overestimate, the formula developed above will effect a reduction; if the company should try to underestimate the result of this method will be to increase the reserve.

Finally, the question remains how to reserve for the cases which

do not appear to be claims at the end of the year, what may be called the "hidden liability." This may consist of cases under the following three groups.

1. Cases supposed to have been finally settled, which may be reopened on various legal grounds.

2. Accidents reported and known to the company, but which appear to be trivial, or for any other reason not likely to develop into claims, but do so develop during the next year, and

3. Accidents altogether unknown on the last day of the year because of the delay either in the making and transmission of the report.

The "loss ratio" method pretends to cover all these cases, while the method of individual estimates does not, and this seems to be an additional difficulty in the way of the method suggested here. But the difficulty is a seeming one only. It can be met in a variety of ways.

1. It is doubtful if it is really necessary to reserve for this hidden liability. As against it each casualty insurance company has much larger hidden asset in premiums earned but not yet reported by the employers. Of the additional premiums collected on payroll audits during the first six months of any year, some 50 to 60 per cent. have probably been earned during the preceding year.

2. If, however, it is not thought desirable to disregard the hidden liability because of the hidden assets, the amount can be easily computed from the experience of the preceding years. From actual calculation the writer is convinced that this hidden liability, though depending upon a variety of fortuitous circumstances, fluctuates but little from year to year. It may be affected by a sudden increase or decrease in volume of business, but then it will remain in a definite constant percentage to payments made during the preceding year.

3. Finally, all these cases may be automatically provided for in the formulæ above given, by a slight modification of the definition of the terms P^n_{n-1} and R^n_{n-1}.

If P^n_{n-1} be defined to stand for all payments made in the year n on all accidents occurring before the close of the year $n-1$, and R^n_{n-1} similarly be defined to stand for the estimates at the end of the year n on cases occurring before the close of the year $n-1$, whether, in either case, those cases had been included in the reserves for the year $n-1$, the correction for the hidden liability will be

included in the one factor by which the estimates of the year will have to be adjusted.

It may be added that the method here suggested is one of extreme simplicity. It does not require any additional labor. Each casualty company should (and most do) compile its own estimates for the purpose of checking the so-called legal reserve. Each company should (and a good many do) check the accuracy of its estimates by comparing them with payments made on the cases in subsequent years. Each company should (and a few do) make an effort to ascertain the value of its hidden liabilities as well as its hidden assets.

Moreover, the present mechanical methods of statistical tabulations make such checks very simple and inexpensive. By the simple expedient of punching the date of the accident on the card carrying the payment, can the payments on all reserve cases be segregated. Often it can be done even on the basis of the accident number alone. Thus considerations of accuracy, speed, simplicity and cheapness can all be brought forth in support of the plan here outlined.