EYE TABLES FOR THE DETERMINATION OF COMPENSATIONS FROM LOSS TO THE EARNING ABILITY OF A PERSON FROM DAMAGES TO THE FUNCTIONS OF ONE OR BOTH EYES.

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1. In an industrial sense a compensation is a payment for the economic loss to a person in consequence of damages to the functions of the body from injury or disease. The economic loss comes from the loss to the income. The loss to the income depends upon the loss to the earning ability of a person, which, after an injury or disease, must be in one of three conditions, namely: (1) No loss to it; (2) partial loss to it; or (3) total loss to it. It will be seen, therefore, that compensations are made either for partial or total loss to the earning ability of a person. Partial loss to the earning ability of a person occurs between no loss to it and total loss to it, or 100 per cent. loss, when it becomes total.

2. The percentages of loss to the earning ability as given in the three eye tables are determined upon a scientific basis, in that they are taken from the 16 computations, which include every degree of loss, for practical purposes, between the two cardinal points of no loss to total loss, or 100 per cent. loss to the earning ability. They are given as examples to represent the percentage of loss to the earning ability which might be determined in certain vocations in individual cases by the medical examiner. If, however, the medical examiner should determine in any given case that the degree of loss to the earning ability is either greater or less than the percentages given in these three eye tables, he can consult

Tables 3 and 4, in which the 16 computations give all the degrees of loss, for practical purposes, within the 100 per cent. loss to the earning ability.

3. With this 100 per cent. loss to the earning ability graded into 16 different degrees by mathematical laws known as involution and evolution, so as to give all the degrees of loss to it that are necessary for practical purposes, and with these 16 degrees divided into three groups and designated as slight, of which there are five computations; severe, of which there are 6 computations; and nearly total, of which there are 5 computations; it is self-evident that these three groups of slight, severe, and nearly total, with total, will embrace all the degrees of loss to the earning ability of a person that it is possible for that person to have from injury or disease.

4. The terms slight, severe, and nearly total with total have been used constantly in medical literature to express the different degrees of partial and complete disabilities of the body, from injury or disease, especially in the Bureau of Pensions of the United States, which has numerous pension boards in the different states, so that they have become familiar terms and their meaning and application has become well understood; hence they may be accepted as standard terms.

5. As to the self-evident truth in the statement that for economic purposes compensations for damages to the functions of one or both eyes must be based upon the loss to the earning ability of a person, there can be no escape, whether a determination of this loss to the earning ability is made by the natural science method, or whether an estimation of it is made by empirical methods; for the earning ability of a person determines that person's economic value, and hence any loss to it, for which a compensation can be given, must come from a loss to that person's earning ability.

6. As to the self-evident truth that the loss to the earning ability of a person must be determined by the only method

known to physicists for the determination of the value of any physical force, or to economists for the determination of the value of any commodity, namely, the natural science method, there can be no escape, for this method is the only one which enables us to determine by analysis, for economic purposes, the two indispensable parts of the earning ability of the body to be used as factors: namely, F, the functional ability of the body, to be used as the factor representing the multiplicand, and C, the competing ability of the person, to be used as the factor representing the multiplier, to obtain a product, namely, E, the earning ability of the person. Hence, we have the equation (1) F C=E, the statement of the earning ability of the body in the natural science formula for the purpose of determining its status, and therefore its loss, according to the actual existing condition of its two indispensable factors (¶29).

7. Now, in order to have a loss to E, the earning ability of a person, from injury or disease, it is self-evident that there must be a loss to one or both of its indispensable factors. After an injury or disease the factor F, the functional ability of the body, representing the multiplicand in the formula, like E, the earning ability, must be in one of the three conditions, namely, (1) No loss to it; (2) partial loss to it; or (3) total loss to it. Compensations must be made either for partial or total loss to the functional ability of the body. For practical purposes a loss of from 0.01 to 0.80 is sufficient to meet all the requirements, and the computation tables in physical economics are based on this range.

8. The loss to the functional ability of the body for the loss of the functions of one eye has been determined to be a partial loss, or 0.18 of the whole functional ability of the body of a person in every vocation.* This loss to the functional

* The standard of measurement for the economic loss to the whole functional ability of the body for the loss of vision in one eye to 20/200 (0.1), or less, according to the scientific standard of measurement which by common consent has been accepted for this economic standard of measurement, may

ability of a person entails a certain damage to C, the competing ability, the other indispensable factor of the earning ability of a person, to different degrees, according to the vocation followed by the individual; but it is self-evident that, after an injury or disease, the damage to C, the competing ability, must be in one of the three conditions, similar to the earning ability and the functional ability, namely, (1) no damage to it; (2) partial damage to it; or (3) total damage to it. Compensation must be made either for partial or

be obtained in two ways, as follows: The first way is from the loss to the functional ability of the two eyes, for with the loss of vision in one eye to 20/200 (0.1), or less, there is usually a loss in the field of vision, and if this is 30° or more, it would be equal to 1/6 of the binocular field of vision, which is absolutely indispensable for the following of any industrial vocation successfully. This amount of loss in the functions of one eye not infrequently gives rise to an imbalance of the muscular functions of that eye causing it to deviate from its normal position in its movements. It always causes a profound disturbance at first in the ability of a person to estimate distances correctly, and although this loss of depth perception damages a person's competing ability in the vocation that person follows, nevertheless it may be largely overcome by those persons who are younger, or not much older than the age at which the growth of the body is completed. However, such a person has only the single vision of one eye for economic purposes and it must inevitably be determined by all tests in every vocation that such a person has actually lost from 1/6 to 1/5 of the 100 per cent. of the normal functions of the two eyes, which in this consideration of the subject is equal to the whole functional ability of the body for economic purposes. Therefore, one group of medical examiners might determine that 1/6 of this 100 per cent. of the whole functional ability of the body should be accepted as a standard of measurement for the economic loss of the functions of one eye, or 16 per cent., while another group of medical examiners might determine that 1/5 of this 100 per cent. of the whole functional ability of the body should be accepted as a standard of measurement for the economic loss of the functions of one eye, or 20 per cent. The two standards of measurement for the loss to the whole functional ability of the body for the economic loss of the functions of one eye would be intolerable; therefore a compromise must be made. This is done by adding 16 per cent. and 20 per cent. together and we have 36 per cent., which divided by 2 gives 18 per cent., which is the standard of measurement for the loss to the whole functional ability of the body for the economic loss of the functions of one eye which we have determined upon after considering this subject for many years. The second way of determining a standard of measurement for the loss to the whole functional ability of the body for the economic loss of the functions of one eye is to compile all the available values that ever have been given for the loss of the functions of one eye for economic purposes. We have done this, and when the sum of the several values are divided by the number compiled, the quotient is the nearest to .18 of any number; and hence, by this statistical method we arrive at 18 per cent. loss to the whole functional ability of the body as a standard of measurement for the loss of the functions of one eye for economic purposes.

total damage to the competing ability of the body, or for the 100 per cent. damage to it, which includes partial and total damage.

9. In the computation tables of physical economics, involution and evolution are used to grade the 100 per cent. damage to the competing ability of a person so as to grade the loss to the earning ability of that person according to the vocation followed, and thereby have it correspond to the actual existing condition of this factor after an injury or disease. For instance, after the loss to the functional ability of the body, for the loss of the functions of one eye, the standard of measurement for which is .18, the coefficient of F, the functional ability, becomes .82 (.82F) and "the primary coefficient of C, the competing ability," becomes .82 (.82C), for it must depend upon the same identical functions of the body for its existence, and must therefore at first have the same coefficient, which is designated "the primary coefficient of C, the competing ability." Hence, we have for the equation $.82F \times .82C = E$, the statement of the earning ability of a person in the natural science formula for the loss of the functions of one eye for the purpose of determining its status and therefore its loss, according to the actual existing condition of its two indispensable factors. In this formula for the statement of the earning ability, for instance, of a floorwalker in a department store, for the loss of the functions of one eye, if it is determined from all the data relative to this person's ability to compete in the vocation he followed, or in any vocation he is able to follow, that his competing ability is damaged to a similar degree to the loss to the functional ability of the eyes, then his earning ability will be the product of these two factors, namely, the coefficient of F, the functional ability, representing the multiplicand, multiplied by the coefficient of C, the competing ability, representing the multiplier. Hence, we have the product .6724, which represents the status of the earning ability of that person (.6724E).

From the status of the earning ability of a person we obtain the loss to it by subtracting the fraction representing it from 1, and in doing so, in this case, we subtract .6724 from 1, and obtain .3276, which expressed in percentage is 32.76 per cent. Therefore, the loss to E, the earning ability of the floor-walker, is 32.76 per cent. (See below, ¶17.)

10. It is self-evident that the loss to the earning ability of a person for the loss of the functions of one eye would be greater than that of the floor-walker if he were a machinist, or a house carpenter, or a chauffeur, for then the loss of ⅙ of the field of vision for the loss of the functions of one eye would be more likely to give rise to accidents. This fact being well known to employers, causes them to avoid employing such persons as much as possible. Hence the competing ability of such persons is damaged much more than that of the floor-walker in the department store. By involution, as is fully explained in the technical consideration of this subject, "the primary coefficient of C, the competing ability," of .82C, the multiplier, is decreased to the tenth involution when it becomes .1372C, which, multiplied by the coefficient of F, the functional ability (.82F), which always remains the same, gives a product of .1125 for the coefficient of E, the earning ability (.1125E), and therefore a loss to it of .8875, or 88.75 per cent. On the other hand, when the occupation of the injured is that of a watch-maker, an engraver, or a proof-reader, which requires only a limited field of vision, that person is not damaged as much in his ability to compete as the floor-walker, and certainly not nearly as much as either the machinist, the carpenter, or the chauffeur. Hence "the primary coefficient of C, the competing ability" must be increased in order to increase that person's earning ability. By evolution, as is fully explained in the technical consideration of the subject, "the primary coefficient of C, the competing ability" of .82C, the multiplier, is increased to the tenth evolution, when it becomes .98C, which multiplied by

the coefficient of F, the functional ability (.82F), which always remains the same, gives a product of .8036, for the coefficient of E, the earning ability (.8036E), and therefore a loss to it of .1964, or 19.64 per cent. Thus to the tenth involution "the primary coefficient of C, the competing ability" becomes .1372C and to the tenth evolution it becomes .98C, which when multiplied by the coefficient of F, the functional ability (.82F), which always remains the same, gives a product of .1125E, and .8036E, respectively, and a corresponding loss of .8875E, and .1964E, between the two cardinal points of no loss to it to total loss to it, of 16 degrees, which, for practical purposes, is divided into slight, of which there are 5 computations; severe, of which there are 6 computations; and nearly total, of which there are 5 computations (¶30), (¶31), (¶32).

11. The damage to C, the competing ability, in the tenth evolution, or the computation giving the 1° slight, is 1.64 per cent., which is as small a per cent. of damage to a person's ability to compete in any vocation after the loss of the functions of one eye as ever would be required for practical purposes. On the other hand, the damage to C, the competing ability, to the tenth involution, or the computation giving the 5° nearly total, is 86.28 per cent., which is as great a per cent. of damage to a person's ability to compete, in any vocation, after the loss of the functions of one eye, as ever would be required for practical purposes. Thus, by evolution and involution provision is made to grade the damage to "the primary coefficient of C, the competing ability" for the 100 per cent. damage, namely, for all practical purposes, from a 2 per cent. damage to it, to 86.28 per cent. damage to it, which is sufficient to grade every damage to the competing ability of a person and through it every loss to the earning ability of that person from the loss to the functional ability of the body for the loss of the functions of one eye.

12. For the purpose of comparison and to show that the

compensation problem should be solved in exactly the same way as any other problem is solved when its economic value is concerned, we will make a comparison between the damage to a piece of cloth by fire and water in a department store and the damage to the left eye of the floor-walker in putting out this fire by a fire extinguisher.

13. The fire which damaged this particular piece of cloth was caused by a burning cigaret, which is the cause of so many fires today. The cloth had been partly unwound by employees in taking account of stock, one of whom was smoking a cigaret, notwithstanding smoking was strictly prohibited. On hearing the floor-walker coming he quickly dropped the lighted cigaret just about the time the signal sounded for the midday meal, and they all left the room immediately. The floor-walker had passed through the room, and upon returning in a few minutes discovered the piece of cloth in a blaze. He grabbed the fire extinguisher and put out the fire. In doing so the stream of fluid from the fire extinguisher struck some newly patched plastering with such force that a piece of it was thrown into the floor-walker's left eye. This plaster and the acid water of the fire extinguisher caused a scar of the cornea of the left eye so that the sight of it was reduced permanently to 4/200.

14. Here we have two damages: one to a piece of cloth in one of the 12 departments of a store; and the other to the left eye of the floor-walker, which is included in one of the 12 parts into which the body is divided for the purpose of determining its economic value.

15. The comparison between an empirical method and a scientific method in ascertaining these damages we are now prepared to make so clear that we hope there will be no hesitation in choosing which method should be adopted in such cases. In an empirical method a guess is made, or an estimation is given of the damage done to the piece of cloth, either as a lump sum, or a guess is made as to the number of yards

the fire destroyed and the probable worth of the remainder that has been damaged by smoke and the acid water of the fire extinguisher, knowing that there were 100 yards in the original piece of cloth which cost $1.00 a yard, or $100. If in using the empirical method the number of yards of cloth not destroyed by the fire was guessed at as 80, and the price estimated to be 85 cents a yard, the value would be found by making 80 for the multiplicand and .85 for the multiplier, thus making the statement of the damaged piece of cloth in the natural science formula as follows: 80×85 = Estimated value of the cloth not destroyed. Hence by multiplying these two factors we obtain the product of 68, making the estimated value of the cloth not destroyed $68. This latter process would be an empirical method because the number of yards of the unburned cloth was not determined by the standard of measurement of the yard-stick, neither was the price which the cloth would sell for in the market alongside of undamaged cloth of the same kind ascertained by any definite method. Hence this method would be empirical, because if one part of a method is empirical, this fact makes the whole method empirical, notwithstanding some parts of it are scientific, like the use of the natural science formula of the multiplicand and multiplier to obtain the product of 68 for the estimated value of the cloth. But those who use empirical methods to obtain the loss to the earning ability from injury or disease do not employ the natural science formula of multiplicand and multiplier to obtain a product.*

* Magnus' contribution to the scientific solution of the compensation problem in "Visual Economics" (translated with amendations by our confrère, Würdemann), was one of the greatest ever published, in that he had the true conception of the earning ability of the body, analyzed it according to the natural science method, determined its indispensable factors, and stated them in its formula in terms which must ever remain classic. He, however, never used this method, but abandoned it and adopted one in which the functional ability of the eyes is assumed to be the whole functional ability of the body instead of just what it is—an important part of it. He resolved the physiologic act of vision into its factors for the earning ability of the eyes, in which, in a case like that of the clerk in ¶37, the functions of the less injured or normal eye constitute F, the functional ability (the multiplicand), in the

They do not use multiplication in any part of empirical methods. They make one estimation and then base another estimation upon that and say that such a table gives such a

formula, and the status of the injured eye with the status of the uninjured, or less injured eye in arithmetical proportion constitutes K, the competing ability (the multiplier), thus stating the earning ability of the clerk as follows:

$$E = C\ (max)\ \sqrt{P}\sqrt[4]{M} \quad \sqrt[x]{\frac{0.4 + 1}{2}}\ \sqrt{P}\sqrt[4]{M}$$

The result is that when a solution is made of this formula the values in it between E, and the radical sign with x for its index, constituting F, the functional ability (the multiplicand) become 1, because any root of 1 is 1, and therefore it is discarded, because if 1 is used for the multiplicand, the product would be the same as the multipler, that is, its value would not be changed. This leaves the formula with only one factor, K, the competing ability (the multiplier). To attempt the solution of a problem with one factor is an attempt to violate an indisputable law of mathematics,—that there must always be at least two factors to solve any problem.† Magnus failed to recognize this fact, for by his method the values under the radical sign with x for its index, which are 1, are discarded, and the formula becomes as follows:

$$E = \sqrt[x]{\frac{0.4 + 1}{2}}$$ Hence, $E = \sqrt[x]{0.7}$, which in reality is that

E = 0.7, the 0.7 representing the status of the clerk's vision, which by Magnus' method is E, the status of the earning ability. The medical examiner determined that the vision of the left eye of the clerk was normal; hence this method determines a wrong value for vision, as has been shown in ¶39. As a status of 0.7 would give a loss to E of 0.3, or 30 per cent., this Magnus deemed too great a loss for the loss of vision in one eye to 20/50; so evolution is employed to increase 0.7, the status of E, and 10 is selected for the x index, hence:

$$\sqrt[10]{0.7} = .965$$

Therefore, E = .965, and the loss is .035, or 3.5 per cent. against that determined in ¶37 of 11.92 per cent. Had not Magnus made the fatal error of assuming that the functions of the eyes are the whole functional ability of the body (as is done in most purely empirical methods), but had used them for just what they are, namely, an important part of the whole functional ability of the body, as he himself determined in his analysis of the earning ability of the body; the great fundamental principles which he contributed toward the solution of the compensation problem would have been made available many years before they were so made in physical economics.

† If, after an injury or disease, there is no loss to the functional ability of the body, but a damage to the competing ability from cosmetic defects to the cornea or lids, only one factor of the earning ability has been damaged; hence the loss to it must be estimated and agreed upon by empirical methods, or by litigation. The same would be true when a compensation is given for non-functional defects, for suffering in mind and body, or for punitative damages; for then there might not be an appreciable loss to the functional ability, or an appreciable damage to the competing ability; hence both factors of the earning ability might be normal and equal to 1, which would preclude any solution of the problem being made mathematically, and therefore any compensation that might be given for such damages would have to be obtained by estimation.

value, hence the loss is so much. They estimate the loss of a part of the body largely upon anatomic and pathologic grounds ignoring the functions of that part as a part of the whole functional ability of the body. Indeed in some of these empirical methods the functions of the eyes are assumed to be the whole functional ability of the body because if both eyes were lost there would be a total disability. This would be equally true with the loss of any one of the 12 parts into which the body is divided in physical economics for economic purposes, and such an assumption is utterly fallacious. Still more absurd is the assumption in empirical methods that because compensation laws give fifty-two weeks as a compensation for the loss of the vision of one eye, this loss is assumed to be a loss of 100 per cent. and when vision is lost in the remaining eye to 20/200, the compensation from such loss is from 500 to 1000 per cent., according to how the promulgator of these methods feels when he puts them forth.

16. We will now determine by a scientific method the damage to the piece of cloth in the department store. This method requires first that the unburned cloth shall be measured by the standard of measurement in use, namely, the yard-stick, and by this process it is found that 82 yards of the 100 yards were not burned, though they were damaged by smoke and the acid water of the fire extinguisher. The next step is to determine by definite methods, not by guess work, what the unburned cloth is worth in the market alongside of undamaged cloth of the same kind, in other words to determine the competing ability of the damaged cloth. For this purpose three parties who are in the market to buy damaged goods made bids for this piece of cloth and the best offer was 82 cents a yard, which was determined by the managers of the department store and the insurance company to be all it was worth. Hence, we have for the natural science formula: $82 \times .82 =$ Value of the cloth, namely, 67.24, or $67.24, and the loss is $32.76 (or 32.76 per cent. loss on the original value

of the cloth). This is the amount the insurance company paid the department store. Every step of the process has been determined by scientific methods and in a manner equitable to all concerned.

17. We will now proceed to determine the loss to the earning ability of the floor-walker who lost the vision in his left eye. The standard of measurement for the loss of an eye to F, the functional ability of the body, is .18. Subtracting this from 1 we have .82 for the coefficient of the first indispensable factor of E, the earning ability of the body, for the multiplicand. As C, the competing ability of a person, the multiplier in this case, depends upon the same identical functions of the structures of the body, its primary coefficient must be the same as that of the functional ability. Hence we have for the natural science formula as follows: $.82F \times .82C = E$. As the floor-walker lost the sight of the left eye to 4/200 and had a permanent scar of the cornea of that eye, making a conspicuous defect in his ability to compete with others, his competing ability is damaged as much as the loss to the functional ability of the body, and was so determined. Therefore the earning ability of the floor-walker is the product of the coefficients of these two factors, and we have $E = .6724$, which, subtracted from 1, gives a loss of .3276, or 32.76 per cent. of his earning ability previous to the loss of his left eye.

18. As the methods used in determining the loss to the cloth are the only ones by which it could be ascertained with mathematical precision, and as the loss of the left eye of the floor-walker produces identical similar conditions to be met, it is idle for any one to assert that there is any other method by which the loss to the floor-walker could be obtained with mathematical precision. If this is true, and we challenge any one to disprove it, it is high time that empirical methods should be abandoned for scientific methods. We have used the terms earning ability, functional ability, competing abil-

ity, and the natural science method and its formula of multiplicand and multiplier to obtain a product. It will assist in understanding the solution of the compensation problem to amplify the meaning of these terms.

19. The natural science method is a collateral branch of science which may be defined in terms of accumulated and verified knowledge formulated for the purpose of discovering and establishing the truth.

20. In seeking the true value of anything, for instance, like that of the earning ability of the body, we must analyze it by the natural science method by resolving it into its component parts which are so interdependent that each is needed to ensure the status of the other and then use these parts as factors in an equation, which is a statement in a formula of the thing that has been analyzed for the purpose of determining its true value according to the actual existing condition of these factors on a basis of 1; that is to say, if each of the factors of the earning ability is found upon examination with instruments of precision, scientific standards of measurement and other data, to be normal and equal to 1, then the earning ability is normal and equal to 1, for the particular person that has been examined. On the other hand, if one or more of the factors of the earning ability is found to be less than normal, or less than 1, by the same scientific procedure, it will be less than normal, or less than 1, and the difference between what it is found to be and 1, represents the loss to the earning ability of the person, upon which loss compensations must always be based.

21. In order to determine the loss to the earning ability of a person we must have a method of ascertaining the status of the earning ability according to its actual existing condition on an economic basis. We must therefore employ mathematics to determine this condition of the earning ability of a person the same as we would employ mathematics to determine the actual existing condition of anything else in the

world on an economic basis, for instance, the same as we determined the value of the piece of cloth in the department store after it was damaged by fire and water.

22. An analysis of the earning ability of a person according to the natural science method shows that the first indispensable part of it is F, the functional ability of the body, for without the functions of the systems and organs of the body there would be no earning ability. The second indispensable part of the earning ability is T, the technical ability of a person, for without the training of the mind and body to perform certain duties successfully, there would be no earning ability of that person. The third and last indispensable part of the earning ability of a person is C, the competing ability of that person, for unless a person can secure work, or establish an occupation for himself, and then perform the duties connected therewith successfully, he would have no income, and therefore no earning ability of economic value.

23. This analysis gives the indispensable parts of E, the earning ability of a person, and employing them as factors, we have the equation as follows: (1) F T C = E, the statement of the earning ability of the body in a formula for the purpose of determining its status according to the actual existing condition of its three indispensable factors.

24. In order to determine the status of the first indispensable factor of E, the earning ability of the body, namely, F, the functional ability of the body, it must be analyzed according to the natural science method in the same manner as E, the earning ability, was analyzed. By this analysis the functional ability of the body may be resolved, first, into four units, in accordance with their development and associated functions, and, second, each unit may be resolved into three parts, making 12 parts which include all the functions of every structure of the body.

25. The following is a chart showing the factors of F, the

functional ability of the body, obtained by an analysis according to the natural science method:

F = { a = { Osseous, articular, and muscular systems, consisting of..... { h, the bones; i, the ligaments; k, the muscles
b = { Circulatory and respiratory systems, consisting of..... { m, the vascular system; n, the blood; p, the lungs and their accessory organs
d = { Digestive and genito-urinary systems, consisting of..... { q, the alimentary canal and its accessory organs; r, the kidneys with the genital organs; s, the skin
g = { Cerebrospinal system, nerves and organs of special sense, consisting of... { u, the brain, its membranes and its nerves; v, the spinal cord, its membranes and its nerves; w, nerves and organs of special sense

26. Arranging the units as factors of F, the functional ability of the body, we have the equation (2) a b d g = F, the statement of the functional ability of the body in a formula for the purpose of determining by examination with instruments of precision and standards of measurement and other data, its coefficient from the status of its four units used as factors.

27. Arranging the parts of each unit as factors of the unit, in a similar manner we have the four equations as follows:

(3) h i k = a,
(4) m n p = b,
(5) q r s = d,
(6) u v w = g,

The statement of each unit of the body in its formula for the purpose of determining by examination with instruments of precision and scientific standards of measurement and other data the status of each of the four units of the body for the purpose of determining the status of F, the functional ability of the body, as per statement in formula (2).

28. Substituting the amplified coefficient of F, the functional ability of the body, with its units as obtained by an analysis of it (¶25) we have as follows: (a b d g) F. As C, the competing ability, depends upon the same identical functions of the body for its existence, it must have the same identical value for its primary coefficient, thus: (a b d g) C. Hence we

have for the equation as follows: (7) (a b d g) F T (a b d g) C = E, the statement of the earning ability of the body in its formula, when the coefficients of its two principal factors have been amplified according to the natural science method for the purpose of determining its true status for economic purposes.

29. In determining damages to the body from injury or disease, T, the technical ability, is seldom impaired, but if it is, the impairment is due to a loss in the functional ability of the brain and, therefore, would be included in that loss. Moreover, at the end of the period of growth of the body* T, the technical ability of a person, becomes established and therefore equal to one for that person. Multiplying any quantity by 1 does not change its value. Therefore, for these reasons T, the technical ability, may be discarded from the formula when determining loss to the earning ability of the body from injury or disease. Hence we have as follows: (8) F C = E, the statement of the earning ability of the body in its formula modified for the purpose of determining any loss to it upon which to base a compensation.

30. When in the case of the loss of the function of vision in one eye, like that of the floor-walker, it was determined that the damage to the coefficient of C, the competing ability, was the same in amount as that of the loss to F, the functional ability of the body, it would of course have the same coefficient which is called "the primary coefficient of C, the com-

*Previous to that time T, the technical ability of the body, with F, the functional ability of the body, are the indispensable factors of the efficiency of a person and should be employed in ranking a pupil at school, or in any vocation. For instance, if a student had a functional ability of .80 (.80F) and a technical ability of .75 (.75T) according to the tests given on entering college, the equation for his (Ef) efficiency would be as follows: .80F × .75T = Ef, the statement of his efficiency in a formula for the purpose of determining its value. Hence, Ef = .60. If at the end of the four years' course the value of the factors by the same identical tests was found to be .90 each, the equation would be as follows: .90F × .90T = Ef. Hence Ef = .81. Subtracting his efficiency at the beginning of his college course from what it is at the end of it we have .21, which was gained in four years on a basis of 60, which is equal to a 35 per cent. gain.

peting ability," as follows: .82F×.82C = E. Hence E = .6724, and the loss to E is .3276, or 32.76 per cent. If in every loss to the functional ability of the body the competing ability were damaged to the same degree as that of the functional ability, the remaining earning ability would be the product, as in the case of the floor-walker and the damaged cloth; but it is evident that the damage to C, the competing ability of a person, is as likely to vary from that of the loss to F, the functional ability, as the price the damaged cloth could be sold for is likely to vary from the amount that might be destroyed by fire or otherwise. In some occupations the loss of a left eye, like that of the floor-walker, would cause a greater damage to the competing ability of the person than it would in others; for instance, if it occurred in a chauffeur, or house carpenter, it would cause a greater damage to the competing ability than it does in the floor-walker. On the other hand, if it occurred in a watchmaker who is constantly using his right eye in his work, it would cause less damage to his competing ability than it does to the floor-walker. Hence, to adjust the damage to the competing ability in an equitable manner in all cases we must have a definite method of accomplishing it. It must be one of mathematical precision and understood by all who have to deal with the compensation problem.

31. In our first study of arithmetic we were taught the axiom that increasing the multiplier increases the product and decreasing the multiplier decreases the product. In order to meet the condition in a given loss to the functional ability of the body, which causes a greater damage to the competing ability than the loss to the functional ability, "the primary coefficient of C, the competing ability," the multiplier, which of course is always a fraction, must be decreased in its value. To decrease the value of a fraction uniformly and with mathematical precision we multiply it by itself, for example: ½ × ½ = ¼. This process is called involution and may be

expressed thus $(\frac{1}{2}) = \frac{1}{4}$, and it can be readily understood by anyone capable of comprehending the solution of the compensation problem. To increase the value of a fraction uniformly and with mathematical precision we must reverse the process of involution, that is, find a factor of it which, multiplied by itself the required number of times, will produce the fraction, for example, the factor of $\frac{1}{4}$, which multiplied by itself is $\frac{1}{2}$, because $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$. This may be expressed thus $(\frac{1}{4})^{\frac{1}{2}}$—it being an expression for a reverse process of involution by the reverse of the exponent 2, used in the involution example $(\frac{1}{2})^2 = \frac{1}{4}$. This process is extracting a root of a fraction and is called evolution. It, also, can be readily understood by any one capable of comprehending the solution of the compensation problem.

32. From a loss to F, the functional ability of the body, from .01 to .80, thus giving it a coefficient of from .99 to .20, and hence "the primary coefficient of C, the competing ability" of the same value, we are able by involution and evolution to grade the earning ability of the body through the damage to the competing ability, between the two cardinal points of slight loss to it and nearly total loss to it, thus giving a range and gradation to the status of the earning ability of the body of 16 different degrees from which the loss to the earning ability of the body can be obtained in percentage (as in Tables 3 and 4), upon which compensations must always be based.

33. The computations in Tables 1 and 2 represent the status of E, the earning ability of the body, after damages to the body from injury or disease are obtained by methods herein described, and when they are subtracted from 1 we obtain the loss to the earning ability of the body, which constitutes Tables 3 and 4, to which reference has already been made. It will be seen then that Tables 3 and 4 are complementary to Tables 1 and 2, and as they give the loss to the earning ability of the body for all the computations made, it is not

necessary to go into the details of the computations made in Tables 1 and 2; but as soon as the loss to the functional ability is determined, in the form of a decimal fraction, to go direct to Tables 3 and 4, and looking down column 1, loss to F, until we come to the same decimal fraction, where we find on a line with it all the computations giving the loss to the earning ability of the body from such a loss to F, the functional ability, together with the damage to C, the competing ability, as herein described in the previous paragraphs. For instance, in determining the loss in percentage to the floor-walker for the loss of the sight of the left eye, the standard of measurement for this loss is .18. With this decimal we look down column 1 until we come to this decimal and on a line with it we find all of the sixteen computations giving the 1° slight loss to E, the earning ability, as 19.64 per cent. and the 5° nearly total loss to it, as 88.75 per cent., thus giving a range and gradation of loss to the earning ability of a person sufficient to meet any damage to the body from injury or disease in a manner equitable to all concerned.

34. The technical consideration of the determination of the loss to the earning ability of the body from injury or disease has been given somewhat in detail to show that it is the same method that is employed in determining the value of any commodity and any loss to it, like that of the piece of cloth which was damaged by fire and water. It is obvious that it would be impossible to carry out the computations in each individual case, so they have all been made, and constitute Tables 1 and 2 and Tables 3 and 4. As the percentage of loss to the earning ability of the body is the key to the solution of the compensation problem, and as it is given in Tables 3 and 4 in a range and gradation sufficient to solve any compensation problem, it is only necessary to employ these two tables, as has already been shown in the case of the floor-walker who lost the vision of his left eye.

35. For an aid in the determination of the damage to the

competing ability, and through it the loss to the earning ability of the body, the computations obtained by involution and evolution between the two cardinal points of slight loss and nearly total loss to the earning ability of the body, have been divided into three groups and designated slight, of which there are five columns; severe, of which there are six columns; and nearly total, of which there are five columns.

36. With the facts as herewith stated, it is self-evident that the values obtained by scientific methods in Tables 3 and 4 can be employed to solve the compensation problem just as readily as those obtained by empirical methods. To illustrate how readily they can so be used we will determine the damage to persons who were injured in one of the 12 divisions of the same department store in which explosives are kept. One day an explosion took place, causing damages to the following persons:

A clerk, who lost vision in his right eye from a scar of the cornea.

A bookkeeper, who lost vision in his left eye from an injury to the cornea.

A salesman, who lost his right eye by removal.

A druggist, who lost vision from a scar of the cornea and a total loss of hearing in the left ear.

A chemist, who lost vision in the left eye and the left hand by amputation at the wrist-joint.

37. An extract from the report of the medical examiner of the clerk is as follows:

V.R.E., 20/50 from a scar in the center of the cornea; field of vision and muscular functions normal.

V.L.E., normal; field of vision and muscular functions normal.

Loss of vision in the right eye severe; hence the loss to F, the functional ability of the body, is .09. (Eye Table No. 1.)

Damage to C, the competing ability, as a result of the loss of vision in the right eye, is as follows: in the "sense of

perspective," slight; in the "appearance," slight; and in his ability to do his work as a clerk, slight. Hence the total damage to his competing ability is slight, and of the 5° slight, according to the determination made. With these determinations "the Insurance Company or Industrial Commission can say" with F and C, we can ascertain at once by Tables 3 and 4 the loss to E, the earning ability of the clerk, in percentage, which is the "X per cent. indemnity" referred to by Dr. Black in his letter,* and is readily found to be 11.92 per cent. upon which a compensation can be given to the clerk for the loss of vision in his right eye.

38. The loss to the earning ability of the clerk as obtained by this empirical method and as determined by the scientific method may be better illustrated by a parallel comparison of the two methods as follows: When it has been ascertained that the "individual's vision with his injured eye is A" (20/50 in the case of the clerk), "and with his uninjured eye is B" (20/20 in the case of the clerk), "and his sense of perspective is C, and appearance is D," we have determined the status of the vision of the clerk which also determines the status of F. Therefore, by the scientific method, F includes both "A" and "B". The damage to C, the competing ability of the clerk, depends upon the loss of the vision in the right eye, which may result in the loss of "sense perspective, C" and the "appearance, D." Therefore, in the scientific method C includes both "C" and "D." We therefore have by the scientific method "A" and "B" represented in F, and "C" and "D" represented in C, a reduction of one-half of the number of the letters used as symbols, which, of course, makes it a simpler method and more readily under-

* Dr. N. M. Black, in a letter to the writer, gives his idea of the solution of the compensation problem, as follows: "We must have a table arranged so that if an ophthalmic surgeon states an individual's vision with his injured eye is A, and with his uninjured eye is B, and his sense of perspective is C, and appearance D, the Insurance Company or Industrial Commission can say, A, B, C, D, so much then he is entitled to X per cent. indemnity, and I do not see how your tables can be made to apply in this simple manner."

stood, because F represents the functional ability, and C represents the competing ability of the two indispensable factors of E, the earning ability of the body, which have been definitely defined and used throughout the solution of this problem.

39. In this so-called "simple" method, as given in "The Computation of Compensation for Ocular Injuries," to which it is assumed reference is made in Dr. Black's letter, namely, the letters A, B, C, D, used as symbols to represent the status of the different functions of the eyes after injury or disease, "A" and "B" are dissimilar to "C" and "D," and "C" and "D" are dissimilar to each other and to "A" and "B." Hence they cannot be added together and the sum called "ocular efficiency," which term is given to "A" and "B," for such process violates an indisputable law of mathematics. Moreover, this process does not give the true state of vision, for the clerk had 20/50 in the right eye, equal to 0.4; and normal vision in the left eye, or 1.0, and when these are added together they make 1.4, which divided by 2 gives a vision of 0.7 for the clerk; whereas the medical examiner's report stated that the vision in the left eye was normal, or 1, and not 0.7 as obtained by this "simple" method. Can we call a method simple when its use transgresses an indisputable law of mathematics, obtains the loss of vision one-third less than that given by the medical examiner, and if tested out in its entirety would lead to an absurdity?

40. An extract from a report of the medical examiner of the bookkeeper is as follows:

V.R.E., normal; Fd. and Mf. normal.

V.L.E., complete loss; No Fd. Mf. normal.

Loss of V. in left eye, Tl; hence loss to F = .18 (Eye Table No. 1). Damage to C, severe, and of the 3° severe, according to the determination made.

With these determinations "the Insurance Company or Industrial Commission can say" with F and C we can as-

certain at once by Tables 3 and 4 the loss to E, the earning ability of the bookkeeper, in percentage, which is the "X per cent. indemnity," and it is readily found to be 44.87 per cent. upon which a compensation can be given to him for the loss of vision in his left eye.

41. An extract from the report of the medical examiner of the salesman is as follows:

R.E.: Wearing an artificial eye, fairly good "appearance"; V.L.E. normal; Fd. and Mf. normal.

Loss to right eye, total; hence loss to F = .18 (Eye Table No. 1).

Damage to C, severe, and of the 4° severe according to the determination made. Hence the loss to E, the earning ability of the salesman, is at once ascertained by Tables 3 and 4 to be 54.80 per cent, upon which a compensation can be given to him for the damage to his right eye, necessitating its removal.

42. An extract from the report of the medical examiner of the druggist is as follows:

V.R.E., 6/200, from central scar of the cornea; Fd. normal; Mf. normal; V.L.E., normal; Fd. normal; Mf. normal.

Loss of vision in right eye, total, hence loss to F = .18 (Eye Table No. 1)
Loss of hearing left ear, total, hence loss to F = .12 (Ear Table Part 1)

Total loss to F = .30

Damage to C, severe, and of 2° severe, according to the determination made. Hence the loss to E, the earning ability of the druggist, is at once ascertained by Tables 3 and 4 to be 51 per cent., upon which a compensation can be given to the druggist for the damage to the functions of his right eye and his left ear.

43. An extract from the report of the medical examiner of the chemist is as follows:

V.R.E., normal; Fd. normal; Mf. normal; V.L.E., 8/200, from scar in center of cornea; Fd. and Mf. normal; has an

artificial hand for the left hand which was amputated at the wrist-joint. Loss of vision in left eye. Total; hence loss to F=.18 (Eye Table No. 1).

Loss of left hand, severe; hence loss to F=.20 (Table No. 5). As these two losses occur in two of the 12 factors into which the body is divided, the medical examiner had to determine the loss, not by adding them together, but as follows: The loss of vision in the left eye is .18 to F, which when subtracted from the normal coefficient g, the factor in which the loss occurred, leaves .82g. The standard of measurement for the loss of a hand is .20 to F, and when this is subtracted from the normal coefficient of a, the factor in which the loss occurs, it leaves .80a. Thus the two losses in formula (2) are as follows: .80a b d .82g=F. Hence F=.656, which subtracted from 1 leaves .344. The medical examiner determines the total loss to F. to be .34* (which is .04 less than that obtained by the addition), thus obtaining the damage to C severe, and of the 3° severe, according to the determination made. Therefore the loss to E, the earning ability of the chemist, is readily ascertained by Tables 3 and 4 to be 71.26, upon which a compensation can be given to the chemist for the damage to his left eye and the loss of his left hand.

44. The determination of the loss to the earning ability of the chemist illustrates how readily the total loss to the earning ability of the body may be determined by the natural science method, not only for the partial or complete loss of the functions of one eye, or both eyes, but for the partial or complete loss of the functions of any other system or organ of the body in the whole range of damages to it from injury or disease. This is only one of the many reasons why the scientific method should be employed in solving the compensation problem. The main reason, however, is that it is the only

* When the figure in the third place of the decimal is less than 5, it is omitted, and when more than 5 it is reckoned as 1.

method by which the compensation problem can be rightly solved, and it never will be settled until it is rightly solved.

NOTE.—To make this paper as complete as possible within itself, one-half of Tables 3 and 4 are included. The values of Tables 1 and 2 can readily be obtained by subtracting the percentage of loss in Tables 3 and 4 from 1. Table 5, Eye Tables 1, 2, and 3, and the Ear Table, which have been used in solving the damages in the illustrative cases, are also included.

EYE TABLE NO. 1, PART 1.—PARTIAL OR COMPLETE LOSS OF THE FUNCTION OF VISION IN ONE EYE.

STANDARD OF MEASUREMENT FOR THE LOSS OF THE FUNCTION OF VISION (V) IN ONE EYE. F (g).

Slight (St.) from 20/25 to 20/35 (0.8 to 0.6 +) Average loss to F = .03	Severe (Se.) from 20/40 to 20/55 (0.5 to 0.3 −) Average loss to F = .09	Nearly total (Nt.) from 20/60 to 20/180 (0.3 to 0.1 +) Average loss to F = .15	Total (Tl.) from 20/200 to 0 (0.1 to 0) Average loss to F = .18

	Min.%	Med.%	Max.%
(1) St. loss of V. loss to F = .03; F × C or E =	3.30 (St. 1°)	3.59 (St. 3°)	4.07 (St. 5°)
(2) Se. loss of V. loss to F = .09; F × C or E =	10.73 (St. 3°)	11.92 (St. 5°)	13.19 (Se. 1°)
(3) Nt. loss of V. loss to F = .15; F × C or E =	17.72 (St. 3°)	19.42 (St. 5°)	27.75 (Se. 2°)
(4) Tl. loss of V. loss to F = .18; F × C or E =	32.76 (Se. 2°)	44.87 (Se. 3°)	54.80 (Se. 4°)

PART 2.—PARTIAL OR COMPLETE LOSS OF THE FUNCTION OF VISION IN BOTH EYES.

	Min.%	Med.%	Max.%
(5) St. with St. loss to F = .06; F × C or E =	6.57 (St. 1°)	7.23 (St. 3°)	7.98 (St. 5°)
(6) St. with Se. loss to F = .12; F × C or E =	13.15 (St. 1°)	15.70 (St. 5°)	17.46 (Se. 1°)
(7) St. with Nt. loss to F = .18; F × C or E =	19.64 (St. 1°)	23.25 (St. 5°)	25.71 (Se. 1°)
(8) St. with Tl. loss to F = .21; F × C or E =	37.59 (Se. 2°)	50.70 (Se. 3°)	61.06 (Se. 4°)
(9) Se. with Se. loss to F = .18; F × C or E =	25.71 (Se. 1°)	32.76 (Se. 2°)	44.87 (Se. 3°)
(10) Se. with Nt. loss to F = .24; F × C or E =	33.73 (Se. 1°)	42.24 (Se. 2°)	56.11 (Se. 3°)
(11) Se. with Tl. loss to F = .27; F × C or E =	46.71 (Se. 2°)	61.10 (Se. 3°)	71.61 (Se. 4°)
(12) Nt. with Nt. loss to F = .30; F × C or E =	51.00 (Se. 2°)	65.70 (Se. 3°)	75.99 (Se. 4°)
(13) Nt. with Tl. loss to F = .33; F × C or E =	55.11 (Se. 2°)	69.93 (Se. 3°)	79.86 (Se. 4°)
(14) Tl. with Tl. loss to F = .36; F × C or E =	59.04 (Se. 2°)	73.79 (Se. 3°)	100.

EYE TABLE NO. 2, PART 1.—PARTIAL OR COMPLETE LOSS OF THE FUNCTION OF THE FIELD OF VISION OF ONE EYE.

STANDARD OF MEASUREMENT FOR THE LOSS OF THE FUNCTION OF THE FIELD OF VISION (FD.) IN ONE EYE. F (g).

Slight (St.) from 150° to 120° (from 1 to .8) (from 1 to 4/5) Average loss to F = .015	Severe (Se.) from 120° to 60° (from .8 to .4) (from 4/5 to 2/5) Average loss to F = .045	Nearly total (Nt.) from 60° to 15° (from .4 to .1) (from 2/5 to 1/10) Average loss to F = .075	Total (Tl.) from 15° to 0 (from .1 to 0) (from 1/10 to 0) Average loss to F = .09

	Min.%	Med.%	Max.%
(1) St. loss in Fd. loss to F = .015; F × C or E =	1.65 (St. 1°)	1.80 (St. 3°)	2.02 (St. 5°)
(2) Se. loss in Fd. loss to F = .045; F × C or E =	4.93 (St. 1°)	5.36 (St. 3°)	5.98 (St. 5°)
(3) Nt. loss in Fd. loss to F = .075; F × C or E =	7.11 (St. 1°)	7.86 (St. 3°)	8.65 (St. 5°)
(4) Tl. loss in Fd. loss to F = .090; F × C or E =	10.73 (St. 3°)	11.19 (St. 5°)	17.19 (Se. 2°)

PART 2.—PARTIAL OR COMPLETE LOSS OF THE FUNCTION OF THE FIELD OF VISION OF BOTH EYES.

STANDARD OF MEASUREMENT FOR THE LOSS OF THE FUNCTION OF THE FIELD OF VISION (FD.) IN BOTH EYES. F (g).

St. from 180° to 120°; (from 1 to 2/3); Average loss to F = .06;	Se. from 120° to 60°; (from 2/3 to 1/3); Average loss to F = .18;	Nt. from 60° to 15°; (from 1/3 to 1/12); Average loss to F = .30;	Tl. from 15° to 0 (from 1/12 to 0) Average loss to F = .36

	Min.%	Med.%	Max.%
(5) St. loss in Fd. loss to F = .06; F × C or E =	7.23 (St. 3°)	8.82 (Se. 1°)	11.64 (Se. 2°)
(6) Se. loss in Fd. loss to F = .18; F × C or E =	21.20 (St. 3°)	25.71 (Se. 1°)	32.76 (Se. 2°)
(7) Nt. loss in Fd. loss to F = .30; F × C or E =	37.77 (St. 5°)	41.41 (Se. 1°)	51.00 (Se. 2°)
(8) Tl. loss in Fd. loss to F = .36; F × C or E =	59.04 (Se. 2°)	73.79 (Se. 3°)	83.21 (Se. 4°)
(9) R. homonymous Hemianopsia,* loss to F = .18; F × C or E =	54.80 (Se. 4°)	62.94 (Se. 5°)	75.09 (Nt. 1°)
(10) L. homonymous Hemianopsia, loss to F = .18; F × C or E =	44.87 (Se. 3°)	54.80 (Se. 4°)	62.94 (Se. 5°)
(11) Inferior Hemianopsia, loss to F = .18; F × C or E =	54.80 (Se. 4°)	62.94 (Se. 5°)	75.09 (Nt. 1°)
(12) Superior Hemianopsia, loss to F = .18; F × C or E =	44.87 (Se. 3°)	54.80 (Se. 4°)	62.94 (Se. 5°)

*In the experience of the author all persons are practically totally disabled with hemianopsia of either kind.

COMPUTATION TABLES NOS. 3 AND 4.—LOSS TO E, THE EARNING ABILITY OF THE BODY, FROM LOSS TO F, THE FUNCTIONAL ABILITY OF THE BODY, WITH ITS CONSEQUENT DAMAGE TO C, THE COMPETING ABILITY OF THE BODY, IN 16 DIFFERENT DEGREES.

COMPUTATIONS SHOWING THE LOSS ON $1.00 WHEN C IS DAMAGED FROM 2 TO 9 DEGREES MORE THAN F.

Nearly Total					Severe			
5° $C^{10}E=$	4° $C^{9}E=$	3° $C^{8}E=$	2° $C^{7}E=$	1° $C^{6}E=$	6° $C^{5}E=$	5° $C^{4}E=$	4° $C^{3}E=$	3° $C^{2}E=$
% 10.54	% 9.61	% 8.71	% 7.78	% 6.84	% 5.89	% 4.93	% 3.96	% 2.98
19.98	18.34	16.67	14.96	13.22	11.44	9.63	7.78	5.85
28.51	26.29	24.01	21.65	19.22	16.72	14.14	11.48	8.74
36.21	33.55	30.78	27.89	24.88	21.74	18.47	15.07	11.53
43.16	40.16	37.01	33.69	30.19	26.51	22.64	18.56	14.27
49.40	46.17	42.73	39.07	35.18	31.04	26.63	21.94	16.95
54.59	51.17	47.99	44.07	39.85	35.32	30.45	25.21	19.57
60.51	57.07	53.33	49.27	44.24	39.39	34.11	28.37	22.14
66.41	61.08	57.23	53.00	48.35	43.24	37.62	31.44	24.65
68.66	65.17	61.29	56.98	52.19	46.87	40.96	34.39	27.10
72.28	68.85	65.00	60.67	55.80	50.33	44.18	37.27	29.51
75.53	72.19	68.39	64.07	59.16	53.58	47.24	40.04	31.86
78.42	75.19	71.48	67.21	62.30	56.66	50.18	42.73	34.15
81.38	78.34	74.81	70.10	65.23	59.56	52.97	45.31	36.40
83.29	80.34	76.86	72.77	67.96	62.30	55.64	47.81	38.59
85.32	82.52	79.19	75.22	70.50	64.88	58.19	50.22	40.73
87.01	84.34	81.33	77.50	72.88	67.32	60.62	52.55	42.83

COMPUTATIONS SHOWING THE LOSS ON $1.00 WHEN C IS DAMAGED TO THE SAME DEGREE AS F AND WHEN C IS DAMAGED TO 6 DIFFERENT DEGREES LESS THAN F.

Severe				Slight				
Loss to F	Status F and C	2° CE =	1° $C^{\frac{1}{2}}E=$	5° $C^{\frac{1}{3}}E=$	4° $C^{\frac{1}{4}}E=$	3° $C^{\frac{1}{5}}E=$	2° $C^{\frac{1}{7}}E=$	1° $C^{\frac{1}{10}}E=$
.01	.99 x .99	% 1.99	% 1.50	% 1.35	% 1.25	% 1.20	% 1.15	% 1.10
Little fin	ger; or se	cond or th	ird toe					
.02	.98 x .98	3.96	2.98	2.69	2.49	2.40	2.30	2.20
Ring fing	er; either	big toe; sl	ight loss h	earing in o	ne ear			
.03	.97 x .97	5.91	4.46	4.07	3.78	3.59	3.49	3.30
Middle fi	nger; slig	ht loss of	vision in	one eye				
.04	.96 x .96	7.84	5.92	5.35	4.96	4.77	4.58	4.39
Index fin	ger; or mi	ddle and li	ttle finger	s; slight l	oss of hear	ing in both	ears	
.05	.95 x .95	9.75	7.38	6.62	6.24	5.95	5.76	5.48
Thumb fi	nger; or m	iddle and	ring finger	s; all the	toes of one	foot		
.06	.94 x .94	11.64	8.82	7.98	7.41	7.23	6.85	6.57
Thumb a	nd little fi	nger; or sl	ight loss o	f field of	vision, bot	h eyes		
.07	.93 x .93	13.51	10.35	9.33	8.68	8.49	8.03	7.66
Thumb a	nd ring fin	ger; or all	the toes o	f one foot	and big to	e of the o	ther	
.08	.92 x .92	15.36	11.78	10.58	9.94	9.57	9.11	8.74
Thumb a	nd middle	finger; sli	ght loss of	hearing in	one ear w	ith severe	loss in the	other
.09	.91 x .91	17.19	13.19	11.92	11.19	10.73	10.28	9.99
Thumb a	nd index fi	nger; seve	re loss of s	ight in on	e eye			
.10	.90 x .90	19.00	14.59	13.24	12.34	11.89	11.35	10.99
Ankylosis	of wrist or	ankle-join	t. Stand	ard of me	asurement	for minor	disabilitie	s.
.11	.89 x .89	20.79	16.08	14.48	13.59	13.05	12.52	12.16
Ankylosi	s of wrist-	joint and	ankylosis	of little fi	nger			
.12	.88 x .88	22.56	17.46	15.70	14.73	14.20	13.59	13.15
Total los	s of hearin	g in one e	ar; ankylo	sis of wris	t and inde	x-finger		
.13	.87 x .87	24.31	18.92	16.92	15.96	15.44	14.74	14.22
Thumb,	middle, in	dex and lit	tle finger;	ankylosis	of wrist a	nd thumb		
.14	.86 x .86	26.04	20.28	18.13	17.10	16.58	15.81	15.29
Thumb, i	ndex, mid	dle and ri	ng finger					
.15	.85 x .85	27.75	21.72	19.42	18.40	17.72	16.96	16.53
Loss of al	l fingers of	one hand;	ankylosis	of elbow	or knee-jo	int		
.16	.84 x .84	29.44	23.06	20.74	19.53	18.86	18.10	17.43
Chopart's	amputati	on and los	s of big to	e of other	foot			
.17	.83 x .83	31.11	24.39	21.98	21.15	20.08	19.25	18.58
Pirogoff's	amputati	on of the f	oot					

88.75	86.28	83.26	79.58	75.09	69.62	62.94	54.80	44.87	.18	.82 x .82	32.76	25.71	23.25	21.94	21.20	20.30	19.64
90.17	87.86	85.01	81.49	77.14	71.77	65.14	56.96	46.86	.19	.81 x .81	34.39	27.10	24.51	23.14	22.41	21.43	20.71
91.41	89.28	86.60	83.24	79.04	73.80	67.24	59.04	48.80	.20	.80 x .80	36.00	28.48	25.76	24.32	23.52	22.48	21.76
92.54	90.55	88.03	84.84	80.81	75.70	69.24	61.06	50.70	.21	.79 x .79	37.59	29.85	27.01	25.51	24.72	23.61	22.90
93.52	91.68	89.33	86.32	82.45	77.49	71.14	62.99	52.55	.22	.78 x .78	39.16	31.13	28.17	26.68	25.83	24.73	23.95
94.38	92.69	90.50	87.66	83.97	79.17	72.94	64.85	54.35	.23	.77 x .77	40.71	32.48	29.40	27.86	27.01	25.85	25.01
95.13	93.59	91.56	88.89	85.37	80.75	74.66	66.65	56.11	.24	.76 x .76	42.24	33.73	30.62	29.02	28.11	26.97	26.06
95.79	94.38	92.50	90.00	86.66	82.21	76.28	68.37	57.82	.25	.75 x .75	43.75	35.05	31.83	30.18	29.28	28.08	27.18
96.37	95.09	93.36	91.02	87.86	83.59	77.82	70.02	59.48	.26	.74 x .74	45.24	36.29	33.03	31.33	30.37	29.11	28.22
96.88	95.72	94.13	91.95	88.97	84.88	79.28	71.61	61.10	.27	.73 x .73	46.71	37.59	34.23	32.48	31.53	30.22	29.27
97.32	96.27	94.81	92.79	89.98	86.08	80.66	73.13	62.68	.28	.72 x .72	48.16	38.88	35.42	33.62	32.61	31.32	30.31
97.70	96.76	95.43	93.56	90.92	87.20	81.96	74.59	64.21	.29	.71 x .71	49.59	40.15	36.60	34.83	33.76	32.41	31.35
98.03	97.18	95.97	94.24	91.77	88.24	83.20	75.99	65.70	.30	.70 x .70	51.00	41.41	37.77	35.95	34.83	33.50	32.45
98.33	97.57	96.47	94.88	92.57	89.22	84.37	77.34	67.15	.31	.69 x .69	52.39	42.67	39.01	37.15	35.97	34.59	33.49
98.58	97.90	96.90	95.44	93.29	90.12	85.47	78.63	68.56	.32	.68 x .68	53.76	43.90	40.16	38.26	37.04	35.68	34.59
98.79	98.19	97.29	95.95	93.95	90.97	86.51	79.86	69.93	.33	.67 x .67	55.11	45.13	41.38	39.44	38.16	36.76	35.68
98.98	98.45	97.64	96.41	94.56	91.75	87.49	81.04	71.26	.34	.66 x .66	56.44	46.35	42.52	40.54	39.22	37.83	36.71
99.14	98.67	97.94	96.83	95.11	92.47	88.41	82.16	72.54	.35	.65 x .65	57.75	47.61	43.71	41.70	40.33	38.90	37.80
99.28	98.86	98.21	97.20	95.61	93.14	89.27	83.21	73.79	.36	.64 x .64	59.04	48.80	44.84	42.79	41.44	39.97	38.82
99.39	99.03	98.45	97.53	96.07	93.76	90.08	84.25	75.00	.37	.63 x .63	60.31	50.05	46.01	43.93	42.55	41.04	39.90
99.49	99.17	98.66	97.83	96.49	94.33	90.85	85.23	76.17	.38	.62 x .62	61.56	51.21	47.12	45.01	43.65	42.10	40.92
99.58	99.30	98.85	98.10	96.87	94.86	91.56	86.16	77.31	.39	.61 x .61	62.79	52.42	48.28	46.14	44.74	43.15	41.99
99.64	99.40	99.00	98.33	97.21	95.34	92.23	87.04	78.40	.40	.60 x .60	64.00	53.56	49.42	47.20	45.82	44.20	43.00
10	9	8	7	6	5	4	3	2	1	2 3	4	5	6	7	8	9	10

Total loss of sight in one eye; severe loss of hearing in one ear with total loss in the other

Chopart's amputation and loss of big, second and middle toes of other foot

Loss of hand and at wrist or a foot at the ankle-joint; standard of measurement for major disabilities

Loss of hand and little finger of the other hand

Loss of hand and ring finger of the other hand

Loss of hand and the middle finger of the other hand

Total loss of hearing in both ears

Loss of forearm at elbow, or leg at knee, joint.

Loss of the forearm at elbow-joint and the little finger

Loss of the leg at the knee-joint and great toe of the other foot

Loss of foot at ankle-joint with thumb and middle finger

Loss of foot at ankle-joint with thumb and index-finger

Loss of arm at shoulder-, or thigh at hip-joint

Loss of arm at shoulder-joint with loss of little finger, other hand

Loss of thigh at hip-joint, and big toe of other foot

Total loss of sight in one eye and Nt. loss of sight in the other

Loss of all fingers, one hand, and ring finger, other hand, with Pirogoff's amputation of the foot

Loss of thumb and thigh at hip-joint

Total loss of sight, both eyes

Loss of left hand, with Pirogoff's amputation of the joints

Loss of thumb and middle finger with thigh at hip-joint

Loss of thumb and index finger with thigh at hip-joint

EYE TABLE NO. 3, PART 1.—PARTIAL OR COMPLETE LOSS OF MUSCULAR FUNCTIONS OF ONE EYE.

STANDARD OF MEASUREMENT FOR THE LOSS OF MUSCULAR FUNCTIONS (MF) OF ONE EYE. F (g).

St. Av. loss to F = .03; Se. Av. loss to F = .09; Nt. Av. loss to F = .15; Tl. Av. L. to F = .18.

St. loss occurs in { Heterophorias P.R. and in A.; Paresis and Paralysis, Slight and without Diplopia; Ophthalmoplegia Interna Slight; Lagophthalmus Slight.

Se. loss occurs in { Heterotropia without Diplopia; Paresis and Paralysis without Diplopia; Ophthalmoplegia Interna Severe; Lagophthalmus Severe and Irremediable.

Nt. loss occurs in { Heterotropia with Diplopia, necessitating exclusion of the eye. / Paresis and Paralysis " " " " " / Ophthalmoplegia Externa " " " " " / Ophthalmoplegia Interna " " " " " / Lagophthalmus Complete " " " " "

Tl. loss occurs in { Affections enumerated under the head of Nearly Total Loss when vision has been lost to a nearly total degree or to a Total Loss

	Min.%	Med.%	Max.%
(1) St. loss of Mf. (Av. loss to F = .03; F × C or E) =	3.3 (St. 1°)	3.59 (St. 3°)	4.07 (St. 5°)
(2) Se. loss of Mf. (Av. loss to F = .09; F × C or E) =	9.99 (St. 1°)	10.73 (St. 3°)	11.92 (St. 5°)
(3) Nt. loss of Mf. (Av. loss to F = .15; F × C or E) =	16.96 (St. 2°)	19.42 (St. 5°)	21.72 (Se. 1°)
(4) Tl. loss of Mf. (Av. loss to F = .18; F × C or E) =	32.76 (Se. 2°)	44.87 (Se. 3°)	54.80 (Se. 4°)

EYE TABLE NO. 3, PART 2.—PARTIAL OR COMPLETE LOSS OF MUSCULAR FUNCTIONS OF BOTH EYES.

	Min.%	Med.%	Max.%
(5) St. with St. (Av. loss to F = .06; F × C or E) =	6.57 (St. 1°)	7.23 (St. 3°)	7.98 (St. 5°)
(6) St. with Se. (Av. loss to F = .12; F × C or E) =	13.15 (St. 1°)	15.70 (St. 5°)	17.46 (Se. 1°)
(7) St. with Nt. (Av. loss to F = .18; F × C or E) =	19.64 (St. 1°)	21.20 (St. 3°)	25.71 (Se. 1°)
(8) St. with Tl. (Av. loss to F = .21; F × C or E) =	29.85 (Se. 1°)	50.70 (Se. 3°)	61.06 (Se. 4°)
(9) Se. with Se. (Av. loss to F = .18; F × C or E) =	25.71 (Se. 1°)	32.76 (Se. 2°)	44.87 (Se. 3°)
(10) Se. with Nt. (Av. loss to F = .24; F × C or E) =	33.73 (Se. 1°)	42.24 (Se. 2°)	56.11 (Se. 3°)
(11) Se. with Tl. (Av. loss to F = .27; F × C or E) =	37.59 (Se. 1°)	61.10 (Se. 3°)	71.61 (Se. 4°)
(12) Nt. with Nt. (Av. loss to F = .30; F × C or E) =	41.41 (Se. 1°)	65.70 (Se. 3°)	75.99 (Se. 4°)
(13) Nt. with Tl. (Av. loss to F = .33; F × C or E) =	45.13 (Se. 1°)	69.93 (Se. 3°)	79.86 (Se. 4°)
(14) Tl. with Tl. (Av. loss to F = .36; F × C or E) =	59.04 (Se. 2°)	73.79 (Se. 3°)	83.21 (Se. 4°)

TABLE NO. 5.—STANDARD OF MEASUREMENT FOR DETERMINING THE LOSS TO F, THE FUNCTIONAL ABILITY OF THE BODY, FOR THE PARTIAL OR COMPLETE LOSS IN THE FUNCTION OF THE JOINTS OF THE BODY FROM ANKYLOSIS; FOR THE LOSS OF THE FUNCTION OF THE MUSCLES FROM ANY CAUSE; AND FOR THE LOSS OF THE FUNCTION OF THE PARTS OF THE BODY FROM AMPUTATION.

Loss to F (a) from ankylosis of the Fingers		Toes		Loss to F (a) from amputation of the Fingers		Toes	
Little	0.01	Little	0.005	Little	0.01	Little	0.005
Ring	0.02	Fourth	0.005	Ring	0.02	Fourth	0.005
Middle	0.02	Middle	0.005	Middle	0.03	Middle	0.01
Index	0.02	Second	0.005	Index	0.04	Second	0.01
Thumb	0.03	Big	0.01	Thumb	0.05	Big	0.02
Wrist	0.10	Ankle	0.10	Hand	0.20	Foot	0.20
Elbow	0.15	Knee	0.15	Forearm	0.25	Leg	0.25
Shoulder	0.15	Hip	0.15	Arm	0.30	Thigh	0.30

At the Medical Section of the Bureau of War Risk Insurance, to which the writer was assigned in 1918, "for the Development and Establishment of Disability Rating," "Intangible Disabilities" were rated by means of the Standard of Measurement for "Minor Disabilities" and "Major Disabilities" used by him in a paper, advocating the revision of the pensions of the Bureau of Pensions of the United States, which was read before the members of the Association of the United States Pension Examining Surgeons and members of the Bureau of Pensions in 1904, at Atlantic City, and published in its transactions. This paper ensured a revision of the pensions which went into effect in 1905, making a change for the better in ten of the principal pensions of $1968. The Standard of Measurement for "Minor Intangible Disabilities" is a loss to F, the functional ability of the body, of .10, the same as that for ankylosis of the wrist, or ankle joint, by which "Minor Disabilities" are compared in the method used by the Bureau of Pensions, and include various intangible disabilities, among which are the following: Facial paralysis, either alone or associated with operation upon the mastoid; loss of teeth below the minimum standard (S.S.R.); loss of voice to the ability of whisper only; loss of one or both auricles with slight loss of hearing; loss of the hair, from other than a specific cause; white hair, caused by a great strain of the nervous system; loss of one kidney, other being normal; loss of the functions of one or both testicles; loss of the functions of one or both ovaries; scars and traumatisms causing disfiguration with or without slight loss of functions of the parts involved; exophthalmic goiter; inguinal hernia on one or both sides with or without passage through the ring; femoral hernia. The standard of measurement for "Major Intangible Disabilities" is a loss to F, the functional ability of the body, of .20, the same as that for a disability equivalent to the loss of a hand at the wrist, or a foot at the ankle, joint, by which "Major Disabilities" are compared in the method used by the Bureau of Pensions, and include various intangible disabilities, among which are the following: Tuberculosis; heart disease; diabetes; aneurysm; hemiplegia; paraplegia; chronic kidney disease; multiple neuritis; mental diseases; spinal degeneration; malignant growths of all kinds; unoperable diseases; myxedema; loss of the voice to a total degree.

EAR TABLE, PART 1.—PARTIAL OR COMPLETE LOSS OF THE FUNCTION OF HEARING IN ONE EAR.

STANDARD OF MEASUREMENT FOR THE LOSS OF THE FUNCTION OF HEARING (H) IN ONE EAR. F (g).

Slight (St.) from 6/6 to 5/6+ Average loss to F = .02	Severe (Se.) from 4/6 to 3/6+ Average loss to F = .06	Nearly Total (Nt.) from 2/6 to 1/6− Average loss to F = .10	Total (Tl.) from 1/6− to 0 Average loss to F = .12

		Min.%	Med.%	Max.%
(1) St.	loss of H. loss to F = .02; F × C or E =	2.20 (St. 1°)	2.4 (St. 3°)	2.69 (St. 5°)
(2) Se.	loss of H. loss to F = .06; F × C or E =	7.23 (St. 3°)	7.98 (St. 5°)	8.82 (Se. 1°)
(3) Nt.	loss of H. loss to F = .10; F × C or E =	11.89 (St. 3°)	13.24 (St. 5°)	14.59 (Se. 1°)
(4) Tl.	loss of H. loss to F = .12; F × C or E =	15.70 (St. 5°)	17.46 (Se. 1°)	22.56 (Se. 2°)

PART 2.—PARTIAL OR COMPLETE LOSS OF THE FUNCTION OF HEARING IN BOTH EARS.

		Min.%	Med.%	Max.%
(5) St. with St.	loss to F = .04; F × C or E =	4.39 (St. 1°)	4.77 (St. 3°)	5.35 (St. 5°)
(6) St. with Se.	loss to F = .08; F × C or E =	10.58 (St. 5°)	11.78 (Se. 1°)	15.36 (Se. 2°)
(7) St. with Nt.	loss to F = .12; F × C or E =	15.70 (St. 5°)	17.46 (Se. 1°)	22.56 (Se. 2°)
(8) St. with Tl.	loss to F = .14; F × C or E =	18.13 (St. 5°)	20.28 (Se. 1°)	26.04 (Se. 2°)
(9) Se. with Se.	loss to F = .12; F × C or E =	17.46 (Se. 1°)	22.56 (Se. 2°)	31.86 (Se. 3°)
(10) Se. with Nt.	loss to F = .16; F × C or E =	23.06 (Se. 1°)	29.44 (Se. 2°)	40.73 (Se. 3°)
(11) Se. with Tl.	loss to F = .18; F × C or E =	25.71 (Se. 1°)	32.76 (Se. 2°)	44.87 (Se. 3°)
(12) Nt. with Nt.	loss to F = .20; F × C or E =	28.48 (Se. 1°)	36.00 (Se. 2°)	48.80 (Se. 3°)
(13) Nt. with Tl.	loss to F = .22; F × C or E =	31.13 (Se. 1°)	39.16 (Se. 2°)	52.55 (Se. 3°)
(14) Tl. with Tl.	loss to F = .24; F × C or E =	33.73 (Se. 1°)	42.24 (Se. 2°)	56.11 (Se. 3°)