

when reading Professor Spaeth's remarks on uncertainty of fatigue data.

110. The question of incentives, as introduced by Professor Spaeth, involves supplementing a study of how much a man *can* do, by a study of how much he *will* do, but the former is an essential element in the latter. Four steps are involved:

- a. Find the One Best Way to do Work;
- b. Identify the method so that there will be no misunderstandings as to what is to be taught or what is to be learned;
- c. Determine how long it takes to do the work in accordance with the clearly defined and identified method;
- d. Consider the incentives that will induce the worker to do as much as he can, and thrive, and improve in his health simultaneously.

These four steps make a dependent sequence not to be tampered with by anyone.

111. The "variability of individuals" and the suitability of jobs and men we shall consider a little later, where Professor Spaeth again refers to them. It is well to mention here that because of the fact that we observe only the super-expert or super-experts, we do not need to be reminded that it is "not exceptional experts with whom we are forced to work in practice." We observe the best there is that we may learn and that their priceless information may be put at the disposal and the use of workers of the present and the future generations. It goes without saying that the "given man" will be the best obtainable of a kind that will be permanently satisfied with the job itself, or with the job as a stepping stone toward a more desirable one. He will vary as to quality according to a great many factors outside the scope of this paper. Of course he will not be expected to do as much work, or as good quality, as the best man obtainable, and a due allowance must be made accordingly.

112. We may say here, however, that while it is desirable to have each grade of work done by workers as nearly alike as possible, this is not practicable, and it is not essential, because those who are still superior to the others will earn more money, which they should. It is neither necessary nor desirable to herd workers into classes, but each should be helped and lifted as far as possible, and each should be paid for his results. If the method of least waste is taught and becomes the method at which one has automaticity, the resulting inequalities in possible performance of two workers who vary greatly in the other respects

which Professor Spaeth emphasizes, simply affect the quantities of their pay. The *method* is determined by the recording of the behavior and motions of the super-experts and the task by the capabilities of the least efficient workers who are to work at that work permanently.

113. There is nothing new about this practice but it completely answers and eliminates all of Professor Spaeth's objections in his parable of the chemist. Surely no thinking man would prevent a worker from learning all possible regarding the most accurately acquired data from the super-expert, simply because workmen differ as to the amount of fatigue they acquire,—or the difference in their strenuousness, brawn and brain, or the difference in effectiveness of the same incentive. These are handled as problems of obtaining utmost skill and greatest productivity according to ability, natural aptitudes, and attainments, and utmost money according to fitness and perseverance. Because these differ greatly is no reason for confusing with them the problem of the accuracy of the One Best Way to do work.

114. Regarding the problem of incentives for workers for maximum economic effort we would call Professor Spaeth's attention to the fact that the worker's pay is a matter of definite percentages above the wages to be obtained elsewhere, on similar kind of work where the workers can take it easy. Of the amount of this percentage which ranges from thirty to one hundred per cent, Dr. Taylor says: "The exact percentage by which the wages must be increased in order to make them work to their maximum is not a subject to be theorized over, settled by boards of directors sitting in solemn conclave, nor voted upon by trade unions."

115. After basic wages for work have been determined by general or local industries, the motion and time study men determine the relation of the method and quantity of output to the time and additional compensation.

116. As for the remainder of paragraph 4, in criticising "the final result" he forgets that what we are stressing is the accuracy of the micromotion method, and the accuracy of the results as obtained by the method. We did not explain this method and the cyclegraph method in our paper, both because we have explained them elsewhere, and because the paper confined itself, as far as possible, to an indictment of the stop-watch. We submitted our methods simply

²See "Shop Management," Paragraph 32, Harper Edition, Page 25.

³See "Psychology of Management," Page 152.

to show that an alternative was available that could do the work better.

117. With our method we can record skill, and we can measure degree and causes of skill. We can determine the One Best Way, and determine and measure the variation from the One Best Way. We can determine commonest pitfalls of method that handicap a worker for life. We can transfer skill from one subject to another. We do not combine unlabeled facts with unlabeled guesses into a "final result," and then claim that we have a scientific achievement. Professor Spaeth knows that any chemist of repute would scorn to make a combination such as he suggests and pretend to call his mixture accurately determined. Why should he imagine that any engineer of long experience would be less particular?

118. In paragraph 5 Professor Spaeth hints that our work is of little value in practice, where it is necessary to deal with "average" men. Perhaps the best answer to this is that we have applied it successfully for years to all kinds of men in all kinds of work. As for the benefits to the same "average workman" from studying the film, the fact that Professor Spaeth is "skeptical," only shows that he has made no intensive study of the possibilities of visual education, in general, and the actual effects of our micromotion study on the training of the worker, in particular. We must say frankly that we have no trouble convincing the workers, compared with that of convincing those who theorize about him. Besides, there is no reason to limit the worker merely to five feet of film and a magnifying glass. Five feet of a film of a super-expert, together with a magnifying glass will open the door of knowledge to anyone. The possible results are not to be doubted; they are actual. The material is at his disposal.

119. Professor Spaeth apparently is not aware of the advantages that come to the worker himself and to his associates and employer, as a result of teaching him to *think in terms of elements of motions*.

120. In paragraph 6, Professor Spaeth concedes the value of our work "as a research method and as a permanent record of the best way to do work." This is all we need. If he acknowledges that, all that we claim for it follows, as we shall show. As for attempting "to control some of the larger errors" before increasing our refinements in one direction, it is thru these very refinements that we get the knowledge and facts to control that he advocates. This is the heart of the whole argument. The attending fatigue causing or eliminating conditions, already referred to, fur-

nish a typical instance of the case in point. The effect on the workers from their control of analysis and synthesis not only makes all work less monotonous and more interesting, but is also educational. Education of the workers has too often and too generally been neglected. Actual practice shows that the micromotion method has done more to cause the workers to think logically and to utilize to advantage their entire fund of craft knowledge than any other one thing.

121. In paragraph 7, the importance of standardization of the *material* element is outlined,—a matter upon which we all agree. The importance of standardizing the *human* element is demanding universal attention also. By such standardization Mr. Spaeth certainly has no thought of limiting the worker's opportunity, but of studying the worker as well as his work to discover "fitness" and insure better placement.

122. The three phases of such standardization are listed in paragraph 8. The account of Dr. Martin's work in paragraph 9 is very interesting and well serves to illustrate much similar work being done in this line abroad, as well as in many parts of this country, including our own laboratory. So do the physiological tests referred to in paragraphs 10 and 11, and the psychological tests referred to in paragraphs 12 and 13. All management men are not unacquainted with such tests, as Professor Spaeth seems to think. Our testing of such psychological tests as those for the selection of candidates for training in world championship contests of typewriting, were carried out in great detail five years ago, and others as far back as 1912. The elaborate paraphernalia of such minute investigations as those being made in their laboratories by Professor Schlesinger, Professor Moede and Doctor Piorkowski,—all of which we have had the honor of inspecting at their invitations,—and their results and applications to and implications in industry, have been carefully investigated by several industrial engineers, at least, who have travelled abroad for years, as well as thru the laboratories of this country, seeking closer affiliation with investigations in the field of physiology, psychology and psychiatry.

123. In paragraph 14 is discussed the illusive character of fatigue and the power of suggestion. It is scarcely necessary to mention that such experiments would not and could not be tolerated in the industries. We agree with Professor Spaeth that the will must be studied and the importance of motivation appreciated, both in its effects on the conscious and the uncon-