

scious mind. We realize the importance of investigating inhibitions, and of "releasing" co-operation. We also second most heartily his suggestion that all who study the human element co-operate, as voiced in his final paragraph. This, however, can by no possible stretch of the imagination be called an "untouched field."

124. Professor Spaeth has been exposed to the doctrine of Behaviorism so long that it is astounding that he does not recognize that both changes in manual processes and in mental processes and attitudes manifest themselves in behavior, in action. Mental processes and the resulting behavior can now be photographed. For such purposes we have used for seven years with most satisfactory success stereoscopic motion pictures examined and charted at leisure, descriptions of which will be given in one of our forthcoming books. Photographing of mental processes as indicated by behavior is the special work of the micromotion and the cyclegraph methods. They were specially devised for this work, they have been developed and supplemented so that now we can obtain records that completely satisfy not only our needs in the industries, but such psychiatrists as the late Dr. E. E. Southard, with whom we co-operated for many years, and such expert psychologists and educators as Professor S. S. Colvin, whose "Learning Process" serves as a guide book in the industries as well as the schools and colleges. The epileptic specialists, such as Drs. L. D. Damon, G. Kirby Collier, W. T. Shanahan, and Dr. Arthur L. Shaw have used our records in studying the epilepsies and the National Safety Council under the leadership of Mr. Louis Resnick and Mr. S. J. Williams have used our conclusions to reduce the "irreducible minimum" in accident prevention.

125. Human standardization, if that means understanding the human element and classifying work and men so that the human element can develop, is the great work of today and tomorrow. But it can only take place when accuracy of devices and records is insisted upon *absolutely*, with no exceptions.

126. Human standardization is desirable only when it raises the standard; when it raises each human being to the standards above. To raise them we must first find the One Best Way and then survey their differences as to method and education. The other differences will, of course, be reflected in the payroll, as they should, and will permit the most efficient to earn the most wages. There can be no logical objection to that.

127. It may not be advisable for mechanical engineers or industrial engineers to carry this psychological discussion further. We therefore will leave Professor Spaeth in the hands of his brother psychologists one of whom, Dr. Henry C. Link, has recently written a most inspiring paper on "The Application of Psychology to Industry."¹ We quote from the opening paragraph:

128. "Psychology as applied to industry is today on the defensive, partly because industry has expected quick, concrete returns, whereas psychology could offer only piecemeal, tentative conclusions; partly because psychologists have approached industrial problems with an assurance which they were unable to realize in actual practice. On the part of business men there has been a failure to appreciate the necessary refinements of the psychological methods. On the part of the psychologists there has been a failure to understand the intricacies of industries."

129. There may still be some question whether the most desirable training consists of *preparation in engineering supplemented by training in applied psychology or training in psychology and education supplemented by training in engineering and practical work in industry*. Certainly we agree absolutely with Dr. Link that training in both lines is necessary. In the meantime, industry is justified in questioning the advice of those who neither understand her theory, her needs, nor her practice.

SUMMARY

130. To summarize;—the managers and stop-watch time study experts who have discussed our paper have in no wise strengthened the arguments in favor of stop-watch time study as embodied in Mr. Merrick's book, neither have they brought any criticism against the micromotion method except its alleged greater cost.

131. Professor Spaeth also has in no wise justified stop-watch time study, even from the stop-watch man's standpoint, for while they all contend that it is accurate enough, he says it is too accurate. We are glad that no engineer ever made this statement, but we regret exceedingly that every member of the Philadelphia Section of the Taylor Society let his statement go unchallenged and without dispute.

¹Psychological Bulletin, Volume 19, No. 10, October 10, 1920.

132. We would ask here, why have these gentlemen confined their discussions to two minor points? Why has no one disputed the principal points of our paper, such as the following:—

a. That stop-watch time study is unethical in so far as it does not define clearly, and in as much detail as possible, the subject matter of the contract between the employer and the employee on which the money paid for achievement and productivity is based;

b. That stop-watch observations lack permanent value;

c. That the stop-watch does not record surrounding conditions;

d. That stop-watch time study is useless from the standpoint of Skill Study;

e. That stop-watch time study does not record anything regarding the priceless methods of the super-skilled expert, or best demonstrator obtainable;

f. That the accepted methods of the stop-watch enthusiasts for handling stop-watch data are wrong from the statistical standpoint;

g. That there is no attempt under the stop-watch method to instruct the worker, regarding the details of those methods which excel his;

h. That there is no standardized procedure for synthesizing better methods under the stop-watch method;

i. That to find the One Best Way to do work under the stop-watch method is impossible;

j. That there is no realization of similarity of the practice of the stop-watch method to the "rule of thumb" practice of the old fashioned manager;

k. That with the stop-watch method there cannot be obtained any records of the "single small elements" that Dr. Taylor demanded;

l. That the laws of habit formation and automaticity, that underlie an efficient learning process and least waste in future practice, are not discovered or utilized?

133. These and many other claims regarding the deficiencies of stop-watch time study and the superiority of micromotion study have not only remained undisputed, but undiscussed. Why?

134. Perhaps we should have described the micromotion method more fully in our original paper, in order to demonstrate not only that the stop-

watch method is inaccurate, but also that its use is absolutely inexcusable, because the micromotion method can do the work of the stop watch better than the stop watch can, and can also supply all the lacks in the stop-watch method. There is not space enough to discuss our methods at length here. They have been fully described.¹ The methods and the films themselves have been offered for observation and for use to our fellow managers, to the engineering profession, to education, in fact to all to whom they can be useful.

135. We have mentioned but a small fraction of the uses for complete and correct data. Such data will in the next few years more completely revolutionize methods of industrial teaching and of production than did knowledge of machine design change machinery.

136. If we have seemed to repeat ourselves unnecessarily in mentioning certain features of the micromotion method in this closure, it was because it was necessary to answer the discussors' paragraph by paragraph and point by point.

137. It is not our function to judge finally between the merits of the methods, having presented ours and pointed out the differences. Neither is it our place to pronounce judgment upon the calibre of the opposition that we have received. We commend Professor Spaeth and his attitude toward accuracy to his brother psychologists. We recommend the Philadelphia Section of the Taylor Society itself for decision as to whether the Society backs up or repudiates the representatives of the Section who confirm or assume the superiority of, or justification for, the inaccurate non-method-recording stop-watch time study, and who remained seated and permitted such statements as were made at this meeting of the Philadelphia Section of the Taylor Society to go unchallenged.

138. Finally, in accordance with the decision that the Taylor Society makes on this matter, we commend the Taylor Society to the Engineering Profession, as having lived up to, or failed to live up to the second article of its own "Management Engineers Creed," which states: "The sublimest duty of the engineer is to keep the faith"—to—"remain true to his science."

¹"Applied Motion Study," "One Best Way," "Fatigue Study," "Motion Study for Handicapped."