

The third characteristic of the Russian scientific management movement was that it assumed the form of a nation-wide educational campaign embracing farmers, all government employees, and school children. The fourth point of distinction is seen in the large scale laboratory researches, coordinated from the Central Institute of Work at Moscow, with thirty-two branches in various localities all over the country. The fifth characteristic follows from the above large scale undertaking, and reflects the national characteristic as well—namely, the theoretical thoroughness with which even minor details are studied and checked with the aid of higher mathematics. The sixth and last characteristic is that the entire movement is regarded as a 'workers and peasants' method of rebuilding prosperity and happiness in a Soviet Republic, and not as a means of increasing the exploitation of one class by another.

"To illustrate these six points:

"1. The productivity of industries introducing scientific management in many cases has quadrupled since the start.

"2. The training of industrial workers, based on bio-mechanics, aided by micro-motion studies and supplemented by dietetics and psycho-physiological guidance.

"3. Educational features may be illustrated by the 'trials' publicly conducted by engineering courts, where the defendant may be a boiler showing low efficiency, and the prosecuting engineer accuses it and exposes the reasons; the punishment is, of course, corrective: to install draft gauges and make a gas-analysis, and to keep it on probation until good habits of industry are implanted. In villages, likewise, trials are held over a cow, for instance, accused of low yield of milk and proper diet is imposed as the corrective method.

"4. Research laboratories are in very close cooperation with all scientific societies, medical academies, clinics, psychopathological institutions, etc., as well as with university research and experiment stations and technological colleges. There are over one hundred such cooperating institutions and many demonstrating 'exemplary plants.'

"5. It is interesting that experimental data are always refined and finally reduced to the form of dynamic formulae, chemical reactions, mathematical equations, etc., striving at the fundamental presentation.

"6. Scientific management, being regarded as a matter of the life and pride of the workers' republic, is

met everywhere with enthusiastic support. It is introduced also in government institutions such as the Supreme Court to schedule procedure and calendar, eliminate red tape, standardize the forms, train judiciaries in mathematical logic, and banish oratory."

While investigations along lines of fatigue elimination should form a part of all standardization, this is not always the case. In general, we have found, however, more cooperation in fatigue elimination abroad than in this country. There is a large quantity of literature on the subject in Great Britain, although in some of this literature the importance of eliminating unnecessary fatigue is not considered. There is strong emphasis abroad on the physiological side of fatigue and also on the necessity of founding fatigue elimination upon scientific laboratory investigations. While fatigue study was started in this country,<sup>7</sup> if leadership in this field is to be maintained, the efforts of the pioneers must be supported.

The same thing is true for the handicapped. So far as we know, the first paper on the possibility of re-educating the crippled soldier was written in this country,<sup>8</sup> but the work was undertaken so intensively in Germany, in France, in Belgium and in other countries, that this country must devote attention and effort to the problems involved if it hopes to equal the activities on the other side. This work also is closely related to standardization.

As for application of standardization in specific fields, such as in the simplification of spelling, we note abroad a strong desire for simplification and a willingness to cooperate with every nation and every group of thinkers who desire this simplification. Proceedings of foreign countries appear in several languages<sup>9</sup> in order to facilitate understanding, and foreigners both abroad and residing in this country immediately support any plan that will make communication easier and agree that the simplification of spelling is an engineering problem and a necessary department of standardization.<sup>10</sup>

Finally, standardization is closely allied to super-standardization, and to the necessity of intensive

<sup>7</sup>Frank B. Gilbreth and Lillian M. Gilbreth, "Fatigue Study," The Macmillan Co., New York, 1919.

<sup>8</sup>Frank B. Gilbreth and Lillian M. Gilbreth, "Applied Motion Study," Chapter 7, The Macmillan Co., New York, 1919.

<sup>9</sup>Frank B. Gilbreth and Lillian M. Gilbreth, "Motion Study for the Handicapped," G. Routledge & Sons, Ltd., London, 1920.

<sup>10</sup>"Wealth from Standardization," Society of Industrial Engineers Bulletin, September, 1923.

investigation in specific fields. In Iceland, the professor of psychology before referred to has made intensive study of the local industries, such as hay-making and fishing, especially the complete handling of herring. This fish, which is extensively packed there, furnishes one of the chief industries of the island. An account of this appeared in a German psychological review, indicating interest in such work. The intensive investigators in psycho-technic in Germany require neither description nor evaluation. It is only a matter of time when every field covered by or allied to scientific management will receive the same intensive investigation with equally valuable results, and this method of attack is spreading throughout Europe and throughout Asia, with headquarters there in Japan. It is only necessary to review laboratory investigations in lines of activity parallel to scientific management in Europe and Asia to realize what must take place during the next decade.

#### Summary of Present State

To summarize. We see everywhere enormous advances in the promulgation of the principles of scientific management. We find great interest in these advances. We see a growing body of advocates of scientific management—a growing body of teachers and installors. We see a closer affiliation with psychology and economics. We see a development of the technique. We see, in some places, an appreciation of the necessity of the growth of the scientific attitude.

It is important to note that, where the growth is entirely in the spread of the principles and there is a notable lack of growth in the intensive scientific investigation, there is a great variation from the established measured functional management practice, as understood in this country. We have noted this diversity in translations and interpretations. The danger is that unless the scientific side of scientific management is stressed when installations take place, the changes, though apparently slight, will interfere with any complete installation or effective operation of the system. American practice has demonstrated this. We find also that the engineer, under these conditions, is losing his leadership in scientific management—such leadership being undertaken by the psychologist or some allied scientist. Far be it from us to decry the findings or the value of psychology, since we believe that we were the first to call attention to the relationship of psychology to management

and to what each could do for the other.<sup>11</sup> But it is obvious that training neither in engineering only, nor in psychology only, fits one adequately to be a manager.

Along with the interest in scientific management developing abroad we find a surprising state of information concerning the subject and a desire to keep pace with the advances. It is doubtful if any prominent European country or progressive country in the Orient can be found as ignorant concerning developments in America as is this country concerning developments abroad—yet it is impossible for engineers in this country to do the best installation without keeping in close touch with advancement abroad. Developments there must form part of the working data of investigators in scientific management and especially of installors, if there are to exist either worth-while research or satisfied clients.

We have noted everywhere the increase of research work abroad, both in the sciences allied to scientific management and in scientific management itself. The only reason why the advances in scientific management are not more noteworthy is because the problems involved are not thoroughly understood.

#### Recommendations

No reviewers of progress abroad during the last fourteen years have a right to consider their recommendations of enormous or of final value. They can, however, serve as thought detonators.

This country has succeeded in convincing the world that scientific management is a splendid philosophy for industry. No more time or effort is necessary to stress this point. The world is now convinced that management is a science; that it cannot develop adequately unless it is based on careful accurate scientific investigations of the minutest details involved. To stress this is now of paramount importance, but if the countries abroad are to be convinced that management is a science, this country—and especially the engineers of this country—must believe this and support scientific investigations in this field. Half-way measures, opportunism and satisfaction with "good enough" results must be done away with. The necessity of finding the One Best Way to Do Work must be acknowledged. Engineers must, as a body, advocate and undertake intensive investigations in the field of our science, the science of management; in

<sup>11</sup>Lillian M. Gilbreth, "The Psychology of Management," in "Industrial Management," May, 1912, May, 1913; The Macmillan Co., New York, 1914.