

who was engaged to go over all the machinery of a very large organization. He made it his aim to eliminate repairs. With this end in view he first examined the materials used in the manufacture of their machines and tools to see if they were right. In a plant employing from two to three thousand workers this approach resulted in a saving of six or seven thousand dollars in the first year. The securing of proper steels for functional parts was alone responsible for the saving. And this was not a poor organization, but, on the contrary, an exceptionally good one.

If we do not have the progressive attitude our maintenance ideas will not work out so well. I know of a firm that recently bought some new machines exactly like some very good machinery which they still had. The new machinery, however, produced 10 per cent more product with the same workers and the same material. But this organization is not interested in putting the old machines in condition to get that extra 10 per cent out of its workers and its investment. A thing may be desirable but still impossible to accomplish.

Hudson B. Hastings.²² There are two additional aspects of this problem of the maintenance of standards to which I would like to draw attention.

Under the stress of competitive sales conditions and the natural desire for perfection, standards are not infrequently set up which involve unnecessary difficulties of management and wasteful expenses of operation. The economic and social costs of varying degrees of perfection should be measured against their real value to the company and the ultimate consumer. No standard should be established without a cooperative study, by both buyers and sellers, of all of the factors involved.

The personnel aspects of the problem also deserve careful attention. A system of control for the maintenance of standards may work well in one plant and poorly in another. The personalities of both foremen and workmen have much to do with the smoothness of operation of any plan. We have long been accustomed to the desirability of drawing up scientific specifications for the raw materials which are appropriate to the required standards in the finished product. Research work in the field of personnel has disclosed a similar need for the proper selection and preparation

²²Professor Industrial Engineering, Sheffield Scientific School, Yale University, New Haven, Conn.

of the supervisory and working forces. Changing standards often call for changing personnel.

The National Committee for Time Study in Germany¹

By OSCAR KNOOP
President of "Refa," Berlin

DURING my latest visit to America, in May, 1930, I had the great pleasure of talking with Mr. H. S. Person about various questions of organization in industry, and especially about the question of time studies. Similar basic ideas about the economic significance of this question, which, alas, as yet is all too little appreciated by the general public, led Mr. Person to suggest to me that I write a short account for the BULLETIN of the organization and development of the National Committee on Time Study in Germany, called "Refa" for short, with which suggestion I gladly comply.

Immediately after the ending of the War there appeared, especially in technical circles in Germany, an earnest attempt to exchange common experiences and ideas. Everywhere special industrial committees were formed for the sole purpose of restoring prostrated industry through the best possible rational management and methods of labor. We realized in advance the difficult years which German economic life had before it, through the high taxes and the burden of reparations, which in the end would have to be produced by the laboring population. Consequently we were aware that only the highest rationalization of work processes would make it possible, if it were possible at all, to bear these burdens. On behalf of the government the Reichskuratorium für Wirtschaftlichkeit (National Committee on Industrial Economy) was created which should further profitable work of all kinds in all districts. The most interesting committees for our purpose were the Committee on Industrial Efficiency and the Association of German Management Engineers, and they were strongly supported.

At this time a Committee on Time Study was organized for the purpose of developing time-study specialists uniformly trained to go into a factory and there determine accurate standard times. Best

¹Translated by Mary T. Person, Dobbs Ferry, N. Y.

sued for this purpose was preliminary experience in the metal industry. By arrangement with the Association of Berlin Metal Industries and the Society of German Engineers a committee was established which organized research courses for the first time in 1922. Herr Director Hegener von Ludwig Loewe, who shortly before had written a book on time study, was active in these research courses. The courses lasted from September to April, that is, during the winter months. The result of this work was so satisfactory that it was decided to extend the organization throughout Germany. For this purpose the National Committee for Time Study, which received the abbreviated name of "Refa," was established. Industry, in association with the Industrial Society of German Management Engineers and the Society of German Engineers, established twenty-two regional boards scattered over the whole of Germany. These boards were concerned with arrangements for training courses and were responsible for their results.

But it was now necessary to create material for instruction. For this purpose we turned to industry, which most readily placed its experience and support at our disposal. The fundamental principles were worked out and tabulated in a graphic manner in special commissions which considered chiefly the program of the course, and from these the students were instructed. They learned in a strictly mathematical way how time studies are made and how they are estimated. The hours of instruction took place after working hours; they were regularly evening courses.

The material for instruction is divided into a series of special folios. In each folio a special branch is treated. At the present time there are in existence instruction folios for cutting processes—that is, for turning, planing, milling, drilling, etc.—for foundry materials and for wood working. A folio is in preparation for the manufacture of work tools. There is now a comprehensive Refa Book which sets forth the basic principles in accordance with which these time-study folios should be used in the factory, and which is in general very instructive for the managers of firms. It would perhaps lead us too far astray to explain further in this place the contents of these folios; perhaps there will be another opportunity to explain these details.

The net result of this book to date has been

astonishing. About eight thousand computers and time-study engineers have been trained through these courses. We estimate the number of workers in firms whose work is regulated on the basis of time studies by our former students at about 600,000. The reports which we receive from these firms are to the effect that their output (aside from that due to new machines or changed work methods) has increased on an average at least 20 per cent through the greater saving in labor. We find, as has already been well proved in America, that through time studies work processes are more carefully planned in advance, and that alone makes possible the attainment of a much greater output. We appreciate especially that the fatigue and exertion of workers must at the same time be taken into account. In no case must the increase in production be achieved at the cost of individual physical speeding-up in any injurious manner; that is directly prevented because well-planned work saves the worker.

This penetration of industry with the idea of time studies has brought about increasing demands in interested circles that we produce something further. Not alone from the metal industry in distant places but from all types of industrial life, demands are made upon us to work out fundamental principles of so-called Refa-folios; e.g., for the textile industry, the building trades, and so on. In the technical high schools and universities the results of the Refa movement are closely watched and many professors are engaged in allied studies. Upon the instigation of the director, Mr. Ludwig, of the firm of Siemens-Schuckert, systematic, scientific investigations of hand work, physical motions and physical performance, have been set on foot in a group composed of Refa teachers, high-school professors and other members of industrial circles. All groups interested in these questions have the greatest hope for the further development of our work. We have many difficulties to surmount, especially with as much political agitation as there is at the present in our country. In spite of this, however, we have the happiness to record that within a few years we have made advances, far beyond our expectations. It would be a pleasure to us to be able to work on this question with interested American groups, and from the conversation with Mr. Person the author believes he may dare to hope for this.