

more interesting (since human affairs always have a great interest for humanity) it has been my experience that the first part, the systemization, is the more valuable. But after the full introduction of the system, when considerable numbers of the employees were working under stimulus, we found that the average increase in their pay was about twenty-seven per cent. In time we expected it to be greater. We also found by records very carefully and accurately kept, that the amount of work performed when following the instructions which were given to the workman, and under the stimulus of a well understood premium, was, on the average, two-and-three-quarters times as much as that which was done by the same man when working under the old system. I need not inform you that the saving in direct labor cost which is indicated by this figure is more than reproduced in the saving of overhead charges resulting from the performance of the work in the shorter time.

The introduction of this system of course requires an initial expenditure; there is the salary of the efficiency engineer; there is usually a certain outlay for standardized tool steel, such that its performance can be counted on; and there are other expenses. It is my recollection that during the first two years of practice with the method at one of the principal arsenals, while we were concerning ourselves only with systemization, the expenditure due to the introduction of the system was about \$11,000. As this was some ten years ago it is probable that, with the prices of labor and material now prevailing, this expenditure would be about doubled.

At first there was no difficulty with labor but after a while the labor unions took alarm, and the leaders apparently feared that, with the harmony prevailing between the workmen and the management, their occupation would be gone. They therefore set about stirring up the workmen, persuading them, among other things, that the scheme was to ascertain the amount of work that they were capable of, and thereafter to require it of them without any increase of pay. I had no fear of their being able to interfere with work by means of strikes, since I was able to out-bid them for the favor of the workmen; but they carried their opposition to the Congress, where the elected representatives of the people had a natural fear of the opposition of any organized body, and there they succeeded in placing some limit, for a time, upon the operation of certain parts of the system. The essentials, however, were not interfered with, and as time went on the limitations were reduced. Quite recently the labor lead-

ers have come to a more reasonable point of view, and the most prominent of them have declared their adhesion to the principles of payment in accordance with output, which had been the principal ground of their opposition.

If it should be decided to attempt the introduction of this system of scientific management in this or any other new locality, the method would be to employ one of the experienced engineers who now exist in such numbers that one could probably be obtained; such an expert could probably take under his charge as many as four and perhaps five establishments, since a single establishment would not occupy all of his time if he were properly assisted. In each establishment he should be given the kind of person whom I have already indicated, to receive his instructions and to have the sole duty of putting the system in practice in the establishment. With such assistance five or six days a month on the part of the expert would probably suffice for each establishment, and the expert could visit them in rotation. A certain amount of printing of forms and construction of special apparatus would be necessary, but the expense of this feature would not be great.

It would be possible to talk for hours upon the various details of the Taylor System, and to give many examples attending its application in the American arsenals; but I think that I have mentioned the principal element, and have said enough to show you that the subject is not one of mystery, but is one in which the most essential ingredient is common sense. I shall be gratified if you find something in my description to commend it to you.

JOB standardization . . . is a part of a well-balanced development which must be carried throughout the entire organization . . . the education of members of the organization . . . the planning of the work from the inception of the orders to the delivery of the finished product . . . the success of standardization is closely bound up with the methods by which the product is routed in the factory from process to process . . . the work of standardization has proved of great importance in connection with labor relations . . . even sales policies are affected by job standardization . . . all the factors of the business, in short, are the concern of the engineer who undertakes job standardization. (William O. Lichtner, *Time Study and Job Analysis*, p. iv).

BULLETIN OF THE

TAYLOR SOCIETY

A SOCIETY TO PROMOTE THE SCIENCE AND THE
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Engineering Societies Building
29 W. Thirty-Ninth St.
New York

DECEMBER, 1921

VOL. VI., No. 6