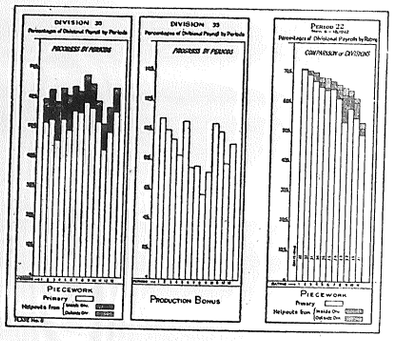

Fig. 8. Chart of Comparative Performance.

progress made from period to period by the individual divisions and by the shop as a whole. These charts, of which Figure 8 is an example, are of obvious value, both to the management and to the foremen of the various divisions. Furthermore, this same information, used in connection with reports of divisional production furnished by the Routing Division, enables us to chart in a similar manner the unit wage cost of the product for each manufacturing division, both as a whole, and divided into its various wage components.

The mechanical method of analyzing these payroll summaries to obtain the data for the above charts may be a matter of some interest. Up to the present time this sorting has been done by means of punched cards, similar to those used in handling Personnel Data and Sales Statistics, and the results have been very satisfactory. However, it has been found that the labor of punching and verifying a large number of cards, and the rental of the additional machinery required, was hardly justified in view of the fact that the cards, after once being used, were of no further value. We have just installed what might be described as a modification of, or rather a new development of, a cash register machine, by which the items of pay may be charged, simultaneously, to one of several accounts representing class of product, to one of a number of accounts representing class of wage, and to a controlling grand total. In fact the machine will carry twenty-seven simultaneous totals and will give a total for any one or all of them whenever desired. This work is done daily and serves two additional purposes. It acts as a daily audit on the work of the payroll division, and it enables us each day to furnish each employee with a detailed statement of his earnings for the preceding day and for the period.

Before concluding this paper it might be well to answer in advance one question that is sure to be asked: What does a statistical division cost? The answer to that question depends upon the size of the division and the nature and amount of apparatus used, and those in turn are dependent on the size of the organization, and the number, kind and extent of the reports and analyses required. For our organization the cost, in payroll alone, is approximately nine-tenths of one per cent of the total payroll; the total cost, including payroll, supplies and royalties on apparatus used, amounts to about two-thirds of one per cent of the total operating cost. But, after all, the question should be, not "What does it cost?" but "Is it worth what it costs?" In our case the answer is without qualification, "Yes." This answer is not based solely on the fact that the output of the division is less expensive than it would be if it came directly from several widely separated sources, though with us that is the case. It also takes into consideration the much more important fact that by means of combining all statistical functions into one unit, much information is obtained which would otherwise be unavailable, and that by virtue of such information, we are able to make savings in many different directions. The extent of such savings is often difficult of demonstration, but that they are made and are of considerable amount is unquestioned.

In conclusion a few words as to why we consider this compilation of statistics a distinct function of scientific management.

Frederick W. Taylor in "Shop Management," paragraphs 149 and 150, lays down the following principles:

> "First: *A Large Daily Task.* Each man in the establishment, high or low, should daily have a clearly defined task laid out before him. This task should not in the least degree be vague nor indefinite, but should be circumscribed carefully and completely, and should not be easy of accomplishment.
>
> "Second: Standard Conditions. Each man's task should call for a full day's work, and at the same time the workman should be given such conditions and appliances as will enable him to accomplish his task with certainty."

Another principle, and one which everyone tries to follow, is that whenever a job is to be done, the man to whom it is given should be the one best fitted to do it.

It is our belief that a separate statistical division is the only means by which statistical information can be compiled and presented in conformity with the above principles. By concentrating this work into one unit, we are able to provide expert supervision, to select a specially qualified personnel, and to train them to do the work more accurately and expeditiously than if they were only called upon to do it occasionally and in addition to other duties. We are able to furnish this personnel with all available data, with the most modern machinery for handling it, and with the proper facilities for filing it. And we are able to plan the work intelligently. We can tell in advance what reports are wanted, and when they are wanted. We can eliminate duplication of effort by eliminating reports furnishing the same information as that given by other more necessary ones. We can combine into one report data originating in various sources and thus avoid a number of reports by separated departments, in which much of the information must necessarily be repeated. And we are in a position to make an immediate response to any sudden or irregular request for special information.

And finally we are able to do this work more smoothly, more quickly, more accurately and at less expense than we can do it in any other way. We regard the gathering, compilation, and distribution of statistical information as a distinct function of scientific management, and believe we are justified in organizing a separate department for the sole purpose of performing that function.

I ASKED the director and his associates of the Central Institute of Research at Karlsruhe what they think of the application of Taylor methods in Germany.

They at once called my attention to the fact that detail elemental time study of the work of the artisan is extremely difficult, and probably not worth while, because the conditions of work vary so greatly in the small industries.

I then asked what they think of the utilization of the Taylor system in the larger industries. They replied that it is desirable not to accept hastily any particular system, but to first consider it in a spirit of reasonable criticism. They seemed to believe (what is certainly an error to one who has studied carefully the work of Taylor and his followers[1]) that the Taylor system transforms a worker into a machine, a worker who has lost interest in his work, and that it would be impossible to develop the system among the workers of Germany. I believe that, judging by this opinion, they have been badly informed concerning recent American developments of Taylor management, in which the interest of the worker has been given primary consideration.

They acknowledge, nevertheless, that Taylor is the real founder of the great movement towards a practicable scientific study of management, and they affirm that in the majority of German industries the function of planning and preparation of work is very advanced; that the forms which pass from process to process to specify the necessary materials and tools for the processing of a predetermined lot are utilized in a large number of establishments; and that it is likewise recognized that a knowledge of the *time* necessary to perform a given task would permit a rational study of work, a circumstance of great importance in the face of the present extremely variable wage conditions. They note on work order slips the time which should be taken for the job and later the time actually taken, but is not customary to base wage payments on a scientific time study of operations. The latter, they say, is difficult because opposed by the workers' organizations.

Management is not able to accomplish all its desires, but it seems that gradually managers and workers are returning to the piece rate system, and analyses of the resultant actual times of operations is permitting the reasonably rapid development of progressive methods. (Translation of an address of M. Antoine, Civil Engineer, France, before the Foundation Michelin; from *Le Genie Civil,* 26 August, 1922.)

[1] The author had just returned from an extended tour of investigation in the United States.