STANDARDS[1]

BY

H. K. HATHAWAY[2]

I INTRODUCTORY

IN his book "Scientific Management and Labor," based upon an investigation conducted in 1915 for the United States Commission on Industrial Relations by a committee of which he was Chairman, the late Professor Robert Franklin Hoxie sets forth under the heading "Possible Benefits of Scientific Management to Labor and Society" a remarkable statement of the importance and necessity for the establishment and maintenance of standards. No more fitting introduction to this paper could be written; hence I wish to quote it in part:

> Experience and reason leave no doubt that a close causal relation exists between productive efficiency and possible wages. No one can deny, therefore, that greater productive efficiency and output make possible higher wages, in general, and better conditions of employment and labor. While in particular instances and trades, wage advances, improved conditions of work and better standards of living can be secured and maintained solely through increased bargaining power of the labor group, the community as a whole, including all classes of labor, can consume more and live better only through an increase in the goods produced. But increase of output is dependent on lower cost of production. Mr. Taylor was right, therefore, when he set up as a goal of achievement and principle of scientific management, "higher wages with lower labor cost." Lower labor[1] costs make higher wages possible, and, while lower capital costs are equally significant in this respect, without both higher wages for all and in the long run are not likely to be realized to any considerable extent.
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> In so far, then, as scientific management affords opportunities for lower costs and increased production without adding to the burden of the workers in exhausting effort, long hours or inferior working conditions, it creates the possibility of very real and substantial benefits to labor and to society.
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> No one who has made a careful study of scientific management can doubt that it does, at its best, afford such opportunities to a very high degree. Fully and properly applied, scientific management may include and may not be incompatible with all that is covered in the phase "Science in Management," and it has of itself developed many devices for the saving of waste and many policies and methods for the improvement of the productive processes, not excluding ideas and methods which promise well for the betterment of labor conditions and the protection of labor interests.
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> At its best, as set forth by Mr. Taylor, and as realized in practice, scientific management means a thoroughgoing improvement and standardization of the material equipment and productive organization of the plant before an attempt is made to apply its peculiar methods and devices to the determination of standards of labor efficiency and wage payments. It means, thus, the installation of the best available machinery and tools so far as compatible with economy, or, at least, the overhauling and improvement of the existing equipment; the careful study of the materials of production and the determination of the speed and feed of the machines calculated under the circumstances to be most effective; the rearrangement of the material equipment so as to avoid the delays and expense of unnecessary carriage of materials and partly finished product, and to secure so far as possible continuous straight-line production; the introduction of known and new devices for economical and expeditious handling of materials and product; the careful study and analysis of the detailed processes and methods of production looking to the elimination of waste motions; the improvement of accessories; and the most effective application of force and coordination of effort; the reorganization of the managerial staff with a view to avoiding so far as possible multiplicity of duties and to securing definiteness of function and responsibility, and therefore, managerial efficiency in every detail; the improvement of the methods of record keeping and accounting so that exact knowledge may be had at all times of available equipment and materials on hand, their disposition, actual and prospective, that the productive needs of the concern may be met without friction or delay; reorganization of the sales and purchasing departments with a view to broadening and stabilizing the market for the product, and purchase by specification, at the most economical rates, and in accordance with needs; improvements in the methods of stores-keeping which insure sufficiency of stock on hand, quick delivery and avoidance of interest and loss on superfluous and unusable stock; better methods of tool storage, care and delivery, and many other material and organic improvements, all possible, theoretically, precedent to and quite apart from the setting of new tasks; the introduction of new modes of payment or the alteration in general of labor conditions and relationships. . . . . .
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> Scientific management not only holds out, therefore, possibilities of substantial benefits to labor, but it points the way and the only way toward raising the standard of living for all classes of labor and for society at large.

The *Century Dictionary* defines a "standard" as, "that which is set up as a unit of reference; a form, type, example, instance or combination of conditions accepted as correct and perfect and hence as a basis of comparison; a criterion established by custom, public opinion or general consent; a model."

The above definition, almost but not quite, gives the significance of the word "standard" as it is used in connection with scientific management. If we change it to read: *"That which is set up as a form, type, example, or combination of conditions accepted as correct; a criterion, established as a result of scientific investigation,"* we should have a better definition of the term in the limited sense in which it is used in this paper. Inasmuch as it is the destiny of mankind to constantly advance and improve I would add, parenthetically, *"for the time being,"* or *"representing the present stage in the development of the art."*

We may classify the standards of scientific management under the following headings:

Equipment: including machines, tools or implements, facilities for handling, transporting or storing materials.
Materials
Methods
Accomplishment
Product

Standards of accomplishment are dependent upon standards of equipment, materials, methods and product.

In 1895 Mr. Taylor said in closing the discussion of his paper on "A Piece Rate System," in which he first described elementary time study as well as his differential piece rate system of pay: "I am surprised and disappointed that elementary rate fixing (scientific analysis and time study of work) has not received more attention during the discussion. No better evidence could have been produced, however, of the crude and elementary state in which the art now stands, of determining the *time to do work* and of fixing rates, than that only one member should have most briefly referred to the matter while thirteen engineers have discussed at length the less important matter of *what kind of piece work to use.*"

The blame for that of which Taylor complained lay largely at his own door; he committed a serious error in the selection of the title for his paper; perhaps had he called it "The Establishment of Standards as a Means to Increased Production" or "The Study of Elementary Time Units for Doing Work under Standardized Conditions"; had he confined this paper principally to what was an epoch making advance in the art of industrial management, if not indeed the elevation of management from "rule of thumb" to an art, a scientific method of determining what represents a fair day's work or the time that a given job under given conditions ought to take; had he reserved the description of his novel pay system—the differential piece rate—for a later presentation, it is altogether probable that his message would have been better understood and more generally appreciated at its true worth.

This error of Taylor's, if it may be so characterized, is significant and shows that even he was not immune from the influences of the time. As is evident to anyone who studies Taylor's writing and is well known to those who were associated with him, the Taylor System, or scientific management, had its genesis in an endeavor to establish *"standards of accomplishment —or in other words to set piece rates on a just and accurate basis."* This Taylor found necessitated an analytical study of the work to be done, which at once brought to light the fact that *there can be no standard or uniformity of accomplishment without standardization of all of the conditions under which the work is done.*

Let us take for example the boring and turning of steel tires for locomotive wheels, which I think was one of the first, if not the first operation, to be studied at Midvale. Having as a result of experiment arrived at and established as standard, proper combinations of feed, cutting speed and depth of cut, it soon became apparent to Taylor that unless the cutting tools used by the machinists were practically identical in quality and temper of the steel and ground to practically the same shape, clearance and lip angles, these standards could not be attained. In this we have the beginning of the long series of experiments and research, described in Mr. Taylor's book "On the Art of Cutting Metals," which culminated in the invention of high-speed steel and Taylor-White process for its treatment; the slide rules started by Mr. Taylor and Mr. Gantt and perfected by Mr. Barth, and the Taylor standard lathe and planer tools. He found that the time-honored practice of each workman grinding his own tools must be abandoned; and the development of an automatic tool grinding machine followed, insuring uniformity and eliminating the loss of production and a variable element in the time taken to do the job as a result of the time spent by the workman at the grindstone or waiting his turn to use it.

Likewise it became evident that not only tools required for cutting, but those required for setting and holding work in the machines and the tools for measuring, must be standardized and must be of the same kind and in the same good condition *as those used when making the elementary studies* upon which was

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[1] A paper presented at the annual meeting of the Taylor Society, New York, Dec. 6, 1919.

[2] Consulting Engineer in Management, Philadelphia, Pa.

The writer wishes to disclaim any personal credit for the advantageous results cited as illustrations of standardization, in those cases where the work was done under his direction. While much credit is due to the men who conducted the investigations and worked out the problems, credit is almost equally due to the operators whose work was studied and who assisted in making the studies, as well as to the principal people in the management of the concerns in which the work was done.

It is mainly however to Taylor and his teachings that credit should be given, as the results were the inevitable outcome of the application of scientific methods to everyday industrial problems, and of the desire to work out in practice what Mr. Taylor stated as the first principle of scientific management,—"the development by management of a science in place of rule-of-thumb or traditional knowledge and method."

In addition to those individuals mentioned in the text of the paper the writer wishes to accord due recognition to Col. W. H. Eaton, Maj. M. C. Herrmann, Mr. Charles Hoffman, Mr. Arthur Holmes, Dr. Ralph Langley, Mr. Wilfred Lewis, Mr. L. S. Tyler and Capt. D. J. Walsh, for the part they took in bringing about the results cited, and to a host of others who took part in the work.