

ing up. It is primarily the interest, the loyalty, the obedience of workmen that scientific management strives for; and for this obedience the management does not hesitate to pay a substantial price.

This method of inducing workmen to do their best constitutes historically, the most fundamental and essential aspect of scientific management. It is, however, by no means, the system's only feature. It was very early discovered that in order to set tasks properly the management had to learn a great deal about the work, and, when it knew a great deal about the work, it could commonly introduce improved methods of performing it. So planning rooms developed, motion studies were made, instruction cards drawn up, employees trained, tools and equipment standardized at high quality. Much of the increased output under scientific management springs from the methodical and exact way in which these features have been worked out. This second story of scientific management is today almost as important as the first.

A third notable characteristic of scientific management is what is known as functional foremanship. In order that the management might discharge creditably its greatly increased responsibility, it became necessary not only to increase its numerical strength, but to split up the duties of management among as many as eight different authorities. These are given such names as gang boss, speed boss, inspector, repair boss, order of work or route clerk, instruction card clerk, time and cost clerk, and shop disciplinarian.

A capacity in scientific management and its leaders to expand Taylor's original program and adjust itself to the needs of industry appeared very early. As the system was first thought out and practiced by Dr. Taylor it had a certain inflexibility amounting almost to impracticability. And especially was this true of the methods which he used in pushing the system. It is no secret that Dr. Taylor was not himself very much of a manager. Persistence and genius he had without end. But he was not an adept at judging men, nor tactful or conciliatory in his method of approach. Even for his friends he was a hard taskmaster, and his entrance into a new plant would stir things up from the bottom. He insisted, too, that reorganization be thoroughgoing and complete, according to what often seemed a preconceived notion.

These characteristics were partly due, doubtless, to the fact that Dr. Taylor himself had comparatively little experience with the introduction of his own system. Besides his deep interest in scientific management, Taylor gave a considerable portion of his time to other matters. He was an inventor of no mean ability, and took much pains with scientific investigations, as, for instance, that into the cutting of metals. Taylor did not work what most men would regard as a full day, but came late and went home early. And

finally, he retired from active service in 1901, at the age of forty-five, fourteen years before his death, and scarcely twenty years after getting started seriously in work. No wonder that he did not accomplish everything, and that much was left to be developed by others.

Among the first friends of Taylor to improve upon his methods was Henry L. Gantt. Gantt is what Taylor never was—a skillful manager. He has carried through such undertakings as the reorganization of the Remington Typewriter Company, the concern which makes Remington, Monarch, and Smith-Premier typewriters, and many other concerns almost equally large and well-known. Gantt gets along well with the people whom he has to manage, bends his course to suit the exigencies of a situation, and aims at important practical savings. He regards every factory as a law unto itself. His scientific management is not one mould, which all factory organizations must be warped to fit; but, as he sees it, there are as many distinct scientific managements as there are different shops. Gantt's work, however, is only one illustration of what has been done to a greater or less degree by all the close friends and followers of Taylor. Scientific management is the joint product of many minds, working under the inspiration of a dominant personality.

The results obtained under scientific management have been such as to attract the attention of a wide public, and to win support in many and important quarters. As before indicated, it seems probable that on many kinds of work, the increased output of employees runs well up to one hundred per cent; while there are instances of increases of two hundred per cent and more. In other instances, of course, the gains are much more moderate. The prestige of the system among engineers and with the public has been heightened by the support of men like Henry R. Towne, James M. Dodge, and Frederick W. Taylor, all past presidents of the American Society of Mechanical Engineers, and Louis D. Brandeis, Justice of the Supreme Court; and by the space given to discussions of the system in leading technical and popular journals and in the writings of leading thinkers. Its standing in the manufacturing world has been assured by its adoption in such representative plants, as that of the Pullman Company, the Yale & Towne Manufacturing Company, the Union Typewriter Company, the Remington Arms Company, the Government arsenals, and, in the old days, the Bethlehem Steel Company and the Santa Fé Railway. Some tens of thousands of workmen are already working under it in a fairly complete form; while it is safe to say that the influence of the system has spread in one way or another into almost all the industrial plants of the country.

In spite of this rapid growth in favor, there nevertheless remain some very powerful and persistent antagonists. When Charles M. Schwab obtained control of the Bethlehem Steel Company in 1901, this company's position as a center of scientific management activity, which up to that had been without a parallel, was promptly destroyed. While much of the system was in fact retained, all allegiance to it was emphatically disowned. It is not surprising that in this and numerous other places scientific management has met with opposition on the part of employers. The idea of one man does not take precedence over the ideas of a thousand other men without meeting constant challenge, especially when it is the province of the other thousand to decide the issue.

The only opposition which may be regarded as really serious, however, is the opposition of organized labor. The reports of the American Federation of Labor show that their first period of rapid growth occurred following 1898 and prior to 1904. In these years the membership of the Federation leaped by one great bound from 275,000 in 1898 to 1,675,000 in 1904. But following 1904, for a period of five years the Federation lost ground, so that in 1909 the membership was about one-eighth less than it had been in 1904. This check seems to have been imposed partly by a hostile attitude assumed by the courts, but more especially by a policy of antagonism on the part of great corporations and powerful employers' associations. Professor Commons, writing in 1908, declared that "the unions have practically disappeared from the trusts, and are disappearing from the large corporations as they grow large enough to specialize minutely their labor." Naturally the unions began to give their attention to the matter of the obstructive forces, and to form plans for defending themselves. In the words of Professor Carlton, writing in 1910-11, "bitter opposition and adverse judicial decisions may force even conservative unions to adopt other methods and policies than those utilized during the last two or three decades."²

It was just at this juncture that for the first time a blaze of publicity was thrown around scientific management. In the fall of 1910 and the spring of 1911, the now Justice Brandeis conducted before the Interstate Commerce Commission his famous defence of the eastern shippers against a proposed advance of railroad rates. Brandeis' main argument was that the railroads would not need to increase rates if they would introduce scientific management. In a few weeks, the entire country was inquiring as to what this scientific management was, and organized labor was confronted by the necessity of taking a stand with reference to the new development.

²American Journal of Sociology, Vol. 13, p. 759.

³History and Problems of Organized Labor, p. 75.

The labor leaders very quickly and very properly decided that the growth of scientific management presented a danger to their organization. The main reason why we have labor unions as at present organized is because of the existence of laboring classes, whose manner of life, education, and interests are enough at variance with those of the employing classes, so that the former crave a special protection. Were there no sharp divergence of interest or sympathy, it would not be necessary to build up class solidarity, to insist on organized action, or to extend systematic aid and protection to the otherwise isolated worker.

It was, however, a postulate laid down by Dr. Taylor that there is no natural clash between employer and employee. Both, he would say, are interested primarily in greater production. Taylor believed that he had devised a system that would substitute a scientific for a contentious division of the product. Employers should not be organized in employers' associations and workmen in labor organizations for the purpose of battle. But all should be partners, work in harmony, and settle their relationships according to scientific truth. Recognizing no divergence of interest, Taylor, therefore, would have the management itself look out for the laboring man.

To Taylor and his followers, moreover, the spirit of the unions seemed unfavorable to industrial progress. Taylor was interested in greater production, in introducing better methods, in progress; whereas the union membership is made up largely of that middle class of people who are conservative, suspicious of change, and somewhat hard to reason with. In particular, the workingman has been suspicious of the introduction of machinery, of increases in output, of speeding up. Partly just, partly unjust, these suspicions have been; but they were a big factor in preventing Taylor and the unions from working as partners in a common cause.

The outcome in scientific management plants of this unfavorable sentiment towards trade unions has been, that the latter have almost invariably had the worst of it. Taylor testified before the Industrial Relations Commission in 1914 that members of labor unions had left in large numbers at Midvale, Bethlehem, Tabor, Link-Belt, and to a certain extent in every company where he had ever been. It is easy to see why unions could not put up much of a fight in shops operating under such a system. In so far as it centralizes skill, scientific management takes from the workmen that bond of common craft knowledge, which tends to make brothers of the men engaged in a trade. Since it pays on an individual or efficiency basis, and promotes the more able men to fill positions as functional foremen, scientific management appeals to personal ambition, rather than to class solidarity, and makes less sharp the line of cleavage between management