

of Cutting Materials). At that time the materials used almost exclusively by engineers were stone and wood. Masonry and carpentry were the trades to which the scientific method was applied, and it consisted principally in determining exactly the dimensions for carving the stone and the girders which was absolutely necessary for the building of bridges in accordance with Perronet's scientific determinations.

The bridge at Neuilly, considered the first and one of the most beautiful specimens of the bridges of the new school, was made the object of an inauguration assuming the character of an event of the highest importance. It was not merely the inauguration of a public monument, but the inauguration of a bridge constructed in accordance with scientific principles. It was conducted with great ceremony before the King and all the Administration. This was the first step in the direction of scientific management to be signalized in France in such an impressive manner.

This new point of view became very general in France, at least among scientific groups.

The illustrious scientist Chaptal, founder of La Société d'Encouragement pour l'Industrie Nationale, wrote in 1790 in his *Eléments de Chimie*: "It would be well to say to artisans 'Know your original material better, study the principles of your art more thoroughly and you will be able to predetermine and to calculate everything. It is your ignorance which makes your operations a succession of blind gropings and a perplexing alternation of success and failure.'" Herein lies the essence of the philosophy developed by Taylor, but it must be noted that Chaptal confined himself to formulating a possibility and that if he caught the attention of the artisan at all, it was only in a small way and in individual cases.

The obstacles which paralyzed the efforts of his forerunners had to be overcome and Taylor was the man who accomplished it. He not only undertook to tell the workmen what had to be done to predetermine and to calculate everything, but he demonstrated it before their eyes. To attain this end he had to move a world. It was a gigantic task that he assumed.

So the soil in France was very well prepared for the understanding and appreciation of Taylor's ideas at their full value and it is M. LeChatelier, one of the men educated by this great movement for the application of the scientific method which can be attributed to Perronet, who first called attention to these

researches. At the same time there were those among them who were too often made to foresee everything and to calculate everything without having in advance "sufficiently studied the principles of the art"; and this fact gave rise to opposition between theory and practice of such a nature as to make one doubt the efficacy of the application of scientific management to industry.

This is the reason for a certain distrust inspired in France by the expression "scientific management." Taylor is certainly the man who has done the most to dissipate these prejudices and it is right that his name should be used to designate the movement which he inspired.

Another point which could not fail to strike him relates to that spirit of cooperation, to the development of which he attached so much importance. He observed that this spirit prevailed in a large measure in French factories, and that if it were properly directed, if better use were made of it, remarkable results were sure to follow.

American problems are strikingly different from ours. There, abundance; here, an insufficiency of certain products. There, a tendency to large production; here, a tendency to exaggerated restriction. But the remedy is nevertheless the same.

It is the proper organization of work which opens the eyes of the man inclined to get involved too easily in large enterprises, and which also gives confidence to the man whose weakness is an excess of caution. So that it may be said that far from wishing to impose methods on Frenchmen which are not agreeable, Taylor seeks to introduce into America what is best in the French idea and to demonstrate to the French the value of what they already possess, by urging them to make better use of it.

Has France seen Taylor's prophecy realized, and are we the country which has known best how to profit by his teachings? Much remains to be done before this can be claimed. His ideas are really better and better understood, they have penetrated the technical schools, they are more and more often applied, albeit with great prudence, and the name of Taylor has become in France a veritable symbol, the symbol of a new spirit from which great things are expected. But Taylor would surely not have been satisfied with this tribute paid to his name, and we may be sure that he would say to us, "Now that you see what you have to do—do it!"

Scientific Management Made Clear

Copley's Story of its Genesis and Development More Informing than any Set of Generalizations

By IRVING FISHER

Professor of Political Economy, Yale University

IT MAY seem strange that so technical a subject as that of shop management could give anyone a thrill. But Copley's Life of Taylor thrilled me as much as Robinson Crusoe did when I was a boy. This is not altogether because of Copley's sprightly way of writing. There was a very dramatic quality in the life of Taylor as a great pioneer—lonely, persevering, unappreciated, cruelly frustrated, and yet increasingly triumphant. There is also something thrilling in the thought that Taylor's work has only just begun; that his life work consisted not so much in directly saving millions of dollars to the people of his generation as in demonstrating the possibility of saving billions more in future generations—to say nothing of the more intangible benefits.

As the story of Taylor's life is the story of "The Taylor System," I shall review that system as traced in Copley's book rather than write a conventional review of the book as a book, and I shall quote liberally from Copley in the double hope of affording representative samples for some of my readers who cannot or will not read the two volumes; and of enticing others, as I was enticed, to do that very thing.

It is altogether likely that Taylor would never have been the Taylor we now know had it not been for the accident of weak eyes. Except for this he would have gone to college and, in all probability, entered a conventional profession. Certainly he never would have begun at the bottom of the ladder and entered a machine shop as an apprentice. But that is what he did do in 1874 at the age of eighteen. It was young Taylor's own idea, when he could not go to college, to enter industry. Though he could have been supported by his well-to-do father, he chose to cast

his lot with workingmen and take voluntarily the hard knocks which that involved.

Frederick Taylor brought to his work a native ability inherited from an unusual ancestry. He put science into the machine shop because he brought to the shop a scientific mind. Given this unusual combination, given Taylor and the shop, the result which followed was as inevitable as any chemical reaction.

A Genetic Exposition of Scientific Management

In telling us the story of what Taylor did to the machine shop, Copley draws the clearest picture of scientific management which has ever been drawn. There are various reasons why his picture is so much clearer than any other. Besides his vivid method of presentation and the fact that he has two volumes in which to elaborate it, there is the still more important fact that a genetic exposition of scientific management, such as a biography requires, is far more instructive than any set of generalizations. To trace the genesis of anything helps us understand it, and this is particularly true of scientific management.

After all, there is, perhaps, nothing qualitatively distinctive in scientific management. Anyone prejudiced against it could, exclaim, after reading Taylor's generalized formulae, "That is nothing new. I've always believed in science, 'harmony,' 'cooperation,' 'maximum output,' and 'efficiency,' the things which according to Taylor constitute his system," and then go smugly on his way, missing the point entirely.

Only recently I read a criticism of scientific management by a scholar who had faithfully read Taylor's books, and yet had failed utterly and ludicrously to catch the elusive vision.

But no one can read Copley's account of the actual evolution of scientific management without obtaining a lively sense of its profound value, simply because he sees it grow, and can measure the contrast between the beginning and the end.

¹"Principles of Scientific Management," page 140.

¹Author of numerous important works in the fields of economics, mathematics and public health; Deviser of the Index Visible and Chairman of the Board, Index Visible, New Haven; Past-President, American Association for Labor Legislation, American Economic Association, Eugenics Research Association, National Institute of Social Sciences, etc.