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The Spirit and Social Significance of Scientific Management	<i>Morris L. Cooke</i>	481
The Training of Industrial Engineers	<i>Hollis Godfrey</i>	494
Security Prices and Interest Rates in 1910-12	<i>Wesley C. Mitchell</i>	500
Certain Changes in New York's Position as a Financial Center	<i>E. M. Patterson</i>	523
Beet Sugar and the Tariff	<i>Roy G. Blakey</i>	540
Notes		555

Washington Notes:

Progress of the Tariff Bill—A Noteworthy Tariff Document—Renewed Petition to Advance Freight Rates.

Book Reviews and Notices		562
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BEER'S *The Old Colonial System 1660-1754* (Chester W. Wright), 562.—JOHNSON'S *Panama Canal Traffic and Tolls* (H. G. Moulton), 566.—*Report of Commissioner of Corporations on Transportation by Water in the United States* (H. G. Moulton), 569.—*Company Fire Insurance in Russia*, 570.—SOMBART'S *Krieg und Kapitalismus*, 572.—BROOKS'S *American Syndicalism*, 572.—WOOD'S *The Finances of Vermont*, 573.—FERNLEY'S *Price Maintenance*, 574.—HARTNESS' *The Human Factor in Works Management*, 574.—CADBURY'S *Experiments in Industrial Organization*, 575.—WORSFOLD'S *The Union of South Africa*, 575.—ALLSOPP'S *An Introduction to English Industrial History*, 576.—SALIER'S *The Coal Miner*, 576.

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AGENTS

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THE SPIRIT AND SOCIAL SIGNIFICANCE OF SCIENTIFIC MANAGEMENT

In discussing the spirit underlying such a movement as scientific management, there is a danger of getting off into the realms of the unpractical, and of looking so far ahead as to take away from the present-day value of what may be said. That danger has been kept fully in mind in the preparation of this paper; and, therefore, although at times the statements which are here made may seem a little utopian or visionary, it may be asserted that there are establishments in this country today operating under conditions which approximate those described.

Scientific management has nothing to sell. Scientific management is not something which can be bought in a box. It is not something in the nature of a drug that one takes, and feels better. It is not a card index. It is dependent upon no single mechanism. Nor is it a combination of any number of mechanisms. It is not a system of keeping costs, as our friends in the printing industry sometimes think. Nor is it a method of paying wages, as members of the engineering profession have sometimes held.

We wish to try to remove honest doubts. Those of us who know something of the movement feel a call to add constantly to the number of the recruits who believe in the economic soundness of scientific management and in its ultimate and general adoption. But we do not feel that it is necessary that everybody who hears

1960-9/2482

about it should become a convert to it. There are undoubtedly a great many men and concerns the world over who are better off without scientific management. Therefore our function must be to point out what are its principles and why we believe they must necessarily be effective in increasing production.

In order to have no misunderstanding, let us admit at the start that there is relatively little scientific management anywhere. Even if from 50,000 to 100,000 men are working under its principles, almost 100 per cent of the workers and managers of this country must still be without what is technically known as scientific management. Dean Gay, the head of the Graduate School of Business Administration at Harvard, said several years ago that he estimated it would require two generations for the principles to become at all generally accepted or the methods to be in vogue in any large part of the industrial field. How could it be otherwise? Work has been going on continuously in the metal-working trades for over thirty years, yet there are today relatively few machine-shops organized in such a way as to measure up to the established standards. We have been working for nearly a decade in the printing industry, yet those who know most about what has been accomplished in this field also recognize most distinctly how much farther we shall have to travel before the industry will be affected in any large way. Even if the application of the principles of scientific management is all worked out for a given type of undertaking it is no easy task to introduce these methods into another and similar establishment. As our industries are organized today, not one establishment in ten can have scientific management because not one in ten is willing to live by law. The fact that it is something difficult to attain must be admitted, but that is, of course, no argument against it, because nothing worth having in life comes except by struggle.

This movement fortunately has long since been put on an international basis. Mr. Taylor's works have been translated into French, German, Italian, Dutch, Russian, Lettish, Spanish, and Japanese. There are some establishments in most of these countries in which real progress in scientific management is being made. Better still in most foreign countries one or more prominent citi-

zens—usually of the engineering profession—are advocating the adoption of scientific management as a means toward national progress.

Up to about two years ago there was practically no interest in scientific management. Even in Philadelphia—the home of Frederick W. Taylor, who first formulated and published the fundamental principles on which this science is founded—it was only within strictly technical circles and among his own friends that anything was known of this man, his work, and the great movement he had originated; one which, in the opinion of many of those most competent to judge, will ultimately affect the lives of all men and women. Up to two years ago I do not remember to have seen more than one reference to scientific management in the daily press. It seemed practically impossible to get a hearing for scientific management, except from isolated individuals, who were forced to it on account of the necessities of some particular business or industry in which they happened to be interested.

Since the rate hearing before the Interstate Commerce Commission in Washington, two years ago last November, all this is changed. Mr. Brandeis, in quoting from Mr. Emerson's book on *Efficiency*, the assertion that under scientific management the railroads could save \$1,000,000 a day, seemed to afford the average man something definite upon which to speculate. This discussion had doubtless been imminent for some time, and if it had not been precipitated in connection with the work of the railroads, it would have been brought on, sooner or later, in connection with the work of government or some other line of human endeavor. To my mind, it is simply another indication of the passing of what may be called the "craft spirit" in human affairs, and the rise of the scientific spirit, with its broader outlook and its more substantial footing. In the old days of handwork, most of the improvement in the product was directly attributable to progress made by individual workmen. So also in the industrial régime, which some of us think is passing, the improvement in the product is due very largely to progress made within the individual industry.

What I have called the "craft spirit" has sought to accentuate the differences between the chemistry of railroading and the

chemistry of bookmaking, for instance. The scientific spirit, while not ignoring the essential differences in the application of a science to different industries, lays its greatest stress on the essential similarities. A railroad machine-shop, a machine-shop in a navy yard, and a machine-shop connected with an industrial establishment, are all viewed by their owners as radically different rather than as essentially similar: simply because the owners are laying stress on the elements in which their shops *are* different. As a matter of fact, an analysis of the factors which go to make up such establishments will show that they are exact counterparts of one another, over, let us say, 95 per cent of their field. This percentage might easily be higher, and it is rarely lower. Therefore, in the future, I take it, the individual industry will look beyond its own borders for help. Scientific management asks of the paper-maker, the college professor, the government official, and the ironmaster that each drop his craft spirit and take on as much as he can of the scientific spirit. Scientific management asks the same of the railroads. All the railroads' problems cannot be solved by railroad men; at least many of them can be solved better by men not solely engaged on railroad work, or men whose training has been obtained, in part at least, in other than railroad work.

In our colleges we teach our engineering students about the strength of materials, the mechanics of materials, and the economy of materials; but we are only beginning to teach them something as to the strength of men, the mechanics of men, the spirit of men; in a word, the economy of men. It is just beginning to dawn on us that there is a philosophy and an art and a science of human labor, with laws as definite as those of any other science. To this science we have given the name "management," and to distinguish it from something else, which in the industrial world has been called management, we call it "scientific management." That this conception is novel may be inferred from the fact that in the German language there are no equivalents even for "management" and "efficiency," and when it came to translating Mr. Taylor's last book into German the translator was forced to use the English words for "scientific management."

What are the ends to be obtained by management? In answer-

ing this question Mr. Taylor has pointed out in convincing fashion the futility of considering dividends as in any way a gauge, or even as the direct object of management. He gives two supreme ends toward which everything that is good in management must tend: (1) high wages coupled with low labor cost, and (2) maximum prosperity for all. These are the agencies through which our productive power will grow and ultimately reach its maximum. And it is only through heightened production that the dream of the race will be realized.

Fortunately for us, political economy reflects the best opinion of the modern world when it includes among the legitimate objects of production such items as the "benefits one derives from living in a certain place at a certain time; civil and military security; access to places of amusement and instruction"; bodily health; and even more substantive things, such as music or works of art, or the higher concepts of the mathematician or the man of letters. To have this in mind is essential in any study of our subject, because so many considerations enter into management when it is taken scientifically which either do not affect the balance sheet at all, or affect it adversely. We operate our businesses *to make money* largely because the making of money has been considered one of the best gauges by which the output and the efficiency of the management could be measured. *Production* is really what we are trying to get, and the earning—certainly the declaring of dividends—may from any economic standpoint mean absolutely nothing as to the efficiency of the management. Under certain forms of semi-military industrial control, it is possible, for instance, to get human beings to work twelve hours a day and seven days a week, at a killing pace and for a very low wage. Even this scheme does not always result in dividends, but even if it did we can all be profoundly thankful that it must be considered uneconomic in America today.

What we want in any industrial or other establishment, if we are to reach the highest point in productivity, is to have every individual use his or her highest powers to the best advantage. This is the final goal of scientific management. It is the goal both for the individual and for society. If you can picture a society in

which every unit is using his or her highest faculties to the best advantage, you will see that it approximates the millennium.

The moment you adopt this as a standard, however, you must frame your organization so that every employee from the humblest to the highest is given a chance to exercise his highest powers and to exercise them to the best advantage. He must not only not be hindered but he must be helped, and helped to the extent of having pointed out and developed faculties and powers of which he may have been unaware. Under scientific management we think we are learning how to do this. Alfred Marshall has called attention to the fact that perhaps half the brains of the world are in the so-called working classes and that "of this a great part is fruitless for want of opportunity." Under the new methods of scientific management this great storehouse of wealth will be tapped, not we hope for the benefit of the few, but for the benefit of all.

To define scientific management is no easy task. Hugo Diemer, professor of industrial engineering at Pennsylvania State College, says, in a recent book, that Mr. Taylor

considers a manufacturing establishment just as one would an intricate machine. He analyzes each process into its ultimate simple elements and compares each of these simplest steps or processes with an ideal or perfect condition. He then makes all due allowances for rational and practical conditions and establishes an attainable commercial standard for every step. The next process is that of attaining, continuously, the standard, involving both quality and the interlocking, or assembling, of all of these primal elements into a well-arranged, well-built, smooth-running machine.

Mr. Taylor says that the philosophy of scientific management is embraced under these four principles:

First: The development of a science in place of "rule of thumb" for each *element* of the work.

Second: The scientific selection and training of the workman.

Third: The bringing of science and the scientifically trained workman together through the co-operation of the management with the man.

Fourth: An almost equal division of the work and the responsibility between the management and the workmen, the management taking over all work for which they are better fitted than the workmen, while in the past almost all of the work, and the greater part of the responsibility, were thrown upon the workmen.

Quite informally, scientific management may be thus defined:

a) It is a definite working policy applicable wherever human effort is put forth.

b) It is the introduction of the laboratory method in everyday affairs.

c) It is the acceptance of the dictates of science instead of those of personal opinion and tradition.

d) It is the establishment of the fact that not to know is no crime—that the crime is not being willing to find out.

e) It is a type of co-operation more intensive than the world has yet seen.

f) It is filling in—not bridging—the chasm between capital and labor.

g) It is making our industrial life square up with the best we know in our personal and social relations.

h) It involves a very radical change in the attitude both of the men and the management to the work on which they are mutually engaged.

My task is not to deal with the technique which grows out of the adoption of Mr. Taylor's four principles. It is rather to reflect the spirit in which they must be applied if they are to be true agents of efficiency, and then to show how when they are so applied they enhance the joy of living.

Practically everything that is done in developing scientific management in an establishment has for its object the setting of tasks. We have tried to avoid the use of this short and, to some, rather disagreeable sounding word, but the language does not seem to afford one that better describes what we have in mind. A task with us is simply a fair day's work and—let us not forget—one which can be repeated day in and day out, year in and year out, if necessary, without detriment to the physical, mental, and moral well-being of the person performing it. Unless you are able to set tasks, you cannot have scientific management. Now, to set a task requires more than a stop-watch. Before the stop-watch, or before any of the other mechanisms that are found useful in management, comes the building-up of a spirit of mutual confidence and helpfulness. To make my meaning entirely clear, let

me say that we never use a stop-watch on an employee except practically at his own request. I do not mean that we wait until the request is framed in so many words, because a good many people on whom we have used a stop-watch with a mutually satisfactory result cannot speak our language. Some of those who can speak our language might *think* the request, without the ability to formulate it in words. Anyone who arbitrarily uses a stop-watch, or any other such mechanism, for getting more work out of an employee, without having in mind that employee's greatest prosperity, and without doing it as much, or more, for the benefit of the employee than for anyone else, is a menace to society.

This place which the stop-watch has in scientific management simply illustrates our attitude toward the workers. We are all workers from the president of the company to the office-boy and the porter, and each one has to be individualized. You cannot have scientific management in one part of an establishment and not have it practically throughout. You cannot have one group of employees impose it on another group. You cannot have "fake" co-operation. To have the president of the company hold that his personal opinions and whims are to be taken into consideration, but that the vice-president and all the rest are to live by law, is to have an unworkable proposition. We do not ask anybody to accept our personal opinions, nor will we accept those of others. Facts must determine each question as it comes up. If you haven't the facts you must get them, whether they can be secured in five minutes at no expense, or whether it takes thirty years and the expenditure of hundreds of thousands of dollars, as it did in the case of the development of the slide rules for machine tools.

I have said that scientific management means the individualizing of the workers, and herein lies the heart of its social significance. As long as William Smith and Molly Brown are simply two units in a group of two hundred, one thousand, or five thousand employees, the individuality and individual welfare of these two workers is of very little moment. When, however, you set out to get from an industrial establishment its maximum production, made up as it is of the maximum production of all the William Smiths and all the Molly Browns, you will never get it unless you study each of them individually.

You must see in the first place that the rewards for high efficiency are not only full, fair, and accurate, but that they follow satisfactory completion of the work in the shortest possible time. It is not enough, as is the case in the profit-sharing plan, to have it come as a bonus at Christmas, twelve months after some of the work was done. Nor does it make for efficiency that Smith gets his whether he had any share in bringing about the result or not. The average job under scientific management takes about three hours to perform. The worker must receive his or her reward for a job efficiently performed within twenty-four hours of its completion. To bring this about requires a type of co-operation and a degree of co-operation that will come only as the result of the most farsighted and kindly interrelation between the different individuals who make up an industrial or other establishment. It is not the kind of co-operation that you get up in a selling force by bringing the men together in a room and filling them full of enthusiasm for increased sales. It can be brought about only after years of effort and following constantly a policy of something more than the square deal. Any effort to introduce scientific management in the absence of a genuine and painstaking co-operative spirit is utterly impracticable.

Scientific management must be relentless in seeing that each worker receives his or her reward and only for work efficiently performed. We must regulate the benefits according to the services rendered. Any system that tries to average up rewards is doomed to failure. At the same time it is the constant aim of scientific management to organize itself so as to be able to help, in the broadest fashion, those who are temporarily or permanently below the average, to be as largely productive as such farsighted assistance can make them. Yet this is not welfare work we are discussing. It is something so immeasurably superior to the best grades of welfare work that the two cannot be compared. It is something that is entirely self-supporting because it really means something to the workers.

Again, scientific management demands the entire elimination of the military system of control. The military system, of course, we inherit from the days when everybody had to "fight for it." It was designed in order to mass one's greatest strength at a given

place at a given moment of time. An industrial establishment is not operated for this purpose. What we are trying to bring about in industrial establishments is a steady, even flow of work, done under the minimum of tension and with the least possible discomfort and disorder. We find that to do work under these conditions the military system has no place and that we must functionalize. Under the functional system a man can take orders from more than one person; in fact, most of our work people take direct orders from eight different people, known as functional foremen. Let me show this by describing that functional foreman whose work illustrates my part of this subject perhaps better than any other. We call him the shop disciplinarian. Under scientific management only one man in the establishment has the authority to discipline employees and he disciplines anyone who may need it. The beautiful part of this is that after you have your disciplinarian appointed and the shop reasonably well organized on scientific management lines, the disciplinarian rarely has anything to do. The reason why he has nothing to do is that after he has been at work for any length of time it gets to be "good form" in the shop not to give him any work. The workman who is uncivil to his mates loses standing. As long as the military system is in control, the man who has the rank usually administers more or less discipline to everybody underneath him and this develops resentment and reaction. Altercations are frequent. With the military system it is usually the under dog that gets discharged. After the disciplinarian is installed and you issue instructions that when two workers get at loggerheads they are to send for him, it seems to take all the fun out of it. The disciplinarian is picked because he has good judgment and knows how to smooth out difficulties. In other words, he is a specialist.

Functional management leads ultimately to the democratization of our industries. Whether it be in the city or in the state or in the nation, we are finding out that democracy will not work with a few men controlling all operations, no matter how competent, farsighted, and amiable the few may be. Democracy in government means not only the rule of the people but the participation by the people in their government in the largest possible fashion.

In an industrial establishment the doing-away with the military control, and especially the functionalizing, makes every worker share, according to his ability, in the conduct of affairs. In other words, after scientific management has been introduced, the shop is run by the collective intelligence of the many, rather than under the "I say so" of those who, in the language of the day, own the business. Under this scheme the employees become more attached to a business. There are infrequent changes in the personnel and this aids very materially in wise administration.

After you have individualized your employees you are not entirely without interest in what they do when they are not at work. It is the experience of every man who has set tasks and watched any considerable number of workers perform them, that sometimes they fail to earn their reward, which we call the bonus, and yet no reason for this can be found in the shop. Nine times out of ten you will find a sick child or wife at home, the worker in debt, or some other purely personal reason for working below par. Working without the closest spirit of confidence and co-operation, no opportunity is afforded for finding out these sources of inefficiency. On the other hand, it is only after your organization is working under the conditions of an industrial family that it becomes almost impossible not to know that this man or woman is in debt, that another has sickness at home, or has some other cause of anxiety.

Then you will find that there are a hundred and one kinds of questions which you ask employees before hiring them that you never thought of asking before. There are under this kind of relationship a hundred and one things that you have in your mind as possibly affecting your employees that you never gave thought to before. I can take you to cotton mills in New England where they hardly stop the machinery when a man loses his arm and where the level of morality among employees of both sexes is at a very low ebb. Compare this with a scientifically managed plant, where it is almost as hard to hide sickness and distress as it would be in your own families. It is the duty of an industrial family—not necessarily of the one individual whom we call the employer—to see to it that the level of morality is high and always going higher. This makes

for individual efficiency and prosperity; and we are finding out more clearly every day that group prosperity is not possible, without individual prosperity. High wages there must be, but high wages must be accompanied by efficiency or they will avail but little.

Any establishment in which scientific management is being developed must necessarily be an educational institution. If you individualize your employees you must let them rise as far as their physique and mentality will permit. You cannot have annoyed and disaffected employees. We have only two classes of people. There are always those who have reached the limit of their capacity and know it and want to be let alone, fully realizing that they are better off working for you than they could possibly be working for anyone else. The only other group are those who are growing, those who have not yet reached their full capacity. These you must help in every possible way, and if their line of best advancement does not lie within your establishment you must make it one of your most important duties to see to it that they get this chance for advancement somewhere else. Here is one of my principal criticisms of railroad management. The railroads are especially likely to have a third class of people, who have never had what they consider a chance—men who have advanced so far and then have stood still for no reason upon which you can lay your finger. These men feel, whether rightly or wrongly, that they have within them the possibilities of further growth. These men are invariably “against the government,” and are a source of weakness in any organization. Something is wrong here. Either they were badly selected or they have been badly trained, or some time since they should have been given a chance elsewhere. Perhaps it is a little of all three.

This paper would be incomplete did I not refer to the attitude of scientific management toward criticism. My eyes were opened to the novelty of our position toward constructive criticism by the way in which my report on *Academic and Industrial Efficiency* was received by the colleges, and more recently by the attitude taken by the railroad world toward scientific management. We feel that everybody in the establishment, from the office-boy up—and those out of the establishment for that matter—should be given the

widest opportunity for making suggestions and criticisms. Suggestions that are in any way adopted should be fairly compensated for. The truth is that after scientific management has made any material progress in a plant it becomes increasingly difficult for those not making a special study of any given matter to make suggestions in regard to it. This does not change our attitude toward the desirability of constructive criticism. We are on our knees begging for it, and the man or the woman who takes the trouble to criticize us most freely and frequently is our best friend. It is a far cry from this attitude toward that which obtains in many establishments—I suppose in the majority of establishments—where an employee is liable to be discharged for constantly making suggestions. We do not see in constructive criticism any of the elements of fault-finding. Surely until we are willing to face the truth in our industries, let it come from where it will, we cannot even begin to allege that we are being scientifically managed.

I have said that scientific management is not something that can be bought in a box. Nor can you lay it on like a suit of clothes. You do not "get it" as we are told one gets certain varieties of religious experience. The truth of the matter is that scientific management *gets you*. If one could casually introduce scientific management in an establishment, much as one would introduce a system of bookkeeping, it would hardly warrant our giving it very much attention. Scientific management can be developed in any group of people only through a course of individual and collective discipline that must last over a long period of years.

Finally, let me say that there is nothing to prevent scientific management from becoming a nuisance—even a menace—in an industrial community. But the same criticism can be made of democracy—even of Christianity—if either is allowed to drift from a genuine purpose or into the hands of charlatans. In my opinion, we shall never fully realize either the visions of Christianity or the dreams of democracy until the principles of scientific management have permeated every nook and cranny of the working world.

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