to have to settle itself without undue friction. All the more reason for giving it time. To keep in touch with the efficiency of the interested merchant, to keep the accounts straight and to control the results seemed all sufficient. This is what they were content to do for more than half a century, and industry's marvelous development at that time can be attributed to the practical use of this method. With the aid of the steam engine, a good stock of tools made it possible for a shop to increase the number and the quality of its products in enormous proportions. Transportation facilities developed extraordinarily and the resources of immense continents were exploited whose conversion into wealth would have been impossible without the aid of the railroads. The most diverse activities sprang up all over the world and a satisfactory state of equilibrium seemed to exist between them. However, it was too soon to conclude that this would continue to be true.

During the first decades of this new era it was easy to distinguish between industrial countries and agricultural countries, and consequently it was easy to exchange their respective products. But that could not last long. Industry developed, so to speak, in every country, even in those which possessed the greatest agricultural resources, and the exchange of merchandise between countries became extremely difficult and in certain cases quite impossible. Now every commercial transaction must be liquidated in the final analysis by an exchange of goods, gold being a particular kind of merchandise whose principal function is to re-establish the equilibrium when the exchange of other goods cannot accomplish it.

Today the markets are extensive and supplied by such powerful means of production that, lacking an organization able to coordinate its use, the flow of goods is subject to variations of a disconcerting importance and rapidity, occasioning great disturbances in industry. Individual effort, whether industrial or commercial, can no longer depend on its own initiative to point the way to success, and it is necessary to turn for assistance to groups capable of directing it.

But in order that the advisers whose assistance is required, whoever they may be, shall function efficiently, so that the shop may promptly turn its attention to whatever manufactures are considered the most useful or advantageous, there must be great adaptability in the shop. It must make the very best use of all of its resources and of its machinery and especially of its men. Which is to repeat that the economic equilibrium of industry depends on good shop management, the objective of all Taylor's efforts.

Bastiat was almost alone among economists in his faith in natural organization, or rather in the absence of organization. Among those who have shared a more enlightened view may be cited again the eminent engineer-economist Le Play, who had so much influence in France. In his work entitled "The Essential Constitution of Humanity" he writes as follows: "I was determined on one essential point, a recognition that in social science, as in the science of metals, I shall not believe myself in possession of the truth until my conviction can rest on an observation of facts." This sentence shows a remarkable community of thought between two men of great distinction, and by a curious coincidence both of them make the science of metals and social science march hand in hand. They came together, however, from two opposite points of the compass. Le Play first received a scientific education and turned his attention towards the positive knowledge of facts after finding that economists proceeded from much too uncertain premises to establish the calculus of probability with which they were satisfied. Taylor's point of departure was the fact. He insisted on studying it to the last degree, using the scientific method, and he was struck by the importance of the deductions which could be drawn from it. He also contributed to the science of political economy, but by giving it a new turn. He administered the last blow to a calculus of probabilities based on unintelligent statistics and substituted the differential calculus and integral calculus.

When Taylor said that France was the country which would make the best use of his ideas, he certainly expressed a sincere conviction to which great importance should be attached. He was not a man to use a diplomatic commonplace or an expression of banal politeness. Such things were foreign to his nature, tact itself being a doubtful expedient from his point of view. But during the sojourn which he had just made in our country he had observed that eminent Frenchmen had been calling aloud for some time for a man to introduce the scientific method into the shop and without undue presumption he had a right to think that he was, indeed, the man whom they were describing.

Among his precursors is Perronet, well known in American scientific management groups by the quotation which Babbage gives from a table about the operations conducted in the manufacture of pins which must have been established in France in 1760, and have resulted in the observations made by M. Perronet. This reference would lead one to believe that it had to do with an unimportant Frenchman and with a negligible observation. Now Perronet, who is justly entitled to be counted among our great men, was far from an unimportant Frenchman. He was the father of our great public works' engineers, the first scientific engineer in the modern sense of the word, officially entitled in his time "the first engineer of France," a title of the greatest distinction. His opinion of the work on the manufacture of pins has therefore great weight. But although he paid very particular attention to this work he was not the author of the first study which was made of it, the origin of which is exceedingly interesting.

This study already figured, in the form cited by Babbage, in the edition of 1755 of the "Grande Encyclopédie de Diderot et d'Alembert" which says that it was made under its direction by M. Delaire, "who was describing our organization for the manufacture of pins in factories at the same time that he was having printed in Paris his analysis of the sublime and profound philosophy of Chancellor Bacon, a work which in connection with the preceding description proves that a great mind can at times equally successfully rise to the most lofty contemplations of philosophy and descend to the most minute details of mechanics. For the rest, those who know a little of the point of view of the English philosopher when he wrote his books will not be surprised to see his disciple passing without condescension from the general laws of nature to the least important use of its productions."

Among the many descriptions of trades contained in the Encyclopedia that of the manufacture of pins was particularly remarked by scientists and philosophers because its author knew how to show the great number of absolutely distinct operations and the division of work better than the man who had been responsible for describing the manufacture of needles had been able to do. It is doubtless the knowledge of this description which led Adam Smith, who was in close touch with the Encyclopedists, to formulate in 1776 the very important principle of the division of work, but it was Perronet who sought particularly for its practical application.

Perronet is the author of the first scientific study on the construction of stone bridges. We owe to him the modern type of bridge with the flat arch and straight apron. Indeed, there is not a city or river in France where bridges built either by Perronet himself or by his associates or pupils cannot be found. His reputation spread over all Europe and he did important work abroad, a bridge over the Neva being particularly notable. All the work which he does or which he superintends he studies in the minutest detail, submitting it continually to measurement or to experiment to establish the suitability of the materials, the number of men necessary for the different operations, and the cost of production. He predetermines the tasks when he can, and regulates the rest periods of the hand laborers working the pumps.

The progressive stages of a bridge, whose building must take several years, are exactly determined for each operation before beginning the work. He foresees the natural hazards which will impede the progress of the work, and the changes in the general plan which are bound to result. With great care he keeps notes of the actual conditions as they develop, parallel with his previous schedule. He makes use of every scientific help, but he always verifies it, and one may rest assured that if the description of the work of the manufacture of pins attracted his attention, he confirmed the study which had been made of it in every particular. He seems to have been especially impressed in this matter by the stretch of the metal in the drawing of the wire and to have made several experiments along these lines. He may be said to have created standards for the building of stone bridges, based on scientific principles, especially in everything that has to do with the materials which he used.

But he was also the real founder of the Bridge and Highway Engineers, whose organization was assured by l'Ecole des Ponts et Chaussées, which he created in 1767. Thanks to the growth of this body, engineers acquired a social recognition in France which they did not have in any other country and they have held an important place in the councils of the state ever since. When in 1794 Napoleon founded l'Ecole Centrale des Travaux Publics, afterwards called Ecole Polytechnique, it was l'Ecole des Ponts et Chaussées which furnished the principal members to the organizer, Gaspard Monge. He was a distinguished scholar who also shows a curious analogy to Taylor, for the work by which he is best known is his Principes Scientifiques de Stéreotimie (The Art