

The three foregoing articles may be found in one volume entitled "Scientific Management," edited by C. B. Thompson, Harvard University Press, Cambridge, 1914. It is recommended that in order to avoid confusion the reader pay no attention at this time to other articles contained in this volume.

4. "Frederick W. Taylor, Father of Scientific Management," A Biography, by Frank Barkley Copley, Harper & Brothers, New York, 1923. This is recommended not so much for the interesting picture that it gives of the man, but for the help that it gives in understanding his work.

5. "The Principles of Scientific Management," by F. W. Taylor, Harper & Brothers, New York, 1917.

6. Preface to the French Edition of "The Principles of Scientific Management," by Henri Le Chatelier, translated by Eleanor Bushnell Cooke. This may be found in "Scientific Management," edited by C. B. Thompson (referred to above).

7. "The Origin and Nature of Scientific Management," by H. S. Person. This is Chapter I in "Scientific Management in American Industry," Harper & Brothers, New York, 1929. The reader should disregard all other chapters in this book for the present.

8. Taylor's testimony in "Hearings Before a Special Committee of the House of Representatives," 1912, reprinted in *Bulletin of the Taylor Society*, June-August, 1926.

Let us now consider what elements are essential to the mechanism of a complete application of scientific management:

1. A plan of organization starting with the chief executive of the business, with clearly defined functions, responsibilities and inter-relationships.

2. A mnemonic classification for the business.

3. A system of periodic reports serving as tools in the hands of the general manager.

4. An accounting system designed to fit in with all other elements of the system of management, primarily with a view to making it useful as a tool of management.

5. A flexible budgetary system providing standards comparable to those established for production, for each class and sub-division of indirect expense under varying operating conditions and for various volumes of business.

6. A purchasing system co-ordinated with and serving the needs of engineering, manufacturing and finance.

7. A system of market and sales analysis co-ordi-

nated with a system for planning and control of sales activities.

8. A system for the planning and control of product development and improvement.

9. A system for the planning and control of engineering or its equivalent.

10. Standardization of plant equipment.

11. A system for receipt, storage and delivery of all materials.

12. A system for planning and control of production, from receipt of a customer's order to its shipment, whether the product may be drawn from stock or must be specially manufactured.

13. A system for maintenance of plant and equipment, involving the principle of prevention of breakdowns and interruption of operation, through planned and scheduled inspections, adjustments and planned major repairs.

14. A properly graded schedule of salaries and wage rates based upon the nature, importance and responsibilities of occupations and positions.

15. An incentive pay system with accurately set tasks or production standards based upon method and time study.

16. A system of employee records coupled with a definite plan for development of men designed to advance them in position and pay as they become qualified and circumstances permit.

Each of these elements must be so designed as to fit in and function harmoniously with all others, like the parts of a watch; otherwise their presence in a business does not constitute scientific management. Lack of co-ordination and disregard of principles characterize most of the present applications of the mechanisms of scientific management.

In regard to mechanisms Taylor said:

The history of the development of scientific management up to date, however, calls for a word of warning. The mechanism of management must not be taken for its essence, or underlying philosophy. Precisely the same mechanism will in one case produce disastrous results and in another the most beneficial. The same mechanism which will produce the finest results when made to serve the underlying principles of scientific management, will lead to disaster if accompanied by the wrong spirit in those who are using it.*

Perhaps one of the principal obstacles in the way of a general adoption of true scientific management is the time required to develop and put in force a system for its application and to effect the necessary changes

*Taylor, F. W., *Principles of Scientific Management*, pp. 128-29.

in organization. This is not due solely to the physical changes and work involved, but fully as much to the fact that considerable time, together with patient teaching, is required for the people affected to change their habits of thought. As Taylor said, "The development and establishment of the various elements of the mechanism should go on as rapidly as may be possible," but "On the other hand, the really great problem . . . in a change to scientific management consists in a complete revolution in the mental attitude and the habits of all those engaged in the management, as well as of the workmen. And this change can be brought about only gradually, through the presentation of many object lessons to the workman, which together with the teaching which he receives thoroughly convince him of the superiority of the new over the old way of doing the work. This change in the mental attitude of the workman imperatively demands time. It is impossible to hurry it beyond a certain speed. The writer has over and over again warned those who contemplated making this change that it was a matter, even in a simple establishment, of from two to three years, and that in some cases it requires from four to five years."

It is not only the workman to whom this applies. It has been my experience that it is frequently true in the case of officials, department heads, salesmen, accountants and supervisors.

After having paved the way for scientific management by an educational campaign, the most important thing to success is to find a competent man to direct the undertaking. On this point Taylor said:

Inasmuch as the writer has personally retired from the business of introducing this system of management . . . he does not hesitate again to emphasize the fact that those companies

**Op. cit.*, p. 131.

IT SHOULD be noted—a fact of transcending importance—that the ability to control huge multiplant enterprises through harmonizing of centralization and decentralization is possible only where there is a preceding progressive development of scientific management in every lesser area of an enterprise; in unit operations, production in general, merchandising, general administration and human relations. It is the splendid fruit of these basic developments. Controls of such huge enterprises is dependent on controls

are indeed fortunate who can secure the services of experts who have had the necessary practical experience in introducing scientific management, and who have made a special study of its principles."

In "Shop Management" Taylor also said that the task of this man is "a difficult and thankless one."

Personally, I have always felt that the best and most lasting results were achieved by bringing in from the outside as few assistants as possible. In practically every organization there will be found ample talent which can be developed and utilized by the man directing the undertaking. I also feel that any assistants whom it may be necessary to bring in from the outside should be directly in the employ of the company. During periods when I have been simultaneously directing the introduction of scientific management in several companies I have found it advantageous to secure for each client an experienced man who devoted his full time to the work and to have someone thoroughly conversant with the particular business delegated from the client's organization to co-operate with him.

As Taylor put it, "To decide where to begin is a perplexing and bewildering problem." Under ideal circumstances, I should prefer to attack the fifteen elements listed above in the order given, but usually some peculiar condition or pressing need prevents following so logical a course. Development should be going on simultaneously at several points. In this series of articles I shall discuss each element, the mechanism associated with it, and its relation to other elements, and shall follow the sequence of subjects listed here.

**Ibid.*, p. 132.

*Taylor, F. W., *Shop Management*, Harper & Brothers, New York and London, 1911, p. 135.

throughout every unit of the enterprise; the larger the area of control, the more essential is control in every constituent unit. Therefore effective rationalization of an entire industry, or of all industry in a nation, is possible only to the degree that the constituent plants are scientific-management plants.

(H. S. Person, *Scientific Management as a Philosophy and Technique of Progressive Industrial Stabilization*, World Social Economic Congress, Amsterdam, 1931, page 38.)