

easy to make sweeping assertions as to factory work and to advise workers to leave their jobs on the slightest pretext of ill health, but professional men, above all, must realize, not only the difference that exists between industries, but also between various establishments in any one industry. The giving up of a job, even temporarily, is a matter of very great moment to the worker, and we question the right of any one's assuming the responsibility of giving such advice without thorough investigation.

6. By reason of the tremendous increase in the productivity of the worker which results under scientific management it has been accused of injuring the health of the worker. Scientific management not only recognizes the basic value of continuity of employment and longevity of the worker, but represents the only scientific attempt to increase production through the conservation of his health and effort. Although this may be contrary to popular conception, scientific management, nevertheless, obtains increased individual output, not by drive, but by the elimination of waste.

7. It is erroneous to assume that speed affects the health of the worker. Speed in itself is not injurious. Under scientific management it is the result of improving conditions of work which under ordinary management tend to contribute to his ill health. There are conditions under which operating at half the best possible speed is more fatiguing and more injurious to the worker's health than operating at the best possible speed under proper conditions. As a matter of fact, when conditions have been properly standardized and operations are taught by an adequate system of instruction, motions become reflex. It is well known that reflex motion is not only essential to the best possible speed, but requires a minimum of physical and mental exertion. We call your attention in this connection to the statement of the eminent psychologist, Professor William James. (*1)

"Habit simplifies the movements required to achieve a given result, makes them more accurate and diminishes fatigue."

8. The enormous saving of time effected under scientific management not only results in increased achievement, but also makes it possible and profitable to bring about that generally desirable end,—the shortening of hours. Greater achievement makes possible the payment of the higher wages of scientific management and at the same time the shortening of hours without increasing the cost of production. Fatigue is not only minimized by the reduction of the hours of work, but also by the conservation of effort while at work. Scientific management

directly concerns itself with the elimination of all factors of fatigue. To quote from a recent work on fatigue study. (*1).

"Even where fatigue is not materially cut down during working hours, because measurement shows that the worker is not getting overfatigued, the general health is apt to improve because of greater regularity in habits of work, and because of better physical and mental habits, while doing the work. The path along this line is a continuous, never-ending, upward spiral. Fatigue is eliminated by establishing proper habits. Proper habits improve health. The improved health allows of more work with less fatigue, etc."

9. Under scientific management not only the physical condition of the worker in relation to his work, but also the physical conditions under which he works are made subjects of scientific study. A study of proper ventilation, lighting and sanitation results in a direct effect upon the quality and quantity of his output. The management must assume not only the responsibility for standardizing and perfecting these physical surroundings, but all other conditions relating to the work before it can proceed with the standardization of the job itself with a view toward scientifically setting a task for the worker. Standardization of tools and equipment by means of time study and other research methods of which the primary object is to eliminate unnecessary effort on the part of the worker—is an essential step in the increase of output. Materials also must be controlled by means of a proper routing system in order to insure an uninterrupted supply of work. By these means alone it is not uncommon under scientific management to effect an increase in output of 100 per cent or more, while lessening, rather than increasing the effort expended by the worker. Finally when time and motion study is applied to the job itself, the efforts of the worker are still further conserved by the elimination of wrong or unnecessary movements and by setting a definite, accomplishable task. No one realizes the amount of hopeless effort which is expended by the worker, or the amount of time and output which is lost because of neglect of these important factors under irresponsible management.

10. Speaking of scientific management, Josephine Goldmark, in her exhaustive study on "Fatigue and Efficiency" (*2) says:

"The new organization of work has brought also a new emphasis upon the workers' physical surroundings. All those physical inconveniences which waste human

*1"Fatigue Study" by Frank S. and Lillian M. Gilbreth. Page 43. Pub. Sturgis & Walton Co., 1916.

*2Pages 201-202-203. Russell Sage Foundation.

*1James' Psychology. Vol. 1. P. 102.

strength and comfort and which are common rather than uncommon characteristics of our workshops,—such as bad air, bad light, overcrowding, dirt, and unsanitary conditions,—are all marks of inefficiency in the management. They are intolerable to the system which is based essentially on the observation and study of cause and effect. Where the ordinary management sees in the crudest so-called "welfare work" (better light, air, sanitation and comfort) merely concessions to the labor force, the engineer sees them as indispensable parts of the equipment. They are the mere commonplaces of efficiency, without which the accomplishment of predetermined tasks cannot be expected.

"Scientific management obtains its marvelous results not only by teaching the worker the best possible way of accomplishing his task with the least time and effort, but also by removing all possible external obstacles. The management has, in advance, perfected his equipment and sees that it is always in perfect order and that the worker is regularly supplied with material in perfect order and condition.

"One of the chief aims has been precisely to regulate the flow of work so that it shall be even and continuous". . . . Compared with such a regime, the crudity and chaos of ordinary systems stand out in glaring contrast. A revolution has been effected; a terrible waste has been checked, of that capital which alone is common and equal, for all mortal beings: of time. . . . Hitherto hours, days, and weeks of employment have been habitually lost to the workers through no fault of their own, but through the sheer incompetence of the management in performing its obligations and supplying materials and equipment fairly. No page in industry's history is more dreary and disheartening than the 'time lost' by competent and willing workers, waiting, unpaid, for employment which might be fairly regularized. Indeed, the daily delays and irregularities of work involve more than the direct loss of wage and earning capacity. They are more subtly interfused into the day's work; and the psychological gain which springs from the elimination of such daily annoyance and friction is undoubtedly an important factor in heightening working capacity under scientific management."

11. This brings out another important factor relating to the health of the worker. The psychological result which springs from the elimination of daily annoyance and friction is, as Miss Goldmark states, of vast importance in heightening working capacity, but is of even more significance in its effect upon the health of the worker. Scientific management replaces

the old system of bosses with its petty annoyances and injustices by a system of functional foremen who are responsible for the development and training of the worker in all of his various functions. This functionalizing implies the assumption of direct responsibility by the management for all conditions and activities, including the important one of personal relationship. This, as Miss Goldmark has said, assures to the worker the "elimination of daily annoyance and friction," of paramount importance both to his good spirits and his good health. In the words of the late Frederick W. Taylor, "More than all . . . close intimate cooperation and constant personal contact . . . will tend to diminish friction and discontent." (*1)

12. Mr. Gantt (*2) not only shows by graphic charts how the capacity of the workers is definitely increased under scientific management, but also points out a marked improvement in right habits of work, self-respect and good health. Too much stress cannot be laid upon the connection between mental and physical well-being. For this reason, alone, scientific management can be credited with being one of the most important forces contributing to the health of the worker.

13. Every one who has visited a plant where scientific management has been practiced for any length of time is immediately struck by the apparent good spirits and good health of the workers. If the individual records of the workers at the Clothcraft Shops of the Joseph & Feiss Company were investigated, they would reveal not only consistent evidence of good health, but also, in the majority of cases, a marked improvement. As evidence of the good effect of scientific management upon the health of the workers of this organization, attention is called to the comparative stability of its working force as shown above. Although a large majority of the workers are women, over one-third have been in the continuous employ of this organization for a period of five years or more. During the year of 1915 with an average standing payroll of seven hundred sixty-two, the average daily absences for all causes amounted to less than seven and one-tenth persons, or about nine-tenths of one per cent.

14. Scientific management has as its object the maximum of prosperity for both management and worker. This object is attained not only by safeguarding, but also by directly contributing to the health of the worker.

*1"Principles of Scientific Management." Page 143. Harper Bros., New York.

*2Gantt, H. L. "Work, Wages and Profits." Engineering Soc. 1911.