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ECONOMICS OF EFFICIENCY

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ECONOMICS OF EFFICIENCY

BY

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To

MY SON NORRIS

PREFACE

THE growing complexity of the American industrial system and the increasing keenness of competition have introduced a new era in business. Goods are produced and sold on small margins, and the extent of profits depends in a large measure upon efficiency. A new business science has grown up in our midst, and it may be called the science of efficiency. Efficiency is the watchword of future industrial progress, growth, and expansion. The nation which produces with the greatest efficiency will be the one which will lead the van of industrial nations. The business man who heeds the edicts of efficiency will be the one who will be able to produce at the least cost, and to command markets.

The aim of efficiency is the elimination of waste. The new science of efficiency bases business activity upon knowledge. Knowledge takes the place of guesswork and ignorance. Efficiency demands a scientific study of the different phases of work to ascertain how it can best be done with the least expenditure of energy, time, and materials. It is giving business a critical aspect, by making a study of how things should be done and how they are done. The chief aim of this book is to open the eyes of business men to the underlying principles of efficiency, to emphasize the importance of these principles, and to explain their methods and workings in such a way that all business men will profit.

NORRIS A. BRISCO.

NEW YORK,
Oct., 1914.

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ECONOMICS OF EFFICIENCY

CHAPTER I

THE ECONOMIC NEED OF EFFICIENCY

THIS is the age of industry. Industrial achievement is the aim and the goal of all civilized nations. National progress and growth are based upon industrial progress. Industrial advancement has been rapid, and to-day the world is progressing with greater rapidity than ever before. Developments and improvements in every niche of industrial life follow one another in rapid succession. They are the rewards of tireless industry, of superior ability, and of genius. American genius is second to none in the world. It has devoted itself chiefly to conquering the forces of nature, devising labor-saving machinery and devices, and making improvements in facilities of transportation and of transmission of intelligence. The last few years have opened a new field, and new problems have presented themselves for American genius to solve. This new field is industrial efficiency. Its borders have hardly been touched, and American genius must be directed to its domains. If so, the revelations which will result will be as astonishing as those resulting from the industrial revolution of the eighteenth century. American genius has not failed in the past, and will not in this case. The future promises in the new field of efficiency, industrial improvements and developments which will make the

Industrial efficiency, a new study.

industrial progress and growth of the twentieth century greater than the phenomenal record of the nineteenth.

Evolution of manufacturing.

Manufactures have developed, in less than two centuries, from mere hand and household industries to those of machine and factory. For thousands of years previous, goods for the satisfaction of all the wants of man were made in households, or in simple workshops adjacent thereto. During the early part of the eighteenth century, the worker performed his work in his own home, where he provided raw material, owned his own tools, furnished the motive power, which was his muscles, and was his own master. By the middle of the century, many changes in the industrial system had taken place, and considerable capital was used in manufacture. Merchants grew rich by furnishing raw material to workers, paying them at piece rates to produce finished articles, and selling these in markets. By this time, many experiments and successful attempts had been made to economize in production by the application of capital through labor-saving devices and machines. But the great mechanical inventions took place in the period from 1760–1790. This was followed by the discoveries of the application of steam power, and commencing with 1830, with marked improvements in facilities of transportation on land and water.

Development under the factory system.

The various inventions introduced so many changes in the industrial system that the process of change is called the Industrial Revolution. The workers were called upon to attend machines, and to work in workshops owned by the employer. The grouping of laborers and machines in buildings for the purpose of production is known as the factory system. The factory and not the home became the unit of production. With the increase of capital and the improvement of machinery, the factory made it possible

to manufacture goods in larger quantities, and of a more varied nature. New improvements in facilities of transportation opened larger markets, and to meet the increased demand, production on a larger scale followed. The development under the factory system made the modern business enterprise possible.

The factory system with its extensive use of machinery, power, and capital, combined with extensive division of labor, introduced new problems of administration. The small business enterprise with its simple organization and methods, so characteristic of the domestic system, gave way to the large business unit with its complicated organization and complex methods. Intensive organization became a necessity, and the independent worker of the domestic system became a part of an organization under the guidance of a new official, the manager. A clear and definite line was gradually drawn between managerial ability and labor. The laborer became a specialist, and was deprived of all responsibility except that of doing efficiently the task assigned him. The present industrial system has been a development from the simple organization to the complex, a process of evolution. Each stage of the development has been attended by labor problems, social difficulties, and class conflicts. The inattention of employers to the new problems has been the chief cause of the numerous clashes between workers and employers. Many of the clashes and much of the antagonism which now exists between the two great factors of production could have been prevented if employers had recognized from the beginning the proper place of labor in our industrial system.

The factory system and labor.

Labor and managerial ability.

The nineteenth century has been frequently called the century of the machine. Successful industrial man-

agement was concerned largely with obtaining greater efficiency through two sources: firstly, the acquiring of a more highly efficient plant through more efficient buildings and arrangement, and secondly, the acquiring of more improved and specialized equipment for the different processes. Production was greatly increased which necessitated more extensive markets. Manufacturers realized that industrial development was dependent upon markets. The question of markets has always been a fundamental one in industrial progress. Improved machinery and production on a larger scale drove the manufacturer to extend his field from the locality to the nation, and further improvements made more extended markets an absolute necessity. With the entrance of our commodities into the world's markets, competition became more intense, and the question of costs became more important, but during the nineteenth century, the average employer in his efforts to lower costs centralized his attention upon buildings, equipment, machinery, and methods. Near the close of the century, a few more enterprising employers had their attention attracted to the human element, the most important factor in production, and this attraction is the beginning of a new science of business, the science of efficiency, which is a secure and sound foundation for further growth and greater industrial progress.

Progress and markets.

New science of business.

It is astonishing that it was hardly more than a quarter of a century ago that employers realized that men and not money were the determining factors in commercial and industrial undertakings. Three important problems enter into production, the material, the machine, and the labor. The keen competition arising from entering foreign markets drove manufacturers to tax their ingenuity to devise

Three problems in production.

methods for lowering costs. Attention first turned to improved machines, equipment, and economies arising from large-scale production. The closer study demanded by increasing competition made clear the limitation upon machines and equipment. Attention was directed to the labor factor, and business men then recognized the importance of the human factor. This factor, so long neglected, has come into prominence as the one to be depended upon to lower costs, make possible successful competition, and pave the way for greater industrial growth and expansion. The human factor is the most difficult one in production, and the most important in the keen competitive activity of the present industrial struggle.

Attention to the human factor.

Machines have been given special study since the introduction of the factory system, but the human factor has been neglected. Machines depend for their output upon the labor attending them, and the worker does the real work of industry. Why should he not be studied to ascertain, as in the case of machines, if wastes exist, or if better methods can be devised for doing work, so as to increase the output with the same physical and mental exertion? Economic necessity in meeting competition drove manufacturers to pay attention to the human factor, and to give it closer study in order to devise methods of lowering costs, so as more successfully to compete in home and distant markets.

Human factor long neglected.

Manufacturers were amazed at the extent of the wastes which were found in their plants. Wastes of material, time, and energy were found everywhere. A prominent manufacturer declared that they were getting only about 50 per cent of the ability of workmen in their factory. Another stated that few shops produced more than 60 per cent

Extent of wastes.

of the work that it would be possible for them to produce with the same working force and the same physical equipment. The chief problem which arose was how to eliminate these wastes. How can an industrial country hampered with the presence of wastes compete with one with the wastes partially or nearly wholly eliminated? It is impossible. It is a dollars-and-cents proposition, and when manufacturers realize this, they will pay heed to the conditions existing in their plants, and make endeavors to eliminate as much waste as possible. The goal is the obtaining of the greatest possible output of the highest quality, and with the least expenditure of material, time, and energy, but at the same time not in any way impairing the health of the workers. The work of studying conditions of material, machines, and labor to ascertain methods for reaching the goal and of putting the methods into practice is called efficiency. Efficiency is the goal in industry. The nation which nearest approaches this goal in its industrial and business pursuits will be the one which will lead the van of industrial nations. Efficiency enters every field of business activity and is not confined to manufacturing enterprises. Efficiency methods will make this nation the greatest of all industrial nations, and in an enterprise will be the greatest guarantee of success.

Problem to eliminate wastes.

Efficiency, the goal.

Human activity is the most valuable of all factors which enter into our business life, yet until recently, less than two decades ago, little or no systematic thought was given to the protection and the conservation of the human element in business. The greatest of all wastes is that of labor. It is all the more serious because it is the human factor which is being wasted, and this factor has always been, and

Greatest of all wastes, that of labor.

will always be, the greatest factor in every branch of business activity. What a saving would result to this nation if we could eliminate, say, 10 per cent of the wastes of the human element, and how much it would mean to laborers if we could increase the percentage to forty! Such saving would not demand a greater expenditure of energy, but a better directed energy. Manufacturers would also profit, as it would lower their costs of production, and would place them in a position more successfully to compete in foreign markets.

The elimination of wastes is the greatest problem in every form of business activity. Wastes are found in every factor of production. The greatest exist with the human factor, and the most difficult place to save waste is with this factor. This presents the most serious and the most difficult problem confronting business men. The new study of efficiency is concerned with the elimination of all wastes, but its most difficult task is the elimination of the wastes of the human factor. So overshadowing is the human factor that its study is the essence of efficiency. It is a dollars-and-cents proposition, and is of vital interest to every one engaged in business activity. Recently, the American people have been aroused to the need of conservation. Attention was aroused, and was focused upon wastes of forests, rivers, mines, and farm lands. No attention was given to the greatest waste, the waste of human beings, more terrible and appalling than all the others. This was unknown, and people were in ignorance of its extent, until necessity drove the business man to study the human factor in order to discover means of lowering costs.

The essence of efficiency.

Conservation of workers.

The most valuable resources of a nation are its own people, and it is only recently that employers are realizing this. Human hands and brains furnish the bases

of great industrial growth, and are the foundation upon which our future industrial extension will be based.

This nation should conserve as well as produce.

The most valuable possessions of a workman are his health, strength, and intelligence. The conservation of health and strength, the prolongation of working life, and the prevention of disease are problems which affect the nation at large, and every employer in particular. Human life is gradually being recognized as a business asset. Employers are realizing the fact that it is a cold business proposition, and that it pays to conserve the health and the strength of employees. It is a function of this industrial nation to conserve as well as to produce. Wastes should be eliminated. Goods should be produced in increasing quantities and at lower costs. Production should continue with the greatest possible saving of wastes, with the best utilization of natural resources, labor, and capital, and with the greatest conservation. Business men should realize that economic conditions have a great effect upon business activities, and the efficiency with which they are performed. It is the economist who in the future will prove the greatest friend of business men in solving the important question of efficiency. Business which is conducted by one part of society at the expense of another cannot be justified, and will not be tolerated under the new efficiency movement.

Labor should be conserved, directed, and given just and fair remuneration. Efficiency demands this, and

Efficiency not exploitation pays.

as soon as business men realize that exploitation does not pay, and that efficiency does, the relations between employers and employees will be less antagonistic, and both will find it to their advantage to work for their common interests. Our industrial progress will to a large extent depend upon our

conforming to the fundamental principles of efficiency. It is only during recent years that this has been realized by business men. This realization and efforts to ascertain and follow these fundamental principles is a dollars-and-cents proposition, and as such appeals particularly to business men. The chief aim of this book is to open the eyes of business men to the underlying principles of efficiency, to educate them to the importance of these principles, and to explain their methods and workings in such a way that all business men will profit.

Labor methods of the last century.

With the ignorance and the wastefulness with which our business was conducted throughout the nineteenth century, one marvels at our industrial growth and expansion. It is not long ago that each workman ground his own tools, and ran machines at rates that seemed to him suitable. No worker knew if work could be done better or faster, because he was supposed to go ahead with his task, and not to stop and try experiments. Skilled mechanics learned their trades by observing others work, taking what movements they thought necessary, and doing whatever appeared to their liking. The object was to learn to do a certain task, and little heed was paid to the question whether or not it was the best method. Each man was supposed to be the judge of his own speed. The average man simply worked fast enough to hold his position, and, if possible, to soldier and not be discovered. No attention was paid to protecting workers from machines, as they were supposed to keep out of the way, and if one was injured, it was usually blamed to the carelessness of the worker, and not to the negligence of the employer. With these conditions prevailing in the average business plant, is it a wonder that the progressive business man marvels at our industrial growth and expansion during the last century?

Management was lax, as everything was based largely upon guesswork. There was little knowledge of the general principles underlying organization, and the well-organized business was the exception. Little heed was paid to system, and the average manager kept the details of the business in his head. He was supposed to look after details, as well as important matters, and to get his information by observation. He laughed at system, and thought it hindered rather than fostered success. The only guide as to whether or not the business was prospering was the bank account, the ability to meet obligations. No knowledge existed as to costs, and no system of cost finding, or cost accounting was found. In regard to costs, everything was based on guess. Guess, haphazard, chance, and luck were the bases of conducting the average business, until recent years. Such methods work, if coupled with judgment and a more or less large margin between selling and cost prices. With keen competition and small margins they fail. They must be eliminated, and their places taken by cost-finding systems, by organization, and by knowledge in dealing with men, materials, and machines.

Lax methods of business management.

The expression "Knowledge is power" is one which has been handed down from antiquity. Knowledge is an absolute prerequisite of efficiency, but knowledge itself is of little avail in obtaining greater efficiency and business success. The proper use of knowledge is what is needed in business. Efficiency is obtained by first acquiring knowledge, and then making proper use of that knowledge. Knowledge as regards machines and equipment has been applied with varying success. The latter part of the nineteenth century showed great development in the acquiring and the applying of knowledge that obtained

Accurate knowledge and machines.

greater results from machines and equipment. The application of exact knowledge was during the last century confined to mechanical equipment. Little was done to obtain a knowledge of the human factor, the greatest factor in production. The neglect of this factor was due more to ignorance on the part of the employer than to anything else. Accurate knowledge should be obtained of the human factor in the various phases of business activity, and applied so as to obtain efficient results. The application of accurate knowledge to the human factor, as well as to the other factors of production, reduces human effort to a minimum and increases production with lessened exertion. The great problem confronting every business man is to furnish daily the prescribed quantity and quality of work in all its varieties by the most efficient methods, and with a minimum amount of capital locked up in work.

Scientific knowledge applied to the human factor.

Men should be studied as well as machines. Methods of modern science should be applied to the acquiring and the applying of accurate knowledge regarding the human factor in business. The value of scientific knowledge in industry has long been recognized, but the idea of applying it to ascertain what a man can do is new. The characteristics of the human element should be carefully studied and analyzed. Much has been done during the past decade, but the study is as yet in its infancy. With its present beginning, much is to be expected from the next few years. Many results have been obtained, but these are slight compared with what will follow. The study will not only benefit large employers, but all employers. The greatest benefit will come to the laboring class in general, as it will assure them proper working conditions, just wages, and higher standards of living.

Accurate knowledge should replace rule-of-thumb practices, and everything should be done intelligently and nothing left to chance or ignorance. Careful study and investigation of the human factor in all its phases should be made for the purpose of obtaining exact knowledge. Experiments for the purpose of discovering the best methods and ways for shaping action should be conducted with the greatest care. Accurate knowledge discloses wastes, but it requires further action to eliminate wastes. It gives conditions most conducive to health and work, but it remains for the employer to apply the knowledge, and to make the working conditions the best possible. Accurate knowledge discloses the best methods for the performance of a task, but training and coöperation are necessary to put these into practice. Accurate knowledge tells the best materials, machinery, tools, and equipment for work. Accurate knowledge discovers how best to conserve health and strength, and employers should be guided by such in looking after the health of their employees. Health is a prerequisite of efficiency, and everything which impairs health impairs efficiency. Employers should care for employees outside of the plant, as well as while working. The obtaining of accurate knowledge demands a careful analysis of the effect of working conditions, habits, and work in its various phases upon the worker. It demands a careful study of materials, machines, and equipment, so as to ascertain that which is best suited for performing the work to be done.

Accurate knowledge and the human factor.

Requisites for accurate knowledge.

Success depends upon the care taken in obtaining accurate knowledge, and upon the use which is made of it. A plant should be made to work under conditions, as near as possible, to what accurate knowledge

demands they should be. Actual conditions should be studied and changed to meet the demands of accurate knowledge. The conditions existing in thousands of plants are the result of ignorance, and much of the waste is due to the same cause. The obtaining and the applying of knowledge obviates guesswork, and eliminates much of the wastes which at present exist in so many of our industrial plants.

Success and accurate knowledge.

Each manufactured commodity found in a market is the work of many hands. The development of machinery made possible production on a large scale and, in its turn, greater division of labor to meet increasing industrial needs. Division of labor means the division of the processes of making a commodity into a number of separate processes, and intrusting the worker with the performance of one or two of these. A visit to any large factory shows a score or more separate processes in the making of a single commodity, which formerly was made entirely by a single individual. For instance, in the making of a ready-made coat there are thirty-nine distinct processes, and in the making of a pair of men's brogan shoes, no less than eighty-four. Production on a large scale and the extensive use of machinery make possible an effective utilization of every kind of individual capacity.

Development of machinery and division of labor.

The proper placing of labor and its proper guidance and training avoid waste of strength, and unite handwork and brainwork. Division of labor causes unskilled work to be performed by unskilled workers, and skilled by experts. Minute division of labor or high specialization is a prominent factor in our industrial system. The all-round worker has been displaced by the more or less specialized one. Chance, luck, and guesswork of the old

Brains and ability to do, requisite in business.

régime should be replaced by skill, the application of accurate knowledge, and efficiency. Specialization in industry and subdivision of labor assume a new importance. Brawn and muscle should give way to skill and intelligence. Brains and ability to do, and not stores of inapplicable knowledge, are the great needs of our industrial system. Inventions and improvements in endless succession are increasing the effectiveness of business activity. They are likewise increasing daily the demand for thinking men, — men with the skill and the ability to perform the work necessary for rapid industrial development. The necessity for economy in lowering costs in production has developed intricate, automatic, and highly specialized machinery to a remarkable degree, and is responsible for the present specialization and subdivision of labor.

Specialization in its broader meaning.

The underlying principle of specialization is division of labor, but it is broader than the ordinary meaning of the term "division of labor," because it is applied to machines and manufacturing as well. A quarter of a century ago it was common to find a plant making many forms of commodities. As markets were extended, and competition became keener, it was found that it was more profitable to concentrate production on fewer lines of work. The extended markets made it possible to dispose of large quantities of product. The lines were narrowed and specialization assumed another form. Formerly, the factory made within its walls all the parts of the article produced. Later, manufacturers found that they could buy many parts more cheaply than they could make them. Enterprising manufacturers soon found that if they would devote their time to manufacturing bolts, screws, tools, etc., and produce them in large quantities, they could produce and

sell at a profit to manufacturers using them in small quantities, at a price less than the consuming manufacturer could produce. Formerly, factories were in a large measure self-sufficient, with few exceptions producing every part of an article, as well as the tools used in its production, while to-day, as a result of growing specialization, it is hard to find a factory that is self-sufficient. Every factory depends upon many others, not only for raw materials, but also for its tools and many parts of the article or articles produced.

Specialization in the factory.

As competition became keener, and the business unit increased in size, the tendency towards greater specialization in the manufacturing plant constantly grew. Plants have not only become more specialized, but also machines and tools. The tendency towards greater specialization is as great with machines and tools as it is with plants and labor. In a big manufacturing plant, many of the tools and machines are especially designed for their particular functions and no others. The increased specialization of tools, machines, and plants has narrowed the work as compared with the old system. It follows that it tends to narrow the field of action of the men employed in a plant. A few years ago, a shoemaker measured his customer's foot and made the shoe, but to-day, with specialized machinery, the making of a pair of brogan shoes is divided into eighty-four different processes. Shoemaking is confined chiefly to the mending of shoes, and its place as a trade has disappeared, and instead there has arisen a highly specialized industry. Markets limit specialization. Specialization depends upon a large market, as a large product must be sold in order to make specialization possible.

Specialization in machines and tools.

Specialization of plant, machinery, and labor is a

feature of our present-day industrial system. Commodities are produced more cheaply than under the older methods, and this fact has attracted the attention of the manufacturer. The influence of the new methods has been the narrowing of the activity of the worker, and the requiring of more special skill of hand and head. It confines human activity to a narrower field, and has caused the disappearance of the old-time, all-round mechanic. The concentration of efforts either mental or physical upon a narrower field of activity increases skill and output. The extensive growth of our business unit and the high degree of specialization in our plants made it difficult for one man to know and to retain a grasp of any one field. Specialization increases skill, dexterity, and speed of workers. The worker of to-day is more highly skilled, and far more productive in the few operations that he performs, than was his many-sided predecessor, the all-round mechanic.

Effects of specialization on labor.

The simplification of processes, the specialization of machinery, and the consequent division of labor are consequences of the modern factory system. The necessity of lowering costs of production developed automatic and specialized machinery to a remarkable degree, and is responsible for the present degree of division of labor. The direct result is the specialist laborer, who performs only one of the many operations in the production of a single article. Specialization is a permanent factor in industry, and is an economic necessity in our struggle for markets. It is carried in many cases to such a degree, that if precautions are not taken, it becomes a menace to the worker. It is in cases where operations are repeated rapidly and require little skill or mental effort, but great concentration of attention, that the

The dangers of specialization.

menace appears. In such cases, it requires the careful attention of employers, and a careful study of the effects of the monotonous repetition, and of the concentration upon workers, so as not to allow work to proceed to the point of overfatigue. Frequent rests are necessary, as overfatigue impairs health and efficiency, and should be avoided.

The highly specialized machines, features of our present complicated industrial system, demand intelligent and highly skilled men to attend them. The present need is for workers, skilled and intelligent. There never was a time in our industrial history when this necessity was realized as it is to-day, and never before have the public and employers taken such an interest to find methods of obtaining and of assuring the supply not only of skilled, but of intelligent workers. The intelligent development of workers has a decided advantage in raising the laborer above the narrowing tendencies of high specialization. Nothing is to be feared from the influence of workers skilled with their hands, and developed in their minds for independent thought and action, but much is to be feared from a body of workers who allow others to think for them. The present activity in all directions for educating workers has a decided benefit in developing independent workers who think as well as perform their manual work.

Industry demands intelligent and skilled workers.

During the last century, industrial progress outran all other forms of development, and it is destined to be greater this century, but the chief attention will be directed to studying the human element, and making possible its greater efficiency. Future industrial progress depends upon the hands and the brains which tend and run the complicated machines. Skill, dexterity, and speed

Requisites for future industrial progress.

combined with intelligent development are what is demanded to-day, and it is well that manufacturers have so early realized this necessity, and have taken measures to assure the higher skill and intelligence so necessary for further industrial progress and development. Modern methods of production favor a continual advance of specialization. Every man should do what he can do best, and only that. It is a fact that the fewer the movements and the simpler, the better and the quicker may work be done. Business success depends upon a most complete subdivision of work, and the greatest number of repetitions of thought and action to the extent of mental and bodily comfort. Specialization, when it works correctly, takes into consideration not only the worker's efficiency working along lines of habit, but it gives every aid to making methods and environment fit the requirements of mind and body. Progress demands specialization, but it also demands that specialization should not in any way impair health or lower the intelligence of the workers. Specialization should be associated with a careful study of results, so that health is not impaired, and at the same time the intelligence of workers is raised.

Standardization: its meaning.

Specialization usually leads to standardization. Standardization is setting up and rigidly following standards or types. It has made considerable progress in manufacturing, but little advancement in other forms of business activity. The tendency of modern business is towards standardization in product, tools, appliances, methods, environment, equipment, habits, devices, and conditions. It is a necessity in manufacturing for a large market, and is the starting point in every attempt to produce great quantities of goods cheaply and uniformly. Its advantages in increasing efficiency and lowering costs of

production are everywhere recognized. The production of an original type or standard involves concentration of thought and skill. It demands expensive study and experimentation by the best talent. When a type is once determined, its reduplication is purely a mechanical process. It permits skill, dexterity, and speed on the part of employees, and greatly increases output at a lower cost.

In the making of commodities, standardization may be carried to any degree of completeness. It may comprise entire parts of an article, as, for example, locomotives, typewriters, or watches. Every part of any one of these commodities may be made so exactly like the corresponding part of every other commodity of the same kind, that perfect exchangeability is secured. The standard for regular product has been set and reached by many manufacturers with many products. The parts making up the finished product are made separately by workmen often in different establishments. A worker does not have an opportunity to fit the part he is making to other parts with which it is to work. The part is made according to a standard type, and is made in great quantities. The part when assembled with other parts which go to make the complete article, fits in its place and performs its function usually without the touch of a file. Sometimes an absolute standard of a product may not be possible. In such cases, standardization should be carried as far as possible. Standardization is the basis of large-scale production, and the tendency is towards adopting types for the parts of regular product, and manufacturing according to standards.

Possible extent of standardization.

The determination of standard methods and the training of workers in their use eliminate much waste

through eliminating unnecessary movements, and make for greater efficiency. The obtaining of standard time for a task for comparison with actual performance is necessary in increasing efficiency. The ascertaining of a high quality, making it standard, and always adhering to it, is a business builder and a valuable asset. Standard environment is important in preventing distraction from work. Wherever possible, standards should be determined and adhered to. Standardization is one of the strongest factors in our industrial system working for greater efficiency, and is a basic structure for successful competition in foreign markets, and for industrial progress.

Kinds of standardization.

Profit making is the aim and the object of business activity. Profits depend upon the selling of product at a greater price than what it costs. From their nature, profits may be classed as competitive and monopolistic. Profits, unless they are monopolistic, depend upon successful competition. Competition is a phenomenon which the average business man must reckon with, because his success depends upon his ability to compete successfully in the market. President Hadley defines competition as the effort of rival sellers to dispose of their goods and services, or of rival buyers to secure the goods and services which they require; an effort limited by the desire of the seller to secure as high a price as possible, and by the desire of the buyer to pay as low a price as possible. Competition is not the product of our present industrial system, as it has existed since the beginning of barter. Under the factory system, competition became a more important factor in business than it was under the domestic system, when goods were usually sold first and made afterwards.

Competition, an important factor in business.

The practice of our industrial system is the production of goods for the market, and frequently new plants are built or additions made to old to fill anticipated orders. The production of goods for future markets intensified competition which made itself felt in every part of our industrial system.

The growth of capital, the various inventions, and the improvements in transportation facilities and in transmission of intelligence increased the size of the business unit, and in the efforts to dispose of product, extended markets to international or world's boundaries. To obtain the advantages of producing on a large scale, a much larger product must be disposed of, and this greatly intensified competition. The best possible method of selling a large product in a competitive market is to undersell one's competitor. Competition resulted in a struggle to lower costs so as to dispose of goods. This made it necessary for the manufacturer to do everything possible to decrease the per unit cost of his good. At first, as previously stated, he directed his whole attention to improved machinery, equipment, and production on a larger scale, with its greater specialization and standardization. Competition became keener and keener and new devices and methods had to be devised to lower costs, or else the market would be lost. It was as a last resort that attention was attracted to the human element, and its study at once revealed wastes which it was never thought existed, and the fact was discovered that costs could be lowered through the elimination of these wastes. The basis of successful competition lies in efficiency, and the more efficient a plant, the better able will the manufacturer be to compete successfully in the market.

Keen competition led to a struggle to lower costs.

Production in its manifold phases is the center of the

present business activity. Production applies to the creating of utilities or capacities in goods for the purpose of satisfying human wants. The utilities with which production is concerned may be divided into four classes — form, place, possession, and time. A new form utility is created by a change in form, shape, weight, color, taste, smell, or any other quality of a thing which increases its capacity to satisfy human wants. Utility may be added by a change in place. Coal in New York is worth more than it is at the mine. Utilities may be added to goods by a transfer of ownership from one individual to another, or by a change in time. Certain kinds of wines, musical instruments, as well as many other products improve in quality by the mere lapse of time. Things that grow, like trees, plants, and animal life, increase in quantity in time. The effort of keeping commodities until they are of more effective service involves the creating of time utilities.

Varieties of utilities.

In production there is coöperation of many economic elements. In a producing plant one finds land, buildings, machinery, tools, raw materials, money, goods in process of production, finished goods awaiting sale, labor, and management. With every business enterprise, certain economic elements are needed for its operation. Generally speaking, each economic element which enters into an industry is a factor, but it is customary to group the numerous factors into four classes, land, labor, capital, and management — and to subdivide each into numerous divisions.

Factors in production.

Land includes not only the surface of the earth, materials above and beneath it, bodies of water and what they contain, but the physical and the natural forces which assist man in his economic activities, as climate, winds, tides, and rainfall.

Land.

Of equal importance with land in production is man. By his efforts, the raw materials are taken from the mother earth, and converted into utilities to satisfy human wants. The efforts of man directed toward the creation of utilities are called labor. Labor includes not only the efforts of persons in the creation of utilities of a material form, but services that yield utilities of an immaterial nature, such as those of the doctor, lawyer, or domestic servant. Land and man are the two primary factors of business, but they can accomplish little without the assistance of a third factor, capital. Capital consists of goods produced in the past and used for further production. The capital of a country consists of buildings used for industrial purposes, tools, machinery, transportation systems, transmission of intelligence systems, money, raw materials, finished goods awaiting sale, etc. Capital is not, like land and labor, an independent factor in production, but is obtained by the application of human efforts to land. The use of capital in its various concrete forms greatly assists production, economizes labor, and permits the extensive utilization of materials and natural forces. The task of coöperating land, labor, and capital in a business enterprise is an important one. The person who performs this task has come to occupy such an important place in modern business that it is necessary to regard this function, the managerial, as a separate factor, distinct from other classes of labor. The managerial function is the most important factor in our complex industrial system. It is true that there must be land, labor, and capital, but they are of little consequence without organization, supervision, and management. The managerial function of coördinating land, labor, and capital, of supervising all

Labor.

Capital.

Management.

activities, and of assuming all the responsibilities and risks of business is the bone and sinew of every business enterprise, and its successful performance means success.

Business men should pay heed to efficiency.

The United States has within the brief span of three score years and ten, one's allotted life, come from comparative obscurity to contending for first place among the world's industrial nations. If she continues her rapid industrial growth for the next two decades, she will easily lead all industrial countries. Our business men should awaken to the great need of a careful study of the factors of production and of business activities, in order to eliminate wastes, and to ascertain how to get the greatest results from the use of the different factors of production. They should heed the cry of efficiency, find out its methods, and do their utmost to eliminate waste, the greatest evil in production as well as the greatest hindrance to industrial expansion and growth.

QUESTIONS

1. What is the factory system? How did it affect labor?
2. Why was the human factor so long neglected? What attracted business men to its importance?
3. What is efficiency? Why is it the goal in industry?
4. What is conservation of workers? Why was it so long neglected?
5. Give an account of methods of management during the nineteenth century.
6. How does the expression "Knowledge is power" apply to business?
7. How should accurate knowledge be obtained and what use should be made of it?
8. What is the meaning of specialization as applied to (*a*) labor, (*b*) machines, (*c*) plants?
9. Show that specialization is a permanent factor in our industrial system and an economic necessity in our struggle for markets.
10. What is standardization? Mention the various kinds of standardization.

11. What are the advantages arising from standardization?
12. What is competition? Show that competition is an important factor in business.
13. Name and define the different kinds of utilities.
14. Name and define the different factors in production.
15. Why is the managerial function the most important in our industrial system?

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CHAPTER II

Efficiency

A few years ago, many believed that markets could be obtained and held by means of large-scale production. The economies and the advantages arising therefrom, it was thought, would so greatly reduce costs of production that American industries could continue to compete successfully with the world. Large-scale production resulted in keener competition, and this had to be met by lower costs. Manufacturers, driven by the necessity of a further lowering of costs, turned their attention to their own plants. Improvements in machinery had followed in rapid succession, and little more could be expected in that direction. Attention was by accident directed to labor, and its study has proven that lower costs must be sought through this neglected factor in production. The study of the human factor in production revealed the existence of much waste in every plant. Manufacturers marveled at the extent of the waste found in their plants, and soon realized that its elimination meant the lowering of costs, and the possibility of extending markets. The movement for the elimination of wastes is given the name of efficiency. The efficiency movement spread with great rapidity until it became first national, and then international. Efficiency is a public need, and is not only necessary to meet competition, but to conserve a nation's resources and its most valuable asset, its working classes.

Evolution of the efficiency movement.

It is difficult to give a definition of efficiency that will be accepted by all who are endeavoring to promote its development in business activities. The usual meaning of efficiency is the ratio between the actual performance of an operation and the maximum performance which has been determined to be possible. The two important problems are what ought to be in case of an action and what actually is. The ratio of what is to what ought to be gives the efficiency of an actual performance. Efficiency, therefore, equals

Efficiency; its meaning.

How to ascertain.

$$\frac{\text{actual performance}}{\text{standard performance}}.$$

It is purely relative and should always be expressed as a fraction, in vulgar or decimal form. The value of a fraction is changed by changing either numerator or denominator, and both should therefore be determined if the result is to be a determined quantity.

The numerator may be easily ascertained by actually measuring a performance under observation. The difficulty comes in finding out the correct value of the denominator. The denominator should be determined by an expert who investigates machines, tools, materials, methods, and arrangements, and ascertains those best adapted for the performance of a task. He carefully studies the performance of the task and ascertains the necessary movements and the time required for their performance. As a result of scientific investigation, and the use of a stop watch, the expert decides what time the performance of a task ought to take, or the denominator. The denominator becomes the standard to be striven for in future performances. Workers should be trained in the methods which are ascertained to be the best for performance

How to find the denominator.

in standard time. The work as actually performed should be carefully studied so as to eliminate misdirected motions, and efficiency increases as the methods of actual performance and the actual time spent approach the standard. As applied to business, efficiency is the relation between an action which has produced a known result and the action which has been previously determined for producing a similar result. The efficiency of an action varies as its performance varies with the standard. It increases as the performance approaches the standard, and the aim should be to have as little difference as possible between the two.

Efficiency in business.

The real value of computed efficiencies lies in the extent to which they indicate the means of eliminating wastes, and the direction in which energy and efforts may be best directed. Computed efficiencies are of little value unless they are used for the purpose of studying actual work in order to discover wastes, and efforts are directed to devise means of their elimination. The purpose of efficiency is to eliminate waste, and this is the object of the scientific study of plant, machines, and men. The elimination of waste should be the goal in a business plant. It is a condition which allows production at lowest cost, and successful competition in markets, national and international. In every business plant, wastes are prevalent, and business men are usually blind to their extent. Ignorance has been and is still the chief factor causing high costs and failures. Efficiency demands that business men investigate and study the various factors in their enterprises. An initial study usually proves so successful that it leads to a more extensive one. The elimination of wastes may be slow, but every elimination lessens costs and increases efficiency. Many believe effi-

Computed efficiencies; their value.

Purpose of efficiency.

Scientific study to reveal wastes.

ciency is only attained when ideal conditions are reached. These are never reached, because the discovery of new methods, machines, etc., continually raises standards. The elimination of wastes in any form increases efficiency and lowers costs. Business men are realizing the importance of the efficiency movement and are taking an increasing interest in it.

Efficiency needed in all kinds of business enterprises.

Efficiency has received the greatest attention and the greatest advancement has been made in manufacturing plants. Wastes are found in every kind of business enterprise, and their elimination means lower costs and increased efficiency. Efficiency, therefore, is of the greatest concern to every business man, it matters not the character of his business activities. It is lacking to a remarkable degree in the conducting and in the management of railroads and transportation companies. If sincere efforts were made to secure efficiency, the result would be a great reduction in the cost of operation of public utility corporations, and it would be possible to give better service at reduced rates, and the companies would at the same time enjoy the same if not greater net earnings. Public officials should also pay particular attention to efficiency. Public administration has been in the past, and is at present, conducted with appalling wastes, and the result is that people receive poor returns for the public money expended. The public should demand a more efficient use of its funds, and if this were done, it would put an end to graft and waste, and secure more than double results for the same amount of public money expended. The entrance of efficiency into our public administration would be a most important factor in placing it on a businesslike basis. One of the greatest wastes in this country has been in the

Efficiency in public administration.

expenditure of public moneys. The sooner the public realizes the need of efficiency in public administration, the better it will be for the country at large.

There is no field where efficiency, if applied, would bear greater fruit than in our educational system. Our schools are seats of appalling wastes. The most important period in the lives of the young boys, who are destined in the future to furnish labor and executive ability to manage the great business enterprises, is largely taken up with training which is of little use to them in preparation for their life's work. How much of the time of children is practically wasted by taking their time for studies which are of little or no use to them in their future work! The aim in our industrial system should be a training which gives the best preparation for our boys in order that they may become efficient and intelligent producers. This demands a careful preparation of school curricula with this aim in view, and the adoption of the best methods of instruction, so as to reach the result with the least expenditure of time, energy, and money on the part of the students, parents, and public in general.

Wastes in our educational systems.

The years from fourteen to sixteen are years of great waste in the lives of many children. They finish grammar school, but are too young to enter a trade or apprentice school. Their parents cannot afford to send them to high school, so they are put to work at whatever they can get. They join the ranks of cheap, unskilled labor, and by the time they have been working a couple of years, many lose the desire to become apprentices, and continue unskilled or, at most, semi-skilled workers. How to eliminate this waste is one of the most perplexing educational questions of to-day. The answer seems to be that the training must come from either or both

Provisions for industrial training.

of two sources, the establishment of industrial schools, or the extension of the training of grammar schools. Either will give good results, and time should not be lost in making provision for this much-needed training.

Physical and moral training; its importance.

Efficiency demands workers developed mentally, physically, and morally. The schools throughout the land should follow large cities in looking after the physical development of children. Efficiency demands a strong, healthy body for work, and this takes us back to the physical development of children. This phase of training has in the past been sorely neglected, and is very important with every boy and girl. Children should be taught proper habits of living, proper ways of looking after their persons, and the necessity of proper diet, regular periods of rest, and proper environments for living. The evils of the use of alcohol, tobacco, and of intemperance in every form should be impressed upon them. The acquiring of good habits of living is very essential for efficiency, and they should be acquired in the home and in the school. Efficiency is as badly needed in our schools as it is in our industrial plants.

Old methods for obtaining increased results from labors.

The study of how to obtain more productive performance of work is not new. It is one of the oldest things in the world. From the most primitive times, men under a natural inherited stimulus have always sought to obtain a desired result with the least possible effort. Since man began to work for man, various methods have been devised for converting a given outlay of time and labor into the largest attainable results. The methods are as numerous as they are varied, and involve every device of human ingenuity. Kindliness and cruelty, high and low wages, the selection of the most intelligent grade of workers, carefully supervised

training, steady work, and reward schemes have all been tried with varying results. The question of obtaining the best possible results with the least possible effort dates back to antiquity.

The idea of applying the term efficiency to the human element in business is new. It is only recently that people have given thought to increasing results by paying attention to the subject of physical and mental work. The efficiency movement is the extension of efficiency to human efforts in business, and the application of scientific study and investigation to methods of work, requirements for work, and conditions of human beings for work. It represents the introduction of science into every phase of business activity, and will result in the reduction of business activities to a scientific basis. The wastes existing in every form of business which the initial study of efficiency has brought forth emphasize its importance in the struggle in every form of competitive business to lower costs. The efficiency movement has suddenly come into prominence and is attracting the attention not only of business men, but of thinkers in every industrial country of the world.

Applying of efficiency to work.

Many believe that efficiency means simply doing things well. It means far more, because things may be done well, but at the same time they may be done as well in far less time, with less energy expended, and with less outlay. Usually, men say things are done well, and it is only a guess, because they have no way of knowing that such is the case. Efficiency is a positive relation between a standard which is possible of accomplishment and the actual attainment. The highest efficiency is therefore when the actual attainment reaches the standard. This should be the aim in every enterprise. The obtaining

Things are done well; the old *vs.* the new meaning.

of standards is of the greatest importance in efficiency. They should be based on actual knowledge and not on guess. The obtaining of actual knowledge demands the services of experts, and careful study and experimentation. The standards should serve as a basis for scientific study of methods, materials, tools, machines, and equipment in order to devise means of eliminating wastes, and bringing actual work as near as possible to standard.

Changes should come slowly.

It is never advisable to be too radical in changes, as the greatest success comes from the gradual introduction of innovations. Many wastes may be eliminated by slight changes. A careful study of machines, tools, materials, equipment, and methods will reveal wastes which may be wholly or partially eliminated by the management without any, or with only slight interference with the working force. The greatest difficulty comes with the elimination of human wastes, or the directing of human efforts in such a way, that the greatest results may be obtained with the least expenditure of effort. A careful study of methods, machines, and equipment will give standards, or the best methods of doing tasks, and the time necessary. The introduction of best methods of doing work in a working force will invariably meet with opposition, and requires tact and judgment on the part of the management. If changes are made slowly, the workers taken into confidence, and liberally rewarded for their efforts, and for following proper methods, opposition will be overcome without antagonism, and at the same time the coöperation of the working force will not only be maintained, but strengthened. The introduction of efficiency to any extent in an enterprise is no easy matter. Tact, judgment, taking men into confidence, and

How to introduce changes.

fairness and justice in dealing with the laboring force are essentials for success.

Efficiency is primarily concerned with the elimination of wastes in every form of business activity. The scientific study of the factors in production is for the purpose of ascertaining proper methods of doing work for a guide in eliminating wastes. Waste has been defined as the difference between what is and what should be. Time, energy, and material are wasted in an infinite number of ways. Much waste frequently occurs in buying and in using materials. In buying, waste is the difference between what it should cost to secure the material which is determined by scientific tests to be the best adapted to producing best results, and what is actually paid. Take, for example, the buying of coal. Careful tests should be made to determine the grade of coal which gives the greatest number of heat units per ton, to buy this grade, and to test it upon delivery in order to see that it is obtained.

Kinds of waste.

Waste in buying.

Much waste exists in the use of materials. By careful testing and experimentation, a standard may be obtained as to what use and method of use should be made of materials, in order to produce a given product under the most favorable conditions. A comparison of this standard with what is actually used gives the waste. Under old methods, it was absolutely impossible to discover the extent of waste in the using of materials, and even the detection of its presence was usually a matter of accident. Efficiency demands the ascertaining of standards in the using of materials, and these should give the best quality of material needed for production, and the amount which should be used under best methods. Standards decide not only the exist-

Waste in using materials.

Importance of standards.

ence of wastes, but, by comparison with the actual amount used, give the extent. They also give a basis for rigid investigation, which, if properly and scientifically conducted, results in the elimination of much waste and the saving of many dollars.

Waste of time.

Time is one of the important items in business, and more wastes occur from lost time than from any other cause. Loss of time increases costs, it matters not the kind of business enterprise where it takes place. Wasted time is the difference between the time taken to perform a task under the most favorable conditions and the time actually spent.

How time is lost.

Time in a factory is lost in many ways, some of the chief of which are: waiting for supplies or materials, waiting for other parts of the plant, breakdowns, not starting machines on time, stopping before the end of the working day, not running machines to capacity, running machines in bad repair, using tools in bad repair, not using best machines and tools for work, not using best methods of production, and soldiering on the part of workers. One or more of these forms are found in every kind of business. The work of efficiency is the reduction of these to a minimum.

Waste of energy.

Great wastes are found in every branch of industry from misdirected energy. A prominent investigator of national reputation declares that misdirected energy is the greatest of wastes. The problem of lowering costs through the elimination of wasted energy is of recent date. The best method for performing a piece of work with the least expenditure of effort should be discovered by scientific study, and this should be made standard. The men should be trained in this standard and precautions taken to make certain of its adoption and use. This is a decided contrast to the

How to eliminate wasted energy.

old method of allowing every employee to use his own method of doing a piece of work, and giving no thought as to whether unnecessary movements were taken. There is a right way and a wrong way to do a piece of work, it matters not what it is. The right way should be ascertained and made standard. The presence of the wrong way means waste and higher costs. This is true with every kind of labor and with the performance of every kind of task. Efficiency is concerned with the discovery of the right way and having work performed according to this standard. The detection of wasted energy and its elimination is a problem of efficiency, and is a subject that deserves the closest attention of every business man. The aim of a business enterprise should be to produce results with the greatest economy, with the preservation of human health, and with the least possible waste of energy or of time to either man or machine.

Strenuousness and efficiency are not synonyms, but are antagonistic in meaning. The former demands the putting forth of extra effort, while the latter stands for the conservation of human energy. Strenuousness overtaxes the strength, but efficiency conserves it. The former brings greater results with greater efforts, while the latter brings greater results with lessened efforts, through the elimination of unnecessary movements and the proper directing of energy. The efficiency pace is one which a worker can maintain from day to day without extra physical, mental, or nervous strain. It is the pace of continuous work, and the one which does not overtax strength or impair health. The strenuous pace is the spurt of a short time, which cannot long be maintained without causing an extra strain upon the human system, undue fatigue, and, if continued,

Strenuousness *vs.* efficiency.

Efforts efficient, but not strenuous.

impaired health. To walk four miles an hour is efficient, because this can be kept up without undue exertion, but to hasten along at six miles an hour is strenuous, because in an hour or two at this pace, a person will be exhausted, and incapacitated for further walking. The efforts of man should be made efficient, but not strenuous. Efficiency means continuous work, while strenuousness stands for temporary spurts. Efficiency does not injure the worker, while strenuousness, if continued, is exhausting and very injurious to health. Strenuousness is something to be avoided if the goal is efficiency.

Efficiency protects health.

Men, women, and children of the industrial classes are the greatest gainers from efficiency. A basic structure of efficiency is health, and the demands upon employers to guarantee the maintaining of a healthy working force, through giving best possible working conditions and environment, through paying special attention to the maintenance of health, and through training in proper habits of living, benefit all members of the working class. Many workers have a fallacious idea that efficiency stands for strenuousness, something which demands efforts which exhaust and undermine health and unfit workers for a long period of service; whereas it stands for the reverse, the taking of every precaution to preserve and maintain health and to prolong the productive period of workers. Efficiency demands working conditions most conducive to health, and a wage which assures a standard of living of a nature to give health, recreation, and a higher level of intelligence. It banishes child labor, and assures the training of children to become normal men and women, and developed mentally, physically, and morally. Efficiency demands physically sound and healthy bodies, a high intelligence, and a high sense of morality, and is gained

The protection of children.

not by a greater expenditure of energy, but by turning the energy used into the most productive channels.

Efficiency demands close attention to the training and the education of boys and girls, in order to develop them into men and women, physically, mentally, and morally fitted to become efficient producers. This will in the future be the means of raising industrial workers to a higher intelligence, which will be a decided benefit to them, and to society in general. Efficiency, in place of degrading workers, lowering standards of living, and narrowing intelligence, works to the advantage of every laboring man in raising standards of living, in guaranteeing him means of obtaining higher intelligence, and in making him not only more skilled and more intelligent, but a better citizen. The efficiency movement demands intelligent workers and the employing of these in a way to attain the best possible results, with a given expenditure of time, energy, and outlay. This should be done by conserving in every way not only health, but physical and nervous vigor, and by creating conditions which permit workers to work out their own happiness and contentment.

Benefits from efficiency.

Efficiency is based upon knowledge. It requires the obtaining of accurate information, and then the correct application of it. Efficiency is simply the careful investigation of every problem of the business world in order to determine its best solution. It introduces scientific methods of research to problems of business. Every step in business should be based upon definite knowledge of how it can best be done. Efficiency depends upon knowledge which is not a matter of guesswork, but which comes from a careful, painstaking, and scientific investigation. It requires critical observation,

Importance of knowledge.

Method of obtaining.

accurate description, careful analysis, and careful classification of industrial and business phenomena. The aim is to get accurate knowledge, not only about machines and materials, but also about workers. Accurate knowledge is used as a basis for devising means for the elimination of wastes of time, material, and energy, and is the corner stone of efficiency and of success.

Ignorance, rule-of-thumb methods, and lack of skill are factors increasing costs and inefficiency. What is more wasteful and costly than the old method of leaving every worker to guess at the best way of doing his work? Customary ways of doing things are inefficient and wasteful. We are living in an age of science, but at the same time in one of great wastes. The requirement is the directing of science to business in all of its manifold phases, in order to eliminate wastes. The introduction of scientific study of business methods aroused, at first, much criticism from all classes of business men, but to-day this attitude has materially changed, and business men are realizing that scientific study in business is the right arm of business progress. Business men are daily realizing that in this age of keen competition and of close margins it is necessary to run business on a scientific basis. The careful study of every phase of business and the application of science and accurate knowledge are factors increasing efficiency. Those who do not heed the demands of efficiency, and still conduct their business on the old system of guesswork, will find themselves severely handicapped, in their struggle to make profits.

Importance of scientific study of business.

Only a few years ago, if a man advanced a new idea in business, he found himself and his innovation ridiculed on every side. To-day, business men are on the search for new ideas which will be helpful in lowering costs, and all suggestions

Search for new ideas.

are given a respectful hearing. Business men are realizing the extent of waste in the old methods of doing things, based on haphazard and guess. They are having brought home to them with increasing emphasis, the necessity of a careful study of every phase of economic activity in a business enterprise, so as to ascertain the best methods of performance with the greatest elimination of wastes. This is the age of science in business, and also the age of lowering costs by elimination of wastes. With this realization, and the application of science to business, the business world will make greater advancement and greater industrial progress.

Efficiency is the applying of scientific method, investigation, and research to business. There are many ways of doing things, but only one is best. This is the most efficient way, and the aim of every business man should be to find the best way for every task in his business, and to have the actual performance approach as nearly as possible to the best. The old method does not pay any heed to ascertaining the best way, while the new, or efficient method finds the best way first. When business is conducted on improved methods, it is run by proved knowledge, rather than by guess. Efficiency utilizes to the fullest extent the valuable experience of the past. A science of work takes the place of the old rule-of-thumb methods. A substitution of exact knowledge is made for guesswork, efficiency increases, and at the same time wastes are reduced and profits increased.

The one best way.

The ascertaining of the best way for every task is the first problem of efficiency. The second is the making of the plant and equipment in such condition that the one best way may be accomplished in the time prescribed by experts. The third is the selection and the training of the workers

Problems to be solved in efficiency.

and the giving of instructions, so that they may, with the equipment, perform their tasks in standard time. The fourth is proper remuneration of labor, so that there will be an incentive for workers to follow instructions and to do their part in performing the tasks according to standard methods in standard time. Efficiency systems are various methods for the purpose of increasing the efficiency of each individual in a plant. Efficiency is gained not by a greater expenditure of energy, but by the elimination of waste, and by getting the greatest productive results from energy, materials, and equipment.

Various degrees of efficiency.

There are various degrees of efficiency. The elimination of wastes of time, energy, or materials, it matters not how slight, results in increasing efficiency. Efficiency is of special interest to the man with a small business, as it is to the million-dollar corporation. It is giving business a critical aspect, making a study of how things should be done, and how they are done. It would appall the average man, if he were aware of the profits he is losing annually through ignorance of how work is performed, and of how it should be performed. Every saving of waste is a step towards greater efficiency and one towards increasing profits. Efficiency has assumed such importance, that it is considered one of the fundamentals of the industrial system.

QUESTIONS

1. Give the evolution of the efficiency movement.
2. What is efficiency? How is it ascertained?
3. What is the value of computed efficiencies? What precautions should be taken in computing efficiencies?
4. What will the public gain by the adoption of efficiency methods in public administration?
5. What wastes exist in our educational systems? How may they be eliminated?

6. What is the importance of physical and moral training?
7. Compare the old methods for obtaining increased labor results with the new.
8. Compare the old methods of doing work with the new.
9. What precautions should be taken in the introduction of changes?
10. Mention the different kinds of waste. How may each be eliminated?
11. What is the relation between strenuousness and efficiency?
12. Mention the benefits gained by the laboring classes from the adoption of efficiency methods.
13. What is the importance of scientific study in business?
14. Why should business men be on the continual search for new ideas? How may new ideas be obtained?
15. What problems must be solved in efficiency?

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CHAPTER III

Management and the Plant

The problem of increasing efficiency is essentially a problem of the management. An attempt to reduce management to a compact body of fixed rules and principles common to all enterprises would be foolhardy, yet there are certain established and well-defined laws and principles which are of great value as aids in determining the organization of any particular business enterprise. It was only a few years ago, that business men ridiculed the idea of using in business anything that was taken from the writings of others. It was not denied that knowledge of management would be of great value, but it was believed that one could learn to manage only by going out and watching others manage. Recently, it was discovered that good management is founded on laws, practices, and methods which may be expressed in simple language, and that their study is of great assistance to business men in making their management more efficient.

The foundation of efficient management.

The foundation of management is efficient organization. Organization consists of individuals, and the object is to unite these into a body working for a common purpose. Extreme care should be taken in the selection of men, and their assignment to tasks for which they are especially adapted and properly trained. The duties of all should be carefully defined, so that no friction will arise through a misunderstanding in giving

Organization; its meaning and importance.

or in obeying orders. The efficiency of an organization depends upon the fact that each part of the business enterprise is placed under the control of a person well qualified to perform the duties in the best possible manner. An organization to be efficient should look after and take care of the men who compose it, because their bodily and mental development is an important factor bearing upon efficiency. Loyalty, enthusiasm, and coöperation of workers in a business enterprise are absolute necessities for success and efficiency, and their presence is what every management should strive for. These three requisites cannot be obtained unless the management inspires confidence by the assurance of proper reward for services, and proper place, tools, and treatment while at work. An organization should have at its head a strong resourceful leader assisted by a carefully selected, well-trained, and enthusiastic staff and working force. There should be a close contact between management and employees, bringing with it a close coöperation, and a working for the success of the business enterprise.

A basic structure for an efficient organization is system. System consists of rules and regulations which are worked out and adopted as governing the actions of members of an organization. System is an absolute necessity in every business enterprise, and is a fundamental for efficiency. Little can be accomplished without its aid, and every business enterprise, large or small, should have some organized method of transacting business, which is system, though it may not be known by that name. Every one admits that a consistent application of clearly defined rules and methods is effective in bringing better results.

System; its meaning.

An efficient system is evolved from within an organization and is not brought in from the outside. No sys-

tem fits all cases because systems vary with enterprises. If a system proves a success under one environment, and under certain conditions, that is no guarantee that it will prove successful in another enterprise. A system which is effective in one business enterprise may work with little success in another and be an absolute failure in a third. Each business enterprise has its own special conditions, and these should determine the system that is to secure results. The success of a system depends largely upon its proper installation. Careful study should be made of the enterprise by one whose knowledge of conditions as they exist makes him most competent to know the situation, and he should devise proper rules, regulations, and methods of procedure. With care in the selection of simple forms, easy to analyze, and giving sufficient details, but eliminating unnecessary data, a system may be evolved which if properly conducted will be successful, and prove a valuable asset to a business. System is a good servant, but a bad master. A system when once introduced should not be subject to sudden changes. This does not mean that the rules and the regulations laid down by a system should not be changed to meet new conditions. Careful investigation should be made by men competent to analyze new conditions, and only on their recommendation should changes be introduced, and in no case until a most searching and thorough investigation has been made. Every progressive enterprise is continually growing and so may soon outgrow its system. An efficient system should be flexible and subject to change to meet new conditions. A system to continue efficient should grow with a business, and be changed to meet new conditions introduced through development and improvement.

Requisites for an efficient system.

Changes in system; when and how introduced.

Efficiency in any business undertaking cannot be obtained and maintained without system and organization. System saves time, eliminates ineffective and unnecessary efforts, cuts expenses, and assures accuracy and dispatch. It enables the management to dismiss details, and at the same time to keep in touch with the different parts of a business. A good system causes coördination of all the best efforts of an organization, the coöperation of all of its members, enthusiasm for the success of the business, and harmony between the departments and members of an organization. Such a system keeps a business enterprise together and is an important essential in efficiency.

Advantages of system.

Efficiency demands that the management maintains proper coördination between the different factors entering into a business enterprise. Coördination is arranging the elements of a business so that each is working to capacity, and at the same time keeps every other element which is depending upon it working to its capacity. Men are frequently prevented from working to full capacity by doing work that should be done by others, as, for example, a carpenter carrying his lumber. A machine is frequently prevented from its full capacity by the loafing of an attendant, by carelessness in feeding, by not being run at full speed, or by lateness in starting. For good coördination, four essentials are necessary: proper planning and routeing of work; regular arrival of materials and supplies; prompt and proper repairs to equipment; and proper quality of supplies. In the struggle to obtain efficiency, the necessity for proper coördination assumes greater and greater importance. It lessens waste, and at the same time assures regular and simul-

Coördination; its meaning and importance.

Essentials for good coördination.

taneous efforts working for a common purpose, the success of the business enterprise.

Efficiency demands that the management should eliminate as many details as possible. Nevertheless, the management should know accurately the actual conditions of every branch of a business. It is absolutely necessary and important that the executive head be thoroughly familiar with his business, its needs, and its operations. The only proper method of gathering the necessary information for the executive head is by a proper series of reports. Efficiency cannot be obtained to any degree in management without reports, and these should be simple and accurate, containing that which it is necessary for the management to know, and eliminating all unnecessary and unimportant details. The heads of the various departments should be thoroughly acquainted with their work and possess, among other qualities, that ability to accurately obtain and summarize into simple reports the details necessary for their chief to know. With an efficient system of reports, the executive head centers his work at his desk, and has constantly before him all the important information concerning his business. He can, without leaving his office, keep in touch with the workings of every branch of his business enterprise. The time of the executive head is too valuable to be consumed with details, which may just as well be performed by minor officials, and time so spent is time wasted.

The handling of details.

Requisites for reports.

It is a poor manager who does not delegate definite responsibilities to his subordinates. Frequently, subordinates become dissatisfied when all responsibility is taken away. A manager should give all possible weight to the opinions of his subordinates, and, as he gains confidence in their

Subordinates and responsibilities.

judgment, leave many points entirely to their decision. Nevertheless, every business manager should insist that his subordinates follow out his decisions as to methods of work, handling men, and other business matters.

Suggestions and ideas; their importance.

Efficiency demands that the management should always be on the alert for new ideas or new methods which might be incorporated in the business and increase efficiency. Information is the very soul of business progress. The business world is presenting continually to the eyes of every business man suggestions and ideas which may be applied to his own business. Many business men find that it pays to pay large sums to their employees for suggestions. Employees are encouraged to offer suggestions for increasing the efficiency of the business enterprise. Every suggestion accepted and adopted carries with it a prize of a sum of money to the one who offered it. Many business enterprises keep a special staff seeking new processes, ideas, and methods that will result in greater efficiency. The modern efficient business enterprise should be kept up to date, as the old way of doing things soon becomes obsolete. New improvements, methods, processes, and systems often arise from ideas obtained here and there, and changed to meet conditions of an enterprise. Efficiency demands a constant study of every branch of a business, as well as a constant study for new ideas and suggestions which might make it possible to devise new methods, processes, machines, materials, and equipment which would make it possible to produce more efficiently.

Every management in its efforts to eliminate wastes or obtain the greatest efficiency has certain demands made upon it. First, it should get its work performed accurately and rapidly. The greater the elimination of unnecessary efforts, movements, and wastes of time,

the nearer is the management to the coveted goal of efficiency. Secondly, it should get the maximum output from machinery and equipment. This necessitates perfect coördination, and the best possible machines, tools, and equipment. Thirdly, it should get the maximum output as well as the maximum quality from materials consumed. Fourthly, it should market goods at the highest price. Lastly, it should take pains to see that improvements in methods and equipment are introduced, in order to keep the business abreast of the times and prevent it from becoming obsolete.

Requisites for the elimination of wastes.

Efficiency demands on the part of the management an accurate and efficient cost-accounting system. Business men formerly did not think it necessary to make any study of costs and determine as nearly as possible their accuracy. Costs were based on guesswork. Among the first requisites of efficiency to which business men gave heed was that demanding the elimination of guesswork in finding costs. This introduced cost accounting. An accurate cost system is an absolute necessity in every business enterprise. It consists of a system of records which enables a business man to ascertain with fair accuracy, not only the production cost of a product, but the constituent elements of that cost. The records are obtained by means of printed cards. Care should be taken to ask only for that information which is necessary to obtain costs. It is the work of a cost expert to ask for essential information, and employees should be instructed in filling out the cost cards, so that all expenditures will be charged in the right places. No fixed rule can be laid down for what information to ask for, as this varies with different business enterprises. The cards should be a suitable size for filing and for

Cost system; its meaning and importance.

easy reference. Nothing is so essential to a cost system as a good indexing and filing system. This has been neglected in the past, and has been the cause of the failure of many cost systems.

Requisites for a cost system.

The principles of a cost system, generally speaking, are the same for all business enterprises, but their application differs according to local conditions. A successful system must be developed for each business enterprise, and should be especially adapted to meet local conditions. A thorough understanding of the general principles of cost accounting and a thorough knowledge of local conditions are necessary for the planning of a successful cost system. No general rigid system can be outlined and made standard, because the cost system should in every instance be the product of the particular business enterprise where it is to work.

Advantages of cost system.

A properly devised cost system readily gives in detail the efficiency of working conditions in every part of a plant. It shows if materials are being economically used, and if the proper amount of finished product of the desired quality is obtained. If the proper amount is not secured, it points out where to investigate to discover the cause of the difference. The accurate account kept of productive workers tells not only the exact amount, but the kind of work that each is doing. Loafing and padding of accounts are prevented. The management knows at all times the efficiency of each productive worker. The management should use the figures ascertained by a cost system to guide it in studying the business enterprise, in order to increase its efficiency. A business man should know what expenses should be, and by comparison with the actual expenses the wastes will be shown. This demands that careful study is

previously made and correct costs ascertained. After this is done, a cost system proves of the greatest possible service for making a comparison of actual expenses with what they should be, and showing exactly where costs should be pruned. The management should strive to learn if it is getting the greatest output, the highest quality, and the best service from materials, machines, and men. A good cost system tells that, but it is of little service, unless it is carefully studied and made the basis for investigation, in order to discover whether it is possible to prune costs. There is no business man who can afford to conduct his business without a reliable cost system. It is one of the requisites for efficiency, and is one of the most valuable assets in business.

Plant location and efficiency.

In every manufacturing plant, an important factor bearing upon efficiency is location. A well-equipped and properly managed plant may fail in a poor location, while the existence of a badly managed concern may depend upon its favorable location. The problem of location is one for the management, and its correct solution frequently results in much saving, and many additions to profits.

Factors to be considered in location.

Several factors have a bearing upon factory location, as, for example, market for sale of the product, suitable transportation facilities, nearness to raw materials, power facilities, available labor supply, favorable climatic conditions, suitable water supply, available capital, and local advantages and disadvantages. The necessary factors in each instance depend upon the character of the article manufactured. Sometimes one factor, and sometimes another, is the one that should be carefully studied in choosing the place best suited for a particular manufacturing plant. Location is an important problem with mercantile enterprises, as well as with other kinds of business.

The design of buildings used in a business enterprise has an important bearing on efficiency. No standard plan can be given, because the design which gives efficiency depends upon the kind of business conducted, and upon local conditions. The chief consideration is a careful study of the different phases of the business to be carried on, and the special local conditions. The size and the design of the buildings may then be made, to secure the greatest economy of space and the greatest saving of time in the particular case. Buildings suited for one kind of business may be entirely unsuited for another. Whatever the design of buildings, the chief aim should be to furnish proper space for the performance of work, with the greatest facility, the greatest saving of time, and the least expenditure of money, effort, and power. The success of many enterprises often depends largely upon their buildings, and no money should be spared in obtaining a design that suits the character of the work to be performed.

Design of buildings and efficiency.

A business plant should be equipped with the latest and the highest grade equipment. In a manufacturing plant, the equipment means success or failure to the manufacturer. The problem of arrangement of equipment is an important factor in every business, and often time and money are wasted by not paying attention to it. Are there sufficient machines of the best grade to do the work required? This is an important question for every manufacturer to answer. There is a second question that needs solution. If a difference exists between the rated capacity of a machine and its actual output, what is the cause, and what should be done to raise the output to the rated capacity? In a manufacturing plant, efficiency demands that the man-

Necessity for high-grade machines and tools.

agement pay particular attention to the attending of machines. Careful watching of parts of machinery for loose or weak parts, regular cleaning, and proper oiling frequently prevent breakages. The management will find it profitable, from the point of efficiency, to employ repair men whose duties are to see that machines are properly tested, cleaned, and oiled, and that machines and tools are always in the best repair.

Efficiency demands that machines and tools used should be the best adapted for the performance of the work which is required. Invention is continually bringing into existence new machines and tools the introduction of which may cause greater efficiency in production. Frequently, a manufacturer is placed at a decided disadvantage, because his competitor is producing more efficiently and at lower costs, due to the introduction of recently invented machines. To assure the use of the best possible machines and tools, an expert is often employed to carefully study those in use, others adapted to the same kind of work, and new inventions, to see if there are any that allow production to be carried on more efficiently, and at lower costs. To lead the van of competition is the ambition of every manufacturer, and to do so, he should produce with a high degree of efficiency and with low costs, but at the same time quality and workmanship should not suffer. A very important factor in increasing efficiency, and one which every factory management should give careful consideration, is to have the factory equipped with the best possible machines and tools. An urgent demand of efficiency in manufacturing is to obtain the rapid production of goods of the highest grade, and at the lowest cost. This necessitates having the machinery

Method of assuring most efficient machines and tools.

The need of an expert.

in operation, as nearly as possible, 100 per cent of the working time. To accomplish this, too much stress cannot be placed upon obtaining the best possible supply of tools, always in the best condition, and distributing them so that a worker has ready at hand the proper tool in the best possible shape.

Quality; its importance in buying.

Materials of various kinds are important expense items in every manufacturing plant. Great wastes exist in their buying and in their use. Efficiency demands the elimination of these wastes, and their elimination is an important problem for the management of every business enterprise. Careful investigation should be made to discover the grade that gives the best product with the least waste. Many plants have finely equipped laboratories for testing quality of goods, and experiments are constantly being carried on to discover if different materials or grades can be more economically used. The question is to discover in any good the quality of the part that is utilized, as in wood pulp, it is the fiber, in coal, the heat unit, etc. What the management wishes to know is the grade which contains not only the best quality, but also the greatest amount per unit of that quality. The same care should be exercised in buying machines and tools, as a flaw in steel may not only cause loss to machinery, but additional loss through the stoppage of machines and the idleness of men. Paying strict attention to quality in order to obtain the best materials for the money expended, is an absolute necessity in every business enterprise where goods are bought. A second consideration, as important as the first, is the careful testing and inspection of goods, when delivered, to see that the quality and the amounts ordered are obtained.

Losses from poor quality.

Quality is an important consideration in production. Every plant should strive to turn out goods of the highest quality, and none except these should be allowed to leave the premises. Precautions should be taken to see that only goods of the highest grade are produced. Competent and trustworthy inspectors should be chosen, and the raw materials should not only be carefully inspected, but a separate inspection should be made during each process of production, and, finally, the finished article should pass most rigid tests. Quality in goods is a demand of efficiency and cannot be overlooked. It should receive the closest attention in the buying of materials and in the production of finished goods. Business failures are frequently due to neglect in not buying according to quality, in not testing goods delivered, and in carelessness in allowing goods of low quality to go on the market.

Quality in production.

The economical use of materials is an important question in every business enterprise. The ignorance of employees in not knowing how to care for materials frequently causes serious loss. Exposure to light, moisture, or dryness causes loss, which care in handling prevents. Many managements never give a thought to instructing their employees in the economical use of materials. A management should instruct its employees in the economical use of materials, and insist that its instructions are carried out. A few lessons in planning prevent waste in the cutting out of garments, leather goods, etc. The management should make a thorough and careful study of how to get the desired result with the most economical use of the materials involved. The most economical use should be made standard, and the working force engaged in using materials should be carefully instructed in the standard, and no other should be allowed in the

Economical use of materials; how to obtain.

plant. A few instructions in firing and keeping boilers in proper shape frequently save hundreds of dollars in fuel. Proper oiling and the careful use of oils will often, in the course of a year, add many dollars to profits.

Efficiency demands attention to waste products. Consideration should in every business enterprise be given to waste material to find if some economical use cannot be made of it. Many large plants have added greatly to their profits by the use of waste products. Many manufacturing plants save annually many hundreds of dollars in fuel by the expenditure of a few dollars to provide equipment for obtaining power by the burning of sawdust, shavings, and other waste products. Every one knows of the vast sums made by the large packing-houses and by the oil refineries from by-products. Savings can be made in small plants, as well as large, by attention to odds and ends. Scores of devices are in use throughout the country for the utilization of wastes, and this is an item which cannot be overlooked, and is one which should receive careful attention.

Savings from waste products.

The storage of materials is an important problem which deserves the careful attention of the management. Goods should be kept in some specifically designated place, either room, shed, or yard. Those which are valuable and easily carried away should be safely kept, while the bulky and less valuable may be stored in yards or sheds. All goods affected by exposure to weather or by the elements should be protected by covers.

Storage of materials.

The storeroom in a plant deserves careful attention. It should be centrally located and permit of easy access. Plants both large and small should reserve proper and sufficient space for stores. In the latter, the owner himself may take

Requisites of a storeroom.

active charge or he may assign it, as part of the work of a trusted employee, while in the former, a special person is assigned to take charge, and, frequently, it is necessary to have a large clerical force to assist him. The arrangement of the storeroom should be of such a nature as to allow the greatest possible dispatch in filling orders. Each article should have its own place, suited in arrangement, capacity, and location to the requirements of efficient use. Bins, shelves, racks, etc., should have easy access and be carefully marked. Nothing pays so well as proper arrangement and system in a storeroom. A management may eliminate much waste by having a centrally located, properly arranged, and systematically run storeroom.

System in recording receipts and issues of goods.

There should not only be system in the arrangement of goods, but also in the recording of goods received and given out, so that the quantity remaining on hand may always be known. This is a necessity in order to prevent overstocking, loss of time arising from shortages or searching for mislaid goods, and deterioration of stock through age. The presence of any one increases costs, and the absence of all is demanded by plants working for greater efficiency. Extreme care should be taken in issuing goods. A competent man should be in charge, and goods should be issued only through him or by his orders. Careful records should be kept of all goods received, and they should, as soon as possible, be distributed to their proper places. A record or permanent inventory should be kept of the receipts and the issues of goods. This shows, at any time, the amount of each kind of goods in stock. The simplest method is to attach a card or ticket to each stock bin or shelf, on which all receipts and issues are recorded. A good stock system works towards greater efficiency by being a

safeguard against waste of materials, theft by employees, and losses from other causes.

Efficiency draws the attention of the management to the moving of goods in a plant. Time may often be saved and costs lessened by using proper facilities for moving goods. Goods are usually moved several times during the process of production, as the moving of goods in and about the place of storage, from storeroom to shop or different shops, from one machine to another, and of all finished goods to the stockroom. Modern methods should be used in conveying goods. Space will not permit the mention of the many devices in use for moving goods, yet conveying in many factories is carried on by obsolete methods. A management should pay particular attention to the problem of conveying goods, as its satisfactory solution saves time, lessens costs, and increases efficiency.

Moving goods in a plant.

The shipping of goods in every manufacturing and mercantile enterprise requires careful attention. If a management has not a good system for the shipping of goods, losses will continually occur. No goods should leave any business enterprise unless they go through the shipping room, or are shipped on instructions from the shipping clerk. Careful inspection should be made of filled orders in order to see that only goods ordered, and of the particular grade ordered, are sent. This saves much expense, in preventing the shipping of goods not ordered, or of a different grade. Carelessness in shipping costs many plants large sums of money annually. Goods sometimes leave a plant without invoice, and this usually means loss. Again, goods are frequently sent to the wrong destination, or are allowed to go the wrong route, and either means additional ex-

System in shipping goods.

Losses from lack of system.

pense. It should be an absolute rule that no goods should leave a plant without careful inspection and proper shipping instructions.

The questions of packing and of routeing are of the utmost importance in pruning costs. This is the special study of the shipping clerk, but in large plants it is assigned to experts. Railroads classify goods and fix rates according to classifications. Often, a little different crating or packing puts goods in a different classification and at a lower rate. The classifications affecting goods of a particular plant should be carefully studied, and the goods packed so as to obtain the lowest rates. **Packing goods.**

The proper routeing of goods is an important task in every plant shipping commodities. The task of finding the route which will get goods to their destination in time, and at the lowest cost, is of special interest to a large class of business men, yet how many pay attention to it? The careful study of routes and proper routeing save a large concern many hundreds of dollars annually. Proper routeing means a saving even to a plant shipping a few thousand dollars' worth of goods, yet it is a part of management which has been, and is to-day, badly neglected. **Routeing goods.**

Every management is confronted with the task of inventory taking at least once a year. A running or permanent inventory does not do away with the annual inventory, because the latter is necessary to test the accuracy of the former. The value of an inventory depends largely upon its accuracy. The greatest care should be exercised to assure correctness in counting, measuring, and weighing goods, and in listing their amounts. Only reliable and trustworthy clerks should be chosen for the task, and every one engaged in taking an inventory should **Inventory; its importance.**

be impressed with the fact that accuracy is the watchword. An annual inventory is an absolute necessity in every business enterprise. It furnishes not only the actual state of affairs, but also records for careful study. It shows whether or not departments are over- or under-stocked. It draws the attention of the management to the presence of undesirable stock, which should be sold at any price, and its place taken by salable goods. Without a stock system, the inventory is of invaluable service, and with it, it tests the accuracy of stock records.

Efficiency demands standardization wherever possible. In a producing plant there should be standard products of a standard quality. In making standard products, it is possible and advantageous to spend large sums of money for special machinery and equipment, which not only reduce costs, but greatly increase rapidity of production. The determination of standard quality in product and the taking of rigid measures to prevent any goods below standard going on the market, give a decided advantage to a business firm. It is equally as important to have standard machines, standard tools, standard methods of using and caring for them, and standard methods for every operation. The standardization of methods of work is one of the chief demands of efficiency. It has made some progress, but as its necessity is daily becoming more recognized, considerable advancement may be expected during the next few years. The tendency of the modern industrial world is toward standardization in every form of economic activity. The efficiency movement is hastening the introduction of standardization in various phases of business activity. Standardization is recognized as one of the basic structures of efficiency, and one of the chief factors working

Standardization; its necessity.

towards lowering costs, increasing markets, and assuring industrial progress.

According to the census of 1910, the percentage of total expenses of all manufacturing industries paid out in 1909 for materials was 65.8. This emphasizes the importance of buying in a manufacturing plant, and it is of equal importance in every mercantile establishment. To obtain goods at the lowest possible prices is of the greatest importance to every business man, and, frequently, decides the success or the failure of a business enterprise. Good buying, or obtaining the grade of goods needed for business purposes, in sufficient quantities to meet the demands of business, and at the lowest possible prices, is a requisite for efficiency, and is a problem to which every management should give the closest attention. A good buyer will not overstock, and will always keep on hand a proper supply of goods to meet the demands of business. He will take advantage of low prices on staple goods to buy additional quantities, but he will not buy in such quantities as to financially embarrass his firm or to cause loss in deterioration or from other causes before the goods are used or disposed of. Good buying is an important factor in every business enterprise, and promotes efficiency as well as adds to the profits of a business.

Importance of buying.

The chief aim in business is profit making. Profits depend upon careful buying, low costs, and good selling. Carelessness or bad judgment in one is sufficient to eliminate profits and to cause failure. The existence of every business enterprise depends upon the ability of the management to dispose of its goods at a greater price than the total outlay or expenses. Selling is therefore an important factor in every business. Too great emphasis cannot

Selling an important factor in business.

be placed upon its importance, for upon it depends not only profits, but the very existence of an enterprise.

To obtain the greatest efficiency in the selling of goods and in the selling force, is an important problem for every management. Value and service are the bases of satisfaction, which is a valuable asset in obtaining and in holding customers. In selling, more depends, in the majority of cases, upon the men than upon the goods. The selection of salesmen should be careful, deliberate, and not hasty. Careful selection should be followed by efficient training in the fundamental principles of salesmanship. A capable, efficient selling force is the aim of every business management, and makes for efficiency and for an increase in profits.

Requisite for efficiency in selling.

Advertising has passed from a speculative stage to where it is a necessity. It is difficult to find a business enterprise which does not advertise in some form. Advertising may be good or bad. Bad advertising is simply a waste of money, while good is one of the most potent factors in business. Thousands of dollars are wasted annually in poor advertising. Advertising is a necessity in every business, yet it is a branch of business where great wastes exist, and where there is a great need for increasing efficiency. Advertising is an important task for every management, and by careful attention and study, greater results may be obtained. The purpose of advertising is to sell goods, and the aim is to sell the greatest amount of goods with the least expenditure in advertising. A management should place its advertising in charge of a competent man, who should strive to increase the efficiency of advertising by obtaining greater results from the money expended for the purpose. Poor selection of mediums

Advertising; its purpose and aim.

Requisites for good advertising.

and poor copies are sources of wastes, and represent large losses. Too great emphasis cannot be placed upon the necessity and the advisability of increasing returns from advertising through the choice of proper mediums and the writing of good copies. Good mediums and good copies sell goods, and are the requisites for the efficiency which every management should strive for in advertising.

Credit has an important bearing upon every phase of industrial activity. The granting of too liberal credit has been, in the past, the cause of many failures, and to-day is too freely practiced. The lowering of margins of profit demands a careful study of credit and the possibility of eliminating losses by discrimination in its use. Recent years have introduced many changes in credit-giving, and the result has been the working, through the elimination of losses, toward greater business stability. Discrimination in credit giving is an important business factor, and is one which, if properly exercised, often brings success in place of failure. The granting of credit demands not only a thorough knowledge of character, but ability to judge capacity, and the necessity of capital. No branch of a business requires greater shrewdness and has a more important bearing upon losses and efficiency than wisdom in granting credit.

Credit; its place in business.

QUESTIONS

1. What is business organization? How may it be attained?
2. Give the relation between system and successful business management. State the advantages of system.
3. What is coördination? How is it ascertained?
4. What are the advantages of a good cost system? What precautions should be taken in its installation?
5. Mention the different factors which should be considered in plant location.

6. What methods should be adopted to assure most efficient tools, machines, and methods?

7. What losses may result from not paying heed to quality? Where in production should quality be considered?

8. Mention the requisites for a good storeroom. What is the importance of system in its arrangement?

9. What losses arise from lax shipping methods? Outline a system for a shipping department.

10. Outline a plan for a good inventory system. Why is inventory a necessity in business?

11. Why is standardization one of the basic structures of efficiency?

12. What is the relation between buying and business success? What precautions should be taken in buying?

13. Why is selling an important factor in business? What are the requisites for efficiency in selling?

14. Why is advertising a necessity in business? What are the essentials for efficient advertising?

15. What are the fundamentals of credit?

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CHAPTER IV

Management and Labor

From the introduction of the factory system until near the close of the last century, machinery and materials were carefully studied to increase output, but labor passed unnoticed. It is only recently that employers recognized the importance of the human factor in the making and in the marketing of goods. The men whose heads and hands perform the labor in our industrial system are the chief factors of efficiency and success. The study of the workman in order to understand the various elements that affect his working power is an important and serious problem for every management. The management should deal with the worker as he is, and should realize that dealing with theories and ideals can only result in inefficiency. An attendant should thoroughly know his machine to get the best results from its working. This has been recognized since the introduction of machinery, but the management has not fully grasped the necessity of understanding and knowing workmen in order that the best results may be obtained from the efforts that they put forth.

The importance of the human factor only recently recognized.

It is surprising how long ignorance governed the relation between employers and employees. Business men paid close attention to machines and equipment, but when it came to the human heads and hands which made the foregoing productive, little or no thought was given.

Formerly no thought given to the labor factor.

No attempt was made to study the demands of work in order to obtain men fitted for its performance. The employer did not realize that health is a prime requisite for good work. No attempt was made to study the working force, and to find the environments and the conditions of work most conducive to health and work. No efforts were made to study methods of performance of work in order to ascertain best methods, to train workers in best methods, and to give proper inducements, so that work would be performed according to standard methods, and as nearly as possible in standard time. Little thought was given to coöperation, loyalty, and enthusiasm, three prerequisites for efficiency. In obtaining efficiency in any business enterprise, the most serious problem for any management to solve is the human. The human worker should be studied as carefully as a complicated machine in order to ascertain conditions of work, environments, and methods of work most conducive to efficiency.

The coöperation of employees is an absolute essential for efficient work, for without it efficiency is impossible.

Coöperation; a requisite for efficiency.

Coöperation, or the act of working together for a common purpose, is a basis of our modern industrial development. Hearty coöperation between the management and the employees is the main strength of every business enterprise, and increases the efficiency of both capital and labor. To enlist the mutual interest and the hearty support of the worker is one of the most important tasks of the management, and success frequently hinges upon its solution. To obtain their coöperation, men should be given a square deal, proper treatment, and a just reward for services. They should have some share in devising methods and plans, be made to feel that they are integral parts of an organization, consulted con-

cerning difficulties, and encouraged to suggest ways of overcoming them. Working together with the interest of the enterprise at heart is the proper spirit of workers, and should be sought by every management. Coöperation has two sides, but the management frequently sees but one. It believes that workers should coöperate to produce efficient results, but is blind to the fact that it should coöperate with the men to assist them to obtain a higher wage. True coöperation cannot exist without mutual benefits. Management and workers should each obtain what they are striving for: the management, low costs; the workers, higher wages. In every form of business, true coöperation is more than a theory; it is a necessity, and its importance is gradually being impressed upon every management.

Personality is an important factor in successful business, and is the element which makes effective organization possible. Personality is the strongest bond between men and management, the foundation of confidence, the basis of permanent growth, and the living spirit of an organization. Dominating every business enterprise is a controlling force, a "man behind" whose personality stimulates into action and guides the whole working force. Such a man should have character and strength, combined with kindliness and good wishes towards his men. He should always keep in touch with his men, and be ever ready to discuss any differences which may arise. Impartiality in dealing with men is a virtue. Nothing fosters discontent, creates friction, and throws the whole working force into confusion more quickly than favoritism. Angry words, harshness, and injustice destroy enthusiasm, interest, and loyalty, and have no place in any business aiming at increasing efficiency.

Personality; its importance.

The attitude which men have towards a business is governed almost entirely by their feelings toward the man who directs them from day to day. It should not be forgotten that men are not bits of machinery, but men, and as such possess certain rights which should be respected. Recognition of the rights of workers and the making them feel that they are integral parts of an organization prevent friction and work toward efficiency. A measure of efficiency is the extent to which the coöperation and the enthusiasm of the working force is sustained throughout an organization. The success of an organization depends largely upon the choice of the proper head, a man who has character and strength to maintain the personality of the organization. Many business enterprises fail through having the personality of the organization destroyed by a weak head. It matters not the kind of business undertaking: success depends, in a great measure, upon the proper relationship existing between the management and the workers.

Rights of workers should be respected.

There is a moral obligation due the management from every employee to give his best mental as well as his best physical efforts. This service is not fully performed unless the men become interested and enthusiastic in their work, and work with their whole heart for the success and the welfare of the business. To obtain and to preserve this attitude of employees toward management and work should be an aim of every management. The management should make the employees feel that they have a stake in the success of the business, and that the management has an interest in their welfare. Then the men will feel that they are a part of the business, and not like a cog in one large wheel. Each will work for the other's welfare, and all for greater efficiency and for the success of the business enterprise.

Duty of employees to employers.

The efficiency of workers is an important source of profits. Nothing affects efficiency more strongly than the interest which each worker takes in his work. The aim of every management should be to increase not only this interest, but loyalty. Wherever there is a lack of interest and loyalty, there is no enthusiasm, and without enthusiasm efficiency is impossible. Coöperation and loyalty should be wholehearted, and then we have enthusiasm. Enthusiasm once aroused needs only direction to turn it into success. Efficiency is largely a matter of coöperation, loyalty, and enthusiasm on the part of the working force. How to treat employees so as to obtain their coöperation and to arouse their interest, loyalty, and enthusiasm is one of the most difficult problems which confronts every management, and its successful solution paves the way for increased efficiency.

Enthusiasm; its importance.

The presence of loyalty in any business is an important factor working towards greater efficiency. The amount of work which any person may do is subject to many various conditions. Intellect, feeling, and will should work together in order to obtain the best results. Where there is no feeling or heart in the work, a serious handicap to good work exists, even if the intellect and the will be strained to the utmost. The worker who is not loyal to the management can render only half-hearted service, even though he strives to his utmost. The management which secures the loyalty of its working force has a valuable factor working towards efficiency.

Loyalty a requisite for efficiency.

Most men are capable of following a worthy leader; few are ever zealots for the sake of a cause, a principle, or a corporation. All these are too abstract to win the affection of the average man. It is the individual, the concrete personality who attracts human interest. The

worker is loyal to his immediate foreman, or to the head of a business enterprise, rather than to the business itself. Loyalty to a business enterprise develops from loyalty to those performing managerial functions. A first essential is to place men of character in all executive offices, men who are leaders, and who inspire men, and win their loyal support. If such is the case, loyalty to the business is assured. Loyalty is reciprocal. If a worker feels that he has no assurance of fair treatment from the management, it is impossible to arouse interest and loyalty to the management. A square deal is one indispensable basis of loyalty, coöperation, and enthusiasm.

Loyalty to business develops from loyalty to bosses.

Human sympathy is an important factor in every business enterprise. If the executive head of an organization knows that the directors appreciate his efforts and are ever ready to back him in any crisis, his enthusiasm and energy for the success of the enterprise never flag. If foremen and superintendents know that the manager is watching their efforts with interest and regard, approving, supporting, and sparing them wherever possible, they will place their entire mind, energy, heart, and enthusiasm in their work in order to obtain the greatest possible results. If a worker knows that his superintendent is interested in him, and that he knows the service being rendered, he will put his heart into his work, and have an interest in the success of the business. To secure efficiency, sympathy of the man above with the man below is essential and necessary.

The importance of sympathy.

Incentive and efficiency are closely related. It must be granted that men will not increase their efficiency without some incentive. Workers cannot be expected to use their best ability unless they feel that they are

getting good returns for it. The management should give its workers some incentive, hope of reward, hope of promotion, better working conditions, and, better still, if a union of all these elements. Sometimes a worker feels that it is to his interest to give just as little work as possible for the wages which he is receiving, and to make the management feel that he is giving a full day's work. If in addition to compensation there is the extra incentive of proper working conditions, benefits, insurance, etc., the employer possesses means that hold the workers in an organization and increase their efficiency.

Incentive is necessary for greater efforts.

The handling of men is a problem which tests the ability of the management, and is one which is a factor in increasing the efficiency of a business enterprise. Two methods are in practice for handling men, one, typical of the last century, is driving, while the other, needed to increase efficiency, is leading. The ignorant workman may be driven to his task, but with the intelligent or skilled workman, driving is a failure. Driving produces discontent, fosters antagonism, and prevents loyalty and enthusiasm. Skill rather than brawn and muscle is needed, and to obtain skilled men with brains, and to get them to do their best work, they should not be treated like bits of machinery, or driven like dumb brutes, but led through their own self-interest. To understand the worker is an important problem, and one which demands much study from the management. The manager should be a close student of human nature, and should know his workers as they are, and not as they are supposed to be. Efficiency requires the coöperation of employers and employees, and this demands that employees be led

Methods of handling men.

Driving.

Leading.

through self-interest. The question of leading, through the arousing of self-interest, is an important problem of the future, and its successful solution insures enthusiasm, coöperation, and efficiency, the goal of industrial activity.

Permanence in the working force.

The industrial struggle is one for profits, and the management which can produce with the greatest efficiency wins. Employers have recently learned that an important factor in lowering costs is permanence in the laboring force. Nothing so works against efficiency as a continuous change in the working force. Workers, when they know that they are likely to be discharged any moment, do not have the interests of the business at heart, and do not give their best service. Experimenting with men is costly, and the less the management is compelled to experiment, the greater are the possibilities of increasing efficiency. During the nineteenth century, machines were carefully nurtured and protected, but little attention was paid to keeping men in a business. The employer failed to realize the loss resulting from constant hiring and dismissing.

Methods of holding men in an organization.

The desirability of keeping men in an organization, is most forcibly expressed in the different pension systems of our railroads and industrial enterprises. They support a pension fund as a pure business proposition. The aim is to hold out a reward that appeals to the worker with greater force than some future inducement to go elsewhere. From the management's standpoint, the pension is the premium that it is willing to pay for continuity of service, and the increased efficiency which it affords. Efficiency demands not only a high-grade and efficient working force, but one where the fewest changes take place. Many influences may be developed to hold workers in an

organization. Money return in some form is perhaps the strongest. The worker who is assured that the longer he stays with an organization, the larger will be his income, and that extra effort and efficiency will bring greater reward, has the strongest kind of an inducement to remain where he is. Interest in work, personal contact with superiors, assured promotion, good working conditions, fair and just remuneration are the strongest inducements to hold men.

Promotion from the ranks; its importance.

An important factor working for efficiency is promotion from the ranks. Hope for the future is the chief incentive for giving best efforts, and a hope which appeals most strongly, and gives loyalty and enthusiasm is advancement. Every manager should make provision for filling any vacancy which occurs from his own working force, and the workers should be given to understand that vacancies will be filled from their numbers. Promotion should not be based upon seniority, but wholly upon ability. Preference to seniority is only justified when the senior in service is of equal ability with others qualified for promotion to a vacancy. Promotion from the ranks has been adopted by many railroads and industrial enterprises. Marshall Field & Co. have only two managers who are not promoted from the ranks. The Pennsylvania Railroad Company rigidly follows the policy, and one hundred and fifty of its one hundred and sixty chief officials started in lower positions. The assurance that promotion will be made from the ranks fosters ambition, gives hope of advancement, and greater satisfaction and contentment with the present position. It encourages employees in their work and arouses loyalty and coöperation. The importance of the policy is daily becoming more recognized, and its adoption is spreading to all fields of industrial activity.

A worker to do his best work should have his mind upon what he is doing. This freedom of mind arises largely from contentment and has a great influence upon the quality of work as well as upon the output. A contented worker has a positive money value. Contentment binds employers and employees closely together and leads to their co-operation for the greater efficiency of an enterprise. Working amidst gloomy and dismal surroundings, with improper equipment, in fear of losing his position, at unfair wages, or under constant nagging by a rough and surly boss causes a man to have his thoughts upon anything except his work. The worst frame of mind for good work is one of continual brooding over being underpaid. Yet in how many enterprises do we find one or more of these conditions prevailing? How many have failed as a result of their presence? Many manufacturers have well-equipped factories, but there is lacking the contented working force. They have yet to learn the value of contentment. Every effort should be made to have working conditions, environments of workers while at work and at home, and equipment the most conducive to health and to work, and with a fair and just remuneration a contented mind follows. Many employers have introduced welfare movements for the benefit of their employees. These are business investments, and the contented mind obtained more than repays the outlay in quality of work and in increase of output.

Contentment; its importance.

Tardiness in attendance is a form of inefficiency which every management should strive to reduce to a minimum. Efficiency demands not only faithfulness in work, but regularity and punctuality in attendance. Experience has proven that tardiness cannot be overlooked, and the best way to

Tardiness and inefficiency.

deal with it is to make it unprofitable. Fines are the usual means of enforcing promptness. Not paying for the time lost, the loss of a day's pay if occurring a certain number of times, suspension, and absolute discharge are among the methods found in practice for the punishment of tardiness. Punishment in some form is absolutely necessary in dealing with certain classes of men. No one method can be given as practicable and workable in all establishments. One which gives satisfaction in one business enterprise might be a failure and the cause of driving good workers away in another. The management should remember that plant organization, working conditions, the personnel and the character of employees are never the same in two places. In deciding upon a method for dealing with tardiness, due consideration should be given to the character of the workers, whether men or women, skilled or unskilled, salaried or working by the piece. If fines are imposed, the management should make it clear to the workers that the purpose of the fines is punishment, and that they are not a money-making proposition. The only safe way to deal with fines collected is to devote them to some welfare movement for the workers. If fines are kept by the management, it inevitably leads to antagonism, and works against loyalty and enthusiasm.

Methods for dealing with tardiness.

Every management finds it imperative to adopt some method of ascertaining whether or not a worker is punctual in attendance. The time clock is the favorite method, but metal or wooden tags, timekeepers, individual tickets punched at entrance, the matter left to the direct supervision of superintendents or foremen, and daily work cards are among other methods found in practice. Many claim that a check upon the time that a worker appears at

Punctuality. How ascertained.

work is not necessary and only antagonizes him. Under the present industrial system, some method is absolutely necessary, and if any trouble arises, it is usually on account of poor judgment exercised in fixing the punishment, or in the use of fines collected.

Methods for encouraging promptness.

Many managements find it profitable to encourage promptness by a system of rewards. An effective method is to take promptness into consideration in increase of pay, or in advancement. Some give cash premiums and prizes at the end of the year to all who have not been tardy, while some base vacations on the timekeeper's record, and take account of promptness in awarding time of vacation with full pay. Those who have adopted the award system find it necessary to have some system for punishing tardiness. If a worker were tardy once or twice, with no chance of obtaining a reward, there is a tendency to be careless about attendance in the future.

Irregularity; its causes.

Irregularity in attendance has a direct bearing upon efficiency, and is a serious problem confronting every management. The chief cause of irregularity is sickness, and the question to be answered is, Who is responsible? The management may be the cause in not having proper working conditions; if so, the worker is not to blame, and the cause should at once be remedied. On the part of the worker, the cause may be lack of nourishment, unsanitary home surroundings, careless exposure, or intemperance. The management should insist upon proper nourishment and proper sanitary home surroundings. It should take all precautions to have working conditions and surroundings of workers while at work the most conducive to health. Careless exposure should be warned against, and intemperance should not be tolerated. Reasons for absence from work are many, and each in-

dividual case should be dealt with separately. The method of treatment should vary with cases, and punishment is only advisable where the cause is due to negligence, carelessness, or intemperance on the part of the worker. None of these should be tolerated, and dismissal should be the punishment for the second or third offense. A great safeguard against irregularity is a healthy working force, working under sanitary and wholesome conditions.

Method of treatment.

It has been said that 95 per cent of the workers of this country are doing less than 60 per cent of what they might do without physical injury or overexertion. This statement is perhaps exaggerated, but it is nevertheless true, that a great waste arises from men loafing, soldiering, or idling away their time. Efficiency demands that this waste be reduced to a minimum, and it is an important problem confronting the management to devise successful methods of doing so. The average worker is naturally inclined to take things easy, and to do the least amount of work necessary to keep from being discharged. This is one of the evils arising from day wages. When all are paid the same wages, the more efficient worker slackens his pace to that of the lazy fellow, because why should he do more when he receives the same pay?

Wastes from men soldiering.

A great part of soldiering is done by men with the deliberate object of keeping their employers in ignorance of how fast work may be done. Many deliberately study how slowly they may go, and still convince their employers that they are going at a rapid pace. The fear of making a record that will be used as a basis of future piece rate causes men to soldier as much as they dare. They look upon extra effort to earn more wages as leading to a cut in piece rate. As one of the main causes of soldiering, the

Soldiering is often deliberate.

prevailing fallacious belief among laboring men that the curtailing of output gives more employment should not be overlooked. Frequently, men do the best they can under discouraging conditions of work, and should not be criticized for not doing more. Soldiering is often deliberate, as wasting time to make a job last, so that it will not be necessary to change jobs at an inconvenient time. Men are frequently careless about being late in starting work, and in stopping a few minutes before closing.

Soldiering or loafing, in whatever form it is found, works against efficiency, and its reduction should demand the careful attention of every management. Its elimination demands the coöperation of management and worker. The management on its part should remove all causes for waste of time from inconvenient plant equipment. It should pay its workers wherever possible by piece rate, and in the determination of the rate, it should take special care that the rate is based upon productivity, and that workers receive a just and fair reward for their efforts. There is no more effective way of reducing idleness than to make idlers losers. Workers on their part should be prompt in starting work, faithful in attending machinery, and in keeping machines running at full capacity while at work, sincere in putting their whole thought into what they are doing, enthusiastic and interested in their work, and loyal in their coöperation with the management for the increasing of efficiency, and for the success of the business.

How to eliminate soldiering.

All human beings possess physical, mental, and moral qualities. These are necessary to a greater or less degree in all classes of work. With unskilled labor and positions of little importance, the physical is the most important, with the skilled trades and positions of in-

creasing responsibility, the mental grows in importance, and with all kinds of work, the moral is absolutely essential. It matters not how healthy a man is, or what ability he has, if he is dissipated, he is physically and morally unfit to be a member of a high-grade organization. Dissipation gradually affects his physical and mental powers, weakens his sense of responsibility, increases irregularity in attendance and causes carelessness in work. The dissipated employee soon becomes a derelict upon an organization, rather than an integral part of it, and his services must soon be dispensed with, in order to avoid friction and loss. The members of a high-grade organization should be healthy, strong, and vigorous, possess the required ability for the work, and have a high sense of moral duty.

Importance of physical, mental and moral qualities in workers.

Every worker should be responsible to some higher authority, and there never should be any doubt as to that authority. Authority should be so established that minor breaches may be ignored and pass unnoticed, but when the time comes for action, and when all consideration has been given, the management should enforce its decision to the letter and without mercy. Care should always be exercised in giving orders only through the immediate boss or superintendent. The giving of orders by a superior official to men who are held responsible to a lower official shows bad judgment, and has a tendency to lower the respect of the men for the official to whom they are responsible. It should not be forgotten that the practice of showing authority for authority's sake is bad, and breeds dissatisfaction and friction.

Authority clearly defined.

Some method of discipline is a necessity in every business enterprise. It is important that the management should have a carefully considered method of

disciplining its laboring force. The method should be sufficiently broad, so as to cover the great variety of characters and dispositions found in every working force. Some workers are so conscientious and desirous of doing right that the slightest word of correction is all that is required. There are others who mistake kindly words for timidity and weakness. With these, talk, either mild or severe, has little or no effect, unless they believe that something more severe and disagreeable will follow. An important question for the management to decide is what will be the most effective method of discipline, and give the least interference with the harmonious working of the laboring force. It should be emphasized that with new workers a beginning should be made with kind words, and these repeated if necessary several times, until it is evident that kindly treatment does not produce the desired effect, and then more drastic methods should be used.

Discipline; its importance.

There are many methods used in enforcing discipline, — kind words and suggestions, fining, laying off for a period of time, lowering wages, giving a series of bad marks, and when they amount to a certain number per week or month, fining, laying off, or lowering wages, and discharge. Discharge is of course the most effective, but this should be used only in those cases which are absolutely hopeless of correction. Between the first and the last, it is always advisable to have many remedies, each more severe than the preceding. Laying off and lowering wages are too severe for ordinary breaches of discipline, and a management will hesitate to enforce them. Men will soon discover this, and many will take advantage of it, and keep most of the time close to the limit. Again, these methods are so drastic that if regularly enforced,

Methods of enforcing discipline.

they arouse antagonism on the part of the workers, and prevent interest and enthusiasm so essential for increasing the efficiency of a working force. In laying men off, a management usually suffers more than the men, through having work delayed, and putting new men in their places. Either of the methods causes more or less friction, and interferes with the smooth working of a working force.

Giving bad marks is objectionable, as many will take advantage of the system, and deliberately keep close to the maximum of bad marks. The best method is that of fining. If applied with judgment, it is to be preferred to the others, and gives the most satisfactory results. Its success depends upon impartiality, and upon sound judgment in levying the fines, and in using those collected to promote some welfare work for the men. Under no consideration should the management retain the fines collected, because, if so, the men will believe that the purpose of fining is to make money. This arouses the workers against the management, and prevents their hearty coöperation in their work. Exceptional cases may arise where fines will not prove severe enough, then the more drastic method of lowering wages or laying men off should be used.

Fining the best method for disciplining.

Those in supervising positions should always maintain their dignity. They should be able to control themselves and give reprimands under the most trying circumstances, without losing their temper. They should be firm, dignified, and always ready to help, and to work with their men, as well as direct them. They should be approachable, sympathetic, and mingle with their men, and take an interest in their welfare, but should not allow familiarity, because it breeds a feeling of disrespect towards

Qualities essential in superintendents.

themselves. They should be entirely free from favoritism, and able to treat every case on its merits. Discipline is then not difficult. In every business enterprise, from the executive head down to the humblest worker, discipline should be maintained.

Superintendents; importance of their selection.

A close man-to-man relationship between employer and employee is priceless. It arouses interest, enthusiasm, and loyalty, three necessary essentials for efficiency. The management should be able to select the right foremen for the different places, — men who are not only best fitted for the positions, but who know how to arouse loyalty with resulting coöperation. It is said that Andrew Carnegie seldom made a mistake in picking the right man for the right place, and his success is largely due to this ability. The selection of proper superintendents, men who know how to handle men, is of much more importance to-day than ever before, and continues to increase in importance as the business units grow in size, and the individual employee is further removed from the executive head of the business. Men who know how to get maximum results from machines are common, but men who know how to get coöperation, and the greatest efficiency from the human element, are rare.

QUESTIONS

1. What is coöperation and why is it a necessity for efficiency?
2. Why is personality a necessity for effective organization?
3. What arouses enthusiasm? Give its bearing upon efficiency.
4. Give the source of loyalty and state its importance in a working force.
5. Mention and give the importance of the various incentives to increase efforts.
6. What is the relation between permanency in a working force and efficiency? Mention methods used to assure permanency.
7. What is the importance of promotion from the ranks?

8. What bearing has contentment upon efficient work? What causes a contented working force?

9. Mention methods of dealing with tardiness. What do you consider the best method, and why?

10. What are causes of irregularity? How should it be treated?

11. What is soldiering? Give causes. How can it be eliminated?

12. Why should authority be clearly defined?

13. Mention different methods of enforcing discipline. Which do you prefer and why?

14. What qualities are essential in superintendents?

15. How may the proper relationship be maintained between superintendents and men?

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CHAPTER V

METHODS

DURING the past two decades, many changes have taken place in the attitude of business men toward problems that they face, and means that they control. Increased competition cut the margins of profit, and if American industries were to continue to flourish and expand, methods must be devised for lowering the costs of production. The struggle for lower costs directed the attention of a few business men to a study of the internal workings of their enterprises. The discovery was soon made that almost the entire operations of their business undertakings were based on guesswork and ignorance, rather than knowledge. It was found that men in executive positions, as well as workers, had little knowledge of how best to perform operations, and what was most conducive to best performance. The business men were amazed at the great amount of work that was performed haphazard, and by guesswork. They were astonished at the waste which existed in their business enterprises through the presence of unscientific methods of doing work, and of conducting enterprises. They realized the necessity of ascertaining knowledge of how best to work, and the saving, if similar tasks were performed, according to the best possible methods, with the best possible equipment, and under conditions most conducive to work.

Guesswork and ignorance in business.

Performance of work.

The methods found in the average business enterprise are not the result of carefully and properly conducted investigation, but are what are guessed to be best by the management and the workers. It is seldom that in the same plant you find the same movements in the performance of similar tasks. The old way is to allow men to learn by observing others work. They are not taught what methods are best, but are left to choose their own. The goal is to reach the one result, the performance of the task, and each worker is left to the choice of his own movements in the reaching of this goal. Habits are formed, and workers continue to perform their work with unnecessary and improper movements. Men when they are left to themselves to discover by observation methods of work do not discover the best methods of performance. The old way and the one that is in common practice is to put everything up to the worker. It frequently happens that a man working as hard as he can, falls short of what could be done, on account of making unnecessary movements, and of employing inferior methods in his work. It is only during the last few years that a few progressive business men have realized that there are many opportunities for better ways of doing things, ways which bring greater efficiency and increased profits. The great need is to make all business men realize this necessity, and have work performed by properly directed energy and by scientifically discovered methods.

The old method of doing work.

Wasteful effects.

Every operation in a business enterprise may be performed in a number of ways, and it is evident that all are not equally efficient. As a rule, many are so inefficient that if only a slight investigation were made, they would be at once discarded. There is one best way to do a piece of work, and that is

The one best way of doing work.

what is needed in every business enterprise. Few workers know the best way of doing a task, and few have the ability to investigate different methods and select the one which is best. Not only the workers, but even the management cannot know at random, or guess, the best method of doing a piece of work. Again, workers in the past, and in the average plant of to-day, decide methods of performing work, and these become habits. They cling tenaciously to their habits of work. Men usually refuse to be shown a better and easier way, declaring that their own is good enough for them. The old way of allowing workers to choose the methods of work which they are to use, should be discarded on account of its inefficiency, and there should be adopted and used in every plant, standard methods previously determined by the management.

Not discovered by worker.

A management should decide what is the best method of doing work, and then introduce it in its plant. Mr. Taylor gives the key for performance of work in stating that you should know exactly what you want men to do, and then see that they do it in the best and cheapest way. The performance of work is usually based upon precedent and established usages. The discovery of the one best way demands the casting aside of guesswork, precedent, and usage. Knowledge is the one chief essential to best performance, and should be ascertained by the management through experts. Thorough investigation should be made of the performance of work, and the best way ascertained. The best way is the one best with conditions existing in the particular plant where it is to be adopted. There should be a clear understanding of what is to be done, and nothing left to guess. The one best method should be made standard, should

Guesswork, precedent, and usage cast aside.

be the only one allowed, and should be constantly and consistently followed.

The only way to determine the best method of performance of work is to ascertain it by scientific investigation, because if it were not so ascertained, differences of opinion would exist as to the best. The average worker who performs an operation in a certain way imagines that he knows all about the performance of the work, and scoffs at the intimation that there might possibly be a better and more efficient way of doing it. Let the average management carefully analyze the methods used in its plant, and it will find that the great majority are inherited from the past, or slavishly adopted from observing others, and little knowledge exists as to whether they are the best for the performance of the work. With no uniformity of methods for performing similar tasks, and little or no knowledge as to what is the best method, there is no ground for forming any opinion as to the efficiency existing in a plant.

The methods of the average worker.

Experience has proved that the average worker, skilled or unskilled, has little or no accurate knowledge of the amount of work that he can perform in a given time, or of his efficiency. Neither the worker nor the management in the average plant knows the best method of performance, or how much an individual at his chosen work can accomplish. With no understanding as to best methods, how is it possible to obtain the greatest efficiency and best results with the least waste? Not only the best methods, but what constitutes a reasonable day's work, can only be determined by scientific investigation and intelligent observation.

A reasonable day's work.

Many business men, even to-day, believe that it is a waste of time to study theoretical principles under-

lying business activities, and declare that scientific investigation and methods have their place elsewhere than in business. They have yet to realize that no operation is so simple that it does not in some way involve the application of a theoretical principle. Business methods and practices are based upon theoretical principles. Business is gradually being reduced to a science, and business activities should be studied and scientifically investigated, as phenomena in the field of science. The sooner business men realize that scientific investigation and research are as necessary in business as in the sciences, the greater will be the advance in efficiency. They must realize that rightly applied theory goes hand in hand with practice. The theoretical principle should be known, and its application should be the result of scientific investigation and careful experimentation. If theory and practice appear to disagree, then theory or practice is wrong. The fault lies with the management in not knowing the underlying principle, or in not making a proper application of it. The man who looks upon theory as something abstract, and entirely foreign to business activities, merely declares his ignorance. Business men should become awakened to the fact that business is a science, and that successful business is based upon certain fundamental principles which underlie business activities, irrespective of whether or not they are recognized by them. The application of scientific method to business activity is a necessity, and is a demand of efficiency. Its resulting influence in lowering expenses and increasing profits should be sufficient inducement to win over the average business man to the necessity of scientific investigation in order to obtain scientific methods of performance of work, and their introduction and consistent following throughout a plant.

Theoretical principles underlying business.

Theory *vs.* practice.

Motion and time studies are the scientific methods used to discover the best way to perform any operation.

Scientific method to discover best way.

These studies provide the necessary information for ascertaining the most efficient way to perform a task. Every operation is divided into its elements or unit operations. Time study is the act of analyzing, recording, and synthesizing the time necessary to perform the elements of an operation.

Time study.

There is no operation which is too simple or too complex to allow of this analysis, and which will not repay scientific study, to ascertain the best way of performance. Time study is made with a stop watch and a sheet of paper, upon which is noted observations.

Motion study.

Motion study is the careful study and observation of the movements making up each element of an operation in order to discover the unnecessary movements, and those which are absolutely necessary for the performance of the operation. After repeated observation and experimentation, a method is eventually obtained which requires the least energy and time. Thus the only way to determine the best way of doing an operation is to analyze it into elementary operations, and determine separately the best way of doing each element. The time for doing an operation is then the sum of the different times that are taken for the performance of the different elements. This is not an easy task, and demands a trained mind and accurate observation.

The ascertaining of the best way extends beyond the movements of performance, as it demands a careful in-

Requisites for standard methods.

vestigation into all conditions relating to the performance. Those conditions which are best suited to the performance should be discovered, and all those which hinder a worker should be discarded. Machines, tools, equipment, and materials

demand careful study and should be such as assist the worker as much as possible. Working conditions and environment should be made the most conducive to health, and to the efficient performance of work. Every condition in a plant should be made as favorable as possible for the performance of work.

An important problem is finding the time to be allowed in the performance of an operation. In the time allowed, consideration should be given to first, the time actually spent at work, secondly, the time allowed for delays, and thirdly, the time allowed to overcome fatigue. The time actually spent is the sum of the time spent upon the elements of an operation. This is determined by the expert investigating the operation, and extreme care should be taken in observation and in timing. There is usually more or less delay in the performance of work, and the allowance for delay should be made only after a thorough examination of a plant. As conditions vary in different plants, so will allowances, and no fixed allowance for delay can be made standard for all plants.

How to determine time for a task.

A third element entering into time allowance is rest. Operations vary in their intensity, and in the amount of mental and physical efforts necessary for their performance. The object sought in time and motion studies is not to find a time for the performance of a task that may be used to drive men, but to find the time and the methods of best performance that will enable men to continue their work from day to day without exhausting their strength, or impairing their health. It is time, as well as methods and conditions of work, which should be considered in order to ascertain the precautions which should be taken to prevent fatigue. Every operation should be given special

How to ascertain time allowed for rest.

Importance of rest.

study in order to ascertain the amount of energy and the intensity, attention, and concentration of thought necessary for its performance. This varies with the character of the operation. Constant application should not be allowed to the point of fatigue, so rest periods are absolutely necessary with many kinds of work. Their length and number depend upon the character of the operation. If necessary, time in every operation should be allowed for suitable rests so as to prevent fatigue. An important precaution in conserving energy is making provision wherever possible for seats, so that workers may be resting as much of the time as does not interfere with the performance of their tasks. The ascertaining of the proper time for an operation is no easy matter, and demands scientific investigation into every condition affecting the operation, and careful observation and measurement in order to ascertain the time in which the operation may be accomplished in the particular plant, and continued by efficient trained workers from day to day.

Many believe that standard means perfection and fixity. This is false, as the idea of perfection is not involved in standard. A standard method is simply the best method that can be devised at the time the standard is set; and in determining it, consideration should be given to the actual conditions as they exist in a plant, and allowance be made for any limitations that might be present. It is also false to associate with standard, fixity and the precluding of change. Improvements in standards are wanted, as progress depends among other things upon them. It is impossible to say when a new discovery may be made, or a new way of doing things be found which demands a change in the old way. The old standard should be

Standard does not mean perfection.

When to introduce changes in a standard.

changed, and a new one set up. Standards should not be subject to frequent changes in order to meet whims of the management. Experts should carefully study standards, new inventions and discoveries, in order to see if any better way may be devised for performing any operation in a plant under actual existing conditions. If a better way is discovered, and it is proven so by careful scientific investigation, the old should be discarded for the new. Changes in standard should be made only after careful investigation by a competent person of new ways of doing work, and it has been conclusively proven that the new is better than the old. As soon as that is proven, no hesitation should exist as to the desirability of the change. A standard is simply the best method known at the time of its adoption, and may not be the best method the following week. The discovery of the best method, and it made standard is a demand of efficiency, but another demand equally important is to see that the standard is always moving higher, keeping pace with new discoveries and ideas in the performance of work. Standard methods are those scientifically based on correct knowledge and principles, and representing the best possible, at the time, in the particular business enterprise, and which are realizable under existing conditions.

Efficiency demands more than standard methods. In fact, standard methods make necessary standardization in many forms. Standard machines, standard tools, standard conditions of work, standard environment, and standard materials are all necessary. Each should be the best possible for accomplishing a desired result under existing conditions. The obtaining of standard methods of work carries scientific investigation into every part of a business enterprise, and demands actual knowledge of every

Standard methods imply other standards.

detail of business activity. It carries science into every phase of business life. Standardization is an absolute demand of efficiency, and is one of the greatest factors working for industrial growth and progress.

Responsibility upon management.

Business managements, in the performance of work, leave too much to workers, and take too little responsibility upon themselves. Workers in the average business enterprise have no knowledge as to what is the best way to perform a task, how long a task should take, how much a man should do in a day, or what are the best environments for the performance of work, and yet the responsibility of performance is largely put up to them. They are to get the work performed, following usually their own methods. The efficiency movement places all the responsibility upon the management, where it rightly belongs. It is the work of the management to discover the best way of doing work, the best conditions and environment for the performance of work, the selection and the training of workers in the best way, and the workers are to coöperate in following instructions, and in putting their entire interest and enthusiasm into what they are doing. Responsibility is taken in a large degree from the workers and placed upon the management, which is better able to guide workers in standards of performance of work.

Adoption and use of standard methods.

The discovery of best methods is of little use, unless provisions are made for their adoption, and their constant and persistent following. The qualifications needed in workers for each operation should be ascertained by careful study and investigation, and workers should be chosen who are especially adapted by nature and by training to efficiently perform the work. Too great emphasis cannot be placed upon the necessity of proper selection

of workers. The ideal condition would be to have every operation in a business enterprise performed by a worker adapted and fitted by nature and by training to do the work most efficiently. This should be the goal, and the nearer it is approached, the greater is the efficiency obtained from the working force. Selection by itself does not give efficiency without proper training. Workers should be carefully trained in standard methods by competent instructors. Where work demands constant repetition of similar movements, the training should be careful until habits are formed. Strict precautions should be taken by instructors to see that only standard movements are repeated, and that they are identically repeated. In other words, the habits formed should be the correct habits of performing work according to standard methods, and training should be careful and thorough until these are formed. In the case of job work, standard methods, conditions, machines, tools, and materials should be worked out in advance by the management. Instructions in detail should be made out and given to the workers, and extreme care taken to see that instructions are carefully and closely followed.

How adopted.

Job work.

Constant and careful supervision of work is an absolute necessity. It is essential to maintain a high quality in goods produced and in services rendered. Supervision is also necessary in making certain that only standard methods are followed. Adequate and proper supervision of every kind of work is absolutely necessary.

Supervision; its importance.

An important consideration in gaining the coöperation of workers in following standard methods is that of remuneration. The coöperation of workers is absolutely necessary, because without it efficiency in any form

cannot be obtained. The best incentive that can be given to any worker to follow methods and instructions is to prove to him that he is a gainer thereby. If a worker can be convinced that following instructions will be advantageous to him, the most difficult part of the task of introducing standard methods is overcome. The incentive which appeals most strongly is that of increased remuneration. The workers should be shown that the increased output which results from following standard methods does not come from increased energy on the part of the workers, but from directing into productive channels the energies which before were misdirected and wasted. They should be assured that increased remuneration follows from increased output, and that the management will be fair and just in remunerating labor, and in all its dealings with its working force. The assurance of just remuneration and treatment is necessary to obtain the coöperation of the working force, so essential in the successful introduction of standard methods.

How to gain coöperation of workers.

Just remuneration.

Work according to its character may be paid for by time or by piece rate. Many kinds of work only permit remuneration by the time occupied. The performance of such work should be scientifically studied, and the best methods ascertained for performance. With many kinds of work, it is possible to set a certain task to be performed during a day, and when this is finished, the worker is allowed to go. This method is successfully used in many of our business enterprises. With piece rate, the task is the fundamental basis. The task is the standard amount of any kind of work that a man should do in a certain period of time. The important problem is to ascertain the best method for the performance of the

Methods and time work.

Piece rate.

task, and what time should be allowed for it. Finding the proper time is an important question in piece rate. The task should be capable of being performed by carefully trained men in the time set, and under existing conditions in the local plant.

The discovery of the best way of performing work is the duty of the planning department. Planning is an important work in any business enterprise. In a small enterprise, the work may be performed by the employer himself, or it may be assigned to a special employee, but in a large enterprise, it is the work of a special department. Planning is absolutely necessary in every establishment, large or small, as it is a necessity wherever any kind of work is performed. The planning department decides what is to be done, the method by which it is to be done, the men who are to do it, the tools and materials which should be used, the time it should take, the quality of the work, and the pay. It selects and trains men in the best methods, and secures machines, tools, materials, and conditions, the best possible for performing the work in the standard time allowed. With job work, the planning department predetermines the methods, tools, machines, and materials used, the men who are to do the work, route of work through the plant, the time necessary for performance, and the pay. The work is thus carefully planned before it goes to the men, and instructions are carefully made out as to methods, men who are to do the work, route, machines, tools, materials used, and the time allowed. The instructions are given to workers, and they should carefully follow them. It is the duty of the planning department to see there is no delay or waiting on the part of the men for machines, tools, or materials. Planning should be placed with experts, where it belongs.

Planning department; its work.

Job work.

Formerly, and even to-day, little or no planning is done by the management. A job is given to the workers, and it remains with them to find a way of doing the work. The workers choose machines, tools, and materials, and no one knows how much time it should take. It is put up to the worker to devise his own methods, and to choose his own tools, materials, etc. The course of all work should be predetermined by experts before it is done, and if this were done, a vast amount of wasted energy would be turned into productive results. Employers would gain by increased profits, and employees by better working conditions, protection of health, and higher wages. The planning department has complete charge of standardization and raising standards. Experts are usually employed to carefully study local conditions and improvements in methods, machines, and tools, in order to ascertain if a better way can be discovered for the performance of any one of the various kinds of work being done, and if a better way is discovered, to change the standard from the old to the new.

Planning neglected in many plants.

Efficiency demands that all work, it matters not its character, should be performed in the way that gives the best results with the least expenditure of energy, materials, and time. The discovery of the best way, and making it standard for every kind of work, is as important to the small establishment as to the million-dollar corporation. The sooner business men realize that there is one best way of doing work, and that it means greater efficiency, lower costs, and higher profits, the greater will be their chance of success in profit-making. They should also realize that the best way is not based upon guess, but upon careful knowledge, acquired by scientific investigation.

Efficiency and the best way.

The one best way based on accurate knowledge.

Business men should bear in mind that knowledge is the foundation of future business expansion and growth. Efficiency, the goal towards which every business man should be working, makes the performance of work according to predetermined standard methods an absolute necessity. Our future industrial growth and expansion depend largely upon making our business enterprises more efficient, and this has its basic foundation upon efficient methods in the performance of work.

QUESTIONS

1. Account for the changed attitude of business men towards performance of work.
2. Compare the old methods of performance of work with the new.
3. What are the methods for ascertaining the best conditions for work?
4. Show that theoretical principles underlie business activities.
5. What is the importance of time studies? How should time study be conducted?
6. What is a motion study? Show its importance to the business man.
7. Mention the requisites necessary for ascertaining standard methods.
8. What precautions should be taken in ascertaining the time for a task?
9. When should rest periods be allowed? How do you ascertain the time to allow?
10. Show that standards do not preclude change. What precautions should be taken in introducing changes in standards?
11. Show that efficiency methods transfer responsibility from the workers to the management.
12. Why should plant conditions be carefully studied in fixing time for task?
13. What are the means for gaining the coöperation of workers in efficiency methods?
14. What are the functions of the planning department? Estimate its importance in a business enterprise.
15. How do employees gain by the adoption of efficiency methods of performance of work?

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CHAPTER VI

Hiring of Labor

A successful business man once remarked that his success was due chiefly to the men whom he gathered around him. Human ability is a great business asset. To-day, more than ever before, the human element is the greatest factor in business operations. The best equipped plant cannot make a success unless properly skilled and trained men are in attendance. Again, skilled and trained labor cannot overcome the handicap of poor machines and equipment. The greatest efficiency is obtained by having the best possible machines and equipment, with skilled and trained laborers properly organized and working together for the success of the business enterprise. Efficiency places particular stress and emphasis upon the working force, the human brains and the human hands which form the most important factor in any business undertaking. In obtaining efficiency in a working force, the most difficult problem is the obtaining of men to perform the different tasks.

Machines, labor, and efficiency.

Importance of skilled workers.

The hiring of labor is an important work in every business undertaking, but it is given little attention and study. It is recognized as true that the men whom an employer employs are the direct cause of his success or failure, yet it is only recently that it is commencing to dawn upon the employer that a large share of the success of a working force comes from hiring the right kind of men for the several places in a business enterprise. The

The hiring of labor, a problem long neglected.

hiring of men is a difficult problem confronting a business man, yet how many employers pay any heed or attention to it? The hiring of an employee, skilled or unskilled, is as important a matter as the buying of a machine, or the buying of goods. Careful examinations and tests are made by experts of every machine before it is purchased. Specialists are employed for the buying of materials and commodities, men who devote their entire time to the study of the goods, markets, etc., and these are often assisted by a staff of chemists and experts. Special care is taken in buying machines, tools, and materials, but little attention is paid to the buying of labor, upon whom depends the getting of the greatest quantity of output of the highest quality, and with the least waste from machines, equipment and materials.

Buying of machines *vs.* buying of labor.

The buying of labor is left usually to people whose special work is something else, with a result that it is done usually in a way which is costly to buyer, and unsatisfactory to seller. The buyer takes little interest in what he is purchasing and few precautions to ascertain what he is getting. An efficient labor force can be obtained and maintained when the following requisites are fulfilled; first, a careful study of each task, its demands ascertained, and workers selected, who are especially fitted for the work to be performed; secondly, extreme care in the selection of workers, so as to obtain those that will be satisfactory, without the expense of the old system of experimenting or trial; thirdly, the best possible method of work for the different tasks, and the training of workers in the methods adopted; fourthly, the equipping of a plant with the best possible machines, tools, and materials, the keeping of machines and tools in the best repair, and proper planning, so that there is no waiting on the part

Requisites for an efficient labor force.

of the workers; fifthly, a fair reward to each man for his labor; lastly, working conditions which are most conducive to health and to work.

A chief requisite in the obtaining of an efficient labor force is the proper selection of workers for the different tasks to be performed. Employers are usually careful in purchasing machines and materials, but when it comes to hiring labor, they wait until a man is needed, and take the first one who comes along. It is true that if a person uses care, he can accurately determine the constituents of materials, and the work and the speed of machines. It is a fact that the capabilities and the efficiency of workers can at most only be estimated. Is it not true, that there are certain external features and characteristics, which portray physical and mental strength or weakness. By a careful examination of applicants, and by information obtained from previous employers, a person skilled in reading human nature, and knowing the requirements of a place to be filled, can decide on the applicant who is best suited to fill a vacancy.

Machines are studied before purchase, but not men.

The uncertainty of a newcomer in a business enterprise is one of the most baffling questions confronting our business men. If it were possible for an employer of labor to order new workers according to exact specifications, as he does his machines and materials, one of the most important problems in our efforts to increase the efficiency of our industrial and business operations would be solved. Dr. Katherine Blackford claims that she has reduced the hiring of labor to a science, and that an applicant may be studied and his special fitness determined for a particular vacancy. Whether she has reduced this important work to a science may be questioned, but it must be admitted that her investigations have done a great deal to solve the ques-

The uncertainty of a new worker.

tion of the uncertainty of a new worker. Nevertheless, it is true that there are certain suggestions, which if followed by employers, will greatly assist in increasing the efficiency of a working force, and in reducing much of the expense incurred by the old haphazard method of hiring men.

Machines are tested for efficiency before purchase, and materials for quality, but the usual practice is to take workers at a rough guess. They are usually hired upon general recommendations, and taken on trial. Those who, on being given a trial, are not satisfactory, are dismissed, and other trials are made until the required number is obtained. The old method of selecting men is a mere process of guesswork. No attempt is made to study the individual. Hiring is usually left to the superintendent, who, when he wishes workers, inserts an advertisement in the city paper, and spends perhaps thirty minutes the following morning to pick out the ten or fifteen men that he needs. He trusts to his snap judgment to size up the men at a glance. Frequently the first ten are taken, and a sign is placed outside, "No men wanted." Out of the ten men hired, the superintendent considers himself fortunate if he secures seven good men. After a trial, the three unsatisfactory ones are dismissed, and three more tried. Of these, one may prove unsatisfactory, he is dismissed, and another one is tried. The process continues until ten satisfactory men are secured. This hire and fire process is wasteful and expensive, yet it is the one in common use to-day. The manager of a large business enterprise estimates that it costs him two hundred dollars for every twenty-dollar-a-week man hired and broken in. Another declares that for every dollar paid a new employee for the first few weeks, he is out two dollars for

Common practice in hiring men.

Hiring based on guess and snap judgment.

breaking in, and still another states that the breaking in of a new employee to a position of any importance costs two months of his time before he is seasoned.

Experimenting with men is costly.

One of the basic principles underlying efficiency is continuity in service. Nothing so works against efficiency as continual change in a working force. Men when they know that they are likely to be discharged at any minute do not take an interest in their work, and do not give their best service. Experimenting with men is costly, and the less an employer is compelled to experiment, the greater are his chances of success. One raw recruit among a number of trained men is a disorganizing element, and adds to expenses by causing a lessened efficiency of the whole body of men with whom he works. Experimenting is one of the direct effects of the old and prevailing hire and fire method. In an enterprise employing a large number of men, and where the hire and fire method is in operation, the annual loss from experimenting amounts to a considerable sum of money. Here is a waste that should be eliminated, and the only way to do this is to be systematic and careful in the selection of workers.

Holding men in an organization; importance.

Employers have recently recognized the great importance of holding men in their organization. In a laboring force, continuity of service is the ideal, and employers should bear in mind that permanence and efficiency go hand in hand. The necessity of discharging men would be obviated by having proper systems of hiring and of handling them. High efficiency cannot be maintained unless a high degree of permanency exists in a working force. In how many establishments do we find men taken on, and laid off, without thought or consideration for their welfare. Men frequently work with the

sword of Damocles hanging over their heads in expecting discharge every pay day. When such a method is in operation, how can an employer expect his men to work with any interest? How can he expect them to coöperate with the management for the success of the enterprise? How can he expect loyalty, interest, and enthusiasm? Permanency in service is one of the handmaids of efficiency, and has its basic foundation in a proper system of recruiting properly equipped, qualified, and trained men for the working force. The hiring of men is closely related to permanency and enthusiasm, which are so essential for increasing efficiency.

Evils of constant hiring and firing.

There are so many incompetent men in the industrial field that it is absolutely necessary to exercise great care in hiring, so as to avoid failures, misfits, and derelicts. Loss and disorganization are occasioned by hiring a man, and later finding him a failure. Every working force, if it is to be efficient, should have its members carefully selected, and it is the wise selection of workers which is one of the marks of good management. Upon hiring the right workmen more than upon anything else depends the efficiency of a working force. Human ability is one of the most important things that a business man buys, and to its selection more careful attention should be given. When the importance of labor in every branch of business is considered, it is strange that employers do not give more care to the work of selecting proper men.

Efficiency and hiring the right men.

A basic requisite in selection is to know the place to be filled. Every place in a business enterprise makes many demands upon its occupant, so that it may be filled with the greatest possible efficiency. The demands should be known and heeded in filling vacancies. A place demands certain

The study of the requirements of places.

qualifications in a man. The first great problem is, therefore, to know the requirements of a place, and the second is to have the ability to pick out a man with the required qualifications. It stands to reason that it is only by luck that a superintendent by snap judgment, and without study of a place to be filled, can decide by glancing at a man that he possesses all the qualifications necessary to meet the requirements of the place. The average superintendent knows little about the requirements of a place, and pays little attention as to whether or not an applicant possesses the necessary qualifications. If an applicant has a good appearance, a good letter from a previous employer, and knows the trade or the work to be performed, he is usually told that he will be given a trial. Guesswork and chance govern selection. Superintendents who in the average business enterprise hire and dismiss workers have their time so taken up with the routine of their work that they have no time for studying the requirements of the different places under them, and little time to study the qualifications of applicants.

A special official, and not the superintendent, should hire men.

The superintendent is not the man to hire men. The hiring of all employees should be placed in charge of an expert, a person competent to make a thorough study of every place in a plant, and able to decide what are its requirements. This is the first essential. The second is that he should be an expert in the reading of human nature, and able by interview and from other sources, to tell the qualifications of men, and to pick out the one possessing the qualifications necessary to fill a place with the greatest efficiency. In the selection of workers, the two fundamentals are to know the requirements of a place to be filled, and to be able to pick the man best fitted to fill it. Formerly, and even to-day, many business men believe

that it is impossible to tell before a man takes a place, if he is fitted for it, and will prove successful. During the last few years, considerable progress has been made in methods for the ascertaining of the requirements of a place, and for the selection of a worker with the proper qualifications to efficiently fill it. The problem is to devise some method of reading a man's qualifications for a place without going through the expensive trial stage. The development of a simple and practical system of hiring labor will be one of the achievements of the next few years, and will prove a great boon to all forms of business activity and a great factor in increasing the efficiency of a laboring force.

Unless men are chosen suitable for the places they are to fill, disastrous results frequently follow. Hiring by guess means the entrance into a working force of misfits. A misfit is one engaged in work for which he is not by nature or by training fitted. Misfits easily gain entrance into a working force under the old system of hiring, while it would be difficult for one to gain entrance under a competent employment system. A misfit causes loss through inefficiency of work, through liability of breakages of machines if attending them, through spoiling materials, and through the lowering of the efficiency of the workers with whom he works. A misfit is usually not interested in his work, or the success of the enterprise. His presence works against enthusiasm and loyalty, and prevents harmony and coöperation. Every business man should strive to eliminate misfits by being cautious in hiring labor. The saving from the elimination of misfits will in a large plant many times cover the expense of maintaining a competent employment system. An ideal working force is one having all places filled by men fitted by nature and by training for their tasks, and working

Misfits in a laboring force.

Evils.

with the greatest efficiency and coöperation for the success of the enterprise.

To get the greatest efficiency from a laboring force, every worker should be not only fitted by nature for his task, but should be trained in the best method for its performance. Every place demands a worker fitted by qualities, aptitude, and training for it. The aim of a business man should be to have every place in his plant filled by a man suited by nature and by training for performing his particular task in the most efficient manner. The men in a plant should be carefully studied, as well as those who are hired. It should be ascertained if they are suited by nature and by training for their tasks. If lacking in training, that may be easily remedied, but if not fitted by nature or aptitude, that is a more serious problem. A change of place may change a failure into a success, or may materially increase the efficiency of a worker. Efficiency may often be increased by a little training, or by transferring a worker to work for which he is adapted. The problem of having men engaged in tasks for which they are best adapted and trained is an important one in every business enterprise, and is one which is sorely neglected by business men. The task of studying the men employed, and of ascertaining whether or not they are especially adapted for their work should be made a function of the employment expert. He is the man best suited to make such a study, and he should be the one given charge of this most important work.

Requisites in labor efficiency.

Are men fitted by nature for their work.

Training.

The employment expert should have on file in his office the requirements of every place in a business enterprise. The office should be open every working day for the receiving of applications. Every applicant should be carefully examined,

How to fill a vacancy.

and if found satisfactory, his name with qualifications should be carefully indexed and filed. The expert should make note of the place which the applicant is best fitted to fill. If there is no vacancy, his name should be put on file for one which he can fill. When a vacancy occurs, the superintendent sends word to the employment office that such a place is vacant. The expert goes to his file and sees if he has passed satisfactorily upon any applicant; if so, word is sent to him that a vacancy has occurred, but before he is finally accepted, it is advisable to have him undergo a thorough medical examination to see if there is any physical weakness which might in the future develop, and unfit him for efficient work. If no names are on file, it may be necessary to advertise. It is poor policy to receive applicants only when a vacancy occurs.

Employment department; its work.

The employment department is one of the most important departments of every large business. Its success in selecting and adjusting men to their work is very important. In a small business, employing only a few men, it is too expensive to maintain an expert, but the employer himself or one of his ablest men should devote time and study to places and men in the enterprise, to find out if the men are qualified, adapted, and trained for their work, and to be able to fill vacancies with workers, who will efficiently perform the required work. The employment expert is an important factor in every business, and his importance is rapidly becoming recognized. Extreme care should be taken in his selection, as a properly qualified employment expert is as essential as a properly qualified superintendent. His success in studying places and men, and adjusting men to places, is an important requisite for efficiency.

Andrew Carnegie frequently refers to what he has

gained by being able to read human character, and to pick right men for right places. His power to read human nature, and tell from an interview whether a man is physically and mentally adapted for a place is phenomenal. During his business career he rarely made a mistake in his choice of men, and his success in surrounding himself with an enthusiastic and loyal working force is largely due to this. This power of selection is intuitive, and belongs to the subconscious mind rather than to reason. It is by intuition rather than by sound judgment that selection is made. Few men have this gift, and the average employer relies on judgment in sizing up men in an interview, and deciding whether or not health, character, and capabilities are adapted to places to be filled.

Requisites for selection of workers.

There are certain fundamental qualifications, the total lack of which, or the serious lack of one, makes an applicant unsuitable for any position. These are health, intelligence, character, and industry. Health is an absolute essential for every kind of work, and a sound body should be the first demand of every applicant. A worker should not be hired who has a weakness, which if it does not at present impair his health, will in the future. If a weakness is only temporary, and can be cured in a short time, that should not count against an applicant, but care should be taken that attention is given until the weakness disappears. A true eye and a steady hand for the full working time are valuable assets in every plant, and they demand a sound healthy body. A healthy working force and precautions for the protection of health are essentials for increasing efficiency. A strong, healthy working force is less liable to accident, fatigue, and overstrain, and promotes efficiency in every form of business activity.

Fundamental qualifications for efficient work.

Health.

A good eye is a valuable asset, and particular attention should be taken with every applicant to ascertain if any eye-weakness exists. Defective eyesight is a hindrance in any kind of work, and this is particularly true in all work where true and keen eyesight is required. Good hearing is essential in the majority of cases, and deafness is a handicap in almost every kind of work. Precautions should be taken to test the sight and the hearing of all applicants. There are certain exterior signs which tell of good health and physical weakness. If the eyes are dull, listless, and show streaks of yellow in place of clear white eyeballs, it shows that something is wrong with the health of the person. A healthy person's finger nails are always pink underneath. Yellow or pallid skin, pale or blue lips, are indications of ill-health and bodily weakness.

Sight and hearing.

Signs of health.

Physical endurance is a fundamental for efficient work and is a valuable asset in every worker. It is in a large measure the result of oxygen taken into the lungs. A large nose and wide-open nostrils are needed to furnish the means of a bountiful supply of oxygen. Physical endurance demands a steady strong heart action, and an accompanying normal nervous system. Workers with a weak heart should be avoided, as the weakness sooner or later undermines health and impairs efficiency. A weak or deranged nervous system works against efficiency, and care should be taken in hiring to avoid those possessing such a physical defect. A weak nervous system causes overstrain, and the consequent evils of fatigue, impairs physical endurance, and undermines health. It causes irritability, and an irritable person is a factor working against harmony and coöperation, and as such is undesirable in a working force. Nervousness

Requisites for physical endurance.

Effects of weak nervous systems.

is betrayed in several ways. A close observation during an interview and during the answering of questions will show the presence of a weak nervous system.

There are many physical weaknesses which cannot be determined by close observation of external characteristics. An employer should never depend entirely upon observation. A thorough medical examination by a physician should be made before a new worker is allowed to go to work. The examination should be not only for the purpose of finding out present ailments, but if the applicant has any weakness which might in the future develop, so as to impair health and efficiency. If a weakness is found, what is its nature? Can it be cured by care and medical treatment? If so, it should not prevent a person from being hired. If a weakness interferes with present or future efficiency, and cannot be remedied, the applicant should not be taken into a force. The presence of any loathsome disease should be a barrier to employment. It not only undermines the health of the sufferer, but such diseases are usually very contagious, and their presence might be the means of impairing the efficiency of several in a force. Physicians should pay particular attention to traces of the drinking habit. A person addicted to the use of liquor should not be taken into any working force, it matters not how unimportant a position it is. It cannot be too strongly impressed on an employer that one absolute essential to work, it matters not its character, is a sound body. This applies to the employer of one or two workers as well as it does to the corporation with a labor force of several thousand. The efficiency of a working force bears a close relation to the percentage of sound bodies in the force. The first step to insure a strong healthy working force is the selection of workers

Necessity of medical examination.

Barriers to employment.

with sound bodies. The work does not end with securing healthy sound workers, but extreme care should be taken to keep a force healthy and strong.

Habits play an important rôle in efficiency. Good habits while at work and while away from a plant have a greater bearing upon the efficiency of a working force than the average employer realizes. They represent a valuable asset to an employer, and as such demand his close attention. It is necessary to find out the habits of an applicant during an interview. The effects of some habits are shown in the features, or in the actions of men. Carefully prepared questions should be made out and answered by the applicant. Note should be made of external characteristics, and of actions during an interview. Questions on diet, regularity of eating meals, hours of eating, hours of rest, interest in theaters, use of alcohol, tobacco, and drugs, interest in games, papers, books and magazines read, card playing, etc., furnish valuable information as to the habits of applicants. All these questions to the average man may seem frivolous and nonsensical, but to the student of human nature they have an important bearing upon habits, and as such, are of the utmost importance to a person hiring men.

Habits *vs.* efficiency.

How to ascertain habits.

Age is always an important consideration. From eighteen to thirty-five are given by experts as the years of maximum vigor, but a man from thirty-five to forty-five, with a sound body, good habits, good eyesight, and a good set of developed muscles is a good investment. With work where skill, alertness, and concentration of thought are necessary, it is advisable to confine new workers to the first age limit.

Age limit.

The drifter or floater has no place in any laboring force, and is an undesirable person in any business enterprise.

His presence usually causes friction, and detracts the interest and attention of others from their work. Drifters are an important factor working against harmony and coöperation in a force. Extreme care should be taken to bar drifters, because every one gaining entrance to a plant means not only loss, but the impairing of the efficiency of those around him. Every applicant should be closely questioned about previous places where he had worked, and his reasons for leaving. A drifter usually has a fund of excuses for his changes, but one who has not a guilty conscience is usually as brief as possible in stating his reasons for change. With unskilled or semi-skilled labor, shrewd questioning and a careful study of the person while answering give sufficient evidence to decide whether or not an applicant is a floater. In cases of skilled workers, it is advisable to corroborate your conclusions by a confidential report from the last employer. "To Whom it may Concern" letters are of little or no value. A list of questions sent to the last employer is of great importance in estimating a man's fitness for a place. Judgment should be exercised in making out the questions, and only information asked which is absolutely needed to decide an applicant's fitness for a vacancy to be filled. No standard list of questions can be given because the questions vary with places and with plants. Answers from employers are usually prompt and honest because they are coming to realize that their interests in this respect are mutual.

The drifter in a working force.

How to tell drifters.

Letters should come from the person who has charge of the employing of men. Wherever the old method of allowing the superintendents to hire and to dismiss is in practice, there is an objection to personal letters. Frequently, a good worker arouses the antagonism of his superintendent and is dis-

Objections to personal letters.

missed, not because he is inefficient, but because he has aroused the hatred of his superior. Many superintendents will go out of their way to prevent such an employee from getting a place elsewhere, and will take special pains to injure him in letters. If a wide discrepancy exists between the estimate of fitness from an interview and a letter from a previous employer, care should be exercised in discovering if any reason exists for the conflicting statements of the letter. A man should not always be condemned because his last employer gives him a bad record, but where there is an employing expert, such an attitude against a man for personal reasons is rare.

A person who is loud in condemnation or in criticism of his previous employer should be avoided. An employer should guard against the chronic fault-finder, as a worker whose interests lie in criticism is not one to increase the harmony or the co-operation of a working force. He is a disturbing element, and usually soon tires of his present work, and in place of working for the welfare of the business, criticizes methods and surroundings. A knocker has no place in any industrial enterprise, and this applies to all members of an organization, including those in executive positions.

Avoid a knocker.

Intelligence is a requirement for every kind of work. Brains as well as brawn are demanded in an unskilled laborer, in order not only to perform intelligently the work to be done, but to permit development into a semi-skilled worker. With the unskilled and the semi-skilled classes, those with intelligence are always reaching out for new methods and for short-cuts. They are more easily trained and are capable of attaining greater efficiency. A greater degree of intelligence is a requisite in the case of the skilled laborer, as contrasted with the unskilled or

Importance of intelligence in workers.

the semi-skilled. With highly specialized and automatic machines, a greater skill is required in workers than in the case of simple machines. A demand of efficiency is an intelligent working force. The greater the degree of intelligence, the greater are the chances of a higher efficiency. The average person carries his marks of intelligence upon his countenance, which a student of human nature may easily read. Intelligence is manifested by the expression of the eyes, by the readiness in answering questions, and by the wording and the pointedness of replies. What is the education and the training of the applicant? What is the nature of his reading? Does he read any technical books or magazines connected with his work? The giving of a few technical questions on the applicant's particular work is a good test of intelligence. All the foregoing are little tests which portray a person's intelligence. The aim of every employer should be to obtain the most intelligent men possible, and special attention should be paid to intelligence in an applicant before employment.

How to ascertain.

Thrift is a good characteristic in a worker. Thrift and floating are seldom found in the same person. A married person is usually steadier than one who is unmarried. Has the applicant any property? Has he a bank account? Is he married? If so, how large a family? All these are indications of steadiness.

Advantages of thrift.

Industry is a necessary fundamental in every worker. A lazy worker is a handicap to every working force. Special care should be taken to assure industry in applicants, so as to avoid the entrance of a lazy worker into a laboring force. Manner of walking, standing, and sitting, and attitude in shaking hands tell much to the student of human nature as to the industry, the alertness, and the

Industry, a requisite in every worker.

stupidity of an applicant. In the case of unskilled labor, bodily strength and endurance are the worker's stock in trade. His hands tell if he is accustomed to toil, and his shoulders, legs, and arms whether he has a physical force to perform the work. The foregoing observations are sufficient to decide industry in the case of the unskilled or the semi-skilled, but with the skilled it is better to further corroborate your decision by reference to a previous employer.

How to detect.

Precautions should be taken to ascertain the characteristics of an applicant to decide whether or not they are likely to be helpful or detrimental to work. Honesty is a necessary quality in every worker. A person carries many exterior signs of honesty. The eyes and the mouth are good indices. A person who seldom meets your gaze, and avoids looking you in the eyes in an interview is usually a person to be avoided. Many experts claim that by a person's eyes and mouth honesty can be told. Honesty, uprightness, and openness are qualities to look for. Gait on entering a room, manner of speech and gestures are guides to foretell these important characteristics. Tact is an important characteristic. Some experts ascertain this by questions as to what would be done in special cases. Perseverance, good-temper, and firmness are valuable characteristics, and may be read from facial features, walk, handshake, straightforward look in the eye while questioning, manner of standing and of sitting, and answers to questions. Neatness and tidiness in dress and in appearance usually foretell neatness and tidiness in work. Carefulness, neatness, tidiness, and system in work are essential for efficiency. These characteristics may be ascertained by paying attention to a person's dress, linen, manners, shoes, finger nails, teeth, and tidiness of person in general.

Characteristics which promote efficiency.

How to ascertain.

Obstinacy, sullenness, quick-temper, carelessness and slovenliness are weaknesses, and should as far as possible be avoided. They may be overcome, but if a person is past middle age, it is difficult to change habits formed in youth. All are weaknesses affecting the efficiency of a working force, and frequently considerable losses arise from their presence. Carelessness is a chief cause of fires, accidents, and business losses arising from breakages, damaged materials, and stoppages due to breakages. A careless worker is an inefficient worker, and is a factor of inefficiency that should be eliminated in order to make the working force efficient. Special attention should be paid to every applicant to ascertain the presence of carelessness, and its presence should be sufficient cause to prevent the hiring of a worker.

Characteristics which promote inefficiency.

How to detect.

Skill and experience are two prime factors in a working force. Has the applicant sufficient skill to do in the most efficient manner the work that the place requires? What has been his training? What has been his experience after receiving his training? What is the length of service in the previous place? Has his work been of the same character as that for which he is an applicant? What training, in the case of a skilled mechanic? Has it been along efficient lines, or not? If not, what is the intelligence of the applicant, and the prospect of training in efficiency methods, or in methods if different from his last place? These are some questions which every employer of men should give careful attention and care. The chief considerations are previous records and training. Close questioning on the technique of his trade usually discloses a person's knowledge of his work. Letters from previous employers as to

Skill and experience in workers.

How to ascertain.

skill, work, promptness, and regularity should be given careful consideration. Too great emphasis cannot be placed upon the necessity of care being exercised in ascertaining a person's skill, which depends almost entirely upon his training and experience.

Ability to tell capability is a valuable asset.

An important power to possess in hiring workers is to be able to decide from an interview what is the capability of an applicant. The ability to recognize, frequently under an unpromising exterior, what a man really is or may grow into, is valuable in hiring men. Andrew Carnegie has an almost uncanny power of sizing up a man, and telling whether or not he would make good in a position, or what he would develop into. Where this power exists, it is a valuable asset. The average employer of men has not this gift of nature, but is compelled to depend largely upon his judgment and his powers of reading human nature.

Limitations and possibilities of men.

It is an easy matter to pick men who have successful records behind them, but a careful examination should be made because often a man who has been a success in one kind of business will be a complete failure in another. Frequently, men are found who are great successes in one plant, and when placed in another with a new laboring force, and new environments, fail. Again, men who have been failures in one plant may, in a new environment, succeed, so a change of place may make a success out of a failure. The greatest asset for a new man is his ability to make good, and the greater the number of newcomers who make good, the less will be the loss from introducing new men, and the greater the chance of increasing the efficiency of the working force. Employers should be on the lookout for men who excel in interviews but are failures at work. Many of these are floating about in

our midst, and the shrewdest hirers of labor are often deceived by them. Care should be taken against this deception, and the fewer hired, the better for any business enterprise. Too great emphasis cannot be placed upon the ability of a hirer of labor to size up men, and pick out those who have the ability and the capacity to make good and become efficient workers. The ability to recognize the limitations as well as the possibilities of men is very important. The ability to size up men for these two essentials intuitively is found only rarely in man and is decidedly no common gift. It is based in the average hirer of labor upon careful investigation and sound judgment, and not upon snap judgment or guess.

Care in selection of apprentices.

Wherever an apprentice school is conducted by a business enterprise, the selection of apprentices is an important task and as great care should be taken as with applicants for the best places in the plant. Apprentices are to be the skilled workers of the future, and from their ranks the chief executive places are to be filled. The greatest care should be taken to select those who have capabilities. They should be under careful supervision during the period of apprenticeship to ascertain whether or not any mistake had been made in foretelling their development into efficient workers.

Acquainting men with new place and training in work.

The average employer makes a mistake in not giving care and attention to acquaint new men with plant conditions, and to instruct them in the duties of their new places, so that they will become efficient parts of the organization in as short a time as possible. Many new men are put to work without a real knowledge of what they are to do, and often they do not understand what is expected of them. It is an actual fact that in many business enterprises, many of the workers have only a

hazy idea of what they are expected to do. A new worker should be placed under the direction of an expert, who is to carefully supervise his work, and to see if he has the plant methods of performing his task. If not, he should be carefully instructed in the plant methods, and the instruction should be continued until proper habits of work are formed, and the worker becomes an efficient member of the organization. The instruction of new workers is an important essential, and frequently efficiency is lost by paying little or no attention to it.

Each man in a plant should have his own card. This card should show the time when first entering the business, and his qualifications as ascertained from reports of previous employers and from interview. If a man is discharged, the reasons therefor should be placed on the card. This is necessary in order to prevent being imposed upon by worthless workers. The card index should be carefully kept for unskilled as for skilled workers. One case recently came to my notice. In a large factory, a man was hired and discharged as incompetent by five different superintendents before it was ascertained that he was an impostor. With a centralized employment bureau, and a good card index, such imposition would be impossible, but under the old system of superintendents hiring and firing men, men were frequently dismissed by one superintendent, and the next morning hired by a superintendent in another department. System is as necessary in an employment department as it is in other departments, and care should be exercised in having an efficient system and not one over-burdened with red tape.

Card record of each worker.

Advantages.

A prime essential for an efficient working force is the selecting of individuals who will soon fit into an organization and become efficient. It means the replacing of

the old haphazard method by one based upon careful investigation and sound judgment. Even to-day, few employers realize the importance of care in selecting qualified workers fitted for the places to be filled. Efficiency demands care in the hiring of workers, and to the employer it is a dollars-and-cents proposition. The placing of hiring in charge of a single person rather than leaving it to different superintendents is an absolute necessity in a business enterprise. The careful study and investigation of the needs of every position will soon be realized and attention given to it. The next few years will see the passing of the old methods of hiring labor, and the growing importance of a new official, the head of the employment department, who will not only be called upon to study carefully every position, and in case of a vacancy, fill it by the choice of one who is best fitted by skill and experience to perform efficient work, but he will also be called upon to carefully study the working force to see that each is assigned to work for which he is the best adapted, and to select apprentices and place them so that they will become efficient workers after they enter regular service. The hiring of labor is so important in every business enterprise that one wonders why business men were so long blind to the defects of the old haphazard, hire and fire method, and did not earlier realize the necessity of giving attention and study to it.

Efficiency and the hiring of labor.

QUESTIONS

1. What have been the changes in our industrial system which have increased the demand for skilled workers?
2. What is the old practice of hiring laborers?
3. State and explain the requisites for an efficient labor force.
4. What is the relation between efficiency and permanency in service?

5. What are the evils of constant hiring and firing?
6. What is the importance of a study of the requirements of places?
7. Why is the average superintendent unfit to hire men?
8. What is a misfit in a labor force? Why should he be eliminated?
9. What are the necessary steps in filling a vacancy?
10. What is the work of an employment department? What are the qualities needed for its head?
11. Name and explain the fundamental qualifications necessary for efficient work.
12. Mention different methods of ascertaining (1) health, (2) skill, (3) habits of an applicant.
13. Why is a drifter undesirable in a working force? How may a drifter be recognized?
14. What precautions should be taken with personal letters?
15. What characteristics in laborers promote (1) efficiency, (2) inefficiency?

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CHAPTER VII

TRAINING

THE industrial revolution ushered in many changes in methods of production and transportation. The numerous inventions which made the industrial revolution possible almost completely revolutionized our industrial system. Concentration of industry, high specialization of labor, increase in the use of capital, rapid introduction of labor-saving machinery, and organization of workers followed with great rapidity. The progress of industrialism led to keen competition, to increasing the size of the producing plant, and to assigning an ever-increasing number of workers to remain throughout their lives in the wage-earning class. The modern organization of industry which followed, and which is based on capital means the employment of numbers of workers as wage-earners, whose duties and only responsibilities are the performance of the productive tasks assigned to them. Towards the end of the nineteenth century a few progressive employers realized that a serious mistake had been made in neglecting the human hands which ran the machines. Little or no attention had been paid to the human element, to the worker upon whom the efficiency of a machine largely depends. Employers did not awaken to the fact of their neglect until they found themselves seriously handicapped by a scarcity of skilled hands which were found necessary to obtain greater efficiency from their expensive and highly complicated machines.

Changes introduced by the industrial revolution.

Little attention paid to labor.

The haste to secure industrial development during the nineteenth century caused employers to neglect the providing of adequate training for workers. Near the close of the century, the absence of systematic training resulted in a scarcity of properly trained men, and placed industry in a serious situation. It looked as though the lack of trained men would to a certain degree block industrial development. The training of men did not keep pace with the rapid industrial development, due to the fact that men were neglected for machines. Employers had concentrated their attention on improvements in machinery, and had forgotten to lay the basis for future development by training workers who were to make the complicated machines productive and efficient.

Training of workers neglected.

Employers did not, until the dawn of the twentieth century, realize that industrial and commercial supremacy depended in a large measure upon a skilled body of wage earners. It cannot be too strongly emphasized that the great cornerstone of our future industrial growth depends upon a supply of industrial workers, intelligently trained to perform their various tasks with the greatest efficiency. The industrial country which will successfully compete in the world's market will be the one which produces with the greatest efficiency. The one absolute essential is a properly trained laboring force, one which combines with general intelligence, the broadest technical knowledge and widest technical skill. The advance of industry depends in a large measure upon intelligent workers, — workers who have been trained so that they possess sufficient knowledge and flexibility of mind to turn readily from one thing to something else according to the demands of improvements and of industry. An efficient worker is one

Importance of properly trained workers.

The efficient worker.

trained so that he has a broad knowledge concerning the technical side of his task, the machines which he works, and commercial business in general, other than performing the few simple motions which his task may demand.

The training of men so as to assure trained and efficient workers for the future is the keynote of industrial progress. The backbone of a business enterprise, it matters not its character, is its contented and satisfied trained workers. Employers should have it emphasized that skilled workers are not born but are made by training. The demand to-day, if we are to continue to advance as rapidly in the industrial field as we have in the past, is the systematic training and education of American workers. The complicated machines, systems, and methods found in the average industrial plant demand workers, skilled, resourceful, and intelligent. The question arises, how are we to train American youth to develop a body of efficient workers. This is one of the most important questions confronting industrialism to-day. Large sums of money have been spent employing experts to devise suitable methods of training. Many systems have been devised and found supporters. The question as to what is best, in order to produce the most efficient workers with the least economic waste has not been unanimously agreed upon. American industrial supremacy depends upon the solution of this problem, and with so much at stake, American genius, which has always solved difficult industrial problems in the past, will bring forth a satisfactory system of training. The guarantee of a large supply of efficient workers will be a great boon to American industry, and will be an important factor in placing America in the van as the greatest industrial country in the whole industrial world.

Importance of training workers.

How to train workers is the problem.

For more than a century after the introduction of the factory system, the only system of training was the apprenticeship system, a system borrowed from the domestic system, the previous system of industrial production. The old apprenticeship system dates back to the reign of Queen Elizabeth, when a statute declared that no person should exercise any trade or "mystery" without serving an apprenticeship of seven years. A boy would bind himself to a master, work for him, and live in his home as a member of his family. The master was his guardian, and was responsible for his physical welfare, his moral and intellectual development, as well as his training in the art or "mysteries" of his trade. During the early years of the system, the master workman bought the raw materials, worked them up into finished articles with his assistants, and sold the finished goods. The apprentice, who was to become a master, was at once both assistant and learner, and received a training which it was to the advantage of the master to make as thorough as possible. The apprentice and his master were usually from the same social class and were socially equal. The apprentice looked forward to becoming in a few years a master himself, and this anticipation was usually fulfilled. The first limitation was when many guilds succeeded in limiting mastership to the families of guild members. This restriction made it impossible for many to become other than wage-earners.

The apprenticeship system.

Characteristics.

Limitations.

As long as the handicraft and domestic systems prevailed, the old apprenticeship system served its purpose fairly well. Nevertheless, during the domestic system, many abuses arose to the disadvantage of the apprentice. With the coming of the journeyman, the close relation which

Abuses in the apprenticeship system.

formerly existed between master and apprentice became more distant. The apprentice during his indenture became merely a chattel of his master, and many advantages were taken from him. No method of instruction was in practice, and the apprentice was supposed to learn his trade from observing the journeyman and receiving instructions from him. He usually devoted most of his time to menial work in no way connected with his trade. The master had more important things to look after, and paid little or no attention to whether his apprentices were receiving instruction or not. The journeymen cared little about the apprentices, looked upon them as coming competitors, and did everything to discourage rather than encourage them. Many an apprentice served his time, and at the end lacked considerable of being a skilled mechanic. The long term of apprenticeship did not always make it possible for the apprentice to master his trade and to become a skilled mechanic. The old apprenticeship system was the crudest possible form of imparting knowledge and of training. The fear that people would be imposed upon if a long service of years was not taken in learning a trade did not assure proper training, and the average apprentice, after many years of service, was frequently poorly equipped for becoming a journeyman. Yet with all its defects, apprenticeship furnished for centuries the only system of training workers.

Crude form of training.

The numerous inventions of machinery during the latter part of the eighteenth century led to concentration of industry and greater specialization of labor. The new changes in the industrial system worked against the old apprenticeship system. It was soon discovered that it was not necessary to have a worker trained in all the elements of a trade in order to attend a machine making only one part of an article, which under the

previous domestic system, was made entirely by a workman. New methods of production made old regulations burdensome. Manufacturers soon began a movement for the repeal of the old Elizabethan law, and finally succeeded in 1814. The repeal of the old law did not abolish training by the old system, but it continued with more or less of the old rigor. In some trades, the old time limit was maintained for years, while in others it was lessened. The form of signing indenture papers continued for years after the introduction of the factory system, and the old legal indentures were common and in everyday use as late as 1840. Soon after this, the old system of indenture began to decline, and by the civil war it had disappeared from many trades. Nevertheless, to-day it is not entirely out of use, for a few occasional instances are still found in practice. Although the old indenture remains, it is very difficult, if not impossible, to find an instance where the same conditions prevail as under the old system.

The repeal of the Elizabethan law.

Indentures common until 1840.

By the close of the civil war, the regulations and customs of the old apprenticeship system had gone into disuse, and a modified form took its place. This in principle was based upon the old apprenticeship, but in practice differed from it. The trade unions became great champions of apprenticeship, and their object was not to assure a supply of trained workers, but to limit the number in a trade, through limiting the number of apprentices and prolonging the time to learn the trade. Frequently, trade unions placed so many restrictions upon apprenticeship that many employers refused to be troubled with apprentices. The policy from the civil war to the close of the century, as far as trade unions were concerned, was to protect their par-

Modified apprenticeship.

Trade unions.

ticular trades through limiting the number and regulating the training of apprentices. Many trades were under the absolute control of unions, and this policy soon made itself felt in a scarcity of skilled workers in particular trades.

Factories, until 1890, were of medium size, and employers had little difficulty in obtaining the number of skilled workers which they wished. They were willing and usually compelled to obey the dictates of unions. When the rather phenomenal expansion of industry began about the year 1890, combinations, consolidations, and an increasing size of the producing plant followed, and there began an extraordinary demand for skilled labor. The enlarged plant brought with it more complicated and intricate machinery, and as a result, more skill and intelligence on the part of workers were demanded. The increased demand for skilled workers came suddenly, and when employers sought skilled workers, they found a great scarcity. The old restrictive policy of trade unions in regard to apprentices threatened to check industrial extension. The cry suddenly arose for some system of training so as to guarantee a supply of skilled men. The unions fought bitterly to protect their policy of restriction, and assailed every attempt to educate and provide skilled workers other than by the old methods. They could see, with their narrow vision, nothing but lower wages with an increased number of trained men, and did not see that the great expansion which would follow would not only take the surplus, but increase the demand for labor, and increase wages. Three avenues opened for the training of skilled workers: firstly, manufacturers to take matters into their own hands and to educate their own men; secondly, employers and the public working together; and thirdly,

Sudden demand after 1890 for skilled workers.

The opposition of unions.

the public through properly equipped schools. The first gave us the new apprenticeship, the second, coöperative industrial institutions, and the third, various varieties of industrial and trade schools.

Skill; its meaning.

Skill means, besides manual dexterity, speed and accuracy. The two latter come as a result of careful training until habit is formed. Efficiency depends upon forming proper habits of performance of work, and the elimination of unnecessary movements. It demands the ability to do the right kind of thing without being told, and the right thing with being told. This comes as a result of careful training.

Requisites for an efficient worker.

Efficiency demands that knowledge should take the place of guesswork. The old saying "Knowledge is power" is in business changed to "The application of knowledge is power." This is a fundamental basis of efficiency, and demands in workers more than the manual skill necessary in performing a task. No man can become an efficient worker who does not understand the scientific principles underlying his trade. A skilled worker should know, if working with a machine, the intricacies of the machine, and should have a knowledge of the material with which he is working, and of the commercial side of business. An intelligent worker is one of the demands of efficiency, and requires a knowledge of subjects allied to and kindred to his particular trade. A training of the mind and of the hands is necessary in our struggle for industrial supremacy. Proper training is required to develop industrial intelligence. Stress in the training of skilled workers should be placed upon intelligence as well as upon manual skill. Intelligence should be developed so that men will work with economy of time, material, and effort.

Industrial intelligence.

Industrial progress demands trained minds, skilled hands, and the adaptability of workers to the performance of their tasks. Proper adaptability is a demand of efficiency. The choice of apprentices who are adapted to particular trades is essential, and demands the closest attention. It requires close observation during apprenticeship. As soon as it is found that a boy is not adapted to the trade that he is learning, he should not be allowed to continue, his case should be studied and if possible a trade chosen for which he is adapted. With few exceptions, every one should be trained to work so as to like it. The habits of carelessness, laziness, and slovenliness are so easily acquired that training is a good antidote to work. With proper training, skill, speed, and accuracy are acquired, and pride grows in one's work. Emphasis should be strongly placed on careful training in the best methods of performance of work, so as to acquire habits of work which guarantee performance with the greatest efficiency. With careful training, and the acquiring of proper habits, appreciation in work grows, and this assures a proper attitude towards work.

Adaptability.

Training in best methods.

Training is of national interest as well as of the greatest importance to business men. With properly trained workers, the economic wastes arising from incompetency and ignorance would be eliminated. This would result in the saving of millions of dollars annually, would benefit employers by increasing profits, employees by increasing wages, and the nation at large by giving a higher standard of living and a better class of citizens. Incompetency and ignorance, the arch-enemies of efficiency, are found lurking in every business enterprise. They cause failures, low wages, poverty, and suffering, and if their presence is

Wastes from incompetence and ignorance.

How to eliminate.

too prominent, prevent industrial progress. Efficiency demands that incompetence and ignorance should give place to skill, intelligence, and competency. The necessity of the presence of these qualities in a working force emphasizes the importance of proper training.

During the last few years, business and railroad corporations have been taking a greater interest in the training of employees. A tendency towards the general adoption of some form of apprenticeship is decidedly marked in all industries where such a system is practical. The apprenticeship or corporation school, as it has come to be called, has had a rapid growth and is yearly increasing in favor. It represents a revival of the old apprenticeship system in an improved form, and adapted to the needs of modern industry. So important was the corporation school considered as a factor in industry that in January, 1913, a number of representatives of the leading corporations possessing schools met at New York University, and organized the National Association of Corporation Schools. The activities of the Association will undoubtedly increase the importance of this system of training apprentices, and raise the standard of the schools now in operation. It seems that the corporation school is destined to become a favorite system for training employees.

The corporation school.

Corporation schools vary widely in methods of instruction. Many are as yet poorly organized, and are not efficiently conducted. Many do not provide any means of classroom instruction, but encourage or insist upon attendance at publicly conducted evening classes. An effective apprenticeship school should have classroom as well as shop instruction. The most satisfactory method is to have competent instructors for classroom work and for shop work. In large enterprises,

Methods of instruction.

Classroom and shop instruction.

two sets of instructors should be maintained, but in small, the classroom instructors may be also the shop instructors.

Both shop and class instructors should be men of practical experience. Shop instructors should be chosen from the best skilled men in the laboring force, and should be men who know thoroughly their work, and are good instructors. They should be familiar with the methods and the practices of the plant, and should inspire the confidence of the young apprentices in the business. Class instructors should be graduates of technical schools, or graduates of apprenticeship schools with advanced training elsewhere. They should be not only competent teachers, but intelligent, moral, and temperate men. Instructors should encourage clean personal habits, inculcate right ideas of work, and exert a wholesome influence over boys, so that they will become temperate and honest men with a high sense of moral duty. Care should be taken that instructors are thoroughly sincere in their loyalty and interest in the enterprise, and heartily coöperate with the management in working for success. This is absolutely essential because instructors should by their sincerity and earnestness in instructing and in dealing with apprentices, arouse their loyalty to the business enterprise, and an interest and enthusiasm in their work. This will later assure a hearty coöperation which is so essential for success in any business undertaking.

Qualities for capable instructors.

Importance of good instructors.

The selection of apprentices should be made with extreme care. A basic test is the physical. A thorough physical examination should be made of each applicant, and if any defects are found that interfere or would be likely to interfere with his becoming an efficient skilled worker, he should not be taken. Sixteen years should

Requisites in selection of apprentices.

be the minimum age for applicants, while the maximum should not exceed twenty-two. An intelligence test in the way of a written or oral examination is necessary. If a boy has reached the age of sixteen and is not competent to pass a good examination in the common school branches, the chances are against his becoming a competent skilled worker. Particular attention should be paid to the moral character of an applicant. No one should be allowed to become an apprentice until a thorough investigation has been made into his moral character and habits. Character is an absolute essential in the making of an efficient worker, and should be carefully heeded in the choice of those who are to become in the future the backbone of an enterprise. Care should be exercised to ascertain a boy's adaptability to the trade which he wishes to learn. Much time is wasted, and additional expense is incurred in carrying boys for some time who are not adapted to the trade chosen, and would never become skilled, competent workers.

Intelligence.

Character.

Adaptability.

The ability which makes one man worth more than another in doing a particular work is not acquired alone by practice, but is partly transmitted to him from his ancestors. If a boy has not latent ability to develop, training will not develop him into an efficient worker. An important problem is the selection of boys who possess the ability necessary for development into efficient workers.

Latent ability.

The usual period of apprenticeship is four years, and this is sufficient to learn any trade. After the probation period is passed, many corporations insist upon written contracts drawn up between them and the parents or the guardians of the boys with the boys' consent. A few insist upon

Period of apprenticeship.

deposits on the part of the boys or their parents, as a guarantee of good faith in fulfilling the period of apprenticeship. An allowance is usually made for previous shop experience. A period of probation from three to six months should be given all apprentices, and particular attention should be given to weeding out undesirables, and those not adapted to the particular trade chosen.

A decided advantage in favor of the corporation school is that apprentices receive pay during their apprenticeship. Many capable young boys must earn or help to earn their own living, and so a course at a trade or industrial school is impossible. A standard of wages is fixed for apprentices, but this varies with corporations. There is usually an increase at the completion of each six months of work. The average corporation gives a bonus of from fifty to a hundred and fifty dollars at the completion of the course. The wages paid are usually sufficient to allow a young man to live economically.

Apprentices paid.

Corporation schools are not confined to manufacturing enterprises and railroad companies. Many retail and wholesale establishments have schools, and the time is not far distant when banks and financial institutions will install schools for training their own employees. These training schools should not be confused with the numerous educational courses carried on by many establishments for the benefit of their employees. These courses are usually conducted at night, but a few corporations have them during working hours. Educational courses and lectures have a beneficial influence, but do not take the place of a carefully planned apprenticeship school.

Where corporation schools are possible.

The training of each apprentice should be along two distinct lines, the one academic, received in the school-

room, and the other practical, given in the shop. The aim is to teach a boy a trade, and that trade cannot be properly learned unless he knows mathematics, mechanics, and the fundamentals of the science which accompanies the trade. Shop management, business methods, business English, and fire and accident prevention are subjects which should be taught every apprentice. Courses and subjects to be taught in the schoolroom vary with enterprises. In some, the fundamental principles of salesmanship and advertising are essential while in others they are not. No standard course of study can be outlined, because such must necessarily vary with business enterprises. The efficiency of an academic course depends upon the efficiency of the instructors in outlining those subjects which are allied to the trade and business, and which assist in making the apprentices efficient and capable workers.

Character of training.

Academic.

Essentials.

Many corporations do not teach academic courses in the plant, and have their apprentices attend evening classes elsewhere. Usually, they are the classes conducted by the public school system of the city, or by some organization. Boys are not paid for attendance, and must attend a certain number of hours weekly, usually four. The giving of academic training in evening schools, in or outside of a plant, is unsatisfactory. Every corporation with a school should have it in charge of competent instructors, and school work should be given during the working day. It should compel attendance in the classroom during working time, and the boys should receive the same pay for classroom work as for shop. The hours of attendance at present vary from plant to plant, but the favorite time seems to be from seven to nine A.M.,

Training outside the plant.

with four the average number of hours of classroom work per week. Some corporation schools are open throughout the year, while others run ten months.

At least six, and even eight hours of academic instruction should be given the first year of apprenticeship, and lessened to four or six the second and the third. If a boy has had previous academic training, allowance should be made in attendance. Three years should be sufficient to give training in academic work. Apprentices should be under the same discipline as employees in the shop, and it should be strictly enforced. The average corporation school does not give any examination in academic work, holding that the instructor should know each student's advancement. Written examinations give the best results, and with prizes for good work, better results may be obtained. The average school uses few textbooks, and the work consists chiefly of written exercises and problems chosen by the instructor. The best results may be obtained by having carefully outlined courses with suitable textbooks. The Baldwin Locomotive Company requires apprentices to attend a free school two evenings per week for twenty-four weeks during the year. Attendance is required for two or three years, depending upon academic training before entering the plant. No system of reports from instructors is required. A boy's written statement made weekly that he has attended school for two evenings during the past week is accepted by the superintendent. The day upon which a boy attends evening school he is excused with full pay one or two hours earlier in order to enable him to go home for supper, and to prepare for school.

Hours of instruction.

Examinations.

Textbooks.

The number of years of apprenticeship may vary in the same plant for different trades. The General Electric

Company of Lynn, Massachusetts, has the following courses: (A) machinists, die and tool makers, four years; (B) pattern makers, four years; in either A or B, graduates of high school may finish the course in three years; (C) iron, steel, and brass molders and steam fitters, two years, including trial period; (D) draftsmen and designers three years; (E) electrical testers, three years; (F) technical clerks, two years. This company has student courses to which only selected graduates of recognized colleges and universities are admitted. Special courses of training may be established when required. The pay for the different courses is as follows: A and B, ten cents an hour for the first year, twelve for the second, fourteen for the third, and sixteen and a half for the fourth with a bonus of one hundred dollars on the completion of a satisfactory course; C, ten cents the first half year, twelve cents the second half year, and fourteen cents the second year, with a bonus of fifty dollars; D and E, twelve cents the first half year, fourteen cents the second half, sixteen cents the second year, twenty cents the third year, with a bonus of seventy-five dollars; F, twelve cents the first half year, fourteen cents the second half, sixteen cents the second year, with a bonus of fifty dollars.

Courses of the General Electric Company.

Many methods are in practice for academic teaching in corporation schools. The most efficient schools have carefully outlined courses for the apprentices of each trade, or for closely related trades. Many give only one course, which all apprentices are to attend. Unless all the trades taught are closely related, this does not give satisfactory results. The most satisfactory system is to have carefully outlined courses for the different trades taught, and not to group, except where trades are so closely related that

Best method for academic work.

they require practically the same academic and theoretical training. If it is business to have an apprenticeship school, it is business to have it conducted so as to obtain the greatest efficiency and best results. Many changes should be made in the majority of existing schools in order to make them efficient, and give the greatest returns for the amount of money expended.

Shop instruction.

Shop instruction should be given by special shop instructors, but in many schools there are no regular instructors, and the boys are dependent upon the shop foremen and the workers for instruction in their trade, as is the case in the Baldwin Locomotive Works. Shop work should be under the supervision and the direction of shop instructors, who should be the best skilled workers in the plant. Greater efficiency is obtained if the instructors are required to receive special training for their work. They should be specialists in their trade, and should make a special study of the various methods of performing the trade that they are to teach. Only standard methods should be taught, and these should be the best possible for local conditions. A shop instructor should always be on the lookout for better and more efficient methods, and if after careful examination and testing such are found, they should be made standard, and it is the duty of the shop instructor to introduce same.

Essentials for good instructors.

Practice shops.

There is a growing practice to maintain practice shops where apprentices do the first part of their shop work. The regular commercial product is made and only apprentices do the work. Extreme patience is essential for getting apprentices started in standard methods, and in a way to arouse interest in their work. When the shop instructor considers an apprentice sufficiently developed, a transfer is

made to the shop proper for the remainder of the apprenticeship. No fixed course can be laid out, because some apprentices are more apt than others in learning, and do not need so much time in certain departments. Each apprentice is advanced in the shop as he has, according to the judgment of the shop instructor, acquired the necessary industrial capacity. Frequently, apprentices who have been some time in the shop proper if the quality and the quantity of their work are of low standard, are sent back to the training room. By competent instruction and standard methods, the grade of skilled labor may be greatly increased. A great deal depends upon proper training and the acquiring of proper habits of doing work. On satisfactory completion of the time of apprenticeship, in school and shop, a diploma or certificate is usually given. Apprentices are not compelled to remain with the corporation, but are encouraged to become a permanent part of the plant organization.

How conducted.

Graduates of properly conducted corporation schools are able to do high grade work, and make not only capable and efficient workers, but from their ranks, capable foremen and executive officers may be chosen. With proper instruction by competent instructors, the average apprentice when he becomes a regular employee has usually acquired loyalty and interest, and at once heartily coöperates with the management. The training received in a shop makes apprentices familiar with shop life, and when they become regular workers, no time is lost and no additional expenditure is necessary in breaking them in as integral parts of the organization. Where a high grade of skill is required, and many workers are employed, the corporation school is a dollars-and-cents proposition. It assures a supply of competent skilled

Increasing favor of corporation schools.

workers. A great increase in the number of these schools will take place in the near future, and the time is not far distant when every large business enterprise will have its school for apprentices. Time will remedy many defects which are found at present in many of our corporation schools. The efficient corporation school has come to stay as an important factor in our industrial system, and its importance is daily becoming more recognized.

Due to the fact that corporation schools are only possible in large enterprises, they cannot be relied upon to provide the entire industrial training. Where it is practicable, the corporation school properly organized and conducted is satisfactory in the training of apprentices. A system closely allied to this system is that of coöperative industrial schools. Academic and theoretical training are given in educational institutions while shop training is given in producing shops. This is a coöperation between employers and educational institutions. The coöperation is brought about in a variety of ways. A particular town or city usually has its own scheme worked out to meet local conditions. If properly conducted, the system brings results, although it is not as efficient or satisfactory as where the training is given entirely in one establishment.

Coöperative industrial schools.

Coöperative schools differ materially in their methods of training. A favorite method is where an apprentice spends half his time in school, and half in a shop. The usual arrangement in half-time schools is to have two apprentices to a job, and each to spend alternating weeks in school and in shop. In some schools all of the first year is spent in school work, and shop work does not start until the second year. Examples of the half-time system are the University of Cincinnati, Fitchburg

Methods of training.

Half time.

High School, Fitchburg, Mass., Technical High School, Providence, R. I., and Lewis Institute, Chicago, Ill. A second form of the part-time system is where the apprentice attends school much less than half time, usually being excused from regular work in the shop a few hours a week to attend some educational institution where subjects correlated with the trade are taught, as the Franklin Union, Boston, Mass., Mechanics' Institute, Rochester, N. Y.; and a third is where attendance at school is only during slack time as in the Horace Mann and James Otis Schools in Chicago, Ill. Apprentices are usually paid for shop practice, but not for attendance in school.

Coöperative *vs.* corporation schools.

The coöperative system is a decided improvement over the ordinary industrial school, but is not as efficient as the corporation school. Apprentices work in a producing plant, and get acquainted to a certain degree with shop practice. The academic training is usually better than in the corporation school, but the shop is not nearly so efficient. The apprentices in the shop are usually supposed to get their instruction from foremen or skilled workers. Sometimes school instructors visit shops and direct the work of boys. This arrangement will not produce the spirit of loyalty and coöperation as will having all boys under special shop instructors. With special pains to improve shop instruction, and assure the teaching of standard methods by having the boys under special experts as shop instructors, the coöperative schools may be greatly improved and made more efficient.

Industrial evening schools.

Many kinds of evening schools are in operation, having as their aim the improvement of industrial education and training. Evening schools were first intended to give workers a rudimentary education. Later, the need of some correla-

tion between academic and shop practice made itself felt, and the continuation school developed. Courses were given in subjects related to trades, as mechanical drawing, shop arithmetic, industrial chemistry, etc. No provisions were made for practical training as preparation for a trade, or for special advancement in a trade. As a result of this demand, evening vocational and evening trade schools came into existence. Evening industrial schools may be grouped under three heads, continuation, vocational, and trade, and may be public or private. Industrial evening schools, in giving employees knowledge of subjects related to their trades, perform an important work in promoting industrial education. They have a drawback in that instruction is given in the evening, and is not sufficient to give the training necessary to make skilled workers. As supplementary aids in industrial education, they perform an important work, and materially assist in giving academic and theoretical training.

Evolution.

Classes.

Industrial training in public schools is a recent development, and it is only since 1900 that it has become general. The universal demand for better trained workers has led recently to much improvement in industrial training. Many public and private institutions have been organized to better equip boys and girls for their life's work, and many old institutions have added courses for that purpose. The question of industrial training is attracting much attention from educators, business men, and legislators, and during the next few years many improvements may be looked for. Industrial, trade, manual training, and vocational are names given to schools for training and better equipping boys to become better and more efficient workers.

Industrial training in public schools.

Industrial is the name given to those schools which train in the general aspects of industry, and do not specialize their training to the extent of teaching specific trades. Many do not differentiate between industrial and trade schools, but they are distinct. An industrial school is not designed to teach any one trade, but teaches what is necessary for the practical working of trades. Industrial schools serve as an important factor in preparing boys to be better equipped when they begin their apprenticeship. Many boys leave public school at fourteen, and few trades are open to them as apprentices until sixteen. Industrial schools may perform an important function in extending the time of these boys in school, and making them much better equipped to become skilled workers. Our educational system could be materially changed to the benefit of the American people by having industrial courses in the last year or two of the grammar schools. Many boys leave grammar school and become unskilled workers; if they learn any trade, it is usually poorly learned, and many remain unskilled throughout their lives. The industrial school is best suited to prepare boys for their vocations by giving them training during the gap, as it were, between leaving grammar school and entering a trade; that is, from fourteen to sixteen years. Public industrial schools may prove of great service in teaching those subjects closely related to the trades, and by so doing make young boys better equipped to become apprentices.

Characteristics of an industrial school.

Industrial courses in grammar schools.

The trade school is for the purpose of giving the training for trades which was acquired formerly under the old apprenticeship system. The trade school of the old type simply taught a trade, and the student spent practically all of his time in

Trade schools.

shop work. The trade school of the modern type gives some academic instruction in subjects allied to a trade as well as teaches the trade itself. In 1907, the first public trade school came into existence, when the city of Milwaukee took over the Milwaukee School of Trades, a private institution, and before that time, trade schools were private institutions. Since 1907, many public trade schools have been opened in different cities. A properly organized, equipped, and conducted trade school gives satisfactory results. A trade school should give academic training as well as practical, and should be equipped with the best possible equipment for the teaching of trades. The backbone of success is the instructing staff. Care should be exercised in ascertaining the best methods for performing the different movements in learning a trade, these should be standardized and taught. If some system could be evolved for standardizing movements, so that only the best were reduced to habit-form, a great advancement would be made in eliminating waste. Strict supervision is required, and the same carefulness should be exercised in working as if working on goods for sale. Usually the output of a school goes to the scrap-heap and is not sold in the market. Learners are likely to become careless and slovenly in their work, and this should not be tolerated. Instructors should insist that in the acquiring of the best methods and best habits, speed is heeded. Several manufacturers complain that boys who are taught in trade schools are slow and do not possess speed. The acquiring of speed is an absolute essential in forming habit. Properly equipped trade schools with efficient instructors teaching standard methods are important factors in acquiring efficiency. They cannot take the place of corporation schools, but after these, are the most efficient means of training.

Requirements for efficiency.

Supervision of work.

Trade preparatory schools are meeting the demand for some system of training for boys from fourteen to sixteen years. They form an important factor in our industrial training and should receive more attention in the future. They teach the elements of a trade, the fundamentals of industry, and some practice. Their purpose is to give a training that prepares students to enter trade and corporation schools.

Trade preparatory schools.

Manual training has received considerable attention in our country. It began with secondary schools, and later courses were given in the elementary schools. The aim is not vocational, that is, to equip a boy directly for industrial pursuits, but is cultural. Statistics show that a very small percentage of graduates of manual training schools enter trades. Manual training is beneficial in giving better equipment for the industrial pursuits, and in furnishing boys a wider outlook in choosing a vocation.

Manual training schools.

The vocational school is an industrial school for the purpose of preparing boys for vocations. Its aim is the giving of training for the purpose of directing a pupil toward a trade, or other manual occupation, rather than as a part of a direct and intensive preparation for skilled workers. The course is usually two years, open to graduates of elementary schools, and to those who have reached the age of fourteen and are prepared to undertake the work.

Vocational schools.

The purpose is not to turn out skilled workers, but to prepare pupils to be better equipped to enter trade and corporation schools. Vocational schools do not supersede high schools, but offer inducements to keep boys at school until the age when they may enter trade and corporation schools, and to give them a practical and an academic training that will be of service to them in their later training. The voca-

Purpose.

Importance.

tional school is a necessity, and its place is absolutely necessary in the training of more efficient industrial workers. Every city in the United States should have these schools, and they should be equipped and conducted at public expense. They have come at an opportune time, and their importance will soon be so recognized that they will be found in every city in the United States.

"We are getting only 50 per cent of the ability of the workmen in our factory," said the foreman of a large plant. "How to get ninety per cent and keep their goodwill is the all-important question." An important question to every employer is how to increase the efficiency of his men. Efficiency has awakened employers to many wastes in the old methods of doing things. One of the greatest wastes is that of misdirected energy, and this introduces the question of training. Training is a requisite in the elimination of wastes due to misdirected energy. The question of training includes school and shop education. How to furnish industry with the best trained workers is an important question which this country must solve. The question of preparation is important, and to solve this problem, vocational schools are a necessity in our educational system. They should be equipped and conducted at public expense, and their value in preparing young boys for trades cannot be too strongly emphasized. Practical training for trades should be given in trade and corporation schools. Properly conducted corporation schools are best for the training of efficient workers and have become a permanent fixture in the efficiency movement. Trade schools will continue a strong factor in training, but they should be equipped and conducted at public expense. They demand extreme care and supervision to bring them to a high standard.

Best systems for training workers.

Efficiency of the training in trade and corporation schools depends upon instructors and methods. The crucial point is the following of standard methods until habits are formed. Vocational, trade, and corporation schools are the chief systems of industrial training. The numerous varieties found of industrial schools, both day and evening, should not be criticized, because each has its place in industrial education, and each is performing its task of better equipping industrial workers for doing more efficient work.

QUESTIONS

1. What is the importance of properly trained workers in our industrial system? Why was training neglected during the nineteenth century?
2. Give the characteristics of the apprenticeship system. What were the abuses of that system?
3. In what way did trade unions control apprenticeship during the latter part of the nineteenth century? Account for the opposition of trade unions to industrial education.
4. What wastes are due to incompetence and ignorance? How may these wastes be eliminated?
5. Give the evolution of the corporation school. Why has it become an integral part of our industrial system?
6. What are the requisites for an efficient corporation school?
7. What should be the characteristics of capable instructors?
8. What precautions should be taken in the choice of apprentices? Why?
9. What is the purpose of the practice shop? What precautions should be taken to make it efficient?
10. What are coöperative industrial schools? What are the essentials for a good school?
11. Give the evolution of industrial training in public schools. What are the characteristics of the industrial school?
12. What is the function of the trade school in our industrial system? What are the requisites of a good trade school?
13. What are trade preparatory schools?
14. What is the purpose of manual training schools? What requisites are necessary for a good school?
15. What is the place of the vocational school in industrial training? Account for its importance.

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CHAPTER VIII

HABITS

THE great countries of the world are competing with one another for industrial supremacy. Industrial expansion depends in a large measure upon efficiency. Accordingly, every factor which has a bearing upon efficiency is of the utmost importance to business men. Of all the factors, the human is recognized as the most important, and industrial progress and development depend more upon it than any other. An important question to solve is how to attain the greatest efficiency from human hands and bodies. This demands the study of many factors which until recently business men thought were of little use to them, either in the building up of a business or in the acquiring of profits. One of the most interesting and important of these factors is habit, and the more careful study that is made of it, the more importance is attached to its place in efficiency, industrial development, and progress.

Industrial expansion and efficiency.

Habit, a factor in efficiency.

Human efficiency depends largely upon the rapidity and the promptness with which workers are able to perform their tasks. In general, tasks become accurate and rapid in the degree to which workers are able to reduce their performance to habits. It stands to reason that the most efficient way to use a man's energy is to allow him to follow habit in thought and in action. It is surprising to a person when he finds out how rapidly he can do habitual acts, and how

Skill results from habit.

slowly he performs a task to which he is compelled to give specific attention. Habit-formation is the greatest labor-saving device in industry. Through a proper use of habits, the efficiency of men in fundamental operations may be increased from 40 to 400 per cent.

Definition of habit.

Habit has been defined as a condition of body or mind or both, which has been established by repetition of an act or mental process or both. It is an individual characteristic and varies with each person. Some habits make life safer and more efficient, whilst others sap vitality, dry up sources of energy, and work toward inefficiency.

Instinct *vs.* habit.

A person should not confuse habit with instinct, because the two terms are not synonymous but different. Habits are acquired, while instincts are inherent. Instincts are innate tendencies which are born with men, and have a profound influence on the development of actions. Animal life is completely controlled by instinctive impulses. The squirrel hides his nuts and the fox buries his food. Each blindly provides against future want. The number of instincts in man is far greater than in animals. Instincts are fixed and defy education and training.

Characteristics of instincts.

Fear, anger, curiosity, jealousy, rivalry, and constructiveness are a few of our instincts. All through life, instincts serve as a background for the acquired capacities. They determine action when experience has failed, and often conflict with acquired knowledge when that knowledge has been fully developed. Instincts are characteristics of a whole class, while habit are acquired during a lifetime, and vary with individuals.

The formation of habit is directly confined to the nervous system. The nervous system is very plastic, and every impression makes its nerve path. Every repeti-

tion of the original impression simply deepens the nerve paths already made. Each repetition of a past action or familiar impulse enables it to travel with less friction along the trodden path. One might liken what occurs to the process by which a path is made across a meadow. The first person may have selected his route for no cause whatever, and his course may have been straight or devious, but he left a mark in the down-trodden grass which the next person to cross the field is likely to follow. Presently the grass is worn away, and thereafter every one follows the beaten path.

Function of the nervous system in habit formation.

The first formation of a nerve course is not strictly haphazard as in the case of the wayfarer's first path across the meadow. The nervous system is part of a living organism, and that organism can itself in a large measure determine whether a movement shall be repeated or not. The organism itself largely decides which pathway shall first become established. Nevertheless it is true that when paths of nervous activity are established, they tend ever after to remain and be used. Every time an act is performed there is a deepening of the nerve rut. The two important factors in habit formation are that nerve currents tend to follow those paths which have been previously established, and that the organism itself plays a governing part in first choosing, and later deciding, what paths shall become fixed.

Determination of nerve paths.

Eating, walking, talking, and all important actions of everyday life are habits in whole or in part. The morning toilet is a habit. You wash, strop your razor, shave, brush your teeth, and comb your hair without being conscious of what you are doing. When an action becomes a habit, it seems to dispense wholly with conscious guidance. A pianist can

Examples of habit.

play familiar airs and carry on a conversation at the same time. A banjoist can play without looking at the strings and talk at the same time. We may not be entirely oblivious of our muscular activities but to all appearances we are entirely preoccupied with other things, and still are able to carry on habitual acts.

Repetition is an imperative demand in habit formation. The only way to master an action is by repeating it at regular and frequent intervals. Each repetition deepens the nerve paths already made and causes travel with less friction. The conversion of action into habit makes other demands than repetition. Knowing how to perform an action, ability to do, and willingness to do, are essentials in habit formation. The mind should be on the performance of the task, and the repetition should be identical. No variations should be allowed. Again, confidence in one's ability to eventually achieve success in making an action a habit is an essential prerequisite. Failure frequently follows, or mastery is unnecessarily delayed, as a result of lack of confidence in one's ability to achieve success. Paying heed to the foregoing demands makes habit formation comparatively simple and rapid.

Repetition a requisite.

As a result of habit, many acts are performed automatically. A machinist does not stop to think what is the next move to make, but it is made without any conscious attention. When a pianist is playing the piano, the finger movements and the reading of notes are carried on with a minimum of thought. Habits relieve the mind from paying attention to the details of successive steps of an act. While the performance of an act is being reduced to habit, a person's whole attention should be given to directing its performance. As soon as habit is formed, work is done automatically, and attention may be turned to other

Habits relieve brain of work.

things. In the Bureau of Engraving at Washington, I saw a young lady carry on a conversation and count sheets of stamps with great rapidity.

Skill, dexterity, and speed in the performance of work are based on habit. Work becomes accurate as well as fast in the degree to which we are able to reduce its performance to habit. No great speed is possible as long as attention must be given to each succeeding step of a task. Speed of action should not be confused with hurried action. Speed resulting from habit is never hurried, and mistakes and inaccuracies are rarities, whereas they abound in hurried action. Speed, precision, and accuracy result only from habit. Business men usually look upon habit as detrimental to efficiency. They invariably associate habits with something undesirable, and regard their possession as a handicap to good work. Little do they realize that the very basis of efficiency is habit, and that a careful study of habit and its proper formation are absolutely necessary and essential.

Results of proper habits of work.

In the formation of habits, oftentimes a severe test is that of overcoming the sluggishness and the inertia of the brain. It frequently requires a hard struggle to apply concentrated thought, and regular and constant application until habit is formed. Determination and perseverance are in many cases given severe tests. Very frequently discouragement follows the first few repetitions, and failure results. Every one should bear in mind the old saying, "If you don't succeed at first, try again." When everything seems hopeless, further repetition will soon give encouragement. The task gradually becomes easier, and eventually precision, accuracy, and speed are obtained. One then wonders how a task so easy to accomplish caused so much trouble and discouragement at the beginning.

Difficulties in habit formation.

Too great emphasis cannot be placed upon the necessity of identical repetition of movements in the formation of habit. Identical repetition not only deepens the nerve paths to the extent that enables response to travel with less friction along the well-marked grooves, but it guarantees, when habit is formed, no deviations from the established movements in the habit. When movements are not identical, other nerve paths are formed. If many repetitions of the exceptions occur, their nerve paths become more and more indented or grooved. So when the habit is formed, in place of one well-grooved path for the response to travel, there is one which it is necessary to follow to get proper performance, and one or more, more or less deeply indented, which it may follow. These exception nerve routes are alert in their efforts to direct the response to their courses, and to divert it from its true course. The exceptions usually put in their appearance at the very time when the worker is most anxious that they should not. Their appearance on one or more occasions frequently encroaches upon the worker's reliability and faith in his accurate performance of a task, and has a tendency to limit his speed. With the additional strain on the brain from watching for the exception, more fatigue is experienced, and frequently work is more exhausting with less speed than it is with greater speed and perfect repetition of a habitual task. Efficiency with its demand of accuracy, precision, and speed does not tolerate any exception in habit-formation, and repetition should be accurate and identical.

Importance of identical repetition.

The exception nerve route.

Efficiency demands industry as well as knowledge and skill. A working force, even if it be skilled, cannot be efficient unless it is industrious. Industry and indolence are largely matters of habit. Industry is the fundamental basis of skill and

Industry *vs.* efficiency.

dexterity, and without it, the latter are of little service. Boyhood and youth are the ages for the formation of proper habits of industry. Fathers and mothers little realize that they are largely to blame for a great amount of the indolence in the world. If they would take more pains to teach their children to be industrious what a boon it would be to industrial society. Youths who are allowed to do as they please soon form the habit of loafing. Work becomes distasteful, and only slight exercise causes discomfort. Indolence is established, and each successive year sees it more firmly rooted. After years of idleness, the habit of indolence is so firmly established that it is impossible to break away, and as a result, thousands spend their lives in indolence. What a blessing it would be to society in general, and to industry in particular, if this vast indolence could be abolished and we could have industry in its stead. The time for the formation of habits of industry is youth, and great care should be exercised to see that such habits are then formed. With habits of industry firmly rooted, skill, dexterity and speed are more easily attained. It cannot be too strongly emphasized that the efficient man is the one who is industrious as well as possessing knowledge and skill. One of the factors underlying our future industrial expansion, and essential in our struggle for the world's industrial supremacy, is efficiency, and one of the great bulwarks of efficiency is habit of industry. Fathers, mothers, and teachers should realize that one of their chief duties is to instill into children proper habits of industry.

Importance of habits of industry.

Visit a plant and watch the movements of the workmen, and you will see many unnecessary movements in the performance of every task. The habits of the average workmen are not such as enable him to do his work in the most economical and efficient manner. Most men

are allowed to choose their own movements in the performance of work. Habits are formed with no thought as to the attaining of efficiency. Many habits cause the expenditure of much unnecessary energy, and not only that, but they entail a great loss of time in performing unnecessary movements. I once watched a mason at work, and wondered why he struck each brick at least two or three times, when frequently it was not needed. On inquiry, I was told that it was habit, and that was the only reason given. The time and the energy given to the extra tappings, if saved, would have enabled him to lay many more bricks in a day without an extra expenditure of energy.

Formation of habit in common practice.

It is only necessary to visit two or three factories to realize the vast amount of time and energy wasted from using unnecessary movements in work. How much more efficient would a man become if this waste were eliminated, and the energy saved for the performance of more efficient work. The blame for the presence of the many unnecessary movements in the performance of work cannot be placed upon the worker because he usually does the best he can under the circumstances, but upon the employer for not taking proper care and pains in the implanting of proper habits for the performance of work. The old method of expecting a worker to observe how work is done, and to use his own judgment in choosing movements, and repeating these until habit is formed, should give way to the demands of efficiency where the employer chooses the best method for the performance of work, and trains employees in it, until habit is formed.

Wastes due to poor habits.

An important problem in business is the elimination of waste in its many varied forms. One of the greatest

wastes is that of misdirected energy, and in this case, a large part may be eliminated through the formation of proper habits. There is a right way of learning the performance of work and a wrong. Two workmen may obtain the same results, but one by unnecessary movements and roundabout methods may take not only much longer, but may consume much more energy, than the other. Frequently in observing two men perform similar work, you would declare that one would do a third more than the other, but on inquiry, you are surprised to find that the larger amount of work is performed by the latter. The movements of the one are much faster and his efforts much more strenuous. Carefully study the movements of the two. One will take three movements to do a certain part of the work while the other takes two. One, in short, has acquired as a habit a number of unnecessary movements, while the other has not. The new efficiency movement has turned the attention of employers to this waste and to its study in order to prevent its occurrence. The remedy lies in a study of necessary movements for the performance of work, ascertaining those best adapted to the attainment of the desired result, and training workers so that they acquire proper habits of work.

Elimination of wastes of energy through habit.

Examples of wastes of energy.

After proper movements have been ascertained, the next essential is training. Careful training is one of the great demands of efficiency. The workers should be carefully taught in the exact methods and movements necessary, and care should be taken that these are exactly repeated until habits are formed. The acquiring of standard methods and movements is of little use unless they become habits of workers in doing work. This demands careful training, and instruction in the understanding and in the

The importance of training.

use of the standards. Competent instructors should take charge of the workers while reducing standard methods and movements to habits. They should instruct and carefully supervise while workers are learning to make certain that only standard methods and movements are used. This avoids exceptions creeping in, and insures greater efficiency when habits are formed. The great aim is to train men so efficiently that they form the habit of doing the right thing at the right time without stopping to think. If proper standard methods and movements are ascertained, and workers are trained in their use, much of the waste of human energy would be eliminated, and an abundant supply of hitherto wasted energy would be made available for more productive work.

How to increase the efficiency of the skilled trades.

The efficiency of the skilled trades could be greatly increased by paying attention to motion study and training. Take, for example, brick laying. An apprentice is supposed to watch the laying of brick and learn the movements necessary. No attempt is made to instruct or assist him in learning the proper movements. The result is that habits are formed and include many unnecessary movements. Mr. Gilbreth has made a special study of brick laying, and has by careful observation and experimentation discovered the movements necessary to get the greatest efficiency in the work. If these movements were made standard, and their compulsory use enforced upon all apprentices and bricklayers, it would greatly increase the efficiency of the bricklayer, and would necessarily bring an increase in wages. If the same were done in all trades, it would greatly benefit employees and employers alike. Efficiency demands standardization of methods and movements, and the time is not far distant when these demands will be fulfilled.

Two classes of workers should be considered in training in efficient habit formation; first, the apprentice, and secondly, the one who has learned his trade. Each should receive special consideration. What would be satisfactory with the former may prove a failure with the latter. With the apprentice, when standard methods and movements have been ascertained, the acquiring of them is simply a matter of instruction and supervision. Little objection is usually found by the young apprentice in getting him to follow instructions. No factor in efficiency demands more careful study than the training of apprentices in acquiring efficient habits, and yet this has been woefully neglected in the past. Employers should be made to realize that efficiency depends in a large measure upon proper methods of doing things, and when this is accomplished, they will devote time and money to acquiring proper methods and training to obtain proper habits. Everything that adds to profits interests employers, yet it is only recently that a few progressive employers are realizing that proper habits add to profits by assuring greater efficiency.

Classes considered in habit formation.

Apprentice.

Skilled worker.

A manufacturer employing several thousand employees once remarked that standard methods and movements in doing work were satisfactory in training new apprentices, but absolute failures when they were forced on employees who had formed habits of doing their work, and that he had not introduced efficiency methods in habit formation because he was afraid of friction on the part of the older employees. The result is that the old haphazard wasteful methods are in operation, and it is not likely that in the near future any attempt will be made to eliminate the great wastes resulting from misdirected

Why changes are not made.

energy. The greatest opposition to new standard methods and movements, it must be admitted, comes from old employees. Each worker follows naturally the habit groove in both thought and action. The nerve paths are usually deeply grooved, and the opposition to forming new nerve paths is deep seated. Change of habit means a complete change in certain parts of the nervous system. One does not wonder at the great resistance in every case to change of any kind. No new habit can be obtained without a hard struggle, and demands for some time increased attention, and a considerably increased outlay of mental and physical energy. With a young worker, who has recently acquired his habits of doing work, habit changes are not so difficult, but with old employees, who are slaves to their deep nerve ruts, a radical change is almost an impossibility, while only a slight change means a great amount of extra effort.

Why do employees oppose changes?

Patience and diplomacy are demanded in every case where the introduction of new ways of doing things is desired. The use of drastic measures in making changes invariably results in failure. The first essential is the coöperation of the working force, and this demands that the workers be taken into confidence by employers. Few realize this, and they wonder why they fail in the introduction of changes. The importance of changes in habit should be made clear, and proper incentive should be given to make the changes. The one great incentive with every wage earner is increase in pay. It should be emphasized that the increased efficiency which will come from the changes will not demand extra effort after habits have been formed, and will increase wages.

Requisites for the introduction of changes.

The saving of energy by eliminating unnecessary movements will result in increased output without any in-

creased effort on the part of the workers. It will simply be converting the energy used for unproductive purposes into productive results. The fact that this is not for the purpose of exploitation, or diminishing the efficiency of the workers, but for increasing their efficiency without any greater expenditure of energy should be made clear. The average worker is opposed to change, because it means for a time paying more direct attention to mastering new methods, and because he believes that every innovation or change is for the benefit of the employer, at the expense of the employee. Prejudices and fallacious beliefs such as these should be overcome at the very outset, or else proper coöperation will be lacking and failure will result.

Effects of proper habits of work.

The coöperation of the laboring force having been obtained, the chief difficulty is over, because without it, the successful introduction of new habits is impossible. Standard methods of work obtained, their successful introduction demands considerable time, patience, and perseverance. The new methods must be mastered, and by repetition converted into habits. This accomplished, the working force through increased efficiency and wages will be better satisfied and more contented under the new conditions than under the old. With proper consideration of employees, clear explanations of purposes and results of changes, proper incentive to make changes, and gradual introduction with considerate and patient instructors, no employer will have much trouble in changing habits of employees, and thereby increasing their efficiency.

Conversion of new methods into habits.

Efficiency demands healthy and intellectual workers. Health is largely dependent upon the formation of proper habits of living. Regular eating, proper mastication of food, cleanliness, regular hours of rest, and wholesome recreation are the

Proper habits of living.

results of habit. Parents, in training their children in proper habits of living, have a duty to perform to industrial society. A person accustomed to dirty and filthy surroundings will have great difficulty in acquiring the habit of cleanliness. Employers frequently have great difficulty in getting their employees to live amidst proper sanitary and hygienic surroundings. If once the habit of proper living has been acquired, they express the greatest abhorrence to the very conditions which had taken so much patience to break them away from. Employers should insist on the acquiring of proper habits of living, and see that they are followed by their workers.

Proper habits of eating.

Many acquire early the habit of rapid eating and the improper mastication of food. Many form habits of overeating, which lead to indigestion and ill-health, and many become accustomed to eating sweets, cakes, and pastry instead of good wholesome and properly cooked food. All of the bad habits of eating lead eventually to ill health, low vitality, and inefficiency. Efficiency demands careful investigation into the habits of living of employees, and the correcting of those detrimental to health. Nurses and dietitians to visit the homes of employees, and to instruct in the proper manner of living and of eating are essentials in large business enterprises. Lectures on hygiene, care of the body, and proper clothing should be regularly given, and all expenses so incurred are good investment, because the increased efficiency of the working force repays manifold every dollar so spent. Even to-day, the average business man hesitates about interesting himself in the lives of his workers. The time is not far distant when nurses and doctors will be regularly employed by large business enterprises, and not the exception, as it is to-day. Training in proper habits of living is as essential in the

Training in proper habits of living.

management of an enterprise as training in the methods of doing work.

Habits, from the point of view of efficiency, may be classified as efficient and inefficient. The former include those which assist in getting the best possible results out of a given expenditure of mental and physical energy, as proper habits of living, work, and industry. The latter include improper habits of work, improper modes of living, and habits of intemperance and of indolence in any form. These should be eliminated if the goal of efficiency is the aim. Employers cannot afford to remain indifferent, and trust that the state and society will eliminate or rid industrial society of these cost-increasing factors, but should take the matter into their own hands, and by their own efforts discover and remedy improper habits in their working force. As soon as employers realize that the decrease in costs will more than repay for the expense of such action, they will become active in studying habits in order to eliminate those which are not conducive to efficiency.

Classes of habits.

Efficient.

Inefficient.

Formerly, and even to-day, business men associate habits with bad habits, and look upon a habit as something undesirable in a worker, and a factor, if present, working toward inefficiency and loss. They look upon all habits as bad and undesirable, and fail to see that good habits are just as desirable as bad are not. Habits play a very important part in the life of every individual, and their study is a much neglected factor in industrial society. It is true that the efficient man is marked off from the inefficient, and the useful from the useless and vicious, by the nature of their habits. Industry and indolence, efficiency and inefficiency, good and bad temper, virtue and vice, are in the last analysis largely matters of

Old notion of habits.

Rôle of habits in society.

habit. Losing one's temper or retaining self-control is a matter of habit. Each time one is angered by a trifle it becomes more difficult to look calmly at anything unpleasant, while each time one controls himself, it becomes easier to retain control over future disagreeable happenings. The habit of self-control is an important factor in business, and is almost a virtue in a superintendent or boss, because if he loses his temper at every trifle, it reacts upon his men and works toward inefficiency. Losing one's temper increases chances of mistake and because one loses partial control over his actions causes many accidents. A hasty temper has no place in a business enterprise, and if one has that weakness, no time should be lost in gaining self-control.

Examples of habit.

The drinking of alcoholic liquors as well as the using of morphine and cocaine are habits, and the excessive use of any one stamps more firmly the habit and makes the user a slave to it. The habitual user loses control of choice, and upon invitation to partake cannot refuse to indulge. The habitual drinker and the drug fiend have no place in an industrial enterprise, and are derelicts upon industrial society. The absolute prohibition of employees to bring alcoholic drinks in any form into a place of business should be rigidly enforced, and everything should be done to discourage the use of liquor or drugs at anytime. Extra precautions should be taken against bringing into a working force a worker addicted to the use of liquor or drugs, and if a habitual user is found, opportunity should be given to reform, and if not promptly acted upon, dismissal should follow. Efficiency has no place for the alcohol drinker or drug user.

Intemperance a habit.

The smoking or the chewing of tobacco is likewise a habit. The excessive use of tobacco undermines the

nervous system and unfits a man for efficient work. Its use in any form should not be allowed during working hours, and punishment should be severe for any infringement of the rules. Employers should discourage the use of tobacco outside their places of business, as no good arises from its use and it works toward inefficiency in every working force.

Effect of the tobacco habit.

The drinking of tea and coffee may become a dangerous habit, but the use of either in mild form will never do any harm. Injury only results when the habit is formed of using strong beverages. I have seen workers drink tea and coffee so strong that to the taste it was almost as bitter as aloes. They were such slaves to the habit that they would far rather go without their breakfasts than without their strong cups of tea or coffee. Such a habit gradually undermines the nervous system, endangers proper digestion, and lowers vitality in general. Everything which impairs health affects the efficiency of the working force. It is advisable for employers to carefully investigate the drinking habits of their employees because they affect efficiency, and everything which impairs efficiency is of vital importance to every employer. The injuries arising from the drinking of strong tea or coffee should be carefully pointed out, and every discouragement given to their use except in mild form.

Tea and coffee habit.

Effects.

The most efficient way to use man's energy is to allow him to follow habit grooves of thought and of action. It is very necessary to see that correct habits are formed, because every correct habit becomes a power which may be used for increasing the efficiency of a worker. Steadiness of production and low costs come from proper habits throughout a business enterprise. A most valued asset

Value of habit in industrial society.

in any business is acquired habits of doing in a standard way, promptly, and to the best of one's ability, the work set before one. The aim of efficiency is to obtain the best use of natural resources and human energy. To accomplish this, careful and close study should be made of every factor of production to make sure that it performs its function with the least waste and with the greatest efficiency. No one factor in efficiency is of greater importance than habit, yet it is one which in the past has been sorely neglected. Waste of energy cannot be eliminated or greatly reduced unless special care is taken to obtain standards of work, and by careful instruction to make certain that they become habits. The obtaining of standards and proper training to acquire correct habits is of great interest to the employer, and the more attention paid to securing this goal, the greater will be the efficiency obtained.

QUESTIONS

1. Why is habit an important factor in efficiency? What is the difference between habit and instinct?
2. What is the process of habit formation? Why is repetition a requisite?
3. In what way do habits relieve the strain of work?
4. What is the importance of identical repetition? What is the exception nerve route?
5. What is the importance of habits of industry? How are they acquired?
6. How may wastes of energy be eliminated through habit?
7. How may the efficiency of the skilled trades be increased through acquiring the proper habits of work?
8. What precautions should be taken in the introduction of changes for the formation of new habits?
9. Why do employees oppose changes?
10. What are proper habits of living? Give their importance in efficiency.
11. What are (*a*) efficient habits, (*b*) inefficient?

12. What are the effects of (*a*) the drink habit, (*b*) the tobacco habit, (*c*) the coffee habit?

13. Why is it the most efficient way to allow men to follow grooves of thought and action?

14. What is the importance of training in habit formation?

15. What difficulties are encountered in the formation of habits?

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CHAPTER IX

Fatigue

One factor in efficiency which the average employer overlooks and which has an important bearing upon efficiency is fatigue. Fatigue is a phenomenon which is daily experienced by men, women, and children. Several psychologists have done excellent work in the study of this phenomenon, and several exhaustive studies have appeared in America and Europe dealing with the cause and effects of fatigue. The importance of the study of fatigue to the business man has received little attention. The struggle for industrial supremacy has brought home to every business man the necessity and importance of efficiency. Efficiency demands a careful study of fatigue, a factor which heretofore has been considered of little importance to business men, and only suitable for conjecture and experimentation in the classroom.

Fatigue, its importance in business neglected.

Work is performed by muscular movement which comes from muscular contraction. A process somewhat similar to oxidation takes place within the muscle during its contraction, and waste products or toxic impurities are thrown off into the blood. Every movement of a muscle and every thought cause oxidation, and dross or toxic impurities are formed. During all work, whether physical or mental, they are accumulating in the blood. They are poisonous, and if accumulated to a large amount, poison an individual like any other poison. Their presence at first is not detected, because they do

Causes of fatigue.

not exist in sufficient amount to make their presence felt. It is only after a certain accumulation that further addition causes injury. When this period has been reached, nature gives warning, and this warning is known as fatigue.

Fatigue is nature's signal to cease the accumulation of waste products and to give it an opportunity to eliminate what has been accumulated. If this warning is not heeded, injurious results follow, and it does not take much more accumulation to bring exhaustion or overfatigue. If carried still further, death results. Men and animals are known to have dropped dead from exhaustion. They are poisoned by their own waste products produced during periods of activity. The muscles almost immediately become rigid, and putrefaction starts in a very short time. Lucky is the one who is able to take heed of the warning signal of fatigue, and not overtax his own capacity for production.

Causes of exhaustion.

Work is performed at the expense of nutrients stored up within the muscles, and of oxygen absorbed from the blood. The toxic impurities produced during work circulate in the blood and act upon the nerve endings in muscles, and upon the gray matter of the brain. They diminish the contractability of muscles and render them less responsive to nerve stimuli. They poison the large nerve cells in the gray matter of the brain, and reduce their power of remitting volitional impulses. When the waste products accumulate in the blood, the period is sooner or later reached when their action will be felt in the sensation of fatigue. Not only is the whole body subject to fatigue, but every organ, tissue, and cell of which the body is composed. Fatigue is thus a sensation, the result of work carried beyond the

Effects of fatigue.

How warning is given.

capabilities of an organism. It manifests itself in various ways. Headache is the usual sensation of brain fatigue, and sleepiness is frequently that of physical. Exhaustion is very injurious, but fatigue is not. Fatigue may readily be done away with, and appears to be a protection to the human body. It warns a person when it is time to rest, and if the warning is not heeded, the injurious stage of exhaustion is soon reached. It is practically impossible to tell when strain begins. The consciousness of fatigue does not appear with the first casting-off of impurities, but only after a certain accumulation has been reached. A person does not perceive the on-coming of fatigue, and only experiences the sensation when it has reached a certain degree of intensity.

Power of work varies with people.

There is a limit to a man's power of doing work, and this varies with different people. It depends upon training, occupation, environment, and the constitution of the individual. Some people tire more easily than others. People with weak nervous systems easily become exhausted and recuperate slowly. Different persons vary in their power of resistance to the action of the toxic impurities of work, and in the rapidity with which their bodies cast the impurities off.

Reserve force.

There is nevertheless a certain amount of reserve force which allows our muscles to be overtaxed without injurious consequences. If the work is prolonged so that the reserve force is consumed, precautions should be taken to make certain that there is sufficient recuperation to restore the used reserve force. Serious injuries arise when reserve force is encroached upon, and complete recuperation does not take place. There is a limit to the reserve, and when it is consumed, exhaustion follows. When the reserve force is approaching final consumption, irritation, nervousness, and impaired

Limit to its extent.

vitality are found. These impair the efficiency of the worker, and make him a fit subject for all kinds of diseases.

The accumulation of toxic impurities without proper elimination lowers the general health of working people. It increases the efforts necessary to perform work. The lowering of a person's vitality makes him susceptible to all kinds of diseases. A greater injury results from work done by fatigued muscles than from harder labor done before the worker is tired. Thousands of workmen are compelled to work while fatigued. Productivity continues, but at the expense of human health. One of the greatest economic wastes is the consuming of an abnormal amount of energy by the thousands who are compelled to work with fatigued bodies. Efficiency demands that work shall not be performed by tired and fatigued muscles and brains. The management, to get the greatest efficiency, should pay particular attention to the question of fatigue, and if it were properly studied, working conditions would be greatly improved to the advantage, profit, and benefit of employer and employee.

Effects of toxic impurities.

It is generally recognized that with work which requires close thinking and close attention, there is a period, varying with the individual but fairly definite throughout, when concentration, thought, and attention may be maintained, but when the limit is reached there must be relaxation, perhaps only momentary, or the productive faculties decrease rapidly in efficiency. All work requires more or less thought and attention. With the increase of the intensity of thought and attention, the casting off of toxic impurities increases at a rapid rate. After nature gives her signal through the sensation of fatigue, sensibility is gradually blunted and attention flags. It is impossible for a fatigued man to give the close attention which he

Effect of fatigue on the brain.

gives when he is fresh. The flagging of attention diminishes precision of movements, and is one of the great causes of accidents. Nervousness and irritability are consequences of a fatigued mind, and their presence prevents efficient work.

Fatigue has a baneful effect upon memory, and if activity is continued, it will not only greatly weaken its power but almost destroy it. Tired persons often wonder why it is impossible for them to remember things, not knowing that the powers of memory have been benumbed by poisonous waste products. The overworking of children causes an accumulation of impurities which weakens memory and prevents intellectual development. Stupidity in working children is usually due to the baneful influence of toxic impurities. Efficiency demands intelligent workers, and this in turn demands proper intellectual development of young boys. One of the greatest curses of fatigue comes from casting into the great industrial system undeveloped and stupid workers. This should be remedied by compulsory training, and the prevention of overwork of boys during years of growth and development.

Fatigue and memory.

Cause of stupidity in many children.

The body purges itself of the accumulated toxic impurities during repose. They are normally burned up by oxygen brought from the blood, excreted by the kidneys, destroyed by the liver, and cast off from the body through the lungs. Rest should eliminate the sensation of fatigue, and the accumulated toxic impurities should be cast off. The body is repaired during rest as long as activity is continued within psychological limits, or as long as it is balanced by rest. An important factor in efficiency is the taking of precautions to make certain that recovery through rest is complete. The efficient

How the toxic impurities are disposed of.

cycle should be, work to the period of sensation of fatigue, and sufficient rest to repair the body of its losses. Work is often carried beyond the warning signal, and it becomes difficult to cast off, through the repose given, the accumulated impurities. This is injurious to health, and the overtaxed worker becomes susceptible to diseases of all kinds, and his efficiency is impeded by nervousness, irritability, loss of memory, and flagging attention. Efficiency demands that the daily average of expended energy should be evenly balanced by fresh strength and recuperation.

The efficient cycle.

Closely related to the repairing of the losses of the body through physical and mental activities is sleep. Sleep is the best-known phenomenon of life. Sleep makes rest more complete, allows greater and more complete elimination of poisonous impurities, and assists the restoration of the tissues necessary for future activity. Overfatigue with its accompanying nervousness and irritability is inimical to sleep. It causes sleeplessness and a further accumulation rather than elimination of waste products. A good sound sleep is one of the blessings of humanity, and fortunate is he who realizes its necessity, and does not impair his efficiency by encroaching upon his proper hours of rest and sleep.

Effect of sleep.

Fatigue and sleep.

Equally difficult with the question as to what extent work may be carried before it is injurious is the problem of how much sleep is required. Some people possess greater recuperative powers than others and impurities are more quickly cast off. Six hours of sleep with them give the same recuperation as eight with others. Psychologists agree that for the average man, eight hours of sleep are sufficient to cast off the accumulated wastes of the preceding day.

How much sleep is necessary.

Effective sleep should be dreamless, because when a person dreams it means so much hindrance to the elimination of poisonous wastes. One of the greatest requisites of effective sleep is a bountiful supply of fresh air during sleep. Efficiency demands proper sleeping quarters and proper ventilation, so as to assure the greatest possible destruction of waste products, and the greatest possible building up of new tissues.

Proper habits of sleep and rest.

Employers are commencing to realize that it is to their interest to see that their employees protect themselves by taking proper sleep and taking it under proper conditions. Strictness regarding regular sleeping hours is an absolute necessity if the greatest efficiency on the part of the working force is to be attained. Nurses should visit the homes of employees in order to see that all precautions are taken for an abundant supply of fresh air during sleep. Sleeping in close quarters retards the process of elimination of waste products, and defeats the purpose and the object of sleep. Precautions taken to assure proper rest increase the efficiency of the working force, and help the employee in protecting his health, and in conserving his strength and vitality.

Evils of improper working conditions.

During work, the process of elimination and destruction of the toxic impurities is going on, but their production is greater than their destruction. Working with proper sanitary conditions, proper temperature, good ventilation, and an abundant supply of pure air increases the destruction of toxic impurities. Dust, odors, high temperature, and high humidity affect the working power of the laborer, through consuming more energy in the performance of his work, and loading the blood with an increased burden of impurities.

One of the chief antidotes to fatigue is nourishment.

Fatigue does not always or necessarily depend upon the amount of work done. A good deal depends upon the state of the body. No general rules can be laid down which apply to all people and to all kinds of work. All circumstances which hamper work in any way, as ill-health or pain, have the effect of increasing the production of toxic impurities. The muscles may for a time continue to perform some work, but they soon give out. Efficient work demands a healthful body and a peaceful mind. Ill-health of any kind increases the energy needed for work and hastens the accumulation of toxic impurities. One of the great essentials for health is regular and proper nourishment. This demands a careful selection of articles of food and their proper cooking. Half-cooked foods cause indigestion, a common ill, and the cause of much unnecessary fatigue. It is a business proposition to see that employees get nourishing food, and to have it properly cooked. Some employers give their employees free lunches or lunches at cost. Little attention has been given to instructing the wives of employees in the selection or in the cooking of food. The time is not far distant when employers will realize that it pays to send domestic science teachers to the homes of their employees to teach wives how to choose the best food, and how to cook it.

Importance of food and good health.

The human body demands relaxation as well as rest to repair the wastes of work. Play, amusement, and reading are the chief agencies for mental relaxation. Athletic sports should be encouraged by employers. The benefit obtained by employees from the mental relaxation during games of ball or tennis fully repays their cost to employers. Indoor games of all kinds furnish wholesome amusement and recreation for the fatigued brain. Efficiency demands

Relaxation, its place in efficiency.

healthy sport and wholesome amusement. It is profitable to employers to furnish and equip athletic fields, indoor gymnasiums, and amusement halls. A hall for dancing, singing, and music during lunch hours and after work is a paying investment in a large enterprise. Many employers find it profitable to have a circulating library with good books and magazines. The furnishing of wholesome recreation takes away the temptation to seek unwholesome centers. Many a good worker has had his efficiency impaired and oftentimes ruined by being induced to take the fatal step in seeking recreation to satisfy the cravings of a fatigued brain. Employers are realizing that wholesome recreation is part of the worker's daily life, and that efficiency is increased by providing various forms of good recreation.

Antidotes to fatigue.

A difficult problem to decide is how much food, recreation, and rest are required for healthy recuperation. This is quite different from what we think we require. Sensations are misleading, and it is not difficult to acquire habits which are quite contrary to nature's demands. The amount of food needed to keep our bodies healthy probably differs with each individual, and at present is not accurately known. The acquiring of the habit to eat proper food, properly cooked, and slowly, and to limit eating to the point of satiety, is a very important factor in the health of every workman. The amount of rest needed for the average man follows very closely the old adage, "Eight hours work, eight hours play, and eight hours sleep." Food, rest, recreation, and sleep are the effective antidotes to fatigue. A careful observance of each is the demand made by efficiency, and it is to the interest of employers and employees to see that a proper amount of each is obtainable.

Efficiency is an enemy of alcohol and of all stimulants.

The efficiency movement puts a ban on the use of all alcoholic drinks, and is an important factor working for temperance. Stimulants are like a whip in that they urge on the muscles, and cause more rapid contraction. They do not bring a new supply of energy into the system, but use the reserve force. Liquor may drive away temporarily the sensations of fatigue, but in the end it is a greater drain on the reserve force, and leaves the worker weaker. The extra drain resulting from the use of stimulants demands longer rest periods for recuperation; when they are not obtained, impurities accumulate, and sooner or later cause a breaking down in health. If toxic impurities are not normally eliminated, they place the workman in an abnormal frame of mind. He seeks to deaden the sensations of fatigue by alcohol, tobacco, exciting amusements, or excesses of any kind. Liquor acts upon the muscles and the nerves, causing uncertain muscular control, and frequently leads directly to accident and injury. The employer who is seeking efficiency in his working force should take extra precautions against hiring men addicted to the use of alcoholic drinks. Their use outside of working hours, if in any quantity, has an effect upon the worker the following day. Alcohol and stimulants of all kinds are factors working towards inefficiency, and if an efficient force is the aim, their use should be strictly forbidden.

Effects of alcohol on workers.

Intemperance comes from overfatigue.

Pauses and rest periods are in many kinds of work great conservers of energy. They allow the blood to renew oxygen, and to partially eliminate the wastes of work. A few minutes rest allows a certain amount of recuperation. The strength of muscles under intermittent work may be almost double that under continuous work. Pauses are

Rest periods, when needed.

absolutely necessary in the case of work requiring considerable thought, close attention, or strenuous muscular activity. If they are not given, the sensation of fatigue comes early, and continuous work uses the reserve force and taxes the body. The additional drain is not repaired overnight, and health is soon impaired. Employers cannot afford to have their employees' strength overtaxed or their health impaired. They should pay close attention to all kinds of work, and where more than ordinary attention, thought, and strength are required, should give proper rest periods so that their employees are not overtaxed, and their strength, health, and efficiency impaired.

Fatigued workers and accidents.

The workman at the beginning of the day is cautious and attentive. He avoids danger because his attention is alert. If work continues after nature's warning in the sensation of fatigue, it decreases sensibility, diminishes attention, and lessens precision of movement. Where before alertness avoided accident, now lack of attention and of precision in movements causes a misstep or a slight deviation in movement, bringing hand, foot, or body in contact with moving machinery, and accident follows. The number of accidents increases with great rapidity as fatigue and weariness of workmen increase. There is an immediate relation between fatigue and industrial accidents. Experts have proven that the greatest number of accidents occur between ten and eleven in the morning and three and four in the afternoon. The losses due to accidents caused directly by fatigue amount to millions of dollars every year.

Effects of dirt, dust, and noise.

Numerous factors besides work have an important bearing upon fatigue. Dirt and dust have a depressing effect upon vitality and lessen resistance to impurities. Efficiency demands cleanliness and freedom from dust in factory and plant.

Noise of all kinds has its influence upon fatigue. The roaring of machinery has a great influence upon attention. It necessitates a greater exertion to maintain attention, and is an extra strain upon the muscular and nervous systems. Every precaution should be taken to lessen the roar of machinery. Where there are constant and loud noises, and close attention is required, frequent rest periods should be given, or the vitality, health, and efficiency of the operatives will soon be impaired.

Workmen, even if properly nourished, cannot produce beyond a certain limit without injury. Capacity for work varies with different individuals. If work is carried beyond a certain point, the work is gained at the expense of the worker's muscular and nervous systems. Speeding, in the majority of cases, is an economic waste. It causes a temporary increase in productivity by an extra drain upon the human system. If sufficient rest is not given to recuperate, it undermines the human system and impairs the efficiency of the workers. Speeding is one of the common evils of piece-work. If piece-work is carried beyond the normal capacity of the worker, it represents an economic waste in curtailing in the long run the productivity and the efficiency of the worker. More sickness and low vitality are found among piece-work tailors than among any other classes of workers. The greatest precautions should be taken to see that workers do not work beyond their physical and mental capacities, which will eventually impair their efficiency through undermining their health. Speeding and piece-work are two causes of economic waste, and the extra productivity gained at the expense of human health is dearly paid for.

Speeding frequently an economic waste.

Effects of speeding.

Good work can never be performed by tired brain or

fatigued muscles. The amount and the quality of the work are greater when fatigue has not been reached. If a worker is tired, and it is necessary to use more effort to complete a task, he completes his work only by using a certain amount of his reserve force and by making additional demands upon his nervous system. Work in itself is a blessing. Work, while physiologically making for health, may, if pushed too far, so as to induce overfatigue, ultimately unfit a worker for his daily task. Work becomes injurious and dangerous when a normal amount of rest does not eliminate the impurities accumulated during work. Instead of the daily cycle of accumulation and elimination of the poisonous wastes, there is a gradual accumulation leading to a progressive impairing of health.

Limits of work.

What should be the length of the working day is a serious problem to-day. Maximum efficiency comes with the adjustment of the work so that it fits the capacity of the workmen. How many hours can a man work without impairing his efficiency is the question which should be solved in order that the greatest efficiency may be attained. The decision should be made after a careful study of work to discover what length of working day accumulates impurities that can be eliminated by a night's rest, sleep, and repose. Again, the decision as to whether a man should work eight, nine, or ten hours per day should depend upon the character, and the intensity of the work, and the surroundings while at work. What energy, whether muscular, mental, or nervous, is necessary to perform the work is the important question. Six hours with some kinds of work are more exacting than nine or ten with others. Where work is intense and carried on amidst noisy surroundings, or where it requires concentrated thought or strong muscular

The length of the working day.

How to decide.

energy, the maximum time should not be greater than eight hours. Where men are compelled to work longer, the additional product is obtained at the cost of impaired health, and represents a loss rather than a profit. Where work is not difficult and no great strain is necessary, the length of the day may be increased by another hour without any injury to health or efficiency. In many cases, not only should eight hours be the maximum limit, but there should be frequent pauses during the working day. An economical period of work gets all the advantages of continued work without injurious fatigue.

Importance of training in resisting fatigue.

The power of resistance to the toxic impurities may be increased by training. Training is the development of skill, and of the power of resistance to the action of the toxic impurities of work. As regards the latter case, it acts in much the same way as increasing the tolerance of a poisonous drug by administration of successively increasing doses of it. Training increases efficiency not only by the acquiring of dexterity, but also by increasing the power of resistance to toxic impurities. William James, in his essay on "The Energies of Man," says, "We live subject to arrest by degrees of fatigue which we have come only from habit to obey. Most of us may learn to push the barriers further off and to live in perfect comfort on much higher levels of power." It is hard, in many cases, to distinguish between real and false fatigue, and to know when real fatigue has been reached. The easy surrender to fatigue may be easily acquired as a habit, and when it is, it is difficult to change. Many people who have little resistance to the toxic impurities of work may account for it by a surrender to habit. Such a habit prevents men from working to their proper efficiency, and if acquired, should be altered by a course of training.

Real and false fatigue.

Progress and development depend upon work. The casting off of toxic impurities is unavoidable if one works. If a worker becomes fatigued before the end of the day, he works with impaired energy. If he is compelled to do things in connection with his work that unnecessarily tire him, the employer loses thereby, and loses in proportion as the condition is remediable. It stands to reason that any means which tend to conserve a worker's strength and to postpone fatigue, give increased productive results. There is no reason why energy should be wasted in tiring the muscles by unnecessary work when that energy saved could be used to more productive advantage.

Unnecessary fatigue.

Climbing stairs is very tiring for women and to a less degree for men. A woman after climbing several flights of stairs starts work with a greater accumulation of toxic impurities than would result from two or three hours of regular work. This handicap is unnecessary and wasteful. There is no reason why this energy should be consumed in unnecessary work when it may be conserved to give more efficient work. An elevator pays for itself several times a year by increasing the efficiency of workers through saving the unnecessary expenditure of energy in climbing stairs. In some plants it is necessary for workers to go several times a day from one floor to another, and they are usually compelled to climb stairs. This causes a great expenditure of unnecessary energy which may be easily conserved.

Saving energy for productive results.

Many operations are of a nature that an employee may sit as well as stand. There are few that do not allow the worker to sit at intervals if only for a few moments at a time. The old notion was that sitting during working hours was a sign of laziness and not to be tolerated. Little did employers

Effects of sitting.

realize that compulsory standing when not necessary was impairing efficient results, and by just so much diminishing profits. The management to-day, working for efficiency, has a very different attitude towards the question. It believes that employees should be encouraged to sit whenever the work may be done as efficiently sitting as standing, and encourages sitting whenever five minutes' rest may be obtained without any loss in work.

Where sitting is possible.

The clerk in a store might just as well sit as stand when not waiting upon a customer or putting stock in order. If seats are provided, and clerks are encouraged to use them whenever it does not interfere with work, they would be able to give better service to both customer and employer, because not unnecessarily tired and worn out by useless standing. The same applies with many operations in a factory. Many machines allow the attendants some time for sitting, and if facilities are provided, many occasions would arise where sitting for a few minutes would be possible. The periods, although short, would in their total make a great difference in the physical condition of employees at the close of a working day.

Kind of stool needed.

The kind of stool has much to do with the kind of rest that it gives. A mere stool serves a purpose, but to give full benefit, it should have back rests, and be of the proper height so that the feet of the employee rest on the floor. If stools are too high, foot-rests should be provided. In many cases, stools should be provided which allow quick rising and sitting. Many factories do not even provide seats, and the foremen do not allow the use of any improvised by the workers. They believe that sitting leads to laziness and diminishes output. They are yet to be enlightened that it increases effi-

Sitting is not laziness.

ciency and output. If they would only reflect a little, they would realize that the more they relieve their employees from unnecessary muscular strain, the more energy is left to turn out work.

Every employee should have a certain definite task to perform. The greater the specialization of industry, the fewer movements are demanded of the employee. All his energy should be devoted to the direct performance of his particular task. Energy consumed in doing other things lessens by so much the energy available to make his work more efficient. This makes many demands upon the management. A worker should not use his time or energy in getting or putting back tools or in obtaining or removing materials. Tools and materials should be delivered and removed by unskilled hands. The proper tools and the proper amounts of materials should always be present, and in a place which causes the least exertion to obtain when wanted. There should be no cause or excuse for a worker to leave his task. Every time this happens it not only takes time, but consumes energy, and diminishes the supply for real productive work.

What a worker should do.

The old method of handling and conveying materials and tools from place to place when wanted was by the use of human muscular energy, whereas efficiency demands the abolition of the use of muscular power for such purposes, and its conservation for more effective work. In many factories, in this enlightened industrial age, you find the calling of men from their tasks to assist in moving heavy articles. Quite different is the modern efficient factory, where a man is not called upon to waste his energy in such work, but all lifting is done more effectively by hoists, cranes, etc. Only recently, I visited a loft fac-

Methods of conserving energy.

tory in the city of New York. It occupied three stories and these did not have any connection except the stairs. A few hundred dollars would have installed an elevator, chutes, and speaking tubes. The saving in time alone is sufficient inducement for the extra expenditure, while the increased efficiency from the wasted human energy saved will repay the cost of installation several times during a year. Elevators of various sorts, chutes, cranes, hoists, movable platforms, electric trucks, and conveying belts are a few of the energy-saving devices which have become necessities and integral parts of modern plants. Speaking tubes and telephones play an important rôle as conservers of human energy. Too much emphasis cannot be placed upon using, wherever possible, various devices for saving human effort and energy. The conservation of human energy wards off fatigue, and to that extent increases the efficiency of the working force.

Wastes from fatigue.

It does not pay to wear out men. If men are forced to work at such a pace that their vigor is diminished, they will in a lifetime do less work than they would if they worked at a lesser pace. Speed causes losses to both society and industry. Professor Irving Fisher estimates the minimum annual cost through serious illness in this country at one and one-half billion dollars, and says that the economic waste through undue fatigue is probably much greater. Fatigue is a factor which should be reckoned with in all work. It is not due to work, but to overwork. Fatigue should be studied by every employer, and the work of his employees should be so directed as to obtain the highest efficiency. This demands a minimum of fatigue. If the warnings of fatigue are not heeded, it may prove very injurious. Fatigue may limit industrial expansion, and is one of the causes of misery, poverty, and disease.

It leads to nervousness, craving for excitement, and frequently to crime. Workmen should be taught to work to best advantage and to accomplish as much as possible with minimum fatigue. No one element of industry is of greater peril to workers than fatigue. It destroys intelligence, cuts down output, impairs quality, and invites industrial accidents.

QUESTIONS

1. What is the relation between fatigue and efficiency?
2. What are the causes and effects of fatigue?
3. What are the effects of toxic impurities on (1) the muscles, (2) the brain?
4. What is the effect of fatigue on memory? Account for the stupidity of children who work.
5. What precautions should be taken in sleep? How much sleep is necessary for a worker?
6. What are the chief antidotes to fatigue?
7. Show the relation between intemperance and overfatigue.
8. What is the importance of rest periods? What decides the length of the periods?
9. What is the relation between fatigue and accidents?
10. What is the importance of training in order to resist fatigue?
11. What is the difference between real and false fatigue?
12. How may fatigue be warded off through conserving the energy of workers?
13. What are the methods of conserving energy?
14. What are the wastes from fatigue? How may they be eliminated?
15. What are the limits of work? How may they be decided?

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CHAPTER X

Working Environments

During the last few years of the nineteenth century, many employers took initial steps to improve working surroundings and sanitary conditions of their plants. Sanitary and hygienic improvements were introduced in many plants, as well as many movements commenced to improve workers mentally, morally, and physically. Employers were not guided by the same motives in the improvements as they are to-day. Employees were dissatisfied, and began to murmur against the appalling hygienic and sanitary conditions found in plants and working places. Times were prosperous and employers were making large profits. To calm the dissatisfaction, many improved sanitary conditions and introduced innovations to benefit the working force. Employers believed that this was the cheapest way to calm the rising discontent. To-day, there is a different motive for looking after the health of the working force. It is a dollars-and-cents proposition, and because of this it is daily attracting more attention and getting a firmer hold on business men. Dollars and cents, and not sentiment, is the ruling force in the business world. Sentiment has little place in actual business where self-interest is the guiding motive, yet many would have us believe that other motives play an important rôle. The average business man is not in business, with its endless burdens and cares, for the love of it, but for the profits made.

Motives for improvements in the nineteenth century.

Sentiment.

Self-interest.

The old saying "business is business" has always ruled supreme in business activities, and will continue to do so as long as men work for profits. Such being the case, it will be only the exceptional business man who is moved by sentiment to introduce changes for the bettering of his working force.

Health an essential factor in efficiency.

As soon as business men realize that safeguarding and protecting the health of their workers lower costs and increase profits, it will be the exceptional employer who will not take every possible precaution to maintain the health of his working force. One effect of the present efficiency movement is the changing of the motive for paying attention to health from one of sentiment, paternalism, and altruism, to one of dollars and cents. Health in a working force is an absolute essential for efficiency, and the realization of this accounts for the interest taken at present in this factor of efficiency. Efficiency depends chiefly upon the human element in business. Health is its basic structure, and without good health efficiency is not attained. The health of the employee is accordingly of primal importance to the employer. Until recently, employers were not only indifferent, but ignorant of the means of maintaining the health of their workers. This surprising lack of interest in the health of the working force has been due to the fact that its relation to profits was not known. Employers are interested in profits alone, and as soon as they realize that profits depend on health, they will become interested in it. One can work at his best only when in good health, with brain clear, and with muscles active and responsive. To obtain the best productive results from the human energy expended is the aim of efficiency. The human element, or workers, should be of the best quality, and this means

Profits and health.

good physical health. Health and efficiency are closely related, and the latter cannot be reached without the former.

Modern industry demands of workers health and good physique, and no kind of work can be performed efficiently without good health. Intellectual keenness and foresight, essential factors in employees, are impaired without it. Sickness and ill-health are the greatest foes to profits, efficiency, and success. The employer cannot afford to tolerate any conditions which endanger or impair the health, or lower the vitality of his working force. Impaired vigor is a loss to everyone. It affects employees by cutting wages, ofttimes causing great misery and suffering, and at the same time is costly to the employer by increasing costs. No one can do efficient work of the proper quality and quantity unless he is fit in body for his task.

Effects of ill-health.

In the struggle for industrial supremacy which is being waged by the great industrial nations of the world, success depends largely upon the efficiency of the human element in industry. The nation which first masters the secret of obtaining efficiency from its working force will be the one which will forge ahead and conquer. The conservation of health, strength, and vigor, the maintaining of a high vitality in the working force, and the prevention of disease are important economic factors in this industrial struggle, and are more important than the conservation of our forests and natural resources. The greatest wastes in our industrial system are those due to illness, and to workers trying to work with impaired health. The conservation of health is of the greatest importance to the employer, to the employee, and to the nation at large, and demands the closest attention of federal, state, and municipal powers, the

Conservation of health; its importance.

care of father, mother, and teacher, and the earnest attention of the employer of men and women.

Environment and efficiency.

The effect of environment on workers is great, and there is an intimate relation between the conditions which surround workers and their efficiency. Expensive machinery is carefully protected from dust, and kept well lubricated and in good repair, but until recently no thought was given to the more important factor in efficiency, the human factor, which tends and operates the machines. Just as machinery is affected by environment so is the worker, but a great deal more so, as he is sensitive to slight changes in the conditions which surround him. Success in the average business enterprise depends in a large measure upon the workers' physical and mental well-being. The importance of the best working conditions and surroundings is more generally recognized each succeeding year. Efficiency depends upon the comfort of workers at work, as well as upon their health. The aim, therefore, in every enterprise is to get working conditions most conducive to the comfort, and to the health of the workers. Working conditions and surroundings should be made hygienic, sanitary, and healthful in every possible way. Light, ventilation, temperature, humidity, cleanliness, dust, air, odors, gases, and dampness are some of the factors which should be given careful study in every enterprise. The neglect of any one has a direct bearing upon efficiency through causing discomfort and impairing the health and the vitality of the working force.

Factors.

Effects of good lighting.

The lighting facilities in an enterprise have a direct and important bearing upon the health and the efficiency of the employees. According to experts, the normal capacity of workers may vary 20 per cent under proper and improper light-

ing conditions. Good lighting affects the efficiency of workers in various ways, as: causes greater accuracy in work, saves eyestrain, permits greater rapidity of work, increases output, reduces the number of accidents, makes more cheerful surroundings, increases the comfort of workers, is conducive to cleanliness by exposing dirt, decreases costs through less spoiled work and fewer mistakes in work, improves the quality of work, and lastly, discourages slovenly work and soldiering.

Efficiency in illumination.

Efficiency in illumination is measured in obtaining the object sought, namely sight. It depends not upon the number of lights supplied but upon the ability of the eyes to perform their duties without the least effort or strain. There is no standard as to light and illumination in plants, offices, or stores. Enterprises vary with the character of work performed, and with the amount of light required. The test is that there should be sufficient light in every part of a plant, so that the work required to be done may be performed without any eyestrain, or delay through lack of proper light.

Natural *vs.* artificial lighting.

The cheapest and the best light is natural light diffused uniformly through sufficient windows for proper lighting. The eyes should not be strained even on a cloudy day. Experiments prove that after three hours of work in ordinary daylight, there is little change in the working efficiency of the eye, but after the same period of work in artificial light the keenness of the eye has fallen off very much, and there is a distinct loss in muscular adjustment for accurate vision. Observe an object steadily for half an hour in natural light and then in artificial; the difference in strain upon the eye will be noticeable. Artificial light of any kind differs materially from daylight in that it does not furnish a pure white light, the customary light

rays being red, yellow, or violet. There is a difference of opinion as to the color best suited to our eyes, but it cannot be disputed that vision is the most perfect, and there is less strain to the eyes under the influence of white light.

How to obtain supply of daylight.

It is only recently that business men have learned the importance and the value of an abundant supply of natural light and have taken special care to have as large an area of glass as possible. Roofs as well as walls are used for windows. The saw-tooth roof with the glass portion towards the north allows a satisfactory diffusion of light. To get the greatest abundance of daylight, the window-glass should be either pure white, ribbed, or prismatic, and scrupulously clean. The walls and the ceiling of a building have an important bearing upon the diffusion of light, and should be painted creamish white, white, or greenish gray. Some use whitewash, but its lack of durability, and its falling off in flakes makes it a continuous nuisance. Frequently a wall painted white gives a glare which is injurious to the eye. A cream color never glares, and gives the best satisfaction as a suitable color for walls and ceiling. Walls should be kept clean, because if dirty and dingy, the proper diffusion is not obtained, and the lack of sufficient light may be the cause of eyestrain.

Benefit from windows.

The eyes of a worker in many kinds of work must remain constantly fixed upon the work which he is doing, or upon near-by objects in the room. This constant watching is fatiguing and straining upon the eyes. A momentary glance at something in the distance relieves the strain, relaxes the tension, and allows the eyes to work on refreshed. Glancing out of a window in such cases has a very beneficial influence, and works toward efficiency. Formerly,

employers objected to windows because they believed that employees wasted time by glancing or looking out, and windows, they declared, interfered with work. Little did they realize that windows, in place of decreasing output, increased it, by furnishing a momentary rest and relaxation to busy eyes, and assisted in increasing the efficiency of workers.

Artificial lighting.

During many months of the year, sufficient natural light cannot be obtained for working through the entire working day, and artificial lighting is absolutely necessary. Every afternoon, frequently mornings, and occasionally during stormy days in winter, artificial lighting must be used, while many employers have night work, and then it is the only light possible. An artificial lighting system is necessary in every enterprise. Arc, incandescent, gas, and kerosene lamps were practically the only artificial lights available ten years ago. During the past few years many improvements have been made in electric and gas lighting. Of the many varieties of electric lights on the market, the tungsten is the most favored and the most satisfactory. Due to the absence of danger from fire, to no gases being thrown off, and to causing no material increase in temperature, the electric lamp has decided advantages over the gas. If the electric lamp is not available or possible, gas used with a Welsbach burner gives the most satisfactory light. With the increase during recent years in the use of electricity, it is hard to find a town of any size in the middle west or the east, or even in the major part of the far west which has not the use of electricity. If a building is not wired, and electricity is available, the greater efficiency resulting from electric lighting will in a short time pay the cost of installation of an

Electric lighting.

Advantages over gas.

electric lighting system. Electric lighting gives the best satisfaction of all lighting, and should be used wherever possible.

Artificial lighting; requirements of a good system.

The requirements of a satisfactory artificial lighting system are as follows: There should be sufficient light to allow every employee to do his work without straining of the eyes, and without hesitation from not being able to see distinctly the part of the task being performed. There should be uniform illumination. The entire working surface should be light, and lighting should not be restricted to certain sections. There should be reliability. The light should always be available when needed, and should be constant and not flickering, because flickering light is very straining to the eye. There should be proper quality. This has to do with intensity, — that is, proper intensity to do work, proper diffusion through the lighted space, and absence of glare.

Overhead and individual lamps.

A room may be lighted by overhead lamps, by individual lamps, or both. Formerly, the individual lamp, with a small number of overhead, was the usual method of lighting, and as a result, a large part of the floor space was in comparative darkness. This method is poor and defective. With the coming of the tungsten, the mercury vapor, and other electric lights, the overhead lamp has come into favor, and the individual is gradually disappearing from use. The overhead is the most efficient, and the only system of lighting which should be in use in any plant, store, or office.

Conservation of the eye.

The eye is the most important organ of the human body, and for its conservation little is being done. The conservation of the eye means the prevention of all causes, and the amelioration of all conditions which tend to the destruction, or the

impairment of eyesight. The improper use of eyes causes injury to the eyes themselves and may greatly decrease the efficiency of workers through producing illness. Loss of sight reduces a worker's efficiency to a minimum, while the least impairment of sight injures it somewhat. The lack of good sight is a more or less serious handicap to every worker. The eye is an organ whose sensitiveness exposes it to numerous risks, and every worker daily runs great risks and is often the victim of injuries resulting in the impairing of sight. These risks are often preventable. Eyestrain causes brain fatigue and has a direct bearing upon efficiency. Poor light produces a bodily and mental discomfort which seriously affects workers and their work. Headache is a common ailment from eyestrain. There is a great temptation to abuse the human eye. Bad methods of lighting are so common that good lighting is the exception. Industrial conditions to-day demand the performance of a lot of work by artificial light, and it is time that employers should realize that good lighting is a dollars-and-cents proposition. The loss in efficiency of all classes of workers through bad lighting entails losses of millions of dollars annually.

Eyestrain.

Every place where work is performed with the aid of artificial light should be carefully studied to see that the following injurious conditions do not exist; excessive light, insufficient light, glare, strong contrasts, flickering, heat or odors from light, and shadows. A too brilliant illumination is just as injurious as lack of sufficient light. Frequently, intensity of light is caused by the lighting fixtures being so arranged that the worker must look steadily, or at intervals, at the source of light. Fixtures should never be arranged so that the light is on a level with the eye of the worker, and to prevent

Injurious lighting conditions.

Excessive light.

occasional glancing at a glaring light, reflectors and shields should be provided for all lights. Insufficient light to see clearly the performing of work, every one knows and admits causes strain upon the eyes. The amount of light needed depends upon the character of the work, and should be sufficient to allow the worker to see clearly every operation necessary to be performed without strain on the eyes. This is a problem for careful investigation, and too great emphasis cannot be placed upon the bearing of proper lighting upon output, quality of work, efficiency and profits.

Insufficient light.

Glare is very fatiguing and straining to the eyes. It may come from the lights themselves, from walls, ceilings, or bright surfaces. To prevent lamps from glaring, reflectors and globes are used. A reflector performs an additional service in diffusing light most effectively for work. To get the best results, reflectors and globes should be kept clean. Where individual lamps have not been discarded, extreme care should be exercised, or the eyes of workers will suffer greatly from strain. The lamps should never be on a level with the eye, and should be such that the light falls over the shoulder. Frequently, a slight change in arrangement and the addition of globes and reflectors will cause much saving of strain to the eyes of workers. A careful examination should be made in every case, and if carefully arranged and protected lamps are not used, a few dollars may greatly increase the efficiency of workers through changing fixtures and the addition of reflectors and globes. Walls and ceilings should be such as to prevent glare. A cream kalsomine gives the best satisfaction for diffusing light, and at the same time is not glaring to the eye. By paying attention to

Glare.

Reflectors and globes.

How to prevent glare.

fixtures, reflectors, and globes, an ample supply of light may be obtained without being in any way glaring to the eyes of workers.

Flickering and strong contrasts, or sudden changes in the intensity of light, are very injurious to the eye. A uniform steady light is what is desired, and is what every employer should insist upon having. There are so many excellent lamps on the market that there is no excuse for a flickering one. Strong contrasts in electric lighting are caused by some fault in the circuit, and the cause should be ascertained as soon as possible, and remedied before injury is done to the eyes of workers. Serious injuries to the health of employees frequently arise from poisonous odors given off by gas lamps. In one factory sickness was reduced 50 per cent by changing from gas to electric lighting. If a working place is lighted by gas, a frequent inspection should be made to see if workers in any way suffer from the products given off by the combustion of the gas. If gas jets are too near workers, discomfort, headaches, and sickness frequently arise from the effects of the products given off and from the heat of burning gas. If gas is necessary, extreme care should be taken to make certain that neither the health nor the eyes of workers suffer therefrom.

Flickering.

Strong contrasts.

Ill effects of gas.

The eye is contracted more during the day than at night, which is due to the greater intensity of daylight over artificial light. It is not so sensitive to changes in illuminating intensity during the day as at night, when it is more relaxed on account of the lower intensities of artificial light. An intensity suitable at night may not be adequate for day illumination. If artificial light is used during the day, special care should be taken to secure proper intensity

Daylight illumination.

so that the worker is able to perform his task without strain to his eyes.

Poor lighting and gloomy surroundings have depressing bodily and mental effects which seriously affect workers in their work. Light and cheerful surroundings have a direct effect upon workers by making them more comfortable, contented, and satisfied. The efficiency of the worker in every form of business activity is greatly increased by the provision of good light. Too great emphasis cannot be placed upon the value of good lighting as a factor in lowering costs of production, and it is only recently that the importance of this factor is being recognized by employers.

Good lighting a necessity.

The discomfort of a stuffy room is apparent when it is entered. It affects health and produces physical and mental conditions which decrease efficiency. No one can work as well in a stuffy, ill-smelling, uncomfortable room as he can where the air is fresh and pure, and has the proper amount of moisture and heat. The breathing of foul air brings on a sense of drowsiness and a lack of ambition, which are conditions which affect thought, interest, attention, and concentration. Foul air fosters indolence, inaccuracy, carelessness, and poor work. Workers are practically forced into these faults through physical conditions under which they work, and yet they are blamed and criticized for them. No matter what the nature of the work, mental, physical, or merely mechanical, if the air a worker breathes and is surrounded by is not suited to his body, an improvement in that air would be an important factor in increasing his efficiency.

Effects of foul air.

The value of pure fresh air of proper humidity and temperature cannot be overestimated, and no effort or expense should be spared to supply it. Pure air is an absolute necessity for effi-

Value of pure air.

ciency, and the expense entailed in procuring it is returned several times during the year in more and in better work. It is strange that shrewd business men who are always on the alert for improvements and innovations for increasing profits have overlooked air, a most important factor in reducing costs and increasing efficiency.

The conditioning of air so that a worker may work under the most favorable conditions demands close attention of every employer. The chief factors to be considered are temperature, humidity, air movement, dust, and fumes. The chief thing which makes air in a working place harmful, aside from the special problems of dust and fumes, is overheating, and this is particularly so with the presence of excessive moisture. A temperature over seventy degrees Fahrenheit affects the heat-regulating mechanism of the body by keeping the blood in the skin and away from the vital organs, which impairs the efficiency of the nervous and digestive systems, and of the body as a whole. The general effect of heat and moisture is familiar to every one who has tried to do either brain or muscular work in a heated boiler room, as compared with the brisk temperature of an October day. It cannot be denied that workers in any place where the temperature is over seventy degrees Fahrenheit have their health impaired by producing a low vitality with a less disease-resisting force, and become easy victims to tuberculosis and other contagious diseases.

Air conditioning; chief factors

Effects of a high temperature.

The first important problem of air-conditioning is the prevention of overheating, and the practical method for attaining this end is the changing of the air. Ventilation or air change is accomplished either by natural or by artificial means. In a

Ventilation: its meaning.

room where only a few people work, the air may be transferred through windows, cracks, substances of walls, ceilings, and floors with sufficient rapidity without making special provisions for the purpose. Where many are working, such is impossible, and some artificial system should be used. The average individual at work produces about as much heat per hour as is given off by the burning of two candles. In many places this is increased by the running of machinery, the lighting system, and other sources of heat. The heated air should be removed, and provision should be made by a ventilating system to remove and to replace it by cool air. If air is introduced from the outside, it should be made in temperature a little below that which is normally felt to be comfortable. In summer time it may be necessary to cool the air, while in winter the air should be warmed. The latest improvement is to cleanse the air from a room, and to force it back again. If such a system is used, the hot air expelled may have to be cooled after it is cleansed before it is returned to the room.

Natural.

Artificial.

In every working place, incoming air should not be below sixty degrees Fahrenheit, because if so, it would interfere with the efficiency of the workers. The chief problem is the expulsion of the heated air, and the introduction of cool pure air to take its place. Methods of ventilation are many and should be suited to meet each particular case. It is generally accepted that hot air should be taken out near the top of a room, and cool air admitted near the bottom.

Temperature.

The problem of space for occupants is an important one in ventilation. Experience has proven that the minimum space per person should not be less than two hundred and fifty cubic feet where artificial lighting is not used, and four hun-

Space allowance.

dred where it is. The two minima should be fixed and provided for by statutory law. When the air space is less than the above minimum, it is practically impossible to properly condition the air, but above, it may be done in some cases by natural, and in others only by artificial means. Having adequate cubic space does not by any means insure good air, because it simply prevents overcrowding to the point where proper air conditions are impossible. Where a room has the proper air space, the question of comfort on the part of occupants depends upon the important problem of air change. English experts have discovered that without proper provision for air change, the condition of air was no better in rooms with over five thousand cubic feet of air space per person than in those with an air space of over three hundred.

Proper air conditions in a room should, except in the case of temperature, closely imitate the outside atmosphere. The air out of doors is never still, and is constantly in motion. The movement brings slight changes of temperature which are invigorating and stimulating. A basic principle of ventilation is not merely that a certain amount of pure air should be brought into a room and foul air expelled, but that the air should be exchanged in such a fashion as to produce a steady movement of air in every part of the room where human beings are at work. Proper circulation or movement is an absolute essential in air conditioning. Experts declare that the air in a room should be made to move at the rate of from two to five feet per minute. A majority of ventilating engineers declare that the Illinois law as to air requirements is satisfactory. The law requires that fifteen to eighteen hundred cubic feet of air per hour according to specified

Air circulation.

Rate.

Illinois law.

conditions, for each person present and employed, should be supplied, unless the cubic space in the room should be over two thousand cubic feet per occupant, and outside window and door space be equal to one eighth of the floor space. This gives a reasonable rate of air change, and is satisfactory for efficient work.

Conditioning of air has to do with quality as well as quantity. Quality deals with temperature, humidity, dust, fumes, and gases. Temperature and humidity are measured by an instrument called a sling-psychrometer, which consists of a pair of thermometers, one of the ordinary type, and the other having the bulb covered with a wet cloth. Moisture evaporates from the wet bulb at a rate which depends upon the amount of moisture in the air, this evaporation cools the wet bulb, and lowers the temperature, which is recorded. From the temperature of the dry bulb thermometer, and the difference in the readings between the dry and the wet bulb, the moisture in the air is determined. A high wet bulb reading denotes high temperature and a high percentage of moisture, a condition most harmful to the human body. Haldane has shown, as far as the psychological effect is concerned, that a very high temperature with low humidity is about the same as a very low temperature with high humidity. When the temperature rises to eighty degrees Fahrenheit with moderate humidity, and about seventy degrees Fahrenheit with high humidity, depression, headache, and dizziness manifest themselves. At seventy degrees Fahrenheit, with saturated air, Haldane found that the temperature of the body actually began to rise, that is, fever set in. A moderately high temperature with a low humidity produces a stimulating effect, causing irritability, nervousness, and discomfort.

Quality.

Sling-psychrometer.

Effects of humidity.

Air always contains a certain amount of water in the form of vapor, which varies from thirty degrees to complete saturation, and gives from one to twelve grains of water in a cubic foot of air according to temperature. A well-known physician states that the daily amount of water given off by the skin of a single person is two and a half pounds, and about ten ounces by the lungs. When the air possesses a high percentage of moisture, it lessens evaporation, as it has little drying power, and the water from the skin is with difficulty evaporated. One of the chief methods of cooling the body is evaporation of the perspiration. When the air is hot with high humidity, it tends to increase the effects of heat, and discomfort, headache, and even fever follow. This condition may become so intensified that the temperature of the body greatly exceeds the normal, and heat exhaustion follows. Excessive dryness of the air is also harmful. It increases evaporation, the skin becomes dry, and the mucous membranes of mouth, eyes, and respiratory passages are irritated. Discomfort, irritation, and nervousness follow. The best working temperature is between sixty-five and seventy degrees Fahrenheit, and with an average humidity of from 60 to 70 per cent. It matters not what kind of work is being performed, every effort should be made to avoid extremes of heat, cold, and moisture.

Water in air.

Causes.

Effects of high and low humidity.

A comfortable temperature, a moderate humidity, and a proper circulation of air are necessary factors for efficiency. A slight variation in the temperature of in-coming air from that of the air in the room stimulates the energies of workers. Working in a high temperature, workers soon become listless, careless, and slovenly in their work, all of which

Effects of high temperature.

have an important bearing upon quality of work, as well as output. It also causes drowsiness, discomfort, and headache, leading to devitalized bodies, which become easy victims to all kinds of diseases.

Window and door ventilation should be carefully controlled. If rooms are hot, and workers perspiring, it is a great danger to their health to open windows and allow draughts of cold air blow through the rooms. During the fall, winter, and sometimes spring, workers are forced to run great risks of ill-health and sickness. They work all day in a high temperature, and going out into the cold air to go to their homes at night, wet from perspiration, and usually with low vitality, they become easy preys to many diseases. Proper air not only assures better health, but increases efficiency. It is a dollars-and-cents proposition, and every employer should pay particular attention and spare no expense in obtaining proper temperature, humidity, and circulation of air. The increased efficiency of the working force repays many times the extra outlay.

Dangers from draughts and heated rooms.

Indoor air is never as pure as that on the outside, because it is always more or less polluted by the products of combustion, by the decomposition of substances, and by the wear and tear of tools, machinery, buildings, and materials. The presence of individuals always tends to vitiate the air with germs and organic matter from their skin, mouths, lungs, and soiled clothing. These impurities may be classified under three heads, dust, fumes, and gases.

Impurities of indoor air.

Dust is an enemy of efficiency and affects individuals in various ways. Dust may be divided into three classes, insoluble inorganic, soluble inorganic, and organic. The first class includes small particles of metals, minerals, stone, etc. The

Dust; kinds.

inhalation of these dusts causes more or less harm to respiratory organs. The inhaling of iron dust, it has been proven, may diminish in time the respiratory efficiency of the lungs through a loss of elasticity. It is certain that the inhalation of these inorganic dusts often carries germs and harmful bacteria to places in the lungs favorable to inoculation. Many die from infectious pulmonary diseases, not knowing that the breathing of dusty air has been the cause of the infection. The exposure of workers to dust is dangerous, as it sooner or later impairs their health and efficiency.

Insoluble inorganic.

Soluble inorganic dusts, as the name implies, comprise particles of those substances which are soluble, and if taken into the body will in the course of time be absorbed, as arsenic, mercury, etc. Many are poisonous, and their absorption by the body causes serious illness and, if in sufficient quantities, death. The third class comprises fine particles arising from flour, grain, cotton, wool, rags, hides, etc. Many diseases are traceable to one or the other of these organic dusts. Many dangers arise from dusts, whether of the one or the other of the three classes, as, firstly, dusts cause irritation of the respiratory passages, eyes, nose, and skin of workers; secondly, if inhaled and lodged in the lungs, they may reduce the resistance of these organs to harmful bacteria, and cause workers to become easy preys to tuberculosis and other diseases; thirdly, dusts may be germ-laden, and carry germs not only to the lungs, but to other parts of the body; fourthly, many are highly inflammable, and in proper proportions and under suitable conditions, are subject to spontaneous combustion.

Soluble inorganic.

Organic.

Effects of dusts.

Many conditions and circumstances have a more or

less serious influence upon the health of workers, but the foremost and most certain of serious results is dust, whether organic or inorganic. Experts have discovered that sickness and mortality of workers are high or low in almost exact proportion as the air is filled with or free from dusts. We also know that the proportion of deaths from tuberculosis is very high in trades with continuous or considerable exposure to metallic and mineral dusts, and the same is true of mortality from respiratory diseases in general. Employers should realize that it is a dollars-and-cents proposition to keep their premises as free as possible from dust. Every dollar spent in so doing repays manifold in giving better health and increased efficiency on the part of the working force. From the point of view of the health of its citizens, it is the right and duty of every state to pass laws to prevent workers from working in dust, and in a more or less germ-laden atmosphere. The better health assured, the loss of time on account of sickness saved, and the general increase in efficiency should be sufficient inducements for dust prevention.

Dusts and sickness.

The problem of dust prevention is more or less difficult. In operations accompanied by the creation of dust, every effort should be made through careful arrangement and mechanical devices to reduce the dust as much as possible. The use of hoods for dust-making machines is absolutely necessary and inexpensive, and a proper ventilation system greatly assists in dust removal. Where it is impossible by hoods or devices to remove dust, and it is in sufficient quantities to be injurious to workers, respirators and goggles should be furnished by employers. If dust is produced which is highly inflammable, and a sufficient quantity is liable to lead to spontaneous combustion,

Means of dust prevention.

care should be taken to introduce into the room, at certain intervals, a certain amount of moisture, sufficient to remove the danger.

Extreme care should be exercised in removing dust from the floors and walls. The old-fashioned broom and the dry duster are dust movers, and not dust removers. They scatter the germ-laden dust throughout a room. Dry sweeping and dusting should never be allowed in any room where people are working, and it is advisable not to use either in any case. Dustless brooms, dustless brushes, wet sawdust, sweeping compounds, hygienic floor brushes, vacuum cleaners, and numerous preparations for dust removal are available and cheap, and should in every place replace the corn broom, cloth, feather duster, and mop and pail.

How to remove dust.

In many places, offensive fumes and gases are produced in the making of the product manufactured. Every effort should be made through careful arrangement, and mechanical devices to reduce the free discharge of these gases to a minimum. Frequently discharge of gas may be prevented by proper covers for vats and vessels, and there are in the market many ventilating, condensing, and burning devices. Where it is impossible to prevent the presence of gas or fumes, respirators, goggles, and sometimes gloves and skin protectors should be used. A proper ventilating system is a great help in lowering the amount of fumes and gases in any place where these are produced. The reducing of these in a plant to a minimum should be compelled by statutory legislation. Many states have made the attempt, while a few have fairly satisfactory laws, but there is still the need of much improvement, and this can be more easily accomplished with the coöperation of employers

Fumes and gases.

How to remove.

and employees. It is an important public health problem, let alone its effect upon efficiency, and either should be sufficient inducement to insure every precaution to protect employees from poisonous and injurious fumes and gases. Poisonous fumes and gases are closely related to inefficiency, and this fact, if no other, should make the progressive employer realize that it is a business proposition to guard the health of employees from them, and thus increase their efficiency. Impure air, dust, fumes, and gases are arch-enemies of efficiency, and efficiency cannot be reached in any plant where their presence is found.

Effects on workers.

Every employer should be made to realize that it is a good investment to study carefully his own plant with special reference to the health and the safety of the employees, and to ascertain and to provide conditions under which his particular plant may be economically and profitably conducted. It is a matter of common experience that an intimate relation exists between the conditions which surround a worker and his efficiency. The proper mental attitude of a worker toward his work is best generated and maintained where best working conditions are provided. Bright and cheery environments, a proper supply of pure air, no dust or fumes, proper temperature and humidity, are great factors in making workers cheerful, happy, and contented. It is poor business to allow conditions to exist that cause ill-health, as costs are kept high through diminishing both the quality and the quantity of goods produced. It cannot be denied that a happy and contented worker turns out better and more work than the unhappy and discontented one. Employers should be made to realize the real value of workers' physical and mental well-being.

Returns for proper environments.

The contentment of the employee with his surround-

ings, and his freedom from mental depression or ill-health are factors directly affecting his output. All physical inconveniences which waste human strength and effort, as foul air, poor light, dust, and unsanitary conditions, are marks of inefficiency. The lack of proper hygienic conditions in the large majority of plants is due to ignorance rather than to neglect. There is need of further development of scientific knowledge of the requirements of the human system. The factors which protect health and give safety to industry are just beginning to be understood in this country. Manufacturers and employers of labor cannot be blamed for not wanting to install expensive safety devices, ventilating and dust-removing systems, and other methods for protecting and promoting health and comfort unless they can be shown that such an expenditure is a profitable investment. With realization of the fact that the increased efficiency obtained will repay several times the expenditure, and an understanding of the demands of the human body for health, the next few years will see a rapid improvement in air conditions. There is no reason why most plants cannot be kept at a comfortable temperature, with air containing the proper percentage of moisture, and at the same time free from dust and impurities.

Lack of proper environments due often to ignorance.

QUESTIONS

1. Why is health an essential factor in efficiency?
2. What is the importance of conservation of health? Mention several ways of conserving health.
3. What precautions should be taken in illumination? Give an efficient illuminating system for a plant.
4. What are the advantages of electric lighting? Give the requirements of a good electric lighting system.
5. How may the eye be conserved? What are the effects of eyestrain?

6. What is air conditioning? Give chief factors.
7. What is ventilation? Outline a good ventilating system.
8. What precautions should be taken with temperature and with humidity?
9. Give proper temperature and humidity for efficient work.
10. What are the impurities of indoor air? How may they be eliminated?
11. What are the dangers of fumes and gases? What precautions should be taken to prevent them?
12. Why did employers so long neglect proper working environment?
13. What is the proper space allowance for work? Give requirements of the Illinois law.
14. What is the relation between efficiency and pure air?
15. Mention various injurious lighting conditions. How may they be remedied?

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CHAPTER XI

Welfare Work

Two necessary factors demanded in every employee for efficiency are skill and health. An employee, to be efficient, has not only to know how to do his work in the best way, but must enjoy good health. If a worker, skilled or unskilled, is worried, discontented, or in poor physical or mental condition, his efficiency suffers. From the time of the introduction of machines, employers knew that to get best results, care and attention as well as skill in operation were absolutely necessary, yet it was not until a comparatively few years ago, that it was realized that the same care and attention were necessary with employees in order to obtain their greatest efficiency. Great care is taken of athletes because their success depends upon their health and ability to endure strain. The same is true of working men. Health should be safeguarded with the greatest care because it is a fundamental prerequisite for bodily and mental achievement, and the attainment of success and happiness.

Protection of health.

According to a statement of Professor Irving Fisher, about three millions of our people are sick at all times, and it is claimed that one-half of this can be prevented. The number of workers who are slightly ill, ill enough to reduce efficiency but not enough to give up work is much larger, and the pres-

Extent of sickness.

ence of such in factories, offices, and stores is a real drain upon industry. It matters not how true and accurate your machine is, a half-sick operative cannot get the best results. Suffering from headache, cold, or indigestion does not allow men to do as efficient work as if they were well. A plant with a healthy working force has a decided advantage in the struggle for markets. In the preceding chapter, it was explained how health is improved by proper lighting, temperature, circulation of air, humidity, and freedom from dust and gases, but it should not be forgotten that health is assured by proper and prompt medical service. Prevention is better than cure, and medical service has a definite place in keeping men at a high point of efficiency. The average plant has a well-equipped repair shop to render proper attention in looking after machines and keeping them in the best repair, but only a small percentage maintain an organized department for keeping their men in good health.

Its drain on industry.

Sickness may not be severe enough to keep a worker from his work, but nevertheless it has a direct bearing upon his efficiency. It may cause a worker to remain away from his work, and the loss in this case is greater. Workmen should be instructed by a doctor or a nurse as to how to prevent sickness, and should receive prompt and effective treatment in case of sickness. A medical department should have its place in every business enterprise. It has five important functions to perform: the physical examination of every employee; the maintenance of health in a working force; the prescribing and sometimes the dispensing of medicines; the care of accidents; lastly, attention to living standards at home.

Medical service.

Medical departments.

Functions.

Every medical department in a large plant should

have at its head a doctor who is either a salaried official and devotes his entire time to the employees, or who makes daily visits and is subject to call at any time. He should be assisted by a nurse, but where men are employed, a male nurse is preferable. A plant employing only a few men will not find it profitable to have a nurse, but two or three in a vicinity may share the expense of one to devote her entire time among the plants, and in visiting the homes and the families of the workers. A small plant need not have a physician visit the place, because this may be too expensive, but it should have some arrangement with one who will examine workers at his office, and prescribe if necessary.

Doctor and nurse in plant.

A large plant should have a well-equipped emergency hospital, while a smaller one will find it profitable to have a small room fitted out for emergency cases. "First aid to the injured" jars or chests should be found in the emergency room, and if the plant is large, several should be placed in convenient places, so that one may be reached from any part of the plant without trouble, and in a very short time. Provision of some kind for emergency cases, and for medical care and inspection of employees, is absolutely necessary even if only two or three men are employed.

Emergency hospital.

Every employee should undergo a thorough physical examination, and the results should be tabulated on cards for the purpose and filed. All new employees should undergo a similar examination, so that there will be a health-card index for every one in a working force. A careful medical examination of all applicants will at the outset eliminate all suffering from any infectious or contagious disease, to which it is very undesirable to expose workers, and will also prevent

Physical examination.

the hiring of those physically unfit for work. No employer should hire a worker without first having a thorough physical examination made by a medical doctor. If this were done, it would be a safeguard to the healthy workers, and would often prevent loss from having workers with impaired health trying to do work which should be performed by healthy strong men.

Importance.

If defects are found in the health of the permanent working force, attention should be given to remedy them, and examinations should be made at regular intervals as long as the defects last. If slight defects are found on the physical examination of an applicant, and this is the only objection, attention should be given, and frequent examinations made until good health is restored. Careful study should be made of the demands of each position, so that the person who fills it may not have his efficiency impaired by physical or mental defects. If a worker is found who has a defect which impairs his efficiency, continuation at the old work should not be allowed. If the defect is only temporary, a rest of a few days or a few weeks may restore health, but if it is permanent, another position should be found where the demands are such that the defect will not interfere with efficient work. If a person is suffering with asthma and is working amidst dusty surroundings, a new position where no dust exists should be given him. Again, if a person is compelled to work in a standing position all day and has spinal trouble, a new position should be given him, where it would be possible to sit the greater part or all of the time, and perform his work. Great losses arise from having workers perform tasks for which they are not physically qualified. Ill-health in any form is a secret force working towards inefficiency, and

Treatment of defects of health.

Change of work often necessary.

frequently can only be detected by careful medical examination. The goal in every plant should be to have all places filled by workers who are competent to perform efficiently the tasks to be performed. This demands medical service, and such is an absolute necessity where efficiency is the goal.

Importance of treating slight ailments.

An employer should insist that every employee consult the plant physician or nurse at the first symptoms of ill-health. It is frequently hard to induce an employee to do so, because he does not realize that if slight ailments are taken in time, it will often prevent the possibility of long sickness following. Severe sickness may frequently be prevented by prescribing at the first symptoms, and slight ailments if neglected often develop into serious illness. Colds, sore throats, and many ailments are contagious, but if promptly treated, and advice given as to precautions to follow, it will frequently prevent their spreading throughout a working force, and save many dollars from loss of efficiency of those affected and attending, and from those suffering from severe cases, and kept away from their places. Maintaining health in a working force is an important factor in efficiency, and is one of the greatest guarantees of regularity in attendance and of increasing efficiency by keeping employees in good health. The doctor or trained nurse should take special pains to instruct employees how to prevent sickness, and how to administer prompt and effective treatment during incapacity.

Dispensary.

In a large plant, it is advisable to have a dispensary in charge of a nurse. If no dispensary, provision should be made with a druggist to give special rates to employees. In a plant dispensary, drugs and medicines should be given gratis. If expensive drugs or medicines are required, they

should be given at cost. A dispensary is inexpensive, and proves a valuable factor in increasing efficiency by assuring better health in the working force. For the treatment of accidents, an emergency room or hospital is necessary in every plant. All injuries, cuts, scratches, bruises, foreign matter in the eye, sprains, etc., should be given prompt treatment. If so, blood poisoning can be almost entirely eliminated, and loss of time and of efficiency from accidents greatly reduced.

How conducted.

Efficiency of body and of mind is affected by home surroundings and conditions. It should be emphasized that no employer can afford to do anything which does not bear directly upon securing increased efficiency of his working force. Anything beyond this savors of charity, and is invariably opposed by workers. Charity is outside the province of a business enterprise, and is bound to react unfavorably upon its success. Anything that increases the efficiency of the working force is within the province of every employer, and should be of special interest to him. The problem of efficiency increases the sphere of activity and the interest of employers in their employees beyond the plant, to their lives outside, and to their homes. A worker's home surroundings react upon his ways of thought and of working. One who comes from a slovenly home, where meals are badly cooked, sleeping quarters not properly aired and ventilated, the house in a litter, and things always in general disorder, will usually be a slack, careless, and unsatisfactory person. The home surroundings of employees are important factors in efficiency, and should be carefully investigated by every employer.

Home surroundings.

Employer's interest.

Workers should be encouraged to live healthy, thrifty,

and moral lives so as to develop into strong, happy, contented working men. It pays to have a nurse visit the homes of workers, and teach their wives how to cook food properly, how to keep the homes sanitary and properly ventilated, and how to administer simple remedies in case of slight illness. Many employers provide medical care for the families of their workers. Word comes to a worker that a member of his family is sick. In place of his going home, a nurse is sent, and he, knowing that a competent person is looking after the sick member, continues his work as usual. Modern industry demands of workers a good physique, as no work requiring strength, dexterity, or brain power can be performed efficiently in the absence of physical stamina, and such cannot be attained with malnutrition, bad housing, or poor sanitation. No employer who desires to obtain and maintain efficiency in his working force can afford to tolerate any of these conditions in the homes of his employees. The instructing of the working force in how to live so as to attain and maintain health is an important problem with every employer, and one which cannot be neglected.

How to encourage proper habits of living.

The personality of the doctor and of the nurse is an important consideration. In either case, the person should be agreeable, sympathetic, possess a cheerful disposition, and one who makes you feel that a great interest is being taken in you, and in whom you are ready and willing to confide. Such a person will greatly increase the efficiency of the medical department, and will have a decided influence in maintaining a good esprit de corps.

Personality of doctor and nurse.

The maintenance of an efficient medical department has a distinct and important bearing upon the efficiency of a working force, and as such is a dollars-and-

cents proposition. Such a department increases efficiency in various ways, some of which are as follows: it eliminates all who are absolutely unfit for work; it increases the efficiency of those with defects by changes in work, and by care and attention; it brings attention to those who have physical defects, which if not cared for, might lead to physical unfitness, but who with proper care can be partially or wholly restored to health; it prevents sickness by giving advice to well employees, and by immediate attention to slight ailments; it reduces loss of time due to sickness or accidents; it reduces accidents owing to the fact that many accidents are due to machines being worked by physically unfit employees; it eliminates loathsome diseases.

Medical department and efficiency.

Many large enterprises maintain sanatoriums in the country where they send their sick employees. A week or two of rest in a sanatorium will frequently restore a valued employee to health when neglect might cause illness of long duration, or result in some dangerous disease frequently causing death. Thousands of deaths occur annually due to neglect and carelessness in not paying attention to slight ailments or symptoms at the proper time. Many employers are not able to bear the expense of private sanatoriums, and make provision with public ones to care for all cases sent. Frequently, the employer bears all the expense whether the sick employee is able financially to do so or not, but in some cases, the employer pays part and the employee part, but if the employee is not able to pay his share, the employer bears all the expense.

Provisions for the care of the sick.

Proper nutrition is essential to good health, and as far as the employer is concerned, presents two problems: first, wholesome food for the employee and his

family in the home, and secondly, lunches during the working day. The importance of instructing the wives of employees as to the necessity of obtaining wholesome food and properly cooking it is not widely recognized by employers. To insure wholesome food at low prices, many employers of large working forces run stores and sell goods at a small margin of profit. Whatever profits remain at the end of the year are given to an association for the benefit of employees, or divided among them on the basis of purchases. Sometimes employees form coöperative associations, and by buying together are able to get discounts. Many employers advise their unmarried employees where to board to get wholesome food, and emphasize the effects on health of irregular eating, imperfect mastication of food, and the eating of indigestible dishes. Many find it pays from a business point of view to run boarding houses and restaurants for unmarried workers. Board is given at actual cost, and frequently at the bare cost of food and service, the building, equipment, and other requisites being furnished gratis by the employer. The obtaining of good wholesome food by workers has an important influence upon health and efficiency, and makes it a business proposition.

Proper nutrition.

How to assure.

Indigestion has a direct bearing upon health and efficiency, and its ill effects should be forcibly impressed upon every employee. The loss in efficiency due to this trouble amounts to millions of dollars annually. One of the chief causes of indigestion is the eating of cold lunches at work-benches, or hurriedly bolting down a lunch at home during the noon hour. Unless a person gets a good substantial lunch, his efficiency must suffer before the end of the working day. Scant and

Indigestion; its effects.

Lunches.

cold lunches have a twofold effect upon efficiency. Workers become hungry long before closing time, and good work cannot be done by any one if hungry. The lunches cause indigestion, and this impairs efficiency during the entire working day. Frequently at noon hour, some hasten to a near-by saloon, drink a glass or two of beer, and snatch a few morsels of food from the free lunch counter, while others get a pint or a quart of beer, and lunch upon that and a few crackers. The free lunch in a saloon is unwholesome and indigestible. Those who lunch on beer and crackers are usually hungry by the middle of the afternoon, and famished before closing time. I have seen men so weak from hunger an hour before closing time that it was practically impossible for them to do half the work that they did without effort during the early part of the day. It is a proven fact that where men are allowed to drink a quantity of beer at the lunch hour, it has an important bearing upon their efficiency immediately following. Beer in any quantity causes drowsiness and listlessness, and is a great barrier to efficiency, and if it is allowed at lunch, it should be only in moderate quantities. From the foregoing, it is readily seen that the lunch problem is a serious one for every employer, and its successful solution adds greatly to the efficiency of a working force.

Kinds.

The lunch problem has during the last decade received considerable attention, and in thousands of enterprises throughout the country some provisions are made to guarantee a warm and wholesome lunch. Nevertheless, there are many enterprises where employees are compelled to eat cold lunches, and are still allowed to patronize the free lunch counters of the near-by saloons. Many started, a few years ago, the practice of providing free coffee and a place to warm

Interest of employers in lunches.

lunches. The experiment proved so satisfactory that to-day a great many furnish good wholesome lunches at cost. A restaurant should pay not in direct profits, but in increasing the efficiency of workers during the last working hours of the day. Scores of different plans are in operation for helping employees get good warm lunches, and vary all the way from a cup of warm coffee for one cent, and a dish of soup for two cents, to full course dinners. A common plan is where the employer furnishes a room, lighting, heat, and equipment, and employees are charged for the actual cost of food and service. Sometimes employers take entire charge of the management of furnishing lunches, and sometimes this is left to a committee of employees. An employer cannot be expected to furnish lunches gratis, but it always pays for him to bear a part of the expense. In every case, it is a business proposition to see that employees get good, wholesome, warm lunches. Where only two or three are employed, a small gas stove or an electric plate furnishes a satisfactory cooking utensil, and a pound of coffee and four or five cans of condensed milk per month will give a warm drink. Employees should be encouraged to bring good substantial food, and warm or cook it in the place. The total outlay amounts to a few cents per month for the employer, and gives each employee a warm lunch, and not only increases his efficiency, but creates a better feeling towards the business.

Methods for assuring proper lunches.

Pure drinking water is as necessary to health as wholesome food. Many factories have been severely handicapped by having a large number of employees absent on account of sickness, and on investigation, the cause was found to be the drinking water. Drinking water should receive careful and constant attention so that the health

Pure drinking water; its importance.

of the employees will not at any time be endangered. Whatever imperils health is of the greatest importance to an employer, and it is a business proposition to protect the health of the working force from all perils and dangers.

Pure drinking water; its importance.

Drinking water comes from various sources: water supply of town or city of location; wells; springs; bays, lakes, and rivers. If the source is the water supply of a town or city, an analysis should be made occasionally for impurities or bacteria which might endanger health. If the source is either well or spring, extreme care should be exercised and frequent analysis of the water made.

Sources of drinking water.

Special pains should be taken to prevent the well or spring from being polluted by surface water or other causes, and it should be frequently cleaned and constantly inspected. Many plants along bays, lakes, and even rivers get drinking water from these bodies. Pipes are laid out some distance from shore, and the water is pumped to the plant. Frequent analysis should be made of the water, and extreme care be taken to see that organic matter or surface water does not pollute the water at the place where the supply is drawn. Many employers take further precautions by filtering all drinking water. Each source has its own problem to solve in guaranteeing pure drinking water, and as such should be carefully studied.

Precautions to assure good water.

Drinking water is supplied to workers in different ways: pail and cup, tank and cup, faucet and cup, sanitary fountain. The old-fashioned wooden pail and tin cup are germ distributors, and a menace to health. The wooden water pail is a relic of the past, and no enterprising employer should allow its presence in his plant. The water tank and individual sanitary cups may be

satisfactory if proper precautions of cleanliness are taken. The water should be drawn off by faucet, and the tank should be carefully cleaned every morning. The common drinking cup should not be allowed in any plant. With city supply, the faucet and cup are the old means for furnishing drinking water, but in every case, individual sanitary cups should be used. The ideal drinking receptacle is the sanitary fountain, of which many varieties are on the market and wherever possible, one should be used. One manufacturer said that in the saving of time between the ordinary drinking cup and the fountain, the latter paid for its installation the first month. Provision should be made for receiving waste water, and it should not in any case be allowed to dampen the floor. There should be a sufficient number of drinking places easily accessible, and convenient to all sections of a plant, so that too much time is not lost by employees going and coming from getting a drink.

How drinking water should be supplied to workers.

Drinking water in every case should be cool and refreshing. Precautions should be taken not to have the water too cold because very cold water increases the desire for it, and the taking of quantities into the stomach is injurious. Ice should not be allowed to float in drinking water. A water tank should have a separate compartment for ice, and with a drinking fountain or faucet connected with the water system of a town, or with artesian well, the water should be made to flow through a coil of pipes packed in ice. A cool refreshing drink invigorates workers, and is an absolute necessity in every plant. Drinking water is a more important factor in efficiency than the average employer believes. An abundant supply of pure, cold, sparkling water is a factor in effi-

Importance of cool water.

ciency, and it also has a further effect of fostering a better spirit between employers and employees.

Even to-day, many employers consider it ridiculous, and an additional expense to furnish sanitary lavatories and washrooms. If men wish to wash before going home, or before lunch, pails of water are obtained, and all help themselves. Sometimes towels are supplied, but ordinarily men use handkerchiefs or whatever they can get. Such practices are not only unsanitary, but are a menace to health, and many infectious diseases are caught from wiping on towels used by many, or washing in the same water with others. Some places still retain the old-fashioned iron sink filled with filth and germs, and one or two rusty iron or tin wash-basins. These are conditions no better than pails. Lavatories and closets are still appalling in many enterprises. Many states have considered it necessary as a protection to health to pass strict laws governing them. In spite of laws, many are simply depositories for germs, filth, and odors, so nauseating that a person cannot remain long in one. Many a severe case of sickness is traceable to infection received in a dirty, filthy closet, or from dirty, filthy washing facilities. Hundreds of such cases occur annually, and they cost employers thousands of dollars. Efficiency and health should be sufficient reasons for sanitary lavatories and washrooms. Cleanliness and sanitary conditions make a closer relationship between employees and employers, and assist in creating loyalty, enthusiasm, and interest, essentials for efficiency and success in every enterprise.

The old lavatory and washroom.

Dangers.

Effects on efficiency.

Closets should wherever possible be flush and sanitary. Urinals should be kept clean and frequently flushed because if not, they will be germ carriers. Everything should be kept sanitary

Closets.

and clean. Employers find that where clean and sanitary closets are furnished, workers take pride in them, and do their part in keeping them clean. The closets should be ample and distributed, so that they are easily accessible to all parts of a plant.

Washing troughs and individual bowls.

Washing troughs and individual wash bowls have taken the place of the old wooden bucket. Individual bowls are the most sanitary and preferable. Soap and towels should be supplied by the employers, and every worker should have his own individual closet, with a shelf in it for towel and soap. It is dangerous to have several using the same towel. Prevention is always the watchword, and is more preferable to cure. Many employers have janitors to look after washrooms, and matrons in the case of women. The washrooms in many of our enterprises are thoroughly modern, sanitary, and models of cleanliness. Such washrooms increase efficiency not only by protecting health, but by assisting to create a proper spirit of coöperation among the laboring force.

Individual lockers.

Each worker should have an individual locker in which to keep his clothing and other personal effects. Lockers are made of wood, iron, or steel wire, but the last two are preferable. They should be carefully ventilated, and arranged so as to be near heated coils, or have drafts of warm air pass through them in order to dry clothes if wet on going to work, or working clothes if damp on leaving off, at the close of work. Frequently, work is of such a nature that it is necessary to work in different clothes from those worn to and from work. If a change of clothing is necessary, both men and women should have their own dressing rooms. In many plants, dressing rooms are absolutely necessary, and they should be light, cheery, and well ventilated.

Cleanliness of person is one of the fundamental laws of health. Many employers realize this and furnish bathing facilities for employees. Bathtubs, shower baths, and, in some cases, swimming tanks are found. Many employers encourage their workers to take frequent baths, and furnish free towels and soap, but they must take their baths on their own time. Some of the more progressive employers allow workers to take baths once a week on their time, and furnish soap and towels. Hundreds of plants have shower and tub baths for men, and tub baths for women employees. It increases cleanliness at home, affects habits of living, promotes health, and creates a closer coöperation and loyalty in the working force toward the business as a whole.

Facilities for bathing.

Spitting on the floor is a filthy habit common in many places. It is a menace to the health of workers, and this is sufficient reason that it should not be tolerated. Men should be told the evil consequences of spitting, and should be warned against its practice. Warning signs should be displayed in conspicuous places. Cuspidors filled partly with sand should be placed in convenient places, and care should be taken to have them cleaned frequently.

Evil effects of spitting.

The plumbing connected with closets, washrooms, and urinals should be regularly inspected. Frequently, employers pay dearly for faulty plumbing in having a large number of their working force absent on account of sickness due to it. An epidemic frequently starts from a leak in a sewer or waste pipe in some part of a plant. If sewage is not emptied into a municipal system, but is carried some distance and allowed to soak into the ground or emptied into some body of water, extreme care should be taken that it does not in any way menace the health of workers.

Care in plumbing.

Organic matter should not be allowed to collect in or near a plant, because it may endanger the health of the working force.

The hour at lunch if used advantageously is of value in maintaining the efficiency of the working force during the afternoon. The first essential is a wholesome, warm lunch, and the second is rest and recreation. A rest room is absolutely essential with a working force of women, and is a good business proposition with men. A bright, cheery, cozy room with lounges, easy-chairs, a piano, a writing-desk, magazines, periodicals, and a library gives opportunities for rest and recreation, and makes workers more efficient for work during the afternoon. Where the work is exacting, many employers give rest periods morning and afternoon. Rest rooms give the rest and the recreation needed, and girls who become temporarily ill find a place for repose. A few pots of flowers add to the cheerfulness of a room. A rest or lounging room for men with easy-chairs, magazines, library, games, and perhaps a piano affords an opportunity to rest weary muscles and fatigued brains, and makes men better fitted for the work of the afternoon. Rest rooms are problems connected with efficiency and should be considered as such. They give a direct assistance in increasing the efficiency of the afternoon, and an indirect, in helping to create a proper attitude in the working force toward the business.

Rest and recreation rooms.

Effects on efficiency.

In order to assure comfortable homes, many employers build houses, and rent them to employees at a sum just sufficient to cover expenses. This should not be confused with the practice found in many places, where employers build cheap houses and rent them to employees at exorbitant rents. The aim in this case is extortion, while in the former it

Assistance in procuring homes.

is to further assure health, comfort, and happiness by giving employees cheery and sanitary homes within their means. Many build homes and sell them to their employees on easy installment payments. The aim is to assure more comfortable homes in the first place, and secondly, to encourage thrift. Some progressive employers, to safeguard the health of their employees, have lodging houses, and rent rooms to the employees at a rent just sufficient to cover expenses and give a low interest on the money invested. This movement is young, but it will not be long before employers will realize that it pays on account of its beneficial effect upon the health of employees, and the time is not far distant when all employers of large numbers of men and women will have their own lodging houses.

Welfare work; its importance.

The coöperation of the working force with the management is absolutely necessary for efficiency and success. An employer may have a finely equipped plant with the best possible sanitary and hygienic conditions, but if his laboring force is dissatisfied and discontented, coöperation is impossible, and the result is greater and greater inefficiency. A satisfied, contented, and healthy laboring force, enthusiastic in coöperating with the management, and working with only one aim, the welfare of the business as a whole, is a most valuable asset of an employer. Many employers realizing the value of a contented and satisfied laboring force, and its important bearing on both success and efficiency, have undertaken many kinds of work to further guarantee and assure this frame of mind. This class of work is called welfare. Employers who have introduced various kinds of welfare work in their plants do not hesitate to declare that the motive for so doing is purely a business one, as it results in a better, more satisfied, and more efficient laboring force. Welfare

work is found in many varied forms. The character of the laboring force determines to a certain extent the kind of work that may be successfully undertaken and carried on. During the past few years, employers have been taking more and more interest in this kind of work, and they declare that as a business proposition it is a good investment. From the success of the past few years, one can prophesy a great increase in this kind of work in the immediate future. Some forms of the work are as follows: benefit associations; educational work; athletic teams; club houses; publications; annual outings and amusements; clubs; pensions; suggestions; savings; vacations.

Varieties of welfare work.

Various methods are in practice for encouraging and looking after the various forms of welfare work. Many large corporations have special departments in charge of managers with assistants who devote their entire time to this kind of work. In many cases, other work is assigned, as safety, fire prevention, and sanitation. Sometimes a special person is in charge of welfare work, and decides what should be done to create in workers a proper attitude towards the management and the business as a whole. As to the kind of welfare work to introduce in an enterprise, study should be made of local conditions, and of the character of the working force in general, and the forms of welfare introduced should be such as will be adaptable and satisfactory to the plant. It is a waste of money to introduce certain forms of welfare work among certain classes of workers. The importance of welfare is daily becoming more recognized, and the welfare department is assuming greater and greater importance. In small enterprises, the work is as important as it is in large, and should be placed under the charge of competent persons, and time should be given to look

How to manage welfare work.

Need of competent persons.

after it. The return in creating a better spirit of the working force towards their work repays several times what is judiciously expended in welfare work.

A welfare work that is rapidly gaining favor is the providing of assistance to workers in case of sickness or accidents, and to dependents or relatives in case of death. This work is called benefit. Benefits may be of different kinds, as, for sickness or disability, for funeral expenses, or in case of death, a small amount paid to family or near relatives. Various methods are in practice for managing the work, but the usual one is for the employees to form a mutual benefit association, and to manage it themselves. An official of the business enterprise is often the custodian of the funds, but this is not always the case. Weekly or monthly assessments are levied, and are usually graduated with salary or wages. When the fund reaches a certain amount, the assessment usually ceases until it is necessary to replenish it. Frequently, in case of extraordinary charges due to unusual sickness or accidents, increased or extra assessments are made. Joining is often optional, but should be compulsory. The management sometimes makes occasional contributions, but usually the association is self-supporting. The weekly amount paid and the length of time of payments in the case of sickness or accident are not fixed, but vary with associations, as well as the amounts paid for injuries, accidents, or death.

Benefit associations.

Kinds of benefits.

How to manage.

A new feature in benefits has been introduced recently in a few large enterprises. The management insures employees against sickness or accident in an insurance company. The premiums are usually paid by the employees, but sometimes a part is paid by the management. Benefits, whether

New feature in benefits.

from local mutual associations of employees or from insurance companies, are absolutely necessary, not only as a protection to employers, but, more so, as a protection to the employees. Mutual benefit associations have given entire satisfaction, but with the lowering of insurance rates there seems to be a good opportunity for the growth of the insurance of entire bodies of workers with regular insurance companies.

Kinds of educational work.

Educational work in practice in American enterprises is of many forms; as, apprenticeship schools, lectures, evening classes, sewing and cooking classes, the teaching of English to foreigners, and kindergarten classes for the children of employees. Apprenticeship schools occupy such an important place in efficiency that they are considered in detail in a previous chapter. The importance of lectures is becoming more recognized. The illustrated lecture is used with great effect in emphasizing and illustrating the various precautions for protection against accidents and fire. It is of the utmost importance in instructing employees how to care for the body, and how to live properly. Employers employing many girls frequently give evening classes in sewing and cooking, and sometimes these classes are provided for the wives of employees. Where many foreigners are employed, it is advantageous to open evening classes to teach the English language, and simple educational subjects. Some employers have kindergarten classes for the children of employees, but this is rather unusual. The kind of work depends in every instance upon the character of the employees. Lectures and evening classes of various kinds improve the working force, and assist in creating and fostering a better attitude toward the management.

It is a common trait in every boy and man to have an interest in athletics, and any encouragement on the part

of employers is much appreciated by employees. Wholesome recreation and outdoor exercise are incentives to health and higher efficiency. Encouragement is given in various ways from contributing to support a team, to furnishing grounds and equipment, and giving a certain time for practice. Baseball is the favorite game, but football, tennis, and cricket receive their share of attention. Finely equipped gymnasiums and indoor ball courts are sometimes found. Girls usually have their own sports, as tennis, basket ball, etc.

Promotion of athletics.

A club house is only a possibility with an enterprise employing a large number of employees. Many large corporations have built and equipped fine club houses for their employees. A small fee is usually charged for club house privileges, and the deficit, if any, is paid by the management. Wholesome recreation and sport are furnished, and their influence upon employees is toward creating a better attitude toward the management, and a better frame of mind for work.

Club house.

Many large corporations print monthly papers, usually in magazine form. The papers contain articles and news of interest to employees. Every employee receives a free copy, and it helps to arouse an interest in the business.

Monthly papers.

It is a common practice for business enterprises, large and small, to have outings and picnics, and to provide various forms of entertainments and amusements for their employees. Frequently, the great events are the annual picnic and the annual ball. Entertainments, dances, and concerts are encouraged, and the expenses are wholly or partially borne by the management. This recreation side of welfare work is important. The providing of proper and wholesome forms of amusement works to the ad-

Kinds of recreation.

vantage of employers, in promoting enthusiasm and loyalty in the working force.

The formation of clubs is an important duty of the person in charge of welfare work. The working force should be carefully studied, and the character of the work of clubs formed should depend upon the character of the workers. Orchestra, mandolin, and various musical clubs give satisfaction where a sufficient number of singers and musicians can be secured. Chess, whist, bowling, and checker clubs are favorites in the average enterprise. Many corporations have their own bands, and these furnish music on special occasions. Frequently the main work of clubs is to promote sociability among the working force. Part of the time in the case of girls' clubs is frequently given to sewing and cooking classes, and the wives of the employees are invited to join. Literary and musical evenings also receive attention. With men, smokers, game tournaments, literary meetings, and debates give satisfaction. Considerable discretion should be exercised in choosing the activities to be undertaken by a club. What would be successful and satisfactory with one class of workers would be an absolute failure with another. Success depends in a large measure upon the discretion of the welfare worker in choosing the work that will be appreciated by the workers. The club is very valuable in creating a better spirit towards the management.

Clubs.

Kinds.

Work.

To encourage thrift on the part of employees, many employers either receive savings directly, and pay a good rate of interest, or encourage the formation of savings associations, and supervise the investment of their funds. Frequently, employees are given loans at low rates of interest, and repayment on the installment plan for the purpose of build-

Savings banks.

ing or buying their own homes. The employees of many enterprises form loan associations, and money is loaned to needy fellow workmen. Encouragement to save and to own homes gives a better contented class of workers, and the provision for loans to the needy frequently protects deserving employees from loan sharks.

Many employers own summer places where their employees are sent on vacations at low rates. The rates charged are just sufficient to cover expenses, and employees are assured a good healthy outing. There are a few instances where the expenses in the case of employees are paid by the management, but such are exceptions. If employers do not own a summer place, many make arrangements with proprietors of suitable places to take their employees at reduced rates. Such an interest is always appreciated by employees, and is amply repaid by their increased loyalty to the business.

Vacations.

To encourage interest in work and business, many employers offer prizes for suggestions that are accepted and adopted. Suggestions are sought for different things, as improvements in methods, machinery, and equipment, devices for the protection of employees and for fire prevention, and innovations that might increase the interest, coöperation, and loyalty of the working force. The kinds of suggestions vary with different enterprises. The suggestion system encourages employees to take a greater interest in their work, and to use their brains to devise suggestions that will increase the efficiency of the enterprise.

Suggestions.

Kinds.

Many employers believe that they owe their employees who have devoted their lives to building up their business enterprises a duty to assist them when old age or incapacity comes. This has led to many voluntarily pensioning their faithful employees when

Pensions.

they reach a certain age. Railroads introduced the pension system before industrial enterprises, and its adoption by the latter has been comparatively recent. When employees know that their employers take sufficient interest in their welfare, to not only assist them to save for old age, but to further assist with pensions, it produces a better spirit on the part of the working force toward their employers.

Other activities in behalf of employees are found. One worthy of mention is where employers give seeds, and offer prizes for the best-kept gardens, lawns, and houses. This increases pride in bright, neat, and cheery homes.

Prizes for homes.

Efficiency demands a healthy, contented, and interested working force. It cannot be too strongly emphasized that efficiency demands more than the physical condition of employees, but also their general attitude toward the business and their employer. The good health of workers demands the best hygienic and sanitary conditions and surroundings while at work and at home, and proper habits of living. The protection of health in enterprises should not be left to employers, but should be a legislative requirement. Every state should have strict laws governing the hygienic conditions surrounding workers at work. Employers should, from the fact of increased efficiency, interest themselves in the home surroundings of workers as well as their habits of living. Efficiency makes it a strict business proposition for employers to protect the health of their workers. A contented, satisfied working force with a proper attitude towards work and employer is a valuable asset, and is essential for efficiency. The chief purpose of welfare work is to create contentment in a working force and a proper attitude toward the management. It is not

Effects of proper environments.

philanthropic, nor does it savor of paternalism, but is guided solely by business motives. The kind of welfare work in every enterprise depends wholly upon the kind of work performed, and upon the character of the working force. Discretion should be exercised in the introduction of any form of welfare work. The increased efficiency coming from a contented, loyal working force, with their hearts in the success of the business and their coöperation in every way to make it a success, is sufficient return for what is spent in giving pleasure, recreation, and happiness to workers.

Business motive.

QUESTIONS

1. To what extent is sickness a drain on industry?
2. What is the importance of a medical department in a business enterprise? Give the requirements of an emergency room.
3. What is the importance of treating slight ailments?
4. What is the relation between nutrition and efficiency?
5. Why should employers pay heed to the home surroundings of their employees?
6. Why is the midday lunch an important factor in efficiency? Outline a plan for giving cheap and wholesome lunches to employees.
7. Mention the various ways of supplying drinking water. What precautions should be taken to assure pure water?
8. Why should employers pay particular attention to lavatories and wash rooms? Give their effects on efficiency.
9. Mention various methods of teaching cleanliness. What is the importance of cleanliness?
10. What is the relation between recreation rooms and efficiency? What is necessary for a good recreation room?
11. Mention several varieties of welfare work. How is welfare work conducted?
12. What are benefit associations? Mention various kinds.
13. Mention various kinds of educational work. Give importance of each.
14. Why should precautions be taken in deciding the character of welfare work to be undertaken?

15. Why are pensions a good business proposition? Mention various pension schemes.

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CHAPTER XII

ACCIDENTS

DURING the past century, improvement in machinery progressed at a rapid rate, and is a chief cause of our industrial development. Decade after decade saw more intricate and complicated machinery introduced into our factories, and found greater numbers of men, women, and children attending thousands of machines. The number of workers annually killed, maimed, and injured has increased at a very rapid rate, until the annual death rate in the United States due to industrial accidents is greater than the number killed during any battle of the Civil War.

Machinery and the increase of accidents.

Every industry has connected with it a certain amount of risk, and in no case is risk entirely absent. Many accidents which daily occur are simply and solely the result of conditions beyond human control, and inseparable from the ordinary course of existence. Accidents may be divided into two classes: first, those arising from causes beyond human control; and secondly, those due to causes preventable by human agencies. The first class, or unavoidable accidents, cannot be diminished by man, but the second, or preventable accidents, are due to the fault of employers or employees, and with due care and precaution may be avoided. The prevention of accidents has during the past few years attracted attention, and is

Classes of accidents.

Unavoidable.

Preventable.

becoming daily more recognized as an important factor in efficiency. Many are devoting time to its study, and it is gradually forging its way to the foreground as an important duty of every business man.

The Germans lead all countries in the collection of accident statistics. According to their statistics of a few years ago, 42.05 per cent of all accidents were due to the unavoidable risks of industry, and 57.95 per cent to the negligence of employers and employees. During the past few years considerable advancement has been made in this country in the taking of statistics, and several states have passed laws compelling the accurate keeping of statistics of accidents. The statistics which we have, appall us by the number of accidents which occur annually, and by the fact that a large percentage is due to negligence in some form or other on the part of employer or employee. A well-known statistician is well within the limit when he declares that 50 per cent of all accidents in the factories of America are preventable.

German accidents.

Need of statistics.

Until reliable statistics are available, people cannot tell the great economic loss from accidents. A conservative estimate of the number of men killed annually in industrial accidents in the United States is five thousand, and the number of accidents two hundred and five thousand. Calculating the economic loss on the basis of insurance tables at $7265 for each man killed and $660 for each man injured would give an annual loss to the country of more than one hundred and seventy-one million dollars. When we hear so much of conservation and the elimination of waste, we cannot help thinking that here is a neglected field, and one where there is a great opportunity to assist industry and humanity at large by

Losses from accidents.

carefully investigating accidents, and putting into practice more efficient means for their prevention. Accident prevention is a study of recent development, and is one which should receive considerable attention in the future.

Profits the goal of business.

It is surprising how stupid the average American employer has been until recently to many of the essentials of efficiency and to important factors in lowering costs. The American employers of the nineteenth century were utterly indifferent to the suffering, mutilation, and even killing of their employees. But later, when it was brought home to them that accidents represent a great economic loss which, if prevented, would assist in increasing profits, they began to take an interest in accident prevention. It carries home the fact that the goal of business activity is profit seeking. In the struggle for profits, the business man is heartless and cruel to those around him. The only way to soften his heart to the interest of those under him is to make clear to him that consideration and care would affect his profits. It must be a pure business proposition assisting in some way to reach the goal, profit making. The new efficiency movement is proving to be a boon to industry and to humanity by making employers realize that a proper consideration of the human element is the chief means of promoting efficiency, and a great factor in increasing profits. It is not only in the interests of humanity, but of profit making, for the employer to use every means in his power to secure prevention against the manifold dangers to life and limb, which are the accompaniment of modern industrial conditions. It is only recently realized that to protect the worker against the many dangers attending every branch of industrial activity, is a necessity in attaining efficiency.

How to arouse employers' interest in accident prevention.

Accident prevention and efficiency.

All accidents cannot be prevented, because accidents in greater or lesser numbers must accompany our complex industrial system. Unavoidable accidents will occur, and cannot be avoided, but the preventable, which total in many industries to more than half of the accidents, can be avoided. It is to this field that the study of accident prevention belongs. The new study may be divided into different branches; as, — first, a careful study of the causes of accidents; secondly, the development of care on the part of employers and employees; thirdly, the use of safety devices; and fourthly, the proper design and construction of plant and appliances. Every effort should be made to find out how an accident happened, the machinery involved, the time of day, and how long the operative had been working. Each accident should be carefully studied to ascertain its cause so as to prevent repetition. When the cause of an accident is discovered, the remedy should be sought and applied so that a similar accident will not occur. In the field of accident prevention, too great emphasis cannot be placed upon the absolute necessity of a most careful investigation into the causes of accidents. In a large factory, it pays to have experts devote their entire time to studying the causes of accidents, and devising appliances and devices for prevention. In a small enterprise, this work, if not carried on by the employer himself, may be assigned to one of the foremen, and encouragement in some material way should be given, so that he will be encouraged to exercise his best ability to prevent accidents.

Divisions of the study of accident prevention.

Study of causes.

Numerous causes have, at one time or another, been given for the happening of accidents. A few of the most common are ignorance, carelessness, unsuitable

clothing, insufficient lighting, dirty work places, defects of machinery and structure, not proper fire precautions, overcrowding of machinery or materials, fatigue, poor sanitary conditions, slippery floors, walks, or stairs, failure to use safeguards provided, and intoxicants.

Causes of accidents.

Many accidents, and often those of a serious nature, are due to the ignorance of workers. Workers are permitted to work on dangerous machinery without either proper training or instructions. Education is the chief remedy, and every workman engaged in work around machinery should receive special instructions in how to avoid accidents and in a language which he understands. Special care should be taken in the selection of workmen for machines, and minors should not under any consideration be allowed to work around dangerous machinery. Strict rules should be formulated in what should be done to avoid accidents; these should be given in pamphlet form to all workers, and the foremen and bosses should insist that they be frequently read. Severe punishment should be imposed upon any one who breaks the rules. Warnings in the form of signs should be distributed about plants. Bulletins should be kept in conspicuous places, and upon them cuts from papers of how accidents occur and general information about the occurring of accidents should be posted from time to time. All workers should be encouraged to read the bulletins. Good pictures will get better results than reading notices. Lectures should be given occasionally with the use of lantern slides, and compulsory attendance should be insisted upon. If these few simple precautions are taken by an employer, the number of accidents would be greatly diminished.

Ignorance.

Remedies.

Bulletins and lectures.

Carelessness is one of the chief causes of accidents.

It cannot be completely blotted out of human nature, but if certain precautions are taken, accidents from this cause may be greatly reduced. Chief Factory Inspector J. C. Delaney of Pennsylvania dwells at some length in his annual report for 1909 upon the danger of carelessness. He says that although workers are aware of unguarded parts, yet some will do their work in a way that borders on criminal negligence. A few of the often repeated careless acts which he mentions are, placing a ladder upon a revolving shaft and mounting thereon to adjust a belt, crawling under machinery in motion, reaching across dangerous parts of machinery in motion, cleaning and oiling machinery in motion, working in baggy sleeves or with flying tresses of hair about dangerous gearing and belting, jumping on or off elevators in motion, and adjusting belts upon rapidly revolving wheels and speeding overhead cranes. He further comments that as long as negligence similar to this occurs, accidents avoidable and serious will continue to happen though the employer of labor exerts himself to the utmost to prevent them.

Carelessness.

Kinds.

These are a few of the many acts of carelessness which are seen in the average plant. The chief remedy is discipline, and its strict enforcement. Back of discipline, it cannot be too strongly emphasized that success depends largely upon the careful selection of superintendents and bosses, and infusing them with the employer's earnest desire to avoid accidents. This sincerity soon makes itself felt with the workers. Strict factory regulations should be carefully drawn up and strictly enforced. Workers should be instructed in their meaning, printed copies should be distributed, and the management should insist that they be frequently read. Every infraction of the regu-

Remedies.

lations should be severely punished. Other precautions that prove of valuable assistance are warnings placed in conspicuous places, bulletin boards with clippings of recent accidents in different parts of the country, pictures clipped from papers and magazines showing accidents, and lectures with lantern slides showing how accidents occur, and how they may be avoided. Careless operatives and violators of rules should be discharged if sufficient warnings fail to reform them. These few inexpensive precautions will prove of great assistance in cutting down expenses through the prevention of many accidents.

Clothing.

Hundreds of accidents are caused annually by clothing being caught in moving machinery. The wearing of clothing should be under the supervision of the employer, and should receive his close attention. A loose sleeve, coat, or pant leg, a flowing skirt or a flying cravat, if caught in any part of moving machinery may cause a serious injury, and sometimes death. In the case of men working around or attending machinery, a tight-fitting, closely buttoned waistcoat, with close-fitting sleeves ending at the elbow, and close-fitting pant legs make the most desirable working apparel. It is advisable for an employer to decide upon a standard suit, and insist that all working men wear it. Women should never be allowed to work around high-speed machinery. A standard dress consisting of a tight-fitting waist with close-fitting sleeves terminating at the elbow, and a close-fitting skirt should be worn by women employees in any plant where they are around machinery in motion. Women working around machines should not wear aprons, and should have long hair under close-fitting caps. These precautions are simple and inexpensive, and if universally adopted, would annually prevent

Standard dress.

thousands of accidents, and save many thousands of dollars as well as prevent much suffering and misery on the part of employees and those dependent upon them.

Poor lighting of buildings and rooms used for productive purposes is responsible for many accidents. In many plants, men are forced to go back and forth through dark passageways, through which run rapidly revolving shafts and high speed belts. A false step usually means a serious accident. An abundance of light, natural or artificial, should be furnished in every part of a plant. Dirty windows often make a place darker than need be. Statistics prove that the greatest number of accidents occur during the months of diminishing light. Even if a plant has good natural light facilities, provision should be made for the providing of sufficient artificial light on short notice. Every stairway, hallway, platform, runway, and passageway should be supplied with sufficient light, either natural or artificial, to enable persons to see distinctly where they are going, and if there are any obstacles in the way. During cloudy days, natural light is frequently not sufficient, and at once, artificial light should be turned on. In fall, winter, and early spring, oftentimes during the day, artificial light is necessary. Proper lighting is not only necessary for accident prevention, but is a prime necessity for efficient work.

Poor lighting.

Precautions to assure safety.

Cleanliness is as important in a plant as in a home. If tools, waste materials, and goods in process of manufacture are allowed to litter the floor, there is always danger of an employee tripping over them, and being injured by the fall, or being thrown against moving machinery, which invariably means a more or less serious accident. Everything in a factory should have its proper place. Every workman should

Cleanliness.

be severely disciplined if found casting tools or materials in aisles, under moving machinery or in out-of-the-way places. Order is the first law for efficient work, and where there is order, many accidents are prevented.

Machinery and structures gradually wear out, and often unexpectedly give way and cause accidents.

Breakages. Breakages are frequently caused by defects in parts of machines or structures. Extreme care should be exercised in buying machinery, tools, equipment, and construction materials to make certain

Care in buying. that only the best are obtained. Platforms, runways, and stairways should be built with extreme care, and only the best materials and workmanship allowed. As a protection against accidents, machinery should not be overfed, or machinery

Inspections. or equipment overloaded. Frequent and close inspections should be made of all parts of machinery and of equipment to discover any signs of wear, or any defects which may not be apparent at first sight. Certain parts of machines often require renewal, and inspections should be such as will show when it is needed. Too great emphasis cannot be placed upon the necessity of regular and frequent inspections by competent men of all equipment, machinery, and appliances, so that defects and unsafe conditions may be discovered promptly and remedied. The losses arising from interruptions in continuous production due to breakages amount annually to thousands of dollars. The buying of machines, equipment, and materials of the highest grade and quality, and careful inspection are essential factors in a plant in preventing accidents and in lowering costs of production.

Fires cause many accidents and injuries as well as

Fires. destruction of much property. Accidents may be greatly diminished by careful construction and equipment of plants, and by proper

protective measures by the management. Every building used for manufacturing or business purposes should be provided with a sufficient number of exits and fire escapes, to permit prompt egress from the building in case of fire. All doors should open outward, and no door should be locked, bolted, or fastened while employees are inside. Fire escapes should be secure and kept clear. Fire drills are of great service in preventing panic, and occasional drills under a competent instructor greatly lessens the risk to life in case of fire.

Precautions.

Many employers, in order to economize space, place machines too close together. The width of passages between machines is reduced to the danger point. A certain amount of space is necessary for the proper operating of machines and the handling of materials, and if this is encroached upon, the probability of accidents is increased. Space should not be economized to the point that risks to workers are increased.

Insufficient space.

Slippery floors form an element of danger, especially in conjunction with unguarded machinery. Even if a slippery floor is not near unguarded machinery, it may cause a bad fall resulting in serious injury, and this is particularly so, if workers are carrying heavy loads. Many accidents are caused by slippery treads on stairs. If treads become slippery, either renew or cover with some material that does not become slippery from wear. All floors and walks should be kept in good condition, and free from holes into which a person may step. If walks or stairs are exposed to the weather, care should be exercised to prevent them from becoming covered with ice. Hundreds of accidents occur annually from falling on slippery walks and stairs. Falls from ladders explain the

Slippery floors, stairs, and walks.

cause of many hundreds of accidents each year. Care is not taken to see if the bottom of the ladder is on a slippery floor, walk, or ground. Small pieces of rubber, lead, or sharp iron points fastened to the ends of ladders are effective devices to keep them from slipping. All floors should be as free as possible from water, oil, and grease, and if there is any danger of slipping, powdered rosin, freely used, prevents many falls and accidents.

Stairways should be provided with handrails. A handrail has often saved a person from a bad fall.

Rails. Stairways, even when inclosed by side walls, should have a handrail on at least one side, that nearest the right hand of the person going down. Platforms should always be railed and skirted at the edge to prevent materials, tools, and persons from falling off. Elevated walks and runways should always be railed. In every case, frequent inspection should be made to see that supports and railings are always in the best condition. Many serious accidents have occurred from persons leaning against railings which were not secure, and from too many persons, or a too heavy weight, being allowed upon elevated platforms and runways.

It is advisable for every employer to prohibit absolutely the drinking of any alcoholic drink during working hours,

Use of alcohol and accidents. and to discourage its use outside of the plant. No man under the influence of liquor should be allowed in a plant, much less to work, because he endangers his own life and the lives of his fellow workers. A man who is usually careful is apt to become reckless under the influence of liquor. The regular use of alcoholic drinks in any quantity soon makes a worker an undesirable person in a laboring force, and unfit for efficient work.

It has been proven that the greatest number of ac-

cidents occur between ten and eleven thirty in the morning, and the hour and a half before the half hour previous to quitting time in the afternoon. During the last half hour before noon, and before quitting time, the final spurt reduces danger. During these hours, there is the greatest fatigue, and it clearly proves the relationship between fatigue and accidents. The worker, when he becomes tired, has no longer full control of his muscles, and loses a certain amount of alertness and watchfulness. The margin of safety in modern industry is small. The swift machinery of modern factories requires attendants to push and guide materials in close proximity to merciless cutting tools. Many types of machines demand working so close to dangerous parts that the misplacement of the hand only a small fraction of an inch means mutilation. The worker is at first cautious and attentive, and avoids danger because his attention is alert, but as sensibility decreases at the onset of fatigue, his attention diminishes and he does not see danger. Reduce the alertness and the exactness with which the body responds to the demands of its labor, and by just so much you increase the liability that a hand will be displaced that fraction of an inch which means mutilation.

Fatigue.

Relation to accidents.

Long hours and over-fatigue are two important factors of inefficiency and leading causes of accidents. When a worker's health and strength are undermined by overwork, he becomes incapable of alertness, attention, and watchfulness, and gradually becomes defenseless against accidents. Low vitality, poor health, and nervousness make an employee unfit for efficient work, and if allowed to attend or work around moving machinery, the chances of accident are increased at a rapid rate. Efficiency

Long hours.

Effects.

forbids long hours, and the undermining of the nervous system and health through overwork, and if its demands are followed, there will be a great decrease in the number of accidents.

It is fatiguing to keep attention on one thing for any length of time, and how much more so must it be, to closely watch rapidly moving machinery. Intense continuous work increases inaccuracy, diminishes alertness and watchfulness, and at the same time increases the chance of deviation of a fraction of an inch in the movement of a hand which results in accident. Employers should realize that workers should be protected from accidents and from working to a point where health is impaired. Extreme care should be exercised in employing as attendants for rapidly moving machinery only those in the best possible health, and with sound nervous systems. The time of work should be decided by a study of its intensity. A worker should under no consideration be allowed to attend rapidly moving machinery with a tired mind or body. Frequent intervals of rest are absolutely necessary. The frequency and the time depend upon the character of work. By precautions in the employing of suitable employees, and by providing proper intervals of rest, accidents will not only be prevented, but efficiency will be greatly increased.

Effect of intense work.

Intervals of rest.

Gases, vapors, dust, and smoke increase chances of accidents. Intense heat and high humidity decrease alertness and watchfulness necessary for the avoidance of accidents. Proper sanitary surroundings are of greater importance to good health than to accident prevention, but the two are closely related, because whatever lowers the vitality of workers decreases their power to avoid accidents. All

Gas, vapor, dust, and smoke.

unsanitary surroundings increase the probability of accident as well as imperil the health of workers.

"Familiarity breeds contempt" is an old saying, and no greater proof of its truth may be found than in the carelessness of men who are daily in close proximity to dangerous moving machinery. A man when first working around dangerous parts of machinery takes pains to avoid the possibility of accident, but after a time becomes so used to his surroundings that he unconsciously takes a great many chances which he would at first have taken pains to avoid. It is well known that men grow careless of dangers. In the bustle of work, men forget even ordinary precautions. An electric circuit marked "Dangerous, 2000 volts" will be shunned for a week, but at the end of that time will be treated as contemptuously as an ordinary door battery. The condition of mind which does not heed danger may be overcome in a large measure by rules, cautions, signs, and by simple protective arrangements which serve to call attention to the existence of danger. Careful instruction and supervision in the formation of habits of carefulness in heeding danger is the chief remedy. Rules and severe discipline when they are broken are necessary, and further assistance may be given by placards, signs, bulletins, and lectures. If these precautions are followed, men will become accustomed to taking pains to avoid dangerous parts, and the constant reminders will prevent them falling into forgetfulness, and taking foolhardy risks.

Men grow careless of danger.

How to prevent.

The greatest thing which an employer may do to make his workers as safe as possible, is to provide adequate safeguards for dangerous parts of machinery and equipment. All machinery is more or less dangerous. A certain number

Necessity of safeguards.

of accidents are unavoidable, but extra precautions should be taken to lessen the avoidable. It is a certainty that a large number of accidents would not occur if machinery and surroundings were made safe.

Employers differ in their opinions as to what is dangerous and what is safe. Whether employers scout at the idea of safety through safeguards or not, they should be made by law to safeguard all dangerous parts of machinery and plant equipment. The progressive employer provides safeguards because he realizes that it is good business. They are a guarantee of continuous production, and one of the factors working towards higher efficiency. The antiquated employer laughs at the idea of protecting a planer and declares, "It has been exposed like that for years and I have not had an accident." Such an argument is nonsensical. If such an employer will not safeguard his machinery, the state should legally force protection.

The old view of safeguards.

Employers should be required under severe penalty to equip machinery and working places with every practical safety device that it is possible to secure. Successful business teaches us that it is cheaper to cover a gear than to pay for a finger. If complete guards were provided, so that every accident due to being caught in moving machinery was avoided, it would not only prevent much suffering, but would add annually millions of dollars to the profits of manufacturers. The proof of the adequacy of a safeguard is its power to prevent accidents. Safeguards are usually simple devices and inexpensive. A question arises as to what is to be safeguarded. Mr. Calder gives a very satisfactory list, which is as follows: all engaging toothed or other gears, rolls, drums, and slides of every description on any ma-

What to safeguard.

Mr. Calder's list.

chine; the spaces between fixed and moving parts of any machine, or between the latter and the structures near it, leaving insufficient working clearance, in no case less than eighteen inches for any person employed thereon or near it; pulleys and clutches; belts, bands, and driving chains; flywheels and starting balance wheels; shafting and spindles, and all couplings or projections thereon, or upon reciprocating or other moving parts of machines; counterweights and balance weights and their suspensions; the actual element in every machine which comes in contact with work, and cuts, shears, or otherwise operates upon the latter, for instance, the circular saw blade in the sawmill, the punch and die in the press, the revolving cutter in the milling machine, etc. Insistence should be that these elements be always guarded where found, unless they are of such form and in such a position as to be as safe to all as if guarded. This gives a good working category of machinery risk. To this list should be added elevators, common utilities, and structures in power generation and transmission.

Safeguards should be durable and easily distinguishable from parts of a machine or equipment. A device which is widely used in Europe, and should be adopted in this country, is to paint guards, safety devices, and, wherever possible, the moving parts of machinery bright red. This is an effective way of drawing attention to dangerous parts.

Drawing attention to safeguards.

The proper guarding of all dangerous parts is the designer's duty. Purchasers should insist in buying machinery that all dangerous parts are protected. The proper time for providing safeguards is while a machine is in the building, because here it may be done with the least effort and the least cost. The devising of a guard that will least interfere with the function of a machine may

Proper time for providing safeguards.

be done better by the designer than by any one else. If dangerous parts are not safeguarded in the making, then it falls upon the user to protect his workers by various devices. There are many patented safeguards in the market, but frequently the user is called upon to furnish home-made guards. A home-made wire screen is as effective a safeguard to a wheel as an expensive one. It is not necessary to have a safeguard a finished piece of work, because as long as it protects that is all that is asked. If buyers would refuse to buy machines unless the dangerous parts were protected, it would not be long before only machinery with all dangerous parts properly safeguarded would be found on the market.

Workers and safeguards.

Many workmen object to safeguards, claiming that they are a nuisance and interfere with work. Every safeguard should be so designed that it does not interfere with the function of the machine. If it does, a little study will devise a slight change so that work will not be interfered with. Frequently, workmen objecting to a guard will not hesitate to remove it. Men who have worked for years without guards frequently develop a spirit of bravo, look upon them as signs of weakness, and scorn them as a reflection upon their cleverness to avoid accident. When safeguards are introduced, workers should be induced to use them. They should be made to see that their purpose is for their protection, and that their coöperation should be with the management to make their use efficient in preventing accidents. Inspectors should see that no guards are removed, and if a workman is found removing one, the punishment should be severe.

Precautions.

The furnishing of safeguards will not assure prevention of accidents unless employees coöperate fully and willingly in the effort to protect them. Workers should feel that all precautions

taken for safety are for their benefit. Many safeguards must be removed for cleaning, oiling, or adjusting machines, and workers should replace them as soon as the work is finished. If a safeguard is provided and left off, there might just as well be no safeguard. Rules should be obeyed, and every case of infringement should receive prompt and severe discipline. Employees should be instructed to report any dangerous places or signs of weakness in any part of the equipment or machinery. A reward for the prompt reporting of danger will often bring attention to weakness in time to be remedied before accident. Every employee should be taught to be cautious, and be encouraged to warn fellow workers of dangerous places.

Dangers in oiling.

The oiling of machinery and shafting while in motion should not be done, unless it is absolutely necessary. Employers should equip all parts of running machinery with automatic oil cups, and these should be filled while machines are at rest. If there are no automatic oil cups, and it is necessary to oil machinery and shafting in motion, certain precautions should be taken. Oiling should be done by experienced men who wear tight-fitting clothes, and use long-necked oil cans so as to keep their hands out of danger. With shafts and machinery a few feet above the floor, special platforms should be built for oiling purposes. Sometimes ladders are used in oiling shafting; if so, special care should be taken that they have special hooks at upper ends to fit over the shafts, and sharp points at the lower to prevent slipping. The safest way to oil machinery and shafts is by automatic oil cups, and these should be introduced, if not already in use.

Precautions.

Cleaning machinery while in motion is the cause of thousands of accidents. The chief cause of danger is

in the soft materials used in cleaning. These catch easily in gears or in running parts of machinery, and draw in fingers, hands, and sometimes arms, and injury follows. Nearly all such accidents are preventable, because, with few exceptions, machines may be cleaned when not running as well as when in motion. If cleaning is absolutely necessary with moving machinery, it should be done only by cautious and experienced men. Under no circumstances should minors be allowed to clean or oil machinery in motion. With precautions in cleaning and in oiling machinery and shafts, nearly 25 per cent of industrial accidents may be prevented.

Dangers in cleaning machinery.

A man with poor eyesight is of little service in the industrial field. Hundreds of workers yearly lose or impair their efficiency by accidents impairing their eyesight. In many factories, little is done to protect this most important member of the human body. Workers operating machines where particles of metal or hard substances are being cast off or likely to be cast off, and workers in rooms where small particles of hard substances are flying about, should have their eyes protected by spectacles or goggles. Screens and hoods should be further safeguards on grinding machines and cutting machines where particles of hard substances are given off. Care should be taken in the choice of goggles. The lenses should be strong enough to stand a hard blow, as many serious accidents occur by the breaking of light, thin lenses. The goggles should be cleaned daily, because this avoids many cases of infection. The cleaning may be done by either dipping in boiling water, or immersing in an antiseptic solution. A promiscuous use of goggles should never be allowed in any plant, as many diseases, as trachoma, iritis, etc., are transmitted by such practices.

Protection of the eyes.

Precautions with goggles.

Every year many men lose their eyesight by permitting other workmen to remove foreign bodies from their eyes. A worker on getting something into his eye tries to remove it by rubbing, or by the use of a dirty handkerchief or rag which happens to be near; if he fails, he calls to a near-by worker to remove it. Infection is often transmitted through the use of dirty handkerchiefs, dirty rags, or fingers when used to push back the eyelids, and frequently means loss of sight. In every plant, there should be proper facilities for removing foreign matter from the eyes, and some one trained in so doing. Every case should at once receive proper treatment and then there is little danger of infection.

Eye infections.

How to prevent.

In the United States, the people at large need the creation and the development of an accident preventive spirit. In Europe, and in Germany in particular, accident prevention is kept constantly before the public, the legislatures, the employers, and the workers. It is taught in the schools, and colleges devote some time to it. Trade and technical schools make courses on accident prevention compulsory parts of their curricula. Insurance rates are based upon the state of accident prevention found in the individual plants. The political and industrial leaders unite their strength in discovering various ways of extending, and of making more effective, accident prevention.

Accident preventive spirit.

In this country, we should in the future devote more time to educating the people in the science of accident prevention. There should be compulsory courses in the prevention of accidents, and in first aid to the injured, in every high, trade, and technical school. Frequent use should be made of the lantern and slides, because in this work the lantern may be used effectively. Advanced courses in accident pre-

How to be attained in America.

vention should be compulsory in every engineering school. Periodicals and newspapers should do their share by contributing numerous articles on accident prevention. More attention should be given to educating the employee within a factory. Care should be taken to form with every employee habits of carefulness, and of acting unconsciously in looking out for self first, and the other fellow always. Every new employee should be given careful instructions as to the dangerous parts of machines and of every part of the plant where his work takes him. He should not be allowed to take his place in the plant until he is thoroughly familiar with his work, and able to protect himself against accidents. In the case of foreigners, they should be instructed in their own language in the proper and safe ways to do work. The aim should be to inculcate habits of caution. Warnings and signs should be put in conspicuous places near dangerous machines and places. Strict rules should be drawn up governing the actions of employees in a plant, these should be closely followed, and infringement should be severely punished. The rules should be printed in a small booklet and each employee furnished with a copy. With foreign employees, the booklet should be printed in their language. Bulletin boards should be placed in conspicuous places, and clippings of accidents should be regularly posted. Pictures or photographs of accidents posted on bulletin boards are always seen, and make an impression. Lectures with lantern slides should be given at regular intervals, and compulsory attendance should be insisted upon. If these precautions are followed, they will soon develop habits of caution and a preventive spirit with the people at large.

An important factor in teaching accident prevention in Europe is the accident prevention museum, or permanent exhibition containing working exhibits of safety

devices for machinery and equipment in all kinds of industries. Amsterdam, Paris, Vienna, Budapest, Munich, Berlin, and other places have their accident prevention museums. Most of these are kept up to date, and have the most improved safety devices on exhibition and explained thoroughly at regular hours each day by competent instructors. This is a field for great development in accident prevention in America. Each large industrial city should have its accident prevention museum of working exhibits, always up to date, and free of admission to the public. Illustrated lectures should be given from time to time, and efforts should be made to get the working people to attend. The coöperation of employees is absolutely necessary. The expense of the museum should be borne by the people at large, and form part of the expenditures of the town or city. The small cost to each person would be a thousand times compensated by its influence in preventing accidents.

Accident prevention museum.

How conducted.

The frequency of occurrence of accidents in any enterprise depends largely upon the character of supervision, and the management. The executive head should be earnest and sincere in his efforts to prevent accidents. Great care should be exercised in choosing superintendents and bosses, and among other things to infuse into them the earnest desire of the management to avoid accidents. The safety of employees depends in a large measure upon the sincerity and the earnestness of those performing managerial duties. Every factory regulation should be carefully followed, and every precaution to avoid accident should be taken by every superintendent and boss. This conduct on their part will be reflected in the conduct of the workmen. The caution exercised by those in authority will unconsciously be imitated by the workers, and

Management, bosses, and accidents.

will be a strong factor in instilling habits of caution and carefulness.

Sickness, accident, and death are three grave realities that the average business man is ill prepared to meet.

Emergency room.

The presence of any one means increased costs and the temporary lowering of industrial efficiency. It pays not only to take precautions to prevent the occurrence of accidents, but to provide facilities for prompt and proper treatment if they should occur. One of the best-paying rooms in a business plant is the emergency room for furnishing first aid to the injured. It pays in a plant employing several hundred hands to have a thoroughly equipped emergency room and to have in attendance a trained nurse. If the factory is small, a room thoroughly equipped to provide first aid to the injured should be provided, and a number of men trained to give first aid. There should be at least two men in each department who have received training in giving first aid, so that whenever an accident occurs, aid will be near at hand.

Importance.

A great amount of knowledge is not necessary to become expert in giving first aid. A competent medical doctor should be engaged to instruct a selected corps to give proper assistance in case of accident. A few lectures on the human body, and how to treat hemorrhage, bleeding, fracture, and insensibility, what to do for sprains, burns, and scalds, and how to remove the sick and the injured, provide the necessary training and knowledge to qualify to give first aid. The names of the men chosen in each department and trained should be placed in prominent places in the department. Illustrated lectures on giving first aid should be given occasionally, and all workers should be compelled to attend. With slight cuts and bruises, the treatment given by the trained men will be the only treatment

Giving first aid to the injured.

necessary, but in the case of a serious accident, the first thing to do is to send for a doctor, and in giving first aid, nothing should be done that should be done only by a doctor.

An emergency room is an absolute essential in every plant. If one is not installed, no time should be lost in doing so. The expense of installation will soon be defrayed by the advantages which it gives. The room should be fitted out with the latest appliances and conveniences for giving assistance in case of accidents. A bed, a movable stretcher, cushions, glass cabinets completely equipped with medicines, instruments, cones for etherizing purposes, bandages, plasters, needles for sewing up wounds, cocaine, absorbent cotton, and everything to apply when aid is necessary, until the physician arrives. The room should also be furnished with heat, electric or gas light, and running water. When the doctor arrives, no time is lost in preparing the patient for removal to his home or hospital, and the doctor is not delayed in looking for apparatus which might be needed in caring for the injured.

Equipment of emergency room.

Cases of sterilized bandages should be placed in convenient places in various parts of a plant, but whenever possible, the injured person should be treated only in the emergency room. Certain cases may arise when bandages will be necessary at once and before removal. In every case, extreme care should be taken to prevent infection, and every injured person, it matters not how slight the injury, should be treated whenever possible, in the emergency room. Even a slight cut or scratch should not be neglected, and the person should go at once and receive proper treatment. It is not unusual to find some of the best mechanics absent for several days as a result of infection caused by slight cuts or bruises. A properly equipped

First aid jars in plant.

emergency room with an efficient man in giving first aid prevents such absences, and the loss of work which might result from men being laid off repays several times the cost of installation.

Good medical attendance hastens healing and saves many a worker from losing time. Proper attention to bad wounds frequently saves hands, fingers, and feet. An injured person should be required to avail himself of the facilities provided for treatment of injuries. Slight injuries and bruises which in the past were neglected, are in the progressive plant given careful attention. Business men are more and more realizing that money expended in providing treatment for the injured is not only the best kind of investment, but essential in an efficient plant. Immediate attention to all injuries saves much suffering, many limbs and lives, and much money.

Gains from medical attendance.

Men engaged in hazardous occupations should undergo careful medical examination at least once a month. If this is strictly followed, it prevents many accidents. Workers with weak nervous systems, run-down health, or over-fatigued lose a certain amount of control over their muscular action, and are more subject to accidents. If any of the foregoing causes are found, workers so impaired in health, and engaged in hazardous work, should not be allowed to continue their present work. A rest of a few days with a prescription usually restores the health, steadiness, and the former efficiency of the worker.

Health of workers in hazardous occupations.

No person under legal age should be employed in a plant. Where age limitation is not provided by statute, no person under sixteen years of age should be allowed to operate any power machinery, and where close attention is required and hazard comes into the operation, eighteen years should be the

Employment of children.

minimum age. The employing of children and youths to do work which they are not physically or mentally able to do should be avoided, because their youth and inexperience endanger themselves and make them dangerous to other workers. The old saying that an old head cannot be found on young shoulders applies to the fullest extent in the operating and the attending of machinery. Accuracy, precision, alertness, caution, and discretion, prerequisites of safety, are the acquirement of maturity, and cannot be relied upon to any great degree in childhood or youth.

Duty of state to protect workers.

It is inconceivable that our complex industrial organization can be conducted without some accidents and some fatalities. Many of our accidents are solely the result of conditions beyond human control, and inseparable from the ordinary course of existence, but thousands upon thousands of easily preventable accidents occur each year, and it is from these that workers should be protected. It is self-evident that in the field of industrial activity, the individual cannot protect himself, and it is the duty of the state to step in and protect him. Every one knows that the average plant is more safe than it was a decade ago. Many plants with their safely protected dangerous places, and precautions taken to protect workers from harm, are equal to the safest protected plants of Germany. But there are thousands of employers who are still indifferent to safety devices, and that is one of the reasons why we should have strict and severe laws. Statutes should be prepared under expert advice and should make employers and makers of machinery responsible for the guarding of dangerous parts and appliances which they use or manufacture.

The law should provide an efficient factory inspection department which should be a division of the labor de-

partment. The number of inspectors should be sufficient to allow thorough inspection of plants, and the pay large enough to get competent men to perform the work. The inspectors should be appointed on merit and be under civil service. The law should insist that all existing factories and every new factory be registered with the factory inspection department, and that employers report to the department every accident, the machine or appliance involved, cause, hour of the day, number of hours the person had been working, age, sex, length of time engaged in the particular work, and the precautions taken by the employer to protect from accident.

Factory inspection.

How conducted.

There are two systems of dealing with employers' liability for injuries from accidents. The first, which formerly prevailed in all industrial countries, but which now only survives in certain states of the United States, is the law of tort, or the master and servant principle of the law of negligence. This harsh common law rule is that no damages are payable when an accident is caused by the fault of the injured workman, or of a fellow servant, or by the unavoidable risks of the employment. It is very unjust to employees, and a travesty upon justice in this enlightened age of ours. All industrial countries except some of our states have recognized the injustice of this law, and have passed statute laws abolishing the old master and servant principle when dealing with industrial and other accidents. The principle originated in primitive times of industry, and is impractical and unjust in any advanced industrial system. It is antiquated and savors of the days of primitive industry.

Systems of employers' liability.

The second system is that of compensation, which includes both ordinary compensation and its complex form,

compulsory insurance. In its simplest form, it is a liability to pay compensation for injuries from accidents to employees, with an added legal obligation to insure its payment. This is the only just way of dealing with compensation for accidents, and it is surprising that America, one of the most enlightened countries of the world, should be so backward in passing legislative acts enforcing this method of payment. Enforced payment for injuries and death due to accident will more than anything else induce the employer to adopt better safety devices. It is essential that the responsibility of the employer be fixed, and that compensation be certain without expensive litigation. Every accident incurring suffering should be fairly and promptly compensated for, without having to wait for delays and uncertainties of the courts. The certainty of responsibility fixed with the employer, and the certainty of compensation fixed with the employee, will make the employer more anxious and cautious to provide safety devices to protect his employees. The compensation provided should cover all injuries irrespective of employer's or employee's negligence except where injury is self-inflicted. The compensation should be fair and just to both employer and employee, and the machinery of awarding should be simple so as to avoid unnecessary delays and expense.

Compensation in accidents.

Workers appreciate measures taken to protect them, and respond by taking a better interest in their work. The fact that they no longer have fear of getting hurt and getting no compensation is a factor working towards greater efficiency. Actual tests have shown a marked increase in output on safeguarded machines due to natural speeding of workers who are relieved of the fear of accident. It stands to reason that if a worker is compelled to divide

Effects of safety devices on workers.

his attention between the fear of coming in contact with dangerous moving machinery and his work, that if he is relieved of the first, he will prove more efficient by giving his entire attention to the latter. Accidents are costly to the employer in the amount of money paid to the injured employee, and in loss of time and output. Employers should be made to realize the importance of accident prevention from the side of waste and increased cost and as soon as this is made clear to them, the great battle for accident prevention will be won.

Necessary measures for accident prevention.

The important measures necessary to minimize accident risks may be summarized as follows: First, the providing of machinery and equipment with safeguards, and the making it almost impossible for a worker to be caught or injured by a piece of machinery or apparatus. Secondly, the careful instruction of workers to inculcate habits of caution and to know how to avoid dangerous places about a plant. Thirdly, the providing of effective rules, signs, bulletins, and illustrated lectures, which constantly remind workers of dangerous places, and the enforcing of strict discipline in carrying out all rules and instructions. Fourthly, the provision of means for promptly caring for any who may be injured, through establishing emergency rooms and first aid to the injured service. Fifthly, the passing of legal statutes compelling every employer under severe penalty to equip machinery and working places with every practical safety device it is possible to secure. Sixthly, the provision of adequate accident compensation to the injured in case of accident. You cannot find a single employer who has installed accident prevention devices, established an emergency room and first aid to the injured service, and made provision for the careful instruction of employees, who will say that money so expended is not well expended, and that it does not pay.

QUESTIONS

1. What are the different classes of accidents?
2. What is the relation between accident prevention and efficiency?
3. Mention various causes of accidents.
4. What remedies would you suggest to overcome ignorance and carelessness?
5. What precautions should be taken to prevent accidents in case of fire?
6. What is the relation between the use of alcoholic drinks and accidents?
7. What is the relation between fatigue and accidents?
8. What parts of machinery should be safeguarded? What precautions should be taken to prevent safeguards being removed?
9. What is the proper time for providing safeguards? What statute law is necessary to have them provided at that time?
10. What precautions should be taken in oiling and cleaning moving machinery?
11. What are the different methods of protecting the eyes from accidents?
12. What is the importance of an emergency room and first aid to the injured jars?
13. What precautions should be taken in the employment of children?
14. What are the requirements of efficient factory inspection?
15. What is a safety museum? How should it be conducted?

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CHAPTER XIII

Fire Prevention

The elimination of wastes of energy, time, and materials has attracted considerable attention, and some progress has been made in its accomplishment, but the question of preventing waste through fire prevention has received little attention. Fire prevention should be an important factor in every business, and it often has an important bearing upon costs and efficiency.

Preventing waste through fire prevention.

During the years between 1881 and 1912, the total value of property destroyed in the United States by fire amounted to $5,364,578,199. The fire losses have increased steadily year after year in greater proportion than the growth of the population. The property loss from fire in 1875 was approximately $78,000,000; in 1885, $102,000,000; in 1895, $142,000,000; in 1905, $165,000,000; in 1911, $217,000,000; in 1912, $225,000,000; and for the first nine months of 1913, $1,026,900 greater than for the first nine months in 1912. Between 1900 and 1910, the population of this country increased by 73 per cent, while the fire loss increased by 134 per cent.

Losses from fire.

The per capita loss from fire in the United States greatly exceeds that of any foreign country. During the year 1911, the per capita loss in this country was $2.62; in Italy, $.31; in Germany, $.21; in France, $.81; and in England, $.53. During the same year New York City had 324 fires for

Europe and United States compared.

every hundred thousand people; London, 67; and Paris, 152. London in 1911 had 4455 fires, but its losses were only one fifth of those in New York, while those of Paris were one ninth. According to ex-Chief Croker of the New York Fire Department, Cincinnati, Ohio, has lost from fire $2092 worth of property every day for fifty-eight years, or a total loss of $44,685,977. During 1911, five cities in this country had fire losses greater than $15 per capita, and nine greater than $10. In addition to this great loss of property, 1500 persons on the average lose their lives annually in fires, and nearly 6000 more are injured more or less seriously.

Reasons for excessive fire losses.

The great difference between the fire loss in Europe and in this country is the more striking in that their fire-fighting equipment is inferior to ours. Chicago has a far more efficient fire-fighting equipment and force than Paris, France, yet the fire loss in Chicago in 1907 was $1.34 per capita, and in Paris it was only $.47. We excel the world in fire fighting, yet our losses per capita are several times greater than any country in Europe. The only reason for this is that we are backward and lax in our methods of fire prevention. Fire prevention is simply making life and property safe against destruction by fire. Ex-Chief Croker declares that at least 50 per cent of our great loss in property and human life is preventable and is directly due to inexcusable carelessness. Much has been learned about fire prevention, but the knowledge is not used by the average person. Little is done in the case of fires to ascertain the cause, so that the knowledge obtained may be of use in preventing future fires. Prevention is better than cure in fire fighting. Employers should be made to realize that it pays to take fire hazard into consideration, and to adopt every means known to modern science to guard against fires.

The losses due to destruction of property do not include those to employees from being thrown out of employment, nor those arising from stoppage of business activities. Many employers seem to think that the only thing to do to protect themselves against loss from fire, is to keep insured. Insurance may cover material loss in buildings, machinery, and stock, but there is in the case of fire a loss to a going concern more or less serious which insurance does not cover. The most disastrous losses from fire are frequently those coming from stoppage of production, disorganization of business, and delay in filling orders. Insurance can never cover a loss of business. Fire loses the trade of customers, who must be steadily supplied with goods or they will go elsewhere, and frequently do not come back when the business has recovered from a temporary cessation as a result of fire. It is good business to pay particular attention to provide in every way for fire prevention rather than depend upon remuneration by insurance for loss.

Insurance does not cover total loss.

People proclaim this an age of conservation. Much has been said and written about the great wastes of material resources, and what should be done to protect and conserve the gifts of nature. It is surprising that so little has been done to prevent destruction and waste of material wealth by fire. The waste is enormous, and when we realize that a large part is preventable and due to carelessness, our negligence appears to be almost criminal. This fact alone would make fire prevention an important factor in efficiency.

Many fires are preventable.

Losses frequently go beyond the individual plant suffering from fire loss, because often one or more plants depend upon goods produced by the plant to maintain production, or, on the other hand, one or more may largely depend upon goods

Losses beyond plant of fire.

consumed by the plant to keep them running at full capacity. Whatever prevents plants running to full capacity affects efficiency, and, at the same time, costs of production. Any fire of any consequence in a producing enterprise has a direct bearing upon production, and productive activities are always to a greater or lesser degree impeded. Fire prevention is therefore an important factor working towards efficiency, and has an important bearing upon maintaining a high efficiency. No treatise upon efficiency is complete without a more or less careful study of fire prevention.

Divisions of fire prevention.

The problem of fire prevention may be divided into three parts, — preventing the origin of fires, putting out fires after they occur, and preventing the spread of fires. The first is the most important to the American people. The subject of fire protection and prevention does not alone concern the producer, but it is of the greatest concern to every man, woman, and child, because fire makes no discrimination, and its devastations are felt by every one whose interests in one form or another come within its destructive path. The second and third, although important and essential, are vastly less so than the first. Prevention is better than cure in fire fighting, but very few men act on this principle.

Chemistry of fire.

To understand the precautions for fire prevention, it is necessary to know something about the phenomenon, fire. Fire results from the mixing of a gas called oxygen with things. Oxygen is colorless and odorless, and with another gas called nitrogen forms air, which is composed of one fifth of the former and four fifths of the latter. Scientists tell us that oxygen makes up more than one half of the earth, and that every living creature must have oxygen to live. Combustion is the process whereby substances or individ-

ual constituents combine with oxygen and become oxidized with the liberation of heat. Decomposition is slow combustion. Oxygen uniting with carbon produces heat, and if the union is rapid and in large enough quantities, the combustion becomes visible in flame and is called fire. If the union is slow as in the decay of organic bodies, the heat escapes unnoticed. An article must be raised to a certain temperature before it can burn. The presence of certain substances increases the rapidity of oxidation and the amount of heat given off, and as soon as the degree of heat needed for flame is reached, fire results.

Combustion.

Spontaneous combustion, or a substance taking fire of its own accord, is very mysterious to the average man. During every year, this is the cause of many fires. The phenomenon is possible without the assistance of any external heat, and this is the mystifying part of its occurrence. Spontaneous combustion, chemists claim, is the result of various processes, but the most frequent one is the chemical process whereby substances combine with the oxygen of the air. Take for example a piece of cotton. It is porous and is filled with a great quantity of oxygen. A slight spark will cause instant bursting into flame. Add to the cotton saturated with oxygen, animal oils also loaded with oxygen, oxidation takes place at a more rapid rate, and as a result more heat is produced. The heat becomes more and more intense until the point of ignition is reached and flame bursts forth. Saturate a piece of cotton with animal oils, and if conditions are favorable, it will burst forth into flame in a comparatively short time.

Spontaneous combustion.

Fibrous, porous, and finely divided materials favor spontaneous ignition because they are always saturated with oxygen. When these are brought in contact with

oils or fats saturated with carbons and oxygen, the tendency to spontaneous combustion is greatly increased. The oxygen-saturated oils and fats scattered over a large surface increase the rapidity of oxidation and the production of heat. The heat becomes more and more intense until the point of ignition is reached, and then flame bursts forth. This is a most favorable condition for spontaneous combustion, and explains many mysterious fires in the cotton mills of New England. Thus is seen the danger in allowing oil-soaked materials to collect in out-of-the-way places, or in any place in a building.

Favorable conditions.

Although water is a fire destroyer, yet under certain conditions a small amount of it may assist in producing spontaneous ignition. Dampness in many substances increases the rapidity of oxidation and heat production. Damp hay or grain stored in a barn favors oxidation, and frequently the heat produced is sufficient to raise the temperature to the point of ignition. Piles of wet excelsior, rags, straw, etc., produce favorable conditions for spontaneous combustion. Many a fire in home and in plant is caused in this way, and is due to carelessness in allowing wet rags to collect in closets, cupboards, cellars, etc. Spontaneous combustion may occur in any inflammable material which is subject to oxidation, and moderate moisture and warmth encourage it.

Danger of dampness in materials.

The principal causes of fire are, according to experts, rubbish heaps, lighted matches, cigars, cigarettes, and exposed gas jets. Rubbish and wastes of all kinds are great fire hazards in every factory, store, or home. Cleanliness is therefore a first requisite in fire prevention, and there is nothing that is so dangerous as an accumulation of rubbish of any sort. Many are the places about a store, factory, or house that

Causes of fire.

collect rubbish. The best way to keep rubbish from becoming a fire danger is to have no rubbish, and to keep places where rubbish accumulates entirely clean. Cuttings, wastes, and rubbish should be deposited in fireproof cans, and removed at the end of each working day. The disastrous Triangle Waist Company fire, causing many deaths, was caused by a lighted cigarette being thrown into a pile of cuttings. A few dollars provide fireproof cans for all kinds of rubbish. The compulsory placing of all rubbish in such cans and their emptying at the end of each working day greatly decreases fire hazard. In a factory or store where more or less cuttings and rubbish find their way to the floor, and are likely to be cast into out-of-the-way places, the employment of a boy to keep the floors clean decreases the fire hazard.

Cleanliness.

Care of rubbish.

Extreme care should be taken in looking after discarded oily wastes of all kinds. Employees should be carefully instructed in the great hazards of their presence in a factory or store. Oily wastes, greasy rags, wiping rags left by painters, greasy lunch papers, should never be thrown aside, but extreme care should be taken to see that all are placed in fireproof cans with self-closing covers. All oxidize very rapidly, and spontaneous combustion is likely to follow. Many fires start from throwing greasy wastes or rags into cuttings or shavings. Frequently oily or grease-soaked clothes are allowed to hang on wooden partitions instead of in fireproof, well-ventilated lockers. All lockers, and especially where they are to contain oil-soaked, greasy clothing, should be fireproof, and such clothing should never be allowed to be left except in the proper places. Such clothing is favorable to spontaneous combustion, and the condition becomes more favorable if the room were to become very

Danger in oily wastes.

Care of clothing.

humid. Many an unknown fire, if the real cause could be known, could be traced to the presence of oily or greasy wastes, rags, or clothing being carelessly cast aside about factory or store, and spontaneous combustion following.

Extreme care should be exercised in the handling and the using of all liquids or materials which are highly inflammable. If it is necessary to keep any quantity on hand, it should be allowed only in fireproof supply rooms, and only enough should be taken out to last for safe periods of time. If artificial light is necessary, electricity should be used, and under no condition should exposed flame be allowed. If the workers handle quantities of inflammable materials, fireproof tables should be used and no cuttings or rubbish of any kind should be allowed to collect.

Inflammable liquids and materials.

Many people make a mistake in using sawdust in pans to catch oil drippings, or in spittoons. Either practice is very dangerous in any place. Sawdust soaked with oil may at any moment spring into flame, and sawdust dampened with water is also very favorable to spontaneous combustion. Sand should be used instead of sawdust, and then no danger lurks in pan or spittoon. Gasoline, naphtha, or other volatile oils should never be stored in buildings. They give off highly inflammable vapors, which, if mixed with air in the right proportion, form explosive gases that very readily ignite. A person cannot be too cautious in the using, handling, or storing of any highly inflammable substance. There is a twofold danger. One is the danger of fire, and the other, the sudden bursting into flame under favorable conditions, frequently causing explosions, accidents, and sometimes the death of people in the near vicinity.

Filling for spittoons and oil pans.

Matches carelessly thrown about are the cause of a great many fires. No match should be manufactured that will strike upon any place except the box. Matches thrown carelessly about are often carried by rats or mice to their nests. These rodents like to nibble at the tips, and this nibbling frequently causes ignition and fire. Ex-Chief Croker declares that more destructive fires are chargeable to the parlor match than to any other cause. Mr. McKeon, the well-known fire expert, states that there is only one safe rule for matches, and that is, use only safety matches, the kind that have to be struck on the box to be lighted. A match falls from the clothes of a worker to the floor, and is lost amidst cuttings and wastes. A person by chance steps upon the tip, and if it is not a safety match, it ignites and a disastrous fire may result. Many a serious fire has its beginning under similar circumstances. In the modern business house or factory, it should not be necessary to use matches, but if matches are needed to light the gas, they should be placed in a fireproof box near where needed, and not be carried by workers. Pipes or matches should not be carried by workers while in a factory or store. Workers should have a place at the entrance of place of work to leave their pipes and matches. This should be enforced by rigid discipline, and if matches are found on a worker in the place of work, severe punishment should follow.

Matches.

Precautions in handling.

One of the most frequent causes of fire is smoking. Smoking should be prohibited in every factory or store. In the majority of factories and stores, in spite of posted prohibitions and verbal instructions not to smoke, smoking goes on all the time by superintendents and employees. The members of the Factory Investigating Commission of the State of New York in

Smoking.

their report state that considerable smoking was found in nearly all of the buildings visited, and frequently the proprietor or superintendent would be smoking while showing the establishment to the inspectors of the Commission, and that smoking employees, seeing their approach, would sometimes throw a lighted cigarette underneath tables and in corners where rubbish and scraps might easily have started a blaze. Some even go so far as to claim that it is impossible to prohibit smoking. The working force should be instructed in the great risks involved, not only to property but to lives, in allowing smoking in a place of work. Strict rules should be made, and penalties should be so drastic to the one who dared to break the rules, that smoking would soon be impossible.

How to prevent.

Hot ashes are responsible for many fires. Many have the bad habit of dumping ashes on the floor and allowing them to accumulate for several days before removing. The ash pile in the meantime becomes the common dumping ground for wastes of different kinds. Ashes should not be allowed to be piled on the floor, or kept in barrels or wooden boxes, but should always be kept in closed metal cans. They should not be allowed to be kept in buildings even over night, but should be removed from the premises as soon as collected.

Ashes.

How to care for.

Many fires occur annually from not properly protected gas jets. All jets in factories and stores should be inclosed by globes, wire cages, or otherwise properly protected. Gas jets should be rigid, or so arranged that they cannot swing against woodwork or other combustible material. If the distance between gas jets and a combustible ceiling or combustible material is less than three feet, there should be provided a heat deflector, preferably in

Gas jets.

Precautions.

the form of a metal bell, which should be suspended over the jet at least four inches from the ceiling or material exposed. Even with a heat deflector, the gas jet should not be less than eighteen inches from inflammable material. All combustible materials on walls behind gas jets, and within one foot, should be protected preferably by a sheet of asbestos-board and tin with an air space. In no case, even where a shield is provided, should a gas jet be less than eight inches from combustible material on walls. Rubber tube connections should be avoided wherever possible, and if it must be used, the gas should be turned on and off where the tube joins the gas pipe, and not at the burner. The use of mantles and inclosed burners is safer and preferable to ordinary tips. If the smell of gas is detected, open doors and windows, and do not look for a gas leak with matches or exposed lights.

Oil lamp.

If the oil lamp is used, many precautions should be taken. Care should be taken that the lamp is always safe from being knocked over. Lamps should always be filled during daylight, and never while burning, and those burning gasoline or naphtha should not be allowed in factory, store, or home. The best grade of kerosene should be used, and it never should be used to start fires.

Precautions in wiring.

Faulty insulation and imperfect wiring cause many fires. When electric lighting is installed in factory, store, or house, the wiring should be such as complies with the regulations of the National Board of Fire Underwriters. Wiring is a true source of danger if not properly installed, but it is perfectly safe if properly done. Careful inspection should regularly be made, and deterioration should not be allowed to go too far before renewing. Incandescent electric light bulbs should not rest on combustible ma-

terials, and the latter should not hang or be draped over the former.

The heating of factory, store, or home is either by gas, electricity, hot water, steam, hot air, or stove. In each case, precautions should be taken, or fire hazards will exist. The gas stove is used more extensively for heating purposes in the house than in factory or store. Gas stoves, if used, should have legs or stands to keep the burners above the base of the stove, but if less than a foot from combustible material, a heat shield should be used. Iron piping should be used for all connections, as rubber tubing wastes gas, catches fire easily, and, by leaking, causes explosions. The same precautions should be taken when wiring for electric heating as for lighting. The electric heater should not be nearer than a foot to woodwork or combustible material. If nearer, a heat shield should be used, and in no case should a space of less than eight inches exist.

Methods of heating.

Gas stove.

Electric heater.

Pipes for carrying hot water, steam, or hot air should be properly protected when installed. Those running underneath floors should be properly covered with non-conducting materials. Many fires are traceable to contact of steam pipes with floors, ceilings, and partitions. If pipes run in concealed parts, there should be proper ventilation, and in every case it should be possible to inspect, and inspection should be careful and frequent. Small pipes for feeding radiators should have a clear space of two inches from wood or combustible materials, and one inch if a shield is used. When pipes pass through ceilings, or floors, there should be metal sleeves or tubes at least an inch larger than the pipe. A tight collar should be next the floor or ceiling to prevent dust or rubbish from getting into the opening.

Steam, hot water, and hot air heating.

Many owners of small factories and stores still use the wood or the coal stove for heating purposes. All stoves should be placed on legs or stands to keep them from the floor. Underneath every stove, there should be a galvanized iron, zinc, or sheet iron covering, and this should extend beyond the front to catch any coals that might by accident drop. At least three feet of clear space should exist around stoves, but if not this distance, metal shields should be used. These shields should be at least one inch from combustible material, so as to allow an air space for heat to circulate. Wood in contact with hot-air or steam pipes will char, and then take fire rapidly, and if conditions are favorable, may ignite spontaneously. Wood within two feet of such pipes should be protected, if possible, by heat shields with air space. A few inexpensive precautions remove many fire hazards, and if all would see that such were used, there would be several thousand less fires every year.

Wood and coal stoves.

Stovepipes should run directly from the stove to the chimney, and should not go through floors or partitions. In case they do, extreme precaution should be taken to protect by heat shield and air space. All chimneys should be inspected regularly and kept clean. Stovepipes should be spark-tight, and sections should fit tightly into each other by at least three inches. Every pipe should enter the chimney horizontally, but should not enter so far as to choke the flue. It is advisable to have one or more turns in a pipe before entering a chimney, because bends and turns are needed to kill sparks.

Stovepipes.

Many of our factory and store buildings have open spaces under floors, behind walls, and over the ceilings. These concealed spaces form excellent hiding places for rats and mice to roam, and build their nests. Holes in floors allow cuttings

Dangers in open spaces.

and wastes to collect, and holes in ceilings and walls permit the collecting of dust. All assist in making conditions most favorable for starting fires by spontaneous combustion. Special care should be taken that no hollow construction exists, and every precaution should be taken to keep floors, walls, and ceilings absolutely tight. Regular inspection should be made for nests of rats and mice, and special care should be taken to prevent the collecting of dust, cuttings, and wastes in concealed places.

Shafts and openings.

In many factory and store buildings, a serious fire hazard exists in shafts and openings through floors and ceilings, as stairways, elevators, belt holes, pipe ducts, ventilating shafts, etc. These openings make it easy for the rapid spreading of fire through a building, and soon getting beyond the control of firemen. Openings should all be closed so as to prevent their acting as fire carriers. A sheathed wall is dangerous, as it allows fire to spread rapidly from cellar to roof. Special attention should be paid to floors, walls, and ceilings to keep them absolutely tight, and if such precautions are taken, fire hazard will be greatly reduced.

Danger in dust.

Means should be taken to keep a factory as free from dust as possible. This is imperative, not only as a protective measure to the health of employees, but is in many cases necessary as a prevention of fire. Frequently in many factories, the dust is of such a character that a quantity of it suspended in the air in the right proportion forms an explosive mixture. This is true of the dust found in grain elevators, flour mills, planing mills, etc. A slight spark caused by a nail or stone getting into the grinder will ignite flour dust, and cause a disastrous explosion. Frequently small sparks of electricity will be given off of belts, and just sufficient to cause if conditions are favorable the ignition and explosion of dust-laden

air. Moisture in the air lays dust and materially lessens static discharges from belts, and may be admitted by allowing jets of steam to escape where most of the dust is found. Just sufficient steam should be allowed to moisten the atmosphere, and not enough to cause damage to whatever stock may be in the room. As regards belts, Professor M. M. Richter states that coating them once a week with acid-free glycerin attracts moisture, and not only gives security against static discharges, but increases the life of the leather.

Controlling a fire.

The second part of the problem of fire prevention is controlling and putting out a fire after it starts. Efficient control of fire requires prompt discovery, prompt application of extinguishing measures, and the provision of retarding or confining measures. For detecting fires, various automatic devices are in use, as well as the old method of employing watchmen or fire patrols. Automatic fire alarms or detectors are operated by the heat of the fire, and ring alarms or give signals to the fire department, or to persons in charge of a building. The automatic fire alarms, or thermostats as they are called, are of various types, and if well made and properly installed, are of great value in fire detection. The majority are alike, in that they send in an alarm when the temperature in the place which they protect rises suddenly beyond a certain degree of heat, usually a hundred and fifty to a hundred and fifty-five degrees Fahrenheit.

Automatic fire alarms.

Electrical thermostats.

Thermostats are either electrical or pneumatic in operation. The great majority are electrical, and depend for their operation on the melting or expansion of parts of the mechanism as a result of a rapid rise in temperature to the point of safety. The melting or expansion causes the completion of an electrical circuit, and the electrical current starts in

operation the transmitting mechanism which sends in the alarm. The pneumatic thermostat depends upon the melting of a fusible strip of metal used as a connection by which a piston is moved and air compressed, and the resulting pressure starts in operation the transmitting apparatus which sends in the alarm. Thermostats of the best variety give an alarm at a sudden rise of temperature only and this avoids alarms when the area protected gradually becomes hot by natural means, as by allowing steam heat to remain on, or through defects of the heating system. Thermostats are placed in ceilings at from eight to twelve feet apart, and cover the entire floor space. Care should be taken in their installation in order to provide the proper wiring. A single circuit should not carry more than twenty-five instruments. Circuits should be provided with automatic means of giving notice when they are out of order, but this precaution should not prevent careful and constant inspection. The wires of the system should be under battery test; if not, a testing apparatus should be in some part of the building where an employee is constantly on duty.

Pneumatic.

Installation of thermostats.

A recent development of the thermostat idea is the use of heated air as an active mechanism. Air when heated expands and produces pressure which is the working principle of this new automatic alarm. The device is simple, and consists of copper tubing of small size which is fastened upon the ceiling of the room to be protected. At the end of the tube is a box containing a detector and a transmitter. The tube is filled with air of the same temperature as the room, and when the latter becomes hot, that in the tube undergoes the same change. The detector is a device whose purpose is to make an elec-

Automatic alarm operated by heated air.

trical contact, and by this means operate the transmitter. It has a silver-foil diaphragm. When the air is heated, the extra pressure pushes the diaphragm outward, and makes an electrical contact, which starts the transmitter, and the alarm is sent in. The contact is made only when the silver-foil diaphragm is pushed outward by a certain pressure which comes from a certain amount of heat in the tube.

Safety valve.

Experts by experimentation discovered that a real fire causes the air in the tubing to increase in temperature at the rate of about four degrees per minute. The detector is set to operate by a rise of temperature of four degrees or more, but if the rise is less than four degrees, no alarm is sent in, because a safety valve or vent prevents it. The safety valve consists of a closed tube with a very small opening. This allows the air to escape as long as it is heated less than four degrees per minute, but if the temperature increases at the rate of four degrees or more, the opening cannot let the air escape fast enough, so the expansion causes sufficient pressure on the diaphragm to make an electrical contact, and to start the transmitter in sending the alarm. It makes no difference whether the temperature in the place protected is high or low, because a rapid rise is what operates the device. The alarm will work as well in a cold-storage vault as in a room with a mean temperature of a hundred and fifty degrees.

Manual alarm box.

A common alarm is the manual alarm box, which is a simple alarm operated by hand. A chief prerequisite is accessibility, so that no time will be lost in giving the alarm. The number of alarm boxes in a building depends upon its area. They should be placed so that in any case no great distance should be traveled to reach one. Manual alarms require testing, which should be thorough, and as frequent

as once a month. The boxes should be painted bright red, have directions posted in one or more languages, if need arises for it, and be so designed that they cannot be used for any other purpose.

Another protection against fire is the employment of watchmen or fire patrols who regularly patrol a building during nights and holidays, and visit every part at least once each hour. The custom is to have watchmen in addition to automatic alarms. For fire detection during nights, holidays, and Sundays, watchmen are necessary in any factory or building of value. As a guarantee that watchmen properly perform their duties, a system of control has been established for them. The movements of the watchman are recorded by means of time detectors, and they are absolutely necessary to make a patrol system effective. A patrol should be made every hour from the end of the day's business until just before business is again resumed. Special care should be taken in the choice of watchmen. They should not only be men of high character and strictly temperate in every way, but if possible, should be men of some experience in fire matters. Veteran firemen or men who have served as volunteer firemen are best suited, and a few dollars a month should not be considered if a properly qualified watchman can be obtained.

Fire patrols.

The general types of instruments for recording the movements of watchmen are the portable watch clock, the stationary watch clock, and the central office system. The portable watch clock in appearance is a small alarm clock, and as the name signifies, is carried by the watchman on his rounds. The record is made on a paper dial by inserting a key, the turning of which punctures or embosses the dial. The dial should be large enough to make it possible to determine with accuracy the time at which the record

Portable watch clock.

is made. A building is divided into a number of stations, and each station has a distinctive key. The paper dial should show the exact hour and minute, and the number of times that each key is used.

The stationary watch clock system may be subdivided into two general classes. The first is one stationary clock in a central location, and the second consists of many stationary clocks located in different parts of a building. A stationary clock of the first class is in appearance like an ordinary office clock. It resembles the portable clock in that it uses a paper record, but it is different in that it is electrically operated. The marking mechanism is a needle point held back of the paper record. The point is mounted on one end of a pivoted lever bar at the other end of which is an electric magnet. When electricity flows through the coil of wire around the magnet, the lever bar is attracted, and the movement forces the point into the paper record. Each station has a separate marking mechanism connected by wires to a small generator at the station. The generator is a device for producing a current, and is operated by turning a handle carried by the watchman. When a watchman visits a station, he inserts his handle into the mechanism and turns it. This starts the electrical current which marks the time on the dial at the office. If there are several watchmen, each having a separate district, each will have a separate clock, or a separate dial on a large clock face.

Stationary watch clock.

The second form consists of a separate clock in different stations of the building. The records of rounds are ordinarily made by puncturing the dial, which is usually made of paper, but sometimes the records are made by embossing. Whatever method is used, the marks should be clear and distinct. The puncture or embossing is made by insert-

Separate clocks in different stations.

ing and turning a key. The opening of the door should make by some mechanical means a distinct record on the dial. A precaution should be taken to have the keys of watch clocks of rather an elaborate pattern, so that duplicates cannot be easily made, and that a key will fit only the clock for which it is intended. The stationary clock of the first type is more commonly used than the second.

Central office system.

The central office system is in use in many large plants. The territory to be covered by watchmen is divided into a number of stations, and each is equipped with a special kind of signal box, which is usually worked by inserting a key and winding a spring. The spring, on being released, starts in motion a tooth wheel which makes an electrical contact with a registering device in the central office. The registering device prints upon a paper tape a mark for each tooth of the wheel in the station box, and the teeth are spaced to correspond to a given number which is a station signal. Each box has a separate signal, and the operator at the central office records the time it is received. In a large factory or store, the central office system may be conducted by the factory or store itself, but the usual practice is to have it conducted by a special company, who make a specialty of fire detection. Messengers are kept in attendance. When signals do not come at allotted times, they are dispatched to ascertain the cause.

Automatic sprinklers.

The third problem of fire prevention is the applying of fire extinguishers as soon as possible after a fire starts. The most efficient means of rapidly checking the spread of fire, and putting it out in its incipiency, is the automatic sprinkler system. Chief John Kenlon of the New York Fire Department declares that the sprinkler is the best single means of

preventing fires and saving life known to scientific fire fighters. The automatic sprinkler, when properly arranged and systematically inspected, has been described as the greatest economic system of the age. One of the best known experts in fire prevention has declared that fully 90 per cent of the fires in buildings equipped with automatic sprinklers have been effectively held in check or extinguished in incipiency. To obtain the greatest efficiency, automatic sprinklers should be properly installed, carefully inspected, and maintained at the highest point of efficiency.

Mechanism of sprinklers.

Automatic sprinklers are of many varieties and vary in size, power, and cost. They are devices for showering water on fires at their starting without specific human agency. The sprinkler is the mechanism which discharges water upon the fire. It holds the water back and turns it on when needed, and in this way resembles an ordinary water faucet. The faucet is turned on by hand, while the sprinkler is started by heat, which makes it automatic. Sprinklers are square or circular plates having one or more openings, and are set in pipes in the ceilings of rooms at greater or lesser intervals. The pipes are connected to large vertical pipes, which are supply pipes, and these connect with the source of water supply.

Operation of sprinkler.

The sprinkler head is sealed under normal conditions, so that the water in the pipe cannot escape. When the temperature in the vicinity rises to a certain intensity, say a hundred and fifty-five or a hundred and sixty degrees Fahrenheit, the seal is automatically broken. The seal is made of a fusible solder which melts at a fixed temperature. By making the seal of solders that melt at different degrees of heat, sprinklers may be made to begin to operate at any temperature, and many are made for high temper-

atures, as two hundred and eighty-five or three hundred and sixty degrees Fahrenheit. When the seal is broken, the water bursts forth. The head is usually provided with a splash plate against which the water is forced, and this causes it to fall like a shower. A single head drenches like rain an area of from eighty to a hundred square feet. Sprinkler heads are so distributed in the ceiling of a room that the water from them covers the entire floor without overlapping.

Distribution of heads.

The automatic sprinkler may be the means of giving an alarm, and frequently it is the first alarm. Attached to the main supply pipe is an alarm valve which is a device so constructed, that the flow of water through it causes the operation of an electric or a mechanical gong. The gong may be either in a central place in a building or in an outside office. The use of both kinds of gongs gives the best protection. Many instances are known where the first intimation of fire to a watchman has come from an alarm operated with the automatic sprinkler system. The modest little sprinkler, almost out of sight in the ceiling, is a great fire fighter in putting out fires at their start as well as a valuable alarm giver.

Automatic alarms.

The automatic sprinkler is an outgrowth of the perforated pipe sprinkler. This is a system of perforated pipes placed close to the ceilings of the rooms to be protected. The perforated pipes are connected with supply pipes leading to the source of water supply. When fire breaks out, the water is turned into the supply pipes, then to the perforated pipes, and by them it is discharged over the area served. The system is frequently used in cellars and out-of-the-way places, where it is difficult for firemen to reach with hose and nozzle. Most cities have strict regulations

Perforated pipe sprinklers.

regarding the installation of perforated pipes, and specifications and standards to be rigidly followed with the pipes used.

Fire pail. A pail of water is the fire extinguisher which is most commonly used. The fire pail is cheap, may be placed anywhere, and its use is understood by every one. The chief objection is that it is used for other purposes, and is not always filled with water. As a result, when needed, it is often empty, and often not found in its place. Fire pails should be placed in conspicuous and convenient places, always kept filled with water, and never allowed to be used for other purposes. In stores, offices, and other places, people object to the inartistic appearance of rows of pails, painted bright red, and labeled "Fire." Bucket tanks are used in their place. These are metal or wooden tanks or barrels filled with water, in which are placed several pails. If fire breaks out, the cover is removed, and the water is dipped out, to put out the fire. Care should be exercised to see that the tanks are always filled with clean water, and that pails are ever ready for use. Where oil, paints, or inflammable liquids are used, it is well to have part of the pails filled with clean dry sand, because with burning oil, sand is more effective than water.

Tanks.

Chemical extinguisher. Many devices have been invented for providing ready means for use in case of fire in addition to the ordinary fire pail. The most successful and the most widely used is the chemical extinguisher, which is a small tank having attached at one end a small hose for the purpose of directing a stream of water. The tank contains about two and a half gallons of water in which is placed some bicarbonate of soda, and at the top is suspended a small bottle of sulphuric acid with a loose stopper. When the tank is turned

upside down, the sulphuric acid flows out, mixes with the soda solution, and gives forth carbonic acid gas. The water carries the carbonic acid gas, which greatly assists in putting out flames. The gas performs another function. In keeping the water in the tank under certain pressure, it makes it possible to throw the stream some little distance. Pails of water and chemical fire extinguishers are fire fighters which may be used by every one, and their presence in sufficient and adequate numbers should be found in every factory, store, and office. Chemical extinguishers should be regularly inspected, and recharged at certain periods of time. There are many varieties of small fire extinguishers, as hand grenades, which are glass bottles of chemical solutions to be thrown on the fire, dry powder extinguishers, or tubes filled with bicarbonate of soda which give off carbon dioxide when heated, etc.

How to operate.

A protective measure which is more important in a large building than in a small, is the standpipe with hose attachments. A fire standpipe is a line of pipe to supply water to hose connections at various places along the pipe. In a large building, a number of these pipes is necessary and there should be hose connections on every floor. The hose used should be of standard size and quality, and should be kept folded on racks rather than rolled. The water supply may come from a tank on the roof or from the city system. A tank is always advisable on a high building, but is only temporary until the city fire department is able to make connections, and force water up with fire pumps. A standpipe is supposed to be only necessary for high buildings, as it does away with long stretches of hose, but it is equally important in buildings of three stories. Whenever standpipes are installed, care should be taken to get adequate water

Standpipe.

Precautions.

supply, and that with sufficient force. The hose and all apparatus used should be regularly inspected and tested. Axes and hooks should be placed in accessible and convenient places on each floor of a building.

A third problem is confining a fire or preventing its spread. This has to do with confining a fire to as small a space as possible, and to preventing a building from taking fire from the outside. Buildings are of two kinds, fireproof and non fireproof. The fireproof building is one with walls of brick, stone, cement, or metal; with floors of cement, stone, or brick; with partitions, ceilings, windows, trim, and doors, of metal or fire-resisting material; and with stairways of stone or metal and inclosed by fireproof walls. These buildings should be supplied with automatic sprinklers, standpipes, and chemical extinguishers. If a fire occurs, it is confined to the floor or room where it starts. If all buildings were so constructed, our fire loss would dwindle to a small fraction of what it is to-day. In New York City, and in other places, many buildings are called fireproof which are not. They usually have open stairways, wooden partitions, doors, floors, windows, and trim, and here is where the fire hazard lies. In Europe, practically all city buildings are constructed of fireproof materials. The Consul-general of Vienna reports that there is no case known in that city where fire has extended beyond the building in which it originated, and cases are hardly ever known where fire extended beyond the floor where it started.

Fireproof buildings.

A fourth problem has to do with the protection of life in case of fire. The ordinary outside fire escape is the usual means provided for escape from fire. Fire escapes should at all times be kept clear of articles and rubbish. Exits to them should

Protection of life.

be clearly marked, and passageways should at all times be kept clear. Windows to fire escapes should be large enough to allow a grown person to pass quickly and easily through, and should be made of wire glass. All doors leading to fire escapes or other means of exit should open outward and be fireproof. **Precautions.** If sliding doors are used, no obstruction should be placed in the way of their sliding freely backward. Doors and windows should be cut down to the level of the floor and the platform of the fire escape should be also on this level. Outside fire escapes are usually inadequate in case of fire. Employees are not accustomed to their use, and usually do not use them except as a last resort. Fire escapes allow only a slow means of exit, because not being accustomed to climbing down, a person moves very slowly. Fire frequently breaks through below the escape and prevents flight by this method. Fire experts throughout the country declare that the fire escape is unsatisfactory, should in future be discarded, and other methods adopted.

Thousands of buildings throughout the land have wooden stairways open or inclosed with wooden partitions. When fire starts, it rushes with great rapidity from floor to floor through these stairways, and makes flight by means of stairs impossible. The open wooden stairway is a menace to property and to life. The law should insist that all wooden stairways be removed, and be replaced by fireproof stairs inclosed with fire-resisting materials. A reasonable safety will then be afforded employees who will be able to descend the stairs in safety. Stairway exits should be distinctly marked, and the passageways thereto should always be clear and unobstructed. **Dangers in wooden staircases.**

The best fire escape for any factory or building is the so-called Philadelphia fire tower. It consists of a flight

of stairs leading to the ground, and inclosed in a tower of brick or fireproof material. The tower is separate and apart from the rest of the building. Its construction should be such that it is absolutely fire- and smokeproof. From each floor there is a fireproof balcony leading to the tower. The tower is the safest and best of all fire escapes. Another type of fire escape is the outside stairs which are regular fireproof stairs placed on the outside of a building. They are reached by doors passing out from the various floors, and these should slide or open outward and be fireproof.

Philadelphia fire tower.

Outside fireproof stairs.

The fire wall is gaining favor as a protection, and a safeguard to life. The simplest form is to have a fireproof wall divide a building from top to bottom into two parts. If a building covers a large area, more than one wall should be built. The doors on every floor should be fireproof and should never be locked. Fireproof walls should be compulsory in every building over three stories, whether fireproof or not. The wall, besides being a safeguard to the lives of employees, is also of great value in confining a fire.

Fire walls.

An important question in safeguarding life is that of overcrowding. The number of persons which should be allowed on a floor depends upon the exits and the fire protection, and whether the building is non-fire- or fireproof. The law should be severe in compelling a sufficient number of exits, and should limit very materially the number of people allowed if fire precautions are not used. The number of persons which should be allowed on a floor of any building, where more than fifty persons are employed, should be ascertained by the fire commissioner of the town or city where the building is located. The number should be posted in

Overcrowding.

Precautions.

a conspicuous place on every floor of the building, and if the number is exceeded, the proprietor should be notified, and if the number is not reduced, he should be severely punished.

In factory and office buildings, and in stores, where more than twenty-five persons are regularly employed above the second story, the use of the fire drill is very necessary. Employees should be shown where the stairways and exits are, told which to use, and the means of reaching them. A fire drill is extremely useful in preventing panic at time of fire. The importance of keeping all passageways to exits open and clear should be strongly emphasized. A fire drill should be held at least once every month under the supervision of one of the members of the local fire department. It serves to constantly bring to the mind of the employer and employee the constant possibility of fire, and the necessity of using every possible precaution to prevent it. The employees in a building of more than two stories in height should frequently have their attention drawn to the exits. Illustrated lectures should be occasionally given upon precautions to prevent fire, and what should be done in case of fire.

Fire drill.

Importance.

Fire protection is a science in itself. It pays every employer to have his premises regularly inspected by a competent fire protection engineer. Every precaution should be taken to prevent a case of fire, and every possible means adopted to put a fire out as soon as possible after starting, to confine its spread, and to protect occupants of the building. Employers and employees alike play an important rôle in reducing our great loss from fire. If we could lower our loss to what it is in Germany or Austria, what a great saving would result in material resources and what a benefit to worker and to employer alike.

Fire protection a science.

QUESTIONS

1. Compare fire losses in Europe with those of the United States.
2. What are the functions of fire prevention?
3. Give the chemistry of fire.
4. What is spontaneous combustion? Mention favorable conditions.
5. Give the causes of fire.
6. What precautions should be taken in electric wiring?
7. What are the dangers from open spaces? How may they be eliminated?
8. What is the automatic fire alarm? How should it be installed?
9. Give a good fire patrol system.
10. What is the automatic sprinkler? What precautions should be taken in installation?
11. Mention various kinds of automatic alarms.
12. What is the chemical fire extinguisher? What precautions should be taken to keep it in good condition?
13. What precautions should be taken to protect life in case of fire?
14. What is the importance of the fire drill? How may the fire drill be installed?
15. What precautions should be taken in the case of fire escapes?

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CHAPTER XIV

WAGES

THE problem of wages has been a perplexing one, and the cause of dissension and strife since man began to work for man. From earliest times, the chief cause of dispute between employer and employee has been what should be paid for labor. With the introduction of the factory system, and the investment of large sums of capital in the industrial field, the wage question caused the opening of a wide chasm between employers and employees. Due to the struggle over wages, trade unions came into existence to protect laborers, and employers' associations were formed for the purpose of carrying on the struggle against labor. The question of what constitutes a fair wage has led to countless bloody conflicts between employers and employees, causing a loss of millions of dollars, as well as much suffering on the part of wage earners and those dependent upon them. During the past year, the struggle between employers and employees over the wage question has been waged more or less bitterly in nearly every industrial country. When one sees the bitterness in many of the recent struggles, it almost makes one believe that the chasm between the two great factors of our industrial system is as wide as it was half a century ago.

Importance of the wage question.

The question arises, Has any progress been made in making employers and employees realize that their interests are not antagonistic but one? Many answer with-

out hesitation in the negative. I am more optimistic, and firmly believe that during the last quarter of a century, a great advancement has been made in making employers better understand employees and *vice versa*. Every day employers are realizing that employees are human beings and should be treated as such, and employees are also realizing that employers are necessities in our industrial system, and should have their rights respected and protected. This realization is gradually bearing fruit, and impressing upon both parties the fact that their interests are not antagonistic, but one, and that both should put their shoulders to the great industrial wheel in order to make America what she should be, the greatest industrial country in the world. Employer and employee should meet on common ground, the one willing and anxious to give to labor the share it produces, and the other contented with that share. The two should be brothers in a great industrial brotherhood, and work for each other's interests, and not like two enemies, each stealthfully watching every move made by the other, suspicious that it is for exploitation.

Interests of employers and employees one.

The wage problem is important with every employer, because upon its successful solution depends efficiency. Efficiency is absolutely impossible with a working force dissatisfied with its pay. The solution of the wage question lies largely in the application of a system of wage payment that appeals to both parties as being essentially just, and one that is adapted to the varying conditions of our modern industrial system. It is folly to advocate a standard system, because such is impossible. Frequently several systems of wage payment are found in the same establishment, all giving satisfaction and working toward greater efficiency. It cannot be too strongly empha-

Requisites for solution of wage problem.

sized that only with satisfaction on the part of the laboring force with wages received may efficiency be attained.

There are two parties to the wage problem, the one who pays and the one who receives wages. It is natural for the employer to try to get all the work he can for the wages that he gives, and for the worker to try to get all the money he can for the work that he does. The meeting of employers and employees in order to try to adjust their differences gave rise to the different systems of wage payment.

Parties to wage problem.

Until the last quarter century, employers gave little heed to justice and equity in dealing with employees. They took every possible advantage to drive as hard bargains as they could in hiring labor. The average employer believed that the cheaper he got his labor, the lower would be his costs, and the greater his profits. Little did he care for the laborers, as long as he could drive them to put forth greater efforts. He was blind to the immediate relation between wages and efficiency, as well as between the hygienic and sanitary conditions of the working place and efficient work by laborers. Wage earners for self-preservation were driven to unite and to deal with employers collectively through unions. Employers are largely to blame for the bitterness which existed for a century after the introduction of the factory system, and which is found even to-day in many plants. The average employer until recently firmly believed that it paid to drive workers, by every possible means, to increased efforts. Workers were to him simply cogs in the great industrial wheel, and were treated like inanimate objects rather than human beings with feelings and rights. With history showing that employers seized every opportunity to lower wages, is it a wonder that

Former attitude of employers.

employees are to-day suspicious of any innovation on the part of employers?

One of the greatest tasks that the new efficiency movement has to overcome is the deep-rooted suspicion of employees against employers. The chief cause of this attitude has been the struggle over wages. Wages are of the greatest importance to every employer. They are usually the cause of strikes, and are the chief cause of friction and antagonism between the two parties. Efficiency, with its demands of interest, enthusiasm, and loyalty on the part of the worker in the success of the enterprise cannot be approached, unless there is satisfaction with both parties over the wages paid. Wages may therefore be emphasized as the first important problem for every employer seeking efficiency to solve. The wage question is one which every employer must solve, and his success in reaching greater efficiency largely depends upon its solution.

Solution of wage problem and success.

There are many ways of paying labor. With some kinds of work only one method of payment is possible, while with others different methods may be used. A method which proves successful in one case may not in another. Because a certain system of payment is satisfactory in one plant, an employer should not take it for granted that it will be in his. Before it is introduced, a careful study should be made of the plant, and the result may prove that it will fail under existing conditions. The great demand is a study of the particular plant, and a decision as to the best method for efficiency, remembering at all times that coöperation is a necessity, and the wage, to give that requisite, should be fair and just. Coöperation cannot be obtained by the mere payment of wages, or the giving of gratuities, but the chief question is whether

No standard methods for all plants.

or not the wage is a fair one. Another thing to bear in mind is that no matter how satisfactorily a method of paying wages may appeal to the few, that the solution of the wage problem rests upon its satisfactory appeal to the many.

The average employer usually makes the mistake of considering only the amount of wages earned by individual members of his working force. He fails to consider what has been done to earn the wages. There is fixed in his mind what a worker should earn, whether working by time or by piece, and if the earnings greatly exceed that amount, he is at once convinced that the pay is too high, and should be reduced. This attitude is one which has been handed down from generation to generation, and must be changed before any great progress can be made in efficiency. It cannot be denied that each worker is vitally interested in an increase of wages, and it is human for him to be so. Every employer is interested in a reduction of wages per unit of output in his place. Fairness and justice should be the basis of deciding the wage which the one is to receive, and the other to give.

Consider what is done to earn wages.

In a working force are found men of various degrees of ability. One is slow in movements while another is quick. One may do in a given time a much larger amount of work than the one working next to him. One is more skilled than another. The question to solve in deciding upon a wage system is to discover one that will pay each according to what he does, rather than according to the time that he serves. Wherever possible, this should be done, but in some cases, labor must be paid according to the time served. The most efficient system of wage payment is that where a worker is paid according to some scheme whereby his pay is directly proportionate

Requisites for a proper wage system.

to his output. The ascertaining of a fair and just wage, and the willingness of employers to give and employees to accept it, is an important factor in assuring coöperation and efficiency.

More wages to the average individual is the greatest encouragement to industry and progress. Wages should be increased to the point of contribution by labor, but beyond that, the only possible way to increase wages is to make labor more productive. The efficiency movement has for its aim the making of labor more productive, and stands for a corresponding increase in wages. Employers should be willing to give in wages what is justly due labor. When employers realize that it is a business proposition to do so, and that they have no right to what labor actually produces, a better understanding will exist between the two parties, and the greater part of the battle for efficiency will be won. Laborers, on the other hand, should realize that there are factors in production assisting in increasing output other than labor. Buildings, equipment, machinery, and managerial ability contribute their share, and in some cases, one assists more than others. Each should receive its share according to the part taken in production. This is practically impossible to ascertain, and approximation is the best that can be done. Laborers and employers working together should try to ascertain approximately the part each takes in production, and each should be willing that the other receive his share.

Labor is not the only factor in production.

Employers usually recognize the fact that efficient men are worth more than inefficient, but many do not know how to introduce a scheme of payment that will pay the efficient a fair wage without trouble with the inefficient. It necessitates great care and diplomacy. The workers

How to introduce a new wage system.

should be taken into confidence and shown how wages will be increased by following the instructions of the employer. Patience in instruction and a suitable reward for success usually win out. Employers should always bear in mind the deep-rooted suspicion of employees, against any innovation, as only a means of exploitation. The suspicion exists and may be overcome by frankness, but if it is not, failure of any new system will follow. A careful study of conditions is necessary before any new system of wages is decided upon, so that the one selected may be the best system of reward for the particular kind of work performed in a plant. Openness, frankness, and justice on the part of employers in their dealings with laborers always pay, and these are essential in any system of wage payment. Laborers should be made to feel that a change is for their benefit, and that it is for the purpose of making them able to increase their wages.

Servitude earliest form of labor.

The earliest system of labor was a form of servitude. The lash and the whip were the chief means of increasing the output of laborers. Sackcloth clothing and the plainest food were the remuneration for services. Under serfdom, the lot of the workers improved. They were bound to the soil, and had to perform certain services for their lord and master. Slavery and serfdom gradually broke down, and the wage system took their place. It may be noted that servitude did not disappear with the introduction of the wage system, but the two existed side by side for years, and the abolishing of the former came much more slowly in some industrial countries than in others.

Almost simultaneously with the breakdown of serfdom, and the general appearance of the wage system, the laborer became the center of restrictive legislation.

Rates of wages, apprenticeship, and other details of labor were fixed by some superior authority. Later, the growth of industry proved that the restrictive measures were not economic and just, and they gave way to a system of contract. The laborers on gaining their freedom of contract were found to be almost helpless in the hands of grasping employers. The contest for freedom of contract was won by employers, and not by employees. Employers foresaw the advantage which they could take of unprotected and unorganized labor, and how they could profit by exploiting the helpless laborers. The policy of exploitation was severe, caused much suffering on the part of workers, and soon drove them to the formation of unions in order to protect themselves.

Restrictions under early wage systems.

Contract system.

The original and first wage system was paying a laborer for the time that he worked. From the earliest introduction of the wage system until to-day, time wages have been in all industrial countries the commonest form of paying labor. The unit of time under the time wage system may be an hour, day, week, month, or year. A certain amount is paid for a unit of time, regardless of the amount of work performed. Wages are fixed by bargain between the worker and the employer. The bargaining may be done collectively at the dictation of a labor union which fixes a minimum rate, or it may be done by the individual workers themselves who fix their wages with their employers. The wages in the case of individual bargaining depend upon two factors, the relation of supply and demand of labor of the particular grade, and the skill of the laborer in bargaining, but in the average case, the latter is of little consequence.

Time wages.

How fixed.

The fundamental principle underlying time wages

is that a certain sum of money is equal to the work of a certain unit of time spent by any man in a plant doing a certain kind of work. The sum, unless it is fixed by unions, may vary from place to place, and even from plant to plant. It takes for granted that every man shoveling sand in a particular plant is worth two dollars for ten hours' work, or every man laying brick in a particular place is worth five dollars for eight hours' work. It cannot be denied that there is always a difference, and often a large one, in the quality and the quantity of work performed by different men doing the same kind of work, and if all are paid alike, either some are not paid enough, or some are paid too much. The system of paying by time is never fair and just to all. All men are born free and equal, but all are not born with the same ability or capacity. This applies to workers of all kinds, and should as far as possible be considered in fixing remuneration for work.

Time wages never fair and just to all.

Time wages present many disadvantages. They put all men on the same level, and men are not paid according to their efficiency. On the part of workers, there is not any difference, whether one man is more efficient than another, because it is practically impossible for him to get higher wages than others of his group. There is no incentive to increased efforts, diligence in work, or interest in what is being done. The good employee receives the same pay as the one who loafs, so he has little or nothing to gain by putting forth greater efforts or taking more interest in his work. The fact that extra effort, greater skill, or more interest is not recognized stifles ambition, destroys interest of the laborer in his work, and prevents coöperation, so necessary for efficiency. The industrious and efficient employees be-

Disadvantages of time wages.

No incentive for work.

come dissatisfied, and slacken their pace to that of the poor and inefficient. The employer who pays time wages usually gets the efficiency of the poor laborer, and there is a tendency to level speed to his pace. The average man works just enough to hold his place, and where there is no inducement, the question arises, why should he do more. Why not save his energy for other things?

Time wages foster soldiering and loafing. Many men make a practice of soldiering even in the presence of their superiors, believing that there is a certain amount of work to be performed, and the less they do, the more employees will get work, or the longer will their jobs last. This erroneous and fallacious idea of curtailing efforts to increase the number of workers or to prolong work is current among laborers. Time wages foster idling on the part of many who develop the practice of awaiting the opportunity for playing pranks, talking, or joking with their fellow workers. How often does work practically cease, when the boss is called away to other parts of the building on some business errand, and at the first sign of his approaching return, every one returns to work, and works with greater vim, as if the pace was kept up during his absence. A worker was asked why such advantage was taken of his employer, and his reply was that it was all in a day, and why not have a good time when possible, and that the pay was the same to those who worked faithfully, as to those who had a good time at every opportunity.

Fosters soldiering.

A great amount of idleness is due to the completion of a piece of work, and the workman waiting patiently until the foreman comes with another job. Little or no effort is made on the part of workers to get a new job, as soon as one is finished. Why not take advantage of a little rest because it amounts to the same thing as far as pay is

Causes for wasting time.

concerned? It would be far better to have a system whereby it would interest a worker to keep steadily employed, and be interested in the amount of work produced from his efforts. It is human nature to take life as easy as possible, and with a worker it is natural for him to take an easy pace and pay little or no heed to what he does. Workers as a whole prefer to sell time rather than labor, and to perform in the time the amount of labor they consider proper for the pay.

Strikes. Thousands of dollars are lost annually through idling of time and soldiering. Frequently time wages cause increased activity of the unions, and labor troubles. The more industrious and efficient men find that they cannot increase their pay by putting forth greater efforts, or being more efficient, and so resort to other methods to try and obtain the result. They get all laborers performing their kind of work to demand an increase of pay, and the cry from both the efficient and inefficient is for more pay. A strike usually follows, and if successful, no one cares whether he does more work or not.

Under the time system, it cannot be said that an employer is totally indifferent to the output of workers.

How to find what a man does. If an employee is found frequently loafing, and his output is below what is considered a minimum, he is discharged, but the discovery depends on his attracting the attention of the foreman. The loafer usually has his loafing down to almost a science, so that it is easily done without his being caught. Frequently, a worker works for a

Soldiering a science. long time far below the minimum, and is not discovered because his foreman has a large number to look after, and his attention has not been directed to the output of this particular worker. It is exceedingly difficult in an ordinary plant for a fore-

man with several men under him to pick out the men who are not doing what is considered the minimum amount of work. A slow, steady, plodding worker, who to the eye is not accomplishing much, may in reality be doing a third more than a nervous, quick-moving worker. Where there is no incentive to increased effort, the average worker will do little more than is necessary to hold his job, or not to have his pay decreased. Even then, there are so many ways of deceiving, and it is so hard to get the amount of output, that many are continued for a long time on pay when they are far below the average.

In spite of all these disadvantages, time wages continue to be the commonest form of remunerating labor. Due to the fact that it is the only system possible in many classes of work, time wages must always occupy a prominent place in our industrial system. Nevertheless, there are many kinds of work where other forms of remuneration are better suited, and work towards greater efficiency. Wherever it is possible, time wages should be replaced by a more efficient system of pay. The wage system which induces men to put forth greater efforts is one where the remuneration is in some way directly proportionate to output. Time wages should be discarded and piece rates introduced wherever it is possible to measure individual performance. Where work cannot be measured in units produced, the time system is the only way of paying labor, as, for instance, with bookkeepers, firemen, engineers, etc.

Time wages *vs.* piece rates.

An increase in wages and a chance of promotion are two chief inducements for workers to take an interest in work, to put forth greater efforts, and to coöperate for the success of a business. Where these inducements are lacking, workers are liable to be indifferent, with little or no interest in work,

Inducements for good work.

and with little desire to increase output. As far as these inducements are present and before workers under time wages, the more satisfactory will be this system of payment, and the greater will be the interest, coöperation, and enthusiasm of workers in the business, and the greater their efficiency. Frequently, promotion and increase in pay are due to favoritism. The foreman takes a liking to a worker, and at the first opportunity increases his pay or promotes him, and pays little or no attention to his efficiency. Oftentimes, a capable worker is not promoted or increased in pay, due to the fact that in some way he has aroused the anger of the foreman. Either case arouses distrust on the part of workers, and causes them to lose interest in their work. Promotion in the ranks, or increase in wages due to favoritism, fosters antagonism and increases inefficiency.

Favoritism.

In some plants, different time wages are paid in the same class, and promotion is made from the ranks. Increase in wages is based as far as possible on efficiency. The more efficient men are rewarded by an increase in pay, and the great difficulty is the ascertaining of those who deserve the increase, and who are more efficient than the others. With no records, extreme care should be exercised, and favoritism should never under any circumstances be a factor. The best results are obtained with a competent boss, and comparatively few men under his direction. He can easily by close observation ascertain, to a certain degree, the quality and the quantity of work of each worker. If a worker knows that his work is under observation, and that if he increases his output, his pay will be increased, there is an inducement to put forth greater efforts. Workers should also be assured that in case of a vacancy, the more energetic and efficient will

Methods for increasing wages.

be promoted. These two inducements give incentives for more efficient work, and good results with time wages.

The more efficient method, wherever conditions are suitable, is to get individual records, and to base increase of pay and promotion on these. Where work is of the same class and gangs are small, the boss may without any inconvenience keep daily records of each of his men. Pay is based on the records, and the men know that the more efficient will receive the larger pay. A great amount of work by its very nature makes record keeping absolutely impossible, and the only measure of efficiency is the close observation of the boss. Wherever the character of the work is such that time wages are the only possible means of payment, care and judgment should be exercised in bringing all under observation, and making all know that they are observed, and that good work will be rewarded. If this is done, many of the faults of time wages will be remedied. Nevertheless, where it is possible to measure, in units of production, the work of a laborer, the most efficient way is to displace the old method by piece rates.

Individual records.

Remedying faults of time wages.

The piece rate system is where a man is paid, not for the time that he spends, but for the amount of work that he does. It is not of recent origin, as strikes for increase in piece rates occurred years before the introduction of the factory system. The factory system, nevertheless, gave great impetus to this method of remuneration, and the piece rate system increased in practice. Employers at first, and even in many cases to-day, introduce this system solely as a method for reducing labor costs. Piece rates, to be successful, should benefit both parties, and each should be willing and anxious for the other to profit. Piece

Piece rates.

rates have caused much friction between employers and employees, because they are usually looked upon as a means to force extra effort with lower wages. Opposition to the system is not the fault of the system, but is due to ignorance and cupidity on the part of employers. Employers themselves are largely to blame for the many failures of piece rates, and the antagonism on the part of employees.

Friction.

Where friction has arisen over piece rates, it has been due chiefly to stupid methods of introduction. No system is used to ascertain the proper rates, which are chiefly based upon guess, or upon the judgment of foremen. The judgment based on past experience is as a rule far from being correct. Some employers try to ascertain the time it takes to perform a certain task, on the basis of previous records, made by men employed on time wages. This fails to account for the fact that with the incentive offered by piece rates, the output of the worker may vary as much as 50 per cent over time rate. Previous records are inaccurate, and form a very unsatisfactory basis for estimating piece rates. Records of past performance are a poor indication of what may be done by capable and industrious workers. No uniform standards in the performance of a task make snap judgment a mere guess. The guess cannot help being inaccurate, and is the beginning of trouble. By fixing rates according to methods which are based chiefly on guess, it is only by chance that any kind of equitable rate is fixed. The whole problem of piece rates is the deciding upon rates satisfactory to employer and to employee.

Friction due to stupidity in rate fixing.

Employers do not make sufficient allowance for the increase in output due to piece rates, and the rates are usually high. A large increase in the weekly wages

arouses an employer, who forgets that more work is being done than under time wages, and as soon as the wages rise above 25 or 30 per cent, he, thinking that he is paying his workers too liberally, cuts the rate. The great bane of piece-work is rate cutting. In the past, and even to-day, many employers believe that a man should not under any circumstances earn more than a certain sum, working either by day or by piece. Where wages are very much increased, the average employer cannot resist the temptation to cut. This has been the cause of many failures of the piece rate system as well as many strikes. If strikes do not occur with rate cutting, bitterness arises, as the average worker believes that it is only to increase the profits of the employers. Rate cutting causes laziness and lack of interest and enthusiasm, and works toward inefficiency and an increase of costs.

Rate cutting the cause of trouble.

The old method is to set a rate and leave it to the worker to solve the problem of making wages, and as soon as he solves it, and increases his wages above a certain amount, to cut the rate. The workers are usually responsible for keeping machines and tools in condition, and for getting work to and from the machines. The employer places as much as possible of the burden of getting work performed upon his men. In one factory, a person noticed that the employer was not as painstaking as formerly about repairs, tool sharpening, and taking care of materials. On being asked why, he answered: "I have put my men on piece rate, and it's up to them now. If they wish to earn wages, let them use extra care to see that machines are in repair, and the goods taken care of." This old practice has caused an endless amount of friction between employers and employees. To prevent friction, rates should not be fixed under the old

Piece rates under the old system.

method, since it is almost impossible to make a rate, without the necessity of later readjusting it, and this is the cause of the failure of many piece-rate attempts.

Employees are more or less suspicious of making too high wages, because they believe that then their rates will be cut. It is a known fact that capable workers will soldier rather than make wages rise more than 20 or 25 per cent above day wages, knowing that if they do, rates will be cut. The capable or more efficient hold back for the slow, who would suffer if rates were cut. The fear of making a record which might be used for a cut in rate causes soldiering. It is claimed that piece rates have developed systematic soldiering to a remarkable degree. Workers after one or two cuts decide that there will not be another if soldiering will prevent it. Piece rates very often under the old method decrease efficiency. The men learn that the management is willing to pay a certain amount and no more, and soldier so as to make their earnings by piece rate about equal to it. Even to-day, the bare mention of piece rates causes great opposition on the part of many employees. This opposition is more or less justified by the experience of history in the working of the system.

Piece rates foster soldiering.

Piece-rate fixing is based upon two factors, the task and the rate. Rate cutting results from ignorance and carelessness in ascertaining the task and in fixing the rate. If these defects can be remedied, there is not the least doubt that piece rate would prove a most satisfactory system of paying labor, where such a system is possible. It solves the question which efficiency sets before us of how to encourage and reward efforts in order to accomplish more efficient results. To obtain efficiency, men should be satisfied that they are getting a square

The task and the rate.

deal, and are receiving a just and fair reward for their efforts and skill.

Opposition to piece rate may be avoided if extreme care is used at the outset in establishing a just rate. This demands a careful study of conditions precedent to its installation. The task and the rate should be properly fixed, and then there would be no reason for a cut. The whole problem is to get the proper piece rate at the outset, and to obtain a just rate, it should not be based on guesswork, but on careful study and investigation, in order to ascertain what a task should be, the time it should be performed in, and what is a fair and just rate, so as to give labor its just reward for its share in production. The best and the only proper method is to ascertain the task and the time by careful time and motion studies. This takes the work of fixing the task and the rate out of the hands of those who fix them by guess, and places it entirely in the hands of specialists, who ascertain them by careful observation, scientific study, and experimentation. By ascertaining the time in which the average worker under ordinary local conditions can perform the ascertained task, a suitable rate can easily be determined upon, which will give an equitable and just rate, fair to employer and to employee alike.

How to establish a just rate.

Essentials.

A careful study should be made of factory conditions, and with equipment and conditions as they are, the rate should be such that the average man will earn from 30 to 60 per cent more under piece rates than he would under time wages. Extreme care should be taken that it is not necessary to work at a speed which is injurious to health. The employer should keep his equipment thoroughly up to date, and materials and tools always on hand when needed, so that there is no unnecessary delay on the part of the worker.

Duties of the employer.

The members of every working force may be divided into three classes: workers below the average, average workers, and workers above the average. It is the average worker who should be carefully studied in making tests and experiments to decide upon task and rate. Tests and experiments should determine the best method and the time required by the average man, to do the task with the factory equipment. The method should be standardized and the workers instructed in its use. The equipment should always be maintained in the same degree of excellence as when the experiments were made. In the determination of the rate, account should be taken of the fact that the men will become more expert with time, so that what might be considered a somewhat low rate at first may be satisfactory after a short experience. In fixing the time, allowance should be made for necessary delays, and where the work is very exacting, time should be allowed for rests in order to prevent injurious fatigue.

Classes of workers.

The average worker is the one to study.

The men below the average should be instructed, and if they cannot make the average, some other kind of work should be found for them. There should be no maximum wage limit to the more efficient, and their wages should depend upon their degree of efficiency. By extreme care in preparation and in proper installation, a rate may be obtained which will be fair and just to both employer and employee, and which will not give cause for cutting. The increased interest and loyalty of the men in the work will make them coöperate with the employer for increased efficiency.

The men below the average.

An important precaution in piece rates is that the workmen should not be allowed to overfatigue themselves, or work to the point of injuring health. The rate

should be such that overfatigue is not necessary to earn a good wage. The ambitious should not be allowed to tax their strength in their endeavors to earn a few more dollars. Care in not allowing workers to overtax their strength, which impairs their health and efficiency, is an important duty of the management. The workers should be taught the evil consequences of overtaxing strength, and how it brings a loss of earning power that more than offsets the few extra dollars earned in the present.

Health precautions.

In every instance, workers should be taken into confidence by employers in ascertaining rates and in the installation of a piece-rate system. The first essential is the coöperation of employees, which may be obtained only by being frank, open, and just with them. Employees should be shown that piece rates are for their benefit, and will enable the average employee to earn a more equitable wage, and the more efficient, a reward proportionate to their output. The necessity of making proper tests to ascertain proper rates should be carefully explained. As soon as employees learn that there is nothing underhand, and that the change is for their benefit, they will, in the majority of cases, coöperate, and their coöperation assures success. Employees should assist in ascertaining the proper task, and be consulted as to the rate, and when a satisfactory rate is obtained, the employer should bind himself to maintain it without cutting, unless unforeseen circumstances should arise that would make adjustment necessary. But adjustment should take place only with the coöperation of the workers. The average worker is a fair-minded, open, and just person, and will every time meet the employer halfway and do his part to obtain a fair wage. If the average employer were more cognizant of this fact, and would be just, open, and fair, we would

Workers' share in fixing rates.

have less friction, more coöperation, and greater efficiency on the part of the working force.

It has been charged that piece rates rest upon a fallacy that permanent just rates can be predetermined. This is quite true, because conditions are always changing, and American genius is always active in devising new machines and methods. If the management goes to the expense of introducing new machines and new methods that greatly increase the output of workers without any increase of effort, the rates should be adjusted. The employees should be told frankly the situation, and then the majority will realize the justice and fairness of a reduction, and will not oppose it. Proper precautions should be taken in fixing rates, and then rate cutting would be necessary only in exceptional cases, and should take place only with the assistance of employees.

Rate cutting may be necessary in some cases.

A method of encouraging employees to increase efforts and become more interested in a business is profit sharing. This is giving employees, in addition to their regular wages, a certain per cent of the net profits of a business. Strictly speaking, it is not a method of wage payment, but many look upon it as such, and on that account, it is considered with the other methods. The practice is more prevalent in England than in the United States, but we have in this country many strong advocates of profit sharing as the best method for obtaining the coöperation of the working force. It is slowly increasing in favor, and several employers of large forces give it considerable credit in increasing the efficiency of their working forces.

Profit sharing.

Profits are divided between employees and employers, and at first sight, this seems equitable and just. The percentage of profits given to employees varies with individual cases, and may

Method of distributing profits.

be divided among all employees, or restricted to those of a certain time of service. The distribution may be equal, or based to a certain degree on salary received, or on years of service.

The distribution of profits to workers depends upon the existence of profits. Profits depend upon many elements, of which labor is only one, and the labor of a single individual a very small fraction. Errors of judgment in buying or in selling, excessive losses through bad debts, unforeseen happenings which affect the markets for goods produced or sold, bad management, losses through accidents or fires, are all costly, and may be sufficient to wipe out profits. Men who have worked faithfully throughout the year expecting at the end a good-sized bonus may be sorely disappointed to find no profits. There are so many elements affecting profits other than labor, that it is always more or less of a speculation as to the existence of profits at the end of a year, and if they will be sufficient to make the amount distributed attractive to individual workers.

Speculation as to existence of profits.

On the other hand, the greater part of profits is usually due to causes over which labor has no control. Improved methods of production, good management, capable executive heads and superintendents, shrewdness in buying so as to take advantage of favorable markets, and in selling to best advantage, carefulness in granting credit, good fortune in not having losses from fires or accidents, all assist in adding to profits. There are so many elements contributing to profits that it cannot be said that they are due to labor alone, and it is difficult to say what part is due to labor. The distribution of profits to workers, or what is known as profit sharing, should be looked upon as a gratuity and not a system of wage payment.

Causes for profits other than labor.

The degree to which the gratuity affects greater interest and coöperation on the part of a working force, is impossible to say.

There are many disadvantages in profit sharing, and these possess such force that the incentive is not sufficiently great to induce workers to put forth increased effort. The bonuses are more or less of a speculation, and come only after long intervals, usually a year. The distribution is not according to efficiency, but usually according to classes, the efficient and the inefficient in a class being rewarded alike, and by the same sum. A worker will not be likely to increase his efforts to increase output when his share will not be any more than that of the one who idles away his time. The share given to a worker does not depend upon his efficiency, but simply on the fact that he is a member of a class coming within the line of distribution.

Disadvantages in profit sharing.

Share does not depend on efficiency.

The remoteness and the probability of a reward are not sufficient inducements to make the average worker take greater interest in his work or increase his efforts to increase his output. To a certain degree profit sharing penalizes the efficient worker by making distribution alike to good and poor workers. Easy work is more attractive than hard with a possible reward to be shared with others many months in the future. Again, there is no way on the part of workers to know the extent of profits, and whether or not, the promise of the employer is carried out. Accounts are not audited, and the word of the employer must be taken. Frequently dissatisfaction arises, due to the fact that employees think that a correct accounting has not been made. Profit sharing is so remote in its reward, so impartial to efficiency and extra efforts, and based upon so many

Remoteness of reward.

No way to know extent of profits.

contingencies, that it gives little incentive to efficiency and extra efforts. It requires a more immediate and direct reward to arouse men to action.

The contract plan is a system of wage payment occasionally found in the United States and Great Britain. A certain rate is agreed upon for a job between the management and a contractor, who uses the shop equipment but hires his own labor. The difference between what he gets for his job and what it costs to get it done is his profit. The contract system is frequently used in the case of unskilled work for which laborers of a low type, usually foreigners, are employed and invariably results in slave-driving habits which will not be tolerated by American laborers. There is no knowledge of what the job will cost, and the price is fixed by higgling between the contractor and the management. Each uses his skill, the one to get as high a price as possible, and the other, as low as possible. With the average worker, the ordinary contract system will continue to lose favor, but there are various modified forms of it which may continue in practice and win favor for some time.

Contract system.

How it operates.

QUESTIONS

1. What is the relation between wages and efficiency?
2. What are the requisites for a proper wage system?
3. What are the various systems of pay?
4. What are the advantages and disadvantages of time wages?
5. In what way do time wages foster soldiering?
6. What are piece rates and when should they be used?
7. Account for the opposition of unions to piece rates.
8. What precautions should be taken in the installation of a piece-rate system?
9. In what way do piece rates foster soldiering?
10. Give the difference between the old system of piece-rate fixing and the new.

11. How may a just piece rate be established?
12. What are the duties of an employer in establishing proper piece rates?
13. What precautions should be taken to protect the health of workers under piece-rate systems?
14. What is the profit-sharing system? Mention different methods of profit sharing.
15. Give the advantages and disadvantages of profit sharing.

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CHAPTER XV

Scientific Piece-Rate Systems

Various systems of pay have during the last few years been devised to additionally reward men for increased efforts and greater output. The earliest method is the giving of premiums to men who perform their tasks in less than a certain allotted time. There are in practice many ways for deciding and awarding premiums, but the one which has reached the greatest favor in the United States and Great Britain is the Halsey premium system. This is named after its originator, Mr. F. A. Halsey, who, when he devised the system, was employed by the Rand Drill Company of Sherbrook, Quebec, Canada.

Halsey premium plan of wage payment.

A certain allotted time is allowed for the performance of a task, and is ascertained by a careful study of the records of the performances of average men in the past. Men are paid their regular time wage, regardless of what their output may be, and if they perform their tasks in time less than that allotted or standard, they receive a premium for the time saved. The premium depends upon doing the task in a shorter time than that of the recorded performance of the average man in the past. Men usually receive their pay in two envelopes, one containing the regular time wage and the other the premium earned during that time. It is optional with the men whether they take the premium or not, but it is very rarely refused. Suppose, for example, the time for a certain

How it operates.

task is ten hours and the pay thirty cents an hour. If a man performs the task in eight hours, he saves two hours. The full amount of the value of the time saved is not given, but a percentage varying from 30 to 50 per cent. The percentage varies in different shops and with different kinds of work. The value of the time saved is divided with the employer, as a reward for the extra wear and tear on the plant and equipment, and extra waste resulting from more rapid work. With the sharing of profit with the employer, there is not the likelihood of cutting rates. If the distribution for time saved is on the basis of 50 per cent, then the worker will receive for the task $8 \times .30$, $2.40, plus a premium of $\frac{1}{2}$ of .60 equals .30, or a total of $2.70 for eight hours' work, or approximately $3.37 instead of $3.00 for ten hours' work.

Wherever possible, all work is given a standard time which is printed on cards, as well as the percentage given for time saved. These are either given to the workers or they have access to them, so workers know when they receive a premium and how much. Daily records are kept of the units of work performed by each worker. Ascertaining the premium is a simple matter of bookkeeping. The timekeeper finds that for a week John Brown performs ten units of work. He looks at the standard time card and finds that the standard time for each unit is eight hours, and the rate per hour thirty cents. John Brown works ten hours a day and during the week performs eighty hours of work in sixty hours, and accordingly saves twenty hours. The week's wage of $18.00 is paid in the regular weekly pay envelope, and in a separate envelope is placed the premium earned during the week, which if the distribution is on the basis of 50 per cent, is $\frac{1}{2} \times 20 \times 30$, or $3.00.

Weekly payment.

The time allotted for a task is not based on scientific study, and no attempt is made to obtain standard conditions or standard methods. A worker is left to himself to devise and to find ways of shortening standard time. No limit is placed upon earnings. The management undertakes to keep each worker supplied with work during the working days, so that he may not be handicapped by waiting for new work. The serious problem under the Halsey system is fixing the standard time. If extreme care is not exercised, the time may be made too low and earnings are excessive; or too high, and then the earnings may be such that few earn premiums, and this takes away the incentive for work. The system with a fair standard of time encourages workers to put forth their best efforts to increase their output, and it further encourages them by making the reward immediate and substantial. Workers who do not do their best are not punished, as every one receives the daily wage. The Halsey system, with care in getting standard times so that cuts are not necessary, is a successful system of paying labor. No change is necessary to introduce the system, and the premium if substantial induces workers to put forth their best efforts. The records kept will show the men below the average. If they remain so for any length of time, and are not able to make the standard time, their places should be taken by others.

The ascertaining of standard time.

Precautions.

A modification of the Halsey premium system is that credited to James Rowan, a member of a prominent firm of engine builders of Glasgow, Scotland. The plan is known as the Rowan premium system. The standard time is obtained as in the Halsey system by a careful study of past records of average men. The time saved is converted into a percentage of the standard time, and this

Rowan premium system.

is the percentage of the regular pay that goes to the worker as his premium. The worker accordingly receives as a premium the percentage of his regular pay that the time saved is of the standard time. If, for example, the standard time for a unit of work is ten hours and the pay thirty cents an hour, and a worker does the work in eight hours, the time saved is two hours, or 20 per cent of the standard time. The premium is therefore 20 per cent of $8 \times .30$, or .48. It is no more difficult to record than the Halsey premium system. If John Brown during a week performs ten units of work, and the standard time for each unit is eight hours, therefore during the week of sixty working hours, he does the equivalent of eighty standard hours and saves twenty hours. The time saved is therefore 25 per cent of the standard time. If the regular pay is thirty cents per hour, the weekly wage equals $18.00 and the premium $4.50. A formula for finding the premium is $\frac{A - B}{A}$ equals premium, where A equals the standard time, and B the actual time consumed. From this formula one may see that under no circumstances can any worker more than double his regular daily wage. This system has met with considerable favor in England but little in the United States.

How it operates.

As a result of the movement for scientific investigation of operations, three new systems of pay have been introduced and have attracted considerable attention. Perhaps the most favored is that introduced by Mr. Gantt and sometimes called the Gantt bonus system. This is a combination of time and piece rates. Mr. Gantt places great stress upon the task and the time required for its performance. Best methods are ascertained for the performance of work and made standard. These are taught to

Gantt bonus system.

workers by competent instructors. The best machinery and equipment are provided and maintained in best repair, and provision is made for providing workers with proper tools and proper quantities of materials. Working conditions and environments most conducive to health and work are provided. Careful time studies and numerous experiments are made to ascertain the proper time for a task. The time allotted takes into consideration the conditions existing in a plant, necessary delays, and rest periods if such are given. When the workers are taught standard methods for performing tasks, and the plant is standardized, the men are paid on the bonus plan. The best methods and tools for performing work are carefully worked out and given to workers as instructions. A worker follows instructions, and if he accomplishes the task in the time allotted, he gets time wage and bonus. If he fails to do so, he gets his time wage, but is supposed to report to the superintendent that he has failed to accomplish the task in the allotted time. Inspection is made of the instructions, and if they are found to be correct, the worker is given further instruction, and if after several trials he cannot make the task in the time set, he is changed to another class of work.

How standard time is ascertained.

Instructions.

The time taken by the average worker is carefully ascertained. The average worker and not the most efficient is the one who is studied, and the one who is considered in allotting the time. The discovery of the average worker is not by guesswork, but is ascertained by careful tests and experiments. Mr. Gantt insists that guesswork in setting tasks should be eliminated. His ideal is where "the best expert available investigates the work, standardizes appliances and methods, and sets the

The average worker is the one to be studied.

task that involves utilizing them to their best efficiency." It stands to reason that if accuracy is to be attained, the use of the stop watch is indispensable. The methods adopted by Mr. Gantt eliminate guesswork, the great cause of mischief and trouble between employer and employee.

Elimination of guesswork.

Mr. Gantt realizes that precautions should be taken not to make the task too difficult or too easy. It should be possible with conditions, machines, and tools furnished, and by the average trained man in the time allotted. It is necessary to emphasize that it is the average trained man, because a man untrained may not accomplish the task in the time set, but the average trained man should. If the task is too difficult and only possible for the most efficient men to attain, it will not be conducive to increased efforts and will cause discontent. This defeats the purpose of the system. Again, if the task is too easy, earnings would be too large. The chief problem is fixing the task, and with careful study, experimenting, and time and motion studies, it is accurately and scientifically determined. After the task has been fixed and the time ascertained, the next important problem is fixing the rate. Mr. Gantt says that the task and the rate should be such as would make it possible for a competent workman to earn from 20 to 100 per cent more than day pay. There should be sufficient inducement for extra effort in order to obtain the best results.

Task not too difficult nor too easy.

Rate cutting, the cause of so much trouble in the ordinary piece-rate system, is eliminated because the Gantt system of establishing task and rate is the result of careful study and scientific investigation. There is no maximum limit placed upon the efficiency of any worker, and his reward is increased with his efficiency. There is

No maximum limit upon earnings.

no object in soldiering to prevent rate cutting, and soldiering is almost entirely prevented. If a man does not reach the standard after instruction, his instructor has to find out the cause, and if it is due to laziness or unwillingness to put forth effort, the man is changed to other work or discharged. If the fault is due to lack of instruction, it is the work of the instructor to take special pains to teach the worker patiently in the best methods until they are mastered. Where it is impossible for a man to learn best methods, he is changed to other work or discharged.

Soldiering eliminated.

Employers should remember that workers can do only a certain amount of work in a day without injurious results, no matter what the reward is. In fixing the rate, the employer should take this into account, and fix a rate where the desired inducement will be present without a worker working to the point of injurious fatigue. A worker should not be allowed to work at a pace that will impair health, because whatever impairs health, impairs efficiency and is a dollars-and-cents proposition to both employer and employee. An important problem is not to get a large output at the expense of health, but to get the largest possible output with the energy expended that will not impair health, and to reward the laborer as liberally as possible for his efforts. Any management which allows workers to become impaired in health will soon find itself seriously handicapped by an inefficient working force. The question is what amount of work can the average laborer perform without fatigue or impairing his health.

Health precautions.

Mr. Gantt does not advocate urging workers to the point of exhaustion, or to the point of injurious results, so as to undermine their health and devitalize them. This fallacious charge has so often been made. He real-

izes as well as any student of efficiency, that efficiency can only be obtained and maintained by a healthy working force, and whatever undermines health and causes dissatisfaction undermines efficiency. The increase in output and in wages claimed by Mr. Gantt for his system comes not from the expenditure of an extra amount of energy, sapping vitality and strength, but from other causes, chiefly those of converting a great amount of the wasted energy under the old methods into productive results, through providing best possible tools, machinery, methods, and working conditions.

Gantt system and health.

The worker who performs the task in the allotted time is given a bonus. At first, the bonus was fixed, and there was no inducement for a worker to do more than just sufficient to earn the bonus. This was later changed to paying the worker the bonus allowed for doing the work in the allotted time, plus an additional bonus equal to the percentage of the time saved. This gives an inducement for further effort, and is more satisfactory.

The bonus.

Workers who perform tasks in the allotted time are encouraged to make suggestions for better methods of performance. If on careful experimentation and testing, a suggestion proves that the average trained worker may perform the work in less than the standard time, the suggestion is adopted, the standard is changed, and the workers are instructed to do the work under the new change. The worker making the suggestion is rewarded. Mr. Gantt further rewards foremen for the men under them making bonuses. A bonus is given to the foreman for each man under him who performs his work in standard time, and a further bonus if all make the bonus. This gives an inducement for the foreman

Suggestions.

Reward for foremen.

to take special care to see if any men do not receive the bonus, and to devote his energies to bring them up to the standard, and earn the extra bonus.

How to obtain the co-operation of the workers.

The great essential for a satisfactory and efficient working of the Gantt system is the support and the coöperation of the working force. With justice and fairness on the part of the employer in fixing the task and the remuneration for the average trained worker, there is everything to gain and nothing to lose on the part of the working force with the introduction of this system. The employer should be open, frank, and just with his employees. He should explain in detail the working of the system, and show that its introduction will increase earnings, reward according to efficiency, and that overwork and overfatigue will not be necessary to earn a fair wage. With careful explanation and proper understanding of a proposed change, the average employee will be ready to follow the instructions necessary to carry out the change. This system may be used to exploit as well as other systems. The employer should expect to be just and to give a fair and just reward for labor. Employees, on the other hand, should be satisfied with a just reward.

Share of employees in fixing rates.

Employees should assist and be consulted in ascertaining task and time, and should likewise be consulted in fixing remuneration. They should be impressed with the fact that fairness and justice are what the employer is seeking, and that he is willing that his employees should give their assistance in ascertaining the proper task and its just remuneration. The success of the Gantt system depends upon fixing the task and its remuneration. The working force should be satisfied or they will not coöperate and the purpose of the system will not be obtained.

The coöperation of the working force in fixing task and remuneration works for harmony and the success of the system.

A second method of remuneration demanding scientific investigation of conditions and methods is the system devised by Mr. F. W. Taylor, heralded as the father of the widespread scientific management movement. Mr. Taylor's system is known as the differential piece-rate system. As under the Gantt system, every task is studied by experts, carefully analyzed into its simplest parts, and the best possible methods ascertained for its performance. Careful time studies are made of the performance of the task, and the necessary time for its performance obtained. The time allotted takes into consideration the conditions existing in a plant, necessary delays, and rest periods, if such are needed. Standardized conditions, best possible equipment, machinery and tools always in the best repair, the working conditions most conducive to health and work are requisites for the system. After the best methods are ascertained and made standard, the workers are instructed by competent instructors to perform the tasks in the standard way. Instruction cards are made out for each task, giving standard methods for performance, tools to be used, and directions to be followed. In every case, the worker follows closely the instructions laid down.

Differential piece-rate system.

Requisites.

Instruction cards.

The system punishes and rewards. If a worker does not perform his task in the given standard time, his rate of pay is lower than if he does. It offers for the same work, a higher piece rate for standard time and perfect work, and a lower rate for slower time. Mr. Taylor uses two different rates for the same task, but there is nothing to prevent the

The differential rate.

use of more than two. The differential scheme of Mr. Taylor allows a lower rate for not finishing on schedule time, but no increase in rate if finished in less than standard time. There is an inducement to reach standard time but none to produce in less than standard time. Mr. Taylor says that the task should be so difficult that only first-class men can perform it in standard time. If the task is so difficult that the average man in a class cannot perform it in the allotted time, the incentive to increased efficiency is restricted to a small number, and the system produces friction rather than an increase in efficiency. It should be possible for the average man to perform the task in the allotted time and get the higher rate. Men below a first-class man should be, according to Mr. Taylor, given additional instruction so that it will bring them up to the standard. If after careful instruction, this is impossible, they should be given other work. The purpose of Mr. Taylor's system may be easily defeated by making the task too difficult. This has been the cause of many failures of the system.

What is a first-class man?

Precaution in fixing task.

Mr. Taylor's differential rate works as follows: If after careful investigation it is found that two units of a certain kind of work can be done in an hour by a first-class man working under standard conditions, with best equipment and appliances, and trained in best methods, two pieces an hour are made the standard. If a man makes two pieces or more, he receives fifteen cents a piece, but if he does not, twelve cents. If he finishes four pieces in an hour, his pay is sixty cents, but the task is so difficult that such an increase is phenomenal and rarely occurs. If a man makes one and a half pieces an hour, his pay is only eighteen cents. Mr. Taylor's

The system in operation.

system is undoubtedly the most difficult to introduce and to maintain. It sounds well from a theoretical point of view, but is not nearly as practical as Mr. Gantt's or Mr. Halsey's. Mr. Gantt furnishes a regular time rate and Mr. Taylor does not. Mr. Gantt rewards all who make the task in the allotted time and does not punish those who do not — except if they cannot make it after further instructions, they are transferred or dismissed. Mr. Taylor punishes as well as rewards. If care is not taken, the punishment may be so severe that the antagonism which it arouses causes its failure. Mr. Taylor strongly emphasizes the fact that the task should be so difficult, that only first-class men can do it in standard time, and if care is not taken, the incentive may not be great enough to induce the average man to coöperate in increasing output. The Taylor system is especially adapted where the same kind of task is repeated day after day. Even here, if the task is made too difficult, so that the proper encouragement is not given, it is likely to be an absolute failure. The principle should be followed that the rate should be such as will allow an increase in wages of from 30 to 60 per cent to all who make standard time, and this should be possible to the average trained man in a plant. If these precautions are not taken, the chances of success are slight. To the impartial observer, it appears that the Gantt system will give all the desired results of the Taylor, will not meet with the same opposition, and will give all necessary incentives for increased efforts. The Gantt and Halsey systems have met with greater favor with employees and will continue to increase in favor.

Proper encouragement should be given.

The task idea with the bonus omitted has been adapted with success for day work. The amount of work which can be performed by the average man under existing con-

ditions is set as the task, and as soon as the task is completed the worker is allowed to go. If the task is not finished at quitting time, those who have not done so are not allowed to go until it is. The boss or superintendent is held responsible for quality, and frequent inspection is made to see that uniform quality of work is obtained.

Task idea in day work.

The last of the wage systems to be considered is the Emerson efficiency system. It was devised by Mr. Emerson, the well-known engineer and efficiency expert. Machines, tools, and factory conditions are standardized and put in the best possible condition. As with the Gantt and Taylor systems, standard times and motions for different tasks are determined by scientific investigation. Employees receive instruction cards, giving instructions as to best methods, tools, and the time the work should take. The standard time is ascertained and is the time which the average trained man takes to perform the task. This point should be emphasized, because if it were the best man of his class, few would reach standard time, and the motive for extra effort would be lost. When a man does the work in standard time, his bonus is 20 per cent, but the bonus starts when the work is performed in two thirds standard time. From two thirds standard to standard time, there is a rising scale until men become 100 per cent efficient, or do the work in standard time, when the bonus becomes 20 per cent. If a worker does the work in still less than standard time, he gets the bonus of 20 per cent plus the value of the time saved at the standard rate.

Emerson efficiency system.

Requisites.

Bonus scheme.

The practice is not to compute the bonus unit by unit of work, but on the sum of the work done during a bonus period, usually a month. Daily records are kept of each

man's performance. Each job or unit of work has standard time. The sum of the standard hours' work is found by adding the standard times for all jobs or units of work performed. The sum of the actual hours of work is known. By the comparison of the actual time with the standard, the efficiency percentage is ascertained. Suppose a man works twenty-six days of eight hours each, or two hundred and eight hours in a month, at a wage of forty cents per hour. The time wage for the month is $83.20. By adding the standard times of the units of work, it is found that this worker performs one hundred and eighty hours of standard work. His efficiency is $\frac{180}{208}$ of 100, or 86.5 per cent. There is a prepared table of percentages for bonuses, from performances in $66\frac{2}{3}$ per cent of standard time to 100 per cent. By looking over the bonus table, this percentage gives a bonus of 7 per cent. Therefore the bonus is 7 per cent of $83.20, or $5.82. If work is found defective, has to be done over and the fault lies with the worker, standard time is counted but once, and the efficiency of the man as well as that of the foreman diminishes. Foremen and bosses also receive bonuses. The average efficiency of his men gives the efficiency per cent of the boss. By comparison with the table of bonuses, the amount of the bonus is easily ascertained.

System in operation.

Foremen receive bonuses.

The Emerson system is used for ordinary piece work and for job work. Where the work consists in turning out like pieces of goods, it is simpler than in job work. Standard time is ascertained, and one set of instructions is given to each man, and he is to follow instructions. Workers are instructed in best methods until they form habits of work. Sometimes inducements are given to workers who turn out 100 per cent efficient work to

How to introduce a cut in standard time.

make suggestions for improvements. These are studied by experts in charge of standard time, and if a suggestion is accepted, a reward is given. If by new methods, devices, or machinery, standard time is reduced, before it is done, the workers are consulted and shown that by instruction in the new methods they are able to perform the task with the same effort and turn out the same amount of work as before, but in shorter time. Allowance is made for instruction, and if properly explained, and with fairness and justice on the part of the employer, the average worker will not object to a cut in standard time when it is shown that he is not the loser. New instructions are given, these are followed in place of the old, and workers are carefully instructed in their use. The efficiency and bonus percentages do not change.

How it works with job work.

In the case of job work, each job is carefully analyzed and planned before it is given to the workers. The experts in charge decide upon best methods, machines, and tools to use, and these as well as routeing are given on instruction cards. The standard times for the jobs are found by experts and given to the workers. The management insists that instructions are followed in all cases, and it remains for the management to keep the plant always equipped with standard machines, tools, and equipment.

Prerequisites in operating system.

As in previous cases, the quantity of output should not interfere with, or impair the health of the worker. The worker should be considered in fixing the standard time, and it should not be made for the most efficient man in a class, but for the average efficient trained man. If too high, the purpose of the system is lost, and antagonism in place of coöperation is obtained. With proper fixing of standard time, a liberal bonus, and the management

fulfilling its part in doing everything to assist the worker in increasing output, the system should prove satisfactory with ordinary piece or job work.

With all wage systems, where increased pay follows increased efforts, extreme precaution should be taken by the employer to see that quality is not impaired. Provision should be made in every case for proper inspection, and it should not be left to the workers themselves. Quality is an absolute necessity, and no system of wages should be allowed to interfere with turning out a product of the highest quality and grade.

Piece rates and quality.

The wage problem concerns two parties, the employer and the employee. Efficiency demands the harmonious coöperation of both for the success of the business enterprise. One requisite for this coöperation is the satisfactory solution of the wage problem. This demands more than the paying of wages or giving a share in the profits. The question is not so much the amount paid, but whether or not the wage paid is a fair and just one. Efficiency is impossible without satisfaction with wages paid. The determination of the method of payment and of the amount paid demands deliberation, tact, and liberality on the part of the employers, and judgment and reasonableness on the part of employees.

Importance of a satisfactory wage.

Many plants have several systems of payment. The character of the work and of the employees should be specially studied. A system of payment should be adopted which will give the greatest satisfaction and bring about the heartiest coöperation on the part of the working force. In one factory, one kind of payment may be best, and in another, another. It remains for the management to make a special study of conditions and adopt

Kind of wage system depends upon conditions.

that which will be just, and give satisfaction. The successful solution of the wage problem is so important in efficiency that an employer cannot afford to experiment, and should be cautious in determining the system of wage payment, the task, the time, and the remuneration, each of which should be based on knowledge and not on guesswork. The day of guesswork is past and that of knowledge is at hand. Every employer should learn the importance of knowledge and base the solution of his wage problem upon it.

QUESTIONS

1. What is the Halsey premium plan of wage payment? Give advantages and disadvantages.
2. What is the Rowan system? How does it operate?
3. Compare the Halsey scheme with the Rowan plan.
4. What is the Gantt bonus system? How does it operate?
5. What precautions should be taken in the introduction of the Gantt bonus system?
6. What are the advantages and disadvantages of the Gantt system?
7. How is the bonus given to foremen?
8. What part should employees take in fixing task, time, and rate?
9. What is the differential piece-rate system? Give its characteristics.
10. Compare the bonus system with the differential.
11. What are the advantages and disadvantages of the differential system?
12. What precautions should be taken in the installation of the differential system in the treatment of labor?
13. Show how the task idea may be applied to day work.
14. What is the Emerson efficiency system?
15. Compare the Emerson system with that of Taylor and that of Gantt.

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CHAPTER XVI

Organized Labor and Efficiency Methods

A TRADE union, as defined by Mr. John Mitchell, is an association of workmen who have agreed among themselves not to bargain individually with their employer or employers, but to agree to the terms of a collective or joint contract between the employer and the union. Employees as well as society in general have benefited as a result of trade unions. No one can deny that unions have been productive of an immense amount of good, but unions have not always been just and right in the wielding of their power. Unscrupulous leaders have often gained control, and wielded the power of unionism for personal aggrandizement or for revenge for fancied wrongs committed by employers. Trade unions should learn to avoid the unscrupulous, narrow-minded leaders, and trust their power in the hands of leaders of sound judgment only. If unions use precautions so that leadership is intrusted in the hands of men of character, they will gain far more in the end, and it will be a great advancement in bringing about a better understanding between employers and employees, and a realization of the fact that workers should coöperate and unite their interests with those of their employers, and not be antagonistic. All the demands of unions should be fair and just. Unions may be guilty of exploitation just the same as employers, and exploitation by either is unjust and should be avoided. Dealings between unions and

Trade union, its meaning.

Unscrupulous leaders.

Exploitation unjust.

employers should be reciprocally based upon fairness and justice.

The industrial progress made in the past has been through the elimination of work and not by making it. The same will be true of future industrial growth. Progress demands the constant invention of new and improved means and methods of production, and the accompanying saving of labor. The great industrial progress of the past century was directly due to the invention of labor-saving machines. The period of invention which gave to the world many labor-saving machines, and so completely revolutionized the industrial system, is known in history as the Industrial Revolution. We are in the dawn of a second industrial revolution which is also based upon labor-saving devices. The focus of attention is upon the human element in industry and not, as in the previous case, upon the mechanical. The aim in this labor-saving movement is to so direct human energy that the best possible results are obtained from the energy expended. The changes which will result from the saving of labor through better direction will be as important upon our industrial system as the previous era of labor-saving machines. The first industrial revolution proved very beneficial to society in general, and the second will eventually prove as beneficial as the former.

Progress depends upon the elimination of work.

The average worker is more or less suspicious of his employer, and this has been true since man began to work for man. A worker has a feeling that his employer will take every opportunity to increase his profits to the disadvantage of the worker. Sad to relate, history proves to us that during the eighteenth and nineteenth centuries, the worker was justified in being suspicious of every

Employees suspicious of employers.

innovation introduced by his employer. Employers as a whole are responsible for instilling into employees this feeling of suspicion of their actions. It is not the fault of the worker that he is against anything that is unwisely or thoughtlessly sprung upon him. The first thought is that it is for further exploitation, and when history proves that this is usually true, can you blame him? It may be said that even to-day, the wage earner is usually skeptical toward any new proposal and suspicious of any innovation. This attitude is always present with every laboring force, and is one which should be considered in the introduction of any change which affects workers. Failure is frequently due to the lack of its realization, and if not failure, considerable hindrance is put in the way of the smooth introduction of a change.

Reason for.

The attitude of suspicion and of doubt of the intention of the employer should first of all be changed to one of confidence and the belief that if a change is made, it is not for the exploitation of labor, but for its uplifting in one way or another. This can be acquired only, in any laboring force, by being open, frank, and just in dealing with labor, by taking labor into confidence in the case of a change, and by carefully explaining the reasons for the change and its effect upon labor. Such has not been the practice of employers in the past, and the result has been, in the introduction of changes, resistance, opposition, and even bitter struggle, often resulting in failure. Efficiency demands protection of labor and the abolition of exploitation in every form. It stands for fairness and justice in dealing with labor, and requires the taking of labor into confidence in all dealings of the management with labor. The realization of this is absolutely necessary to change the long-rooted

Feeling of confidence in employer.

How acquired.

attitude of suspicion into one of confidence, which is essential and necessary to obtain the coöperation of the laboring force, and an absolute essential for the successful introduction of efficiency methods.

Opposition to new machines.

For a century after the introduction of the factory system, whatever tended to increase output met with more or less strenuous opposition from the workers. Workers invariably believed that the benefits of improved machinery accrued to the employer, and not to the employee. During the last quarter of the nineteenth century, many unionists bitterly opposed the introduction of machinery, and refused to allow union men to operate machines. Coopers, iron workers, stonecutters, plumbers, and cigar makers followed this policy. During recent years, organized labor has gradually been forced to recognize the fact that the introduction of labor-saving machines is necessary for industrial progress, and that labor benefits thereby. A different attitude toward the introduction of improved machinery exists to-day from that which existed even a decade ago, because organized labor does not oppose generally the introduction of new labor-saving machines, but welcomes such changes. In England, the Lancashire unions encourage improvements in cotton factories, knowing that upon the prompt adoption of them depends the very life of the industry in which they are engaged.

Effects of new machines on labor.

Laborers should realize that the present supply of useful things is possible only with machinery, and without it, they would not be enjoying their present standard of living. They should also know that it is only by more and better machinery that the commodities now enjoyed can be increased and cheapened so as to give them

greater comforts. From the point of consumption, a greater blessing comes from increased output.

Many workers doubt if it would really benefit the working people to turn out a larger output than at present, and still believe that an increased output will throw men out of work. History shows that increase in output in any trade always results in more men being employed, and usually in an increase in wages. The cheapening of any article in common use almost immediately results in an increased demand for that article. Take the case of shoes. The use of intricate labor-saving machines for doing every element of the work which was formerly done by hand has resulted in the making of shoes at a much less cost than they were formerly made. As a result, shoes have greatly decreased in price, and have become so cheap that now almost every man, woman, and child in the working classes buys one or two pairs of shoes a year and wears them all the time, whereas formerly each worker could not afford more than one pair of shoes a year for himself, and his wife and children were forced to go barefooted six months of the year. The demand for shoes has so increased that there are more workers engaged in the shoe industry to-day than ever before. As a result of the increased output coming from the use of more improved machinery and better methods, workers are enjoying comforts of living which would have been impossible without them, and are not only enjoying higher wages but more of their number are employed than would have been if such improvements had not taken place. Yet even to-day, many unionists and workers may be found who still believe, as their fathers before them, that it is against their best interests for each man to turn out each day as much as possible.

Increased output beneficial to labor.

Concrete case of shoes.

The average worker does not realize that the more labor produces, the more it has. The greater the average output of the average individual in a particular trade, the greater will be the average wage earned in that trade. The worker contributes a certain share in production, and if he gets more than that share, he is exploiting some one else, but if he is not getting that share, he is being exploited. The wage which he receives is paid from the share he contributes. It stands to reason that the greater the share which the laborer produces, the greater will be his wage. This is invariably the case, as the history of wages proves. The greatest blessing to the laborer in his struggle for increased wages is to be able to increase his share of production. Every worker should realize that every machine, method, and device to increase the product of labor is a blessing to labor.

Wages depend on output.

The very same thing is true of the new efficiency movement which has proved true in the case of labor-saving machines. Efficiency increases output with the same amount of energy previously expended and the same time occupied. It allows the worker to increase his share in production, and consequently assures him a higher wage. Efficiency will bring to the door of the worker many comforts which he does not now enjoy. Workers should realize that efficiency methods are not subtle schemes on the part of employers to advance their interests at their expense. It took nearly a century and a half for workers to realize that improved machinery was for their good. The realization that increased output and improved machines work for improved standards of living and higher wages will soon convince workers that efficiency methods will work for the same end.

Efficiency consists of labor-saving devices.

One of the greatest fallacies believed by many union-

ists is that restricted output would benefit the working classes. This fallacy is the result of the erroneous belief that there is just so much work in the world, and the less one does the more there will be for others. It was long held as a unionist doctrine that if a worker worked too fast or too long hours, it would take employment away from others. Enlightened unionists to-day realize the fallacy of this doctrine, but it is still believed by many. In many cities, the plumbers' unions forbid the use of the bicycle in going from job to job because one can go more quickly than on the cars or by walking. A few years ago, the carpenters' union of Chicago declared that any member found guilty of excessive work and rushing on a job would be subject to a fine of five dollars. It is a common practice of union men even to-day to make it unpleasant for any member found hastening with his work or continuing work after quitting time. It has been a hard struggle to convince unionists that restricting output works to their disadvantage rather than to their benefit. This short-sighted policy must be blotted out, and unionists should be made to realize that all restrictions upon output, whether due to lack of sufficient incentive or other causes, inevitably lead to a reward commensurate with the output, and that in every trade wages received become ultimately proportionate to output.

Effect of restricted output on workers.

Methods of restriction.

During the nineteenth century, unions usually pursued the policy of increased wages and curtailed production, believing that it would improve the condition of labor. Little did they know that there is a close relation between wages and output. Workers in general were inspired to curtail output by the widespread delusion, that there will not be work for all if all work to their utmost. Beginning

Changed views of workers.

with this century, the fallacy of restriction of output began to dawn upon the more enlightened unionists, and their influence upon the laboring force in general has been to impress it upon an increasing number of workers. Every day the fallacy is being brought home to a greater number of workers, and the time is not far distant when the working force in general will hold up to ridicule what for many years was held as an absolute necessity in increasing wages and improving their condition.

Efficiency and restriction of output.

All who believe in the policy of restriction will oppose the efficiency movement. Efficiency demands the very opposite, the greatest possible increase in output without impairing the health of workers. The universal acceptance of the old belief of restriction of output, as a delusion detrimental to the interests of workers, will make workers the more easily realize that increased output coming from the various efficiency methods is for their benefit. This will break down the opposition which developed so strongly against the efficiency movement in its incipient stage. The fallacy of the restriction of output idea must be made plain to all workers because it is a strong factor working against the acceptance of efficiency methods as beneficial to workers. Restriction of output is antagonistic to efficiency. Efficiency, as a result of the rapid conversion of the workers from the restriction of output delusion, will have far less opposition to the introduction of its methods than was experienced in the introduction of labor-saving machines.

Efficiency and protection of workers.

Energy, skill, and dexterity are the worker's capital and should be adequately protected by law. Organized labor declares that under highly specialized conditions workers are frequently compelled to work at a speed which impairs their health and their efficiency. A prominent defender

of unionism declares that no industry has a right to more than that amount of the worker's energy which can normally be replaced by the food and the rest allowed him. Such an attitude of unions should be supported by every one. Speeding, overdriving, and sweating, as they impair health and efficiency, should be abolished. Speeding machinery at the expense of sapping the vitality of workers is one of the greatest crimes on humanity. Efficiency demands the conservation of the human element. It demands health and every possible precaution and care on the part of the management to maintain working conditions most conducive to health, and to take the very best care of workers. It further demands a careful study of the work to be performed, and of the workers so that workers will not work beyond their strength.

Efficiency stands for a pace which may be maintained day after day without impairing the health or the vitality of the workers. It is not obtained by driving or by speeding, but through the careful directing of energy, and having the worker perform his task with the best methods, amidst the best environments, and with the best conditions possible. It is not efficient to speed up temporarily, and overstrain, overfatigue and undermine the health of workers, but it is efficient to scientifically investigate conditions and workers, and to guide their energy so that the greatest possible results can be obtained from the amount of energy spent, but at the same time, the fact is borne in mind that the pace and the work should be such that workers can maintain their speed day after day without impairing their health. Efficiency prolongs the productive period of a man's life, and makes his productive period more productive by protecting him against fatigue, and everything which impairs his health. The

Methods of protecting workers.

efficiency movement from the standpoint of health is one of the greatest blessings which has befallen labor. The charges that efficiency stands for speeding, sweating, and overdriving are absolutely false, and are made by those who have an entirely wrong conception of what efficiency stands for. There never has been an industrial movement which promises so much for labor in general, organized or unorganized, as the efficiency movement.

The charge has been made that the efficiency movement means greater specialization of labor, and that this will make work more monotonous, demoralize the laboring class, and produce a class of workers of lower intelligence. Efficiency on the other hand demands a high degree of intelligence, provides for the careful training of workers, and chooses occupations for workers for which they are by nature best fitted. Efficiency demands careful training of the inefficient to make them efficient. It recognizes the need of an intellectual laboring force, and the providing of careful training and instruction in order to give skill and dexterity. Not only that, but it demands various ways of making the laborers more intellectual as free libraries, free classes, and lectures, and in so doing, gives the laborer an opportunity to extend his knowledge to a broader sphere so that it may be possible for him to make the most out of his occupation. Efficiency stands for the uplifting of labor, for making the inefficient efficient, and for giving the industrial system of to-day better trained, more intellectual, and better skilled workers.

Efficiency and intellectual development.

Some see in the efficiency movement a cause of alarm, claiming that it casts upon society an ever increasing army of unemployed. The inefficient and the old, they claim, will be dismissed without compunction, and this will entail an increasing burden upon society and cause

much suffering to the discharged workers. As already stated, efficiency endeavors to make efficient workers out of the inefficient through careful training. It recognizes permanency in service which is quite the opposite of a temporary speeding up, sapping the vitality of workers, and then dismissal. Efficiency demands the protection and care of the sick, and recognizes the fact that workers who through their lives have assisted in building up a business have a right to be protected when old age overtakes them. Efficiency strongly advocates sick benefits, and pensions to those who grow old through giving their best service to a business organization. All business men who believe in efficiency advocate that those who have spent their lives in building up a business should be cared for. Pension schemes have during the past few years made wonderful growth, and their growth will be still greater with the greater spread and more universal advance of efficiency methods. For safeguarding against inefficiency, and for the provision of protection for old age, the efficiency movement promises a great blessing to the laboring class as a whole.

Efficiency and the care of the aged workers.

Pensions.

Many unionists believe that the piece-rate system of rewarding labor is some arrangement to squeeze the worker into making him work for less wages. Unionists generally consider piece rate as an evil to be abolished whenever possible. Nevertheless, many successful unions operate by piece rate. There is a growing tendency to view piece rate with somewhat greater favor, as a proper system for rewarding labor according to its efficiency. The present widespread distrust of piece rate is due to the practices of employers in the past. Experience has taught workers that when wages exceed a certain amount, their piece rates are cut, so that

Opposition of unions to the piece rate.

Reasons.

they earn no more for working hard than they do for taking it easy. This is not the fault of the piece-rate system, but ignorance in the operation of the system. Rates are fixed by guess and no attempt made to find out what would be just, and no knowledge of what would be the increased output as a result of the introduction of the piece-rate system. With such a haphazard method of introduction, readjustment and rate cutting results, and trouble arises. The system should not be blamed but the ignorance of employers.

Proper piece rates benefit labor.

Efficiency methods demand that wherever possible the laborer should be paid according to piece rate, but instead of guess in ascertaining the task and the rate, scientific investigation is made, and as we have seen, a just and fair rate is ascertained. Knowledge takes the place of guess. Labor is not allowed to overtax its strength in work. All possible means are taken to find out the proper task and its fair and just remuneration. What is fairer than the rewarding of labor wherever possible according to its efficiency, and with a reward that is fair and just? With a bonus or premium, extreme care is taken to guarantee labor a fair and just reward, and, to the efficient, a greater reward based upon productivity. It matters not the scheme of payment for wages, the worker himself is carefully studied, and every precaution taken to conserve his health and strength. Increased wages are not the result of overtaxed, overtired, and overstrained muscles. With efficiency methods, good wages can be earned by the average worker without strain, overfatigue, and impairing health. Opposition to the piece-rate system of the efficiency movement has been chiefly due to a misconception of what efficiency stands for. As soon as workers know the demands of efficiency, and its precautions to guarantee labor its

fair and just remuneration, they will realize that the efficiency movement is ever protecting and looking out for their interests.

Mr. Mitchell states the view of organized labor when he declares that the destruction of the working men is the individual bargain, and that their salvation is the joint, united, or collective bargain. There are two forms of wage bargaining, individual and collective. If each worker makes a separate and independent bargain with his employer, the method is one of individual bargaining. If employees or a group of employees send representatives to bargain with the employer, and an agreement is reached which fixes the standard wage for each group or for each class of work, the method is collective bargaining. The ability to require collective bargaining is the chief aim of unionism, and is a right which every union man is very jealous in demanding and in protecting.

Forms of wage bargaining.

Individual.

Collective.

Collective bargaining is essential to guard the interests of labor; few to-day advocate its overthrow and the return to individual bargaining. It is an integral part of our industrial system, and its operation is necessary and essential for industrial growth and progress. Nearly all abuses and unjust conditions affecting workers have arisen where workers have not enjoyed this right for determining wages and conditions under which work is carried on. The efficiency movement in its demands for fairness and justice in the treatment of labor does not advocate the abolition of collective bargaining, but its continuance as a further guarantee for the protection of labor. A misconception of efficiency exists among employers as well as among employees. Some employers have declared that the efficiency movement would

Efficiency does not abolish collective bargaining.

abolish collective bargaining, would restore individual bargaining in all classes of labor and would at the same time gradually cause the disappearance of unions. Such employers do not know of what they are talking. The efficiency movement stands for the coöperation of labor working through unions and collective bargaining.

The unions should not be controlled by selfish narrow-minded leaders but by broad-minded, fair, and just men who work not for selfish motives but for the fair and just treatment of labor in their particular trades. Unionism has suffered more from the abuse of power by unprincipled, selfish, and ignorant leaders than from any other cause. Unionism, to accomplish the most good, has no place for such leaders, nor has the efficiency movement.

Union leaders.

Unions in general have opposed the premium and the bonus systems of paying labor, and there is no reason for such opposition. The task, its method of performance, the time and the remuneration allowed are not fixed except with the coöperation of the laboring force affected. Both employers and employees work in harmony in their effort to establish a fair task, just time, and fair remuneration. The premium or the bonus is fixed with the assistance of labor through its representatives. It is short-sightedness on the part of unions to oppose either scheme for remunerating efficiency because it is just that greater efficiency should be rewarded, and the premium or the bonus is a fair way of remuneration. Unions should bear in mind that the premium or the bonus is not earned at the expense of overstrain, fatigue, or impaired health. If this were so, it would increase inefficiency and defeat the very purpose of both premium and bonus schemes of rewarding labor. Success and the greatest benefit to labor come

No basis for opposition of unions to premium and bonus systems.

through unions and collective bargaining, but are based on justice and fairness in dealing with employers. Fairness and justice between the two great classes should be reciprocal. Efficiency demands such reciprocal relations, and only where such prevail, can coöperation and efficiency be found.

Efficiency demands conditions of work most conducive to health and to continuity of service. Such conditions are ascertained by careful and expert investigation, and with the coöperation of labor. In the past and at present, unions base their demands in the case of wages, conditions of work, and hours of work, upon guess. How much better it would be to follow the dictates of efficiency and base their demands upon knowledge. This recognition by unions would give us a new unionism accomplishing more for labor than the old, working in harmony with employers for industrial progress, and would confer benefits upon labor and society in general.

Union demands based on guess.

Mr. John Mitchell strikes a keynote when he declares that if the trade-union movement is permanently successful, it will be due to the compelling of constant invention of improved means and methods of production, and the continual saving of labor, and that trade-unionism should make labor valuable, compel employers to save it wherever possible, and make the competition among workers one of efficiency. With this declaration of the aims of unionism coming from its most distinguished and ablest member, can organized labor consistently oppose the efficiency movement? The opposition to efficiency methods will continue for years to come, and will be due to ignorance on the part of workers of what efficiency really means and its demands on labor. Until unionists are educated as to what unionism stands for, serious

Aims of unionism and efficiency not antagonistic.

opposition will arise to efficiency methods. A great need is education in the principles of unionism, in what efficiency methods stand for, and in what way labor will be affected as a body. As soon as union men know what unionism stands for, and what the efficiency movement means, they will realize that to follow consistently the principles of unionism they cannot oppose the efficiency movement.

Ignorance as to the meaning of efficiency.

There is urgent need of teaching employers what efficiency means and what it demands. Few employers really know what efficiency demands of them and of employees. As a result of this ignorance, many false views have been given as to the effects of efficiency methods upon labor. Fallacious effects are stated, and cause antagonism to arise between employer and employee, as, for example, many employers have declared that efficiency stands for the abolition of collective bargaining. This fallacious notion has caused no end of opposition from organized labor. A number of employers have said that efficiency stands for the abolition of unionism, and this has aroused many of the unions to stand at almost open arms against efficiency methods. The teaching of the fundamental principles of efficiency is essential to employers as well as employees, and when the principles are understood, each will realize that when efficiency methods are properly carried out, they confer benefits upon both, and it will be to the interest and advantage of each to hasten their adoption in every plant and enterprise.

The efficiency system is destined to become an integral part of our industrial system in the future. Mistakes will be made by employers in the installation of efficiency methods, and opposition will be made by misinformed unionists. Knowledge must take the place of ignorance in the conducting of business enterprises, and

efficient methods of doing work will sooner or later displace inefficient methods. The change may be retarded, but the constant pressure of economic forces will finally break down all opposition. Men working for themselves do not object to methods which will make their work easier and more productive. Why do wage-earners oppose efficiency? Efficiency adds to wages, to the comfort of workers, protects their health, saves them from fatigue, and prolongs their years of productivity. The opposition which exists to-day is the result of lack of knowledge of the principles underlying the efficiency movement. The dissemination of these principles is what is badly needed to break down this opposition, and will change the opposition into a fervent support of efficiency methods.

Efficiency system an integral part of our industrial system.

Efficiency is necessary for progress, and opposition to its methods is due to ignorance and suspicion rather than to observation of what efficiency will do. A large amount of opposition also comes from the remembrance of bitter experiences of the past. Teaching the laboring classes the general principles of unionism and of efficiency will clear away much of the opposition because it will be shown that unionists should support efficiency if they support their own principles. There is no basis for any opposition of organized labor to efficiency methods except ignorance, bad economic theory, and the remembrance of bitter experiences. Any system which lowers costs by eliminating unnecessary labor should be welcomed and encouraged. It is inefficiency which retards industrial progress. The converting of inefficiency into efficiency benefits labor, employers, and society in general. Theodore Roosevelt once declared that we have no higher duty than to promote the efficiency of the

Opposition to efficiency due to ignorance.

individual and that there is no surer road to the efficiency of the nation.

QUESTIONS

1. What is a trade union?
2. Show how society is benefited by unions.
3. What has brought about the present attitude of suspicion of many laboring men toward employers?
4. Account for the opposition of many unionists to new machines and new methods of production.
5. What is the fallacy of the restricted output theory?
6. Why are so many union people opposed to the piece-rate system? How may this opposition be overcome?
7. Show how proper piece rates benefit labor.
8. What are the different forms of wage bargaining? Why do unions place so much importance on collective bargaining?
9. Show that efficiency does not abolish collective bargaining.
10. Show that the aims of unionism and of efficiency are not antagonistic.
11. Show that much of the opposition of unionism is due to selfishness of union leaders.
12. What are the methods of protection of workers advocated in the efficiency movement?
13. What methods should be adopted by employers to gain the confidence of employees?
14. Show that progress depends upon the elimination of work.
15. Show that increased output is beneficial to labor.

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