

our theme is better understood and more widely taught than the other. When we have acquired the most perfect and well-balanced equipment of machinery, bought at right prices and installed correctly in proper buildings, well arranged, with ample, constant and economical power cheaply transmitted; when our stocksheds are filled with the right material conveniently located, and with proper cranes and other handling facilities; when light and heat are wisely applied; when gas, compressed air and electricity have done their perfect work; when shipping facilities are complete; when an accurate cost-accounting system is installed, and the best of salesmen are employed; then, if this be all, we have but entered on the road to efficiency.

In a college class of one hundred, perhaps five will be fine students, twenty-five may be good students, others ordinary, some poor. Then out of the same hundred some will have natural skill with their hands, others will be of the reflective type without manual facility; some will be imaginative, some artistic, some musical. These are facts that all know. These differences exist in any group of men, among the machinists or the molders, the carpenters or clerks. They may not be the same differences, but the variation in temperament and endowment is there. Some of these men are more fit for one kind of work in their own trade than another. Some of them respond more quickly to suggestion, to orders, to light, than others do. In some the hand responds to the brain quicker than in others. One can patiently stand watching a lathe all day; another would be in nervous distress at so doing. The point is that men are unlike—as unlike as the tools we use. Efficiency requires that the man shall be fitted to the work. One finds pleasure at a vise or in the deft, active movements of assembling work; another, more phlegmatic, rejoices to run a boring mill. Each tool to its use—this we understand. Each man to his best use—this we must learn. There are misfit stenographers as we know to our sorrow; so there are misfit machinists who might be draftsmen or steamfitters. You and I if we will have efficient shops must search our force for the work each can best do and fit him to it and if need be, instruct him patiently in it. That word "patiently" does a lot toward making things efficient. It means "step by step"—one step only at a time but one always following another. Step by step will end the longest journey. Step by step will climb the steepest hill. It was an old Roman rule "Never a step backward." It would be a good American rule—"Always a step forward." Remember, however, that while high-speed steel-cutting does very well high-speed man-working deals with different material.

Assume that it is the habit to make slightly sarcastic remarks to subordinates when for any reason they fail, and that words of praise are forgotten when they succeed. Are the laws of human nature going to operate for their efficiency in such cases? Some have perhaps resisted the idea of a shorter working day, with sincerity, indeed, believing it to be a matter of mere arithmetic that the shorter day must cost more for labor than the longer did. But talk some day with your family doctor and ask him what science teaches about fatigue. He will tell you that fatigue is the result of a definite poison, because the wastes in the human body from exertion have accumulated faster than the powers of nature can remove or replace them. It is no dream, but a commonplace fact known to physicians, that fatigue is a form of poison. We should not think that poisoned men could do good work, and yet the fact that men may be weary has possibly never occurred to us as a reason for shutting the shop down a half-hour sooner. Yet if by a shorter day men and women can go without exhaustion to their homes, their work upon the morrow will be better.

A great cement plant, with painful misgivings, caused by arithmetic, went from the ten-hour day to the eight-hour day without changing the wage. At the end of a year they were glad, for they were doing better than before. The same is true of a paper mill in New England and of a shipyard in Scotland; another in Massachusetts has now made the change. Men wonder why it is so, when it is quite in accord with the laws of the human body and mind that it should be so. Men who are innocent of precise knowledge of the human frame, have had strong opinions about the shorter working day, yet this, after all, is a question of exact knowledge of the human machine.

Suppose some group of manufacturers, resist-

ing the eight-hour day, had employed a commission of physicians to advise thereon, and these had reported that the ten-hour day was better for men, that the longer work was helpful to their bodies, and that a thorough study of the human frame showed that the greater exertion meant stronger men, and that fatigue was nothing of moment. Then the resistance of the manufacturers would have some scientific basis. But suppose, on the other hand, the fact to be that fatigue is a cumulative thing, that it is not always worked off, if it be excessive, in one night's rest, but that as a matter of fact it is a shortener of life and has the same definite action towards reducing the span of life that a planer has in finishing a casting. These are or are not facts, and they are the controlling facts, if they are facts at all. I suspect that our own ignorance of the laws of fatigue has held back our efficiency and that overtime has sometimes meant a temporary profit at a permanent loss.

Look for a moment at your human mechanisms with no more or no less careful thought than a shop superintendent gives to machine tools. This man here has eyes: delicate organs; under certain conditions they work well, under others they do not; continuous strain on them produces nervous trouble which affects the whole man adversely. Can you expect him if so affected to work efficiently in your shop? Yet are we as particular about eye-strain as about the conditions of the standard gauges in our tool room? The man has lungs—they need air. You would not run an air compressor without a fit supply for it—you would hardly permit foul gases to enter it. How about these lungs? You do not want grit and dust to get at polished surfaces of fine machines. Dust carries germs of disease, and these germs taken through the lungs endanger a man's health, and hence his producing power. Is dust allowed so to gather that many feet stir it up to be breathed over and over, or if not, is it so swept up during working hours that while this fool process goes on men are forced to breathe it whether they will or no? Ill health is a foe to efficiency as truly as intoxication. We are very particular often about the latter.

Financial success is no necessary evidence of efficiency, as the cases cited testify. It may come from circumstances that permit high selling prices, such as patent or trademark protection, and these high prices and the consequent profits may hide wasteful methods. There is a large concern paying unusual dividends in whose works a recent examination showed conditions that would cripple a house less favorably placed.

The truth is that a casual glance into two factories might seem to show both alike, whereas one was efficient and the other not; for the difference, in its essence, lies not so much in the outward appearance as in the inward life. Closer study would discover that in the efficient shop there were few wastes of time, effort or material; that the stops between operations were cut out; that no one was looking for tools and fixtures or wondering either what to do next or how to do it. There would be definite standards of working and a constant effort to reach them. There would be a spring and "go" in the men's movement that was neither haste nor hustle. The foremen would be leading and helping, neither pushing nor driving. The work would be exact but it would not be allowed to be exacting. Waste of men would be as sternly forbidden as waste of any other power. The efficient shop comes to be manned by picked men, through a natural process of selection, and these men ensure a productivity and a peace alike lucrative to master and workmen, and beneficial to their families and to the community.

Some days ago I read a statement in which a few millions of the capital stock of an industry were said to be for "good-will"—and we all know that the good-will thus mentioned has a real value. But whose good-will? You say, the good-will of the people who buy. But these people who buy are outside the shop—perhaps far away. They can not affect the efficiency of the plant, but in that plant are—let us say—500 or 1,000 men who not only can affect that efficiency, but do. How about their good-will? Has it ever been heard that the good-will of the operatives in a factory had a tangible business value? I wish to speak soberly and with care in saying that the idea forces itself more and more upon my mind that the good-will of the workers within has nearly, if not quite, as much value as the good-will of the buyers without, because if the good-will inside the shop is active there, the efficiency will be such that

the good-will outside is almost a matter of course.

We all know that team-work wins in baseball; that a lot of stars playing each for his own record will be beaten by players of less individual skill who pull together. Yet in commercial and industrial life we are slow to learn this lesson. In a great corporation, the purchasing department held up certain work because the specifications did not please them, and thus crippled a part of the selling force. In another case, personal politics abound within the corporation, and disappointed ambition acts as a clog on progress. In still a third case, personal antagonism keeps the heads of two departments so hostile that they do not speak to one another for long months. Some men cultivate what they seem to think the "dignity that doth hedge a king." One such did not wish his clerks to recognize him on the street. These things are expensive luxuries. So is it costly also to have discord between shop and office, to think the men in the works of different clay, whose sole privilege it is to follow office orders for the least pay at which their services can be had. A factory will never be efficient wherein a large part of the workmen are looking for another job, whether because of pay or conditions or tools or management.

For efficiency at its best is a mutual thing. We can not if we will impose it from above by arbitrary orders upon unwilling men, and to be real, efficiency must take in all the facts—not leave a part of them out. Doubtless there are men who would be amused to be told that the laws of psychology had business value. It was once arranged in a large store that the selling force, who had the habit of saying to each buyer—"Where shall we send this," should change their phrase and say instead—"Will you take this with you?" The result of this was a great reduction in the number of packages to be delivered, and a direct economy in the cost of the delivery department. Anyone familiar with the facts of suggestion will know that this is normal.

Sometimes rules are made that are very costly. In a French factory any outlay for tools or fixtures over \$25 was considered as a permanent addition to plant, and required the approval of the directors, who met four times yearly. The superintendent could not appear before them; he could only recommend in writing, and his suggestions were often ignored. Therefore it was that on an American boring mill made in this French plant, but one tool was used for an operation, instead of many, and that the product was less than one-tenth of what it is in this country on similar work.

On the other hand, when sound rules are made we ourselves should keep them. I went with a gentleman I will call Jones, since that was not his name, into the restaurant of his large establishment. Wishing to treat me to an ice-cream soda he said to a saleswoman: "Please get me two soda checks." She said with a pleasant smile and a blush: "You'll have to get those yourself, Mr. Jones." Hesitating a moment, he laughed, then rose and got them. When he had reseated himself he asked for the floor manager, to whom he said—"That's a good girl you have there. Keep your eye on her, for she will grow. She just had the courage to make me keep my own rule." Then he spoke to the girl when she served the soda, and thanked her for reminding him, said she did just right and that if she kept on that way she would do very well indeed. And in my presence he commended her very strongly for her obedience to rules even when he himself asked her to break them. He was an employer not cursed with the fatal disease called "big-head" but rather blessed with a broad mind.

I sometimes think that arithmetic is a curse to manufacturers—hiding from our eyes valuable things. One will say with great emphasis that two and two make four, which is true as far as it goes, though it does not go far; for when to two men in your shop you add two more, you do not necessarily double the work you get. You may more than double it—you may only add one-half to it; for arithmetic leaves quality out. Not only so, but it leaves out motive-power; and in dealing with men it is the motive-power and quality that is important. What matters it if the brain is keen and the hands skilled, if the spirit be unwilling? Motive-power is lacking. Or suppose that for some just discontent this motive-power is held back, who suffers? Assume that the common but ignorant habit of cutting piece-work rate prevails, and the men "soldier," who loses the more—you or they? I call the cutting of piece-work rates ignorant because it leaves out of