

Shop Management

Frederick Winslow Taylor

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Shop Management

By

Frederick Winslow Taylor

1911

Through his business in changing the methods of shop management, the writer has been brought into intimate contact over a period of years with the organization of manufacturing and industrial establishments, covering a large variety and range of product, and employing workmen in many of the leading trades.

In taking a broad view of the field of management, the two facts which appear most noteworthy are:

(a) What may be called the great unevenness, or lack of uniformity shown, even in our best run works, in the development of the several elements, which together constitute what is called the management.

(b) The lack of apparent relation between good shop management and the payment of dividends.

Although the day of trusts is here, still practically each of the component companies of the trusts was developed and built up largely through the energies and especial ability of some one or two men who were the master spirits in directing its growth. As a rule, this leader rose from a more or less humble position in one of the departments, say in the commercial or the manufacturing department, until he became the head of his particular section. Having shown especial ability in his line, he was for that reason made manager of the whole establishment.

In examining the organization of works of this class, it will frequently be found that the management of the particular department in which this master spirit has grown up towers to a high point of excellence, his success having been due to a thorough knowledge of all of the smallest requirements of his section, obtained through personal contact, and the gradual training of the men under him to their maximum efficiency.

The remaining departments, in which this man has had but little personal experience, will often present equally glaring examples of inefficiency. And this, mainly because management is not yet looked upon as an art, with laws as exact, and as clearly defined, for instance, as the fundamental principles of engineering, which demand long and careful thought and study. Management is still looked upon as a question of men, the old view being that if you have the right man the methods can be safely left to him.

The following, while rather an extreme case, may still be considered as a fairly typical illustration of the unevenness of management. It became desirable to combine two rival manufactories of chemicals. The great obstacle to this combination, however, and one which for several years had proved insurmountable was that the two men, each of whom occupied the position of owner and manager of his company, thoroughly despised

one another. One of these men had risen to the top of his works through the office at the commercial end, and the other had come up from a workman in the factory. Each one was sure that the other was a fool, if not worse. When they were finally combined it was found that each was right in his judgment of the other in a certain way. A comparison of their books showed that the manufacturer was producing his chemicals more than forty per cent cheaper than his rival, while the business man made up the difference by insisting on maintaining the highest quality, and by his superiority in selling, buying, and the management of the commercial side of the business. A combination of the two, however, finally resulted in mutual respect, and saving the forty per cent formerly lost by each man.

The second fact that has struck the writer as most noteworthy is that there is no apparent relation in many, if not most cases, between good shop management and the success or failure of the company, many unsuccessful companies having good shop management while the reverse is true of many which pay large dividends.

We, however, who are primarily interested in the shop, are apt to forget that success, instead of hinging upon shop management, depends in many cases mainly upon other elements, namely,--the location of the company, its financial strength and ability, the efficiency of its business and sales departments, its engineering ability, the superiority of its plant and equipment, or the protection afforded either by patents, combination, location or other partial monopoly.

And even in those cases in which the efficiency of shop management might play an important part it must be remembered that for success no company need be better organized than its competitors.

The most severe trial to which any system can be subjected is that of a business which is in keen competition over a large territory, and in which the labor cost of production forms a large element of the expense, and it is in such establishments that one would naturally expect to find the best type of management.

Yet it is an interesting fact that in several of the largest and most important classes of industries in this country shop practice is still twenty to thirty years behind what might be called modern management. Not only is no attempt made by them to do tonnage or piece work, but the oldest of old-fashioned day work is still in vogue under which one overworked foreman manages the men. The workmen in these shops are still herded in classes, all of those in a class being paid the same wages, regardless of their respective efficiency.

In these industries, however, although they are keenly competitive, the poor type of shop management does not interfere with dividends, since they are in this respect all equally bad.

It would appear, therefore, that as an index to the quality of shop management the earning of dividends is but a poor guide.

Any one who has the opportunity and takes the time to study the subject will see that neither good nor bad management is confined to any one system or type. He will find a few instances of good management containing all of the elements necessary for permanent prosperity for both employers and men under ordinary day work, the task system, piece work, contract work, the premium plan, the bonus system and the

differential rate; and he will find a very much larger number of instances of bad management under these systems containing as they do the elements which lead to discord and ultimate loss and trouble for both sides.

If neither the prosperity of the company nor any particular type or system furnishes an index to proper management, what then is the touchstone which indicates good or bad management?

The art of management has been defined, "as knowing exactly what you want men to do, and then seeing that they do it in the best and cheapest way." No concise definition can fully describe an art, but the relations between employers and men form without question the most important part of this art. In considering the subject, therefore, until this part of the problem has been fully discussed, the other phases of the art may be left in the background.

The progress of many types of management is punctuated by a series of disputes, disagreements and compromises between employers and men, and each side spends more than a considerable portion of its time thinking and talking over the injustice which it receives at the hands of the other. All such types are out of the question, and need not be considered.

It is safe to say that no system or scheme of management should be considered which does not in the long run give satisfaction to both employer and employee, which does not make it apparent that their best interests are mutual, and which does not bring about such thorough and hearty cooperation that they can pull together instead of apart. It cannot be said that this condition has as yet been at all generally recognized as the necessary foundation for good management. On the contrary, it is still quite generally regarded as a fact by both sides that in many of the most vital matters the best interests of employers are necessarily opposed to those of the men. In fact, the two elements which we will all agree are most wanted on the one hand by the men and on the other hand by the employers are generally looked upon as antagonistic.

What the workmen want from their employers beyond anything else is high wages, and what employers want from their workmen most of all is a low labor cost of manufacture.

These two conditions are not diametrically opposed to one another as would appear at first glance. On the contrary, they can be made to go together in all classes of work, without exception, and in the writer's judgment the existence or absence of these two elements forms the best index to either good or bad management.

This book is written mainly with the object of advocating high wages and low labor cost as the foundation of the best management, of pointing out the general principles which render it possible to maintain these conditions even under the most trying circumstances, and of indicating the various steps which the writer thinks should be taken in changing from a poor system to a better type of management.

The condition of high wages and low labor cost is far from being accepted either by the average manager or the average workman as a practical working basis. It is safe to say that the majority of employers have a feeling of satisfaction when their workmen are

receiving lower wages than those of their competitors. On the other hand very many workmen feel contented if they find themselves doing the same amount of work per day as other similar workmen do and yet are getting more pay for it. Employers and workmen alike should look upon both of these conditions with apprehension, as either of them are sure, in the long run, to lead to trouble and loss for both parties.

Through unusual personal influence and energy, or more frequently through especial conditions which are but temporary, such as dull times when there is a surplus of labor, a superintendent may succeed in getting men to work extra hard for ordinary wages. After the men, however, realize that this is the case and an opportunity comes for them to change these conditions, in their reaction against what they believe unjust treatment they are almost sure to lean so far in the other direction as to do an equally great injustice to their employer.

On the other hand, the men who use the opportunity offered by a scarcity of labor to exact wages higher than the average of their class, without doing more than the average work in return, are merely laying up trouble for themselves in the long run. They grow accustomed to a high rate of living and expenditure, and when the inevitable turn comes and they are either thrown out of employment or forced to accept low wages, they are the losers by the whole transaction.

The only condition which contains the elements of stability and permanent satisfaction is that in which both employer and employees are doing as well or better than their competitors are likely to do, and this in nine cases out of ten means high wages and low labor cost, and both parties should be equally anxious for these conditions to prevail. With them the employer can hold his own with his competitors at all times and secure sufficient work to keep his men busy even in dull times. Without them both parties may do well enough in busy times, but both parties are likely to suffer when work becomes scarce.

The possibility of coupling high wages with a low labor cost rests mainly upon the enormous difference between the amount of work which a first-class man can do under favorable circumstances and the work which is actually done by the average man.

That there is a difference between the average and the first-class man is known to all employers, but that the first-class man can do in most cases from two to four times as much as is done by an average man is known to but few, and is fully realized only by those who have made a thorough and scientific study of the possibilities of men.

The writer has found this enormous difference between the first-class and average man to exist in all of the trades and branches of labor which he has investigated, and these cover a large field, as he, together with several of his friends, has been engaged with more than usual opportunities for thirty years past in carefully and systematically studying this subject.

The difference in the output of first-class and average men is as little realized by the workmen as by their employers. The first-class men know that they can do more work than the average, but they have rarely made any careful study of the matter. And the writer has over and over again found them utterly incredulous when he informed them, after close observation and study, how much they were able to do. In fact, in most cases when first told that they are able to do two or three times as

much as they have done they take it as a joke and will not believe that one is in earnest.

It must be distinctly understood that in referring to the possibilities of a first-class man the writer does not mean what he can do when on a spurt or when he is over-exerting himself, but what a good man can keep up for a long term of years without injury to his health. It is a pace under which men become happier and thrive.

The second and equally interesting fact upon which the possibility of coupling high wages with low labor cost rests, is that first-class men are not only willing but glad to work at their maximum speed, providing they are paid from 30 to 100 per cent more than the average of their trade.

The exact percentage by which the wages must be increased in order to make them work to their maximum is not a subject to be theorized over, settled by boards of directors sitting in solemn conclave, nor voted upon by trades unions. It is a fact inherent in human nature and has only been determined through the slow and difficult process of trial and error.

The writer has found, for example, after making many mistakes above and below the proper mark, that to get the maximum output for ordinary shop work requiring neither especial brains, very close application, skill, nor extra hard work, such, for instance, as the more ordinary kinds of routine machine shop work, it is necessary to pay about 30 per cent more than the average. For ordinary day labor requiring little brains or special skill, but calling for strength, severe bodily exertion, and fatigue, it is necessary to pay from 50 per cent to 60 per cent above the average. For work requiring especial skill or brains, coupled with close application, but without severe bodily exertion, such as the more difficult and delicate machinist's work, from 70 per cent to 80 per cent beyond the average. And for work requiring skill, brains, close application, strength, and severe bodily exertion, such, for instance, as that involved in operating a well run steam hammer doing miscellaneous work, from 80 per cent to 100 per cent beyond the average.

There are plenty of good men ready to do their best for the above percentages of increase, but if the endeavor is made to get the right men to work at this maximum for less than the above increase, it will be found that most of them will prefer their old rate of speed with the lower pay. After trying the high speed piece work for a while they will one after another throw up their jobs and return to the old day work conditions. Men will not work at their best unless assured a good liberal increase, which must be permanent.

It is the writer's judgment, on the other hand, that for their own good it is as important that workmen should not be very much over-paid, as it is that they should not be under-paid. If over-paid, many will work irregularly and tend to become more or less shiftless, extravagant, arid dissipated. It does not do for most men to get rich too fast. The writer's observation, however, would lead him to the conclusion that most men tend to become more instead of less thrifty when they receive the proper increase for an extra hard day's work, as, for example, the percentages of increase referred to above. They live rather better, begin to save money, become more sober, and work more steadily. And this certainly forms one of the strongest reasons for advocating this type of management.

In referring to high wages and low labor cost as fundamental in good management, the writer is most desirous not to be misunderstood.

By high wages he means wages which are high only with relation to the average of the class to which the man belongs and which are paid only to those who do much more or better work than the average of their class. He would not for an instant advocate the use of a high-priced tradesman to do the work which could be done by a trained laborer or a lower-priced man. No one would think of using a fine trotter to draw a grocery wagon nor a Percheron to do the work of a little mule. No more should a mechanic be allowed to do work for which a trained laborer can be used, and the writer goes so far as to say that almost any job that is repeated over and over again, however great skill and dexterity it may require, providing there is enough of it to occupy a man throughout a considerable part of the year, should be done by a trained laborer and not by a mechanic. A man with only the intelligence of an average laborer can be taught to do the most difficult and delicate work if it is repeated enough times; and his lower mental caliber renders him more fit than the mechanic to stand the monotony of repetition. It would seem to be the duty of employers, therefore, both in their own interest and in that of their employees, to see that each workman is given as far as possible the highest class of work for which his brains and physique fit him. A man, however, whose mental caliber and education do not fit him to become a good mechanic (and that grade of man is the one referred to as belonging to the "laboring class"), when he is trained to do some few especial jobs, which were formerly done by mechanics, should not expect to be paid the wages of a mechanic. He should get more than the average laborer, but less than a mechanic; thus insuring high wages to the workman, and low labor cost to the employer, and in this way making it most apparent to both that their interests are mutual.

To summarize, then, what the aim in each establishment should be:

(a) That each workman should be given as far as possible the highest grade of work for which his ability and physique fit him.

(b) That each workman should be called upon to turn out the maximum amount of work which a first-rate man of his class can do and thrive.

(c) That each workman, when he works at the best pace of a first-class man, should be paid from 30 per cent to 100 per cent according to the nature of the work which he does, beyond the average of his class.

And this means high wages and a low labor cost. These conditions not only serve the best interests of the employer, but they tend to raise each workman to the highest level which he is fitted to attain by making him use his best faculties, forcing him to become and remain ambitious and energetic, and giving him sufficient pay to live better than in the past.

Under these conditions the writer has seen many first-class men developed who otherwise would have remained second or third class all of their lives.

Is not the presence or absence of these conditions the best indication that any system of management is either well or badly applied? And in considering the relative merits of different types of management, is not that system the best which will establish these conditions with the

greatest certainty, precision, and speed?

In comparing the management of manufacturing and engineering companies by this standard, it is surprising to see how far they fall short. Few of those which are best organized have attained even approximately the maximum output of first-class men.

Many of them are paying much higher prices per piece than are required to secure the maximum product while owing to a bad system, lack of exact knowledge of the time required to do work, and mutual suspicion and misunderstanding between employers and men, the output per man is so small that the men receive little if any more than average wages, both sides being evidently the losers thereby. The chief causes which produce this loss to both parties are: First (and by far the most important), the profound ignorance of employers and their foremen as to the time in which various kinds of work should be done, and this ignorance is shared largely by the workmen. Second: The indifference of the employers and their ignorance as to the proper system of management to adopt and the method of applying it, and further their indifference as to the individual character, worth, and welfare of their men. On the part of the men the greatest obstacle to the attainment of this standard is the slow pace which they adopt, or the loafing or "soldiering," marking time, as it is called.

This loafing or soldiering proceeds from two causes. First, from the natural instinct and tendency of men to take it easy, which may be called natural soldiering. Second, from more intricate second thought and reasoning caused by their relations with other men, which may be called systematic soldiering. There is no question that the tendency of the average man (in all walks of life) is toward working at a slow, easy gait, and that it is only after a good deal of thought and observation on his part or as a result of example, conscience, or external pressure that he takes a more rapid pace.

There are, of course, men of unusual energy, vitality, and ambition who naturally choose the fastest gait, set up their own standards, and who will work hard, even though it may be against their best interests. But these few uncommon men only serve by affording a contrast to emphasize the tendency of the average.

This common tendency to "take it easy" is greatly increased by bringing a number of men together on similar work and at a uniform standard rate of pay by the day.

Under this plan the better men gradually but surely slow down their gait to that of the poorest and least efficient. When a naturally energetic man works for a few days beside a lazy one, the logic of the situation is unanswerable: "Why should I work hard when that lazy fellow gets the same pay that I do and does only half as much work?"

A careful time study of men working under these conditions will disclose facts which are ludicrous as well as pitiable.

To illustrate: The writer has timed a naturally energetic workman who, while going and coming from work, would walk at a speed of from three to four miles per hour, and not infrequently trot home after a day's work. On arriving at his work he would immediately slow down to a speed of about one mile an hour. When, for example, wheeling a loaded wheelbarrow he would go at a good fast pace even up hill in order to be as short a

time as possible under load, and immediately on the return walk slow down to a mile an hour, improving every opportunity for delay short of actually sitting down. In order to be sure not to do more than his lazy neighbor he would actually tire himself in his effort to go slow.

These men were working under a foreman of good reputation and one highly thought of by his employer who, when his attention was called to this state of things, answered: "Well, I can keep them from sitting down, but the devil can't make them get a move on while they are at work."

The natural laziness of men is serious, but by far the greatest evil from which both workmen and employers are suffering is the systematic soldiering which is almost universal under all of the ordinary schemes of management and which results from a careful study on the part of the workmen of what they think will promote their best interests.

The writer was much interested recently to hear one small but experienced golf caddy boy of twelve explaining to a green caddy who had shown special energy and interest the necessity of going slow and lagging behind his man when he came up to the ball, showing him that since they were paid by the hour, the faster they went the less money they got, and finally telling him that if he went too fast the other boys would give him a licking.

This represents a type of systematic soldiering which is not, however, very serious, since it is done with the knowledge of the employer, who can quite easily break it up if he wishes.

The greater part of the systematic soldiering, however, is done by the men with the deliberate object of keeping their employers ignorant of how fast work can be done.

So universal is soldiering for this purpose, that hardly a competent workman can be found in a large establishment, whether he works by the day or on piece work, contract work or under any of the ordinary systems of compensating labor, who does not devote a considerable part of his time to studying just how slowly he can work and still convince his employer that he is going at a good pace.

The causes for this are, briefly, that practically all employers determine upon a maximum sum which they feel it is right for each of their classes of employees to earn per day, whether their men work by the day or piece.

Each workman soon finds out about what this figure is for his particular case, and he also realizes that when his employer is convinced that a man is capable of doing more work than he has done, he will find sooner or later some way of compelling him to do it with little or no increase of pay.

Employers derive their knowledge of how much of a given class of work can be done in a day from either their own experience, which has frequently grown hazy with age, from casual and unsystematic observation of their men, or at best from records which are kept, showing, the quickest time in which each job has been done. In many cases the employer will feel almost certain that a given job can be done faster than it has been, but he rarely cares to take the drastic measures necessary to force men to do it in the quickest time, unless he has an actual record, proving conclusively how fast the work can be done.

It evidently becomes for each man's interest, then, to see that no job is done faster than it has been in the past. The younger and less experienced men are taught this by their elders, and all possible persuasion and social pressure is brought to bear upon the greedy and selfish men to keep them from making new records which result in temporarily increasing their wages, while all those who come after them are made to work harder for the same old pay.

Under the best day work of the ordinary type, when accurate records are kept of the amount of work done by each man and of his efficiency, and when each man's wages are raised as he improves, and those who fail to rise to a certain standard are discharged and a fresh supply of carefully selected men are given work in their places, both the natural loafing and systematic soldiering can be largely broken up. This can be done, however, only when the men are thoroughly convinced that there is no intention of establishing piece work even in the remote future, and it is next to impossible to make men believe this when the work is of such a nature that they believe piece work to be practicable. In most cases their fear of making a record which will be used as a basis for piece work will cause them to soldier as much as they dare.

It is, however, under piece work that the art of systematic soldiering is thoroughly developed. After a workman has had the price per piece of the work he is doing lowered two or three times as a result of his having worked harder and increased his output, he is likely to entirely lose sight of his employer's side of the case and to become imbued with a grim determination to have no more cuts if soldiering can prevent it. Unfortunately for the character of the workman, soldiering involves a deliberate attempt to mislead and deceive his employer, and thus upright and straight-forward workmen are compelled to become more or less hypocritical. The employer is soon looked upon as an antagonist, if not as an enemy, and the mutual confidence which should exist between a leader and his men, the enthusiasm, the feeling that they are all working for the same end and will share in the results, is entirely lacking.

The feeling of antagonism under the ordinary piecework system becomes in many cases so marked on the part of the men that any proposition made by their employers, however reasonable, is looked upon with suspicion. Soldiering becomes such a fixed habit that men will frequently take pains to restrict the product of machines which they are running when even a large increase in output would involve no more work on their part.

On work which is repeated over and over again and the volume of which is sufficient to permit it, the plan of making a contract with a competent workman to do a certain class of work and allowing him to employ his own men subject to strict limitations, is successful.

As a rule, the fewer the men employed by the contractor and the smaller the variety of the work, the greater will be the success under the contract system, the reason for this being that the contractor, under the spur of financial necessity, makes personally so close a study of the quickest time in which the work can be done that soldiering on the part of his men becomes difficult and the best of them teach laborers or lower-priced helpers to do the work formerly done by mechanics.

The objections to the contract system are that the machine tools used by

the contractor are apt to deteriorate rapidly, his chief interest being to get a large output, whether the tools are properly cared for or not, and that through the ignorance and inexperience of the contractor in handling men, his employees are frequently unjustly treated.

These disadvantages are, however, more than counterbalanced by the comparative absence of soldiering on the part of the men.

The greatest objection to this system is the soldiering which the contractor himself does in many cases, so as to secure a good price for his next contract.

It is not at all unusual for a contractor to restrict the output of his own men and to refuse to adopt improvements in machines, appliances, or methods while in the midst of a contract, knowing that his next contract price will be lowered in direct proportion to the profits which he has made and the improvements introduced.

Under the contract system, however, the relations between employers and men are much more agreeable and normal than under piece work, and it is to be regretted that owing to the nature of the work done in most shops this system is not more generally applicable.

The writer quotes as follows from his paper on "A Piece Rate System," read in 1895, before The American Society of Mechanical Engineers:

"Cooperation, or profit sharing, has entered the mind of every student of the subject as one of the possible and most attractive solutions of the problem; and there have been certain instances, both in England and France, of at least a partial success of cooperative experiments.

"So far as I know, however, these trials have been made either in small towns, remote from the manufacturing centers, or in industries which in many respects are not subject to ordinary manufacturing conditions.

"Cooperative experiments have failed, and, I think, are generally destined to fail, for several reasons, the first and most important of which is, that no form of cooperation has yet been devised in which each individual is allowed free scope for his personal ambition. Personal ambition always has been and will remain a more powerful incentive to exertion than a desire for the general welfare. The few misplaced drones, who do the loafing and share equally in the profits with the rest, under cooperation are sure to drag the better men down toward their level.

"The second and almost equally strong reason for failure lies in the remoteness of the reward. The average workman (I don't say all men) cannot look forward to a profit which is six months or a year away. The nice time which they are sure to have today, if they take things easily, proves more attractive than hard work, with a possible reward to be shared with others six months later.

"Other and formidable difficulties in the path of cooperation are, the equitable division of the profits, and the fact that, while workmen are always ready to share the profits, they are neither able nor willing to share the losses. Further than this, in many cases, it is neither right nor just that they should share either in the profits or the losses, since these may be due in great part to causes entirely beyond their influence or control, and to which they do not contribute."

Of all the ordinary systems of management in use (in which no accurate scientific study of the time problem is undertaken, and no carefully measured tasks are assigned to the men which must be accomplished in a given time) the best is the plan fundamentally originated by Mr. Henry R. Towne, and improved and made practical by Mr. F. A. Halsey. This plan is described in papers read by Mr. Towne before The American Society of Mechanical Engineers in 1886, and by Mr. Halsey in 1891, and has since been criticized and ably defended in a series of articles appearing in the "American Machinist."

The Towne-Halsey plan consists in recording the quickest time in which a job has been done, and fixing this as a standard. If the workman succeeds in doing the job in a shorter time, he is still paid his same wages per hour for the time he works on the job, and in addition is given a premium for having worked faster, consisting of from one-quarter to one-half the difference between the wages earned and the wages originally paid when the job was done in standard time. Mr. Halsey recommends the payment of one third of the difference as the best premium for most cases. The difference between this system and ordinary piece work is that the workman on piece work gets the whole of the difference between the actual time of a job and the standard time, while under the Towne-Halsey plan he gets only a fraction of this difference.

It is not unusual to hear the Towne-Halsey plan referred to as practically the same as piece work. This is far from the truth, for while the difference between the two does not appear to a casual observer to be great, and the general principles of the two seem to be the same, still we all know that success or failure in many cases hinges upon small differences.

In the writer's judgment, the Towne-Halsey plan is a great invention, and, like many other great inventions, its value lies in its simplicity.

This plan has already been successfully adopted by a large number of establishments, and has resulted in giving higher wages to many workmen, accompanied by a lower labor cost to the employer, and at the same time materially improving their relations by lessening the feeling of antagonism between the two.

This system is successful because it diminishes soldiering, and this rests entirely upon the fact that since the workman only receives say one-third of the increase in pay that he would get under corresponding conditions on piece work, there is not the same temptation for the employer to cut prices.

After this system has been in operation for a year or two, if no cuts in prices have been made, the tendency of the men to soldier on that portion of the work which is being done under the system is diminished, although it does not entirely cease. On the other hand, the tendency of the men to soldier on new work which is started, and on such portions as are still done on day work, is even greater under the Towne-Halsey plan than under piece work.

To illustrate: Workmen, like the rest of mankind, are more strongly influenced by object lessons than by theories. The effect on men of such an object lesson as the following will be apparent. Suppose that two men, named respectively Smart and Honest, are at work by the day and receive the same pay, say 20 cents per hour. Each of these men is given

a new piece of work which could be done in one hour. Smart does his job in four hours (and it is by no means unusual for men to soldier to this extent). Honest does his in one and one-half hours.

Now, when these two jobs start on this basis under the Towne-Halsey plan and are ultimately done in one hour each, Smart receives for his job 20 cents per hour + a premium of 20 cents = a total of 40 cents. Honest receives for his job 20 cents per hour + a premium of 3 1/8 cents = a total of 23 1/8 cents.

Most of the men in the shop will follow the example of Smart rather than that of Honest and will "soldier" to the extent of three or four hundred per cent if allowed to do so. The Towne-Halsey system shares with ordinary piece work then, the greatest evil of the latter, namely that its very foundation rests upon deceit, and under both of these systems there is necessarily, as we have seen, a great lack of justice and equality in the starting-point of different jobs.

Some of the rates will have resulted from records obtained when a first-class man was working close to his maximum speed, while others will be based on the performance of a poor man at one-third or one quarter speed.

The injustice of the very foundation of the system is thus forced upon the workman every day of his life, and no man, however kindly disposed he may be toward his employer, can fail to resent this and be seriously influenced by it in his work. These systems are, therefore, of necessity slow and irregular in their operation in reducing costs. They "drift" gradually toward an increased output, but under them the attainment of the maximum output of a first-class man is almost impossible.

Objection has been made to the use of the word "drifting" in this connection. It is used absolutely without any intention of slurring the Towne-Halsey system or in the least detracting from its true merit.

It appears to me, however, that "drifting" very accurately describes it, for the reason that the management, having turned over the entire control of the speed problem to the men, the latter being influenced by their prejudices and whims, drift sometimes in one direction and sometimes in another; but on the whole, sooner or later, under the stimulus of the premium, move toward a higher rate of speed. This drifting, accompanied as it is by the irregularity and uncertainty both as to the final result which will be attained and as to how long it will take to reach this end, is in marked contrast to the distinct goal which is always kept in plain sight of both parties under task management, and the clear-cut directions which leave no doubt as to the means which are to be employed nor the time in which the work must be done; and these elements constitute the fundamental difference between the two systems. Mr. Halsey, in objecting to the use of the word "drifting" as describing his system, has referred to the use of his system in England in connection with a "rate-fixing" or planning department, and quotes as follows from his paper to show that he contemplated control of the speed of the work by the management:

"On contract work undertaken for the first time the method is the same except that the premium is based on the estimated time for the execution of the work."

In making this claim Mr. Halsey appears to have entirely lost sight of

the real essence of the two plans. It is task management which is in use in England, not the Towne-Halsey system; and in the above quotation Mr. Halsey describes not his system but a type of task management, in which the men are paid a premium for carrying out the directions given them by the management.

There is no doubt that there is more or less confusion in the minds of many of those who have read about the task management and the Towne-Halsey system. This extends also to those who are actually using and working under these systems. This is practically true in England, where in some cases task management is actually being used under the name of the "Premium Plan." It would therefore seem desirable to indicate once again and in a little different way the essential difference between the two.

The one element which the Towne-Halsey system and task management have in common is that both recognize the all-important fact that workmen cannot be induced to work extra hard without receiving extra pay. Under both systems the men who succeed are daily and automatically, as it were, paid an extra premium. The payment of this daily premium forms such a characteristic feature in both systems, and so radically differentiates these systems from those which were in use before, that people are apt to look upon this one element as the essence of both systems and so fail to recognize the more important, underlying principles upon which the success of each of them is based.

In their essence, with the one exception of the payment of a daily premium, the systems stand at the two opposite extremes in the field of management; and it is owing to the distinctly radical, though opposite, positions taken by them that each one owes its success; and it seems to me a matter of importance that this should be understood. In any executive work which involves the cooperation of two different men or parties, where both parties have anything like equal power or voice in its direction, there is almost sure to be a certain amount of bickering, quarreling, and vacillation, and the success of the enterprise suffers accordingly. If, however, either one of the parties has the entire direction, the enterprise will progress consistently and probably harmoniously, even although the wrong one of the two parties may be in control.

Broadly speaking, in the field of management there are two parties--the superintendents, etc., on one side and the men on the other, and the main questions at issue are the speed and accuracy with which the work shall be done. Up to the time that task management was introduced in the Midvale Steel Works, it can be fairly said that under the old systems of management the men and the management had about equal weight in deciding how fast the work should be done. Shop records showing the quickest time in which each job had been done and more or less shrewd guessing being the means on which the management depended for bargaining with and coercing the men; and deliberate soldiering for the purpose of misinforming the management being the weapon used by the men in self-defense. Under the old system the incentive was entirely lacking which is needed to induce men to cooperate heartily with the management in increasing the speed with which work is turned out. It is chiefly due, under the old systems, to this divided control of the speed with which the work shall be done that such an amount of bickering, quarreling, and often hard feeling exists between the two sides.

The essence of task management lies in the fact that the control of the

speed problem rests entirely with the management; and, on the other hand, the true strength of the Towne-Halsey system rests upon the fact that under it the question of speed is settled entirely by the men without interference on the part of the management. Thus in both cases, though from diametrically opposite causes, there is undivided control, and this is the chief element needed for harmony.

The writer has seen many jobs successfully nursed in several of our large and well managed establishments under these drifting systems, for a term of ten to fifteen years, at from one-third to one-quarter speed. The workmen, in the meanwhile, apparently enjoyed the confidence of their employers, and in many cases the employers not only suspected the deceit, but felt quite sure of it.

The great defect, then, common to all the ordinary systems of management (including the Towne-Halsey system, the best of this class) is that their starting-point, their very foundation, rests upon ignorance and deceit, and that throughout their whole course in the one element which is most vital both to employer and workmen, namely, the speed at which work is done, they are allowed to drift instead of being intelligently directed and controlled.

The writer has found, through an experience of thirty years, covering a large variety in manufactures, as well as in the building trades, structural and engineering work, that it is not only practicable but comparatively easy to obtain, through a systematic and scientific time study, exact information as to how much of any given kind of work either a first-class or an average man can do in a day, and with this information as a foundation, he has over and over again seen the fact demonstrated that workmen of all classes are not only willing, but glad to give up all idea of soldiering, and devote all of their energies to turning out the maximum work possible, providing they are sure of a suitable permanent reward.

With accurate time knowledge as a basis, surprisingly large results can be obtained under any scheme of management from day work up; there is no question that even ordinary day work resting upon this foundation will give greater satisfaction than any of the systems in common use, standing as they do upon soldiering as a basis.

To many of the readers of this book both the fundamental objects to be aimed at, namely, high wages with low labor cost, and the means advocated by the writer for attaining this end; namely, accurate time study, will appear so theoretical and so far outside of the range of their personal observation and experience that it would seem desirable, before proceeding farther, to give a brief illustration of what has been accomplished in this line.

The writer chooses from among a large variety of trades to which these principles have been applied, the yard labor handling raw materials in the works of the Bethlehem Steel Company at South Bethlehem, Pa., not because the results attained there have been greater than in many other instances, but because the case is so elementary that the results are evidently due to no other cause than thorough time study as a basis, followed by the application of a few simple principles with which all of us are familiar.

In almost all of the other more complicated cases the large increase in output is due partly to the actual physical changes, either in the

machines or small tools and appliances, which a preliminary time study almost always shows to be necessary, so that for purposes of illustration the simple case chosen is the better, although the gain made in the more complicated cases is none the less legitimately due to the system.

Up to the spring of the year 1899, all of the materials in the yard of the Bethlehem Steel Company had been handled by gangs of men working by the day, and under the foremanship of men who had themselves formerly worked at similar work as laborers. Their management was about as good as the average of similar work, although it was bad all of the men being paid the ruling wages of laborers in this section of the country, namely, \$1.15 per day, the only means of encouraging or disciplining them being either talking to them or discharging them; occasionally, however, a man was selected from among these men and given a better class of work with slightly higher wages in some of the companies' shops, and this had the effect of slightly stimulating them. From four to six hundred men were employed on this class of work throughout the year.

The work of these men consisted mainly of unloading from railway cars and shoveling on to piles, and from these piles again loading as required, the raw materials used in running three blast furnaces and seven large open-hearth furnaces, such as ore of various kinds, varying from fine, gravelly ore to that which comes in large lumps, coke, limestone, special pig, sand, etc., unloading hard and soft coal for boilers gas-producers, etc., and also for storage and again loading the stored coal as required for use, loading the pig-iron produced at the furnaces for shipment, for storage, and for local use, and handling billets, etc., produced by the rolling mills. The work covered a large variety as laboring work goes, and it was not usual to keep a man continuously at the same class of work.

Before undertaking the management of these men, the writer was informed that they were steady workers, but slow and phlegmatic, and that nothing would induce them to work fast.

The first step was to place an intelligent, college-educated man in charge of progress in this line. This man had not before handled this class of labor, although he understood managing workmen. He was not familiar with the methods pursued by the writer, but was soon taught the art of determining how much work a first-class man can do in a day. This was done by timing with a stop watch a first-class man while he was working fast. The best way to do this, in fact almost the only way in which the timing can be done with certainty, is to divide the man's work into its elements and time each element separately. For example, in the case of a man loading pig-iron on to a car, the elements should be: (a) picking up the pig from the ground or pile (time in hundredths of a minute); (b) walking with it on a level (time per foot walked); (c) walking with it up an incline to car (time per foot walked); (d) throwing the pig down (time in hundredths of a minute), or laying it on a pile (time in hundredths of a minute); (e) walking back empty to get a load (time per foot walked).

In case of important elements which were to enter into a number of rates, a large number of observations were taken when practicable on different first-class men, and at different times, and they were averaged.

The most difficult elements to time and decide upon in this, as in most cases, are the percentage of the day required for rest, and the time to allow for accidental or unavoidable delays.

In the case of the yard labor at Bethlehem, each class of work was studied as above, each element being timed separately, and, in addition, a record was kept in many cases of the total amount of work done by the man in a day. The record of the gross work of the man (who is being timed) is, in most cases, not necessary after the observer is skilled in his work. As the Bethlehem time observer was new to this work, the gross time was useful in checking his detailed observations and so gradually educating him and giving him confidence in the new methods.

The writer had so many other duties that his personal help was confined to teaching the proper methods and approving the details of the various changes which were in all cases outlined in written reports before being carried out.

As soon as a careful study had been made of the time elements entering into one class of work, a single first-class workman was picked out and started on ordinary piece work on this job. His task required him to do between three and one-half and four times as much work in a day as had been done in the past on an average.

Between twelve and thirteen tons of pig-iron per man had been carried from a pile on the ground, up an inclined plank, and loaded on to a gondola car by the average pig-iron handler while working by the day. The men in doing this work had worked in gangs of from five to twenty men.

The man selected from one of these gangs to make the first start under the writer's system was called upon to load on piece work from forty-five to forty-eight tons (2,240 lbs. each) per day.

He regarded this task as an entirely fair one, and earned on an average, from the start, \$1.85 per day, which was 60 per cent more than he had been paid by the day. This man happened to be considerably lighter than the average good workman at this class of work. He weighed about 130 pounds. He proved however, to be especially well suited to this job, and was kept at it steadily throughout the time that the writer was in Bethlehem, and some years later was still at the same work.

Being the first piece work started in the works, it excited considerable opposition, both on the part of the workmen and of several of the leading men in the town, their opposition being based mainly on the old fallacy that if piece work proved successful a great many men would be thrown out of work, and that thereby not only the workmen but the whole town would suffer.

One after another of the new men who were started singly on this job were either persuaded or intimidated into giving it up. In many cases they were given other work by those interested in preventing piece work, at wages higher than the ruling wages. In the meantime, however, the first man who started on the work earned steadily \$1.85 per day, and this object lesson gradually wore out the concerted opposition, which ceased rather suddenly after about two months. From this time on there was no difficulty in getting plenty of good men who were anxious to start on piece work, and the difficulty lay in making with sufficient rapidity the accurate time study of the elementary operations or "unit

times" which forms the foundation of this kind of piece work.

Throughout the introduction of piece work, when after a thorough time study a new section of the work was started, one man only was put on each new job, and not more than one man was allowed to work at it until he had demonstrated that the task set was a fair one by earning an average of \$1.85 per day. After a few sections of the work had been started in this way, the complaint on the part of the better workmen was that they were not allowed to go on to piece work fast enough. It required about two years to transfer practically all of the yard labor from day to piece work. And the larger part of the transfer was made during the last six months of this time.

As stated above, the greater part of the time was taken up in studying "unit times," and this time study was greatly delayed by having successively the two leading men