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One of the marked advantages of scientific management lies in its freedom from strikes. The writer has never been opposed by a strike, although he has been engaged for a great part of his time since 1883 in introducing this type of management in different parts of the country and in a great variety of industries. The only case of which the writer can think in which a strike under this system might be unavoidable would be that in which most of the employees were members of a labor union, and of a union whose rules were so inflexible and whose members were so stubborn that they were unwilling to try any other system, even though it assured them larger wages than their own. The writer has seen, however, several times after the introduction of this system, the members of labor unions who were working under it leave the union in large numbers because they found that they could do better under the operation of the system than under the laws of the union.

Schmidt and Scientific Management

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A railroad switch was run out into the field, right along the edge of the piles of pig iron. An inclined plank was placed against the side of a car, and each man picked up from his pile a pig of iron weighing about 92 pounds, walked up the inclined plank and dropped it on the end of the car.

We found that this gang were loading on the average about $12\frac{1}{2}$ long tons per man per day. We were surprised to find, after studying the matter, that a first-class pig-iron handler ought to handle between 47 and 48 long tons per day, instead of $12\frac{1}{2}$ tons. This task seemed to us so very large that we were obliged to go over our work several times before we were absolutely sure that we were right. Once we were sure, however, that 47 tons was a proper day's work for a first-class pig-iron handler, the task which faced us as managers under the modern scientific plan was clearly before us. It was our duty to see that the 80,000 tons of pig iron was loaded on to the cars at the rate of 47 tons per man per day, in place of $12\frac{1}{2}$ tons, at which rate the work was then being done. And it was further our duty to see that this work was done without bringing on a strike among the men, without any quarrel with the men, and to see that the men were happier and better contented when loading at the new rate of 47 tons than they were when loading at the old rate of $12\frac{1}{2}$ tons.

Our first step was the scientific selection of the workman. In dealing with workmen under this type of management, it is an inflexible rule to talk to and deal with only one man at a time, since each workman has his own special abilities and limitations, and since we are not dealing with men in masses, but are trying to develop each individual man to his highest state of efficiency and prosperity. Our first step was to find the proper workman to begin with. We therefore carefully watched and studied these 75 men for three or four days, at the end of which time we had picked out four men who appeared to be physically able to handle pig iron at the rate of 47 tons per

day. A careful study was then made of each of these men. We looked up their history as far back as practicable and thorough inquiries were made as to the character, habits, and the ambition of each of them. Finally we selected one from among the four as the most likely man to start with. He was a little Pennsylvania Dutchman who had been observed to trot back home for a mile or so after his work in the evening, about as fresh as he was when he came trotting down to work in the morning. We found that upon wages of \$1.15 a day he had succeeded in buying a small plot of ground, and that he was engaged in putting up the walls of a little house for himself in the morning before starting to work and at night after leaving. He also had the reputation of being exceedingly "close" that is, of placing a very high value on a dollar. As one man whom we talked to about him said, "A penny looks about the size of a cart-wheel to him." This man we will call Schmidt.

The task before us, then, narrowed itself down to getting Schmidt to handle 47 tons of pig iron per day and making him glad to do it. This was done as follows. Schmidt was called out from among the gang of pig-iron handlers and talked to somewhat in this way:

"Schmidt, are you a high-priced man?"

"Vell, I don't know vat you mean."

"Oh yes, you do. What I want to know is whether you are a high-priced man or not."

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"Oh, come now, you answer my questions. What I want to find out is whether you are a high-priced man or one of these cheap fellows here. What I want to find out is whether you want to earn \$1.85 a day or whether you are satisfied with \$1.15, just the same as all those cheap fellows are getting."

"Did I vant \$1.85 a day? Vas dot a high-priced man? Vell, yes, I vas a high-priced man."

"Oh, you're aggravating me. Of course you want \$1.85 a day--every one wants it! You know perfectly well that that has very little to do with your being a high-priced man. For goodness sake answer my questions, and don't waste any more of my time. Now come over here. You see that pile of pig iron?"

"Yes."

"You see that car?"

"Yes."

"Well, if you are a high-priced man, you will load that pig iron on that car tomorrow for \$1.85. Now do wake up and answer my question. Tell me whether you are a high-priced man or not."

"Vell--did I got \$1.85 for loading dot pig iron on dot car tomorrow?"

"Yes, of course you do, and you get \$1.85 for loading a pile like that every day right through the year. That is what a high-priced man does, and you know it just as well as I do."

"Vell, dot's all right. I could load dot pig iron on the car tomorrow for \$1.85, and I get it every day, don't I?"

"Certainly you do--certainly you do."

"Vell, den, I vas a high-priced man."

"Now, hold on, hold on. You know just as well as I do that a high-priced man has to do exactly as he's told from morning till night. You have seen this man here before, haven't you?"

"No, I never saw him."

"Well, if you are a high-priced man, you will do exactly as this man tells you tomorrow, from morning till night. When he tells you to pick up a pig and walk, you pick it up and you walk, and when he tells you to sit down and rest, you sit down. You do that right straight through the day. And what's more, no back talk. Now a high-priced man does just what he's told to do, and no back talk. Do you understand that? When this man tells you to walk, you walk; when he tells you to sit down, you sit down, and you don't talk back at him. Now you come on to work here tomorrow morning and I'll know before night whether you are really a high-priced man or not."

This seems to be rather rough talk. And indeed it would be if applied to an educated mechanic, or even an intelligent laborer. With a man of the mentally sluggish type of Schmidt it is appropriate and not unkind, since it is effective in fixing his attention on the high wages he wants and away from what, if it were called to his attention, he probably would consider impossibly hard work.

What would Schmidt's answer be if he were talked to in a manner which is usual under the management of "initiative and incentive"? say, as follows:

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What do you think Schmidt's answer would be to this?

Schmidt started to work, and all day long, and at regular intervals, was told by the man who stood over him with a watch, "Now pick up a pig and walk. Now sit down and rest. Now walk--now rest," etc. He worked when he was told to work, and rested when he was told to rest, and at half-past five in the afternoon had his $47\frac{1}{2}$ tons loaded on the car. And he practically never failed to work at this pace and do the task that was set him during the three years that the writer was at Bethlehem. And throughout this time he averaged a little more than \$1.85 per day, whereas before he had never received over \$1.15 per day, which was the ruling rate of wages at that time in Bethlehem. That is, he received 60 per cent higher wages than were paid to other men who were not working on task work. One man after another was picked out and trained to handle pig iron at the rate of $47\frac{1}{2}$ tons per day until all of the pig iron was handled at this rate, and the men were receiving 60 per cent more wages than over workmen around them.

The writer has given above a brief description of three of the four elements which constitute the essence of scientific management: first, the careful selection of the workman, and, second and third, the method of first inducing and then training and helping the workman to work according to the scientific method. Nothing has as yet been said about the science of handling pig iron. The writer trusts, however, that before leaving this illustration the reader will be thoroughly convinced that there is a science of handling pig iron, and further that this science amounts to so much that the man who is suited to handle pig iron cannot possibly understand it, nor even work in accordance with the laws of this science, without the help of those who are over him. ...

What is Scientific Management?

I want to tell you as briefly as I can what Scientific Management is. It certainly is not what most people think it to be. It is not a lot of efficiency expedients. It is not the printing and ruling of a lot of pieces of blank paper and spreading them by the ton about the country. It is not any particular system of paying men. It is not a system of figuring costs of manufacture. It is none of the

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ordinary devices which unfortunately are going by the name of Scientific Management. It may in its essence be said in the present state of industry to involve a complete mental revolution, both on the part of the management and of the men. It is a complete change in the mental attitude of both sides towards their respective duties and toward their opponents. That is what constitutes Scientific Management.

There are now, I don't know exactly how many, but at a fair estimate I should say 50,000 men working under Scientific Management. These men are on the average turning out twice as much work per day as they formerly did.

As a result of this increase in output, their employers are profiting by a very material reduction of the cost of whatever they are making. This diminution of cost has enabled them, on the one hand, to earn a larger profit and, on the other hand, in most cases to somewhat reduce the selling price of the goods which they make. And let me tell you, gentlemen, that in all cases of Scientific Management, in all cases of increase in efficiency, the general public takes almost the whole of the increase in the end. We consumers are the beneficiaries of the increase in output. The history of the matter shows that neither the manufacturer nor the workman through any long period gets very much benefit from increased output except as the whole world takes it. The world takes that benefit and is perfectly entitled to it. Now the workman: what have these 50,000 men who are working under Scientific Management got out of it? On an average those men are earning from 30 per cent to 100 per cent higher wages than they did, and I look upon that as perhaps the smallest part of their gain. Those workmen, to my mind, have gained something far greater than that; in place of looking at their employers with suspicion, in place of looking upon them as at least tactical enemies, although they may be personal friends, they look upon their employers as the very best friends they have in the world. I look at that as the greatest gain that can come under Scientific Management, far greater than any increase in wages. The harmony that exists between employer and employee under Scientific Management is the greatest gain that can come to both.

That is mere assertion, but in proof of the fact that this harmony does exist between the workman and the employers under Scientific Management, I wish to make the statement that until perhaps three months ago there never had been a single strike of men employed under Scientific Management. Even during the difficult period of changing from the old management to the new, that difficult and dangerous period when a mental revolution was taking place and causing readjustment of attitude towards their own duties and towards

the duties of the management, there had never been a strike until this year. This system has been applied to a great number and variety of industries, and the fact that until recently there had never been a single strike is ample proof that these friendly relations actually exist between both sides. That, perhaps, is the most important characteristic of Scientific Management.

In order to explain what Scientific Management is, I want to present first what I believe all of you gentlemen will recognize as the best of the older types of management and to contrast with that type the principles of Scientific Management. If you have an establishment with 500 or 1,000 men, there will be, perhaps, twenty different trades represented. Each of the workmen in those trades has learned practically all he knows from watching other workmen. When he was a young apprentice he would watch a journeyman, imitate his motions, and finally perhaps the journeyman would get interested and turn around and give the boy a little friendly advice; and thus the boy, merely by personal observation and a very small amount of incidental teaching, learned the trade. In just this way every operative in every one of those twenty different trades in your establishment has learned his trade; it has come to him just as it did in the Middle Ages, from mouth to mouth, or rather from hand to eye, not through teaching. Nevertheless, in spite of the old traditional way of learning a trade, this knowledge is the greatest asset that a workman possesses. It is his capital.

The manufacturer who has any intelligence must realize that his first duty should be to obtain the initiative of all these tradesmen who are working under him, to obtain their hard work, their good will, their ingenuity, their determination to treat their employer's business as if it were their own. And in this connection I wish to strain the meaning of the word "initiative" to indicate all of those good qualities. It should be the first object of a good employer to obtain the real initiative of his workmen.

There is an occasional employer, possibly one in a hundred, who deliberately sets out to give his employees something better in the way of wages and opportunities than his competitors give their men. These very few rare employers who are farther sighted than the average, deliberately set out to give their men a special incentive, and in return they expect, and they frequently get, from their men an initiative which other employers do not dream of getting. However, this initiative is generally spasmodic. Workmen come to have confidence in their superintendent, or in their foreman, and in the honor of their company; and when the superintendent tells them that he intends to have them

earn more money than other employers are paying their workmen, they believe it and respond in a generous way. But I want to tell what happens almost always, even in such a case; some new workman comes in for whom they have respect; he tells the men the usual story; that the same promise had been made to him or to friends of his in some other shop by a foreman, a square man, but it happened that that foreman died, or was replaced, or the board of directors did just what I outlined at the beginning, and then those promises went to the winds, and the men found themselves working harder than before at the old wages. When a man comes in among them and tells them that story the men think, "Perhaps that is so--it is likely to happen in our shop; I guess we had better not work too hard," and they slow down. Finally, as they think it over and realize that their foreman can be relied on, they say, "This fellow is all right, he can't treat us like that, we have got to be square," and eventually they will work hard again. But under the old system the initiative of the workmen is obtained spasmodically at best; it is rarely obtained to the fullest extent.

The first advantage which Scientific Management has over the older type is that under Scientific Management the initiative of the workmen is obtained with absolute regularity; their hard work, good-will and ingenuity are obtained with absolute regularity. I refer of course only to those cases in which Scientific Management is actually introduced and in operation, not where it has just been started; but in practically all cases where Scientific Management has been once established the initiative of the workmen is obtained with absolute regularity. That alone is a marked advantage of Scientific Management over the best of the other types.

This is not, however, the greatest advantage of Scientific Management. This is the lesser of two advantages. The greater advantage comes from the new and unheard-of burdens and duties which are assumed by the men in the management, duties which have never been performed before by the men on the management side. These new duties are divided into four large classes which have been, properly or improperly, called "The Four Principles of Scientific Management."

1. The first of these four great duties which are undertaken by the management is to deliberately gather in all of the rule-of-thumb knowledge which is possessed by all the twenty different kinds of tradesmen who are at work in the establishment--knowledge which has never been recorded, which is in the heads, hands, and bodies, in the knack, skill, dexterity which these men possess--to gather that knowledge, classify it, tabulate it, and in most cases reduce it to

laws and rules; in many cases, work out mathematical formulae which, when applied with the cooperation of the management to the work of the men, will lead to an enormous increase of the output of the workmen. That is the first of the four great principles of Scientific Management, the development of a science to replace the old rule-of-thumb knowledge of the workmen.

2. The second of the new duties assumed by the management is the scientific selection and then the progressive development of the workmen. The workmen are studied; it may seem preposterous, but they are studied just as machines have been studied in the past and are being more than ever studied. In the past we have given a great deal of study to machines and little to workmen, but under Scientific Management the workman becomes the subject of far more careful and accurate study than was ever given to machines. After we have studied the workman, so that we know his possibilities, we then proceed, as one friend to another, to try to develop every workman in our employ, so as to bring out his best faculties and to train him to do a higher, more interesting and more profitable class of work than he has done in the past. This is the second of the principles of Scientific Management.

3. The third duty is to bring the scientifically selected workman and the science together. They must be brought together; they will not come together without it. I do not wish for an instant to have any one think I have a poor opinion of a workman; far from it. I am merely stating a fact when I say that you may put your scientific methods before a workman all you are of a mind to, and nine times out of ten he will do the same old way. Unless some one brings the science and the workman together, the workman will slip back as sure as fate into the same old ways, and will not practice the better, the scientific, method. When I say, make the workman do his work in accordance with the laws of science, I do not say make in an arbitrary sense. If I did it would apply far more to the employing than to the working class, because in the work of changing from the old to the new system, nine-tenths of our troubles are concerned with those on the management side, and only one-tenth with the workmen. Those in the management are infinitely more stubborn, infinitely harder to make change their ways than are the workmen. So I want to qualify the word make; it has rather a hard sound. Some one must inspire the men to make the change, for it will not occur naturally. If you allow things to wait, it will not occur in ten years when it should occur in two months. Some one must take it in hand.

4. The fourth principle of Scientific Management is a little more difficult than the others to make clear. It is almost impossible to explain to the average man what I mean

by it, until he sees one of our companies organized under Scientific Management.

The fourth principle is a deliberate division of the work which was formerly done by the workmen into two sections, one of which is handed over to the management. An immense mass of new duties is thrown on the management which formerly belonged to the workmen. And it is this handing of duties which they never dreamed of assuming before over to those on the management side; requiring cooperation between the management and the workmen, which accounts more than anything else for the fact that there has never been a strike under Scientific Management. If you and I are doing a piece of work together, and realize that we are mutually dependent upon one another, it is impossible for us to quarrel. We may quarrel, perhaps, during the first few days. Some men find it difficult to cooperate. But when they once get to going and see that the prosperity of both sides depends on each man doing his share of the work, what is there to strike about? They realize they cannot strike against the friend who is helping them. That is what it is, a case of helpfulness. I think I can say truthfully that under Scientific Management the managers are more the servants of the men than the men are the servants of the managers. I think I can say that the sense of obligation is greater on the part of the management than on the part of the men. They have to do their share and be always ready. That is the feeling of those on the management side under Scientific Management.

In order to make that equal division a little clearer, I will say that in one of our machine shops, for instance where we do miscellaneous work, not work that is repeated over and over again, there will be at least one man on the management side for every three workmen throughout the whole establishment. That indicates a real division of work between the two sides. And those men on the management side are busy, just as busy as the workmen, and far more profitably busy than they were before.

Testimony

... To give you one illustration of the application of scientific management to a rather high class of work, gentlemen, bricklaying, so far as I know, is one of the oldest of trades, and it is a truly extraordinary fact that bricks are now laid just about as they were 2,000 years before Christ. In England they are laid almost exactly as they were then; in England the scaffold is still built with timbers lashed together--in many cases with the bark still on it--just as we see that the scaffolds

Reprint of public document, Hearings Before Special Committee of the House of Representatives to Investigate the Taylor and Other Systems of Shop Management under Authority of House Resolution 90; Vol. III, pp. 1405-1409.