

But does not this new school teach us that it is necessary to call in many assistants if we are to organize an industry thoroughly and to utilize properly the hand of the workman? Where are we to find these assistants and how are we to teach them? To begin with, the first requisite is to transfer some of the actual workers over to the task of analyzing and planning the work, which is an essential characteristic of the new methods. Numerous examples might be cited to show how the output of the shop is increased in more than proportionate measure by detailing a few competent men to analyze and plan the work in advance. In this way, the output frequently amounts to two or three times the output of an ordinary shop; sometimes more. I might mention a recent example in which a riveting job turned out five hundred rivets in a ten hour day under average conditions. There was nothing difficult about the mechanical process, and as the workman was paid by piece rate, it was to his interest to do his best. Careful study developed the fact that there was no synchronism between the various tasks of boring, heating and riveting, and that this lack of synchronism which retarded production never corrected itself. In a very few days, a minute study brought about the necessary changes, and the workmen soon increased their output from five hundred to three thousand rivets a day. This increase in production was due entirely to the proper utilization of both the tools and the labor of the workmen, without any suspicion of overwork.

Examples of this kind have been cited sufficiently often to leave us no room for doubt. Many employers would like to get the benefit of them. But how shall they change from the old way to the new? They cannot begin by robbing the shop of its best material and assigning them to an investigation of the work, without running the risk of lowering the production. There is reason enough for hesitation, even on the part of those who are the most thoroughly convinced. To help them to a decision, I would say to them quite frankly: You have at hand a way of making the experiment without disturbing a single man in your shop. Take a maimed soldier, a good workman who is no longer able to work with his hands. You will unquestionably find in him an excellent assistant for what you wish to undertake. You will render the greatest possible service to a brave man, as well as to yourself.

An intelligent workman may easily prove to be the man competent to be detailed to the analysis of the work. By this I mean a workman, who, having served a more or less difficult and thorough apprenticeship, is conscious of having earned an honorable place in the world of work, and is not without hope of continu-

ing to rise, if circumstances are favorable. It is to such a man that you must appeal; to the man who, before he was injured, might have looked forward to being a gang boss or foreman. Heretofore the chances were very much against his realizing this ambition because the multiplication of the functions of an ordinary foreman required a great variety of qualifications and of general knowledge; of physical and moral qualifications; of administrative, technical, and professional knowledge. It was very difficult for the average workman to possess all these qualities, even in an elementary degree.

It was in speaking of this all round foreman that Taylor said, "When you do succeed in finding a man able to fulfill all these functions satisfactorily, you must not make a foreman of him, but a chief engineer, or a manager at least." We used to think that all our efforts should tend towards the development of this rare bird and even that he ought to emerge full fledged from school *ad hoc*. But, if we may believe Taylor and his school, we were on the wrong road, and it might even be said that this conception of the qualifications of a foreman was such as to reduce the number of candidates for the position and, therefore constituted a serious obstacle to the development of industry. The new school has fewer requirements as to what concerns the equipment of its assistants. It demands, first of all, that after having received a good elementary instruction, they may have acquired genuine faith in the power of the analytical method of work; a faith that will enable them to attack new problems and new difficulties without fear.

This productive method must take full possession of the Industrial School; but it can also be introduced directly into the shop. It is the shops which will develop most of the assistants which Industrial Expansion demands.

The new methods have separated the duties of the foreman, and have distributed them among several heads, which have sometimes been called "functional foremen." One of them is especially responsible for the management of the personnel; another for a study of the work; another for the study of the use of tools, etc. The first of these functional foremen must primarily understand men: he must give an account of their intelligence: he must know whether they are occupied to the best of their ability and physical strength; which of them are ambitious to better themselves; which of them believe themselves incapable of further advancement and are without ambition to do more than honestly earn their daily wage; he must know how they can be helped and encouraged; and which of them are entirely out of their element, and should be induced to change their

line of work. Without unduly meddling in the private life of the men, he must have sufficient tact not to press a man who is laboring under some grave anxiety. He must study the new comers; put them in the right path; direct them and follow them up. In a word, he must hold the personnel in the hollow of his hand. To accomplish all this in a shop of one hundred and fifty or two hundred men, a man must have nothing else to do. Perhaps we will find that the maimed are able to fulfill this function and it is interesting to call attention to the possibility, although it is not the chief object of this paper whose main purpose is the utilization of professional knowledge.

Professional knowledge is particularly essential to the analysis of the task of the workman. It is equally necessary for the preparation of detailed instructions; for the methodical forwarding of the material to be manufactured; for the study of improvements to be brought about in the tools themselves as well as in their maintenance; for the preparation of the tools necessary in all the tasks to be performed. Each of these operations must be entrusted to a special head, and it is here that the injured workman heretofore described has the greatest chance of finding employment.

The analysis of the work is, moreover, the key to the new methods. The breaking up of the work as completely as possible into its separate elements is the only way of establishing a definite basis for the regulation of the wage of the workman. When this method is used, a fair bargain can be entered into, by which a workman earns good wages, and is free from the temptation to limit his output. Above all, the analysis of work is the only method of study and research by which it is possible to attain the maximum utilization of the two means of production: viz, the hand of the workman, and the use of tools. Such a separation of work into its component parts can be made only by one who is familiar with the work and able to understand all its elements. It must be made by a man from the shop. It is not absolutely necessary that he study only those tasks which he knows best how to actually perform, but he must be familiar with shop life.

It is quite true that at one time the only thing supposed to be necessary in making a time study was to put a stop watch in the hands of the first comer, but this idea has been rapidly outgrown. Time study made by an incompetent man is worthless. An intelligent workman, who is able to understand the difficulties of the work, and the point of view of the operator, must therefore be detailed to it. To a shop worker there is nothing more absorbing than the study of the elements of a given task. I have always found that the most experienced workers are amazed at the revelations, that reward such investigation. You would

think there would be many applicants for this position, but there are none.

A good workman always experiences a certain degree of apprehension when he considers giving up a trade in which he is proficient and which has been the main object of his life. He is not quite sure where the path which has been recommended to him may lead him. He is often afraid of becoming what they call "a paper employe." It requires some special occasion to induce him to enter upon the new road. I have already found a few workmen for whom this occasion was their being injured. Taylor would have said, "That was their opportunity."

Again, a man must also be young to be able to change his habits, and herein is one more augury of success for the maimed. I have said that there is an unlimited field for the utilization of the injured in the scientific organization of work. I can cite a very important building establishment which, after resolutely launching itself in the new path, has seen its efforts crowned with success—due in large measure to the intelligent and faithful co-operation which it has met among the maimed; a co-operation which is both material and moral. This is an example which might easily be made general.

In the foregoing statement, the examples have been taken principally from the shop, but it must not be assumed that the so-called workman is the only one concerned. Without going beyond the plant which I have just mentioned, I came across an injured man who never having done any manual work took as a model the analysis which he had seen made for shop work, and proceeded in the same way to analyze several of the tasks in the work of the accounting office, to the great benefit of the service. Similar good could be accomplished in many commercial and administrative concerns. They would find it of great advantage to study in this way what steps are necessary to take in order to make the work of their employees more productive and less laborious. In conclusion, I would like to address a few words directly to one of the most interesting among the injured of our country—the farmer. It is true that Taylor began his studies in scientific management by devoting his attention to the workman of the mechanic class, but he reiterated for those who had ears to hear, that agriculture was the most fruitful field for the application of these methods. He advised their application, there, as everywhere else, with the object of increasing the output of the worker but above all, with the object of giving an account himself of everything that might be better utilized, better chosen, and better directed towards the desired end. He included in this list the patient researches relative to the selection and distribution of crops