four hundred and seventy-nine dollars was due to lack of help; and fifty-six dollars due to repairs. When a carding machine is idle on account of repairs, its depreciation, the rent, the interest on the money we borrowed to buy it is going on all the same. Look at the record of spinning; run seventy-eight per cent of capacity; had twelve hundred dollars for idleness, due to lack of work, lack of help, lack of material and so forth. It is the same all the way down. Look at the weaving record; run eighty-three per cent of capacity, and had twenty-three hundred idleness, twelve hundred dollars due to lack of work, and so forth.

Let us see what this means: look at the column headed "lack of work,"—the machine is idle because they haven't got work. That is a question between the management and the selling department. Can't we sell the capacity of the mill? What is the trouble? Why don't we keep the mill full? Is it due to the incapacity of the selling people, or to a wrong policy by the selling department. If it is a wrong policy by the selling department, it has nothing to do with the workingman. It is a question of the management.

The same with lack of help. What is the trouble? Why can't we get help? Why don't we get help? It is either inability on the part of the hiring department or a wrong labor policy. That goes straight to the management and not to the workman.

Again: lack of material of various kinds. Here is lack of material for the spinning department. That probably was due to lack of bobbins, lack of help in twisting; they were not getting the yarn off the bobbins fast enough to get them back to the spinning department. In this case of twisting, through lack of help they had not been able to get the work done, and a lot of this work had piled up in the twisting. The bobbins had to go back to the spinning department. This lack of material was due to lack of bobbins there.

Refer now to weaving: lack of material due to lack of help in spinning, and of the purchasing department for not ordering harnesses on time. The harness is one of the tools used in a loom for moving threads up and down. They had work, but they did not get the harnesses to set up the loom to keep it running.

Repairs: These machines were shut down for repairs. In this case the repairing and maintenance department has two hundred and fifteen dollars worth of poor planning. They had the work, the materials and machines and everything, but did not arrange it right; did not get there on time; the orders were there; the materials were there but they did not operate the processes on time. All of these factors together are the fault of the management. That amounts to fifty-four hundred dollars; probably considerably more than the loss due to the inefficiency of the workmen that did the work.

In one case, when one of these charts was shown for the first time to some people who owned a mill—they were two brothers—one of them figured up and he said, "Bill, do you realize that we lost as much money last month due to our machinery being idle as we should have lost if we had had two hundred men standing idle in the plant a whole month?" We would raise a battle cry if we had two hundred men standing around idle, but nobody said a word about the machinery. It comes right straight back to the management. That is where to begin, to measure the efficiency of the management. If we can measure the efficiency of the management and make them efficient, the problem is easy. With an efficient management there is very little difficulty in making the rest of the mill efficient; but without an efficient management, you cannot do it to any considerable extent, and even the little that you do accomplish goes to pieces as soon as the management makes some fool decision, as they always will do.

MR. CARL G. BARTH:[1] I will say that, in a broad sense, I am delighted with both Mr. Gantt's and Mr. Coburn's discussion of Professor Drury's paper, and that I share entirely Mr. Gantt's idea that the man to talk about is not the man at the machine, but the man higher up.

I think, however, that Professor Drury's book on Scientific Management has done a great deal of good in spite of Mr. Gantt's condemnation of it, and in spite of the fact that I have greatly resented that Dr. Drury published some things about myself that are not true, and that he did not show the decency and good sense to refer them to me for verification, for I was still alive at the time.

I am also indeed delighted that Mr. Gantt so fully and beautifully cleared up the uncertainties about how Mr. Taylor first entered into this work, and the manner in which he briefly followed up the essential parts of it, up to the time when Mr. Gantt's intimate association with Mr. Taylor ceased.

While I wish to say something more, I am not going to try to philosophize about these matters, but will merely point out the mistake both Professor Drury and others make in principally judging scientific management by the work done by numerous mediocre or fake workers in the business, instead of by that of the real leaders, and the basing of so many of their arguments on the results of the work.

These mediocre and fake workers see but little in scientific management except time study and rate setting, and some of them from sheer ignorance, others because they have not the backbone to insist upon the right course being pursued by the management, often begin to practice their elements without any preparation in the way of repairs and standardization of machine tools and other equipment, or of standardization of methods. A couple of illustrations will serve to make my contention clear.

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Recently I got into a shop where some two to three years ago a bonus system had been installed as an incentive to the workers to increase the output of their machinery. One bonus job was thus the milling of the flukes in a small reamer of which an enormous quantity is consumed every year. At the time, the worker was making more money on this job than would ordinarily be paid for that class of work; and still, inside of two hours after I looked into it, it was being done with the feed of the machine increased eighteen times. The explanation is a very simple one. The man who had taken the time and set the bonus production, turned out to be utterly ignorant of what the machine could do, and the work could stand, and had merely timed the operation as he had found it; namely, run with the finest feed the machine had, whereas I found that the coarsest could be used. In this instance no serious difficulty had arisen but you will all realize that this kind of ignorance in a man entrusted with such serious duties as rate setting, might have resulted in different conditions.

Some years ago Mr. C. Bertrand Thompson made an investigation of numerous shops that had undertaken to install some kind of an efficiency system, and among many interesting things that he learned was the following: A shop in the Middle West had engaged one of the large and advertising efficiency companies to install a premium or bonus system of payment; and in a manner similar to that described above, one of the representatives of this efficiency company determined a bonus production as a punch press of some kind, without in any way improving the machine operation itself. After this was done, the operator, who happened to be a near relative of one of the higher officials of the company managed to have the speed of the press so increased that he without difficulty turned out twice the expected number of pieces per hour. Needless to say that the pretended efficiency man was dismissed at once.

To show you how seriously I look upon this matter of beginning to make time studies, and set rates by them too soon, I will mention that I still have two client companies that I took on in the early spring of 1913, and yet the time is only just approaching when time studies may be made in accordance with Dr. Taylor's principles, and then rates of one kind or another set by them.

It has taken all this time to bring the general management around and to get all the other preliminary work done in the shop, without which time-studies become worse than a farce. However, this preliminary work has of itself brought about such excellent results that everybody is satisfied, and that is why I am still with these companies.

Some of the results have been obtained by bringing to the attention of the management the utter folly of merely getting after the labor cost, while they remained unconcerned about valuable machinery standing idle for one poor reason after another. With the increased efficiency of the machinery we bring about, it is not always possible to procure work for it all. Thus nearly ten years ago I was able to report to the president of a certain company that after increasing the production of a certain department over fifty per cent., we were nevertheless utilizing only fifty-one per cent. of the average machine capacity.

Regarding the diagram Mr. Gantt has just shown us, and which he has devised for the purpose of showing the management the actual loss incurred in dollars and cents through idle machinery, I think the same is right nicely gotten up, but I fail to see in it anything essentially new or startling. In fact, it does to some extent annoy me, as it has been presented as something not covered by Mr. Taylor himself, which is not the case, and it is not the first time that Mr. Gantt has brought, as new matter, things that Mr. Taylor had fully covered in his production and cost system, though in a somewhat different way. The reason is that Mr. Gantt got away from Mr. Taylor's influence long before he had had the opportunity to learn even approximately all that Mr. Taylor had accomplished. He has thus never mastered Mr. Taylor's cost and accounting methods, as is fully demonstrated by his attitude towards certain of the problems that confront every factor-cost-finder and accountant.

By making these statements I do not mean to belittle what Mr. Gantt is doing, but I consider it both my duty and my pleasure to see to it that Mr. Taylor, as much as possible, gets credit for all he did; and more particularly so, as some day I may claim for myself and others the credit for some things that have erroneously been accorded to him.

I am a great admirer of the broad manner in which Mr. Gantt at times deals with his subjects, which it is beyond me to do, and I think it is about time that he became a member of our Society.

MR. WALTER N. POLAKOV:[1] I hope that I will not take any more than ten minutes to deliver my discussion on Mr. Drury's paper after hearing what Mr. Gantt said and several other speakers, the first

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