that I know of, that says if a man discovers a better way than the prescribed way of doing a job it shall not be done that way. In my own experience I have been delighted indeed to find men who could show better ways, because there are always better jobs waiting for men like that. The difficulty is to find the man who has brains and initiative enough to think new ways of doing things. I am of the opinion that we spend too much time talking about time study and the troubles incident to making time studies and getting men to work under task-work with bonus. Times change.

They have changed greatly since Mr. Taylor started his classical work, and people have to change with these times.

Time study started the new movement. Time study in itself was an endeavor to get at the facts, and to get at the facts Mr. Taylor adopted the scientific method, of finding out the first thing, then knowing the first thing, stepping to the next thing and so forth. The time study and stop watch features have received all the attention.

But time study, important as it is, we know now is not of *primary* importance. I will illustrate that from my own experience. My connection is with the U. S. Navy Yards, and I am concerned principally with the repair and manufacture of ships, principally with the repairs. It is true that ship repairing, like ship building, consists largely in making holes and filling them up again. To that extent the work can be analyzed into a series of well-known and simple operations. Years ago at Mare Island we went into the planning of our work; the disintegration of the job; its routing; picking men and putting them on the job; we did a little time study and we settled the material question very well. But we were not getting the ships out on time.

The time element obtruded itself. The more I struggled with it the less I could see in the time study matter a solution for my problem. We gathered time study data; also a good deal of performance data, because our routing system had shown us how to accumulate data and put them where we could get them again and use them with intelligence.

We began to lay out the work with the heads of departments and head men and then we began to let this time feature show itself where we could do something with it. We have gone ahead and developed it to a point such that by the time I left the Philadelphia Navy Yard, four years later, we could do this sort of thing: one morning the Department called up the yard and wanted to know when a certain ship could be ready to sail. We were able to state in fifteen minutes, by consulting our schedules, the date on which we would finish her. There was a large amount of work to do on her, and much readjustment of other work. But we kept our promise.

The time element was there—we had some time study data to help us and enough other data, but it was not time study that saved the situation. We were not thinking about time study; we were thinking about the time of getting the job done. We have found out by carrying along the time idea that we can say, to the request for immediate completion of a job, "Very well, if you want that job done by Wednesday noon, here are some other jobs that must be deferred," naming the particular jobs, and how long they will be deferred. In the old days we were told to do the job, and were expected to get that job done and all the rest of the work too. In other words, the responsibility was passed to us. We now pass it back to where it belongs, to the management. We have shown up the inefficiency of our general management. Stonewall Jackson was a great general because he recognized the value of time. He copied from Napoleon. The Germans have copied from Napoleon. You notice that the Germans are always there a little ahead of the other fellow. Mr. Gantt told us, the other morning, of his way of putting back to the management a reflection of their own inattention as regards idle time. That is a development of scientific management which is simply this; that we are finding some facts and we are putting those facts into such shape that the financial man and even the director can understand them.

We have always been unable to make the financial man understand anything about time study. He has always had a readier ear for the working man having the iron heel of capital ground into his neck than he has had for the fellow running the shop. It was easier to say, "I hold the manager responsible for results." We are coming back to the management with our scientifically obtained and scientifically presented facts, and putting the onus right where it belongs.

We are doing that as regards the time of equipment, and we have for some time been doing it in regard to the time of doing jobs. If we are going to talk about scientific management and progress, let us talk about progress in scientific management. Let us say, yes, time study is with us, but we have learned a lot. Time study is now an incident.

It is part of the game. It helps us along. The great thing about scientific management to my mind is the idea that we are going to base our decision and action on the knowledge of fact. The author talks about democracy in industry.

There can be no democracy while there is distrust between the man who is working and the man who owns the money. When we can produce the facts and have a basis of facts upon which to talk we can eliminate distrust and have real democracy.

To sum up; to my mind the function of scientific management with regard to progress is found in the progress of scientific management. We are going to put the responsibility for industrial inefficiency, not with the workingman, where for so many years we thought that it belonged, but with the management, where we know very well now it does belong.

PROFESSOR JOSEPH H. WILLITS:[1] Mr. Chairman: I think I can say that I am in agreement with Dr. Drury's main thesis, namely, that if scientific management is to realize its greatest possibilities with regard to what it can contribute to progress, it must devote even more attention to the man in the plant. I believe that there is an added responsibility for scientific management to take such an attitude because of the fact that it is more intelligent and is therefore in advance of ordinary management with regard to its dealing with all of the factors under its control. I am in accord with Dr. Drury's main thesis on that particular point.

As a corollary to what Dr. Drury has said, however, I want to take the converse of his proposition and point out that not only must scientific management devote somewhat more attention to personal questions, but also that this science of personnel or science of human engineering, or whatever it may be called in different cases, can only persevere to the extent that it is linked up very closely with thoroughness and with the system of scientific management. While on the other hand you might have scientific management under certain leaders developing to a point, as Dr. Drury indicated, where it might not be democratic; nevertheless on the other hand, if your personal science or human engineering, or whatever it may be called, is divorced from the system and the thoroughness and science of scientific management, it is apt to be characterized by the attitude of "strong in the heart, but somewhat weak in the head"; it is apt to degenerate to the point where it may be welfare work that has no direct or even indirect relation with output.

Perhaps after Dr. Drury's statement with regard to some figures that Mr. Taylor used, it is not good form to point to the analogy between our treatment of domestic animals and our treatment of employes. Nevertheless, recognizing that no man's analogy ought to be pushed to its logical conclusion in every case, I am going to make my point a little clearer by referring to an analogy which has been made before. We have passed through or are passing through, as every one is more or less familiar with, three stages with regard to the treatment of domestic animals. In the first we had a period of disregard in which the treatment of domestic animals was entirely incidental and you had conditions which were cruel, to say the least. As the second stage in the treatment of domestic animals, we had the stage in which by coercive measures, certain humane-minded individuals endeavored to set up a minimum standard of conduct or a minimum standard of treatment of domestic animals below which nobody would be allowed to fall, and legislation was passed to enforce that standard of treatment. Our Societies for the Prevention of Cruelty to Animals were formed in this period. The third stage is marked by voluntary better treatment on the part of those who have domestic animals and is brought about by scientific study on the part of students of animal industry and of just what effect that poor treatment may have on production.

It seems to me that we, in our attitude toward the personal question in industry, are passing through essentially similar steps. We had as a first stage immediately after the Revolutionary War or industrial revolution, a condition of fourteen or sixteen-hour working days, in which almost no attention was given to the workmen's welfare or working conditions. As to the second stage, which we are largely in at the present time, we are endeavoring to control things by various legislative actions, various coercive actions which shall enforce a minimum standard of good treatment. That stage to some extent will be permanently necessary, but to a larger extent will pass over to what I think we might call the third stage, entirely analogous to the third stage in the treatment of domestic animals, in which we witnessed, as the result of scientific analysis, the effect of long hours on output, the effect of low wages and bad conditions on output. Here you find a voluntary attempt to bring about better conditions because it is in line with larger profits. With regard to this development of personnel science the service of scientific management is analogous to the service performed by students of animal industry. Scientific management reveals the facts which will point out the wisdom and methods of more thorough going personnel work. The two are interdependent, and your personal science cannot be developed in most cases to its best unless it is joined with the system and thoroughgoingness of scientific management. I can perhaps illustrate that somewhat specifically by referring to a case which came under my notice last Monday night. Mr. Feiss was addressing our executives or management organization in Philadelphia. He pointed out a fact which most of the people here are familiar with,—namely, his theory of the balance of personnel, the fact that, by the scientific methods

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