tific management have either died with the workingman or have been handed over by him to one or two of his friends, and then have gradually gone out of existence. Whereas, when the management make an accurate study of processes and methods, it is not only their duty but their profit to see that this science is disseminated and is spread out before all of the workmen who are under them. For instance, when we developed the science of cutting metals, after it was developed we published it broadcast to the world. This science was published as a part of the proceedings of the American Society of Mechanical Engineers which is not a copyright publication and is free to the entire public to publish. It went all over the world at once. It was not kept as a trade secret but was made public property.

Mr. Tilson. Does everybody use it now?

Mr. Taylor. Everyone uses it all over the world. It is open to everyone.

Mr. Tilson. How extensively is your system of cutting metals being used?

Mr. Taylor. I can say that it has been translated into Russian, into German, into French, into Danish, and into Dutch; it was also published in England.

Mr. Tilson. That is all right about the books, but how about the use, the actual application of it?

Mr. Taylor. I assume that the people would not have translated it into German if they had not proposed using it. This much I can say, Mr. Tilson, that one of the great results of this careful scientific investigation—one of the direct products of it—was the discovery of high-speed steel and the moment that this discovery was published to the world every machine shop grabbed it from one end of the world to the other. It is used all over the world. It has increased the average cutting speed of machine shops at least three times over their former speed. High-speed steel went all over the world right off. There is no question about that.

Mr. Tilson. Were you the first to use it?

Mr. Taylor. Mr. White and I are the joint inventors. We have patents for it all over the world. And we were fortunate in selling many of them. We got $100,000 for the patent rights in England, but the fellows over there did not get anything out of the patent rights in the way of royalty, I understand they far more than got their money back through being first in England to equip all of their shops with high-speed steel.

The Chairman. Might not those books be bought simply for the purpose of investigation to determine from them whether or not they did want to use your art of cutting metals, and the fact that they bought the books or that they were translated into those various languages would not in itself be evidence that they had adopted the system after having had investigated it through your books, would it?

Mr. Taylor. I am quite sure that a great part of that art has not yet come into use because in order to properly use it you must have a slide rule such as I have shown you here.

The machine shops in this country have not taken the pains to use those slide rules as they should. They are not used to the extent that they ought to be. I may state, however, that I had a recent visit from the owner of the Renaud Automobile Works, the largest automobile works in France, together with Monsieur de Ram, the young French engineer who personally became interested in the art of cutting metals some years ago, and in our system of management, and who put this system into one of Renaud's departments. These two men came over to this country especially to study our system (scientific management) and the art of cutting metals, and assured me that in those departments in which they had introduced the art of cutting metals and our system of management that they had much more than doubled their former output. They said that they were going back to France to spend any amount of money and any amount of effort to get it in as fast as possible in their entire works. The warning I gave them before they left was this: I said, "You have been at it three years. Do not expect to get through with it for five years, because you will not. It will take you more than five years before you will get through the entire process of putting our system in."

The Chairman. You spoke of laboratories in connection with scientific management. Is it not true that nearly all the large firms in the country, irrespective of what system of management they have, maintain laboratories?

Mr. Taylor. I do not remember to have spoken about laboratories. Was it chemical laboratories you referred to?

The Chairman. Yes; chemical laboratories.

Mr. Taylor. Every steel works that amounts to anything has chemical laboratories, but I was not aware that I had spoken of chemical laboratories in my testimony. I may have.

The Chairman. My recollection is that you did speak of laboratories in connection with your testimony, and that recollection is reenforced by the fact that I have a note in connection with it.

Mr. Taylor. More than likely I did, then, Mr. Chairman. But I have forgotten. At any rate, I shall be glad to answer whatever questions you may ask.

The Chairman. I wanted to know if it was not a fact that nearly all of the large manufacturing establishments in the country maintain laboratories, irrespective of what management they may have?

Mr. Taylor. All the large steel works do, but I do not think the large machine shops have the chemical laboratories.

The Chairman. There are a great many industries where laboratories are maintained, are there not?

Mr. Taylor. Yes, indeed.

The Chairman. Irrespective of what system is used?

Mr. Taylor. In the cement mills, in some pulp mills, in the chemical works of the country, in the steel mills of the country, in the rubber establishments of the country there are laboratories.

The Chairman. So that a laboratory would not for the purposes of investigation in connection with the particular industry, would not in itself be peculiar to scientific management?

Mr. Taylor. Certainly not.

The Chairman. Would it not be more peculiar to scientific research? Would it not be more peculiar to scientific research than scientific management?

Mr. Taylor. I think that these laboratories that are established in connection with industrial works are not often research laboratories in the sense in which that word is used in university parlance. I think they are very rarely research laboratories. I think they are practical laboratories needed for the everyday analysis of the products that are being made or the materials being bought.

The Chairman. Mr. Taylor, if men are induced to a greater productivity by virtue of a bonus system, and consequently an expenditure of greater energy on their part to secure this bonus, would there be any possibility of their securing a positive guarantee that would be binding for all time that the bonus would not be taken away, and thereby leaving them with the expenditure of energy at the old rate of pay?

Mr. Taylor. Most certainly no permanent guarantee could ever be given for anything that I know of in this world. But the workman would always have his remedy open to him. If he were badly treated he could soldier just as he is now doing under the present system. This is his cardinal remedy. This is the final word. The workman always has that resource. All the workmen have to do is to sit down and soldier, and the injustice comes to an end.

Mr. Redfield. Does he not have the interest of his employers always at heart?

Mr. Taylor. Yes, indeed. I am assuming that a fool employer, and there are a good many of them—

The Chairman. Are there not differences of opinion as to what constitutes a fool employer?

Mr. Taylor. Yes, sir; and a great many of the old-style employers are pointing to those who are introducing scientific management as being fool employers, inasmuch as they pay this unnecessary increase in wages to their workmen, as they call it. I do not share that view, of course, but a great many of the old-style employers do.

Mr. Redfield. Have you dealt with the question as to what happened to those laborers in the yards of the Bethlehem Steel Co. who were laid off from shoveling, so to speak, when the force was reduced, as you have testified, from between 400 and 600 to about 150?

Mr. Taylor. Mr. Redfield, I am very glad, indeed, that you asked that question. The gen-