machines, indicate the order of the work, designate the amount of work to be done, fix the time of completion of the various jobs, inspect the quality and look after repairs.

In connection with scientific development we find the foreman who feels that a thing always has been done in a certain way, hence that way must be right; the foreman who knows it can't be done; the foreman who has tried it out and it wouldn't work; and perhaps worst of all the foreman who says, "I know it can't be done, but go ahead and do it." Sometimes a foreman is reluctant to furnish technical information which he feels is an asset that makes him of greatest value to the company. This is particularly the case with foremen, and there is quite a large percentage who hold their positions in spite of small executive ability because of special knowledge of processes. We find occasionally that a foreman is reluctant to aid beyond a certain point through fear of the discovery that he has turned over to his men certain of the duties which had been assigned to him personally.

After all that can be said in criticism, it is surprising how willing a foreman usually is to cooperate during the period when studies are made preliminary to the actual development of control. One is impressed, however, with his lack of understanding of the results to be obtained. It is always necessary to go into each point in great detail to show where the changes mean real assistance to him in the performance of his duties, and particularly with respect to the competent foreman who always has the good of the company at heart, how these changes will operate to improve conditions.

It is hardest for the foreman after the preliminary studies are complete and actual development is begun and he sees some of his authority passing away. In some cases it seems absolutely impossible to convince him of the advantages until he can actually see results. I have in mind a foreman in a coating mill, a man with a good grasp of his department, but who could not see the advantage of detail study of the methods of handling the rolls, or the way in which the pasting was done, or of counting the defective material; but just as soon as the methods worked out were put into operation and he saw a sudden jump on the first machine in output of over one hundred per cent, and when he saw the operators on the other machines clamoring to be put onto the new plan, it took him just about two days to be converted. But this conversion was later than it should have been. The foreman should be right in on the game from the very start. Those of you, however, who have not been up against it, cannot fully appreciate how difficult a matter it is to manage it. It is much easier to analyze a proposition, develop the scheme, and with complete authority put it into effect, than it is to make the foreman actually a part of the developing force, and have him so considered by the employees and by the management.

Whatever the type of foremen they must be carefully dealt with, and personally instead of in a group. This is particularly true with the cantankerous foreman who tells you that your plan has already been tried and given up; that he put in piece-work once on that particular job and it didn't work; that the variations in the conditions make planning impossible; that he must have first-class quality. He must be shown that as a result of thorough analysis and standardization, both the variation in conditions and the quality are taken care of; that the work will run smoother and the quality will be better than under day work or ordinary piece work.

It is a good plan to get suggestions from the foreman and see that they are put across with the company, and get his approval on everything else that is done; at any rate sit down and go over things with him carefully. Let him see that the increase in output and improvements in conditions will be due to his work and that the credit will not go to outsiders. In case he cannot be convinced, then higher authority must be evoked and the management kept in touch with the actual conditions by frequent reports.

Sometimes the major responsibility for the development may lie with the foreman. In the pulp mills of the Eastern Manufacturing Co., at Bangor, Me., the foreman, who later became superintendent, was the man more than anybody else who put it across. As foreman he was given certain tests to make as of density of the pulp, examination of defects, rate of flow, etc. Later he worked out the standard temperatures and pressures for cooking the pulp in the digesters, interested his men in the development and in the special plans for paying bonuses based on maintenance of standards and on quality of product. In another case the superintendent of the plant, a small one, after the development of the control through the planning department, which relieved him of much of his worry, actually by his own wish became time study man and spent a considerable part of his time on the detail analysis of the operations.

Sometimes the development of the foreman cannot be accomplished. There was a "terrible Swede," a man more than sixty years old, at the head of a department in a textile mill; the department had run down

badly, only a small portion of it being in proper mechanical repair. He tried to make all repairs himself, feeling that if he allowed anybody to become acquainted with the machines he would lose his value to the company. He opposed studies in his room, notwithstanding their great need as shown by the poor work produced. Finally an understudy had to be placed there and the foreman demanded a show down, with the result that he had to be pensioned. A young man with no previous experience was placed in charge and he made rapid progress toward intensive and successful control.

Another foreman in the same plant, another Swede in fact, but one of the most capable overseers in the organization, a hard-headed man with ability to maintain excellent discipline and produce good quality of product, was much opposed to the development of new methods; he flatly refused, in fact, to give information to aid the work, and stated that it was "all damn foolishness." He really felt if he gave out information that he would lose his personal value to the company. Much time was spent upon him to show him the benefits to himself, but to no purpose. The work had to be carried on without his cooperation. When the development was about fifty per cent complete, he came to find that he was being relieved of the major part of the burdensome detail which he had been carrying. As the engineer on the job tells the story, Swansen came to him one day and said, "Hanson, I am beginning to like this scientific management." Asked why, he said, "I can go around the room seeing that the weavers are doing their jobs, and I don't have to stay an hour after quitting time at night, all Saturday afternoon and sometimes Sunday, planning out the work. I can go home five minutes past five on week days and five minutes past twelve on Saturday, and not think of the work again until I get to the mill in the morning." One of the most important benefits derived from the foreman's having a definite place in the development of scientific methods is the psychological effect on the employees. He can explain to them the principles being adopted, and enlist their creative powers in applying the methods to the particular work in which they are engaged. Finally, by recognizing the foreman's place we build up a better organization to carry on the work of development after the initial steps have been made, and oftentimes prevent a reaction by the restoration of unimportant details which an unsympathetic foreman might consider as essential.

And don't forget the actual value of the advice given through the foreman's keenness in appreciating the effect on the men and the method of handling them, and his knowledge of processes.

The place for the old foreman in the new organization must be carefully thought out. They are most valuable men. They must be developed for the job they are best fitted for. A foreman has the chance of his lifetime for a position suited to his particular ability. He may, for example, though a mediocre foreman, make an excellent production man. If a good executive, he is naturally left in his old position, but with many of his functions transferred to others. If kept in this place, he must be impressed with the fact that as incentives for quantity and quality are introduced to the operative, his duty must be to guide rather than to command. He must see particularly that the operations decided upon as standard are maintained by the operatives, a thing which is particularly hard to do when they are just starting.

To illustrate, a group of girls were given standard methods of operation with bonus in an operation of pasting which involved considerable manipulation. The work was undertaken with enthusiasm, but gradually, as is usually the case at the start, one of them began to fall off in her production. Investigation showed that she had gone back to the former careless, thoughtless, haphazard methods (this is sometimes called exercising individual initiative) which she had formerly employed, instead of doing the work in the easier way which resulted in her turning out the larger quantity with no added effort. With very brief instructions she came at once to her higher standard and again became satisfied with the work.

The foreman must assist the inspector in designating quality. He must coordinate the work of the operators, movemen, helpers, etc., who are all trying for improvement in the quantity and quality. He is the connecting link between the mill and the office.

Particularly, unless there is a teaching force, he must give instruction of two kinds. He must give preliminary instruction on methods of doing the machine or hand work, emphasizing the necessity of avoiding certain common errors, and he must caution the men at the start on safety in the use of the machine.

Then, second, he must attend to the follow-up instructions. He must be sure that the methods are grasped and understood and carried out.

As an illustration, a man was given a job of punching metal with instructions to punch holes in one end of the sheets. He decided that this was the wrong end, and that they should be punched on the other end, which resulted in the scrapping of a large order. The