knowledge and experience but for infinite patience and confidence. Owing to the multiplicity of factors upon which success in the undertaking depends, not the least of which is the human factor, each feature of the system as installed may be expected to break down several times before it finally works smoothly. At such times there is a strong impulse to assume that the trouble may be corrected by making changes in the plan. The engineer directing the installation must be on his guard against changes, which in themselves may be harmless so far as the feature of the system directly affected is concerned, but which may fail to fit in with other features whose development may not be taken up until some later time. Each change of this character encourages others and may result in the complete failure of the undertaking, or what is almost as bad, in a mongrel system affording little satisfaction to anyone and which sooner or later may bring discredit to the scientific management movement. In this matter to follow the path of least resistance is almost always to court trouble.

After the system has been properly installed it is not so easy to make "damned improvements" or to lightly depart from standards, yet that must be guarded against, particularly by those high in authority who unfortunately cannot be expected to have a knowledge of all the details of the system, their relationship and interdependence. The motive for making such changes usually lies in a desire to correct trouble resulting from some standard having been imperfectly established or maintained.

Most of the injustice with which ordinary piece work has been charged may be traced to lack of standards. We must be on our guard against further injustice. There are today managers who are unwilling to go to the expense or to undertake the work that is involved in the establishment and maintenance of standards essential to a true application of the principles of scientific management; they crave the benefits of increased production and delude themselves that they can get them by taking a short cut. These misguided individuals mistake the form for the substance just as did those who in 1896 discussed Taylor's piece work paper, and think that by merely making time studies—"frequently unworthy of the name"—and setting tasks they will get to the ultimate object directly. Alas, it won't work!

Several years ago a large establishment in Europe started, under the direction of an able engineer, to install the Taylor System. In one department it was well done; conditions were properly standardized and maintained; the work was routed and well controlled; proper tools and instructions were provided, and tasks were set justly on a basis of good elementary time study. Everything was going well in this department; so well in fact that the owner became impatient to see similar results in all other departments. He demanded that the workmen in another department be put on task and bonus, a certain number per day, faster than standard conditions could be established. The engineer in charge protested and left when the owner insisted. Nevertheless, the owner's orders were obeyed and a long and bitter strike resulted. In reality the men struck not against the system but for it. They said, "We can't make these rates; in the other department where you installed this system you have fixed up the machines and the belts and have men to keep them in repair; you deliver the tools—which are better than ours—to the machine in advance for each job; you have the material placed conveniently to the machine so that no time is lost between jobs. In that department the time can be made and the men earn their bonus. We have to take care of our own machines and belts, hunt up and grind our own tools and hunt up our own jobs. We demand that you do in our department what you did in the other department."

The late James M. Dodge told a story to the effect that shortly after the Taylor System had been installed in the shops of the Link-Belt Company, a friend of his—the head of a large machine works—after seeing and having explained to him the slide rules by which the proper combination of feed, speed and depth of cut are computed, persuaded Mr. Dodge to lend him one for a day or two in order that he might show it to his superintendent and foreman. A short time later Mr. Dodge heard that this friend had stated at a meeting of some kind that "he had tried the Taylor System in his shop but it had proved a failure." Upon investigation it was found that he had taken the slide rule—specially designed for a machine in which the speeds and feeds had been standardized, as had also been the cone and countershaft belts and in which were used standard cutting tools—and had tried to operate according to it a machine in his shop for which none of the conditions had been standardized!

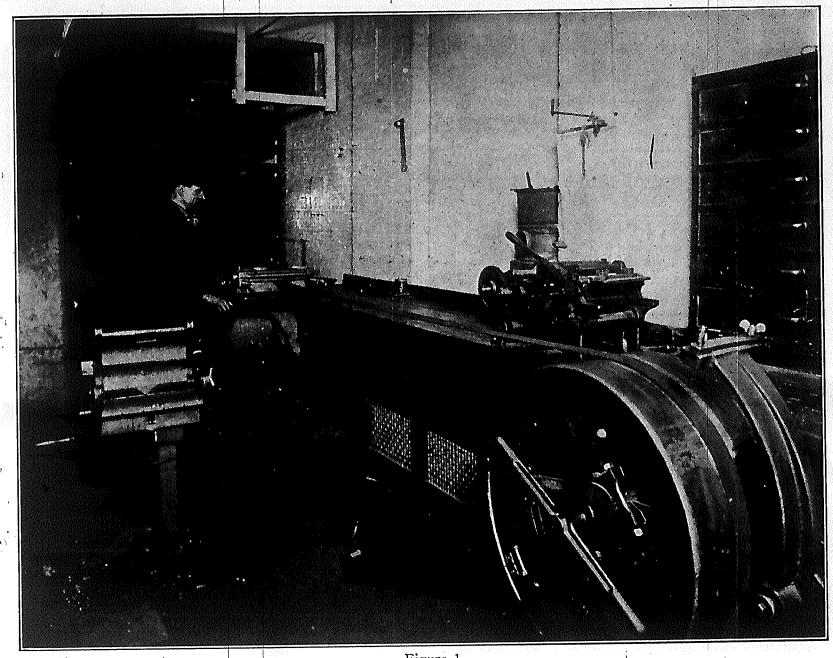

Figure 1

Barth-Gulowsen "Belt Bench." A device for periodically inspecting, repairing and tightening belts. An outgrowth of Taylor's work in standardizing belting practice.

It is indeed surprising that the importance of standards in the attainment of results should be so little understood or appreciated. Only ignorance, the adherence to policies of "penny wisdom and pound foolishness," reluctance to assume responsibility, or sheer indifference on the part of the management can account for it.

In the paper, "Shop Management," Mr. Taylor made the following statements with reference to standards:

In many cases the greatest good resulting from the application of these systems is the indirect gain which comes from the enforced standardization of all details, and conditions, large and small, surrounding the work. All of the ordinary systems can be and are almost always applied without adopting and maintaining thorough shop standards. But the task idea cannot be carried out without them.

The adoption and maintenance of standard tools, fixtures and appliances down to the smallest item throughout the works and office, as well as the adoption of standard methods of doing all operations which are repeated, is a matter of importance, so that under similar conditions the same appliances and methods shall be used throughout the plant. This is an absolutely necessary preliminary to success in assigning daily tasks which are fair and which can be carried out with certainty.

One of the most important functions of the planning room is that of the maintenance of the entire system, and of standard methods and appliances throughout the establishment, including the planning room itself.