

the problem had been solved in a fundamentally correct manner from the outset. Nor was there any apparent good reason why he should do so. Humanity had already acquired more or less the habit of guessing and of cutting corners to speed solutions, and moreover, there happened to be a certain venturesome charm in such procedure. Therefore, it took man a long time to free himself sufficiently from the immediate needs of life to apply analysis and measurement, followed by synthesis. In other words, it was a long time before he came to see research as a distinct function. And, after all, standardization at its best is the storing away of the precious results of experience, of which research is a highly intensified form.

I shall illustrate this by a few examples. A very large organization in this country is now engaged in a study of the basic principles underlying the function of the wheel in contact with the ground. How many thousands of years had to go by before this scientific analysis was started, since—who can say by what laborious method—one of our remote ancestors, desirous of improving transportation, attempted to cut slices from the trunk of a tree? And how much progress did brick masonry make, since the achievements now being studied by the archeologists in Mesopotamia, before Gilbreth dissected bricklaying practice by means of an intensive motion, time and fatigue study and reassembled its elements into a method which is now held up to the world as a brilliant example of pioneer work in this field? Not that his method has now been generally adopted by that same world; it is evidently still too far ahead of conventional methods. A technical committee appointed by the American Standards Association is now studying the establishment of a "Code of Good Practice for Brick Masonry," an interesting development in an art known to be more than 6,000 years old.

Coming back, then, to the manner in which human skill in the trades developed along parallel, but often isolated, lines we are not astonished to find that in more recent times, say after the introduction of steam power into industry, it was found extremely difficult, if not sometimes impossible, to straighten out the discrepancies between fundamentally identical practices which had grown up independently in different industries, even though there was created an increasing desire, based on necessity, to do so. Even now specialists in various

lines frequently do not feel much disposed to bridge the gap between their conventional solutions of the same problem. As bearers of practical progress in their respective trades, they have pushed so far ahead into the unknown regions stretching out before them that they have been unable to maintain the lateral contacts and the interpenetration of ideas necessary for the regular advance of a duly co-ordinated general front. Men of their type have been pushing the art of their particular trade so forcefully that they are now being pulled along by the requirements of their art, or its tradition.

This phenomenon is found all along the line, from the broader division of work into trades, as exemplified in the several branches of a large organization, to the more subtle division of work in an individual plant. For example, each of five first-class railroad companies, located in one of the large railroad centers in this country, requires twenty-five to thirty sizes of steel tubes to cover its needs. There is so much diversity in the requirements of the individual companies, however, that a tube mill which supplies all of them is obliged to carry more than one hundred sizes.

One concern found that about one thousand different miter gears for driving two shafts at right angles at a 1 : 1 ratio had been developed in the course of time. Although the discovery may have been somewhat of a shock to the management, it must have experienced a feeling of reassurance that after all it was now finding out flaws of this kind and could save money by eliminating them. No doubt other concerns will find similar opportunities for savings, provided they are also willing first to go through similar shocks.

The ability of leaders to push ahead on the strength of their vision and good judgment, where experience and data are still lacking, has quite naturally become one of their main characteristics. No wonder then that the born leader, whether he be called an executive, manager, superintendent or foreman, will himself put more value on his ability to cope with problems for which no standard solution has as yet been found, than on his capacity to deal with those problems which have been captured by analysis and experience. This explains, I believe, why this type of man is likely very often to find the problems of standardization devoid of interest, and consequently to pay only scant attention to the machinery evolved to deal with them.

However, if the standpoint of the "born leader" is correct, that management is an art whose greatest intrinsic value lies in the ability of the executive to judge non-measurable conditions, then there is no better argument for the thesis that every executive should consider it his duty to adopt, introduce and enforce the use of standards as a means of enabling him to concentrate his energy more intensively on exactly that part of his function in which he takes the greatest pride and which he deems most indispensable, as it cannot be supplanted by systematization. I have never seen this more beautifully expressed than in a paper written by Mr. A. W. Whitney, former president of the American Standards Association, in which he says:

"Standardization is the liberator that relegates the problems that have been already solved to their proper place; namely, to the field of routine, and leaves the creative faculties free for the problems that are still unsolved. Standardization from this point of view is thus an indispensable ally of the creative genius."

The executive should, moreover, bear in mind that apart from the managerial aspect, the practice and economy of production obviously require temporary constancy of a number of factors in order to prevent technical and commercial problems from becoming a series of equations with too many unknowns, leaving too much to guess. It might be put in this way, that the upward slope of industrial progress can be scaled only by providing, between flights of steps, platforms in the form of standards where one can take a moment's rest, look around to survey the new situation and gather energy for the next partial ascent.

The establishment of a standards department in an organization does not necessarily mean a costly set-up of a large-staffed division. It may be started on a modest scale, perhaps with the services of a single man, and gradually expanded when the movement grows and branches out.

An essential point, to be carefully observed, is that the standards division must be free to tackle the problems of co-ordination between the several departments without having to give special consideration to any particular one of these. If it is to be the ward of some other branch of the company, however well organized and managed the latter may be, and however co-operative its intentions, there is little chance of success. The prin-

ciples incorporated in the charter of the standards division should involve consultation with, service to, but independence of all other departments.

My purpose in presenting this paper has been to establish some kind of basis from which we may measure, or at least reasonably estimate, the degree to which standardization has actually become the habit-forming instrument of American industry in general. The results seem to indicate that there is still an enormous task before us, whose accomplishment will, however, be greatly facilitated by the contributions made to the technique of standardization by those concerns which have already gone deeply into it.

The American Standards Association occupies a privileged position in this problem. Founded with the idea that it should become the center of national standardization work in this country, and the authoritative channel for international co-operation in such work, it is excellently equipped to lend its assistance to any concern that has placed, or wishes to place, standardization on the list of its managerial functions. Realizing that to do so, in addition to promoting the establishment of national standards, is a matter of the highest importance, the American Standards Association stands ready to put its experience, and the data available in its files, at the disposal of any concern that may care to avail itself of them.

In conclusion, let me say a few words about the international situation. During the last twelve years, there has been a tremendous increase abroad in the attention paid to standardization from the standpoint of national economy. At present there is a national standardizing body in each of twenty-one countries.<sup>2</sup> These bodies not only regularly exchange information on projects completed and in course of development in their respective countries, but there was also founded in 1928 an International Standards Association, whose office is in Zurich, Switzerland, for the purpose of facilitating and systematizing this exchange of information. It also works to eliminate discrepancies between national standards on the same subject wherever this is desirable and feasible. The benefit derived from such international co-operation by each country

<sup>2</sup>Australia, Austria, Belgium, Canada, Czechoslovakia, Denmark, Finland, France, Germany, Great Britain, Holland, Hungary, Italy, Japan, Norway, Poland, Roumania, Russia, Sweden, Switzerland and the United States.