

business that this would be one of the first things I should undertake if I were taking over the management of a company. In doing so I should acquire in a very short time such an intimate and detailed knowledge of all phases of the business and its problems as I could otherwise only hope to acquire after years of experience in its operation.

Such a classification during the World War of the activities of a tremendously expanded Army Ordnance Department was one of the things which made it possible to build up in a few months an organization which would ordinarily have taken at least as many years to develop in a commercial establishment. Not only was the organization built up from a handful of commissioned officers and civilian employees to one of thousands of workers, but an inexperienced personnel was placed and assigned to clean-cut, definite duties and responsibilities in such a manner that it operated with an efficiency which attracted much favorable attention.

In its evolution, the art of classification and designation seems to have passed through the following stages:

1. A serial number was arbitrarily assigned to things as they happened to occur. Typical of this is the scheme of numbering the machines in a plant in one series without regard to kind, size or type; thus, Machine No. 1 might be a planer, No. 2, a lathe, No. 3, a drill press, and so on. One milling machine might be designated by the number 73 while another along side of it, identical in all respects, might be 107. This primitive and ineffectual scheme is still to be found in many plants.

2. A certain range of numbers in the same series was assigned to a class; for example, under the designation of machines in a shop, numbers from one to fifty would be lathes; from fifty-one to seventy-five, planers; from seventy-six to one hundred, drill presses; from 101 to 125, milling machines, and so on. This is the first step toward a mnemonic system.

3. A range, as from 1 to 100, was assigned to one class; from 101 to 200 was assigned to another, and so on. This might equally well be from 1001 to 1999; from 2000 to 2999; from 3000 to 3999, etc. Here we begin to have an approach to the Dewey scheme of classification. As a rule under this scheme only the first numerals have significance for classification but in some instances a certain mongrel resemblance to the Dewey scheme may develop.

4. Then came the Dewey decimal system. Following our illustration, 1 designated lathes, 2, planers, etc.

Engine lathes might be designated as 11 and the particular type of engine lathe by the addition of another digit. Thus 111 would be an engine lathe of one type, 112 an engine lathe of another type, etc. Turret lathes would be designated by 12, chucking lathes by 13, etc.

5. The Taylor mnemonic system came next. Under this the letter B would designate boring mills, D drill presses, G grinders, L lathes, M milling machines, P planers, etc. Each of these classes of machines would be divided into subclasses according to variable characteristics. Thus, BH would designate horizontal boring mills, BV vertical boring mills. DR would designate radial drill presses, DB bench drills, DM multiple drills, LE engine lathes, LT turret lathes, LC chucking lathes. Further peculiarities of type, design or make would be expressed by adding appropriate letters. The size might be inserted in the body of the symbol thus: the symbol for a Monarch twenty-four-inch, geared-head engine lathe with a six-foot bed might be L246EGM. If we had several of these we should add the figures 1, 2, 3, etc., to the end of the symbol. By this method of classifying, all machines that are identical have the same designation except for the final figure. We also have a symbol which is largely self explanatory.

In a complete classification for a business the letters I have given as the initial class designation would, if the symbol were written out in full, be preceded by certain other letters to locate these machines in their proper place or class among the company's assets and in its equipment inventory. For example, in our primary grouping of main classes as designated by the first letters of our classification the letter Y would stand for all machinery; YP for power-plant machinery, YT for transportation equipment, YM for machines used in manufacturing, YMM for metal-working machines. Thus the full symbol for the engine lathe in question would be YMML246EGM1. In actual practice we omit the use of the letters YMM as being understood. This practice is also followed in the case of hand tools.

Strange as it may seem, the thinking of a great many people concerned with industry has not, in the matter of classification, progressed much beyond what I have described as the first or second stages. Many businesses muddle along handicapped to a greater extent than they realize by poor classification, or none at all. A shining example of faulty and inadequate classifications may be found in those prescribed by the various states for the public utilities and by the Inter-

state Commerce Commission for the railroads. Both the regulating bodies and the corporations have been inconvenienced by the restrictions which these classifications impose.

Taylor's references to that ingenious and valuable device which he designated as "the mnemonic symbol system for identification of parts and for charges" gave no indication which would enable the reader either to understand the nature of such a system, how to devise and apply it, the many valuable purposes that it served, or the years of work involved in its evolution. And yet it ranks in importance with, and is a valuable auxiliary to, all of the other features of scientific management. In "Shop Management" it is briefly mentioned in two instances. Under the head of "the leading functions of the Planning Department" Taylor says:

Some one of the mnemonic symbol systems should be used instead of numbering the parts or orders for identifying the various articles of manufacture, as well as the operations to be performed on each piece and the various expense charges of the establishment. This becomes a matter of great importance when written directions are sent from the planning room to the men, and the men make their returns in writing. The clerical work and the chances for error are thereby greatly diminished.

The second reference is even more brief and is a partial reiteration of the foregoing. In the evolution, or rather the development, of the mnemonic system of classification and symbolization, to the improvement and perfecting of which Carl G. Barth contributed more than the others associated with Taylor, as indeed he did to most of the features of the Taylor mechanism, Taylor followed the scientific principle of classification. This is to group all things into broad generic classes and thus bring into a relatively small number of principal groups everything of a similar or pertinent nature. A logical division of each of these primary groups or classes is then made into subclasses and this operation is repeated with the subclasses and their subdivisions until the original subject has been sorted out into its component elements.

The basic principle of the Taylor scheme of classification is identical with that of the Dewey decimal system of classification, which is most commonly used for cataloging books in libraries. This plan provides, for example, for the division of all works on all subjects into ten primary or main groups each of which is designated by a numeral. For example, general works are designated by 0, philosophy is designated by 1;

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religion by 2; sociology by 3; philology by 4; natural sciences by 5; useful arts by 6; fine arts by 7; literature by 8, and history by 9. Each of these broad, generic classes or groups is then broken down into ten secondary groups, the designation of which is a number beginning with the figure assigned to the primary group. Useful arts, for example, comprise medicine, designated as 61; engineering as 62; agriculture as 63; domestic economy as 64; communication as 65; chemical technology as 66; manufactures as 67; mechanical trades as 68, and building as 69. Each of the ten secondary subdivisions of a main class is, or may be, again broken down or fanned out, into ten further subdivisions, and so on *ad infinitum*. A few minutes spent in any library will serve to make this principle and scheme of classification perfectly clear.

In his early efforts to set up a classification, Taylor made use of the Dewey system, adapting it to purposes of accounting, the designation of materials, tools and products. From two of his contemporaries, Oberlin Smith and Henry R. Towne, Taylor got the idea of using letters instead of numerals for purposes of designation. From this grew the plan of also using numerals in combination with letters, for the purpose of expressing numerical values such as sizes, piece numbers, lot numbers, operation sequence numbers, etc. These were appropriately placed in front or at the end of the symbol, or in a significant position between the letters composing the symbol. It will readily be seen that the use of letters, instead of numerals as in the Dewey scheme, affords more than double the classes and subdivisions that may be set up under that scheme, and further, the letters of the alphabet possess a mnemonic or suggestive value which is lacking in numerals when used to designate subjects, material things or activities. It will also be evident that if we use numerals to express subjects or things we are deprived of their use for the expression of many values which may not be expressed symbolically in any other way short of the development of a new set of numerals, or the employment, for instance, of those of the Japanese. For example, in a symbol composed of numerals, it would be difficult to signify, in a manner largely self explanatory, a historical work dealing with a European nation, specifically France, in the eighteenth century. With letters we should set it up something like this—HE18F. It would not be quite so simple as that, but that gives the idea.

The use of the alphabet as a base, and the combination of numerals therewith, seems so natural a course