

One reason for questioning the propriety of this word is that we already use it in a more restricted and definite sense in describing the sequence of operations on a piece of work. On a machine part for instance we do the routing when we determine the most advantageous sequence for performing the several operations upon it such as drilling, turning, milling, etc. This is the use of the word which gives the names to our route charts, route sheets, route files, etc. Let me in the smallest possible space and without any effort at formal or final definition mention some of the other terms which occur to me as affording the basis for sub-functions under the general division of "routing."

Order—or *order of work* as we usually express it—has to do with the sequence of operations as between two or more jobs. Considerations of "routing proper" may dictate that the drilling on a given piece be done before the turning. Considerations of *order-of-work* however may suggest that as a given lathe is about to become idle and as the drill presses are all full that the usual order be reversed. Then Mr. Gantt has familiarized us with the term *balance* also usually expressed *balance-of-work*. One of his early papers before the American Society of Mechanical Engineers was largely devoted to this subject. Mr. Taylor used the underlying idea of *balance-of-work* in his work. Essentially *balance* is a scheme by which in the manufacture of a more or less standard article such as locomotives daily, weekly and monthly balances of required work is kept between departments.

Production is another word probably poorly adopted to express the ideas which underly it. The word production has such an important meaning in the whole science of economics that its use here in such a limited sense is probably a mistake. In my own mind considerations of *production* are those which only indirectly have to do with the actual doing of the work. *Production* plans are made at a conference between the financial, selling and manufacturing ends of the business. If the concern is short of funds for instance the financial man will ask that the work in which the greatest amount of money is tied up be pushed to early completion. On the other hand the selling man may have a disgruntled customer for whom he wants some special service in the way of expedited deliveries. Or the manufacturing man may feel that too large a proportion of the work has been "promised" for given dates in order to allow of economical manufacturing. These are simply typical considerations which occur to me as illustrating my conception of the field of *production*. The word *promise* used above has a definite routing significance.

Included in *progress* are those mechanisms and considerations which have to do with recording the

state of advancement of items of work grouped after a certain fashion. On our *progress* sheets the records are not kept in such detail as on our route sheets. *Scheduling* is still a different function but is usually somewhat related in character to both *production* and *progress*.

Another term that may perhaps be ultimately included in the lexicon of "routing" is the word *control* as used at the Franklin Automobile Co. It is a term I am not familiar with but from what Mr. Babcock has said it would appear to be a sort of complex of some of our other and more familiar terms. One of the objects of *Control* seems to be to avoid too early purchase of materials.

The word *work* itself seems to have or can be made to have a more or less technical significance in this field. I think we have used it too much and that it is probably superfluous as usually used in such terms as *order-of-work*, *balance of work*, etc. The whole point of this memorandum will be lost if friends who are good enough to comment on it object to my definitions. My reply to any such critic would be to simply insert his own definition in place of the one I have used. The argument would remain the same.

Perhaps one of the most interesting sub-functions of "routing" is one which I have had the temerity to name "*complexion*" or *complexion of work* if we are to follow precedent. Mr. Feiss uses a certain group of considerations at the Clothcraft Shops in determining the proportion of different models of men's suits which he puts through in a given batch. Obviously if all the work is of a kind which requires skill in its execution the total output of the plant will not be as great as if the proportion of skilled work required corresponds measurably with what might be called the skill modulus of the plant. The moment we give attention to such a consideration we discover that skill itself as a factor in "routing" has several varieties. There is for instance the skill required to perform a genuinely difficult task—one for instance demanding extreme physical dexterity. Then again there is the skill required to do something which has never been done before, the capacity to study out and perform novel tasks. Some people are almost devoid of such capacity. But the skill factors are not the only ones which enter into *complexion*. The demands on machine equipment and even total quantity of work per unit of output are simply two further examples of the other factors involved. Mr. Feiss has made a very interesting original and valuable contribution to the science of routing in this work on what I have called *complexion*. There are many lines of work—book manufacture for instance—where these same principles are obviously applicable.

Other terms properly pertaining to this general part of our field occur to me as they doubtless do to

you. But perhaps I have listed enough of them to warrant the suggestion that it would be profitable if we could take stock of what we have, determine which if any of these terms are to be changed, and make the attempt at least roughly to define those which are to become the basis of an ever enlarging art and science of "routing."

The industrial world is waiting for a text on "routing." It is much more urgently needed than are books on time study of which we are apt to have too many within the next ten years. The novice rushes to the stop watch as the solver of all difficulties. When used prior to the development of an adequate routing system time study simply gives rise to a new brood of

troubles. I wish I knew that an adequate book on routing was shaping itself up in some author's mind. No greater service could be rendered to scientific management than to produce such a book. Perhaps a meeting of the Society where most of the papers were devoted to this one topic would lay the foundation.

My own conception of routing in management suggests an analogy to stream flow in hydraulics. The volume is the product of the cross section times the speed. So in industry our volume of production is the quantity of materials and work going through as affected by its speed. Routing or flow is the art and science of studying and controlling this stream.

"PHYSICIAN, HEAL THYSELF!"

A PLEA TO REDUCE THE WASTE OF OUR OWN EFFORT BY BETTER CO-ORDINATION.

By HENRY W. SHELTON¹

To apply to ourselves the same principles of good organization which it is our effort to apply to others would seem obviously desirable. Our Taylor Society is called "a society to promote the science of management." Yet, like the proverbial shoemaker's children, in our solicitude that other organizations be well-shod we are in danger of going barefoot ourselves.

It is said that the progress of civilization rests on the ability of one generation to profit by the recorded experience and discoveries of those preceding. If our Society is to be not merely an ephemeral expression of the interest of its members it must consciously undertake to perpetuate the best of the past and to build better for the future. Mr. Taylor in his last address on "The Principles of Scientific Management"² says, as he vividly pictures the attitude of the surgeon toward his student, "Invent so that you can invent upwards, do not go inventing things which we discarded years ago." How are we fulfilling this duty? How are we protecting ourselves from duplication of effort? What kind of a standing order file are we preparing by which to measure the value of future proposed improvements? Have we a planning department to co-ordinate our various activities?

Care has been exercised, rightly and successfully, to keep the work of our members on the highest professional plane and prevent its becoming so commercialized as to lose its vitality. At the same time, is not all professional work successful in proportion as there is free interchange of discovery and idea for the equal benefit of all? The most respected profes-

sions are those which have no corners on information but which make available for the service of man their entire progressive achievement.

As a result of this effort to keep our activities on a high professional plane the work of our members is individual and independent. This is right, as responsibility must be individually assumed. Our work is also, however, too much isolated and this is a weakness. At present our members who are engaged in working out their individual problems of organization are, many of them, working independently on identical problems without knowing it. As they develop their individual solutions independently, their solutions may be largely identical and yet are achieved separately with all the expenditure of time and effort necessary for any original research. Are we not doing just what Mr. Taylor warns us against and, by hard labor, discovering individually many things which have already been discovered before? Why are we not aware of this duplication of effort? Simply because we have no organized means of comparing our problems and our progress in solving them with other solutions, past or contemporaneous. In a manufacturing plant, we recognize the folly of failing to record the results of all investigations so that new investigations may start where old ones stopped. The methods of elementary time study illustrate the proper application of this principle within an industry. Yet have we not largely failed to apply this principle as between different industries and more particularly between the work of our different members?

Unquestionably a few of our members of wide experience and contact are in rather close touch with the best that is being done in the field. Even their

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²See Taylor Society Bulletin, Volume II, No. 5, December 1916, page 13.