Tiering is done as soon as the nature of the goods permits and as high as possible so long as the stacks are stable, the uniform groups are preserved, and the stack does not come too near the ceiling. Space will be left for the proper working of the sprinkler pipes (in this case . . . inches), and for properly removing (such as by upending) the goods on the top tier.

Stowing volume.

16. In any cubic space to be filled, such as a bin, stowing is commenced at the back left-hand corner, and carried on vertically until one column is completed. This is made the first of a row of such columns brought to the front and completed. The second row of columns will commence as did the first, in the farthest left-hand corner of the remaining available space, and be built up and forward in the same manner.

Separation of lots.

17. Different items or different lots of the same item will be kept distinct. If placed in the same storage space, they will be separated by a space of at least one inch if in bins, or three inches if on platforms. Each lot of each item has its own separate tag and lot number.

Direction.

18. Goods will be placed all one way unless for stability it is necessary to reverse or cross-pile. *Reversing* will be done singly or in groups, according as the goods are piled singly or in groups, the same dimensions, however, lying the same way. *Cross-piling,* or laying goods in each tier or course at right angles to those just below, while increasing stability, decreases accessibility and sureness of count. As stability is generally less vital than accessibility and flexibility, cross-piling will be resorted to only in special cases. Where ventilation is required, as in piling lumber, cross-bars separating each course will be used. Thus the goods in all the courses may still lie all one way. The best way in general for goods to lie is with their ends out towards the aisle into which they will be withdrawn. If, however, space is economized to a marked degree (at least 25%) by placing the goods in some other way, it may be done.

Labels.

19. Labels, or other means of identification, will be placed all one way, showing outward if consistent with other rules.

Wrappings.

20. Articles with defective wrapping will be placed last, in order that they may be removed first. The person stowing goods is responsible for seeing that the tying or wrapping on packages is in as good condition as his facilities enable him to secure. This includes the putting on of new wrappings when necessary and feasible.

Maximum.

21. The maximum quantity ordinarily stowed will occupy not more than 75% of the space available. The remaining space is reserved for times of special need.

Removing.

Parts of one lot.

22. In removing goods from storage, in any one lot the last goods to be put in place are removed first, and further removals are made in just the reverse order to that in which they were placed. This means the cleaning up of incomplete before complete columns, stacks and blocks are touched.

More than one lot.

23. In the case of more than one lot of any one item, the lots are drawn from in order of age commencing with the oldest, unless otherwise specified on the issue. Not until all the goods of one lot are removed from any part of a storage space and the tag removed, is that part available for stowing a new lot.

Goods concentrated in aisles.

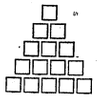
24. Where goods have been concentrated by stowing in side aisles between regular storage rows, (see paragraphs 7-9), removals will be made first from aisle spaces. No goods will be removed from a regular row until adjoining aisle spaces have been entirely cleared.

Pyramidal blocks.

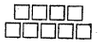
25. Removals from a pyramidal block will not be from the side slopes or from along the top, but will be stack by stack from the front. Thus there will be not more than one incomplete stack at any one time, all stacks behind the front one being complete. Removals from any one stack will be tier by tier from the top, so as not to disturb existing stability, or any braces at the bottom tier.

e.g.

Full Stack of 15



Correct removal of 6, leaving 9



Incorrect removal of 6, leaving 9

THE METHOD OF MAKING ROUTE CHARTS AND ROUTE SHEETS

How the Operations of Assembling a Machine are Controlled and Graphically Charted

By John W. Carter[1]

One of the most important phases of Scientific Management and one which ranks among the first in order is the establishment of a "routine" in which are shown the various processes through which any unit or combination of units must pass in order to be converted from the raw material to the finished product. It includes an analysis of work which involves the provision of sufficient quantities of raw material in advance and their proper assignment; the sequence of operations; the sub-division of labor; the assignment of men and materials to machines, and the making of time or motion studies. All these must be simplified to such an extent that they can be quickly and easily comprehended by the novice as well as by the experienced engineer.

"Routine" is a very abused term and is very often misconstrued for red tape, but obviously there is a vast difference. Red tape is something to eliminate, while a well laid "Routine" is an indispensable asset. While numerous arguments might be offered to substantiate this assertion, it is only possible in a paper of this length to enumerate a few reasons for its maintenance.

First—As we all know, Scientific Management is efficiency; efficiency is co-operation or team work, and to quote what has already been said, "efficient team work in any organization is only possible when a clear and complete understanding of what is to be done exists between all members." We must all pull together, not in opposite directions, but the same way and at the same time. To know when, how and in what direction to pull is the chief purpose of the "routine."

Second—Under Taylor System management men are paid a bonus, but a bonus or task system can only become operative when a definite knowledge of what is to be done is available. In other words, to make a systematic time study we must first have a well defined task. This information is conveyed to the time study department through the medium of the routine or route chart.

Again—A "routine" is a perpetual inventory of analyses of various products with their methods of manufacture, which becomes invaluable in the duplication of orders and estimating for work.

Just a word about the control of work. So long as the supervision of work is vested in several departments, each with entirely different conditions and perhaps variable attitudes of executives, there can be no accurate control of work. No two heads of departments have time to be very much interested in each other's work,—they are too much absorbed in their own. There might be over production in one department and the reverse in the other. No correct schedule could be laid out by which each unit or number of units could be started out at a period which would insure their being delivered to the assembly floor in proper sequence so that the combination of the several units would be in harmony. So this initiative must be removed from the several departments and concentrated at one point, namely, the planning department, which in turn must be governed by a "routine."

From the time a manufacturing order (Figure 1) leaves the drafting room until the finished product is either shipped or placed in stock, the path of progress even to the minutest details must be laid out so that when once started out each unit or component part will find its own way to the proper destination without the continuous supervision of executives.

The planning department must know the exact duration of each operation and its sequence in order to provide steady employment for men and machines; to regulate the volume of work so that congestion or scarcity of work will be reduced to a minimum or be entirely eliminated; to provide periodical inspection; to carry in stores sufficient quantities of raw materials such as are needed for immediate use.

There is an endless variety of products which do not require an elaborate analysis, some being so simple that route charts are unnecessary and the few operations required to produce the finished article can be contained on a single route sheet. But in the more complex industries, such as engine or machine building, in order to provide for the multitudinous functions incident to such production, it is necessary to make route charts and route sheets, to an exposition of the principles of which I wish to devote the balance of this paper.

Let me first refer to the analysis of work which is the most important phase of the subject and one which requires a combination of general shop experience, a familiarity with the equipment available, an analytical mind and common sense. Upon the degree of accuracy of this analysis depends the success or failure of all subsequent effort; therefore careful and mature deliberation is essential.

Under the old method it was customary to build a machine up, piece by piece, that is, as fast as parts arrived in the assembly floor they were placed in their

[1]Tabor Manufacturing Co., Philadelphia, Pa.