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Accounting for the Nail and Tack Industry*

BY GEORGE N. DESCOTEAUX

Among the accounting necessities of the nail and tack industry, the one which stands out pre-eminently is that of a cost system or plan for accurate cost finding. The wide variety in kinds and sizes of the product renders any rule-of-thumb methods entirely inadequate for intelligently fixing selling prices in advance of sale or for furnishing bids on contracts. In order to determine the price at which each size and style of the product should be sold, the costs must be built up for each style of head, length and kind of nail or tack produced; and this can be done only where trustworthy information is available. Trustworthy information as to costs by departments and accurate records covering the elements by which costs are applied can be obtained only where a definite plan is followed. Such a plan requires a careful analysis of purchases of materials, labor and expenses, in order properly to distribute these items so far as they apply directly to the various departments. Accurate records must be kept of the weight of the product at certain stages and of the operating hours of the cutting machines, because weight and machine hours provide the means by which costs may be applied to individual styles and sizes of nails and tacks.

In order to show this need for a cost-finding plan it will be necessary to describe in some detail the various manufacturing departments and operations of a nail and tack factory. This description will serve to bring out many of the peculiarities and problems encountered in the finding of costs in the industry.

The factory which has been selected to serve as a basis for this description is one which is engaged principally in the manufacture of iron and brass nails and tacks.

Such a factory would ordinarily be departmentalized somewhat as follows:

- Receiving and storing.
- Pickling (iron only).
- Gauging.
- Chopping.

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Cutting.
Polishing.
Sifting.
Applying finish (blueing, etc.).
Assorting.
Packing.

The principal raw materials are iron and brass, which are purchased from rolling mills in plates of various sizes and gauges. When the plate is unloaded from the cars in which it was shipped from the rolling mills, it is piled in storerooms, each gauge and size being kept in a separate pile. This arrangement makes it possible to verify the inventory of the various gauges of iron and brass plates on hand at any time with a minimum of effort, as it is necessary only to measure the height of each pile of plate. If, in addition to piling the plates of each gauge and size separately, permanent measurements be painted on the walls indicating the height in feet and inches, the sum total of the heights of piles of a given size can be obtained without even the necessity of measuring them. Having ascertained the total height of each pile of plate, the weight of each pile can readily be computed by multiplying the height by the weight per vertical foot of each particular size. This method of inventorying plate is so simple and expeditious that a monthly inventory, by which to verify the records of the amount of iron plate sent to the pickling department and the amount of brass plate sent to the gauging department during the month, can be quickly and accurately obtained. The labor and expenses incidental to handling the plate are included in the overhead expense.

In the pickling department the iron plates are placed in metal baskets having separators to keep the plates apart so as to permit the solution to come in contact with the entire surface of each plate. These baskets are then immersed successively in three separate tanks. The first tank contains vitriol which removes the scale and rust. The second tank contains water which flushes the plates. The third contains a lime solution which neutralizes the vitriol and reduces wear on cutting and forming tools. After the plates have gone through the lime solution the baskets are moved into a drying room. After the plate is dried it is weighed and sent to the gauging department. The costs applied here are those of labor, supplies and overhead expense applicable to this department.

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The cost of pickling the plate per hundredweight varies with the gauge. The lighter the gauge—that is the thinner the plate—the more plate surface per hundredweight. Where various sizes and gauges are pickled during the month, the pickling cost per hundredweight of each size and gauge may be determined as follows:

First, the operating cost of the department is divided by the total area of the surface pickled in order to ascertain the surface cost.

Second, the surface area per hundredweight of each size and gauge is multiplied by the average surface cost.

In the gauging department, iron plate and brass plate are gauged and sorted into piles according to gauges ready for the choppers. The costs in this department are labor and overhead expense. The gauging department cost varies for each gauge because each gauge has a different number of plates per hundredweight.

When plates of various gauges are handled in this department during the month, the cost per hundredweight of each gauge can be determined as follows:

The cost of operating the department is divided by the number of plates gauged and the result is multiplied by the number of plates in a hundred pounds of each gauge.

In the chopping department the plates are chopped into strips. These strips vary in width for each size and length of nail or tack to be manufactured. After chopping, these strips are piled or bundled by widths and gauges ready for the cutters. The costs applied here are labor and overhead expense. The chopping department cost varies by gauges for the same reason that has already been mentioned in discussing the cost of the gauging department and may be determined in a similar manner.

In the cutting department the strips which have come from the chopping room are fed into machines which cut and shape the nails and tacks. The elements of cost applied here are labor and overhead expense. The labor cost consists entirely of wages paid to the tackmakers and their assistants. These wages are based either on the product at piece rates per hundred thousand nails or tacks or at day rates. In determining either day or piece rates consideration must be given to the wide difference in the production of the various kinds and sizes of product of tack-making machines. This difference results from two factors, namely, the

differences in the cutting speeds of the machines themselves and the differences in the sizes of the nails or tacks being cut. For example, a machine making large sizes produces more pounds in a given amount of time than a machine making small sizes, although it is operating at a lower rate of speed.

Labor costs, either at piece rates or at day rates, are therefore lower per hundredweight on large sizes than on small sizes. When the product is paid for on the basis of established schedules of piece rates, the labor cost of cutting any size per hundredweight can be ascertained readily. When the product is paid for at day rates, the cutting cost per hundredweight of each size and kind can be determined by first finding the average labor cutting cost per machine hour and then determining the time consumed in cutting a hundredweight of each size and kind. After these facts have been ascertained, the labor cost of each size and kind may be easily determined.

Whether labor is paid for at piece rates or day rates, the weight of the daily product of the department is recorded. This record, which consists of an analysis of the product of each tackmaker, is kept by the weighing clerk. Where piece rates are used the tackmaker also keeps a daily record of the weight of his product to enable him to make up his monthly or weekly "pay bill." After the bills have been verified from the factory weighing clerk's record, the amount of advances, if any, made to the tackmakers are deducted and the balances are paid to them. Where day rates are used there is no necessity for the tackmaker to keep a record of his production.

The average overhead expense of the cutting department is determined by dividing the total expense of the department by the total number of operating machine hours. This average machine-hour cost may be applied to each size and kind of nail or tack, after determining the time consumed in cutting a hundredweight of each size and kind. On leaving the cutting department the nails or tacks are sent to the polishing department, sifting department, assorting department or direct to the packing department, according to the treatment the product requires.

In the polishing department the nails and tacks are polished in revolving drums. The elements of cost applied here are labor, supplies and overhead expense. The cost is determined by dividing the cost of operating this department by the number of pounds of nails and tacks polished. After being polished the nails or tacks

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are sent either to the sifting department or directly to the packing department, the destination depending on the particular kind or style of product.

In the sifting department the defective nails and tacks are eliminated by means of mechanical sifters. The product is then sent to the finishing department, assorting department or packing department. The elements of cost applied in the sifting department are labor and overhead expense; and the sifting-department cost is determined in the same manner as that adopted in the polishing department.

Applying finish consists of japanning, tinning, blueing, etc. The elements of cost are labor, supplies and overhead expense. This cost is also determined in the same manner as are the costs of the polishing department and sifting department.

In the assorting department certain kinds of nails or tacks are hand picked to discover any imperfect nails or tacks which have not been eliminated by the mechanical sifters; and after being assorted they are sent to the packing department. The elements of cost applied here are labor and overhead expense. The cost is determined as in the polishing department.

In the packing department the product is weighed and packed in a variety of containers, including boxes, kegs, cartons and paper wrappers. The elements of cost applied here are the container, labor, supplies and overhead expense. The costs of the container and supplies are readily ascertainable. Labor for packing small packages as differentiated from bulk packing is generally paid at piece-rate prices per hundred packages. Where the product is paid for on the basis of established schedules of piece rates, the labor cost of packing per hundredweight of each size and kind can be readily ascertained. Overhead expense may be applied on a weight basis. After the product is packed it is sent to the storeroom.

Having sketched very briefly the course of the product through the factory and having called attention incidentally to some of the accounting problems encountered, there remain for consideration some further matters peculiar to accounting in this industry. The method of distributing general overhead expense among the various departments and the method of accounting for waste present some interesting features.

Overhead expense so far as possible should be applied directly to the various departments. The greater part, however, of the

overhead expense is not incurred by any particular department and must be distributed on some equitable basis. Such expenses can often be grouped to reduce the number of items to be thus apportioned.

Under the general classification of rent, heat, etc., should be included expenses of an allied nature, such as depreciation, repairs and insurance on buildings, local taxes on buildings and heat. This division of expense may be apportioned to each department on the basis of floor space. In like manner items applicable to machinery, such as depreciation, insurance and local taxes on machinery, can be apportioned to each department on the basis of the investment value of the machinery in each department.

Under power should be included all expenses necessary to its production; and records should be kept of the horsepower produced by the power plant. These records will furnish the basis for the distribution of the horsepower cost to the several departments. The horsepower cost may be apportioned to the several departments by determining the horsepower required to operate each department. Where the power is furnished by electric motors the installation of a meter in each department will provide the information necessary for finding the cost of power.

It has been found most equitable to distribute such items of overhead expense as general factory superintendence, expense labor and sundry factory expense on the basis of "operating cutting machine hours," because the total product passes through the tack machine. The method by which the cost of such items can be applied to each size and kind of nail and tack manufactured has already been explained in discussion of the cutting department.

There remains the element of waste which is deserving of special consideration. Many tests have proved that it takes varying weights of plate in excess of 100 pounds to make 100 pounds of finished nails or tacks. The waste occurs in part in each department and may be either invisible or visible in its nature.

The pickling department furnishes a particularly notable example of invisible waste that is caused by the action of the vitriol which removes iron scale and rust from the plate. In the cutting department the visible waste consists mainly of the ends of chopped strips of plate held by the feeder clamps. It is necessary to determine the amount of waste which occurs in each department, as this information is needed to compute the cost of finished goods per hundredweight. This necessity becomes apparent

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as each department successively handles a gradually diminishing weight in excess of one hundred pounds in the production of one hundred pounds of finished goods.

The cost of finished goods per hundredweight must include the necessary weight handled by each department ultimately to produce 100 pounds of finished goods.

Administrative and selling costs, of course, would be recognized in the cost-finding plan in order to determine the total aggregate outlay against which the selling price shall provide for a satisfactory profit, but as these items present no greater problems than in other industries, no further comment will be made upon them.

Emphasis must be laid upon the point that an industry in order to be in a position to charge fair prices, bid successfully on contracts and operate on a good competitive basis, must know definitely the cost of its product.

The foregoing description of the various departments and the comments as to needed basic cost-finding information should show the necessity for a definite operating plan of accounting. An attempt has been made to indicate broadly the elements of cost in the various departments, the sources of these costs and the method of applying them.

The solution of the cost-finding problems in each department and the application of these departmental costs to so varied a finished product require a system carefully planned which would have to be adapted to fit the needs of each particular factory.