

1917

Cost accounting for brass manufacturers, Final report on the preparation of a uniform cost accounting system

L. H. Burleigh

George C. Whitaker

F. P. Sanders

National Association of Brass Manufacturers

Follow this and additional works at: https://egrove.olemiss.edu/acct_inst

Recommended Citation

Burleigh, L. H.; Whitaker, George C.; Sanders, F. P.; and National Association of Brass Manufacturers, "Cost accounting for brass manufacturers, Final report on the preparation of a uniform cost accounting system" (1917). *Publications of Accounting Associations, Societies, and Institutes*. 135.

https://egrove.olemiss.edu/acct_inst/135

This Article is brought to you for free and open access by the Accounting Archive at eGrove. It has been accepted for inclusion in Publications of Accounting Associations, Societies, and Institutes by an authorized administrator of eGrove. For more information, please contact egrove@olemiss.edu.

COST ACCOUNTING
FOR
BRASS MANUFACTURERS



Final Report on the Preparation of a Uniform Cost
Accounting System

National Association of Brass Manufacturers

COST ACCOUNTING

FOR

BRASS MANUFACTURERS



**Final Report on the Preparation of a Uniform Cost
Accounting System**

National Association of Brass Manufacturers

National Association of Brass Manufacturers

SPECIAL COST COMMITTEE

L. H. BURLEIGH, Chairman
H. Mueller Mfg. Co.
Decatur, Ill

GEO. C. WHITAKER
L. Wolff Mfg. Co.
Chicago, Ill.

F. P. SANDERS
Standard Sanitary Mfg. Co.
Louisville, Ky.

FOREWORD

The following report of the Special Cost Committee, appointed by the Permanent Cost Committee at the meeting held at the Congress Hotel, Chicago, May 22nd and 23rd, 1917, outlines a Uniform Cost Finding System that will adequately meet the needs of Brass Manufacturers.

It has been constantly borne in mind by this Committee that this Uniform Cost Finding System must be as applicable to the small manufacturer as to the large one, and we believe that a careful study of this report will bear out the statement that it will meet the requirements of any brass manufacturer, regardless of the size of his plant.

In considering a Uniform Cost Finding System, its relation to other phases of the business of manufacturing must be taken into consideration. There is production work, which consists of planning the work to be performed in the factory, and the issuing of instructions covering it; control of labor and pay-roll department. Then there is Purchasing, Inspecting, Receiving, General Accounting and Shipping.

It has been the aim of this Committee to confine its recommendations to actual cost finding as much as possible, although occasional references to Production and General Accounting will be found. By this is meant, the general books should reflect in total what the cost accounts represent in detail—in other words, the accounts in the general books must be so arranged that the detailed charges and credits turned in monthly by the Cost Department can be posted directly to the general account affected. The accounts in the general books must be of sufficient detail to overcome the bad practice of charging many items to General Expense that really deserve separate accounts.

Production and Cost Accounting are very closely related, and for the benefit of those members operating large plants, it is the suggestion of this Committee that their Cost and Production Departments be "tied in" with each other in order that factory production may be given the advantages of all findings of the Cost Department which will tend to increase production by means of arriving at fair and standard working times for various classes of work, etc., decrease expenses by keeping an intelligent control over indirect labor; reduce the amount of defective work by making detailed studies of defective parts manufactured.

The suggested method will give manufacturers unit costs, viz:—costs of individual articles made for sale—usually figured on a basis of 100 pieces, so that the relation of cost to selling price can be immediately ascertained. Such knowledge, immediately available, will enable the management to set a selling price so that a reasonable profit is assured. If, however, the market prevents a sale at a profit at **his** price, then the manufacturer has **real** information which will enable him to act along any of the following lines:

REDUCE THE COST OF MANUFACTURING STRIKE THE ARTICLE OUT OF HIS LINE

or, if neither of the above courses is possible or desirable, he will **know** his losses.

At the present time the price of labor and material is increasing out of all proportion to the advance it is possible to make in the selling price of an article. Therefore, the only avenue left open to the manufacturer to overcome this in-

creased labor and material cost, is to reduce his cost of manufacture, which can only be done by the use of an adequate cost and production system.

A Cost System laid out and operated along the lines suggested in this report will always be able to furnish the manufacturer with the following information:

COST OF RAW MATERIAL

COST OF MELTED METAL READY TO POUR

COST OF ROUGH SOLID CASTINGS WITH GATES AND HEADS
—AND WITHOUT

COST OF ROUGH CORED CASTINGS WITH GATES AND HEADS
—AND WITHOUT

COST OF GROUND AND CLEANED CASTINGS READY FOR MA-
CHINING

COST OF EACH OPERATION ON EACH PART FROM ITS RAW
CONDITION TO THE FINISHED PRODUCT

COST OF EACH INDIVIDUAL PART

COST OF EACH SUB-ASSEMBLED PART

COST OF EACH COMPLETED ARTICLE

also

PERCENTAGE OF GATES AND HEADS AS COMPARED WITH
USABLE CASTING ON ANY DISTINCTIVE CLASS OF WORK
OR INDIVIDUAL PATTERN.



BRASS FOUNDRY COSTS

Section One

Metal Room:

It is taken for granted that member plants maintain a Stock Room or a department that serves that purpose, in which an account of metals is kept, viz:—metals purchased and metals delivered to furnacing (melting) department. These accounts should be reconciled monthly, making a statement of all metals used (See Form No. 1). It is necessary that gates, heads, sprues, overmelt, bad or obsolete castings, turnings and all metals **returned** from foundry and finishing departments, be handled as a credit to the melting account (Work in Process) of the current month and be charged back to the metal account (Inventory). The details of this statement are taken up later in this report and are so arranged that the information necessary to show the percentage of gates, heads, sprues, bad or obsolete castings, turnings, etc., can be readily determined.

Furnacing:

All materials as received from the Metal Room will be charged to furnaces at purchase price, thereby establishing a gross metal price per mixture. It is recommended that metals be kept in separate lots as purchased, each lot bearing the purchase order number, thereby enabling each manufacturer to use the exact purchase price.

There should be kept in the Stock Room a record of all metals received (See Form No. 2). This being the case, the price from the invoice covering each particular lot of metal received in the metal room should be entered on this stock record. This places the Stockkeeper in a position to correctly price all requisitions received from the metal room. If the space available is too limited to keep the metal by lot numbers and it becomes necessary to mix the lots, then requisitions should be priced by using an average of the prices paid for the metals on hand. The former method is much to be preferred.

Section Two

Commencing with the Furnacing Room, the following items of expense must be added to the Gross Material Cost:

FUEL

BRICK

CRUCIBLES

FIRE CLAY

FURNACE TOOLS

DEPRECIATION

TAXES

FIRE INSURANCE

LIABILITY INSURANCE

Also MAINTENANCE OF EQUIPMENT, sub-divided as follows:
REPAIR LABOR AND MATERIAL FOR:

MACHINERY
ELECTRICAL EQUIPMENT
FURNACES

LABOR—FURNACING DEPARTMENT:

FURNACE TENDERS
FOREMEN
METAL ROOM
CRUSHER OR WASHER ROOM
MISCELLANEOUS

PRO-RATED EXPENSE—FURNACING DEPARTMENT:

HEAT, LIGHT AND POWER
GENERAL EXPENSE

The total of Section No. 1 and Section No. 2 will give the Gross Melted Metal price.

From actual tests which must be made by each individual manufacturer to cover his particular case (a detailed description of such tests will be found in this report—See Form No. 3) a given per cent for melting loss will be determined. This melting loss must be deducted from the gross weight of metals charged to furnaces, thus leaving net weight of melted metal. The Gross Melted Metal price divided by net weight of melted metal will give the cost of metal as poured.

As a check on the accuracy of the foregoing test, and giving, we believe, a more accurate method of determining melting loss, the following method will give the desired check:

Assuming that most member plants are keeping a fairly accurate record of all castings delivered from the foundry, it is suggested that a little additional care taken in assuring the accuracy of these weights will make it possible to ascertain the approximate melting loss, which compared with the test made, will give the figure to be used as a melting loss.

Drafting Room:

All labor in this department should be distributed as follows:

Direct labor should be charged to the order covering the work being done, whether a customer's order, a betterment order or a repair order.

All other labor to be charged to the General Expense of this department.

Pattern Shop:

The expense of this department should be kept as a separate item. At the end of each month this expense should be closed into the General Foundry account.

Direct Labor—New Work

All direct labor should be charged to pattern upon which the expense is incurred.

Direct Labor—Repairs

All this labor to be charged into Foundry Expense at the end of each month. The overhead of the Pattern Department is composed of the following items:

PATTERN AND FLASK LABOR
SUPPLIES
TOOLS

REPAIR LABOR AND MATERIAL FOR:

MACHINERY
EQUIPMENT

LABOR—PATTERN DEPARTMENT:

FOREMEN
MISCELLANEOUS

PRO-RATED EXPENSE—PATTERN DEPARTMENT:

HEAT, LIGHT AND POWER
GENERAL EXPENSE

Tool Room:

The expense of this department should be kept as a separate item. At the end of each month this expense should be charged to the departments benefited. Any of this expense that cannot be directly allocated to a department should be charged to General Factory Expense.

Direct Labor—New Work

All direct labor should be charged to the order upon which it is incurred.

Direct Labor—Repairs

All this labor to be charged to General Factory Expense at the end of each month.

The overhead of the Tool Room is composed of the following items:

SUPPLIES
TOOLS
TOOL STEEL

REPAIR LABOR AND MATERIAL FOR:

MACHINERY
MOTORS
EQUIPMENT

LABOR—TOOL ROOM:

TRUCKING
CLEANING
INSPECTORS
FOREMEN
TOOLMAKERS
MISCELLANEOUS

PRO-RATED EXPENSE—TOOL ROOM:

HEAT, LIGHT AND POWER

Core Room:

Core-making labor should be treated as a direct charge to each individual order: It will be found advantageous to give all miscellaneous small core-making jobs to one person, thus allowing the rest of the force to stay on their regular work, all of which materially helps in obtaining accurate labor records.

The following expenses should be treated as Core Room overhead:

MATERIAL:

Core Sand
Core Wire
Resin
Glucose
Core Oil
Fuel

It is intended that these charges, cover the expense of all general supplies to Core Room.

DEPRECIATION
TAXES
FIRE INSURANCE
LIABILITY INSURANCE
TOOLS

also

MAINTENANCE OF EQUIPMENT, sub-divided as follows:

REPAIR LABOR AND MATERIAL FOR:

OVENS
MACHINERY
EQUIPMENT

LABOR—CORE ROOM:

FOREMAN OR FORELADY
MISCELLANEOUS

PRO-RATED EXPENSE—CORE ROOM:

HEAT, LIGHT AND POWER
GENERAL EXPENSE

Foundry Moulding:

Moulding labor should be treated as a direct charge to each individual order, whether for regular production, betterment or repair work.

The following items will be treated as moulding overhead:

DEPRECIATION
TAXES
FIRE INSURANCE
LIABILITY INSURANCE
MOULDING SAND
SUPPLIES
TOOLS

LABOR—FOUNDRY:

FOREMAN'S AND ASSISTANT'S WAGES
GENERAL FDY. LABOR

REPAIR LABOR AND MATERIAL FOR:

MACHINERY
EQUIPMENT

PRO-RATED EXPENSE—MOULDING DEPARTMENT:

HEAT, LIGHT AND POWER
GENERAL EXPENSE

Cleaning and Grinding:

In member plants where there is no large variation in the size of the castings going through this department, the "per pound" basis of figuring cleaning and grinding labor can be used, although the method of charging this labor directly to the production order number is to be preferred.

The following expenses will be treated as cleaning and grinding room overhead:

DEPRECIATION
TAXES
FIRE INSURANCE
LIABILITY INSURANCE
SUPPLIES
TOOLS

REPAIR LABOR AND MATERIAL FOR:

MACHINERY
EQUIPMENT

LABOR (OTHER THAN REPAIR):

TRUCKING
SCALEMEN
CLERKS
FOREMEN
CLEANERS
GRINDERS (Where direct labor method is used)
SORTERS
MISCELLANEOUS

PRO-RATED EXPENSE—CLEANING AND GRINDING ROOM:

HEAT, LIGHT AND POWER
GENERAL EXPENSE

Method For Arriving at Melted Mixture Cost

It is, of course, necessary that the actual castings produced shall carry the melting expense of the gates, head, overmelt, etc., made necessary to produce them. The following method will enable member plants to determine their actual mixture cost:

Cold Mixture

Copper	850 lbs.	@	.30	\$255.00
Tin	40 lbs.	@	.58	23.20
Lead	40 lbs.	@	.10	4.00
Zinc	70 lbs.	@	.10	7.00
1000 lbs.				\$289.20

Cold metal cost per pound equals \$289.20 divided by 1000 lbs., or, .2892c.

Gross Cold Metal Cost per 1000 lbs. equals	\$289.20
Furnace Room Expense per 1000 lbs. equals	7.00
Gross Melted Mixture Cost equals	\$296.20

Assuming that the melting loss equals 5%, or 50 lbs., 1000 lbs. less 50 lbs. equals 950 lbs., or, 950 lbs. of melted mixture actually cost \$296.20.

Melted mixture cost per pound equals \$296.20, divided by 950 lbs., or, .3118c.

In actual practice the above method would work out as follows:

Illustration of Costing the Material in 100 Castings, Complete with All Gates, Heads, etc.

	Debit	Credit
Moulded or Gross Weight	180 lbs. @ .3118	\$56.12
Gates and Heads	72 lbs. @ .2892	\$20.82
Grindings	3 lbs. @ .0000
Defective Castings	5 lbs. @ .2892	1.45
	\$56.12	\$22.27

Gross weight of 100 castings, 180 lbs.
Less:—

Gates and Heads	72 lbs.	
Grindings	3 lbs.	
Defective Castings	5 lbs.	80 lbs.
Weight of Good Castings		100 lbs.

Gross Material Cost of Castings \$56.12
Less

Credit for return of Gates and Heads to the Metal Room	\$20.82	
Credit for return of Defective Castings to the Metal Room	1.45	22.27

Net Material Cost of 100 Castings (100 lbs.) \$33.85

Net Material Cost Per Pound .3385c.

The ratio of .3385c to .3118c equals 1.085.

The advantage to be gained by arriving at a ratio as above, is, that as long as the melting loss remains within a reasonable limit of test made, an advance or a decline in the market price paid for metal can be automatically taken care of, either by the Cost Department or the Sales Department, by multiplying the ratio by the up-to-date melted mixture cost, thereby obtaining the up-to-date cost of the casting.

A further advantage is to be gained by dividing all patterns into classes, for instance:

All caps, nuts, handles, flanges, stems, etc., into Class "A".

All small compression and Fuller bodies, etc., into Class "B".

All small ground key work into Class "C",

and so on along the line.

While the above illustration may not be typical of every brass manufacturer's line, it serves to bring out the point that by classifying patterns according to the proportionate weight of gates and heads to casting proper, each manufacturer puts himself in a position to predetermine for cost or production purposes the amount of metal it will be necessary to melt in order to produce a given number of any class of castings. In other words, if a manufacturer is asked to submit a price on an article that has never gone through his shop, he can, by comparing it with the classification coming nearest to it, obtain all the information necessary to enable him to make a really intelligent estimate as to the price he should charge for it, and what his profit will probably be.

In starting such a record of patterns, the following weights of a few representative patterns of each class should be taken:

1. Weight of brass in entire mould, as poured, including, of course, gates and heads.
2. Weight of gates and heads after being cut off.
3. Weight of castings ground and ready to be machined.

This becomes a permanent record and requires no upkeep expense after it is once done, except to classify new patterns as they are brought out.

It will be noted in the Illustration of Costing 100 Castings, page 10, that grindings have been charged into the mixture at no cost whatever. This, the Committee believes to be good practice, as it leaves this relatively small item to offset the unknown losses that cannot be tabulated. However, in member plants where their grindings are usually sold, the management will determine the disposition of this item, in case a portion of their grindings go into the remelt.

MATERIAL

A stock record (See Form No. 2) of all material should be kept, and too much emphasis cannot be placed upon putting a capable man in charge of this work.

The first thing necessary in starting a stock record is to take an inventory and post the quantities on a card similar to Form No. 2. It will be noted that this particular card also serves the purpose of a location sheet, showing the building, floor, aisle, and bin numbers of the various materials.

In laying out a brass stockroom it will be found that better results can be obtained by storing material by classes rather than by articles, that is:

ALL COMPRESSION WORK TOGETHER
ALL FULLER WORK TOGETHER
ALL SELF-CLOSING WORK TOGETHER
ETC., ETC.

not

ALL BODIES TOGETHER
ALL STEMS TOGETHER
ALL HANDLES TOGETHER

Issuing:

No material should be delivered from stockroom under any condition except upon a properly signed requisition (See Form No. 4). There should be no more exception to this rule than there is in requiring the cashier to get a receipt for all moneys disbursed by him.

Pricing:

In order to obtain accurate pricing on all requisitions it is absolutely necessary that the stockkeeper be furnished with a copy of all invoices covering materials delivered to the stockroom, and, to obtain the best results, everything purchased should go through the stockroom—at least by way of record.

In charging material out of stockroom it is recommended that each manufacturer add a certain per cent to the invoice price of the material, to cover the loss caused by breakage and handling. This percentage will necessarily have to be determined by each individual plant, based on past experience.

Classification:

For Accounting Department records, material should be divided into three classes, viz.:

Product Material
Supplies
Special Material

Product Material:

This account should cover all materials purchased that enter directly into the manufacture of the product made for sale.

Supplies:

This account should cover all materials purchased that are used in the operation and maintenance of the plant and equipment.

Special Material:

This account should cover all materials purchased for special purposes, other than product and supplies—plant made equipment, for instance.

STOCKROOM MATERIAL CLASSIFICATION:

For cost accounting purposes material should be divided into the following classes:

- Raw Material (Including Metal Room)
- Finished Parts
- Sub-Assembled Parts
- Assembled Articles
- Supplies

Raw Material:

This account should cover all material which is processed into a different form to produce a salable article.

Finished Parts:

This account should cover all finished parts in stockroom, either for use in the assembled article, or whether they are sometimes sold in this condition.

Sub-Assembled Parts:

This account should cover all material in stockroom in a sub-assembled condition, either for use in the completely assembled article, or whether for sale in this condition.

Assembled Articles:

This account should cover all completely assembled articles in stockroom, whether loose, or wrapped and boxed.

Supplies:

See previous explanation under Accounting Department.

At the end of each month the stockkeeper will furnish the Cost Department with a detailed statement of all material delivered, charging each department with the total of its monthly requisitions.

In this connection it might be added, that a more complete check may be kept on material and labor performed thereon, by putting every order through the shop on a number, which number, in addition to the other information required, must be shown on the requisition calling for the delivery of material from the stockroom.

See Form No. 5 for detail of reconciling Cost Department accounts with Accounting Department records.

LABOR

An absolutely accurate record of all labor is a matter of fundamental importance in all cost-accounting. This should be divided into direct and indirect labor. The extremely important matter of correct overhead expense distribution is entirely dependent upon a correct record of the time spent on each job. All labor tickets should be closely checked with the clock or attendance cards of each man, and in order to do this in the most advantageous and economical manner, the pay-roll

should be made up in the cost department; that is to say, the cost department should have entire charge of the pay-roll.

There are a number of ways of recording labor. The three methods most generally in use are:

1. Allowing the workman to keep a record of his time on a daily or job time ticket.
2. Having a clerk in the factory whose duty it is to keep a correct record of each workman's time.
3. Automatic time-keeping equipment and cost-recording machines, of which there are a number of good makes on the market.

Method No. 1 is not recommended by this Committee—its faults are many and its virtues few. Methods 2 or 3 should be used, or some other method equally as good.

Tabulating of labor tickets can be handled to the best advantage by having a separate ticket for each job. After the tickets have been figured they should be filed away in job order number. It is then merely a simple matter of addition to get total job labor costs. This method is an improvement over the use of the consolidated daily time ticket on which the workman enters the time spent on different jobs, as it eliminates the posting of labor expended on each job to a job-cost-sheet.

POWER

This account includes Power, Heat and Light, and should be kept as an individual account, charging all material and supplies used by this department to its operating cost. A list of the usual expenses entering into this account, follows:

FUEL

SUPPLIES

WAGES OF:

ENGINEERS

FIREMEN

OILERS

ATTENDANTS whose duty it is to keep in order the power
developing and transmitting machinery

DEPRECIATION AND MAINTENANCE OF EQUIPMENT

TAXES

INSURANCE

The total monthly expense of the above charges should be prorated to the different departments on the basis of H. P. or K. W. used.

One method of determining the power used by each department, is to list the H. P. of each machine, then the total of each department and then the total for the entire plant. It will be found that this total rated machine H. P. is in excess of the power developed by the plant. The reason for this is apparent. For instance, if the machine H. P. is found to be 500 H. P. and the generated H. P. is but 400 H. P., the factor to be used in determining the departmental H. P. to be used for cost

purposes will be 400/500 (4/5) of the rated machine H. P. This method will give a figure that will prove satisfactory. However, there are other methods of figuring this expense and pro-rating it fairly to the various departments. The above method is simple, and the information required is easily obtainable, as the rated H. P. of each machine is usually shown on the manufacturer's plate, or, if an appraisal has been made, the required information can be obtained from this.

In those departments that use no power, the expense for light and heat should be properly charged. The lighting expense can be satisfactorily pro-rated on a basis of the wattage used by each department, which can be determined from the lighting equipment. It is a good idea to figure this expense out on a quarterly basis to conform to the seasons of the year.

The heating expense can be satisfactorily pro-rated on the basis of feet of heating piping or radiation surface in each department. The heating expense, of course, is seasonable.

NICKEL-PLATING

The total operating expense of the Nickel-Plating Department should be handled as an overhead charge against the direct labor of nickel-buffing, or coloring, as it is sometimes called.

It is pertinent to call attention here to the fact that nickel-buffing labor must be handled as a distinct operation, so that buffing labor on articles not going through the nickel-plating department will not be charged with any of this department's overhead expense.

In case of rough nickel-plating, the cost of this operation should be determined by assuming that it was buffed, and the same proportion of expense should be added to the rough plated cost.

It should be remembered that this part of the expense of the Nickel-Plating Department must be deducted from the amount of overhead to be absorbed by the direct nickel-buffing labor.

OVERHEAD

This element of cost is one of the most confusing, and being so, is generally handled in a more loose manner than any of the other items of expense.

There cannot be given a detailed description of this element of expense as the different methods employed by the various plants makes it impossible to set any hard and fast rules.

The different plants will have to treat their various items of overhead expense as they influence production.

This committee offers the following recommendation as a general method:

The expenses of a manufacturing plant are divided into three main divisions, viz.:

MANUFACTURING EXPENSE
ADMINISTRATIVE EXPENSE
SELLING EXPENSE

Manufacturing expense will absorb all the expenses incurred in the manufacture of the product. This expense is divided and charged to the overhead of the

departments incurring it, and, where it is impossible to definitely charge it to a department the same should be charged to General Factory Expense to be pro-rated to the various departments at the end of each expense period.

The items that are usually included in General Factory Expense are:

SUPERINTENDENT'S AND ASSISTANTS' SALARIES
COST AND PRODUCTION MANAGER AND CLERKS
GENERAL FACTORY SUPPLIES
SUCH MAINTENANCE AND OPERATING EXPENSES AS
ARE GENERAL

The expenses of machining departments, as a rule, are distributed as follows:

BRASS DEPARTMENT:

SUPPLIES
TOOLS

REPAIR MATERIAL AND LABOR FOR:

MACHINERY
MOTORS
EQUIPMENT

LABOR:

TRUCKING AND CLEANING
INSPECTORS
GENERAL IN DEPARTMENT
FOREMAN AND ASSISTANT
HEAT AND LIGHT
PRO RATA OF POWER
PRO RATA OF GENERAL EXPENSE

BRASS POLISHING DEPARTMENT:

SUPPLIES
POLISHING WHEELS AND STRAPS
POLISHING MATERIAL
TOOLS

REPAIR MATERIAL AND LABOR FOR:

MACHINERY
MOTORS
EQUIPMENT

LABOR:

TRUCKING
GENERAL IN DEPARTMENT
FOREMAN'S WAGES
HEAT AND LIGHT
PRO RATA OF POWER
PRO RATA OF GENERAL EXPENSE

BRASS BUFFING AND COLORING DEPARTMENT:

SUPPLIES
BUFFING MATERIAL
TOOLS

REPAIR MATERIAL AND LABOR FOR:

MACHINERY
MOTORS
EQUIPMENT

LABOR:

TRUCKING
GENERAL IN DEPARTMENT
FOREMAN'S WAGES
HEAT AND LIGHT
PRO RATA OF POWER
PRO RATA OF GENERAL EXPENSE

NICKEL-PLATING DEPARTMENT:

ANNODES
LIME, SALTS, POTASH, ETC.
SUPPLIES
TOOLS

REPAIR MATERIAL AND LABOR FOR:

MACHINERY
EQUIPMENT

LABOR:

TRUCKING
GENERAL IN DEPARTMENT
ALL WAGES
HEAT AND LIGHT
PRO RATA OF POWER
PRO RATA OF GENERAL EXPENSE

*(All labor, material and
expense of this department
handled as an overhead ex-
pense against the operation of
nickel-buffing, see page No.
15.)*

BRASS, GENERAL EXPENSE:

REPAIRS TO BUILDINGS
INSPECTORS AND TESTERS
WATCHMEN, ELEVATOR MEN, ETC.
GENERAL LABOR
SUPERINTENDENCE, CLERKS, ETC.
COST AND PRODUCTION DEPARTMENT
STORES KEEPERS
EXPERIMENTAL
OBSOLETE AND SPOILED STOCK
STATIONERY, ETC.
TOOL ROOM (Closed into General Expense)

ADMINISTRATIVE EXPENSE

The Administrative Expense is, as the name implies, the expense of the general management of the business, and as a general rule is composed of the following items:

SALARIES AND EXPENSES OF:

EXECUTIVES AND MANAGERS
GENERAL BOOKKEEPING
CASHIER'S DEPARTMENT
CLAIM DEPARTMENT
STATIONERY DEPARTMENT
GENERAL OFFICE SUPPLIES
TELEPHONE AND TELEGRAPH
POSTAGE
JANITORS
BILLING DEPARTMENT
HEAT AND LIGHT
TAXES
DEPRECIATION }
INSURANCE }

As per values used by general office.

This expense in its entirety, at the close of an expense period, is pro-rated to manufacturing and selling expense.

SELLING EXPENSE

The selling expense is the entire cost of selling and distributing the product. The dividing line between manufacturing and selling expense occurs when the factory delivers the finished product to the storeroom. Theoretically, at this point, they are sold to or become the property of the sales department at the manufactured cost price. All expense incurred after this must become a selling expense.

The sales expense, as a general rule, is composed of the following items:

SALARIES AND EXPENSES OF OFFICE SALES DEPARTMENT
SALARIES AND EXPENSES OF CREDIT AND COLLECTION DEPT.
SALARIES AND COMMISSIONS OF SALESMEN
EXPENSES OF SALESMEN
GENERAL SUPPLIES OF SALES DEPARTMENT AND SALESMEN
SALARIES AND EXPENSE OF SHIPPING DEPARTMENT
GENERAL SUPPLIES OF SHIPPING DEPARTMENT
LOSSES ON BAD ACCOUNTS
CONVENTIONS (Manufacturing, Administrative or Selling)
ADVERTISING
CATALOGUES
RETURNED GOODS
DEPRECIATION }
TAXES }
INSURANCE }

On above department's equipment

This expense should be taken as a yearly item, as the monthly figures give too large a fluctuation for practical purposes. In other words, standardize the sales expense in the same manner as suggested for manufacturing expense.

The per cent of this entire expense to the manufactured cost of goods sold should be ascertained and this per cent is then the fixed figure to be used against the manufactured cost of the product to determine the selling expense to be added to produce the sold cost.

INTEREST

It will be noticed that interest has not been included in the items making up the overhead charges. This was not an oversight. It was purposely omitted on account of the widely conflicting views of the members of this association.

If a competent man is selected to visit the different plants in the interest of the Uniform Cost Accounting System, we recommend that the views on this particular question be investigated among the various plant executives and definite action be taken on this information.

Methods of Distributing Overhead Expense

There are a number of methods by which production can be properly charged with overhead expense. The four most common methods are:

1. As a certain percentage of direct labor cost.
2. As a certain cost per direct labor hour.
3. As a certain percentage of prime cost.
4. The machine-hour basis.

Method No. 2 supplemented by method No. 4 are the ones that will give the best results in our case. A description of both methods follows:

No. 2—Direct Labor Hour or Man-Hour:

Under this method for the distribution of overhead expense, the total producing hours of labor are reduced to a per-man-hour basis. Assume, for example, that a plant employs 160 workmen, each of whom averages nine (9) hours per day for three hundred (300) working days per year, or, 2700 hours per year; the total time of the entire working force will be 432,000 man-hours per year. If we divide this time into the total indirect expenses (estimated) for the year, the result will be the total overhead expense per man-hour. This method can, and should where conditions warrant it, be further refined by dividing the plant into departments and figuring each department as a unit, in the same manner as above.

To the prime cost (direct labor and material) of any piece of work is added the per-man-hour rate, determined as above, multiplied by the number of producing man-hours spent upon the job. The result is the total manufacturing cost.

However, the above method does not always furnish accurate results. Take the following case:

“A 23-cent man works on a drill press for two hours, and the hourly rate for the distribution of overhead expense is 30 cents, then the total cost for labor and overhead expense for the two hours will be \$1.06.

"In another case the same priced man is in charge of five automatic screw machines working under the same overhead charge. Considering two hours as the time occupied with the job the total cost for labor and overhead expense would still be \$1.06, which is obviously wrong owing to the greater value of the equipment used."

To overcome this defect of the per-man-hour method, there is what is known as:

No. 4—Machine Rate Method:

It is intended that this method be used as a supplementary rate to be added to the man-hour cost.

This supplementary Machine Rate method usually takes into account:

Interest on investment in each machine or group of machines similar in cost and type;

Depreciation;

Floor Space Occupied (Including space for operator);

Power;

Insurance;

Miscellaneous Supplies, etc.

The next thing to ascertain is the probable producing hours of each machine or group of machines. The estimated number of producing hours for each machine or group of machines divided into the expenses enumerated above will give the supplemental machine-hour rate to be used in addition to the man hour rate on all machine work.

In plants operating entirely on a piece-work basis, method No. 1 will give fair results, provided that the entire plant is properly departmentalized, each department being further divided into classes to separate hand-workers, machines, special machines, automatic machines, etc. However, this committee recommends as a standard and more accurate practice, that methods No. 2 and No. 4 be used.

UNEARNED BURDEN

Unearned Burden or Overhead, as applied to machine equipment, represents the difference in hours the machines have actually worked as against the number of hours they were supposed to work when figuring up the machine-hour rate.

The amount actually earned by the machines during a certain period deducted from the amount they were supposed to earn during this period gives the Unearned Burden.

For instance, if only one-half of the accepted charges were earned by a machine or group of machines during a dull period, it would not be proper nor fair to charge against costs double the amount of machine-hour burden.

It is the suggestion of this committee that Unearned Burden be charged direct to the Loss and Gain Account. Each monthly operating statement should show the amount of this charge as a separate item.

STANDARDIZATION OF COSTS

The standardization of costs is a very important matter to the manufacturer in the brass business. As we are all aware, the manufacturing of the different lines is seasonable, and if costs are not standardized the real value of the costs to the sales department is, to a certain degree lost, and will often cause the sales department to question the figures furnished by the cost department.

Due to the fact that the different lines are seasonable, production is large some months and small during others, and with the overhead fluctuating monthly, it is very evident that the individual cost of an article will have a variation during these different periods; having a lower cost in active periods, and a higher cost during dull periods.

If these costs, taken from a monthly statement, were to be considered as a basis for the sales department, it is evident that they would often receive a high cost at the time when they should have as fair a cost as possible. It is to overcome this trouble that a method of standardization should be adopted.

Plants having a piece-work system have virtually standardized their direct labor. The following method of standardization applies particularly to plants operating either wholly or partially on a day-work basis, although it is just as applicable to a plant operated on a piece-work basis.

Costs of a manufacturing plant are of two distinct classes:

1. Figured costs of individual production and assembling orders as used for comparative purposes.
2. Standardized costs which are used as a basis for sales.

In the standardization of costs, the cost data for one year should be used, as in this way all conditions of the business are taken into consideration and an average obtained of the real activities of the business, both manufacturing and selling.

This would mean a yearly average of the direct labor taken from the cost data; a yearly average of the material prices and a yearly average of the overhead. This standard is then used as a basis for the sales department and is changed only in the material values, as the market value of materials should be used to bring the cost up to date for sales purposes. It is essential that good judgment be used, in addition to the information at hand, in changing these standards.

Having set up this standard, it gives the factory a mark to work to during the coming year, different costs can be figured on separate runs and compared with this standard. A monthly statement of overhead expense should be taken off and compared with the standard overhead previously set up. This comparison will immediately indicate whether the current overhead is too high or too low.

This same standardization must be maintained in the selling costs that are added to the manufacturing costs, because it must be seen that if one advances the manufacturing cost by increasing the material costs, it is a fallacy to further advance this suddenly increased manufacturing cost by using the same per cent of selling expense.

For this reason we should always figure our manufacturing cost to the standard and then arrive at a standard amount of selling expense computed on this standardized manufacturing cost and maintain this same amount of selling expense throughout the next year unless a very good and apparent reason is seen for changing it.

Example of a Figured Cost

(The figures used are not actual)

In the article on Foundry Costs, page 10, the method of finding the metal cost of a part is shown in detail. In the following example this same part is taken and continued to its completed cost.

Foundry Division:

	Labor	Overhead	Material
Core Department	.63	1.23	
Molding	.47	.70	
Cleaning and Grinding	.20	.40	
Material			33.85
	\$1.30	\$2.33	\$33.85

The summary of the cost at this point produces a figure which places the foundry on a competitive basis against purchased castings, producing a total cost of \$37.48, or, .3748 per pound, the castings weighing one pound each.

Finishing Division:

Assuming that a spoilage of two castings is to be expected in finishing the parts, it will be necessary to obtain 102 castings to get 100 final good.

Quantity	Operation	Labor	Overhead	Material
102	Foundry	1.33	2.38	34.53
102	Mach. Oper. No. 1	.10	.12	
102	Mach. Oper. No. 2	.15	.18	
100	Mach. Oper. No. 3	.15	.20	
100	Polishing No. 4	1.80	1.44	
		\$3.53	\$4.32	\$34.53

Total cost of 100 castings, \$33.85.

Total casting cost of 102 castings (to allow for spoilage) \$34.53

Total weight of 102 castings, 102 pounds.

Less 2 defective castings, 2 lbs. @ .2892 .58

Less borings and chips 25 lbs. @ .2747 6.87

Total metal credit (27 lbs.) \$7.45 7.45

Net value of brass (75 lbs.) in finished parts \$27.08

Total direct labor 3.53

Total overhead 4.32

Total manufactured cost of parts.....\$34.93

It will be noted that chips and borings are credited at a less value than defective castings, gates or heads. This the committee recommends, as borings and turnings are a difficult problem to control and losses are sustained which do not occur as in gates, heads or defective castings. It is recommended that 95% of the cold metal mixture price be used to credit all borings and chips.

Assembled Cost per 100:

Part	Material	Labor	Overhead
Body	\$27.08*	\$3.53	\$4.32
Cap	3.80*	.50	.61
Stem	6.50*	1.30	1.23
Handle	3.06*	.80	.96
Packings	.40		
Brass Washer	.22		
Fibre Washer	.25		
Assembling		.80	.70
Buffing		1.20	1.10
Packing	.17	.15	.12
	<u>\$41.48</u>	<u>\$8.28</u>	<u>\$9.04</u>

There being \$40.44 (items starred (*) in assembled cost) of cast brass in the total cost, a ratio of this value to the mixture price of .3118 is found, which is 1.297. A final cost is then established as follows:

Cast Brass (ratio 1.297)	\$40.44
Purchased Parts	1.04
Direct Labor	8.28
Overhead	9.04
MANUFACTURED COST.....	<u>\$58.80</u>
Selling Expense	11.78
SOLD COST.....	<u>\$70.58</u>

This cost can be brought up to date at any time by multiplying the up-to-date metal mixture cost (as poured from furnace or crucible) by the ratio established and by also allowing for the current prices of the purchased parts.

Depreciation

The term "depreciation" has been variously defined, and the conceptions of the term as used at present differ. For our purpose depreciation will be considered as the reduction in actual value of manufacturing and office property, due to wear and tear by use, as well as the effect of natural deterioration.

Depreciation accounting takes into consideration the following factors:

- Reproductive Value
- Estimated Life
- Residual Value

Reproductive value is that value of the entire plant which would be required to replace it at any given time in order to render the same productive capacity as existed originally. The methods of arriving at the reproductive value are usually ascertained from data, such as purchase price of new equipment, cost of privately made equipment, and appraisals. In case of a plant element which is purchased

outright, the purchase price, together with transportation charges, plus installation charges, represent the reproductive value. In the case of properties acquired by forced sale or second hand, care should be taken that the actual purchase price is not confused with the reproductive value. It might be considered as the "sound" or "depreciated" value.

Estimated life, expressed in terms of years, represents the estimated period during which the plant or element in question can be effectively used for production purposes.

The Residual or scrap value is the market value of any part of the property that would be realized on a purely scrap basis.

The object of depreciation accounting is to establish a reserve account during the useful life of a plant element which will suffice to purchase a replacement of the same productive value. These reserve accounts are not ordinarily accumulated or reserved at one time, but are generally collected gradually through annual charges so proportioned that the total amount will be realized at the time that the estimated useful life of the element has become exhausted. These annual charges, as they are set aside, form the depreciation reserve, this reserve increasing as the plant grows older. The difference between the reproductive value and the depreciation reserve of any element is the "sound value."

From the standpoint of production costs, the only consideration is the annual depreciation charge which must be taken up during the year. To do this it is necessary that all product made by use of a given plant element during its useful life shall include in its total costs of production an amount equal to the reproductive value of that element.

Obsolescence is that feature whereby the usefulness of a plant element stops, not through wear and tear or deterioration, but on account of the availability of some improved kind of apparatus which must be employed to realize reduced production costs.

Repairs and maintenance are made to recover values that are lost through wear and tear (depreciation) and this being the case, the cost of repairing and maintaining a plant element in its highest productive capacity should be charged against the depreciation reserve.

Betterment items are those which increase the productive or physical value of a plant and it is proper in such cases to add them to the fixed assets.

It is the recommendation of this committee that each member plant have an appraisal made, if a fairly recent one is not at hand. It is impossible to set up a dependable depreciation schedule without the information contained in an appraisal.

For some reason, or for no reason at all, it is the policy of some firms to charge off depreciation only when they think the Profit and Loss account will justify it. Such practice is totally wrong, and to overcome any tendency that member plants may have to handle their depreciation charges as above, it is the suggestion of this committee that a minimum depreciation charge of three per cent (3%) on the total reproductive value of the plant be charged off annually. In nearly every case good business judgment will dictate the charging off to depreciation each year an amount much greater than three per cent (3%) of the total reproductive value.

Conclusion

It has been the aim of this committee to bring out in as much detail as possible, the items and processes that go to make up a finished cost. If the reader into whose hands this book may find its way, desires additional information or a more detailed explanation, it will be cheerfully furnished upon application to

WM. M. WEBSTER, Commissioner,
1818 City Hall Square Building,
Chicago, Illinois.

Nov. 1, 1917.

FORM N° 3

TEST FOR MELTING LOSS

COLD MIXTURE

MATERIAL

LBS.

COPPER

TIN

LEAD

ZINC

INGOT

GROSS COLD WEIGHT

GROSS MELTED WEIGHT

DIFFERENCE

DIFFERENCE DIVIDED BY COLD METAL WEIGHT
EQUALS % OF LOSS

WEIGHT OF CRUCIBLES SHOULD BE ASCERTAINED BEFORE
PUTTING IN COLD METAL

METAL MIXTURE COST

DESCRIPTION OF MIXTURE _____

FROM _____ TO _____ MIXTURE N° _____

DETAILS OF TOTAL CHARGE				PER 100 LBS BASIS	
MATERIAL	WEIGHT	PRICE	AMOUNT	WEIGHT	AMOUNT
COPPER					
TIN					
LEAD					
SPELTER					
SCRAP BRASS					
SWEEPINGS					
CRUSHINGS					
GATES AND HEADS					
RECHARGED CASTINGS					
BORINGS AND TURNINGS					
ALLOYS					
TOTAL MELT					
FURNACE EXP.					
FONDRY LOSS					
NET COST					

FORM No 7

STOCK REPORT OF METAL ROOM

MONTH OF _____ 191__

MATERIALS		PURCHASED AND ON HAND			DELIVERED			BALANCE ON HAND		
		WEIGHT	PRICE	AMOUNT	WEIGHT	PRICE	AMOUNT	WEIGHT	PRICE	AMOUNT
COPPER	ON HAND									
	PURCHASED									
	TOTAL									
TIN	ON HAND									
	PURCHASED									
	TOTAL									
LEAD	ON HAND									
	PURCHASED									
	TOTAL									
ZINC	ON HAND									
	PURCHASED									
	TOTAL									
SCRAP BRASS	ON HAND									
	PURCHASED									
	TOTAL									

FRONT

FORM No 8

MACHINE AND MACHINE TOOL RECORD CARD

FACTORY No	CARD No	CO. SER. No
NAME		SIZE
MAKER		
PURCHASED FROM		DATE
ORIG. COST \$	FRT. AND INSTAL'N \$	
TOTAL ORIG. COST	ANNUAL INT. AT 6%	
EST. LIFE	YEARS	TOTAL COST TO RETIRE \$
ANNUAL DEPREC'N	PRESENT VALUE \$	DATE
HOUR RATE	IN OR OUT OF USE	
NOTE - ALL COUNTERSHAFTS MUST BE INCLUDED IN INSTALLATION COST		

BACK

MAINTENANCE RECORD

JANUARY			FEBRUARY						
JULY									

FORM ILLUSTRATING
THE DISTRIBUTION OF EXPENSES
BY DEPARTMENTS

NON PRODUCTIVE

		DEPT. HEADS			CLERKS			TIME KEEPERS			DAY WORKERS			TOTALS	
DEPARTM'TS	AMOUNT	NO. MEN	%	AMOUNT	NO. MEN	%	AMOUNT	NO. MEN	%	AMOUNT	NO. MEN	%	AMOUNT	NO. MEN	
NON PRODUCTIVE	60 FOUNDRY														
TOTALS															
MANUFACTURING PRODUCTIVE															
TOTALS															
COMMERCIAL EXPENSE															
TOTALS															
GRAND TOTALS															
ACCOUNT NO'S.	A-1			A-2			A-3			A-4					

