1915

Cost accounting

Association of American Portland Cement Manufacturers

COST ACCOUNTING

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"Concrete for Permanence"

ASSOCIATION OF AMERICAN PORTLAND
CEMENT MANUFACTURERS

PHILADELPHIA, PA.

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Cost Accounting

I

The Purpose and Value of Cost Accounts

BEFORE attempting to outline or discuss any system of cost accounts, it might be well to say a few words in defense of systems in general. So many people still cling to the idea that systems and red tape are identical, that we may be justified in telling beforehand what we aim to accomplish, and why we believe it should be accomplished. Red tape, as far as the writer has been able to learn, consists in doing unnecessary things, apparently only for the sake of doing them, or because they have been done in the past; whereas system implies the orderly working-out of a plan that has been carefully studied and defined, with the object of arriving at certain definite results.

Since there still may be an inclination in some quarters to consider cost accounts as red tape, let us consider the reasons why complete and accurate cost accounts are essential to the proper administration of a corporation and the proper operation of its property.

In the first place, no corporation that is conducted for profit has a right to undertake to sell material without knowing its cost. To embark blindly on the sale of a product of which the cost is not known will surely be productive of bad results, and may be the cause of disaster. Fair treatment of customers, stockholders, and competitors, the possible limit and scope of markets, and the permanent well-being of the company will depend on complete and honestly stated cost figures. Estimated costs, and similar guesses, may serve the purpose as long as luck is with the guesser, but if these estimates are properly checked and verified, the labor involved in so doing will be found, in the long run, to be nearly equal to the labor required in the production of systematic and accurate costs, while the security to be derived from a proper knowledge of costs, together with other collateral benefits, will more than pay for any slight additional expense that may be involved in their compilation.

One of the great advantages of properly kept manufacturing costs is their value as an index of operating efficiency. Estimated costs tell what the plant should do, but actual cost figures tell what is really being done,

and are valuable accordingly. With properly prepared cost figures the relative efficiency of the various departments of the plants may be watched and compared. The current results obtained in each department may be checked against those obtained in the past, thereby showing increases in efficiency, or the reverse, and the results of improvements in practice and equipment. A constant study of properly prepared cost figures will help to bring to light dishonest and improper management, and will enable standards to be set for the less efficient departments, based on what actually has been done in departments that are being properly and efficiently administered. In other words, a complete and properly kept cost accounting system will be found to exercise the important and productive function of helping to lower costs, and holding them at the lowest practicable level.

There is one more point that must be urged in favor of a cost accounting system. The officials of a corporation are trustees of the property that has been turned over to them by the stockholders, and as such must render a proper account of their stewardship. The raw materials, semi-finished product, and finished product of a manufacturing plant constitute a large and important part of the assets of the company. Such assets must be correctly stated with respect to price, as well as quantity, and the only way to insure this correct statement is to show exactly what they have cost. In order to make a proper accounting of the property of a company the officials must know what has been done with that property. An estimate or a guess is not sufficient. Understated manufacturing costs mean overstated profits, and when these overstated profits are disbursed in the form of dividends, the capital of the corporation has been depleted, and the officials are, at least, morally liable.

Cost accounts fall logically into two main divisions. The first of these is the manufacturing cost, which is the cost of producing a completed and marketable article or material, and delivering it, as required, to the carrier for transportation to the customers. In other words, manufacturing cost comprises a complete record of the work performed by the factory. The second item is the overhead cost of administering and financing the company and marketing its product. These two items together make up the commercial cost of the product, and give a figure at which the product must be sold in order to come out even.

The simplest and most generally effective way of keeping track of the manufacturing costs of a cement company is on the basis of each month's production. This requires that each department shall be charged with all labor and material used, and all expense incurred during the month. The total charges against each department for the month, divided by the number of barrels or tons of output produced, will give the month's unit cost for the product of the department. These monthly charges may be consolidated by departments at the end of the year, and divided by the yearly

output, in order to arrive at the average yearly costs both for departments and finished product. This will have the effect of equalizing fluctuations due to variations in operation at different seasons.

In our detailed consideration of this subject we will take up, first of all, the question of manufacturing costs. For the sake of having some concrete basis on which to work we will consider the case of a cement company operating on the dry process, quarrying two raw materials, and using coal for fuel. We will assume that the operation of the plant is directed by a superintendent, and that an independent organization, reporting to the chief accounting officer in the general office, is in charge of, and responsible for, the accounting end of the work, including the handling of the Stores Department and, if possible, all the timekeeping work. It should be understood that no attempt will be made to lay down any hard and fast rules, and if any rules are formulated, it will be done only with the object of expounding and illustrating the fundamental principles on which they are based.

II

Analysis of Manufacturing Costs

Since the object of any system of cost accounts is to afford information, we must decide, first of all, what information we need. We must know the cost of our finished cement. Our Clinker Inventory is liable to fluctuate widely from time to time, owing to the fact that in some months more clinker is likely to be produced than is ground into cement, while in other months the quantity of clinker produced will be much less than the quantity consumed. Therefore, in order to equalize matters, and to have our cement costs reflect the results of current operations, we should arrange to carry our clinker in inventory, and in order to do this we must know what our clinker costs. The same condition obtains with respect to raw materials. It may be that the raw materials for the entire year's consumption are quarried during the summer. It would not be right to charge our clinker costs for the summer months with the cost of producing the entire year's supply of raw material. Therefore our raw materials should also be put into inventory as produced, and carried until consumed, and we must know how much they cost. In other words, it is essential that we should have separate costs on each of our raw materials, and on our clinker, and on our cement, as each of these commodities is an individual item in our inventory accounts, and each occupies a distinct place as an asset of the company. Furthermore, separate costs on these items are highly desirable for comparative purposes and to aid in maintaining the efficiency of the departments under review.

If further refinements are desired, they may be obtained without much difficulty. If the manager of the company desires to know, for instance, how much the coal costs, when ground and ready to be fed to the kilns, a separate cost on coal grinding may be kept, or, if it is considered necessary, a separate cost and inventory may be kept on ground raw material.

The next question to consider is how minutely we desire to analyze these various main costs. It would be quite possible to take the total charges to one of the quarries for a month, dividing it by the number of tons of rock quarried, and say, "This is what the stone has cost us per ton." This process may give all the information necessary from an accounting point of view, but it will not tell the Operating Department very much. Therefore, we will put ourselves in the place of the general superintendent of the plant, and try to imagine what he would like to know about the detailed costs of operating his quarry.

First of all, it is wise to assume he would like to know how much it costs to run the quarry; that is to say, whether the superintendents, foremen, and clerks necessary to operate Quarry No. 1 are costing more per ton of product than in the case of Quarry No. 2, so the first account that we will set up for Quarry No. 1 will be—

SUPERVISING LABOR:

Superintendents, general foremen, and clerks.

He would want to know how much labor is required in the work of drilling and blasting, as this constitutes a separate and individual detail in the operation of the quarry, so we will set up an account for—

LABOR, DRILLING AND BLASTING:

Assistant or gang foremen, drillers, air-compressor operators, and employees engaged in handling explosives.

Assuming that this quarry is partially equipped with steam shovels and cars, and that the remainder of the rock is loaded by hand into wagons or push-carts, we ought to keep track separately of the cost of each of these operations. It may be that some figures of this kind will show the desirability of making an additional investment in mechanical equipment. Therefore we will set up two accounts to cover these two classes of labor.

LABOR, STEAM SHOVEL AND HOISTING:

All labor having to do with the operation and handling of steam shovels, car-haulers, quarry engines and hoists, including engineers, firemen, and helpers.

LABOR, HAND LOADING AND HAULING:

Assistant or gang foremen, teamsters, and laborers engaged in breaking stone and loading, pushing, or dumping cars or carts.

Certain quarry work, such as stripping off the overburden and moving tracks, should be kept track of separately. This work is done irregularly, and the cost of it should be segregated in order to prevent unfair comparisons between the costs of months when it is done with months when it is not done. Therefore, we will set up another account to cover

LABOR, STRIPPING, AND MOVING TRACKS:

Assistant or gang foremen, and all labor employed in preparing quarry for actual work of blasting and removing stone.

These accounts will take care of all the labor actually involved in getting out the stone; but there is another class of labor to be considered, and that is, the labor required to repair and keep in good condition the equipment and buildings connected with the quarry. It will be desirable to keep separate figures on the mechanical equipment as distinguished from cars and carts, and to differentiate between the operating equipment of the quarry and the permanent improvements on the property, such as buildings, permanent tracks, etc Therefore, the following accounts may be provided:

LABOR IN REPAIRS—STEAM SHOVELS AND HOISTS:

All labor in repairs of power equipment used in quarry excepting drills (which are regarded as tools).

LABOR IN REPAIRS—CARS AND CARTS.

LABOR IN MAINTENANCE:

All labor required to keep in good condition buildings, permanent tracks, fences, sidewalks, and other structures pertaining strictly to the quarry. Also labor in general cleaning up in and around quarry.

In order to obtain complete figures on cost of repairs and maintenance the materials used in this work must also be kept track of, so that similar accounts, as outlined below, may be set up to take care of the materials.

MATERIAL IN REPAIRS—STEAM SHOVELS AND HOISTS:

All material and parts used in repairs to power equipment in quarry, excepting drills.

MATERIAL IN REPAIRS—CARS AND CARTS.

MATERIAL IN MAINTENANCE:

All material required to keep in good condition buildings, permanent tracks, fences, sidewalks, and other structures pertaining strictly to the quarry. Also appliances for fire protection.

There are three other classes of materials which are used by the quarry,

the consumption of which it may be desirable to watch, in order to obtain a complete line on the way in which the quarry is being operated. To take care of these materials we will set up accounts as follows:

LUBRICANTS AND WASTE.

TOOLS:

Cost of all new tools, including drills and air apparatus, and expense of repairs to tools.

EXPLOSIVES AND SUPPLIES:

Explosives, caps, fuses, fuel, and miscellaneous supplies not provided for above.

The above analysis of the expense of quarrying rock is purely a suggested one. The analysis may be made much more minute or much more simple. If necessary, it can be boiled down to the following items:

OPERATING LABOR.

REPAIR AND MAINTENANCE LABOR.

OPERATING SUPPLIES.

REPAIR AND MAINTENANCE SUPPLIES.

The guide to this, from start to finish, is simply the question, "What do we want to know?"

In a similar way we can go through the mill, outlining an analysis of the cost of operating the other quarries (or clay pits, or marl-beds), the cost of converting the raw materials into clinker, and the cost of converting the clinker into finished cement. We can take each of our subordinate departments, such as the packing and loading department, machine shop, laboratory, or any of the others, and work out an analysis of each of these, for the purpose of holding the costs down to a reasonable level. When we have finished, the result will be a series of carefully laid-out groups, into which all the expense of the plant can be divided, and which will arrange and classify these expenses in such a way as to give the Operating and Executive Departments, as well as the Accounting Department, the information that they require, in order properly to keep track of the operations of the plant.

A list of these groups, properly designated and defined, when assembled in proper order, is called a Card of Accounts. In the following chapter is presented the outline of a card of accounts to cover the operations of a cement plant. This card is based on the analysis of operations set forth

on the Association Cost Sheet, and is intended to be used in connection therewith. More minute analyses of costs and detailed statements of various phases of plant operations will undoubtedly be desired by the managers of many cement plants; but, by following the suggestions already made, the operating accounts of any cement company may be so analyzed as to present whatever degree of information may be required, and each division so defined as to insure consistent and logical distribution of operating expenses to the proper accounts.

III

Card of Accounts

In outlining this system of accounts we assume that there are in a mill six departments, each of which has its own product; that is to say, two raw material departments, and raw grinding, coal grinding, clinker burning, and clinker grinding departments; each department being charged with the material and labor that it consumes and the expense that it incurs, and credited with the product that it turns out and puts into the proper inventory accounts.

In order to furnish a simple and logical basis for the distribution of the various items of expense incurred in the operation of the mill, each department has been allotted a series of account numbers as follows:

Department	Series
Raw Material No. 1	100
Raw Material No. 2	200
Raw grinding	300
Coal grinding	400
Clinker burning	500
Clinker grinding	600
Packing and loading	700

In the classification of accounts as outlined below each account bears a number consisting of two figures. In order to make the complete account number, each of these account numbers will have to be prefixed by the proper serial number. For instance, Operating Labor, which is shown below as Account 01, will be charged to Account No. 101 when chargeable to the quarry producing Raw Material No. 1; all Operating Labor with which the Raw Grinding Department is charged will go to Account 301, the Operating Supplies consumed by the Clinker Burning Department will be charged to Account 511, etc.

No provision will be made for giving account numbers to the various Raw Material, Expense, or Reserve Accounts, but if it is so desired, the system outlined below can be expanded sufficiently to give a number to every account called for by the Cost Sheet.

LABOR

01. Operating Labor.
All supervising and direct producing labor employed in the regular operation of the department.

02. Repair and Maintenance Labor.
All labor employed in repairing or keeping in repair the machinery, buildings, and other equipment used by the department. Mechanics and other repair men will be charged to these accounts, even though they may be continuously employed in a single department.

SUPPLIES

11. Operating Supplies.
All materials used and consumed by the department, excepting raw materials and items specifically provided for below.

12. Repair and Maintenance Supplies.
All materials used in repairs to the machinery, buildings, and other equipment used by the department.

13. Tools.
All tools regularly used in the operations of the department.

14. Oils and Waste.
All lubricants and waste used in the department.

15. Fuel.
All fuel used in the department for drying raw materials, and purposes other than burning clinker or generating power, which latter items are shown separately on the cost sheet.

A. Power, Light, and Water.
This account will be charged with all fuel for generating power and with the wages or salaries of all engineers, electricians, stokers, and other labor regularly employed in the power plant and waterworks; with all labor and material required to care for and maintain in good order all buildings, machinery, and equipment for producing and delivering power, light, and water to the consuming department at the point of consumption, including the maintenance and trimming of electric lights; and all supplies, lubricants, and waste used or consumed in the production and distribution of power, light, and water.

The total expenses charged to this account in each month will be prorated among the various producing departments to which power, light, and water have been furnished during the month, on a basis of the approximate number of horse-power and gallons of water that each of the producing departments has received.

B. Laboratory Expense.
This account will be charged with the wages or salaries of all chemists, testers, samplers, and other labor employed regularly in the laboratory work; with all labor and material required to repair and maintain in good order the laboratory equipment and, if the laboratory is located in a separate building, the laboratory building; with all supplies,

chemicals, etc., consumed by the laboratory and all apparatus used by the laboratory. Laboratory expense may be charged to the various departments served on a basis of the proportion of time of laboratory employees devoted to each, excepting when the amount of laboratory work done for other departments is not of sufficient volume to entitle it to consideration in this distribution.

C. Shop Expense.

Shop expense will be charged with the wages and salaries of master mechanics, mechanical foremen, shop clerks, and any other shop labor that cannot be charged direct to the various repair, maintenance, or inventory accounts. This account will also be charged with all labor required to repair and maintain in good order the shop equipment and buildings; with all supplies, tools, lubricants, and waste used in the shops or by members of the mechanical department; and with light, power, and fuel used in the shops if the quantity of light, power, and fuel so used is sufficient to entitle it to consideration in the distribution of these charges.

Shop expense will be distributed to other departments each month on the basis of the number of hours of mechanical labor furnished each department during the month. All shop labor employed in the manufacture or finishing of repair material which is carried in stores will be added to the inventory accounts in which the articles so manufactured or finished are carried, and, if the labor so employed is sufficient to warrant it, a fair proportion of shop expense will be distributed to these inventory accounts also.

D. Stable Expense.

Stable expense will be charged with the wages and salaries of stable foremen and other help employed around the stables (the wages of teamsters and team bosses being chargeable to the direct operating labor of the department in which they are employed); with all labor and material required to repair and maintain in good order the stable buildings and equipment, with replacement of horses or mules and with all supplies, feed, tools, and harness used in the stables.

Stable expense will be distributed each month to all departments for which teaming has been performed on a basis of the number of team hours used.

E. Mill Office Expense.

Mill office expense will be charged with the salaries of general superintendents, mill auditors, accountants, chief clerks, and others having general charge of, or supervision over, the entire plant, together with their clerks, stenographers, etc.; with labor in repairs and maintenance of mill office building, and with stationery, supplies, furniture, apparatus, and fixtures used in the mill office. This account will also

be charged with telephone and telegraph expenses, postage, traveling, and entertainment expenses, and miscellaneous expenses incurred in connection with the conduct of the mill office.

Mill office expense will be distributed each month to the various producing departments on a basis of the ratio that the monthly payroll of the respective department bears to the total payroll of all producing departments.

F. Maintenance and Track Expense.

Maintenance and track expense will be charged with all labor, material, and expense expended in general cleaning-up and maintenance work, which cannot be charged direct to any of the producing departments, such as general cleaning-up of yards and maintenance of switch leads and other general railroad facilities, bath-houses, ball-grounds, safety expense and other conveniences furnished by the company gratis to its employees, and from which no revenue is derived. This account will also be charged with any miscellaneous switching expenses that cannot be applied direct against inventory or operating accounts.

The total charges of this account will be distributed each month among the main producing departments on a basis of the average number of men employed by each.

IV

General Plant Records

The scheme of accounts outlined in the Card of Accounts represent the classifications of expense that we desire to obtain in our accounting work; so, having decided what we want our machine to do, the next thing to consider is the general outline of the machine itself. The accounting machine will consist of men and records, but it will be sufficient for present purposes to consider the records alone, and only those records which are general to the accounting work of the entire plant. The Operating Department will undoubtedly require and compile reports and records of its own, and some of these records may also be available for incorporation in the accounting system, but they will not be considered specifically here. Other accounting records and forms of a more specific nature will be taken up in connection with the consideration of that part of the work to which they particularly apply.

The record in which the entire accounting work of the plant is brought to a focus is the Plant Ledger. This should be a self-balancing ledger, the controlling account of which is carried in the General Ledger of the company. It will consist of four main divisions, as follows:

Manufacturing Accounts.
Inventory Accounts.
Suspense Accounts.
Reserve Accounts.

The manufacturing accounts will be closed off each month to the inventory accounts, and the same disposition will eventually be made of the suspense accounts: while the reserve accounts will be closed off to the General Ledger each month. Therefore, the trial balance of this ledger, when all closures are made, should represent the company's inventory at the plant.

In the Manufacturing Accounts division of the ledger, accounts should be opened for each of the production accounts outlined in the Card of Accounts, and it will probably be found desirable to do the same with each of the expense accounts. The Inventory Division should contain accounts for the Raw Materials, Clinker, Cement, Coal, Packages, etc.; also a Stores Account, which will be the controlling account of the detailed Stores Ledger. Suspense accounts may be opened up from time to time to take care of sundry items of which immediate disposition cannot be made, but these accounts should be watched very carefully in order to make sure that no items are allowed to be buried in them, or to remain undisposed of any longer than is necessary. In the Reserve Account division separate accounts should be opened for the debits and credits, respectively, to each reserve for which a provision is charged to the operating costs.

Journal vouchers are mentioned here because they constitute the most effective means of journalizing the distribution of the various items to be considered in the compilation of cost accounts. Several examples of journal vouchers, to be presented later on, will show the general arrangement of this form and illustrate the way in which it can be used. The great advantage of the journal voucher, as compared with bound journal books, is that the papers supporting each entry may be attached to it and the complete file of papers placed in a document file for ready reference when desired. Spaces may be provided on the back of the form for the index number, title, certification, and approval of the voucher, so that this data can be readily noted when the forms are folded for filing.

One more form should be considered here, and that is the Distribution Sheet. Any standard multi-column sheet will do for distribution work, provided that it is of sufficient size and has enough columns for the purpose required. The use of such a sheet is most desirable, for the reason that it enables the distribution of any class of expense to be made on a single sheet, and the details filed in an orderly way, instead of using scattered slips of paper; while the work of checking, balancing, and entering the figures is greatly facilitated.

Freight payments should be made by draft on the treasurer. For the general freight records of the plant, a form of freight voucher will be found

most desirable. This should be a form headed up with blanks for the number of the freight draft that it supports, the date of payment, and the name of the railroad to which the payment is made. It will probably be found highly desirable, in practice, to set up separate drafts and vouchers for incoming and outgoing shipments; and also, possibly, for various classes of materials received. This plan will facilitate the task of distributing the charges to the proper accounts. If it is followed, blanks should also be provided at the head of the form for proper description of the class of shipment covered. Columns should be provided for expense bill date and number, car number, material, shipper or consignee, point of origin or destination, weight, rate and minimum, and charges paid; also for distribution of the charges to the claim, inventory, profit and loss, or other accounts chargeable. The freight so vouchered should be credited to accounts payable, in the same way as approved material bills. Freight on materials received should be taken up in the inventory accounts; while freight on shipments (which is chargeable to profit and loss) and all overcharges or freight collectible from shippers or consignees may be carried currently in the Suspense Division of the Plant Ledger, and written off at the end of the month to the proper accounts on the General Ledger. The weights, rates, and extensions should be checked and approved by competent parties, preferably before payment is made, and their approval noted, either on the vouchers or on the expense bills that support them.

No mention is made of cash books, or other cash records, because it is believed that the plant should not have very much to do with the handling of cash. All bills for material should be vouchered and paid at the general office. Certain petty cash payments, which must be made at the plant, can be handled through an imprest or working fund in the hands of the plant cashier or some other responsible party, but if this party's reports of disbursements are distributed and passed for payment in the same way as bills for material, etc., the petty cash expenditures need have no other connection with the cost accounting work of the plant.

The same condition prevails in the case of company stores, villages, or boarding-houses. These are all separate activities, and have no direct connection with the cost of manufacturing cement. If any of these institutions are operated at a loss, as a special inducement to hold men in service, such losses may consistently be charged to costs under some special and appropriate designation, but the detailed accounting of these activities should at all times be kept entirely distinct and separate from the cost accounts. Accounts receivable from plant employees, for board, rent, etc., may be carried in the Suspense Division of the Plant Ledger until liquidated, because it is to be expected that they will be settled in the month in which they are incurred, either by deduction from wages due or otherwise.

V

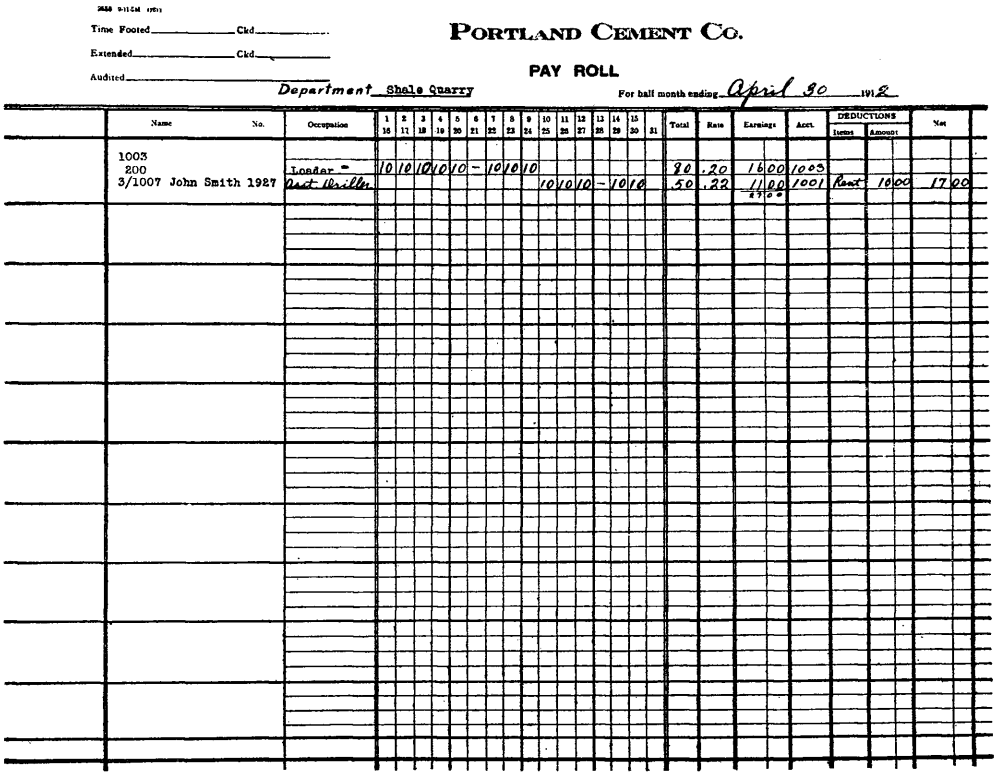
Labor Accounts

The subject of wage systems has been so thoroughly covered in so many books, and the problems attendant upon the employment and holding of workmen differ so widely in different localities, that no attempt will be made to give them consideration here. An effort will be made simply to outline a system of keeping track of the labor that is employed, and of making sure that the cost of it will be distributed to the proper accounts.

As a preliminary to this, however, two or three points might be mentioned, if only by way of suggestion. The first of these is the desirability of standardizing the work throughout the plant, and of giving accurate designations and complete definitions to every occupation in which men are engaged. This having been done, it naturally follows that proper wage rates can be fixed for each occupation, and the result will be simplicity and accuracy in the handling of wage payments. In classifying these occupations, the account to which each is chargeable should be shown, so as to facilitate and standardize the distribution of labor charges. Wherever practicable, it is desirable that all *operating* labor should be employed by the Operating Department, in the same way that materials are bought by the Purchasing Agent, leaving to the Accounting Department the one task of seeing that the company gets what it pays for, and that these payments are properly charged in the accounts. Changes in wage rates should be made by the Accounting Department only on authority of written instructions from the Operating Department, approved by the plant superintendent or higher authorities. These written instructions should be retained by the Accounting Department as its authority for making changes in the payroll, and it should be definitely understood by everybody concerned that unauthorized changes are absolutely prohibited.

The most important record in Labor Accounting is the payroll, as all other forms and records in this branch of the accounts are subordinate to it. Fig 1 illustrates a form of payroll sheet that has been found to be generally acceptable with concerns paying day rates, and figuring costs on a unit of a month's production. This sheet covers the payroll for half a month. It shows all necessary information regarding occupation and hours worked, provides spaces for the total hours, rate, total earnings, any deductions that may need to be made from the total earnings, such as de-

ductions for rent, supplies furnished, etc., and the net earnings of each man. The totals of the Net Earnings column on each set of payroll sheets will be the amount of cash that will have to be provided for the semimonthly payroll. It will be seen that the form here suggested provides for several changes of occupation per man per month, with corresponding changes in rates, if necessary. These extra faint lines are also of advantage in the case of an employee whose time it may be desirable to prorate to two or more accounts.


Time Footed_____ Ckd_____
Extended_____ Ckd_____
Audited_____

PORTLAND CEMENT CO.

PAY ROLL

Department Shale Quarry — For half month ending April 30 1912

Name	No.	Occupation	1 16	2 17	3 18	4 19	5 20	6 21	7 22	8 23	9 24	10 25	11 26	12 27	13 28	14 29	15 30	31	Total	Rate	Earnings	Acct.	DEDUCTIONS Items	DEDUCTIONS Amount	Net
1003																									
200		Loader	10	10	10	10	10	-	10	10	10								80	.20	16 00	1003			
3/1007 John Smith 1927		Asst. Driller										10	10	10	-	10	10		50	.22	11 00 / 2700	1001	Rent	10 00	17 00

Fig. 1.—Pay Roll Sheet.

These payroll records can be written up by hand, but a vast gain in time and accuracy will be made if one of the standard addressing machines is used for this purpose. Where these machines are used, a plate is made for each employee, on which are shown his name, number, occupation, wage rate, the account to which his occupation is charged, and the date of employment, or any other information that may be desirable. By means of suitable cut-out plates this one name plate may be used for writing up the payroll, timebooks, pay checks or envelopes, clock cards, or any other

employment records that may be desired. The important point is that, once the plate has been made and checked, errors in copying are absolutely eliminated. Whenever a man leaves the service, his plate should be destroyed, and when his rate or occupation is changed, the plate should be corrected or a new one made, and the old one destroyed. Fig. 1 has been filled out to show the payroll record of John Smith, loader in the shale quarry, for the half month ending April 30, 1912. His payroll number is 1927, and his wages are chargeable to Account 1003; his daily rate is $2.00 for ten hours' work, and he was employed March 10, 1907. On the twenty-fifth of the month he was promoted to the position of Assistant Driller, and his rate increased to 22 cents an hour. During the half month he earned $16.00, which is chargeable to Account 1003, and $11.00, which is chargeable to Account 1001. From his total earnings of $27.00 a deduction of $10.00 was made for rent, leaving a net balance of $17.00 cash due him. The typewritten figures on his record show that part which was written with the addressing machine. Beginning with the first of the following month, his plate will be changed to show him as an Assistant Driller, charged to Account 1001, and earning $2.20 a day.

There is no reason why this payroll form should not be used as a time-book as well as a payroll. The timekeepers can carry the book containing these leaves through the mill when checking up the force. If the time is kept by the foremen, they may be given covers in which to hold these sheets, in order to keep them from getting too badly soiled, and required to turn them in at the end of each half-month. On the other hand, if, for any reason, it is considered preferable to use separate timebooks, all the data required may be posted from them to the payroll sheet, as required. If the time records are kept by timekeepers or foremen, however, they should be carefully compared with the clock record, check sheet, or some other independent record of the time that the men start and stop work, in order to make sure that no one is being paid for time to which he is not entitled. In writing up these payroll sheets it is recommended that men whose labor is charged to the same account be kept on the same sheet as far as possible. This system of classification is advantageous in many ways, and will be found particularly useful in making the labor distributions to the cost accounts; as, when it is followed, it will simply be necessary to foot up the columns of each section of the payroll. A separate division should be kept for the mechanical labor employed in repairs and maintenance throughout the plant, and the total thereof distributed at the end of the month on a basis of figures obtained from work orders, a sample of which is also submitted. When wages are paid, the paymaster and some other independent witness should initial each item as evidence that the payment has been properly paid, or a column may be provided for the employee's signature and receipt.

PORTLAND CEMENT CO.

Ckd..... Order No.....

Posted..... Date.....

WORK ORDER for.....Dept. Charge % No.....

Work to be done:.....

.....

.....

Time wanted.....By.....
Foreman

See Mat'l Reqn. No..... Date.....

JOB RECORD

Work Done By	Time Started	Time Finished	Total Time		Rate	Charge	
			Hrs.	Min.			

Job O. K.

.....
Dept. Foreman

Approved:

.....
Master Mechanic

Fig. 2.—Work Order.

Fig. 2 shows a suggested form of work order which should be used whenever men are called from the shops to any department, and which may be used when regular operating employees are borrowed temporarily by some department other than the one in which they are regularly employed. A pad of these work orders should be supplied to each foreman, and should preferably be made up in carbon book form, such as is used for sales tickets, etc., so that the foreman may keep a carbon copy of his order. When something happens in a department, requiring the services of a mechanic, the foreman should issue a work order covering the job, and it should be understood throughout the mill that no mechanical labor will be performed unless ordered on this form. Jobs originating in the shop should be handled on work orders made out by the master mechanic or shop foreman.

When the master mechanic is ready to assign men to the job called for by any work order, he may list in the proper spaces the names or numbers of the men by whom the work is to be done, and the time that he sent them from the shop to do it. The order should then be handed to the man, or the leader of the crew, to whom the work has been assigned, and the men sent to the place where the work is to be done. When it is finished, the O. K. of the foreman is obtained on the order and the men return to the shop. Upon their return the time that they get back is noted in the column headed Time Finished. The order may then be approved by the master mechanic and turned in to the office, where the total time worked on the job and the proper charge for that time may be figured. Then the number of the account to which the job is to be charged should be inserted, if it has not already been done, the calculations checked, and the time posted on the sheet used in distributing the mechanical payroll. After this is done, the work orders may go to the superintendent for his information before being filed. At the end of the month the mechanical payroll will have been charged with all wages and salaries carried thereon. The total time accounted for by the work orders of the month will constitute a credit to apply against this charge. After this, any balance that remains may be charged direct to shop expense. This system is not the acme of refinement in cost accounting, but it has, at least, the merit of simplicity. The cross-reference on the work order to the material requisitions applying on the same job will be of assistance in preparing detailed job costs when they are called for.

At the end of each pay period the amounts chargeable to each of the accounts are drawn off on the distribution sheets, and the payroll for the month journalized, as shown in Fig. 3. This journal voucher will credit the Unpaid Payroll Account and debit the various labor accounts with the total earnings of the mill employees for the month, a part of which earnings, the total of the Net Earnings column, will be paid in cash, and the balance, the total of the Deduction column, offset by deductions to be made

from wages as noted on the payroll sheets. These deductions will be taken into account by a journal voucher debiting Unpaid Payrolls and crediting rentals, stores, or other accounts to which credit is due. Then the charges for the repair jobs, etc., covered by the work orders for the month, are

PORTLAND CEMENT CO.

JOURNAL VOUCHER. NO._____

_____ 191____

Sundries		
To		
Unpaid Payrolls		
Labor Distribution for Month of.....		
Quarry No. 1 a/c	101	
	102	
Quarry No. 2	201	
	202	
Raw Grinding Dept.	301	
	302	
Coal Grinding Dept.	401	
	402	
Clinker Burning	501	
	502	
Clinker Grinding	601	
	602	
Power Light & Water		
Laboratory Expense		
Stable Expense		
Mtce. & Track Expense		
Mill Office Expense		
Packing and Loading	701	
	702	
Mechanical Roll		
Store a/c		

[Fig. 3.—Wage Voucher.

drawn off on journal voucher Mechanical Payroll to Sundries, a sample of which is shown in Fig. 4. The posting of these two journal vouchers should effectually distribute all labor charges for the month. On the journal voucher distributing the mechanical payroll the hours of labor charged to

each account are entered, as well as the cost of the labor, thereby affording a convenient basis for the distribution of shop expense.

PORTLAND CEMENT CO.

JOURNAL VOUCHER. NO._____

_____ 191____

		Sundries											
		To											
		Mechanical Pay Roll											
		Distribution of Mechanical Pay Roll											
		for Month of											
		Quarry No. 1 a/c	102										
		Quarry No. 2	202										
		Raw Grinding Dept.	302										
		Coal Grinding Dept.	402										
		Clinker Burning	502										
		Clinker Grinding	602										
		Laboratory Exp.											
		Shop Exp.											
		Stable Exp.											
		Power, Light & Water											
		Mtce. & Track Exp											
		Mill Office Expense											
		Packing and Loading	702										
		Balance Shop Expense											

Fig. 4.—Mechanical Payroll Voucher.

It will be noted that the wage charges shown in Fig. 3 are offset by a credit to an account entitled Unpaid Payrolls. This account shows the

company's liability to employees for wages due. It should be carried on the General Ledger, and charged from the cash book with all cash disbursed for wages. Contingencies are likely to arise which will make it impossible to pay out all wages that have been earned, in which case the regular payroll should not be kept open for too long a time. All such items should be transferred to a Remainder Roll, and the regular payroll closed and filed. Then, if after the expiration of a reasonable time, the wages are still uncalled for, they may be transferred from the Unpaid Payroll Account to the credit of a special Profit and Loss Account or the Contingent Reserve, as policy may dictate. Frequent analyses should be made of the Unpaid Payroll balance, in order to guard against carelessness or fraud; and the Remainder Roll should be the subject of constant, careful scrutiny.

VI

Material Accounts

The various classes of material over which the Accounting Department must exercise supervision are:

Operating supplies and repair parts.
Fuel and gypsum.
Packages.
Raw materials.
Clinker and cement.

Each type of material demands individual handling in the accounts, but all require the same, or possibly more careful, watching than is demanded by cash. It is true that cash, when misappropriated, is more negotiable and may be disposed of more readily; but other, and more important, considerations depend on the faithful maintenance of careful and accurate inventories of materials and supplies. If the inventories are not carefully kept and accurately rendered, cost sheets, profit and loss statements, and balance sheets will be incorrectly stated; and false figures are worse than useless—they are dangerous.

The accountant must do more than merely make correct entries of the figures that are furnished him. The cash entries that he makes are meaningless unless the material is accounted for as well as the money. As an illustration may be mentioned a case where the inventory accounts of a certain company showed $800 worth of gypsum on hand. The material records, kept by the superintendent, showed that the gypsum stock at that time amounted to only ten tons—in other words, that company was carrying ten tons of gypsum on its books at a price of $80 per ton. If the

inventory accounts had contained debit and credit columns for tons of gypsum, as well as for dollars and cents, the discrepancy would have become apparent at the time the error was made, and the books would have been made to tell the exact truth regarding this detail of the company's affairs. It is not sufficient, however, to post debits and credits in the Material columns as well as in the Money columns. The balances in these Material columns must be verified by physical inventory, regularly and faithfully taken by a representative of the Accounting Department. Details of the verification of these balances in the different divisions will be discussed later.

Methods and systems of purchasing materials and supplies will not be considered in very much detail in this place. Conditions vary so widely that there would be scant use in attempting to outline a standard system or organization for handling the purchasing. There are, however, some essentials that must be given constant attention, regardless of the personnel of the Purchasing Department or the system used in making and checking purchases. These might be outlined as follows:

1. No purchase amounting to more than a purely nominal sum shall be made without the approval of some official of standing in the company, in addition to that of the official who regularly does the buying. It should be understood, however, that, in case of a breakdown, where no spare part is at hand, the superintendent, chief accounting officer, or even the senior foreman may make such purchases as will enable the plant to resume operation, such purchases being confirmed by the regular buying official or officials at the earliest possible moment. In cases of this kind, however, stringent inquiry should be made as to why the needed spare part was not in stock.

2. Receipt of material covered by each invoice must be proved by actual count, weight, or other measurement. If the full quantity and quality called for by the purchase order or invoice is not received in good condition, this fact must be noted on the face of the invoice; and where the loss or damage is apparently chargeable to the railroad, immediate steps must be taken to secure proper notations on freight bills and such other data as may be necessary to back up a claim against the shipper or the railroad.

3. It is strictly the duty of the Accounting Department to see that invoices are paid within the discount period when possible, and that all precautions outlined in the two preceding paragraphs are observed strictly and without fail. The Accounting Department shall certify all invoices to the Treasury Department for payment and, in so doing, throw all possible safeguards around the payment of invoices to insure that the company gets full value for all the money that it pays out, and to make fraud or the misappropriation of money or materials so difficult that no employee shall be tempted to go wrong.

4. The Accounting Department, having furnished a basis for sundry credits to Accounts Payable, must now debit the proper accounts with the exact quantity and value (F. O. B. the point where they are stored or consumed) of the materials for which payment has been authorized.

Operating Supplies and Repair Parts

This caption, as indicated by its name, embraces all the small and numerous items of hardware, tools, lubricants, shafting, gears, and other supplies which must be carried in stock at all times in order to insure constant and regular operation of the plant. These stocks cannot be allowed to fall too low, for, if they should, great annoyance would result and possibly the plant would be shut down for the lack of a few dollars' worth of castings or other supplies. On the other hand, too large a supply must not be carried; for, if this is done, a large part of the company's capital will be tied up in an unnecessary and profitless investment. Therefore, these stores must be watched very carefully. Card records, comprising a card for each item in stock, should be maintained, and the movements of the various items in stock watched and studied until a safe estimate can be made of the safe minimum and the safe maximum quantity of each item that can be carried.

A sample of the card that is recommended for this purpose is shown in Fig. 5. The columns on the left-hand side are used for setting down all the details in connection with each order for the material covered by the card in question. There are also columns for the quantity used monthly and a blank-head column for use in adjusting overages or shortages, or for other miscellaneous purposes. On the right-hand side are two sets of columns in which the issue of stores may be recorded. The columnar features of the right-hand side of this card should be printed on both sides, and numerous other variations may be made, as required by local conditions; but some sort of detailed stores record *must be kept* if accurate statements are to be obtained of the company's manufacturing costs and liquid assets.

This card record may be regarded as a sub-ledger, the controlling account of which may be kept in the General Ledger or in the Plant Ledger, as may be most convenient. On either of these ledgers, Stores will be debited at the end of each month with all store materials for which a credit has been set up to Accounts Payable during the month. In the same way, only currently, as the bills are passed, debit entries will be made on the left-hand sides of the proper cards. This process will be reversed in the case of credits for stores issued, so that the controlling account on the General or Plant Ledger should at all times be in balance with the total of the balances carried on the store Stock Cards, while these balances should, in turn, be represented by material on hand in the storehouse or material yards.

STORE STOCK CARD

DESCRIPTION _____

COMMODITY No. _____

CLASS _____ UNIT _____

FLOOR _____ SEC. _____ BIN _____

MIN. _____ MAX. _____

Quantity Ordered	Date 191__	Order No.	Rec'd	Date 191__	Price	Used Mo.		Date 191__	Rec'd	Issued	Balance	Date 191__	Rec'd	Issued	Balance

Fig. 5.

Practically every cement plant has its form of requisition, which is used in drawing material from the store, and it should be very clearly understood that only a few people be authorized to sign these requisitions, and that the storekeeper should recognize signatures from none others. During the day the storekeeper may occupy himself, at odd moments, by posting in the Issued Column the material issued on any requisition, and if some of that material should be returned to him it should be entered in the Received Column, on the left-hand side of the card, leaving the right-hand side and back of the card entirely free for records of disbursements. When these requisition slips have been noted by the superintendent (as he will undoubtedly desire to see what is going on throughout the plant), they should be sent to the chief clerk, who should see that a correct entry has been made on each slip of the number of the account to which the material delivered on the slip should be charged. When scrap or unused store material is returned to the store, it must be credited to the account to which it was originally charged, and charged back to stores, this process being the reverse of the process of issuing stores.

The slips, having all been posted on the record cards and numbered with the proper account numbers, should be sorted out by the various accounts that they charge, and then all slips chargeable to each account should be posted to the proper column of a distribution sheet—a wide sheet ruled with many columns, which may be used for accumulating the total charges to the various accounts in the Manufacturing Ledger during the month.

Fuel and Gypsum

Materials of this kind are received in carload lots, so the best way to keep track of them is in what is generally called a "car book." In one of these car books, which we will call the "Inbound" book, a record is kept of each loaded car that comes into the plant. It shows, in proper columns, the date and hour car is received, the car initial and number, the shipper and point of origin, the contents of the car, the expense bill number, the expense bill weight, the plant scale weight, gross tare, and net, if there is a scale at the plant; and also shows the number of the draft or voucher on which the freight was paid, the amount of freight paid, and also the same information regarding the invoice covering the material; then the date, hour, and place that the car was unloaded, the account to be charged with the material, and the amount charged, including freight. The inclusion of the hour and minute that cars are received from and returned to the railroad may be highly necessary in straightening out demurrage disputes. Coal may be unloaded into sheds, stock piles, or directly into hoppers, from which it will be dried and pulverized; while gypsum will undoubtedly be unloaded into the gypsum storage. In either of these cases care must be taken that the coal or gypsum be accurately weighed, when possible, as it passes from

storage into the process of manufacture, and that it is all carefully and accurately accounted for. The various movements of cars, from the time of receipt until they are unloaded, will be recorded on switching tickets—and these will serve as a basis for verifying all unloading reports.

Packages

This is a subject that will be discussed in further detail in another chapter.

Raw Materials

We are now coming to materials that are generally produced and not purchased; therefore, the principles of cost accounting begin to apply, in order to determine—first, the manufacturing cost of this part of the product; second, the asset values of piles of raw materials that have been quarried, but which have not yet been put into manufacture, and in our Manufacturing Ledger we must have pages or accounts to which all the labor and supplies used shall be charged, as outlined in the Card of Accounts. If the accounts of the company are handled as outlined in the earlier part of this book, there will also be proportions of laboratory expense, stable expense, etc., to be charged into the Raw Material accounts. Finally, the rock accounts, for instance, will show the number of tons of rock produced during the month, and the cost of producing them. This tonnage of rock will be charged to the current month's cost of raw grinding, provided all rock produced was consumed. If more rock was produced than was consumed, the excess rock will naturally go into the rock storage; and, on the other hand, if the consumption of raw rock is in excess of the production, such excess will be drawn from the rock storage. Measure up the pile of rock remaining on hand at the end of each month, and see whether the number of tons of rock on hand are equivalent to the balance shown in the book. If they are, the month's production and consumption of limestone will have been accounted for. This process of verifying all production and consumption should be followed every month and in all departments.

There are, of course, some little snags to be encountered in the raw material accounting, such as, for instance, rock that has been shot down, but which has not yet been transported to the stock pile. Cases of this kind should be handled exclusively on their own merits, and local conditions should be allowed to govern.

Clinker and Cement

It is generally preferred to keep the manufacture of clinker distinct and separate from the manufacture of cement, and there is a general inclination to split the manufacture of clinker between raw grinding and burning. As far as the Accounting Department is concerned, any one of these proc-

esses may be taken as representative of the others, in that each process takes raw or semifinished material from the previous one and delivers it to the next process. Thus, for instance, the Cement Grinding Department takes the clinker from the kilns at the clinker value, which has already been determined through the medium of the clinker cost sheet. In addition to this charge for clinker the cement grinding cost would comprise a charge for all labor employed in the department, and for all gypsum and other material, both repair and operating, and its proper proportion of whatever expense was necessary for the plant to undergo before it could transform clinker into cement, and deliver the cement into the stockhouse bins. As a result, the company will have acquired a certain number of barrels of cement, which will have cost it a certain figure that can be worked out to the cost per barrel, but the cost per barrel so obtained will not be worth very much until to it have been added some of the items to be treated of in the next chapter. At present all we have is a rather incomplete "cost in bins" of our cement.

In the mean time, however, and before leaving this subject, there are one or two minor points that should be considered. First is the relation which each department bears to the other of buyer and seller. The Stores Department buys from outside people and sells to everybody in the plant. The quarry buys the rock as it lies in the ground and adds to this cost the cost of labor and expense, which enables it to sell the rock to the Raw Grinding Department; the Raw Grinding Department takes the stone that it buys, and, after preparing it for burning, sells it to the Clinker Department, and so on. In order to record these various transactions the various departments must have daily reports, showing how much they have bought and how much they have sold. These reports will serve as the basis for certain bookkeeping entries, and these entries must be checked up and verified by physical measurement of the material on hand at the end of the month, before reports are accepted as correct.

VII

Plant Overhead and Indirect Expense

The handling of general plant expense and the expenses of service departments has already been indicated in Chapter III, under the subject of Card of Accounts, so we have practically outlined a program of the expenses, etc., which should be charged to general plant expense and the expenses of other service departments, and have also suggested a method whereby the various expenses chargeable to these various accounts might be distributed among the main producing accounts. So far, however, we have treated only the direct expense, leaving the items of indirect expense

still to be considered. First of all, in the interests of a generally good understanding, let us try to understand the distinction between direct expense and indirect expense. For the purpose of the present discussion, I would like to ask that direct expense be defined as expense that the company has already incurred concurrently with the production of its product; while indirect expense be considered as expense that is not yet incurred, and which may not fall due until some remote and indefinite time in the future, but which, nevertheless, we will have to pay some day, as, for instance, taxes. A cement company cannot make cement without paying taxes on its plant and real estate; nevertheless, it pays these taxes only once a year. Now it would be manifestly unfair to load costs of the day, or even the month, in which the whole year's taxes are paid, with that tremendous burden of taxes. We know with reasonable fairness what the amount of these taxes will be for the year and when we will have to pay them. Therefore we must charge into our Manufacturing Ledger, at the close of each month, one-twelfth of the taxes that we will have to pay for the year, and credit Reserve for Accrued Taxes.

In the same way a charge to the Manufacturing Ledger and a credit to Reserve for Insurance should be made if the terms of the insurance policy warrant it, or it may so happen that we are required to pay our insurance in advance, in which case the insurance payment may be carried among the assets as a Deferred Charge to Operation, one-twelfth of it being written off to the Manufacturing Ledger at the end of each month.

The land that we bought for quarry purposes is not going to last forever. Every ton of rock taken out of the quarry diminishes its value to a certain extent, and when the quarry has been exhausted and is still carried on the books of the company as an asset, something suspicious is in the wind, to say the least. As a matter of fact, when a man buys a quarry, containing on an estimate 100,000 tons of rock, and has paid for it $1000, he has bought that rock at a cent a ton F. O. B. in the ground, and that cost of the rock in the ground is just as much a part of his rock cost as is the expense of blasting it out and hoisting it up to the crushers. Therefore, either in the raw material costs, or in the costs that we propose to add to our "cost in the bins," must be added that one cent a ton, which in turn will be credited to the Reserve for Extinguishment of Wasting Assets.

Then there is another point to be considered. The machinery and buildings that go to make up the plant are not as young as they used to be. Some day one of the buildings is going to become so weak that it will have to be dismantled and replaced with a new building. Some day somebody is going to invent an apparatus for burning which will so cut the cost of burning clinker that no one can afford to use such a costly implement as the present kiln. We will have to buy that fancy new burner or go out of business. Then we will regret that we have dished out all our earnings

in dividends, instead of making a provision for obsolescence of the kilns and other machinery. We don't know when the depreciation of the building or the obsolescence of the kilns is going to come, but we certainly know that it is our duty to protect our stockholders against the wasting of their interest in our company by paying dividends without making provision against the day when the physical assets of the company are *passé*, and there is not a cent in the treasury that can be legitimately used to renew them. Therefore, before we close our Manufacturing Ledger let us charge Manufacturing Expense and credit Reserve for Depreciation and Obsolescence with a reasonable sum per barrel. Montgomery suggests that the depreciation provision be based on every ton or barrel of output produced, while provision for obsolescence be set aside from profits in excess of the sum required to pay the regular dividends. However, I do not believe that there is any serious objection among many accountants to carrying a lump reserve for the two, and raising that reserve from costs.

There is still another reserve, the amount of which may be determined from actual experience in the plant, and that is the Reserve for Contingencies. "Accidents will happen," nobody knows when or how, but we all do know that in a manufacturing plant they are likely to be costly. Now the cement made in a month when one of these accidents occurs is not any more valuable, nor is it likely to be sold for any higher price, than the cement produced under normal conditions, in spite of the fact that the accident has made it cost us much more. Therefore, we may safely and consistently charge to our manufacturing costs each month a sufficient sum per barrel to take care of all the accidents or other contingencies we have decided to charge against our Contingent Reserve, and to credit this amount, in turn, to the Contingent Reserve. It should be remembered that this reserve is not a jack-pot account. If it has been decided that only mill accidents and losses shall be charged to the Contingent Reserve, it is unfair to the plant and distorts the cost figures to charge in a loss sustained, perhaps, by an accident occurring in the city warehouse.

VIII

The Cost Sheet and Monthly Closing

At the end of the month, when all the materials have been credited to the inventory accounts and charged to the manufacturing accounts, when the reserve accounts and the subsidiary accounts, such as power, general plant expense, etc., have been charged into the cost of manufacture, the first thing to do is to make sure that the Manufacturing Ledger is in balance with the account by which it is controlled. Then let us take, first of all,

one of the sets of raw material accounts and draw off a trial balance of it. The figures on that trial balance will represent the details of the cost of producing that raw material. Divide each item and the total by the total tons of raw material produced during the month, and the result will be the detailed cost per ton of that raw material. The same process may be followed with the other raw materials, and, at the end, you can write back from the manufacturing accounts to the inventory accounts the costs of raw materials produced.

Now, certain raw materials have been taken from the general stock and used in turning out, say, ground raw material. We may credit inventory and charge the raw grinding account with the tonnage of raw materials so used. The raw grinding accounts will have been already written up so that nothing remains but to pull off a trial balance of the ground raw material accounts. This trial balance, treated in the same way as the trial balances of the raw material accounts, will give the detailed cost of ground raw material. The same general process may be made to apply to the burning of clinker, drying and grinding of coal, and to the grinding of clinker into cement, and with each process we get a cost sheet that will show, itemized and in detail, the various elements of cost per ton or per barrel of the product of that department. It is to be recommended that the compilation of the various costs proceeds on the theory that this month's product is consumed this month; that is to say, if we grind 100,000 barrels of clinker this month, but produce 125,000 barrels, we will charge our costs with the 100,000 barrels of the clinker produced this month, and let the remaining 25,000 barrels be charged to our clinker inventory, where its cost will be merged with the cost of the clinker already in inventory. The same rule will apply in the case of the raw materials, but it probably will not apply with any degree of propriety to pulverized fuel or to the ground raw materials. These commodities are generally produced simultaneously with their consumption. This rule will also fail to apply to cement itself. The selling price of cement is based on all the cement that is produced. Therefore it is well to carry the finished cement at a running inventory price. It is also well to debit each inventory account with the full number of barrels and the full cost of the commodity produced each month, and to credit the accounts with the full quantity and cost of material consumed, as this will make the Inventory Ledger a complete running record of production and consumption in all departments.

The manner of handling the manufacturing accounts that has been outlined above is markedly different from that followed by a great many cement companies. The general tendency in the cement business seems to be to handle the cost accounts on about the same basis as a mercantile institution would handle its accounts; that is to say, there is a manufacturing account that is charged at the beginning of the year with the in-

ventory of all merchandise on hand, whether cement, clinker, rock, coal, stores, or what not. It is then charged with all purchases made and expenses incurred during the year, and credited with all the year's sales. A physical inventory is taken at the end of the year, which is also credited to the manufacturing account, leaving a balance which is assumed to be the year's profit. This method of cost accounting does not give anything beyond estimated cost accounts every month. Profit and loss statements and balance sheets, drawn off at intervals during the year, are based more or less on an estimate, unless physical inventories are taken at these periods, a process that would be almost impossible. We take the liberty, therefore, of recommending the above method of accounting, whereby everything received is thrown into inventory and everything disbursed credited to inventory and charged to a proper manufacturing inventory or profit and loss account. It can readily be seen that by the method outlined above the cost accounts of a cement company may be kept accurately, and accurate monthly cost sheets, as well as other statements of production and consumption, obtained automatically, as a result of the actual labor and store distributions and the record of materials produced, received, and consumed.

IX

Commercial Costs and Profit and Loss

So far, our Cost Accounts have covered only the cost of manufacturing our cement and storing it in the bins. Now, we cease to be manufacturers and become merchants, with our merchandise in our warehouses, ready to be sold and delivered to the railroads for transportation to our customers. This work of packing and loading is the one function which the plant still has to discharge; and we will treat of it later, when we come to the general consideration of the Profit and Loss Statement.

It is true that the Administrative and Selling Departments exert a powerful influence on the operation of the Plant; but it is also unquestionably the best practice to keep Administrative and Selling Expense entirely separate and distinct from the items that we have already considered as Manufacturing Costs. For instance, the Administrative Department will be in control, and in possession, regardless of what the Sales Department or the Plant may be doing; while the Sales Department, in turn, may be active and busy although the Plant may be completely idle. In other words, the General Office, and everything they do, may justly be considered from the mercantile point of view; and their cost of doing business—the Commercial Cost of the Company's product, as it were—should be worked out to a unit cost per barrel *shipped.*

Administrative and Selling Expense are likely to amount to considerable sums during the course of a year and large amounts of money may be saved or wasted, depending on the way in which these items are handled. It will be found well worth while to work out a card of accounts covering this part of the Company's expenditures, the basis thereof being, as in the case of our Manufacturing Accounts, the one fundamental question, "What do we want to know?"

Then, there are certain items which enter into the Company's cost of doing business in another way, that is to say, its financial expense. At some time or other, the Company might have found that it had not enough capital with which to do business. Money would have to be raised, by means of notes, bonds or other financial devices, before the resumption of active business would be possible. Then, if the Company would remain solvent, the interest on these loans would have to be earned by operations—in other words, the cost of doing business on insufficient capital—and sometimes the cost of getting the Company back on its feet financially—are, for the time being, just as much a part of the cost of doing business as Administrative Expense or any other expense item.

Two or three other items of a purely mercantile nature must be taken into consideration before the Commercial Cost of our cement is complete. Sales Adjustments and certain claims and allowances are bound to occur. Provision must be made to take care of outstanding cloth sacks, which we have contracted to count, inspect, clean and, if necessary, repair when they are returned to us. And, finally, some of the cement that we sell is never going to be paid for, so we must set up a Reserve for Bad Accounts. Then, when all these various and sundry items have been added up, we will have the Commercial Cost of our product—the *minimum* cost at which the cement must be sold unless we are content to lose money on it.

The Profit and Loss Statement is always a very interesting document, but it can be so arranged as to make it even more interesting with a little care in its arrangement. Purely by way of a suggestion, a sample of such a Profit and Loss Exhibit is shown below:

PORTLAND CEMENT CO.

Profit and Loss Statement for Month

and_____Months Ending_____

Gross Sales (total invoice value of all cement sold)
LESS Freight Paid on Cement Shipped
LESS *Value of Packages used in Shipments*
BALANCE: Commercial Mill Net Price of Cement Sold
LESS Allowances and Sales Adjustments
LESS Provision for Handling Returned Sacks
LESS *Provision for Bad Accounts*

BALANCE: Actual Net Price of Cement Sold
Bin Cost of Number of Barrels of Cement Sold
PLUS *Cost of Packing and Loading*
TOTAL: *Cost on Cars of Cement Sold*
DIFFERENCE BETWEEN "ACTUAL NET PRICE" AND "COST ON CARS": Gross Profit on Cement Sold
LESS *Administrative and Selling Expense*
BALANCE: Net Profits from Operation
PLUS Profit or Loss on Barrels and Paper Bags
PLUS *Sundry Items of Miscellaneous Income*
TOTAL: Gross Profits from Operation
LESS *Sundry Items of Financial Loss or Plus Financial Income (Itemized)*
BALANCE: Net Profit or Loss for Period

X

Package Accounting*

As we all know to our sorrow, cement is still generally shipped for domestic consumption in two styles of package: the non-returnable paper bag and the returnable cloth sack. The non-returnable paper bag presents very few problems, the only serious one being that of breakage; but since cement is sold at the purchaser's risk of breakage, it is very seldom that we need to consider it. We buy our empty paper bags for whatever we have to pay; we fill them and sell them for 2½ cents apiece, take up the profit or loss on them, and the transaction is finished. An item of a few dollars appears on our profit and loss statement as "Profit and Loss on Paper Bags"—that is all there is to it.

In the case of cloth sacks, however, matters are different. These sacks, which generally cost when new slightly under ten cents each, are sold, when filled with cement, at ten cents each. The price quoted for a barrel of cement includes forty cents for the four cloth sacks. The stipulation is made that the sacks must be paid for with the cement; and the cement manufacturer agrees, in his contract of sale, to repurchase at ten cents each from the purchaser of the cement such of the cloth sacks as may be returned in fit condition for further use. It is also stipulated that the customer must pay the freight on the returned empties, and that the cement manufacturer's count and inspection shall be final in determining which sacks shall be repurchased.

Certain other conditions arise in practice which must be provided for. The sack end of the cement business is a fertile field for disputes between manufacturers and their customers, and it is sometimes imperative that arbitrary allowances be made. These allowances fall into three classes:

*Reprinted from the Journal of Accounting of March, 1915.

First: Allowances that the cement manufacturer makes as an accommodation to his customers, as for instance, if a customer returns a thousand sacks, of which nine hundred and ninety-nine are available for further use. It might be considered expedient and reasonable to pay the customer for the full thousand sacks, although only nine hundred and ninety-nine could be taken into inventory.

Second: Allowances made under obligation, as, for example, in cases where a shipment of cement gets to a customer with some of the sacks torn. In cases of this kind, the manufacturer, in order to protect delivery of his product in good condition, may find it necessary to allow the customer credit for the damaged sacks, although they may be quite unfit for further service.

Third: Forced allowances representing small uncollectible sack balances on the sales ledgers. These balances arise directly from sack disputes. They are not sufficiently large to justify any great trouble or expense to secure their collection, so the wise thing to do is to charge them off. At the same time, since they are distinct and separate from regular commercial transactions in cement, and arise entirely in connection with the package end of the business, it is desirable that they be given recognition in the package accounts rather than to charge them off to bad accounts.

Needless to say, it is to be expected that all these allowances will be held down to an absolute minimum.

The operating end of the question also must be considered. The labor of receiving, counting, inspecting, cleaning and mending the returned second-hand sacks, in order to put them into the same condition of availability for further use as new sacks, is quite an important detail in the operation of a cement plant. It is necessary that properly defined cost accounts be set to cover this work. Finally, there is the question to consider of certain inventory deficits which result from the accidental acceptance of sacks that prove to be unfit for further use, from regular inventory shortages, and the disposition to be made in the accounts of sacks of the company's brand which are received without means of identifying the shipper, and of unclaimed sacks of foreign brands. Foreign sacks, unless reclaimed by the customers who inadvertently sent them in, are generally exchanged between cement manufacturers, an arbitrary price of five cents each for all good and repairable sacks being set as a basis for the exchange.

It is essential from every standpoint of accounting and administration that the package accounts be kept separate and distinct from all the regular operating and income accounts of a cement company; and when the principles underlying the package accounts are analyzed, the necessity of this method of handling becomes even more obvious. The fundamental principles to consider in designing a system of package accounts are as follows:

1. When a barrel of cement in cloth sacks is sold, the transaction is not complete with the delivery and invoicing of the cement to the customer. There still remains to be discharged a vital and essential part of the contract of sale, to wit, that when the customer returns the empty cloth sacks the cement company will perform all the work necessary to count and inspect these sacks and refit the great majority of them for further use, paying the customer ten cents each for such sacks as have been returned in condition for further service.

2. When a cement manufacturer puts into service and sells for ten cents a sack that has cost him, say, eight cents, the profit of two cents has not been earned forthwith. The sale has been made subject to the obligation to repurchase the sack for ten cents if returned in good condition; and the profit has not been earned until the sack has been finally sold for ten cents—that is to say, until it is sent out on its last trip. The sack may make one trip before being put out of commission or it may make twenty trips, so this point alone is well worth careful study.

3. The price of new cloth sacks varies widely from time to time, depending on the fluctuations of the cotton market. These sacks once put into service lose their identity absolutely, and there is no practical way of distinguishing the sack that cost seven cents new from the sack that cost nine cents. Therefore, second-hand cloth sacks must be inventoried at some arbitrary figure. The question of depreciation does not need to be considered, because it is an established principle in the cement industry that the wear and tear on cloth sacks shall be finally borne by the consumer of the cement. It has been found most convenient in practice to inventory the second-hand sacks at ten cents each—the price at which they have been repurchased from customers and the price at which they will be resold. This constitutes an inventory inflation to the extent of the difference between ten cents a sack and the price at which the sacks were purchased when new; but this inventory inflation need not be inconsistent with the principles of conservative accounting if, on the other side of the balance sheet, a liability is set up to cover the inflation on the sacks so inventoried.

In our consideration of the first of these problems, we may begin by laying down the proposition that when a barrel of cement is sold in cloth, the actual net profit cannot be stated until provision has been made for discharging the contractual obligation that exists to perform certain work in connection with the returned empty sacks. We may go further and say that this provision must go to the extent of comprehending a proper proportion of all the various losses and expenses to which the manufacturer has subjected himself by consenting to ship his product in a returnable package. Therefore, the first thing to do is to ascertain, from past experience, the relation between the sum total of all these losses and expenses and the number of barrels shipped in returnable cloth sacks—to figure out, in

other words, the cost per barrel shipped in cloth of doing all the things that are necessary in handling the returned second-hand sacks and putting them back on the same basis as brand-new sacks. When this figure has been worked out, profit and loss may be charged, and a "provision for handling returned cloth sacks" credited each month with a sufficient sum to provide for the subsequent handling of all the cloth sacks which are likely to be returned from the month's shipments. By prorating each year's sack expense against each year's shipments in cloth for a number of years, a fair average figure may be obtained which will equalize variations in yearly sack handling costs and in the percentage of sacks which fail to come back each year; and this figure will form the basis for a conservative estimate of the sack handling losses and expense per barrel to be shipped in the future.

Against the provision for handling returned cloth sacks may be charged:

A. The cost of receiving, cleaning, counting, inspecting, mending and warehousing returned sacks.
(This information should be analyzed and itemized in regular cost sheet form, and unit costs per thousand sacks shown.)

B. Inventory value of sacks which have been accepted, but which prove to be worthless when the attempt is made to repair them or to refill them with cement.

C. Inventory shortages and deficits disclosed by physical inventories.

D. Cost of handling and disposing of accumulations of worthless and foreign sacks.

E. Cost of return tags, instructions for bundling, and shipping, and other material furnished customers to assist them in returning empty sacks properly and safely.

F. Arbitrary allowances made, in issuing credits, purely as an accommodation to customers and for the purpose of retaining their good will.

G. Arbitrary allowances on sack credits, made under obligation.

H. Forced sack allowances.

I. Freight on sack shipments which is justly chargeable to customers, but which has not been deducted from their credits.

As an offset to these charges, the following items of miscellaneous income, arising directly out of returnable package transactions, may be credited to the provision account:

J. Proceeds of sales of unclaimed foreign sacks to the cement manufacturers whose brands they bear.

K. Inventory adjustments, resulting from the purchase, from other cement manufacturers, of sacks of the company's brand, which sacks are purchased, at, say, five cents each, but are inventoried, with other second-hand sacks, at ten cents each.

Sacks of the company's own brand which are received without tags or other means of identifying the shipper, either by railroad records or otherwise, should be held in a liability account to the credit of unknown sack shippers, until it is evident that they will never be claimed. They may then be credited to the reserve for handling under caption K, or to a special sub-account, as may be desired. The same general plan should be followed in the case of sacks received from parties with whom no contract to repurchase exists. Such parties frequently acquire their sacks from rather questionable sources, and are not prone to reclaim them when they find they cannot realize on them.

A monthly statement, exhibiting these various charges and credits in detail, together with the credit by provision raised from profit and loss, will give the executives of a cement company an excellent review of the manner in which the returnable package end of their business is being conducted. More minute analyses may be made if desired and cumulative figures for the current year, or comparative figures for previous years, will also be found to be of value. The statement will serve as a detailed analysis of the balance that is shown to the credit of provision for handling returned cloth sacks on the balance sheet; and, if supplemented with statistics regarding the number of good, repairable, worthless and foreign sacks received and the number of new and second-hand sacks shipped, will give a thorough bird's-eye view of the work of the sack department. The personal element enters so largely into both the work of inspecting sacks and passing credit for them that no very detailed control or audit can be exercised; therefore a review of this kind is most necessary.

The next question to be considered is the disposition to be made of the profit that is taken up when a new sack is put into service. This profit will not be earned until the sack dies—until it has made its final trip and will never be returned to the manufacturer again. As has already been explained, the sacks lose their identity when once put into service and no one knows how long any sack is going to last. A sack may be totally destroyed on the first trip it makes; and, on the other hand, I know of a certain lot of sacks that have been in more or less active service for nearly fifteen years and which are still hale and hearty. Therefore, the only practical angle from which to consider this problem is that of the average life of a cloth sack. People who have studied the question agree that a cloth cement sack makes, on an average, seven or eight trips before it dies, and that its average life is two years. In view of these facts, is it not reasonable and sufficiently conservative to credit the difference between cost and selling price of new sacks, as they are put into service, to a reserve account entitled, "Unearned profits on cloth sacks," carry this difference in that reserve for two years and then take it into profit and loss as "Earned profits on cloth sacks?"

Theoretically, the balance to the credit of the provision for handling returned cloth sacks should at all times be sufficient to pay for the expense of taking back into inventory all the outstanding cloth sacks which are likely to come back, while the balance in the unearned profits on cloth sacks account should be equal to the difference between cost and selling price on all second-hand cloth sacks that are either in inventory or likely to be returned to inventory. These are pretty hard conditions with which to comply, however, especially in the case of a going concern which has been in business for a long time, so some practical solution of these questions must be sought. My accounting experience embraces the handling of several hundred million cement sacks, both inbound and outbound, and I have studied the question from every point of view, but I will frankly confess that I have no idea how many sacks of my company's brand are in existence and likely to come back to us. There is no way of telling, because there is no way of knowing how many of the sacks have been destroyed or diverted to other uses. Therefore, I believe that a happy medium between theory and practice may be struck, and the interests of conservatism sufficiently considered, if we approach the problem from another angle.

When a cement company sells a sack of cement, the sack is not lent—it is sold. It becomes the property of the purchaser, to be disposed of as he pleases. That part of the company's accounts receivable which is made up of charges for sacks is essentially no different from the part that is made up of charges for cement or for freight. The sacks have passed out of the ownership of the cement company and beyond its control. True, the obligation to repurchase the sack, if it is returned in good condition, still remains; but when it becomes operative the cement company simply acquires an asset which it requires in the regular conduct of its business and which it can sell at the same price, ten cents, that it pays for it. Therefore, as long as a cement company is established as a going concern, and is not obligated to conduct its accounts on a liquidation basis, is it not justified in ignoring certain intangible and contingent liabilities represented by sacks outstanding in the hands of customers?

I believe that, in practice, the balance in the provision for handling returned sacks account should be sufficient to pay for the cost of completing the handling of all the sacks on hand at the time of closing the accounts, but that otherwise it will be sufficient to raise each year only a sufficient provision to pay for the handling of the sacks received in that year. The balance to the credit of unearned profits on cloth sacks should at all times be sufficient, at least, to offset the difference between ten cents and a fair approximation of what the sacks cost when new, on all second-hand sacks carried in inventory at ten cents each; and any excess over this amount that stands to the credit of the reserve may be justly regarded as a gratuitous tribute to the cause of conservative accounting.